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Copperwood Estates – Block 73 1100 Spoor Street Servicing and Stormwater Management Report

Copperwood Flats
Block 73
City of Ottawa
Servicing and Stormwater Management Report

Prepared By:

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April 8, 2026
Novatech File: 125113
Ref: R-2026-028

April 08, 2026

City of Ottawa
Planning, Infrastructure and Economic Development Department
Planning and Infrastructure Approvals Branch
110 Laurier Avenue West, 4th Floor
Ottawa ON, K1P 1J1

Attention: Sean Moore, MCIP, RPP – Manager, Development Review West
Reference: Copperwood Estates – Block 73
Servicing and Stormwater Management Report
Our File No.: 125113

Please find enclosed the 'Servicing and Stormwater Management Report' for the above noted development located in the City of Ottawa. This report is being submitted in support of the site plan application for the proposed development.

Should you have any questions or require additional information, please contact the undersigned.

Yours truly,

NOVATECH



Anthony Mestwarp, P. Eng.
Project Manager, Land Development

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1.0 INTRODUCTION

Novatech has been retained to prepare a Servicing and Stormwater Management Report for the proposed site plan located within the City of Ottawa. The proposed site is denoted as Block 73 within 1053, 1075 and 1145 March Road Copperwood Estates Subdivision and is located at the corner of Spoor Street and Buckbean Avenue. The legal plan is included within **Appendix A** for reference. The purpose of this report is to support the site plan application for the subject development. **Figure 1** Key Plan shows the site location.

1.1 Existing Conditions

The subject site is approximately 0.92 hectares (ha.) in size and is denoted as Block 73 of the Copperwood Estates Subdivision. Presently the site consists of vacant and undeveloped land.

The site is bound by rue Spoor Street to the East, Buckbean Avenue to the north, Dandelion Mews to the west, and Shirley's Brook Northwest branch tributary 2 to the south. **Figure 2** shows the existing site conditions.

The Copperwood Estates subdivision development was designed by Novatech and information is provided in the following report:

- '1053, 1075 and 1145 March Road Copperwood Estate - Detailed Site Servicing and Stormwater Management Report (Phase 1) By Novatech dated May 19th, 2023 – 4th Submission' (Referenced as **Copperwood Estates Report**).

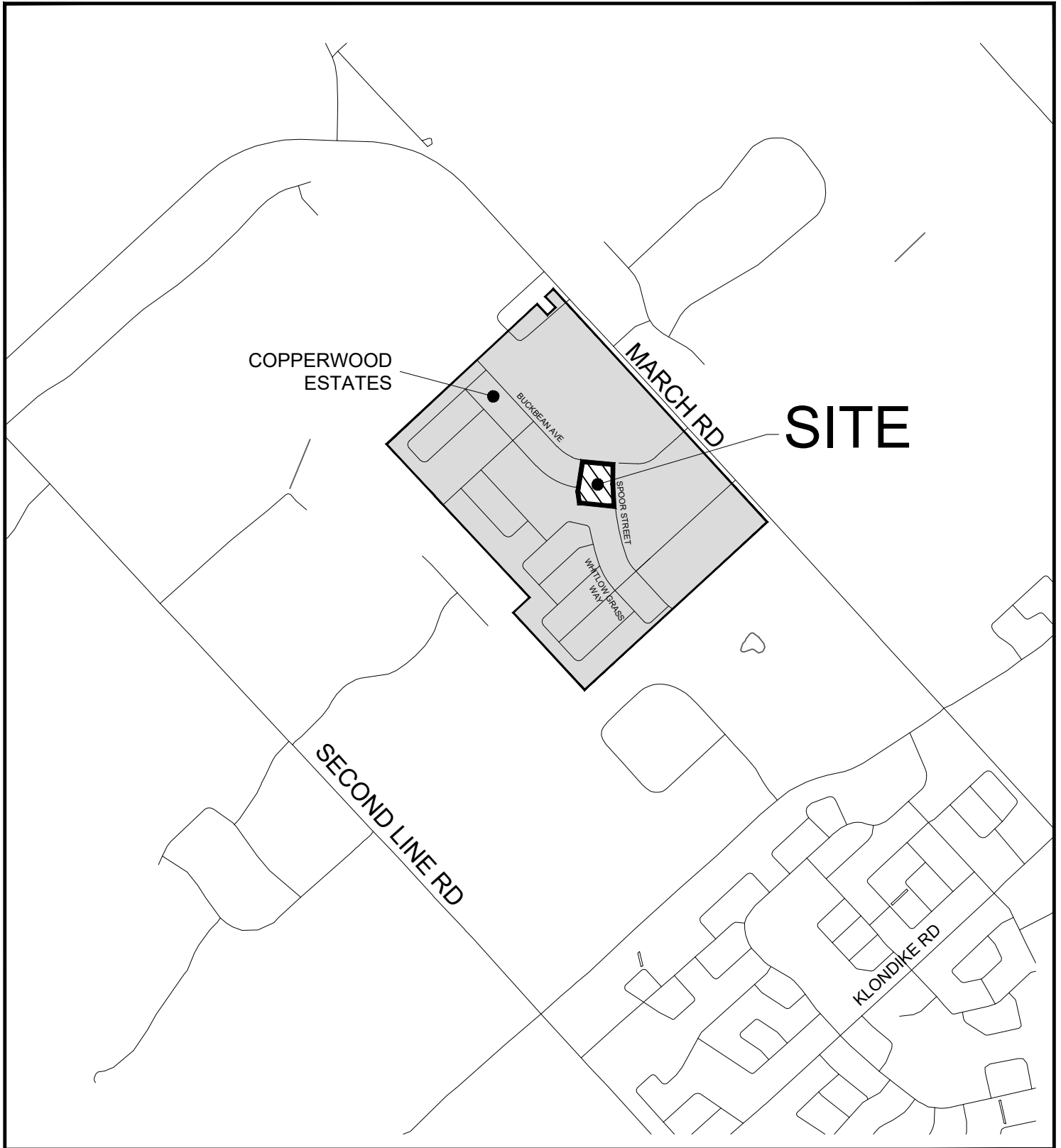
1.2 Proposed Development

The proposed development consists of five (5) residential buildings with above-ground parking. Each building will accommodate twelve (12) dwelling units, resulting in a total of sixty (60) units on the site. Each building has an individual footprint of approximately 420 m². Vehicular access to the site will be provided via Rue Spoor Street and Buckbean Avenue, with pedestrian access also provided from both streets and the walkway adjacent the Shirley's Brook Tributary 2. **Figure 3** shows the concept plan for the proposed development.

2.0 GEOTECHNICAL INVESTIGATION

A geotechnical investigation was completed for the Block 73 development, and a report prepared entitled 'Geotechnical Investigation, Proposed Residential Building Development, 1100 Spoor Street (Copperwood-Block 73), Ottawa Ontario prepared by Paterson Group Inc. dated March 5, 2026 (PG4258-3)'. The following is a summary of the findings of the report:

- The field program for the current geotechnical investigation was conducted on February 19, 2026.
- Practical refusal was encountered in all the test hole locations at depths ranging from 0.7 to 1.4 m.
- Based on available geological mapping and refusal to auguring /excavation, the bedrock in the subject area consists of sandstone and dolomite of the March Formation, with an overburden thickness of 1 to 2 m.



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CITY OF OTTAWA
 1100 SPOOR STREET (BLOCK 73)

KEY PLAN

SCALE N.T.S

DATE MAR 2026

JOB 125113

FIGURE FIGURE 1

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LEGEND

--- SITE BOUNDARY

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CITY OF OTTAWA
1100 SPOOR STREET (BLOCK 73)

EXISTING CONDITIONS

SCALE 1 : 500
0 5m 10m 20m

DATE MAR 2026 JOB 125113 FIGURE FIGURE 2

- Generally, the bedrock quality is very poor within the upper 3.0 m and improves to good quality at greater depths, based on the RQD values.
- Based on groundwater levels measured in the monitoring well from our previous site investigation, the long-term groundwater table is estimated to be about 1.5 to 2.5 m below the existing ground surface.
- Overbreak is expected to occur throughout the lowest lifts of blasting due to the variable bedding planes and planes of weakness in the in-situ bedrock. It is very difficult to mitigate significant over-blasting given the constraints posed by footing geometry and spacing with respect to the zone of influence of blasts and the bedrocks in-situ characteristics.
- Overbreak below footings should be in-filled with lean-concrete and approved by Paterson prior to placing concrete.
- Under the current regulations enacted by the Ministry of Environment, Conservation and Parks (MECP), any dewatering in excess of 50,000 L/day requires a registration on the Environmental Activity and Sector Registry (EASR), provided that dewatering is related to construction. If the dewatering is not related to construction, a Permit to Take Water obtained from the MECP will be required.
- In the event that an EASR is required to facilitate dewatering of the proposed development, a minimum of 3 to 4 weeks should be allotted for completion of the EASR registration and the Water Taking and Discharge Plan, to be prepared by a Qualified Person as stipulated under O.Reg. 63/16. Should a Permit to Take Water be required, a minimum of 5 to 6 months should be allotted for completion of the permit, due to the minimum review period imposed by the MECP

3.0 WATER SERVICING

There are existing City watermains in all rights-of-way fronting the proposed site. There is an existing 300mm PVC diameter (dia.) watermain within Rue Spoor Street, and a 300mm PVC dia. watermain within Buckbean Avenue.

It is proposed to service the development with a private 200mm diameter watermain which will connect to the existing 300mm diameter watermain in both rue Spoor Street and Buckbean Avenue. The site will be serviced internally with 38mm services to water entry rooms of each building. Each 38mm service will supply three (3) apartment units resulting in four (4) services per building to serve a total of twelve (12) units per building. Refer to the General Plan of Services drawing (125113-GP) for servicing details.

3.1 Watermain Design Parameters

Water demands have been calculated using criteria from Section 4 of the City of Ottawa Water Distribution Guidelines, and ISTB-2021-03 as follows:

Table 3.1: Watermain Design Parameters and Criteria

Domestic Demand Design Parameters	Design Parameters								
Unit Population: 2 Bed Apartments/ Stacked Towns	2.1 people/unit*								
Basic Day Residential Demand (BSDY)	280 L/c/d								
Maximum Day Demand (MXDY)	Residential: 2.5 x Basic Day (> 500 Persons) MOE Table 3-3 (<500 Persons) Commercial: 1.5 x Basic Day								
Peak Hour Demand (PKHR)	Residential: 2.2 x Max Day (> 500 Persons) MOE Table 3-3 (<500 Persons) Commercial: 2.70 x Basic Day								
Fire Demand (FF) Design	Design Flows								
Stacked Townhomes Hydrant spacing	per FUS 2020, and ITSB-2018-02 Within 45m of the building Siamese								
System Pressure Criteria Design Parameters	Criteria								
Maximum Pressure (BSDY) Condition	< 80 psi occupied areas < 100 psi unoccupied areas								
Minimum Pressure (PKHR) Condition	> 40 psi								
Minimum Pressure (MXDY+FF) Condition	> 20 psi								
Friction Factors	<table border="0"> <tr> <td>Watermain Size</td> <td>C-Factor</td> </tr> <tr> <td>• 150mm</td> <td>100</td> </tr> <tr> <td>• 200-250 mm</td> <td>110</td> </tr> <tr> <td>• 300-400 mm</td> <td>120</td> </tr> </table>	Watermain Size	C-Factor	• 150mm	100	• 200-250 mm	110	• 300-400 mm	120
Watermain Size	C-Factor								
• 150mm	100								
• 200-250 mm	110								
• 300-400 mm	120								

*2.1 persons per unit utilized as stacked towns are all one storey with two bedrooms.

3.2 Fire Demand

The required fire demand was calculated using the Fire Underwriters Survey 2020 (FUS) Guidelines and City of Ottawa ITSB-2018-02. It is understood that the proposed building is residential occupancy (Limited Combustible) and is composed of Wood Frame construction. The building will have a footprint of **420m²**.

3.3 Water Demand

A summary of the water demand and fire flows are provided in **Table 3.2**.

Table 3.2: Domestic Water Demand Summary

Population	Ave. Daily Demand (L/s)	Max. Daily Demand (L/s)	Peak Hour Demand (L/s)	Fire Flow (L/s)
126	0.41	3.88	5.84	250

As per **ITSB 2021-03** the proposed development has greater than **50 units** and thus, will need to be serviced with two (2) services separated by an isolation valve. Therefore, it is proposed to service the site by connecting the site with a private watermain looping through the proposed site connection to both the existing watermains within Spoor Street and Buckbean Avenue.

Additionally, the required site fire flow will be provided by a proposed on-site private hydrant and the existing City owned fire hydrants within the surrounding rights-of-way. All existing hydrants within the vicinity of the development are blue top hydrants indicating a rating of Class AA. As per **ITSB 2018-02** the fire flow allowance from the existing hydrants was assumed to be as outlined in **Table 3.3**.

Table 3.3: Maximum Flow to be considered from a given hydrant.

Hydrant Class	Distance to building (m)	Contribution to Fire Flow	
		(L/min)	(L/s)
AA	≤75	5700	95
	>75 and ≥150	3800	63.33
A	≤75	3800	63.33
	>75 and ≥150	2850	47.50
B	≤75	1900	31.67
	>75 and ≥150	1500	25.00
C	≤75	800	13.33
	>75 and ≥150	800	13.33

With a calculated fire flow requirement of **250 L/s**, at least three (3) hydrants will be required to achieve the required flow. There are currently two (2) existing Class AA hydrants along Spoor Street fronting the site, and there is also an existing hydrant within Buckbean Avenue along the site frontage. Additionally, a private hydrant is proposed within the proposed parking area to provide additional hydrant coverage. Utilizing the existing and proposed hydrants the required fire flows can be met as outlined in **Table 3.3**. Refer to **Appendix B** for calculations and the Hydrant Coverage figures.

3.4 Water Boundary Conditions

The above water demand information was submitted to the City for boundary conditions from the City’s water model. The boundary conditions are summarized within **Table 3.4**:

Table 3.4: Water Boundary Conditions

Criteria	Head (m)
Connection 1 (Buckbean Avenue)	
Max HGL (Average Day)	130.2
Min HGL (Peak Hour)	125.2
Max Day + Fire Flow (267L/s)	105.9
Connection 2 (Spoor Street)	
Max HGL (Average Day)	130.2
Min HGL (Peak Hour)	125.2
Max Day + Fire Flow (267L/s)	107.1

Refer to **Appendix B** for the City boundary conditions, and correspondence.

3.5 System Pressure Modeling and Results

The above boundary conditions were used to create a hydraulic model using EPANET for analyzing the performance of the proposed watermain system for three theoretical conditions: 1) High Pressure check under Average Day conditions, 2) Peak Hour Demand, 3) Maximum Day + Fire Flow Demand. The following **Table 3.5** provides a summary of the results from the hydraulic water model.

Table 3.5: Water Boundary Conditions and Hydraulic Analysis Summary

Condition	Demand (L/s)	Min/Max Allowable Operating Pressures (psi)	Limits of Design Operating Pressures (psi)
High Pressure (Average Day)	0.41 L/s	80psi (Max)	60psi
Maximum Daily Demand and Fire Flow	253.88 L/s	20psi (Min)	24psi
Peak Hour	5.84 L/s	40psi (Min)	53psi

Based on the preceding analysis it can be concluded that the existing watermain system will provide adequate system pressures and flows to service the proposed development. Refer to **Appendix B** for detailed model results.

4.0 SANITARY SERVICING

There is an existing 375mm PVC diameter sanitary sewer within rue Spoor Street right-of-way, and a 200mm PVC diameter sanitary sewer within Buckbean Avenue that was installed as part of the **Copperwood Estates Subdivision**.

It is proposed to service the proposed development with a 200mm diameter private sanitary sewer. The proposed sewer will connect to an existing 1200mm diameter sanitary manhole within rue Spoor Street. The site will be serviced internally with 135mm services to water entry rooms at each building. Each 135mm sanitary service will serve three (3) apartment units resulting in four (4) services per building to serve a total of twelve (12) units per building.

4.1 Sanitary Design Parameters

Sanitary flows for the proposed development were calculated using criteria from Section 4 of the City of Ottawa Sewer Design Guidelines, ITSB-2018-01, and the Ontario Building Code as follows:

Table 4.1: Sanitary Sewer Design Parameters

Design Component	Design Parameter
Unit Population: 2 Bed Apartments/ Stacked Towns	2.1 people/unit*
Residential Flow Rate	280 L/cap/day
Residential Peaking Factor	Harmon Equation (min=2.0, max=4.0) Harmon Correction Factor = 0.8m (Design)
Extraneous Flow Rate	Design = 0.33 L/s/ha
Minimum Pipe Size	200mm (Res)
Minimum Velocity ¹	0.6 m/s
Maximum Velocity	3.0 m/s
Minimum Pipe Cover	2.0 m (Unless frost protection provided)

¹A minimum gradient of 0.65% is required for any initial sewer run with less than 10 residential connections.

*2.1 persons per unit utilized as stacked towns are all one storey with two bedrooms.

The peak sanitary flow including infiltration for the development was calculated to be **1.77 L/s**. Detailed sanitary flow calculations are provided in **Appendix C** for reference.

As noted previously, the detailed design of the **Copperwood Estates Subdivision** was completed by Novatech with details provided within the Report. The Subdivision design assumed that Block 125 & Block 73 (previously known as block 307 & 284 respectively) was to be a residential development area for a total assumed population of 232. The proposed block 73 will contain a population of 126 and the neighboring block 125 is proposed to contain a population of

76 for a total population of 199. Refer to **Appendix C** for the corresponding calculations for the overall subdivision and the neighboring site. The assumed population was higher than currently proposed, thus the existing infrastructure within the Copperwood Estates Subdivision has capacity to service the proposed development.

5.0 STORM SERVICING

There is a 1500mm concrete storm sewer located within Rue Spoor Street right-of-way fronting to the proposed development and a 900mm concrete storm sewer located within Buckbean Avenue right-of-way as a part of the **Copperwood Estates Subdivision**.

It is proposed to provide storm sewers within the development and connect to an existing storm manhole within rue Spoor Street. The proposed storm sewers will vary in size ranging from 250mm to 450mm in diameter. The site will be serviced internally with 100mm services to water entry rooms at each building. Each 100mm storm service will service the foundation drainage system of the proposed building. The proposed roof is peaked, and roof drainage will be directed to downspouts that will discharge to the surface.

The design criteria used in sizing the storm sewers are summarized below in **Table 5.1**.

Table 5.1: Storm Sewer Design Parameters

Parameter	Design Criteria
Local Roads	2 Year Return Period
Storm Sewer Design	Rational Method
IDF Rainfall Data	Ottawa Sewer Design Guidelines
Initial Time of Concentration (Tc)	10 min
Minimum Velocity	0.8 m/s
Maximum Velocity	3.0 m/s
Minimum Diameter	250 mm

Refer to **Appendix D** for detailed storm drainage area plans and storm sewer design sheets.

6.0 STORM DRAINAGE AND STORMWATER MANAGEMENT

The stormwater management strategy for the site is based on the established criteria from the City of Ottawa, and the **Copperwood Estates Subdivision Report**.

6.1 Design Criteria

Through correspondence with the City of Ottawa, the **Copperwood Estates Subdivision** Report and our knowledge of development requirements in the area, the following criteria have been adopted to control post-development stormwater discharge from the site:

- Control proposed development flows, up to and including the 100-year storm event, to an allowable release rate of **210L/s**
- Provide source controls which are in conformity with the City of Ottawa requirements, where possible;
- Limit ponding to 0.15 m for all rooftop storage areas and 0.30 m for all parking storage areas;
- Quality control will be provided by the downstream SWM pond associated with **Copperwood Estates Subdivision**.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

The approach to the stormwater management design is to determine the allowable release rate for the site, calculate the uncontrolled flow, and ensure that the remaining flow, in combination with the uncontrolled flow, does not exceed the allowable release rate. All proposed development runoff in excess of the allowable release rate, will be attenuated on-site prior to being released into the storm sewers within rue Spoor Street.

6.2 Quantity Control

The allowable release rate for the 0.92 ha catchment was calculated to be **196L/s** for the 5-year event and **210 L/s** for the 100-year based on the SWM criteria provided by the City of Ottawa, and the **Copperwood Estates Subdivision** Report. Excerpts from the report are included within **Appendix C** for reference.

Design Storms

The design storms are based on City of Ottawa design storms. Design storms were used for the 5, 100, and 100+20%-year return periods (i.e. storm events).

Model Parameters

Post-development catchments were analyzed utilizing the rational method based on the proposed site plan and grading as shown on **Drawing 122144-SWM** within **Appendix D**.

The site has been divided into eleven (11) drainage areas for the post development condition. The drainage areas are as follows:

Area A-01

- Runoff from the rear half of the Building 'E' roof and adjacent landscaped area will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be captured by a catch basin and landscape drain receiving runoff via a swale and conveyed by storm sewer without flow control.

Area A-02

- Runoff from the proposed parking area will be directed to the existing storm sewer on Rue Spoor Street. Flows will be collected at a catch basin and conveyed via storm sewer. Discharge will be controlled using an inlet control device (ICD), with surface storage provided within the parking area.

Area A-03, A-04, A-05, A-06

- Runoff from the proposed central parking area and stacked townhouse roofs will be conveyed to the existing municipal storm sewer on Rue Spoor Street. Runoff will be collected via catch basins and conveyed through a storm sewer system. Discharge will be regulated using an inlet control devices (ICD) within the individual catchbasins. Surface storage will be provided within the parking area to assist with flow attenuation.

Area A-07

- Runoff from the grassed area surrounding the proposed transformer will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be directed via swales to a catch basin and conveyed by storm sewer without flow control.

Area A-08

- Runoff from the stacked townhouse roofs and rear yard areas along the western townhouses will be conveyed to the existing storm sewer on Rue Spoor Street. Flows will be collected by catch basins and landscape drains receiving runoff via swales. Discharge will be controlled using an inlet control device (ICD).

Area D-01:

- The drainage along the South property line including the rear of the roofs from Buildings 'A' and 'B' and the adjacent landscaping will drain uncontrolled to Shirley's Brook Tributary 2.

Area D-02:

- Runoff from the northwestern frontage of the property adjacent to the existing switchgear will drain uncontrolled to the Dandelion Mews right-of-way, where it will be collected by the existing storm sewer system within the Copperwood Estates Subdivision.

Area D-03:

- Runoff from the northeastern frontage of the property adjacent to Building 'A' will drain uncontrolled to the Spoor Street right-of-way, where it will be collected by the existing storm sewer system within the Copperwood Estates Subdivision.

Table **6.1 below** summarizes the flow, storage required, and storage provided for each of the site drainage areas.

Table 6.1: Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device		Outlet Location	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			Max. Vol. Provided (cu.m.)
							Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	
D-01	0.114	0.55	0.58	N/A		Shirleys Brook	13.50	N/A	N/A	18.30	N/A	N/A	32.90	N/A	N/A	N/A
D-02	0.001	0.53	0.60	N/A		Dandelion Mews	0.20	N/A	N/A	0.20	N/A	N/A	0.40	N/A	N/A	N/A
D-03	0.010	0.37	0.60	N/A		Spoor Street	0.80	N/A	N/A	1.00	N/A	N/A	2.10	N/A	N/A	N/A
A-01 (CB 05)	0.087	0.48	0.76	N/A		Spoor Street	9.00	N/A	N/A	12.20	N/A	N/A	22.50	N/A	N/A	N/A
A-02 (CB 06)	0.063	0.73	0.64	Oriface Plate	83.00	Spoor Street	9.91	0.449	0.00	13.44	0.829	0.00	18.50	1.571	4.38	33.21
A-03 (CB 01)	0.152	0.72	0.74	Oriface Plate	94	Spoor Street	23.50	1.55	0.00	25.75	1.86	3.68	27.00	1.97	19.52	44.67
A-04 (CB 04)	0.041	0.77	0.85	LMF	105.00	Spoor Street	6.76	0.50	0.00	9.17	0.88	0.00	12.00	1.52	3.19	3.68
A-05 (CB 03)	0.116	0.80	0.86	Oriface Plate	102.00	Spoor Street	19.77	0.78	0.00	26.82	1.43	0.00	29.00	1.64	12.18	15.36
A-06 (CB 02)	0.171	0.77	0.83	Oriface Plate	108.00	Spoor Street	28.02	1.25	0.00	31.50	1.57	3.91	32.75	1.70	22.74	35.36
A-07 (CB 08)	0.023	0.47	0.50	N/A		Spoor Street	2.30	N/A	N/A	3.10	N/A	N/A	5.80	N/A	N/A	N/A
A-08 (CBMH 07)	0.143	0.54	0.58	Oriface Plate	94.00	Spoor Street	11.80	0.38	6.70	14.50	0.57	9.72	25.00	1.75	18.183	24.09
Post-Development Total	0.92	0.66	0.72				125.56		6.70	155.98		17.31	207.95		80.19	156.38
Total Allowable Release Rate										196.00			210.00			

Refer to **Appendix D** for Rational Method calculations and **Drawing SWM**-Stormwater Management Plan.

As per the above table the site flows will be restricted to a release rate of **207.95L/s**. This release rate meets the requirements noted within the **Copperwood Estates Subdivision Report**, and thus no additional quantity control measures are required.

6.2.1 Impacts to the Copperwood Subdivision System

The original design of the Copperwood Subdivision assumed that all flows from Block 73 would be controlled on site with no direct run-off to the surrounding rights-of-way or the adjacent tributary of Shirleys Brook. As outlined above the proposed development contains three (3) direct run-off areas. As such the model for the overall subdivision was updated to review the impacts on the overall system. There are no significant impacts to the system, and the overall system will continue to function as designed. A memo titled Copperwood Block 73 Medium Density Development Stormwater Impacts of Block 73 on Overall Subdivision Model (PCSWMM) was prepared and is included within **Appendix E** for reference.

6.3 Quality Control

Quality control will be provided by the existing downstream SWM Pond for the **Copperwood Estates Subdivision**.

6.4 Major Overland Flow Route

A major overland flow route will be provided for storms greater than the 100-year storm event. Stormwater will be directed to the surrounding rights-of-way, and the SWM Pond for the **Copperwood Estates subdivision**. The major overland system is shown on the Grading Plan (drawing 122144-GR).

7.0 EROSION AND SEDIMENT CONTROL

Temporary erosion and sediment control measures will be implemented on-site during construction in accordance with the Best Management Practices for Erosion and Sediment Control. This includes the following temporary measures:

- Filter socks (catchbasin inserts) will be placed in existing and proposed catchbasins and catchbasin manholes, and will remain in place until vegetation has been established and construction is completed;
- Silt fencing will be placed along the surrounding construction limits;
- Mud mats will be installed at the site entrances;
- The contractor will be required to perform regular street sweeping and cleaning as required, to suppress dust and to provide safe and clean roadways adjacent to the construction site;

Erosion and sediment control measures should be inspected daily and after every rain event to determine maintenance, repair or replacement requirements. Sediments or granulars that enter site sewers shall be removed immediately by the contractor. These measures will be implemented prior to the commencement of construction and maintained in good order until vegetation has been established. Refer to the Erosion and Sediment Control Plan (drawing 125113-ESC) for additional information.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Watermain

The analysis of the existing and proposed watermain network confirms the following:

- The proposed 200mm dia. private watermain which connects to the existing 300mm watermain within rue Spoor Street, and Buckbean Avenue can service the proposed development.
- There are adequate pressures in the existing watermain infrastructure to meet the required domestic demands for the development.
- There is adequate flow to service the proposed fire protections system.

Sanitary Servicing

The analysis of the existing and proposed sanitary system confirms the following:

- It is proposed to service the development with a proposed 200mm private sanitary sewer which will connect to the existing manhole within the rue Spoor Street right-of-way.
- It is anticipated there is adequate capacity within the existing sanitary infrastructure to service the development.

Stormwater Management

The following provides a summary of the storm sewer and stormwater management system:

- The proposed private storm sewer system is to connect to the storm sewers within in the rue Spoor Street right-of-way.
- Storm flows will be attenuated through the implementation of inlet control devices.
- As per existing conditions major overland flow routes have been provided to the surrounding rights-of-way.
- Quality control is provided by the existing downstream SWM facility.

Erosion and Sediment control

- Erosion and sediment control measures (i.e. filter fabric, catch basin inserts, silt fences, etc.) will be implemented prior to construction and are to remain in place until vegetation is established.

9.0 CLOSURE

The preceding report is respectfully submitted for review and approval. Please contact the undersigned should you have questions or require additional information.

NOVATECH

Prepared by:

Anjush

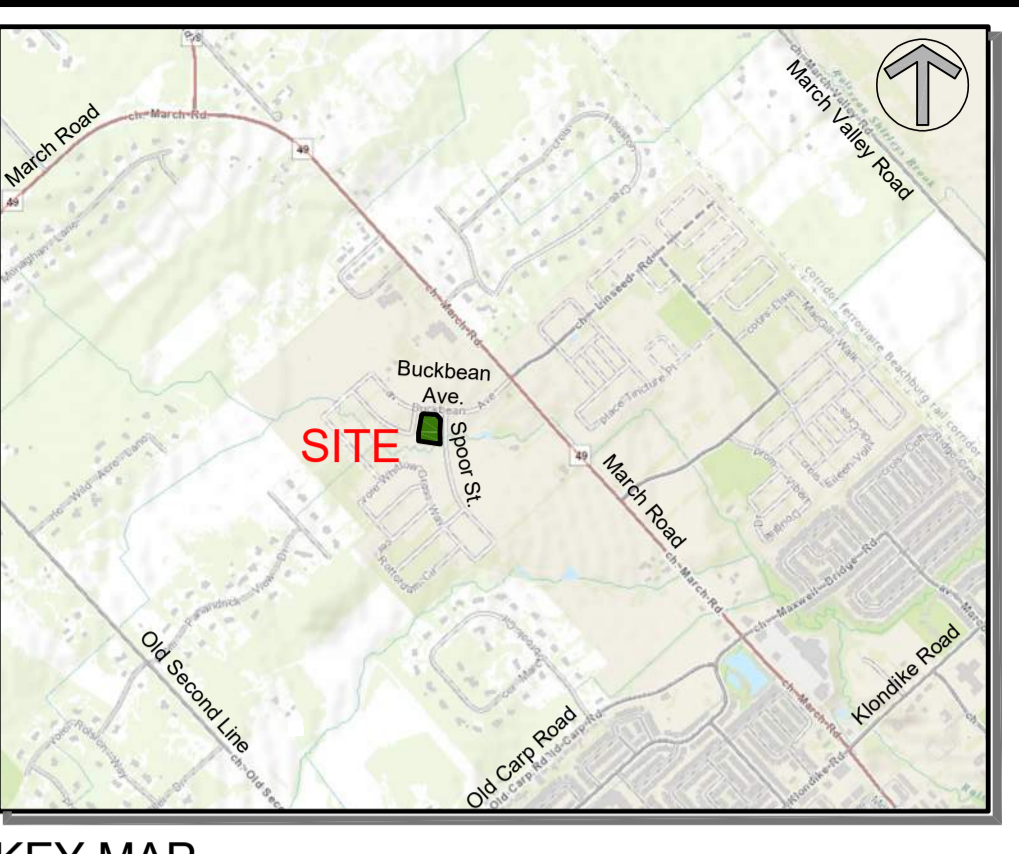
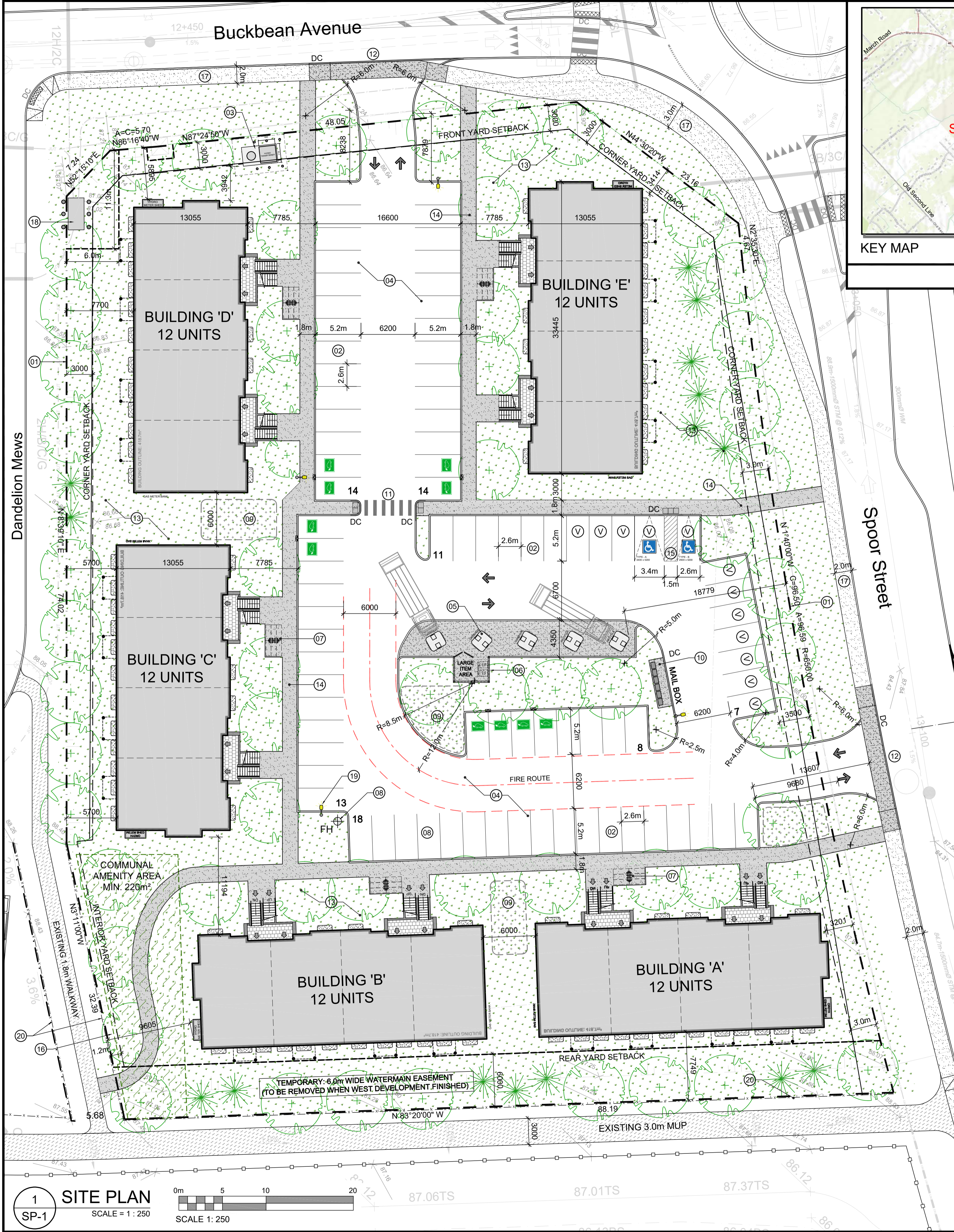
**Anjush Musyaju, EIT
Land Development Engineering**

Reviewed by:



**Anthony Mestwarp, P.Eng
Project Manager
Land Development Engineering**

Appendix A
Site Plan & Legal



PROJECT INFORMATION

Zoning By-law 2008-250 / 2026-50	R4Z / N4B	SITE AREA	0.9 ha, 9,219.4 m ² / 99,237 ft ²
ZONING	REQUIRED	PROVIDED	
ZONE: PLANNED UNIT DEVELOPMENT: STACKED STYLE TOWNHOUSE	R4Z / N4B	R4Z / N4B	
BUILDING HEIGHT	14.5m	9.3m	
MINIMUM LOT WIDTH	7.5m	53.8m	
MINIMUM LOT AREA	1,400 m ²	9,218 m ²	
FRONT YARD SETBACK: BUCKBEAN AVENUE	3.0m	5.8m	
CORNER YARD SETBACK: SPOOR STREET & DANDELION MEWS	3.0m	6.8m & 5.7m	
INTERIOR YARD SETBACK: PATHWAY	1.2m	9.6m	
REAR YARD SETBACK	6.0m	7.7m	
BUILDING SETBACK TO A PRIVATE WAY	1.8m	4.8m	
BUILDING SEPARATION (UNDER 14.5m HT.)	1.2m	6.0m	
AMENITY AREA - TOTAL 6.0m ² PER UNIT	360.0m ²	380.0m ²	
AMENITY AREA - 50% COMMUNAL PER UNIT	180.0m ²	220.0m ²	
VEHICLE PARKING - RESIDENTIAL - 1.2 PER UNIT	72	73	
VEHICLE PARKING - VISITOR - 0.2 PER UNIT	12	12	
BICYCLE PARKING - RESIDENTIAL - 0.5 PER UNIT	30	30	
aisle & DRIVEWAY MINIMUM / MAXIMUM WIDTH	6.0m / 6.7m	6.2m / 6.7m	
MINIMUM WIDTH OF LANDSCAPED AREA - ABUTTING A RESIDENTIAL ZONE	3.0m	9.6m	
MINIMUM WIDTH OF LANDSCAPED AREA - ABUTTING A STREET	3.5m	3.0m	
MINIMUM WIDTH OF LANDSCAPED AREA - AROUND A PARKING LOT	15%	26.5%	
MINIMUM LANDSCAPED AREA - IN A PLANNED UNIT DEVELOPMENT	25%	43.3%	
MINIMUM AGGREGATE SOFT LANDSCAPE AREA - 3.0m SETBACK & LOT WIDTH 12m+	40%	97.5%	

IT IS THE RESPONSIBILITY OF THE APPROPRIATE CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS ON SITE AND TO REPORT ALL ERRORS AND/OR OMISSIONS TO THE ARCHITECT.

ALL CONTRACTORS MUST COMPLY WITH ALL PERTINENT CODES AND BY-LAWS.

THIS DRAWING MAY NOT BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

DO NOT SCALE DRAWINGS.

PROJECT DEVELOPER
Claridge Homes
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E-Mail: marc.stpierre@claridgehomes.com
E-Mail: victoria.st.pierre@claridgehomes.com

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Email: g.Macdonald@novatech-eng.com

LANDSCAPE ARCHITECT
James B. Lennox & Associates Inc.
3332 Carling Ave.
Ottawa, Ontario, K2H 5A8
Tel: 613-722-5168
Email: ml@jbla.ca

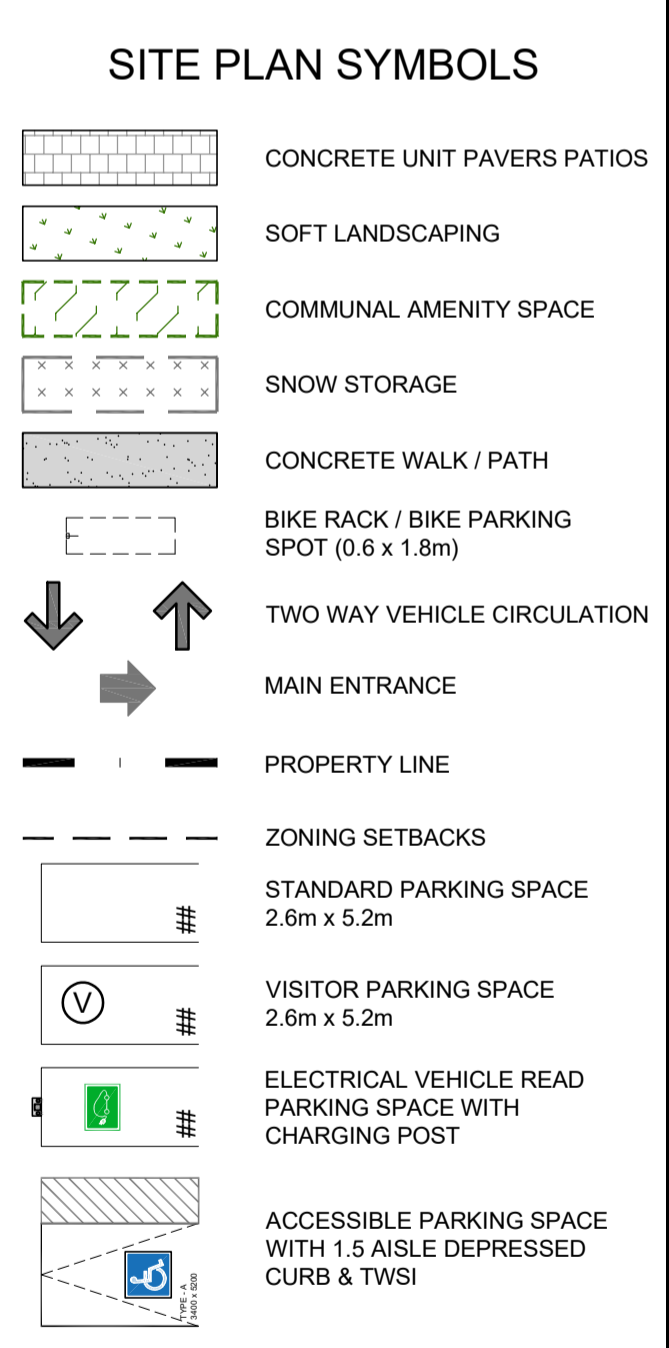
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Email: sdennis@patersongroup.ca

LEGAL DESCRIPTION
PRELIMINARY 4M-PLAN
BLOCK 73
Geographic Township of March
CITY OF OTTAWA
Surveyed by Annis, O'Sullivan, Vollebek Ltd.

SURVEYOR
Annis O'Sullivan Vollebek Ltd.
14 Concourse Gate, Suite 500,
Nepean, Ontario K2E 7S6
Tel: (613) 727-0850
E-Mail: TravisH@aovltd.com

- DRAWING NOTES**
- PROPERTY LINE
 - PARKING SPACE: STANDARD SIZE 2.6 x 5.2 METRES
 - PROPOSED HYDRO TRANSFORMER
 - ASPHALT DRIVING SURFACE
 - IN GROUND WASTE BINS
 - ORGANIC WASTE / OVER SIZED GARBAGE ENCLOSURE 2.0m HIGH OPAQUE SCREEN AROUND PERIMETER
 - BICYCLE PARKING SPACES 0.6m x 1.8m (6) WITH RACK
 - PROPOSED HYDRANT
 - SEASONAL SNOW STORAGE
 - CANADA POST MAIL BOXES ON CONCRETE SURFACE
 - 1.8m WIDE CONCRETE CROSSWALK PAINTED WITH TWSI
 - DEPRESSED STREET CURB & SIDEWALK, CONTINUOUS AND DEPRESSED @ DRIVEWAY
 - SOFT LANDSCAPED AREA, SEE LANDSCAPING
 - 1.8m WIDE CONCRETE WALK
 - ACCESSIBLE PARKING SPACE WITH ACCESS AISLE, DEPRESSED CURB AND TWSI
 - EXISTING CITY SIDEWALK, WIDTH VARIES
 - EXISTING HYDRO TRANSFORMER WITH EASEMENT
 - LIGHT POLE: LOCATION TO BE CONFIRMED BY ELEC.
 - EXISTING CHAIN LINK FENCE TO REMAIN, ALTER AS REQUIRED FOR NEW CONNECTION PATH



GROSS BUILDING - AREAS
(CITY OF OTTAWA'S DEFINITION)

PROPOSED BUILDING 'A'	1,256.0 m ²
PROPOSED BUILDING 'B'	1,256.0 m ²
PROPOSED BUILDING 'C'	1,256.0 m ²
PROPOSED BUILDING 'D'	1,256.0 m ²
PROPOSED BUILDING 'E'	1,256.0 m ²
TOTAL PROPOSED AREA	12,560.0 m²

UNIT STATISTICS

2 BEDROOM UNIT	60
----------------	----

CAR PARKING

REQUIRED by ZONING BY-LAW

RESIDENCE	- 1.2 PER UNIT	72
VISITOR	- 0.2 PER DWELLING UNIT	12
TOTAL		84

PROVIDED

RESIDENCE	- 1.2 PER UNIT	73
VISITOR	- 0.2 PER DWELLING UNIT	12
TOTAL		85

BICYCLE PARKING

REQUIRED LONG-TERM - 1.0 PER UNIT 30

PROVIDED 30

WASTE COLLECTION

GUIDELINES		
GARBAGE	- 0.231 YARDS ³ / UNIT	13.9 YARDS ³
RECYCLING (GMP)	- 0.018 YARDS ³ / UNIT	1.1 YARDS ³
RECYCLING (FIBRE)	- 0.062 YARDS ³ / UNIT	3.7 YARDS ³
ORGANICS	- 240L CONTAINER / 50 UNITS 1.2 x 240L	

	REQUIRED	PROVIDED
GARBAGE	3 EARTHBINS	3 EARTHBINS
RECYCLING (GMP)	1 EARTHBIN	1 EARTHBIN
RECYCLING (FIBRE)	1 EARTHBIN	1 EARTHBIN
ORGANICS	2 x 240L BINS	2 x 240L BINS
LARGE ITEM GARBAGE	N/A	5 m ² *EARTHBINS= (6.5 YARDS ³)

AMENITY REQUIREMENT

REQUIRED AMENITY SPACE

6.0 m ² PER UNIT =	360.0 m ²
50% COMMUNAL AMENITY AREA =	180.0 m ²

PROVIDED AMENITY SPACE

PRIVATE BALCONY / PATIOS =	160.0 m ²
COMMUNAL EXTERIOR AREA =	220.0 m ²
TOTAL =	380.0 m²

SITE COVERAGE

BUILDING FOOTPRINT =	22.7%	2,093.5 m ²
DRIVING SURFACE =	27.2%	2,509.3 m ²
LANDSCAPE AREA =	50.1%	4,616.6 m ²
TOTAL =	100.0%	9,219.4 m²
HARD SURFACE WALK AREA =	6.7%	621.0 m ²
SOFT LANDSCAPE AREA =	43.3%	3,995.6 m ²

ARCHITECT ASSOCIATION

ARCHITECTS

CLARIDGE HOMES

ARCHITECT: rla/architecture roderick lahey architect inc.

56 beach street, ottawa, ontario K1S 3J6
t. 613.724.9932 f. 613.724.1209 rla@architecture.ca

PROJECT TITLE: COPPERWOOD ESTATES

1100 SPOOR STREET
BLOCK 73: NORTH KANATA

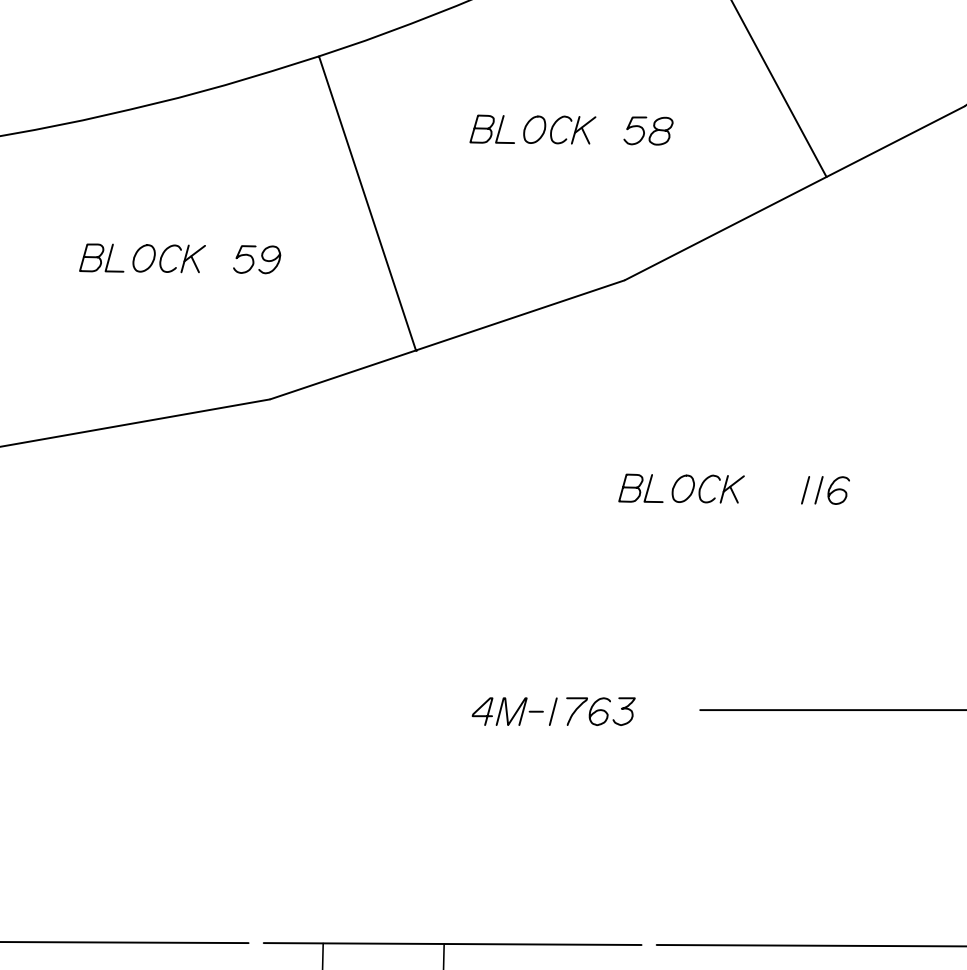
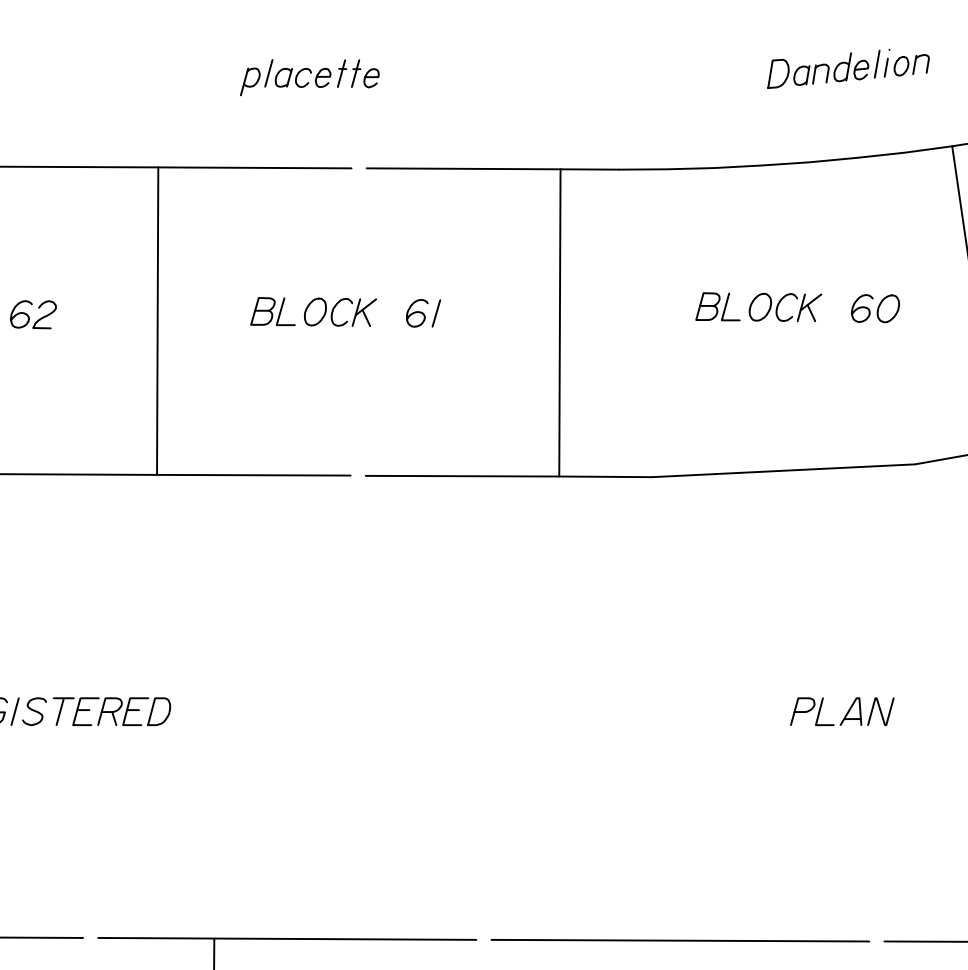
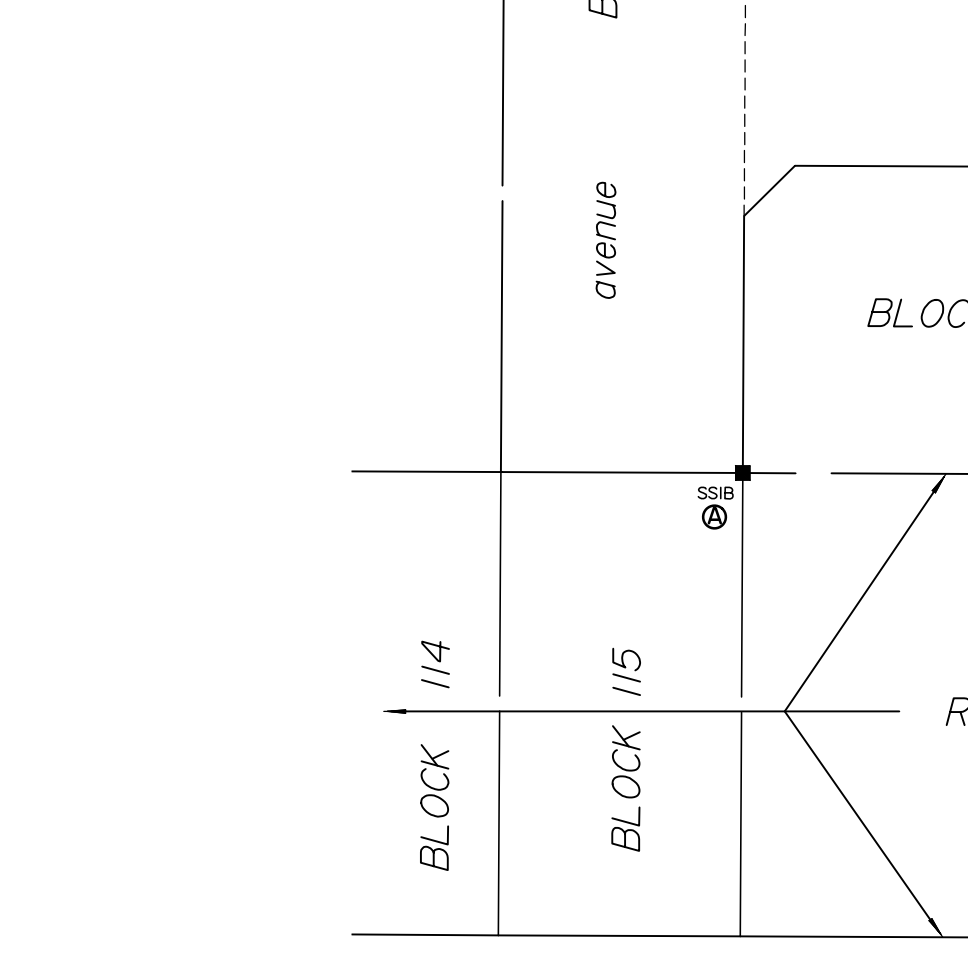
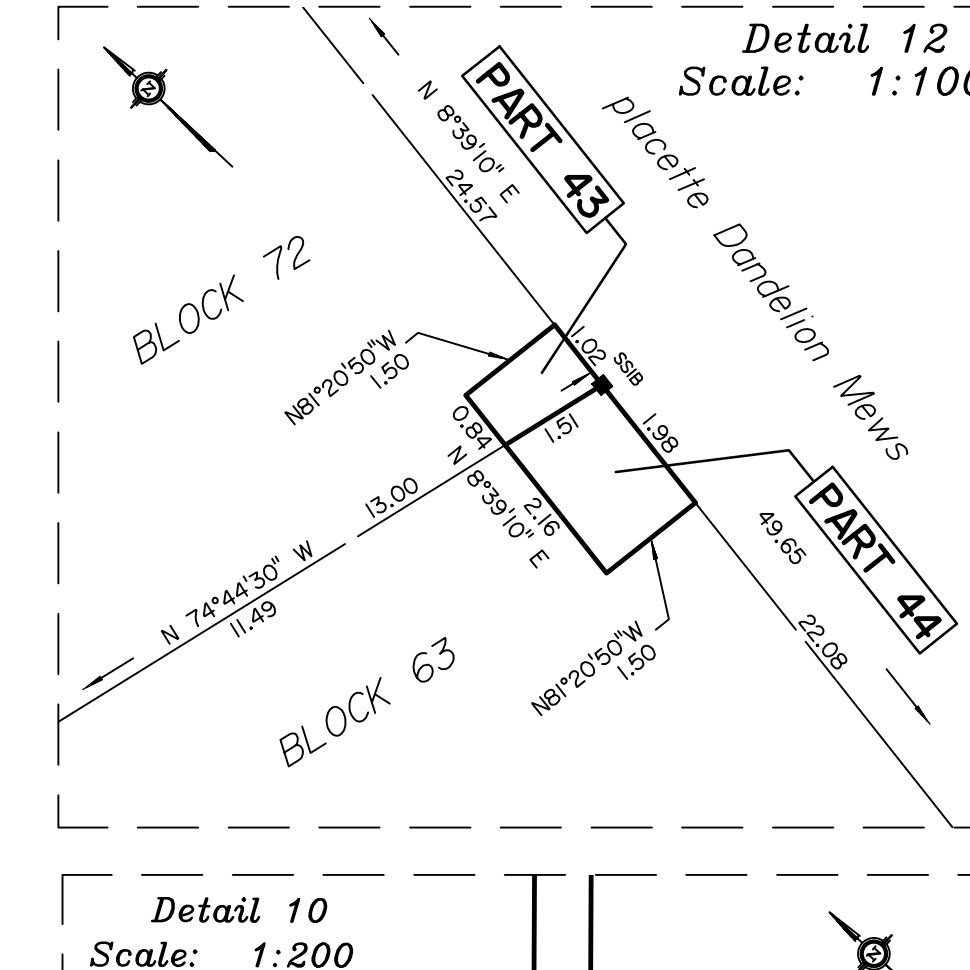
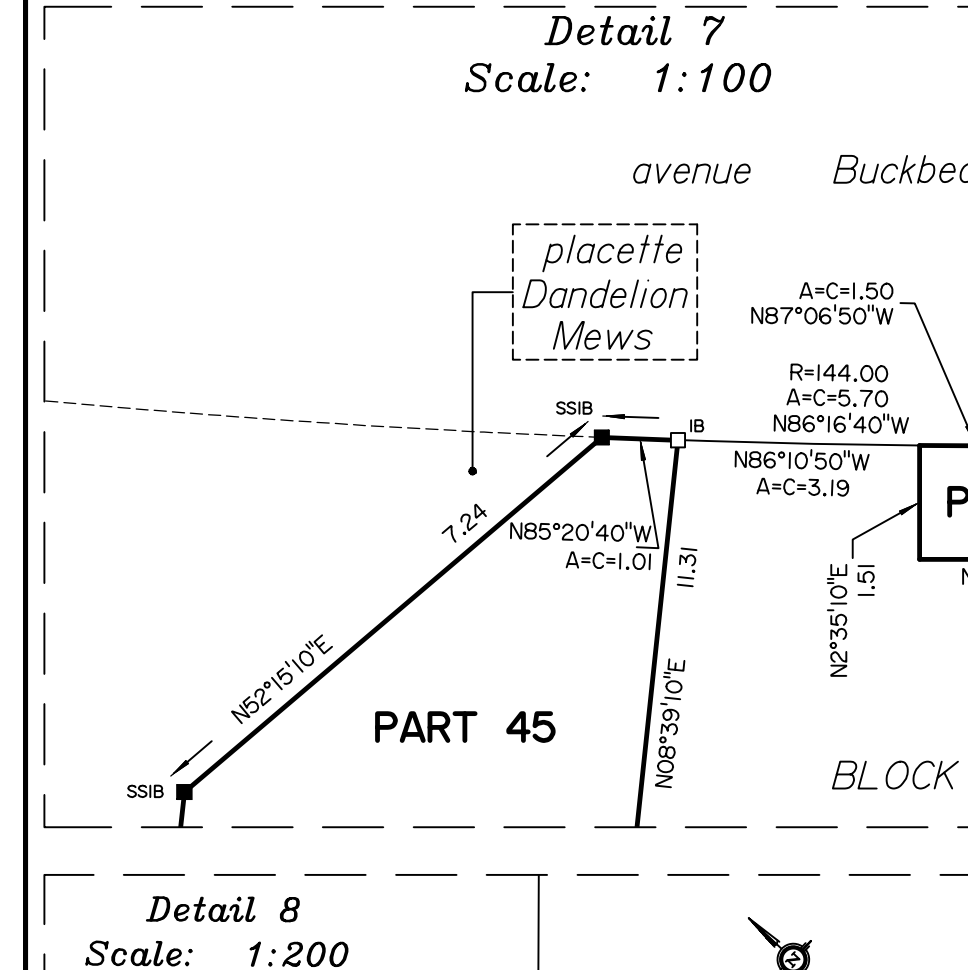
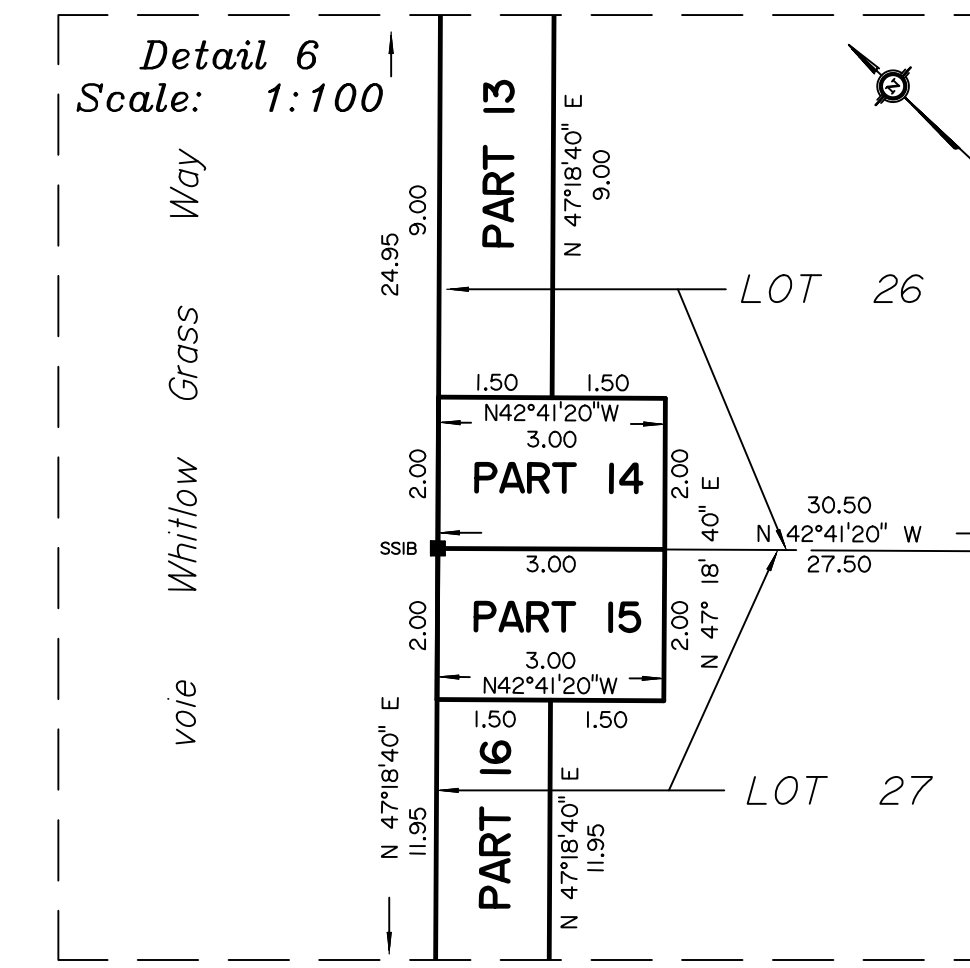
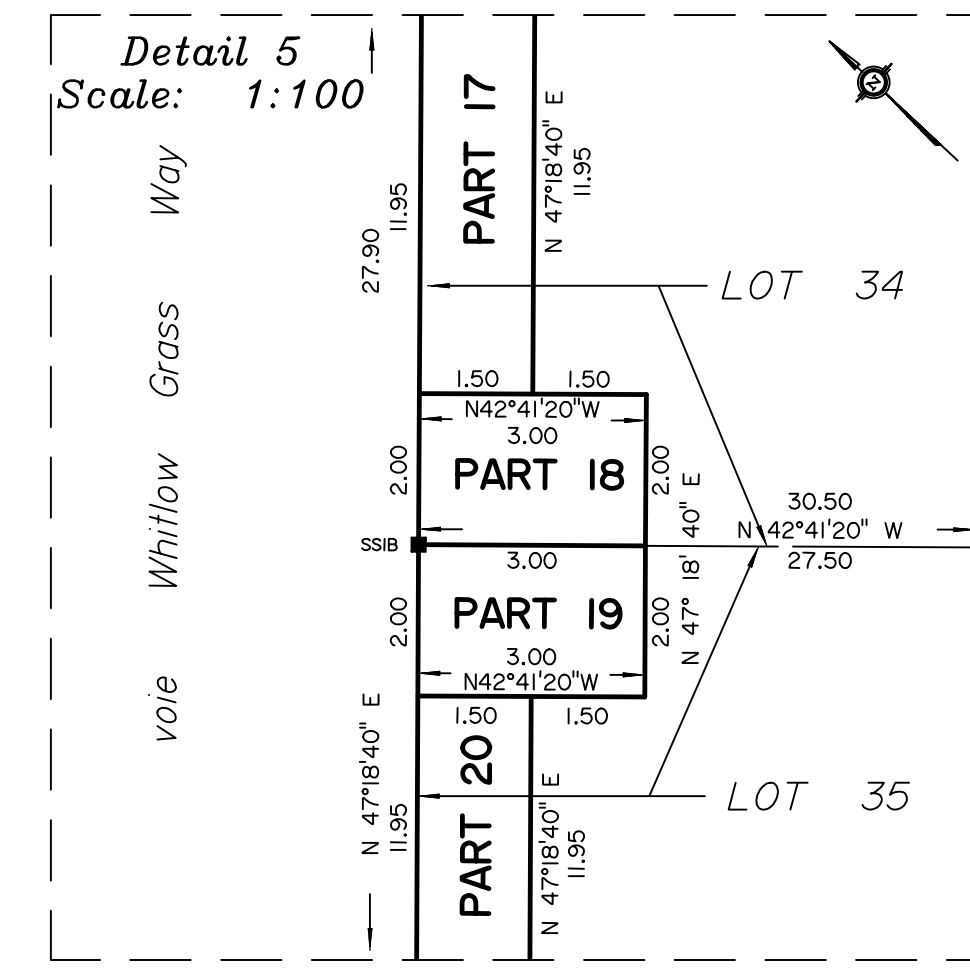
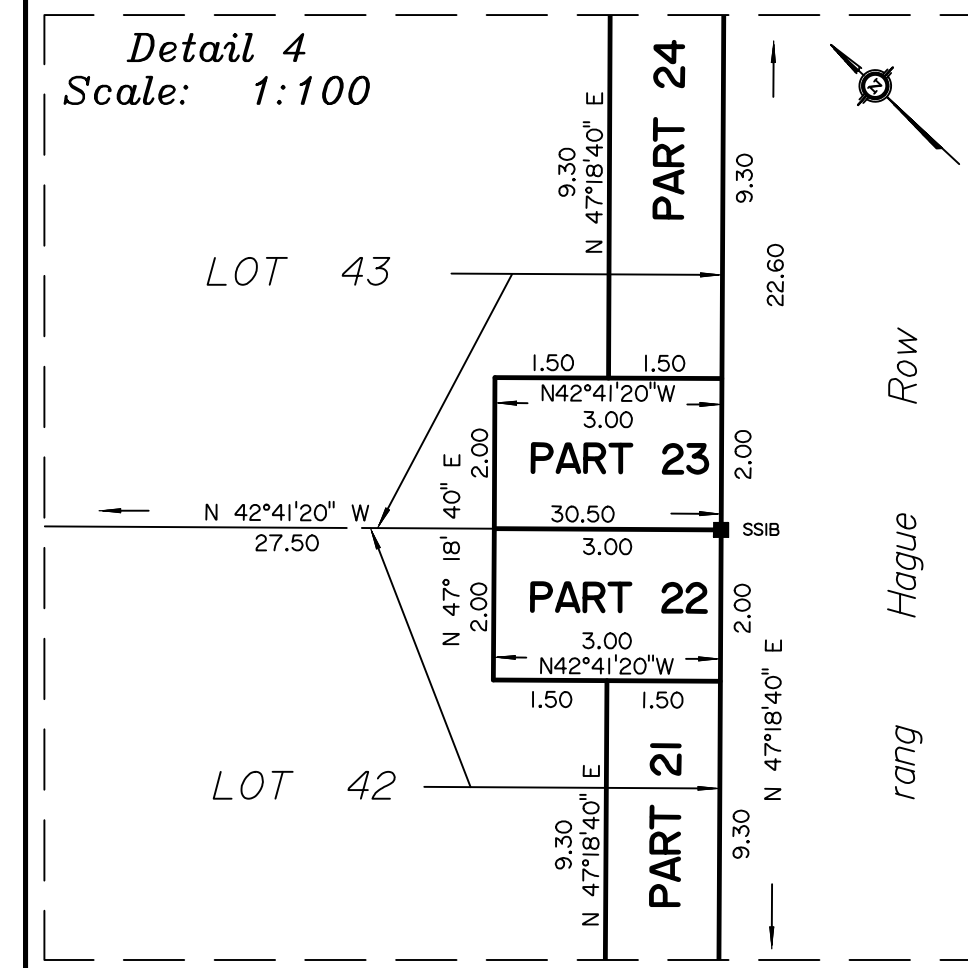
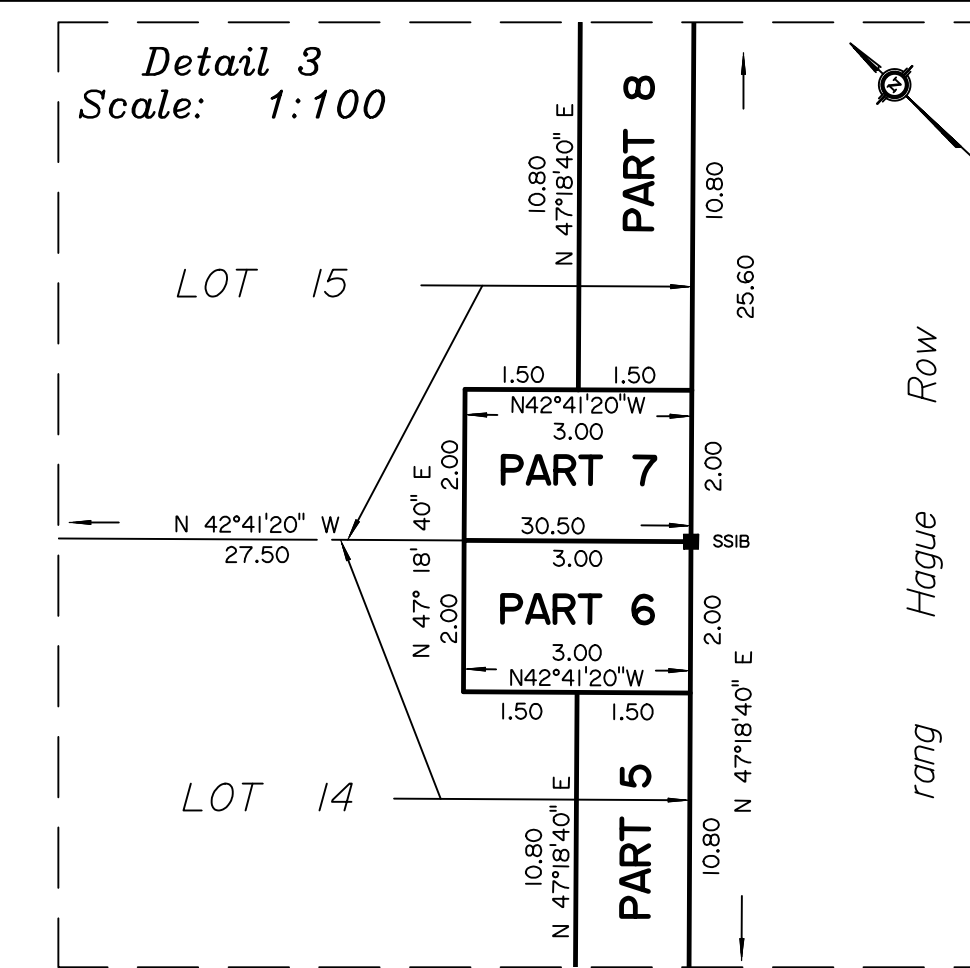
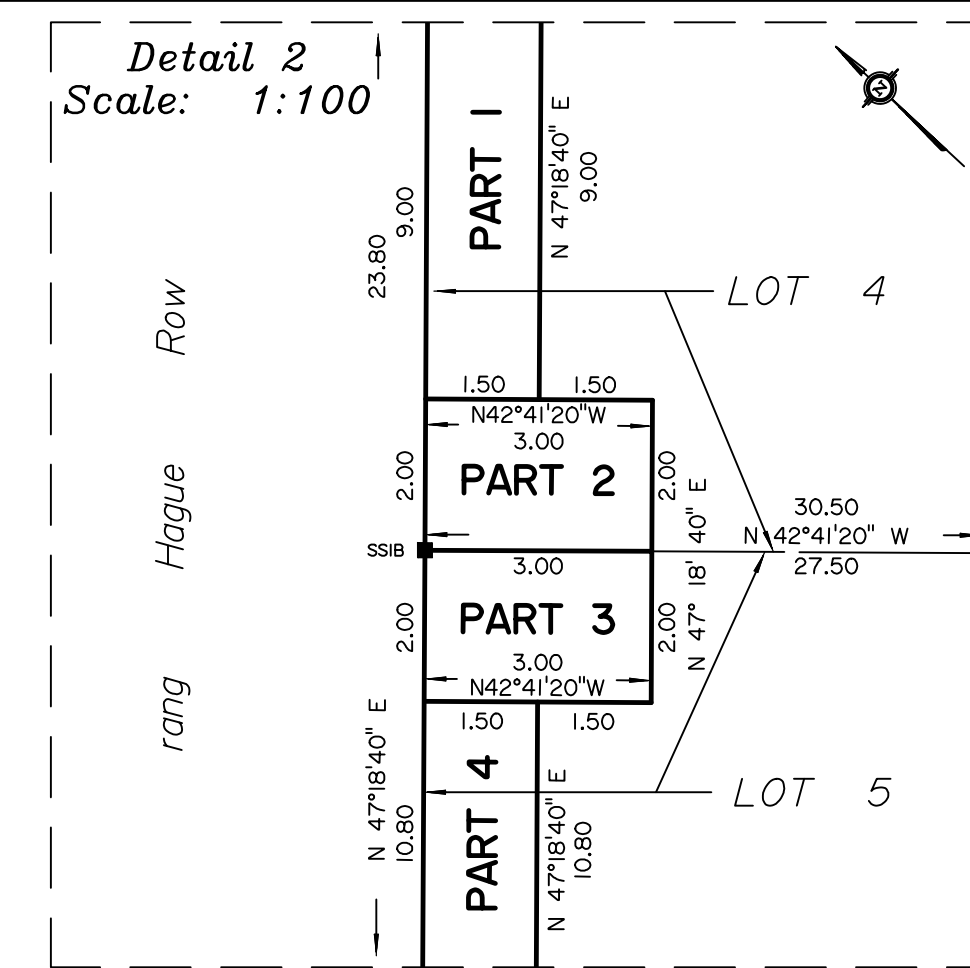
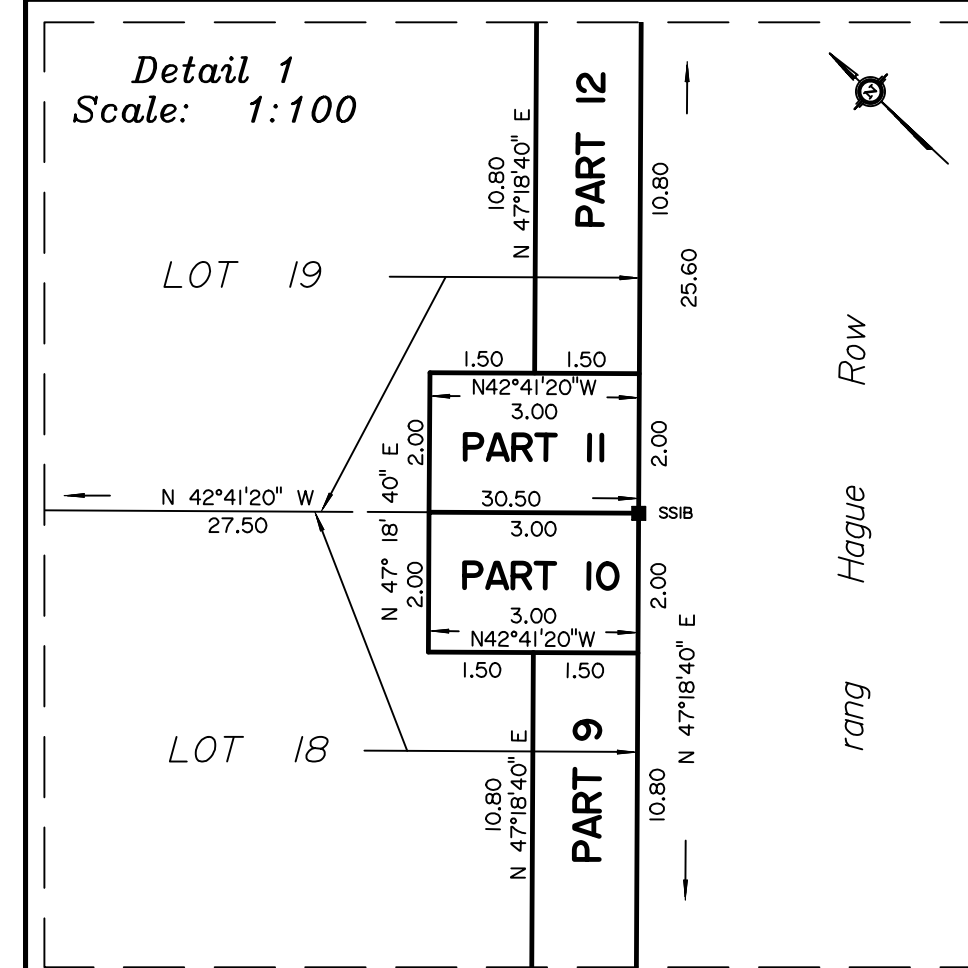
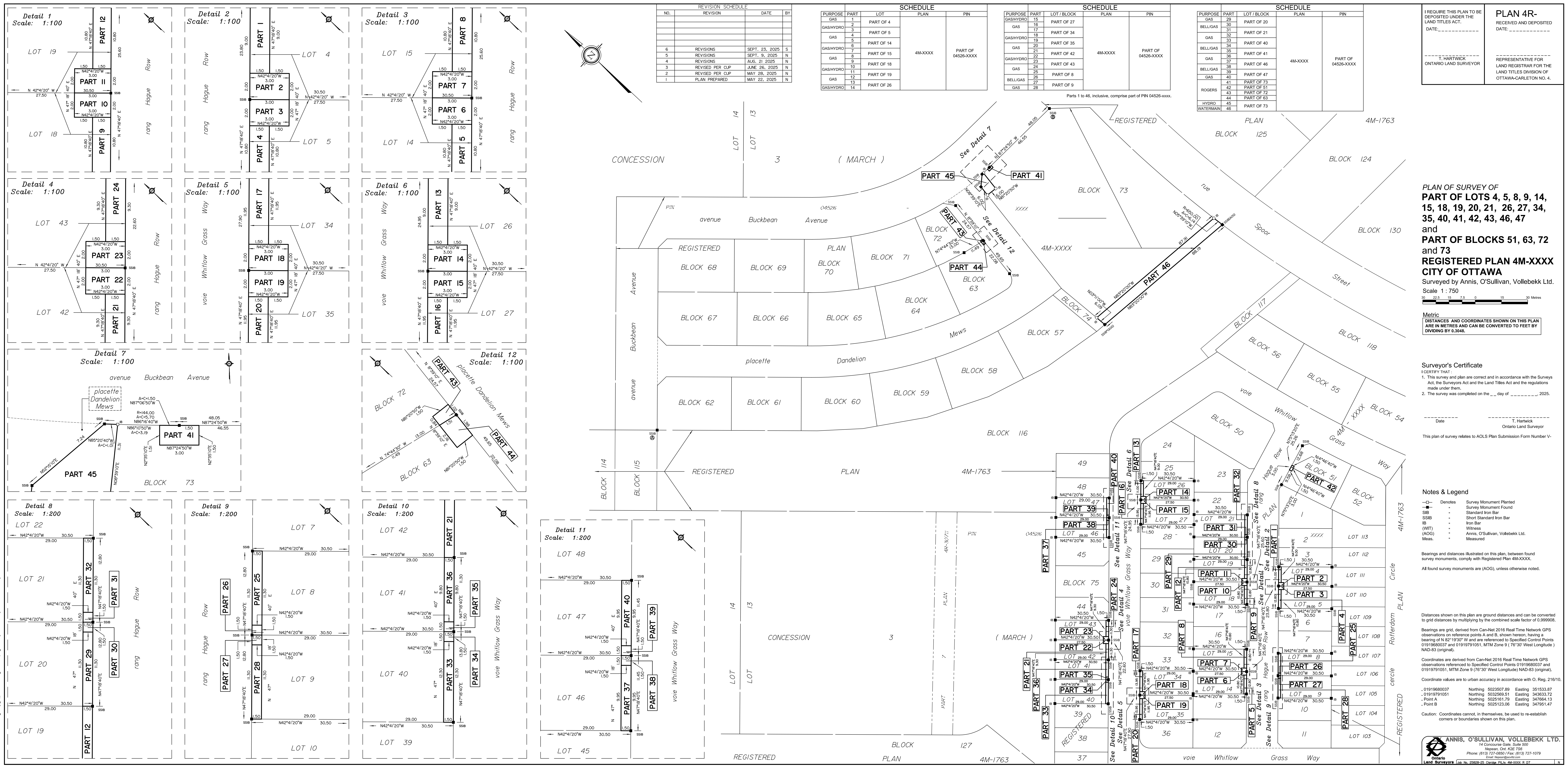
OTTAWA ONTARIO

SHEET TITLE: SITE PLAN

DRAWN: R.V. CHECKED: RV

SCALE: 1:250 SHEET No. SP-1

PROJECT No. 2513



REVISION SCHEDULE

NO.	REVISION	DATE	BY
6	REVISIONS	SEPT. 23, 2025	S
5	REVISIONS	SEPT. 9, 2025	N
4	REVISIONS	AUG. 21, 2025	N
3	REVISED PER CUP	JUNE 26, 2025	N
2	REVISED PER CUP	MAY 28, 2025	N
1	PLAN PREPARED	MAY 22, 2025	N

SCHEDULE

PURPOSE	PART	LOT / BLOCK	PLAN	PIN
GAS	1	PART OF 4		
GASHYDRO	2	PART OF 5		
GAS	3	PART OF 14		
GASHYDRO	4	PART OF 15	4M-XXXX	PART OF 04526-XXXX
GAS	7	PART OF 18		
GASHYDRO	8	PART OF 19		
GAS	9	PART OF 26		
GASHYDRO	14	PART OF 27		

SCHEDULE

PURPOSE	PART	LOT / BLOCK	PLAN	PIN
GAS	15	PART OF 27		
GAS	16	PART OF 34		
GAS	17	PART OF 35		
GASHYDRO	18	PART OF 42	4M-XXXX	PART OF 04526-XXXX
GAS	20	PART OF 43		
GAS	21	PART OF 46		
GAS	22	PART OF 47		
GAS	23	PART OF 51		
GAS	24	PART OF 52		
BELLGAS	25	PART OF 63		
BELLGAS	26	PART OF 73		
GAS	27	PART OF 73		
GAS	28	PART OF 73		

SCHEDULE

PURPOSE	PART	LOT / BLOCK	PLAN	PIN
GAS	29	PART OF 20		
BELLGAS	30	PART OF 21		
GAS	31	PART OF 40		
GAS	32	PART OF 41		
BELLGAS	33	PART OF 41		
GAS	34	PART OF 46	4M-XXXX	PART OF 04526-XXXX
BELLGAS	35	PART OF 47		
GAS	36	PART OF 51		
BELLGAS	37	PART OF 52		
GAS	38	PART OF 63		
GAS	39	PART OF 73		
GAS	40	PART OF 73		
GAS	41	PART OF 73		
GAS	42	PART OF 73		
GAS	43	PART OF 73		
GAS	44	PART OF 73		
GAS	45	PART OF 73		
GAS	46	PART OF 73		

I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.
DATE: _____

PLAN 4R-
RECEIVED AND DEPOSITED
DATE: _____

T. HARTWICK
ONTARIO LAND SURVEYOR

REPRESENTATIVE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON NO. 4.

PLAN OF SURVEY OF PART OF LOTS 4, 5, 8, 9, 14, 15, 18, 19, 20, 21, 26, 27, 34, 35, 40, 41, 42, 43, 46, 47 and PART OF BLOCKS 51, 63, 72 and 73 REGISTERED PLAN 4M-XXXX CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebek Ltd.
Scale: 1 : 750

Metric
DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

Surveyor's Certificate

I CERTIFY THAT:

- This survey and plan are correct and in accordance with the Survey Act, the Surveyors Act and the Land Titles Act and the regulations made under them.
- The survey was completed on the ___ day of _____, 2025.

Date: _____
Ontario Land Surveyor

This plan of survey relates to AOLS Plan Submission Form Number V-_____.

Notes & Legend

- Denotes Survey Monument Planted
- Survey Monument Found
- SIB— Standard Iron Bar
- SSIB— Short Standard Iron Bar
- IB— Iron Bar
- (WIT)— Witness
- (AOG)— Annis, O'Sullivan, Vollebek Ltd.
- Meas.— Measured

Bearings and distances illustrated on this plan, between found survey monuments, comply with Registered Plan 4M-XXXX.

All found survey monuments are (AOG), unless otherwise noted.

Distances shown on this plan are ground distances and can be converted to grid distances by multiplying by the combined scale factor of 0.999908.

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations on reference points A and B, shown hereon, having a bearing of N 82° 19' 30" W and are referenced to Specified Control Points 0191968037 and 01919791051, MTM Zone 9 (78° 30' West Longitude) NAD-83 (original).

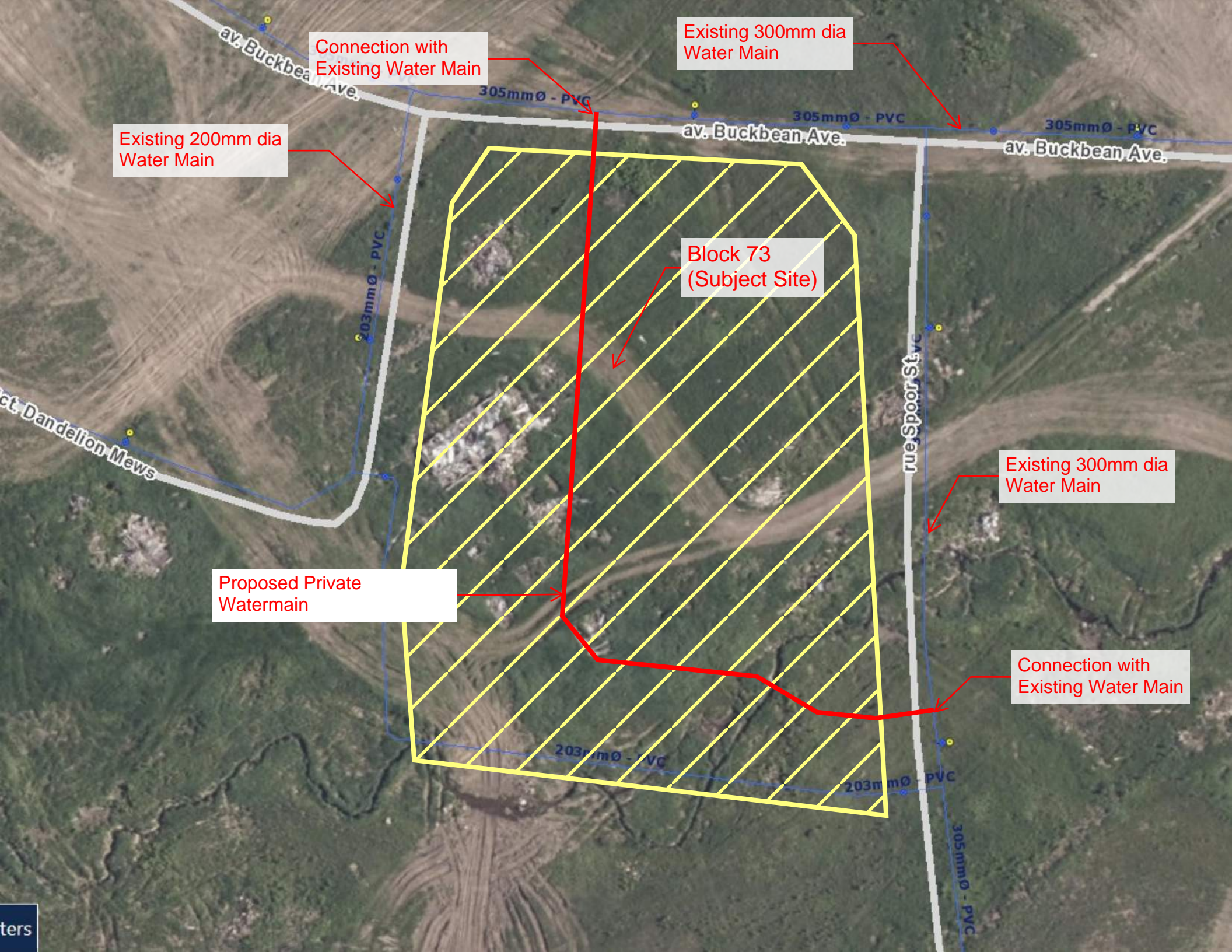
Coordinates are derived from Can-Net 2016 Real Time Network GPS observations referenced to Specified Control Points 0191968037 and 01919791051, MTM Zone 9 (78° 30' West Longitude) NAD-83 (original).

Coordinate values are to urban accuracy in accordance with O. Reg. 216/10.

.0191968037	Northing	5023507.89	Easting	351533.87
.01919791051	Northing	5023569.51	Easting	343633.72
.Point A	Northing	5025161.73	Easting	347664.13
.Point B	Northing	5025123.06	Easting	347951.47

Caution: Coordinates cannot, in themselves, be used to re-establish corners or boundaries shown on this plan.

Appendix B
Water Servicing



Connection with Existing Water Main

Existing 300mm dia Water Main

Existing 200mm dia Water Main

Block 73 (Subject Site)

Proposed Private Watermain

Existing 300mm dia Water Main

Connection with Existing Water Main

av. Buckbean Ave.

av. Buckbean Ave.

av. Buckbean Ave.

ct. Dandelion Mews

rue Spoor St

305mmØ - PVC

305mmØ - PVC

305mmØ - PVC

203mmØ - PVC

203mmØ - PVC

203mmØ - PVC

305mmØ - PVC

Boundary Condition Request

Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 12/19/2025
Input By: Anjush Musyaju, E.I.T
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference:

Legend: Input by User No Input Required
 Calculated Cells →
Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
 MOE Design Guidelines for Drinking-Water Systems (2008)
 Fire Underwriter's Survey Guideline (2020)
 Ontario Building Code, Part 3 (2012)

Small System = YES

	# of Dwellings	Area (ha.)	Pop. Equiv.	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Residential Input						
Stacked Towns	60	0.00	126.00	0.41	3.88	5.84
Totals	60	0.00	126.00	0.41	3.88	5.84

Summary

i. Type of Development and Units:	Low-Rise Stacked Flats-5 Blocks, 12 Units per Block
ii. Site Address:	1100 Spoor Street (Block 73)
iii. Proposed Water Service Connection Location(s):	Spoor Street and Buckbean Ave
iv. Average Day Flow Demand:	0.41 L/s
v. Peak Hour Flow Demand:	5.84 L/s
vi. Maximum Day Flow Demand:	3.88 L/s
vii. Required Fire Flow #1:	16000 L/min
viii. Required Fire Flow #2:	L/min
ix. Required Fire Flow #3:	L/min

Design Parameters

Residential					
Unit Type Population Equiv.	Singles	Semis/ Towns	Apts (2-BR) / Stacked Towns	Apts (1-BR)	Apts (Avg)
	3.4	2.7	2.1	1.4	1.8
Daily Demand	L/per person/day				
Average Demand	280				
Basic Demand	200				

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

Institutional / Commercial / Industrial				
Industrial		Commercial	Institutional	Other Use
Light	Heavy			
L/gross ha/day				L/m ² /day
35,000	55,000	28,000	28,000	5
10,000	17,000	17,000	17,000	3

ICI Peaking Factors	Max Day (x Avg Day)	Peak Hour (x Avg Day)
		1.50

FUS - Fire Flow Calculations








Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 12/19/2025
Input By: Anjush Musyaju, E.I.T
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-SEP

Legend: Input by User
 No Input Required
Reference: Fire Underwriter's Survey Guideline (2020)
 Formula Method

Building Description: 12 Unit Stacked Town
 Type V - Wood frame

Step		Choose		Value Used	Total Fire Flow (L/min)	
Base Fire Flow						
1	Construction Material		Multiplier		1.5	
	Coefficient related to type of construction C	Type V - Wood frame	Yes	1.5		
		Type IV - Mass Timber		Varies		
		Type III - Ordinary construction		1		
		Type II - Non-combustible construction		0.8		
Type I - Fire resistive construction (2 hrs)			0.6			
2	Floor Area				12,000	
	A	Building Footprint (m ²)	420			
		Number of Floors/Storeys	3			
		Protected Openings (1 hr) if C<1.0	No			
		Area of structure considered (m ²)		1,260		
F	Base fire flow without reductions $F = 220 C (A)^{0.5}$					
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		FUS Table 3	Reduction/Surcharge	10,200	
	(1)	Non-combustible		-25%		
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
Rapid burning			25%			
4	Sprinkler Reduction		FUS Table 4	Reduction	0	
	(2)	Adequately Designed System (NFPA 13)	No	-30%		
		Standard Water Supply	No	-10%		
		Fully Supervised System	No	-10%		
		Cumulative Sub-Total				0%
Area of Sprinklered Coverage (m²)		0		0%		
		Cumulative Total	0%			
5	Exposure Surcharge		FUS Table 5	Surcharge	5,100	
	(3)	North Side	3.1 - 10 m	20%		
		East Side	>30m	0%		
		South Side	10.1 - 20 m	15%		
		West Side	10.1 - 20 m	15%		
		Cumulative Total	50%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	15,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	250
				or	USGPM	3,963

LEGEND

-  DISTANCE FROM HYDRANT TO SIAMESE CONNECTION
-  PROPOSED HYDRANT
-  EXISTING HYDRANT
-  PROPOSED SIAMESE CONNECTION
-  PROPERTY LINE

WATERMAIN AND CORRESPONDING 6.0m EASEMENT THROUGH BLOCK 73 IS TEMPORARY AND ONLY REQUIRED UNTIL A WATERMAIN LOOP THROUGH COPPERWOOD PHASE 2 IS CONSTRUCTED AND DEEMED IN-SERVICE. SUBSEQUENTLY, THE WATERMAIN LOOP THROUGH BLOCK 73 FROM SPOOR STREET TO DANDELION MEWS CAN BE DECOMMISSIONED AND TREES PLANTED ALONG THE EASEMENT CORRIDOR. REFER TO COPPERWOOD PHASE 2 APPROVED PLAN AND PROFILE - BLOCK 74 - WATERMAIN REMOVAL, 116132-PR16-REM, FOR DETAILS ON THE WATERMAIN DECOMMISSIONING.

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

1100 SPOOR STREET (BLOCK 73) COPPERWOOD

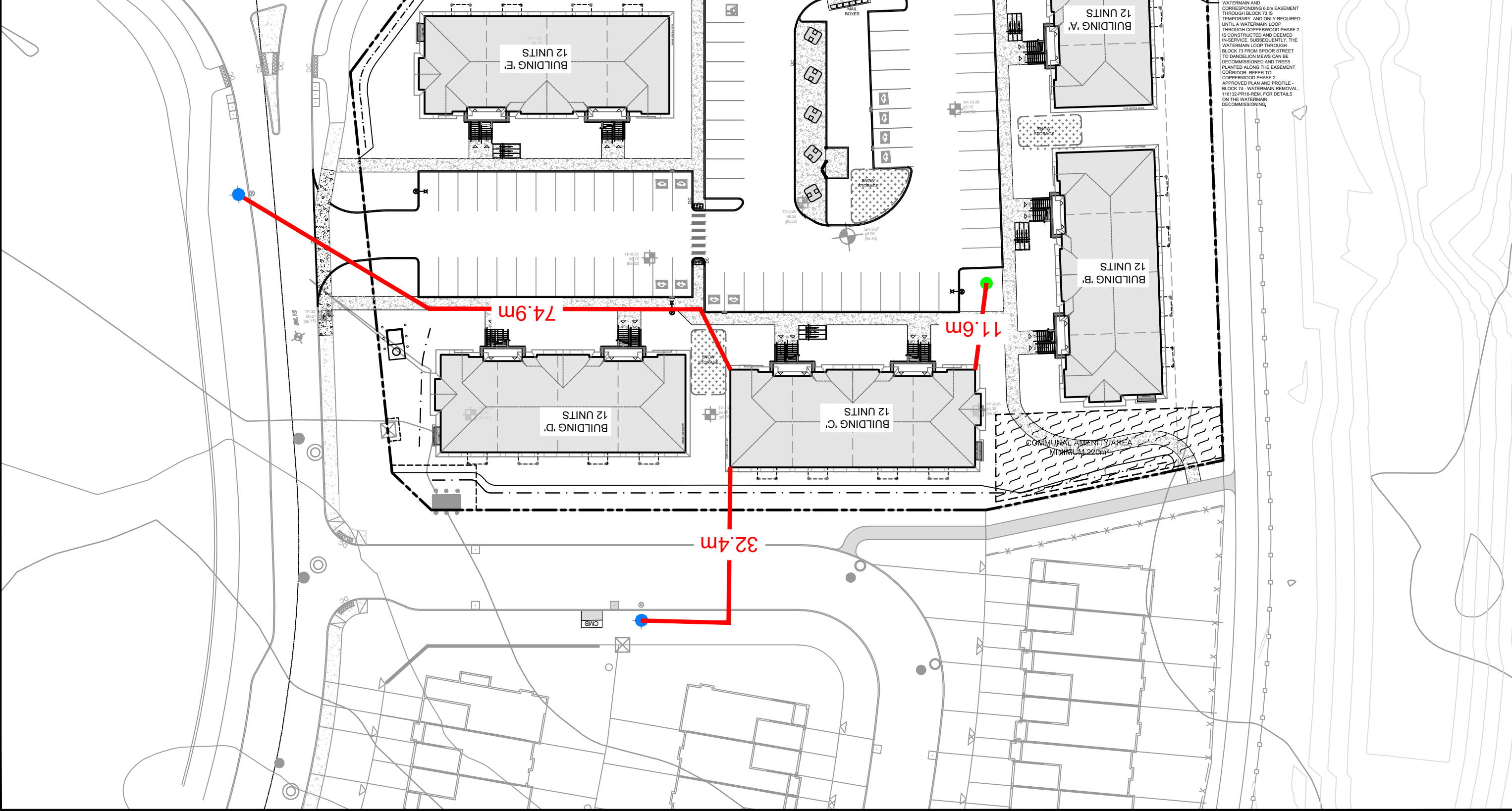
FUS COVERAGE

SCALE 1 : 500

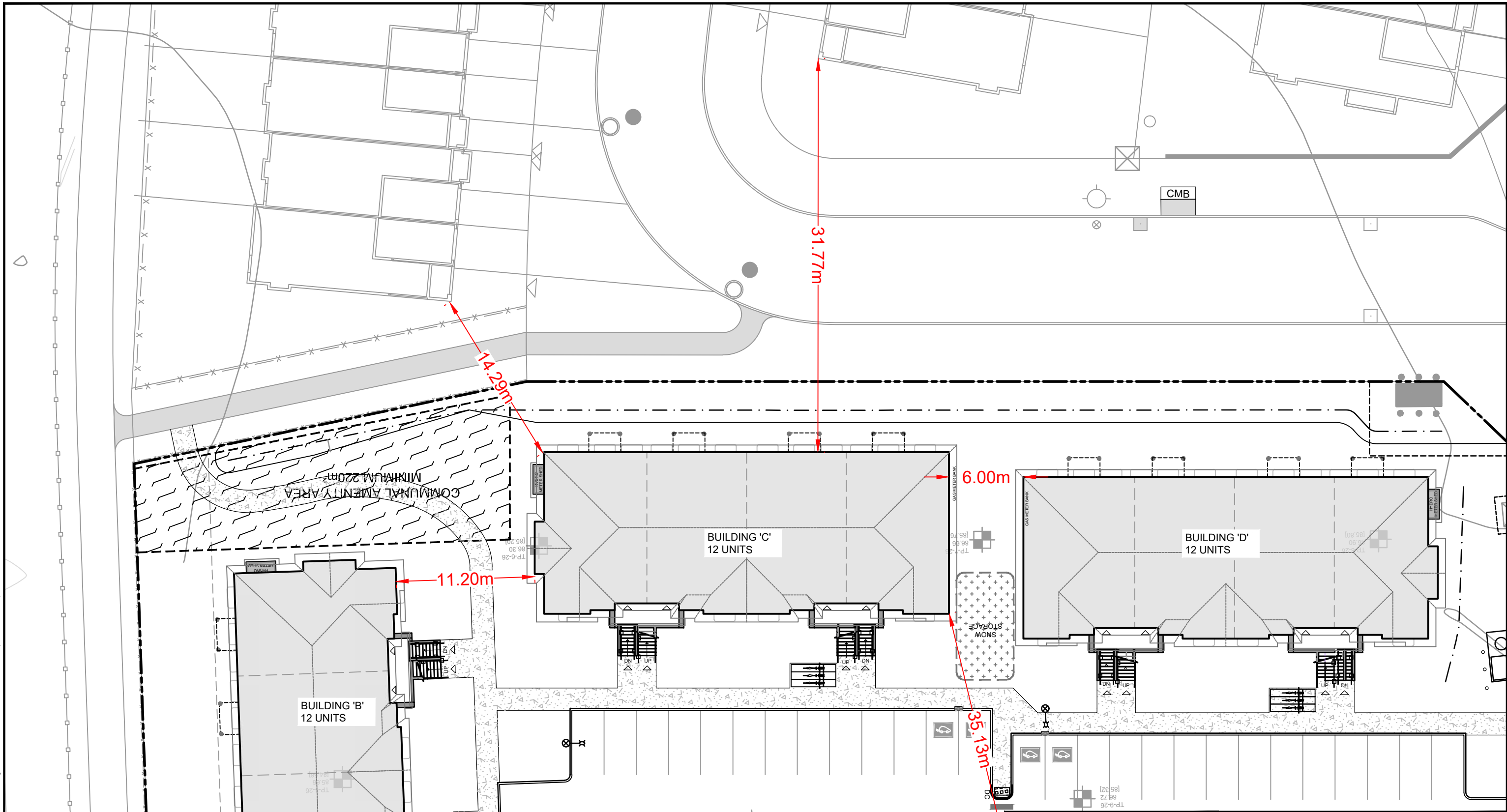
DATE MARCH 2026

JOB 125113

COV-C



M:\2025\125113\CAD\Civil\Figures\Serviceing\125113-SEP.dwg, BUILDING 'C', Mar 06, 2026 - 5:42pm, amestwarp



LEGEND

- PROPERTY LINE
- EXPOSURE DISTANCES



NOVATECH

Engineers, Planners & Landscape Architects
 Suite 200, 240 Michael Cowpland Drive
 Ottawa, Ontario, Canada K2M 1P6

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

1100 SPOOR STREET
 (BLOCK 73) COPPERWOOD

FUS SEPARATION

SCALE 1 : 300

DATE	JOB	FIGURE
DECEMBER 2025	125113	SEP

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Tuesday, February 24, 2026 5:51 PM
To: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Cc: Polyak, Alex <alex.polyak@ottawa.ca>
Subject: RE: Block 73 Copperwood - 125113

Hi Anthony,

I did - Fire Services clarified that no additional onsite hydrants are needed, as the hydrants located across the collector streets can be used.

Thanks,

Julie Candow, P.Eng
Project Manager
Development Review – West Branch
Planning, Development and Building Services Dept.
110 Laurier Avenue West, 4th Floor East
Ottawa, ON K1P 1J1
613.580.2424 ext. 13850
Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Sent: February 24, 2026 1:43 PM
To: Candow, Julie <julie.candow@ottawa.ca>
Subject: RE: Block 73 Copperwood - 125113

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Julie,

Did you receive any feedback regarding the need for additional site hydrants?

Thanks,

Anthony Mestwarp, P.Eng., Project Manager | Land Development Engineering

NOVATECH

Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext. 216

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**Electronic documents, when supplied, are supplemental. The print (or pdf) versions of the documents govern. Requested electronic documents remain the property of Novatech (on behalf of the Owner) and shall only be used for the purpose for which they were originally intended

From: Candow, Julie <julie.candow@ottawa.ca>
Sent: Tuesday, January 27, 2026 10:40 AM
To: Anthony Mestwarp <a.mestwarp@novatech-eng.com>
Subject: RE: Block 73 Copperwood - 125113

Hi Anthony,

Please see attached BC results.

I am waiting to hear back from Fire Services as to the need for an additional private hydrant onsite.

Thanks,

Julie Candow, P.Eng

Project Manager
Development Review – West Branch
Planning, Development and Building Services Dept.
110 Laurier Avenue West, 4th Floor East
Ottawa, ON K1P 1J1
613.580.2424 ext. 13850

Classified as City of Ottawa - Internal / Ville d'Ottawa - classé interne

From: Anthony Mestwarp <a.mestwarp@novatech-eng.com>

Sent: January 21, 2026 4:07 PM

To: Candow, Julie <julie.candow@ottawa.ca>

Subject: Block 73 Copperwood - 125113

CAUTION: This email originated from an External Sender. Please do not click links or open attachments unless you recognize the source.

ATTENTION : Ce courriel provient d'un expéditeur externe. Ne cliquez sur aucun lien et n'ouvrez pas de pièce jointe, excepté si vous connaissez l'expéditeur.

Hi Juile,

I am working on the engineering design of Block 73 of the Copperwood subdivision; the client has presently opted to proceed without a preconsult for the site. Can you confirm if the City can provide water boundary conditions for the site? If the area is not yet in the model, we can utilize the overall subdivision model to review the available site flows and pressures.

It is proposed to develop the site with a five (5) stacked townhome dwellings each containing 12 units for a total of 60 units

Total demands and fire flows are summarized below.

- Average Daily Demand: 0.41 L/s
- Max Daily Demand: 3.88 L/s
- Peak Hour Demand: 5.84 L/s
- Fire Flow (FUS): 267 L/s

Due to the high demands, it is proposed to connect to the existing City watermains in two (2) locations.

Please refer to the attached for the supporting figures and calculations.

Please let me know if you require anything further.

Thanks,

Anthony Mestwarp, P.Eng., Project Manager | Land Development Engineering

NOVATECH

Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 Ext. 216

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**Electronic documents, when supplied, are supplemental. The print (or pdf) versions of the documents govern. Requested electronic documents remain the property of Novatech (on behalf of the Owner) and shall only be used for the purpose for which they were originally intended

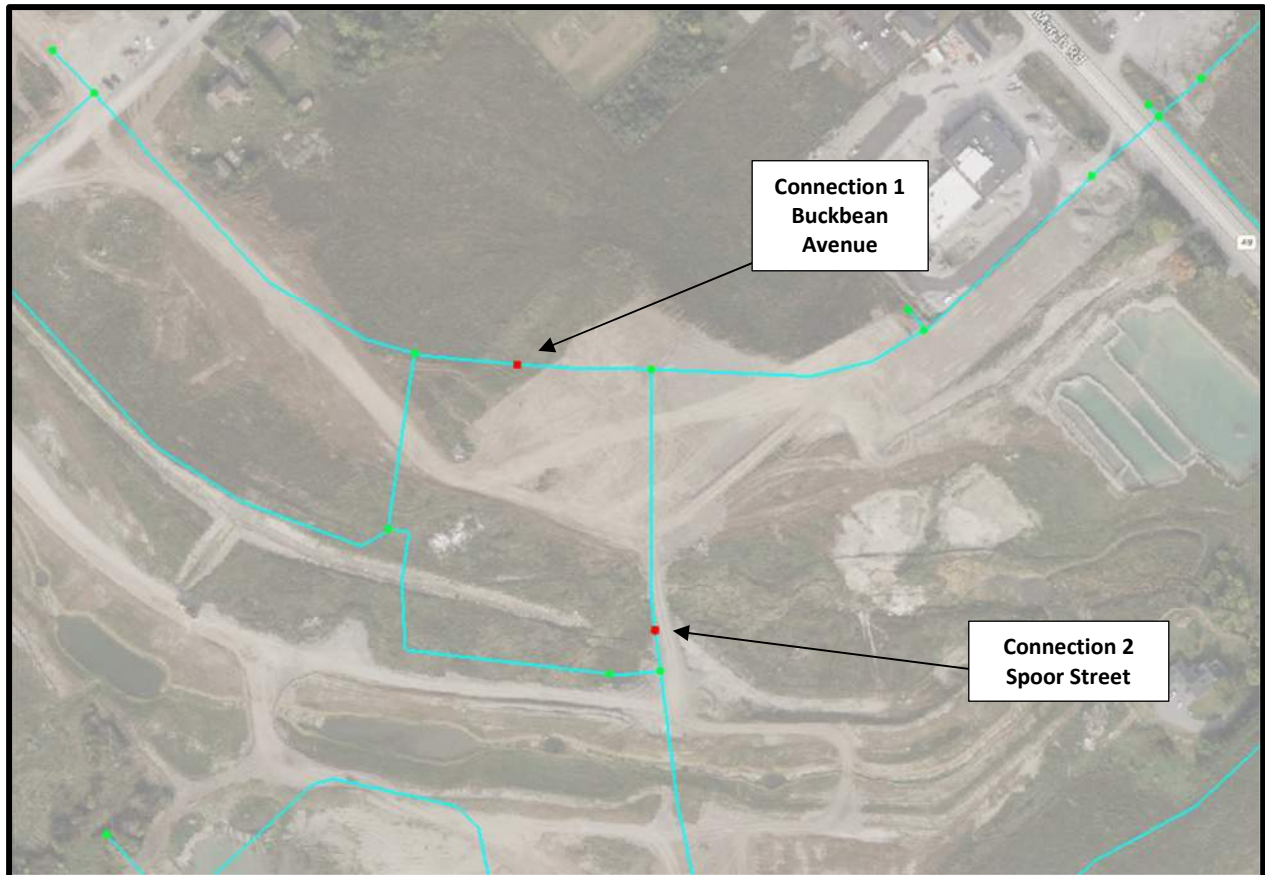
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Boundary Conditions Copperwood – Block 73

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	25	0.41
Maximum Daily Demand	233	3.88
Peak Hour	350	5.84
Fire Flow Demand #1	16,000	266.67

Location



Results

Connection 1 – Buckbean Avenue

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	61.8
Peak Hour	125.2	54.6
Max Day plus Fire Flow #1	105.9	27.3

¹ Ground Elevation = 86.8 m

Connection 2 – Spoor Street

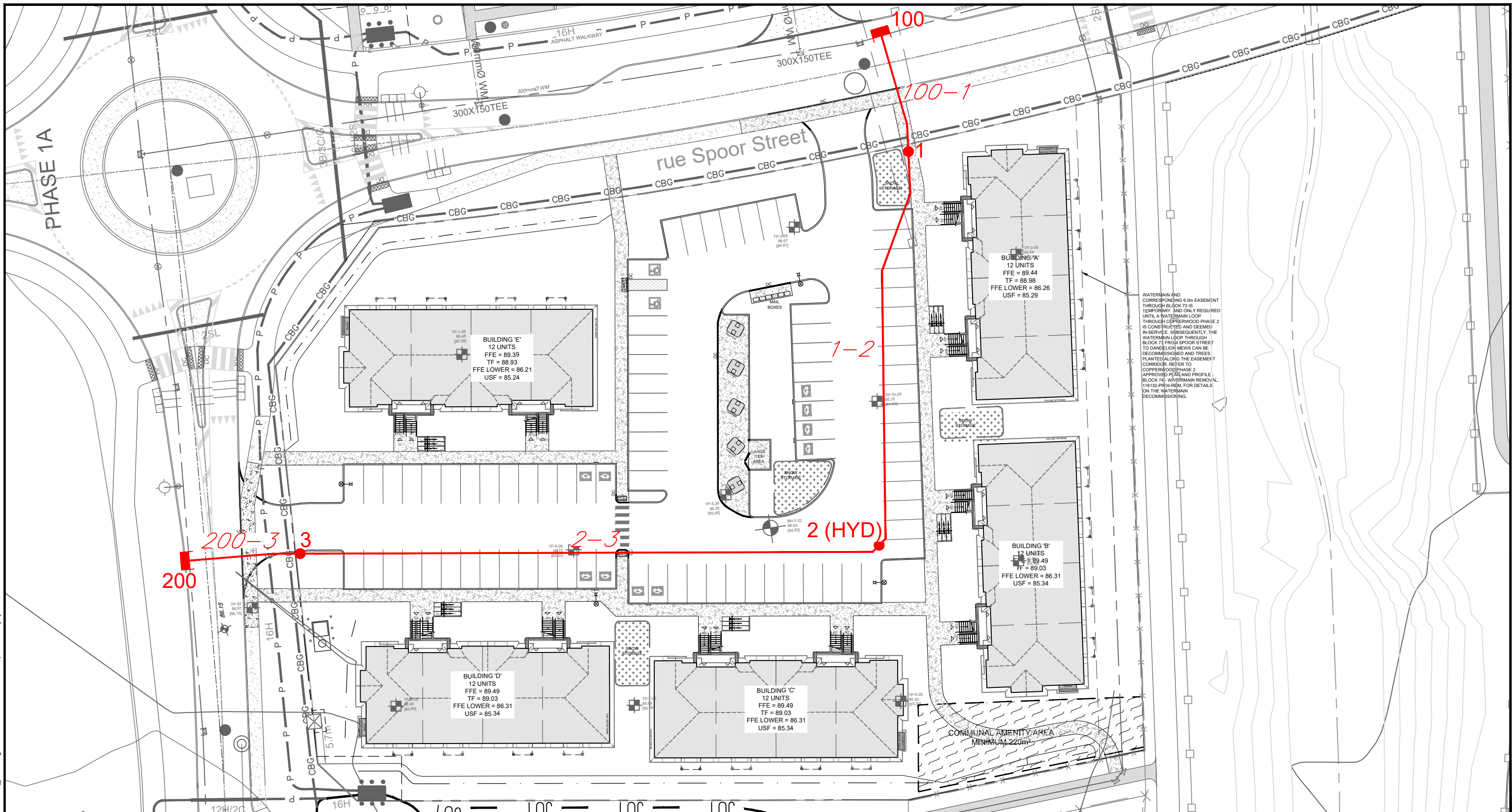
Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	130.2	64.4
Peak Hour	125.2	57.2
Max Day plus Fire Flow #1	107.1	31.5

¹ Ground Elevation = 84.9 m

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

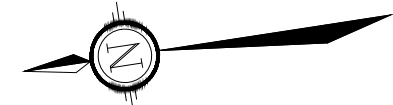
M:\2025\125113\CAD\Civil\Figures\Watermain\125113-EPA_Net.dwg, EPA, Feb 19, 2026 - 4:18pm, amusyaju



WATERMAIN AND CORRESPONDING 6.0m EASEMENT THROUGH BLOCK 73 IS TEMPORARY AND ONLY REQUIRED UNTIL A WATERMAIN LOOP THROUGH COPPERWOOD PHASE 2 IS CONSTRUCTED AND OPERATIONAL. SUBSEQUENTLY, THE WATERMAIN LOOP THROUGH BLOCK 73 FROM SPOOR STREET TO DANDELION MEWS CAN BE DECOMMISSIONED AND TREES PLANTED ALONG THE EASEMENT CORRIDOR. REFER TO COPPERWOOD PHASE 2 APPROVED P23 AND PROFILE BLOCK 74 - WATERMAIN REMOVAL, 116132-P16-REM FOR DETAILS ON THE WATERMAIN DECOMMISSIONING.

LEGEND

- 5-4 --- WATERMAIN PIPE
- 4 WATERMAIN NODE
- 400 RESERVOIR



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

CITY OF OTTAWA
 COPPERWOOD FLATS, BLOCK 73

WATERMAIN LAYOUT PLAN

SCALE 1 : 500

DATE	JOB	FIGURE
MARCH 2026	125113	EPA

Water Demand Design Sheet



Novatech Project #: 125113
Project Name: Copperwood-Block 73
Date: 2/17/2026
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-EPA

Legend: Input by User (Yellow) No Input Required (Grey)
 Calculated Cells → (Green)
Reference: Ottawa Design Guidelines - Water Distribution (2010 and TBs)
 MOE Design Guidelines for Drinking-Water Systems (2008)
 Fire Underwriter's Survey Guideline (2020)
 Ontario Building Code, Part 3 (2012)

Small System = YES

Location	Total Water Demand																				
Node	Residential Input & Average Demand							Industrial / Commercial / Institutional (ICI) Input & Average Demand					Maximum Day & Peak Hour Demand					Design Fire Demand			
	Singles	Semis / Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)	Pop. Equiv.	Res. Average Day Flow Demand (L/s)	Indust. Area		Comm. Area (ha.)	Inst. Area (ha.)	Other Area (m²)	ICI Average Day Flow Demand (L/s)	Maximum Day Demand			Peak Hour Demand			Required Fire Flow (RFF) FUS (L/min)	Max Day + RFF (L/s)
								Light (ha.)	Heavy (ha.)					Res. Peaking Factor	ICI Peaking Factor	Max Day Flow Demand (L/s)	Res. Peaking Factor	ICI Peaking Factor	Peak Hour Flow Demand (L/s)		
J1			9			18.90	0.06						0.00	9.50	1.50	0.58	14.30	2.70	0.88	5,700	95.58
J2 (HYD)			27			56.70	0.18						0.00	9.50	1.50	1.75	14.30	2.70	2.63	5,700	96.75
J3			24			50.40	0.16						0.00	9.50	1.50	1.55	14.30	2.70	2.34	3,600	61.55
Totals	0	0	60	0	0	126.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	9.50	1.50	3.88	14.30	2.70	5.84		

Demand Parameters

Residential					
Unit Type	Singles	Semis / Towns	Apts (2-BR)	Apts (1-BR)	Apts (Avg)
Population Equiv.	3.4	2.7	2.1	1.4	1.8
Daily Demand	L/per person/day				
Average Demand	280				
Basic Demand	200				

Institutional / Commercial / Industrial				
Indust.		Comm.	Inst.	Other Use
Light	Heavy			
L/gross ha/day			L/m²/day	
35,000	55,000	28,000	28,000	5
10,000	17,000	17,000	17,000	3

ICI Peaking Factors	Max Day (x Avg Day)	Peak Hour (x Avg Day)
	1.50	2.70

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

Quick Fire Flow Reference Guide			
FUS (L/min)	Comments	OBC (L/min)	Comments
> 2,000	Min FUS	< 9,000	Unsprinklered Non-Combustible
10,000	Low Density - Singles/Towns Complies w/ TB2014-01 Cap. (10m rear spacing, 6 units max, <600 m²)		
13,000	Non-complying w/TB2014-01. Calculate.		
15,000	Medium Density Back-to-back Towns.		
20,000	High Density Wood Frame 4-Storey		
5,000	Fire-Resistive Podium/Multi-Storey		
30,000	High Contiguous / Hazard Areas		
< 45,000	Max FUS		

Maximum Pressure During Average Day (AVDY) Conditions

Novatech Project #: 125113

Project Name: Copperwood-Block 73

Date: 2/17/2026

Input By: Anjush Musyaju, EIT

Reviewed By: Anthony Mestwarp

Drawing Reference: 125113-EPA

Legend: Input by User No Input Required

Acceptable (40psi - 80psi)

Acceptable w/ PRV (81psi - 100psi)

Unacceptable (< 40psi or > 100psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)	Age (hrs)
J1	87.77	0.06	130.20	42.43	60	1
J2 (HYD)	87.50	0.18	130.20	42.70	61	7
J3	87.42	0.16	130.20	42.78	61	1

Minimum Pressure During Max Day Plus Fire Flow (MXDY+FF) Condition

Novatech Project #: 125113 **Legend:** Input by User No Input Required
Project Name: Copperwood-Block 73 Acceptable (\Rightarrow 20psi)
Date: 2/17/2026 Unacceptable ($<$ 20psi)
Input By: Anjush Musyaju, E **Note:** Hydraulic modelling completed using EPANET 2.0.
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-EPA

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
J1	87.77	95.58	105.14	17.37	25
J2 (HYD)	87.50	96.75	104.11	16.61	24
J3	87.42	61.55	104.99	17.57	25

Minimum Pressure During Peak Hour (PKHR) Conditions

Novatech Project #: 125113

Project Name: Copperwood-Block 73

Date: 2/17/2026

Input By: Anjush Musyaju, E

Reviewed By: Anthony Mestwarp, P.Eng

Drawing Reference: 125113-EPA

Legend: Input by User No Input Required

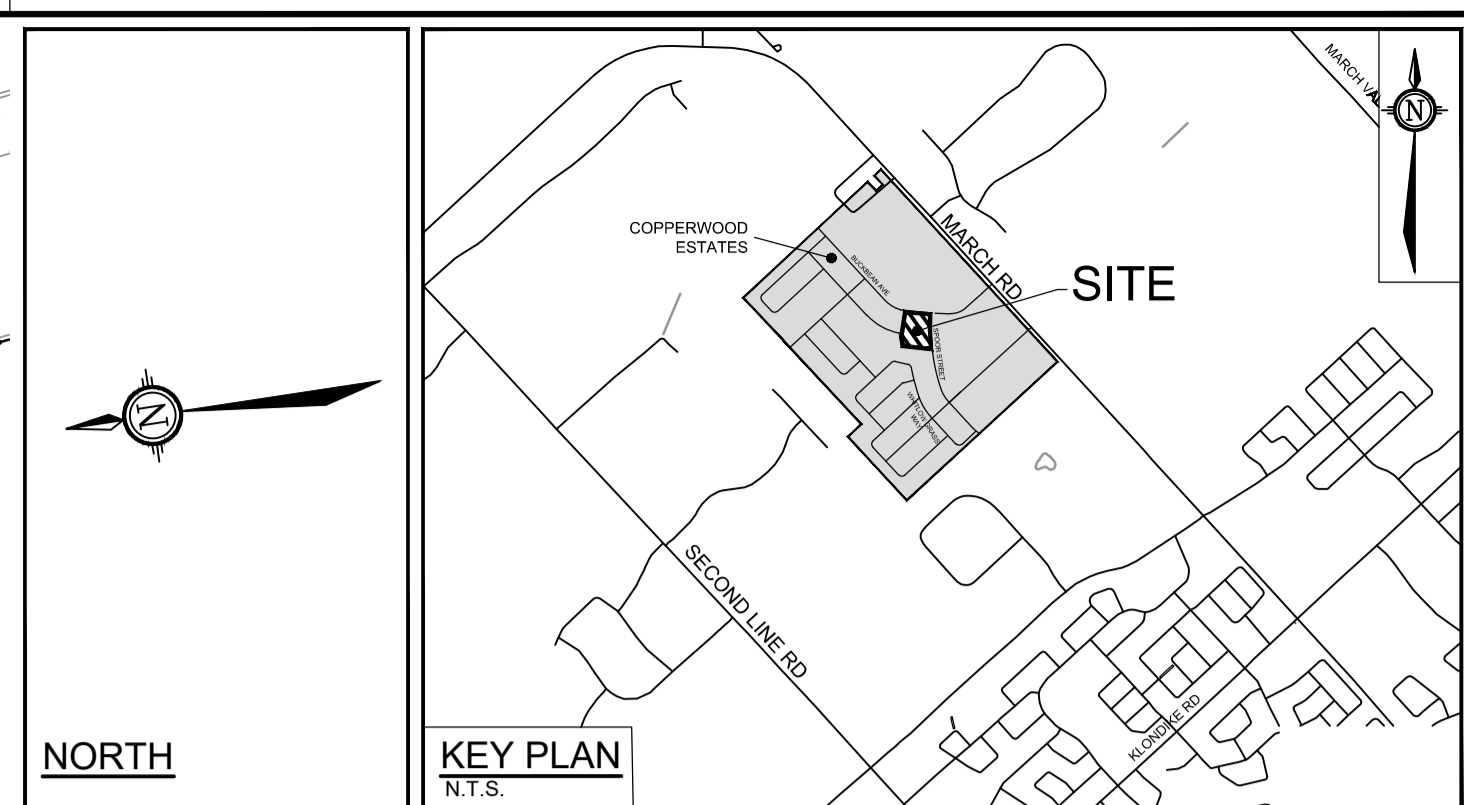
Acceptable (≥ 40 psi)

Unacceptable (< 40 psi)

Note: Hydraulic modelling completed using EPANET 2.0.

Node	Elevation (m)	Demand (L/s)	Total Head (m)	Pressure (m)	Pressure (psi)
J1	87.77	0.88	125.20	37.43	53
J2 (HYD)	87.50	2.63	125.20	37.70	54
J3	87.42	2.34	125.20	37.78	54

Appendix C
Sanitary Servicing



LEGEND

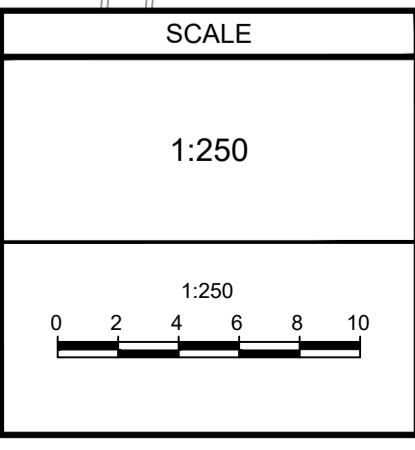
	SITE PROPERTY LINE		EXISTING DITCH CENTRELINE
	MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS		EXISTING SANITARY MANHOLE & SEWER
	PROPOSED SIDEWALK		FENCE BY OTHERS
	PROPOSED CURB		EXISTING DITCH CENTRELINE
	PROPOSED DEPRESSED CURB		EXISTING JOINT UTILITY
	SWALE c/w SUBDRAIN AND DIRECTION OF FLOW		EXISTING HYDRO
	PROPOSED SANITARY SERVICE c/w MANHOLE		EXISTING UTILITY CROSSINGS
	PROPOSED TRANSFORMER WITH BOLLARDS		EXISTING LIGHT STANDARD
	SANITARY DRAINAGE AREA BOUNDARY		EXISTING HYDRO INFRASTRUCTURE

	AREA IN HECTARES
	MANHOLE TO MANHOLE
	POPULATION EQUIVALENT

WATERMAIN AND CORRESPONDING 6.0m EASEMENT THROUGH BLOCK 73 IS TEMPORARY AND ONLY REQUIRED UNTIL A WATERMAIN LOOP THROUGH COPPERWOOD PHASE 2 IS CONSTRUCTED AND DEEMED IN SERVICE. SUBSEQUENTLY THE WATERMAIN LOOP THROUGH BLOCK 73 FROM SPOOR STREET TO DANDELION MEWS CAN BE DECOMMISSIONED AND TREES PLANTED ALONG THE EASEMENT CORRIDOR. REFER TO COPPERWOOD PHASE 2 APPROVED PLAN AND PROFILE - BLOCK 73 - WATERMAIN REMOVAL, 116132-PR16-REM, FOR DETAILS ON THE WATERMAIN DECOMMISSIONING.

NOTE:
 THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	ISSUED FOR SPA	MAR 27/2026	ARM



DESIGN	AM
CHECKED	ARM
DRAWN	AM
CHECKED	ARM
APPROVED	GJM

FOR REVIEW ONLY

NOVATECH
 Engineers, Planners & Landscape Architects
 Suite 200, 240 Michael Cowpland Drive
 Ottawa, Ontario, Canada K2M 1P6

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

LOCATION 1100 SPOOR STREET, CITY OF OTTAWA COPPERWOOD ESTATES (BLOCK 73)	
DRAWING NAME SANITARY DRAINAGE AREA PLAN	PROJECT No. 125113
	REV #1
	DRAWING No. 125113-SAN

M:\2025\125113\CADD\Civil\125113-SAN.dwg SAN, Mar 20, 2026 - 2:34pm, ameshawp

SANITARY SEWER DESIGN SHEET



Novatech Project #: 125113
Project Name: Block 73 Copperwood
Date: 3/27/2026
Input By: Anjush Musyaju, EIT
Reviewed By: Anthony Mestwarp, P.Eng
Drawing Reference: 125113-SAN

Legend: Design Input by User
 As-Built Input by User
 Cumulative Cell
 Calculated Design Cell Output
Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
 MOE - Design Guidelines for Sewage Works (2008)

Location			Demand													Design Capacity								
Street	From MH	To MH	Residential Flow										Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design								
			Singles	Semis / Towns	Apts	Park Area	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull
N/A	205	204			12		0.025	0.025	0.08	3.69	0.30	0.170	0.170	0.170	0.06	0.36	9.9	200 PVC	0.203	0.013	0.65	27.6	0.85	1.3%
N/A	204	203			24		0.050	0.076	0.25	3.62	0.89	0.393	0.564	0.564	0.19	1.07	55.0	200 PVC	0.203	0.013	0.40	21.6	0.67	5.0%
N/A	206	203			6		0.013	0.013	0.04	3.72	0.15	0.098	0.098	0.098	0.03	0.18	19.3	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%
N/A	203	202			12		0.025	0.113	0.37	3.58	1.32	0.177	0.839	0.839	0.28	1.59	35.7	200 PVC	0.203	0.013	0.40	21.6	0.67	7.4%
N/A	202	201			6		0.013	0.126	0.41	3.57	1.46	0.080	0.919	0.919	0.30	1.76	14.7	200 PVC	0.203	0.013	0.40	21.6	0.67	8.1%
Spoor Street	201	1301					0.000	0.126	0.41	3.57	1.46	0.015	0.934	0.934	0.31	1.77	12.9	200 PVC	0.203	0.013	0.40	21.6	0.67	8.2%
Totals			0	0	60	0.000	0.126	0.126	0.41	3.57	1.46	0.934	0.934	0.934	0.31	1.77	147.5							

Demand Equation / Parameters

- $Q(D) = Q(p) + Q(ici) + Q(e)$
- $Q(p) = (P \times q \times M \times K / 86,400)$
- $q = 280$ L/person/day (design)
- M = Harmon Formula (maximum of 4.0)**
- K = 0.8** (design)
- Park flow is considered equivalent to a single unit / ha**
 Park Demand = 4 single unit equivalent / park ha (~ 3,600 L/ha/day)
- $Q(ici) = ICI \text{ Area} \times ICI \text{ Flow} \times ICI \text{ Peak}$
- $Q(e) = 0.33$ L/s/ha (design)

Definitions

- Q(D)** = Peak Design Flow (L/s)
Q(p) = Peak Design Population Flow (L/s)
Q(q) = Average Population Flow (L/s)
- | | | | |
|--|----------------|----------------------|-------------|
| | <u>Singles</u> | <u>Semis / Towns</u> | <u>Apts</u> |
| P = Residential Population = | 3.4 | 2.7 | 2.1 |
| q = Average Capita Flow | | | |
| M = Harmon Formula | | | |
| K = Harmon Correction Factor | | | |
| Q(ici) = Industrial / Commercial / Institutional Flow (L/s) | | | |
| Q(e) = Extraneous Flow (L/s) | | | |

Institutional / Commercial / Industrial

Design = 35000 (Industrial) 28000 (Commercial / Institutional) L/gross ha/day

ICI Peak *

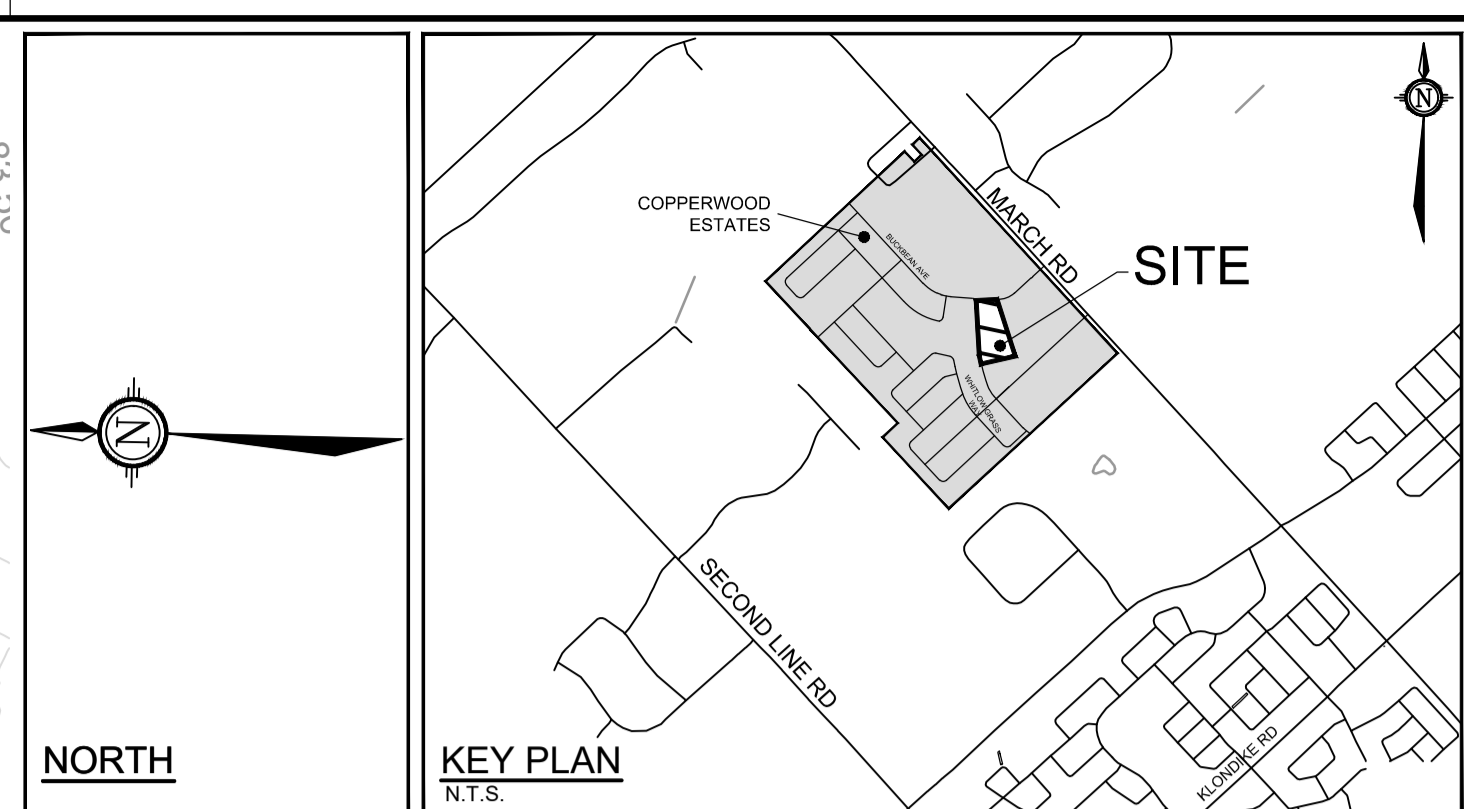
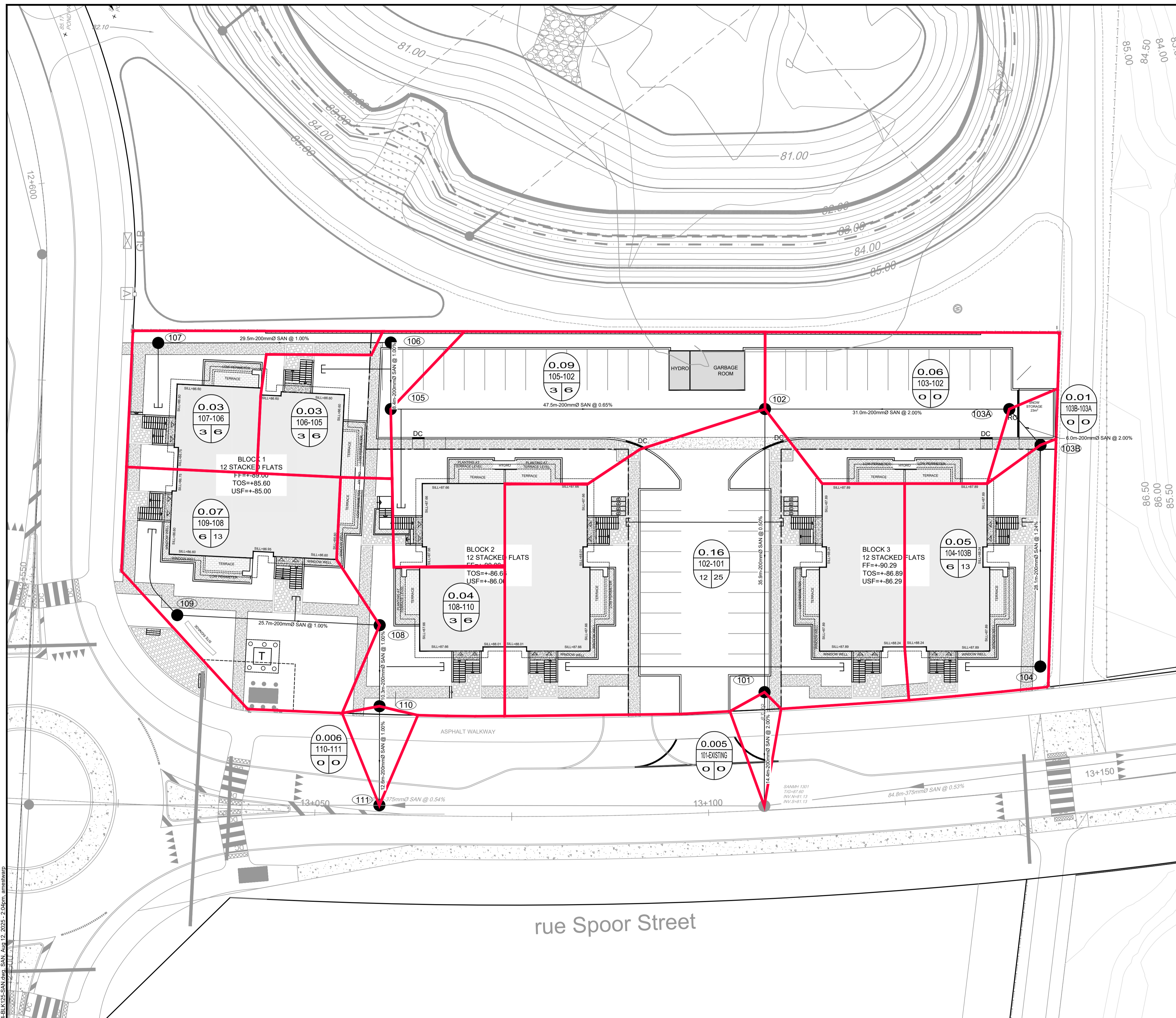
Design = 1.0 (Industrial) 1.5 (Commercial / Institutional) * ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)

Capacity Equation

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

Definitions

- Q full** = Capacity (L/s)
n = Manning coefficient of roughness (0.013)
A_p = Pipe flow area (m²)
R = Hydraulic Radius of wetted area (dia./4 for full pipes)
So = Pipe slope/gradient



- LEGEND**
- SITE PROPERTY LINE
 - MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS
 - PROPOSED SIDEWALK
 - PROPOSED CURB
 - DC PROPOSED DEPRESSED CURB
 - PROPOSED ASPHALT DRIVEWAY
 - SWALE c/w SUBDRAIN AND DIRECTION OF FLOW
 - PROPOSED SANITARY MANHOLE
 - (10) PROPOSED SANITARY SEWER AND FLOW DIRECTION
 - SANITARY DRAINAGE AREA BOUNDARY
 - AREA IN HECTARES
 - MANHOLE TO MANHOLE
 - POPULATION EQUIVALENT
 - SAN MH ● EXISTING SANITARY MANHOLE & SEWER

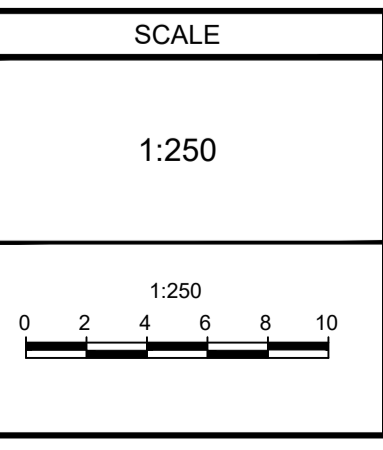
rue Spoor Street

REFER TO 122144-ND FOR ADDITIONAL NOTES & DETAILS

NOTE:
 THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOT FOR CONSTRUCTION

No.	REVISION	DATE	BY
3.	REVISED PER CITY COMMENTS	AUG 19/25	GJM
2.	REVISED PER COMPLETENESS REVIEW COMMENTS	MAY 09/25	GJM
1.	ISSUED FOR SITE PLAN APPLICATION	MARCH 21/25	GJM



DESIGN	FOR REVIEW ONLY
ARM/AM	ISSUED FOR REVIEW
CHECKED	
ARM	
DRAWN	
ARM/CJ/AM	
CHECKED	ISSUED FOR REVIEW
ARM	
APPROVED	
GJM	

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 Engineers, Planners & Landscape Architects
 Suite 200, 240 Michael Cowpland Drive
 Ottawa, Ontario, Canada K2M 1P6

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

LOCATION		DRAWING NAME	
1101 SPOOR STREET, CITY OF OTTAWA COPPERWOOD FLATS - BLOCK 125		SANITARY DRAINAGE PLAN	
PROJECT No.	122144	REV#	REV#3
DRAWING No.	122144-SAN		

M:\2025\122144\BLOCK_307\CAD\Civil\22144-BLK125-SAN.dwg SAN, Aug 12, 2025 - 2:04pm, amestwarp

D07-12-25-0038

SANITARY SEWER DESIGN SHEET



Novatech Project #: 122144
Project Name: Copperwood Flats - Block 125
Date: 3/19/2025
Revised: 05/08/2025 (Anthony Mestwarp)
Revised: 08/12/2025 (Anthony Mestwarp)
Input By: Curtis Ferguson, E.I.T.
Reviewed By: Anthony Mestwarp, P.Eng.
Drawing Reference: 122144-SAN

Legend: Design Input by User
 As-Built Input by User
 Cumulative Cell
 Calculated Design Cell Output
 Calculated Annual Cell Output
 Calculated Rare Cell Output
Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
 MOE - Design Guidelines for Sewage Works (2008)

Location			Demand														Design Capacity								
Street	From MH	To MH	Residential Flow											Extraneous Flow Area Method		Total Design Flow	Proposed Sewer Pipe Sizing / Design								
			Singles	Semis / Towns	Stk. Towns	Park Area	Population (in 1000's)	Cumulative Population (in 1000's)	Average Pop. Flow Q(q) (L/s)	Design Peaking Factor M	Peak Design Pop. Flow Q(p) (L/s)	Res. Drainage Area (ha.)	Cumulative Res. Drainage Area (ha.)	Cumulative Extraneous Drainage Area (ha.)	Design Extraneous Flow Q(e) (L/s)	Total Peak Design Flow Q(D) (L/s)	Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Q(D) / Qfull	
South Connection																									
Copperwood Flats	107	106			3		0.006	0.006	0.02	3.75	0.08	0.034	0.034	0.034	0.01	0.09	29.5	200 PVC	0.203	0.013	1.00	34.2	1.06	0.3%	
Copperwood Flats	106	105			3		0.006	0.013	0.04	3.72	0.15	0.031	0.065	0.065	0.02	0.17	8.4	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%	
Copperwood Flats	105	102			3		0.006	0.019	0.06	3.71	0.23	0.090	0.154	0.154	0.05	0.28	47.5	200 PVC	0.203	0.013	0.65	27.6	0.85	1.0%	
Copperwood Flats	104	103B			6		0.013	0.013	0.04	3.72	0.15	0.052	0.052	0.02	0.17	28.1	200 PVC	0.203	0.013	1.24	38.1	1.17	0.4%		
Copperwood Flats	103B	103A			0		0.000	0.013	0.04	3.72	0.15	0.005	0.057	0.057	0.02	0.17	6.0	200 PVC	0.203	0.013	2.00	48.4	1.49	0.4%	
Copperwood Flats	103A	102			0		0.000	0.013	0.04	3.72	0.15	0.060	0.117	0.117	0.04	0.19	31.0	200 PVC	0.203	0.013	2.00	48.4	1.49	0.4%	
Copperwood Flats	102	101			12		0.025	0.057	0.18	3.64	0.67	0.162	0.433	0.433	0.14	0.81	35.9	200 PVC	0.203	0.013	0.50	24.2	0.75	3.4%	
rue Spoor Street	101	EX			0		0.000	0.057	0.18	3.64	0.67	0.005	0.438	0.438	0.14	0.81	14.4	200 PVC	0.203	0.013	2.00	48.4	1.49	1.7%	
North Connection																									
Copperwood Flats	109	108			6		0.013	0.013	0.04	3.72	0.15	0.067	0.067	0.02	0.17	25.7	200 PVC	0.203	0.013	1.00	34.2	1.06	0.5%		
Copperwood Flats	108	110			3		0.006	0.019	0.06	3.71	0.23	0.069	0.069	0.02	0.25	10.3	200 PVC	0.203	0.013	1.00	34.2	1.06	0.7%		
Copperwood Flats	110	11			0		0.000	0.019	0.06	3.71	0.23	0.069	0.137	0.137	0.05	0.27	12.6	200 PVC	0.203	0.013	1.00	34.2	1.06	0.8%	
Totals			0	0	36	0.000	0.076	0.076	0.25								249.4								

Demand Equation / Parameters

- $Q(D), Q(A), Q(R) = Q(p) + Q(fd) + Q(ici) + Q(e)$
- $Q(p) = (P \times q \times M \times K / 86,400)$
- $q =$
 - 280 L/per person/day (design)
 - 200 L/per person/day (annual and rare)
- M = Harmon Formula (maximum of 4.0)**
- $K =$
 - 0.8 (design)
 - 0.6 (annual and rare)
- Park flow is considered equivalent to a single unit / ha**
 $Park Demand = 4 \text{ single unit equivalent / park ha } (\sim 3,600 \text{ L/ha/day})$
- $Q(fd) = 0.45 \text{ L/s/unit}$
- $Q(ici) = ICI \text{ Area} \times ICI \text{ Flow} \times ICI \text{ Peak}$
- $Q(e) =$
 - 0.33 L/s/ha (design)
 - 0.30 L/s/ha (annual)
 - 0.55 L/s/ha (rare)

Definitions

- $Q(D)$ = Peak Design Flow (L/s)
- $Q(A)$ = Peak Annual Flow (L/s)
- $Q(R)$ = Peak Rare Flow (L/s)
- $Q(p)$ = Peak Design Population Flow (L/s)
- $Q(q)$ = Average Population Flow (L/s)
- P = Residential Population =

<u>Singles</u>	<u>Semis / Towns</u>	<u>Stacked Towns</u>
3.4	2.7	2.1
- q = Average Capita Flow
- M = Harmon Formula
- K = Harmon Correction Factor
- Typ. Service Diameter (mm) = 135**
- Typ. Service Length (m) = 15**
- I/I Pipe Rate (L/mm dia/m/hr) = 0.007**
- $Q(fd)$ = Foundation Flow (L/s)
- $Q(ici)$ = Industrial / Commercial / Institutional Flow (L/s)
- $Q(e)$ = Extraneous Flow (L/s)

	<u>Institutional / Commercial / Industrial</u>	<u>Industrial</u>	<u>Commercial / Institutional</u>
Design =	35000	28000	L/gross ha/day
Annual / Rare =	10000	17000	L/gross ha/day
ICI Peak *	#DIV/0!	1.5	* ICI Peak = 1.0 Default, 1.5 if ICI in contributing area is >20% (design only)
Design =	#DIV/0!	1.5	
Annual / Rare =	#DIV/0!	1.0	

Capacity Equation

$$Q_{full} = 1000 \cdot (1/n) \cdot A_p \cdot R^{2/3} \cdot S_o^{0.5}$$

Definitions

- Q_{full} = Capacity (L/s)
- n = Manning coefficient of roughness (0.013)
- A_p = Pipe flow area (m²)
- R = Hydraulic Radius of wetted area (dia./4 for full pipes)
- S_o = Pipe slope/gradient

SANITARY SEWER DESIGN SHEET
1053, 1075 and 1145 March Road
Copperwood Estate- Phase 1



PROJECT # : 116132
 DESIGNED BY : MM/SAZ
 CHECKED BY : DDB
 DATE PREPARED : 6-Jun-18
 DATE REVISED : 8-May-19
 DATE REVISED : 20-Apr-20
 DATE REVISED : 23-Dec-21
 DATE REVISED : 4-May-22
 DATE REVISED : 9-Dec-22

LOCATION					RESIDENTIAL								COMMERCIAL / INSTITUTIONAL / PARK						INFILTRATION				FLOW		PROPOSED SEWER									
					INDIVIDUAL				CUMULATIVE				COMM		INST		PARK		PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/Qcap	d/D _{full}	Actual Velocity	
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi-Town Units	Multi-Unit Towns	Multi-Unit Apartment	Multi-Unit Flats	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)																Accu. AREA (ha.)
Outlet 1 - Street 1 and March Road																																		
Future Phase 2	FUT	405								0.000		0.078	1.29	3.6	0.92					1.17				2.46	0.81	1.78								
cours Strawberry Walk	405	607	B10	0.25	3					0.010	0.25	0.252	4.31	3.5	2.84		0.00	0.00	1.17	0.05	0.25	5.48	1.81	4.70	79.8	250	254.00	DR 35	0.66	50.4	0.99	9.3%	0.19	0.60
voie Whitlow Grass Way	603	605	B13	0.15	3					0.008	0.15	0.008	0.15	3.7	0.10		0.00	0.00	0.00	0.00	0.15	0.15	0.05	0.15	14.0	200	203.20	DR 35	0.95	33.4	1.03	0.4%		
voie Whitlow Grass Way	605	607	B14	0.70	25					0.068	0.70	0.076	0.85	3.6	0.89		0.00	0.00	0.00	0.00	0.70	0.85	0.28	1.17	92.6	200	203.20	DR 35	0.97	33.7	1.04	3.5%		
voie Whitlow Grass Way	607	609	B15	0.62	21					0.057	0.62	0.384	5.78	3.4	4.26		0.00	0.00	1.17	0.05	0.62	6.95	2.29	6.60	79.5	250	254.00	DR 35	0.55	46.0	0.91	14.4%	0.25	0.64
voie Whitlow Grass Way	609	611								0.000	0.00	0.384	5.78	3.4	4.26		0.00	0.00	1.17	0.05	0.00	6.95	2.29	6.60	7.4	250	254.00	DR 35	0.68	51.2	1.01	12.9%	0.23	0.68
voie Whitlow Grass Way	611	613	B16	0.11						0.000	0.11	0.384	5.89	3.4	4.26		0.00	0.00	1.17	0.05	0.11	7.06	2.33	6.64	51.0	250	254.00	DR 35	0.55	46.0	0.91	14.4%	0.25	0.64
voie Whitlow Grass Way	613	615								0.00	0.00	0.384	5.89	3.4	4.26		0.00	0.00	1.17	0.05	0.00	7.06	2.33	6.64	11.3	250	254.00	DR 35	0.71	52.3	1.03	12.7%	0.23	0.69
voie Whitlow Grass Way	615	617	B17	0.44	14					0.038	0.44	0.422	6.33	3.4	4.66		0.00	0.00	1.17	0.05	0.44	7.50	2.48	7.18	47.7	250	254.00	DR 35	0.55	46.0	0.91	15.6%	0.27	0.66
rang Hague Row / Park / voie Whitlow Grass Way	601	703	B18	2.06	30					0.081	1.01	0.081	1.01	3.6	0.95		0.00	0.00	1.05	1.05	2.06	2.06	0.68	1.67	108.0	200	203.20	DR 35	0.85	31.5	0.97	5.3%		
rang Hague Row	703	705	B19	0.39	11					0.030	0.39	0.111	1.40	3.6	1.29		0.00	0.00	1.05	0.04	0.39	2.45	0.81	2.14	39.2	200	203.20	DR 35	1.30	39.0	1.20	5.5%		
rang Hague Row	705	617								0.000	0.00	0.111	1.40	3.6	1.29		0.00	0.00	1.05	0.04	0.00	2.45	0.81	2.14	41.8	200	203.20	DR 35	2.82	57.5	1.77	3.7%		
voie Whitlow Grass Way	617	619	B20	0.49	16					0.043	0.49	0.576	8.22	3.4	6.26		0.00	0.00	2.22	0.10	0.49	10.44	3.45	9.80	70.1	250	254.00	DR 35	0.57	46.8	0.92	20.9%	0.30	0.72
cer. Rotterdam Circle	901	801	B27b	0.36	5					0.017	0.36	0.017	0.36	3.7	0.20		0.00	0.00	0.00	0.00	0.36	0.36	0.12	0.32	73.4	200	203.20	DR 35	1.20	37.5	1.16	0.9%		
cer. Rotterdam Circle	801	803	B27a	0.08	1					0.003	0.08	0.020	0.44	3.7	0.24		0.00	0.00	0.00	0.00	0.08	0.44	0.15	0.39	12.1	200	203.20	DR 35	1.07	35.4	1.09	1.1%		
cer. Rotterdam Circle	803	805	B21	0.31	5					0.017	0.31	0.037	0.75	3.7	0.44		0.00	0.00	0.00	0.00	0.31	0.75	0.25	0.69	61.2	200	203.20	DR 35	1.69	44.5	1.37	1.6%		
cer. Rotterdam Circle	805	807	B23	0.68	14					0.048	0.68	0.085	1.43	3.6	0.99		0.00	0.00	0.00	0.00	0.68	1.43	0.47	1.47	83.0	200	203.20	DR 35	1.51	42.0	1.30	3.5%		
cer. Rotterdam Circle	807	809	B24	0.49	10					0.034	0.49	0.119	1.92	3.6	1.38		0.00	0.00	0.00	0.00	0.49	1.92	0.63	2.01	70.9	200	203.20	DR 35	1.40	40.5	1.25	5.0%		
cer. Rotterdam Circle	809	619								0.000	0.00	0.119	1.92	3.6	1.38		0.00	0.00	0.00	0.00	0.00	1.92	0.63	2.01	9.8	200	203.20	DR 35	1.95	47.8	1.47	4.2%		
voie Whitlow Grass Way	619	621	B25	0.16	4					0.011	0.16	0.705	10.30	3.3	7.58		0.00	0.00	2.22	0.10	0.16	12.52	4.13	11.80	39.2	250	254.00	DR 35	0.61	48.5	0.96	24.4%	0.34	0.79
voie Whitlow Grass Way	621	907	B26	0.06						0.000	0.06	0.705	10.36	3.3	7.58		0.00	0.00	2.22	0.10	0.06	12.58	4.15	11.82	41.2	250	254.00	DR 35	0.61	48.5	0.96	24.4%	0.34	0.79
place Bosch Place	901	903	B28	0.59	10					0.034	0.59	0.034	0.59	3.7	0.41		0.00	0.00	0.00	0.00	0.59	0.59	0.19	0.60	75.0	250	254.00	DR 35	1.97	87.1	1.72	0.7%	0.00	0.00
place Bosch Place	903	905	B29	0.61	10					0.034	0.61	0.068	1.20	3.6	0.80		0.00	0.00	0.00	0.00	0.61	1.20	0.40	1.20	75.0	250	254.00	DR 35	2.27	93.5	1.84	1.3%	0.08	0.61
place Bosch Place	905	907	B30	0.57	10					0.034	0.57	0.102	1.77	3.6	1.19		0.00	0.00	0.00	0.00	0.57	1.77	0.58	1.77	70.9	250	254.00	DR 35	2.17	91.4	1.80	1.9%	0.08	0.60
cer. Rotterdam Circle	901	1001	B31	0.40	5					0.017	0.40	0.017	0.40	3.7	0.20		0.00	0.00	0.00	0.00	0.40	0.40	0.13	0.34	72.1	200	203.20	DR 35	0.65	27.6	0.85	1.2%		
cer. Rotterdam Circle	1001	1003	B32	0.12	1					0.003	0.12	0.020	0.52	3.7	0.24		0.00	0.00	0.00	0.00	0.12	0.52	0.17	0.42	13.4	200	203.20	DR 35	0.45	23.0	0.71	1.8%		
cer. Rotterdam Circle	1003	1005	B33	0.97	18					0.061	0.97	0.082	1.49	3.6	0.96		0.00	0.00	0.00	0.00	0.97	1.49	0.49	1.45	114.4	200	203.20	DR 35	1.60	43.3	1.33	3.3%		
cer. Rotterdam Circle	1005	1101	B34	0.72	14					0.048	0.72	0.129	2.21	3.6	1.49		0.00	0.00	0.00	0.00	0.72	2.21	0.73	2.22	97.6	200	203.20	DR 35	2.29	51.8	1.60	4.3%		
rie. Spoor Lane	1103	1101	B35	0.34	7					0.019	0.34	0.019	0.34	3.7	0.23		0.00	0.00	0.00	0.00	0.34	0.34	0.11	0.34	53.0	200	203.20	DR 35	0.66	27.8	0.86	1.2%		
rie. Spoor Lane	1101	907	B36	0.25	6					0.016	0.25	0.164	2.80	3.5	1.89		0.00	0.00	0.00	0.00	0.25	2.80	0.92	2.81	82.0	200	203.20	DR 35	0.40	21.6	0.67	13.0%		
place Bosch Place	907	1311	B37	0.56	10					0.034	0.56	1.006	15.49	3.2	10.56		0.00	0.00	2.22	0.10	0.56	17.71	5.84	16.50	82.8	375	381.00	DR 35	0.53	133.2	1.17	12.4%	0.23	0.78
Salinger Street	1315	1313	B38	0.44	8					0.022	0.44	0.022	0.44	3.7	0.26		0.00	0.00	0.00	0.00	0.44	0.44	0.15	0.40	57.8	200	203.20	DR 35	0.80	30.6	0.94	1.3%		
Salinger Street	1313	1311	B39	0.25	5					0.014	0.25	0.035	0.69	3.7	0.42		0.00	0.00	0.00	0.00	0.25	0.69	0.23	0.65	73.6	200	203.20	DR 35	1.13	36.4	1.12	1.8%		
Salinger Street	1311	1309	B40	0.25						0.000	0.25	1.041	16.43	3.2	10.90		0.00	0.00	2.22	0.10	0.25	18.65	6.15	17.15	24.1	375	381.00	DR 35	0.58	139.3	1.22	12.3%	0.23	0.82
Salinger Street	1309	1307			4					0.011	0.00	1.052	16.43	3.2	11.00		0.00	0.00	2.22	0.10	0.00	18.65	6.15	17.25	33.9	375	381.00	DR 35	0.53	133.2	1.17	13.0%	0.23	0.78
Salinger Street	1307	1305	B41	0.23	6					0.016	0.23	1.068	16.66	3.2	11.16		0.00	0.00	2.22	0.10	0.23	18.88	6.23	17.49										

SANITARY SEWER DESIGN SHEET
1053, 1075 and 1145 March Road
Copperwood Estate- Phase 1



PROJECT # : 116132
 DESIGNED BY : MM/SAZ
 CHECKED BY : DDB
 DATE PREPARED : 6-Jun-18
 DATE REVISED : 8-May-19
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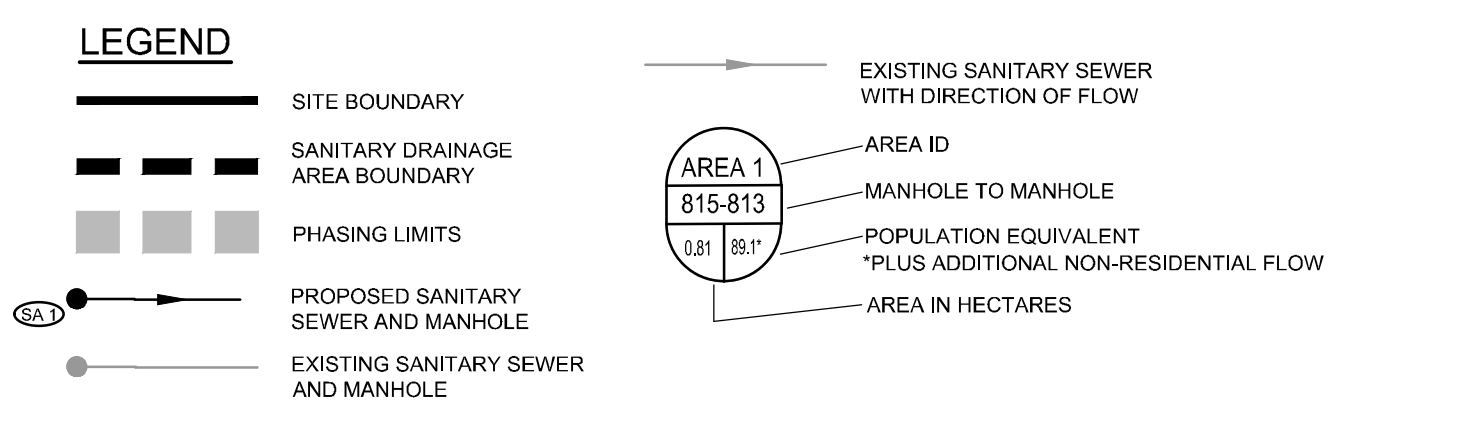
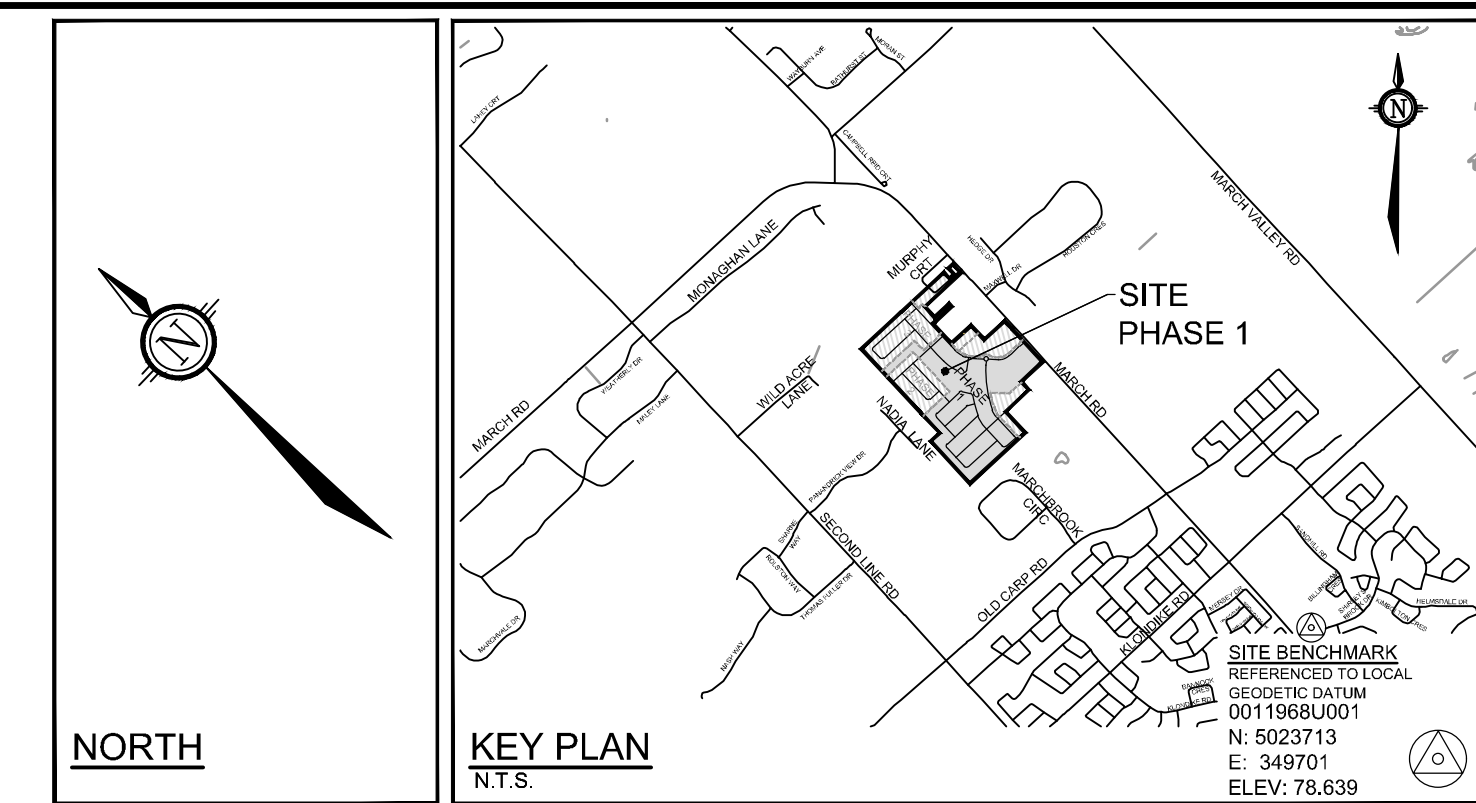
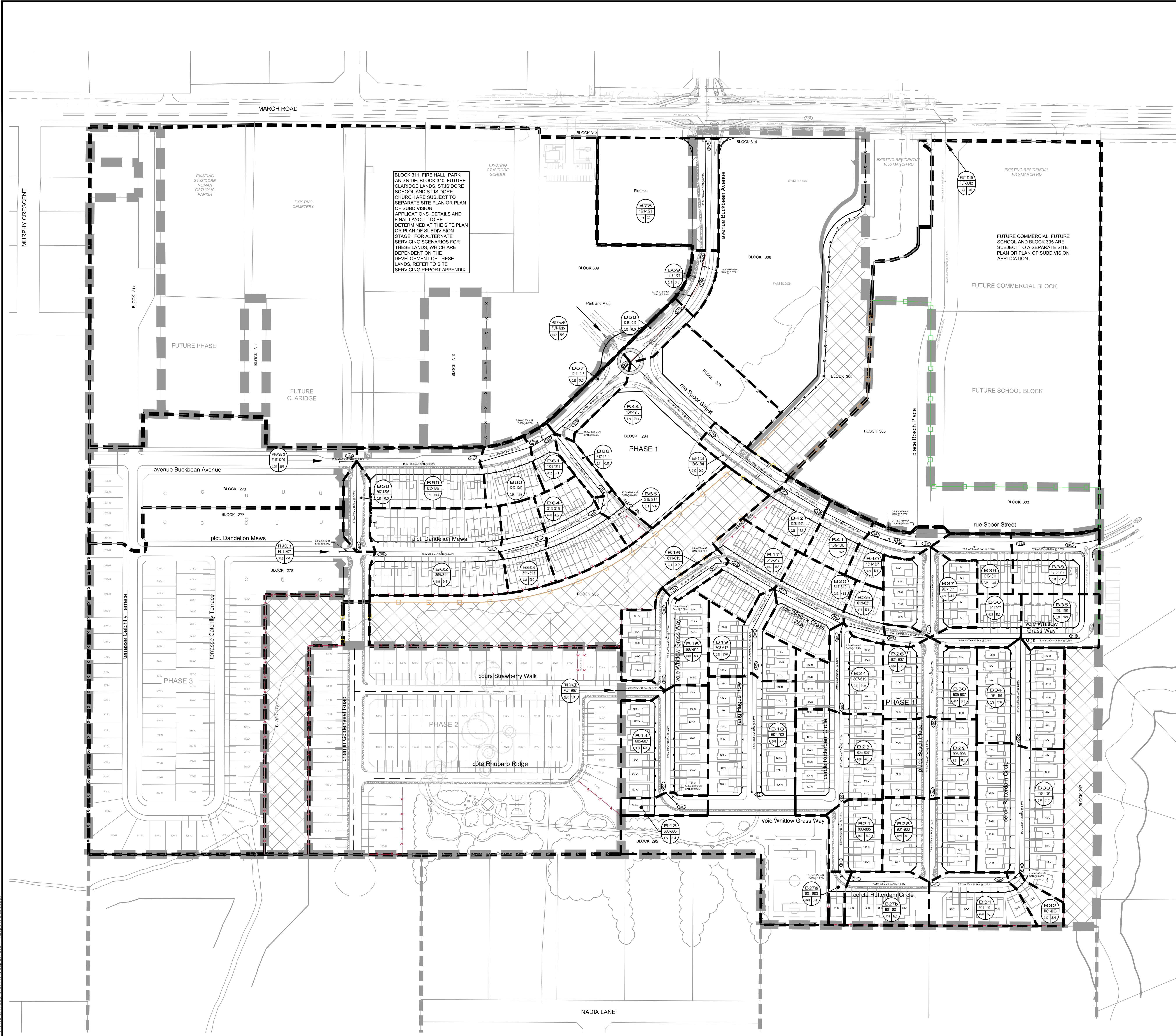
LOCATION					RESIDENTIAL										COMMERCIAL / INSTITUTIONAL / PARK						INFILTRATION		FLOW		PROPOSED SEWER															
					INDIVIDUAL					CUMULATIVE					COMM		INST		PARK		Total Area (ha.)	Accu. Total AREA (ha.)	PEAK EXTRAN. FLOW Q(i) (L/s)	PEAK DESIGN FLOW Q(d) (L/s)	LENGTH (m)	PIPE SIZE (mm)	PIPE ID (mm)	TYPE OF PIPE	GRADE %	CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	Qpeak/Qcap	d/D _{full}	Actual Velocity						
STREET	FROM MH	TO MH	Area ID	Total Area (ha.)	Single Units	Semi/Town Units	Mult-Unit Towns	Mult-Unit Apartment	Mult-Unit Flats	Population (in 1000's)	AREA (ha.)	Population (in 1000's)	AREA (ha.)	PEAK FACTOR M	PEAK POPULATION FLOW Qr(p) (L/s)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)	Accu. AREA (ha.)	AREA (ha.)															Accu. AREA (ha.)	PEAK COMM/INST/PARK FLOW Qc(p) (L/s)	PEAK COMM/INST/PARK FLOW Qc(p) (L/s)			
FUTURE BLOCK / EXISTING LANDS ACCOUNTED FOR INCLUDING BLOCK 315	FUT / EX	1407		0.00						0.000		0.280	5.69	3.5	3.15							0.00	4.34	0.00	1.41	0.00	10.03	3.31	7.86	69.2	200	203.20	DR 35	0.45	23.0	0.71	34.3%			
Easement - Park&Ride	1407	1409	B77	3.33			25	25		0.113	3.33	0.392	9.02	3.4	4.35							0.00	4.34	0.00	1.41	3.33	13.36	4.41	10.16	103.3	200	203.20	DR 35	0.44	22.7	0.70	44.8%			
Easement - Park&Ride	1409	1215		0.00						0.000		0.392	9.02	3.4	4.35							0.00	4.34	0.00	1.41	0.00	13.36	4.41	10.16	97.2	200	203.20	DR 35	0.44	22.7	0.70	44.8%			
avenue Buckbean Avenue	1215	1217	B68	0.13						0.000	0.13	2.452	38.60	3.0	23.94							0.00	4.34	2.22	1.50	0.13	45.16	14.90	40.34	69.9	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15	
avenue Buckbean Avenue	1217	1219	B69	0.14						0.000	0.14	2.452	38.74	3.0	23.94							0.00	4.34	2.22	1.50	0.14	45.30	14.95	40.39	27.1	375	381.00	DR 35	0.75	158.4	1.39	25.5%	0.34	1.15	
avenue Buckbean Avenue	1219	1221								0.000	0.00	2.452	38.74	3.0	23.94							0.00	4.34	2.22	1.50	0.00	45.30	14.95	40.39	28.2	375	381.00	DR 35	0.76	159.5	1.40	25.3%	0.34	1.16	
avenue Buckbean Avenue	1221	1223	B78	1.10						0.000	0.27	2.452	39.01	3.0	23.94			0.83	5.17			2.22	1.77	1.10	46.40	15.31	41.02	99.1	375	381.00	DR 35	0.75	158.4	1.39	25.9%	0.34	1.15			
Total Flows - Outlet 1															23.94																									
Outlet 2 - Street 10 and March Road																																								
place Bosch Place	909	911	A1	1.05					42	0.088	1.05	0.088	1.05	3.6	1.03							0.00	0.00	0.00	0.00	1.05	1.05	0.35	1.38	82.0	250	254.00	DR 35	1.94	86.4	1.71	1.6%			
place Bosch Place	911	913	A2	3.57				48	0.101	0.50	0.189	1.55	3.5	2.16			0.00	3.07	3.07			0.00	0.99	3.57	4.62	1.52	4.68	45.3	250	254.00	DR 35	1.94	86.4	1.71	5.4%					
place Bosch Place	913	915	A3	0.00					0.000	0.00	0.189	1.55	3.5	2.16			0.00		3.07			0.00	0.99	0.00	4.62	1.52	4.68	47.4	250	254.00	DR 35	1.71	81.1	1.60	5.8%					
place Bosch Place	915	917	A4	0.25					0.000	0.00	0.189	1.55	3.5	2.16		0.25	0.25		3.07			0.00	1.08	0.25	4.87	1.61	4.84	75.7	250	254.00	DR 35	1.98	87.3	1.72	5.5%					
place Bosch Place	917	919	A5	2.36					0.000	0.00	0.189	1.55	3.5	2.16		2.36	2.61		3.07			0.00	1.84	2.36	7.23	2.39	6.39	74.9	250	254.00	DR 35	2.15	91.0	1.80	7.0%					
Total Flows - Outlet 2															2.16																									

Notes:
 1. Q(d) = Qr(p) + Q(i) + Qc(p)
 2. Q(i) = 0.33 L/sec/ha
 3. Qr(p) = (P x q x M) / 86,400
 3. Qc(p) = (A x q x Pf) / 86,400

Definitions:
 Q(d) = Design Flow (L/sec)
 Qr(p) = Population Flow (L/sec), Residential
 Q(i) = Extraneous Flow (L/sec)
 Qc(p) = Population Flow (L/sec), Commercial/Institutional/Park

P = Population (3.4 persons per single unit, 2.7 persons per townhouse unit, 2.7 persons per multi-unit townhouse unit, 2.1 persons per multi-unit apartment, 1.8 persons per multi-unit apartment)
 q = Average per capita flow = 280 L/cap/day - Residential
 q = Average per gross ha. flow = 35000 L/gross ha/day - Light industrial
 q = Average per gross ha. flow = 28000 L/gross ha/day - Commercial/Institutional
 q = Average per gross ha. flow = 3700 L/gross ha/day - Park (20L/day/person, 185 persons/ha - as per Appendix 4-A of the City of Ottawa Sewer Design Guidelines)
 M = Harmon Formula (maximum of 4.0), K = Correction Factor = 0.8
 Min pipe size 200mm @ min. slope 0.32%
 Mannings n = 0.013
 Pf = Peak factor (Commercial/Institutional/Park) = 1.0 (less than 20% of total contributing areas), 1.5 (if area is 20% or greater of total contributing area)

*Assumes existing single lot along roadway will ultimately become 2 single units.
 **Assumes north half of property is 50% towns and 50% singles at same density as CU lands (25 singles/ha, 47 towns/ha), south half of property assumed to be multi unit residential at same density as CU lands (62.8units/ha).



BLOCK 311, FIRE HALL, PARK AND RIDE, BLOCK 310, FUTURE CLARIDGE LANDS, ST ISIDORE SCHOOL AND ST ISIDORE CHURCH ARE SUBJECT TO SEPARATE SITE PLAN OR PLAN OF SUBDIVISION APPLICATIONS. DETAILS AND FINAL LAYOUT TO BE DETERMINED AT THE SITE PLAN OR PLAN OF SUBDIVISION STAGE. FOR ALTERNATE SERVICING SCENARIOS FOR THESE LANDS, WHICH ARE DEPENDENT ON THE DEVELOPMENT OF THESE LANDS, REFER TO SITE SERVICING REPORT APPENDIX.

FUTURE COMMERCIAL, FUTURE SCHOOL AND BLOCK 305 ARE SUBJECT TO A SEPARATE SITE PLAN OR PLAN OF SUBDIVISION APPLICATION.

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY	No.	REVISION	DATE	BY
9.			SAZ	8.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 19/23	SAZ
				7.	REVISED AS PER CITY OF OTTAWA COMMENTS	DEC 9/22	SAZ
				6.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ
				5.	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP
				4.	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP
				3.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP
				2.	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP
				1.	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP

DESIGN	SCALE
TJM	1:1500
SAZ	1:1500
MTM	1:1500
SAZ	1:1500
MSP	1:1500

CHECKED	DATE	BY
		TJM
		SAZ
		MTM
		SAZ
		MSP

REFER TO 116132-NL FOR ADDITIONAL NOTES

CITY OF OTTAWA
COPPERWOOD ESTATE
1053, 1075 AND 1145 MARCH ROAD

DRAWING NAME
SANITARY DRAINAGE AREA PLAN
PHASE 1

PROJECT NO.
116132-00

REV #
REV 9

DRAWING NO.
116132-SAN

#17801

Appendix D
Storm Servicing

The storm drainage designs for the future development areas will likely have multiple storage elements and ICDs and will be developed in support of the development applications for these areas. For modeling purposes, each block within the Future Development Area is represented as a single catchment with a storage node and an orifice to control flows to the 5-year peak flow. The 5-year head on the orifices is 1.40m, which represents the average depth of a catchbasin. Storage for storms greater than the 5-year event is represented as a ponding area, with an additional 0.35m of head on the orifice for the 100-year storm event. Therefore, the 100-year release rates are slightly higher than the 5-year peak flow due to the additional 0.35m of head. Runoff from storms that exceed the 100-year design event are assumed to flow overland to March Road. **Table 3.4** summarizes the required storage and 100-year inlet capture rate for the future development blocks. It should be noted that storage requirements can be different during the detailed design of the blocks.

Table 3.4: Summary of required storage and 100-year inlet capture rate for future development block (Scenario2)

Area ID	Drainage Area (ha)	Runoff Coeff.	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m ³)
NW-110B	2.58	0.65	483	244
NW-118	0.91	0.70	218	50
NW-120	2.31	0.65	469	140
NW-122	0.25	0.77	69	20
NW-123	0.62	0.85	175	46
NW-125	0.24	0.88	69	24
NW-114	0.89	0.85	256	69
NW-112	2.58	0.85	730	143
NW-31	0.94	0.70	210	66
NW-104B-1 & 2	2.37	0.65	234	312
NW-108B	0.66	0.65	120	64
NW-109	1.98	0.67	420	122
NW-90	0.60	0.65	120	37
NW-98	0.57	0.70	135	34
NW-111	0.79	0.70	167	54
FUT1204/NW-9	3.08	0.65	588	300
FUT306	2.82	0.65	600	236
FUTURE	4.21	0.59	888	271

Refer to detailed ICD sizing calculations, release rates and 100-year surface storage volumes provided in **Appendix B-3**. ICD calculations are based on the 3-hour Chicago storm distribution, which generates the highest peak flows and is the critical design event for the sizing of the storm sewers and ICDs for the future development areas. In the detailed design stage for each of future development blocks, required storage will be determined, but considering the release rates and boundary condition will be essential.

Scenario 2 - Equivalent Orifice Sizing & Required Storages

Name	Inlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Orific Dia. ¹ (m)	5-year Peak Runoff ² (L/s)	5-year Inlet Capture Rate ³ (L/s)	100 Year Peak Runoff (L/S)	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m ³)
Orifices (Future Development Areas)										
O-SU110B	SU110B	NW-110B	2.58	0.35	0.465	466	459	892	483	244
O-SU118	SU118	NW-118	0.91	0.35	0.285	185	184	352	218	50
O-SU120	SU120	NW-120	2.31	0.35	0.424	429	419	824	469	140
O-SU122	SU122	NW-122	0.25	0.35	0.159	62	61	116	69	20
O-SU123	SU123	NW-123	0.62	0.35	0.255	160	157	293	175	46
O-SU125	SU125	NW-125	0.24	0.35	0.159	68	63	118	69	24
O-SU2	SU2	NW-114	0.89	0.35	0.310	236	235	426	256	69
O-SU3	SU3	NW-112	2.58	0.35	0.600	567	566	1092	730	143
O-SU31	SU31	NW-31	0.94	0.35	0.280	196	189	375	210	66
O-SU4	SU4	NW-104B-1&2	2.37	0.35	0.295	211	208	567	234	312
O-SU108B	SU108B	NW-108B	0.66	0.35	0.211	106	105	251	120	64
O-SU5	SU5	NW-109	1.98	0.35	0.400	382	374	731	420	122
O-SU90	SU90	NW-90	0.60	0.35	0.211	111	108	214	120	37
O-SU98	SU98	NW-98	0.57	0.35	0.224	118	117	225	135	34
O-SU9	SU9	NW-111	0.79	0.35	0.250	156	152	302	167	54
O-CB16/CB15	CB16/CB15	FUT1204/NW-9	3.08	0.35	0.485	627	549	1271	588	300
O-MH429-MH306	CB86/CB87	FUT306	2.82	0.35	0.485	574	544	1163	600	236
O-CB109/CB110	CB109/CB110	FUTURE	4.21	0.35	0.600	762	761	1607	888	271

¹ Equivalent orifice diameter corresponding to 5-year peak runoff; based on 1.40m of head (CB T/G - CB Inv.).

² Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment.

³ Inlet capture rate (max. flow through orifice) based on 1.40m of head (CB T/G - CB Inv.) for 5-year & 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.

⁴ Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.

Scenario 1 - Equivalent Orifice Sizing for Existing St. Isidore Church (DME, 2010)

Name	Inlet / Outlet Node	Area ID	Drainage Area (ha)	Static Ponding Depth (m)	Artificial Orific Dia. ¹ (m)	5-year Peak Runoff ² (L/s)	Target 100-year Release Rate ¹ (L/s)	100-year Inlet Capture Rate ³ (L/s)	Required 100-year Storage ⁴ (m ³)
O-SU-104B	SU-104B	NW-104B	3.03	0.35	0.264	186	189	187	73

¹ Equivalent orifice diameter corresponding to 100-year release rate of 189.3 L/s (per DME, 2010); based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth).

² Peak runoff for 5-year, 3-hour Chicago Storm from subcatchment. Subcatchments parameters calibrate to follow the DME, 2010 report.

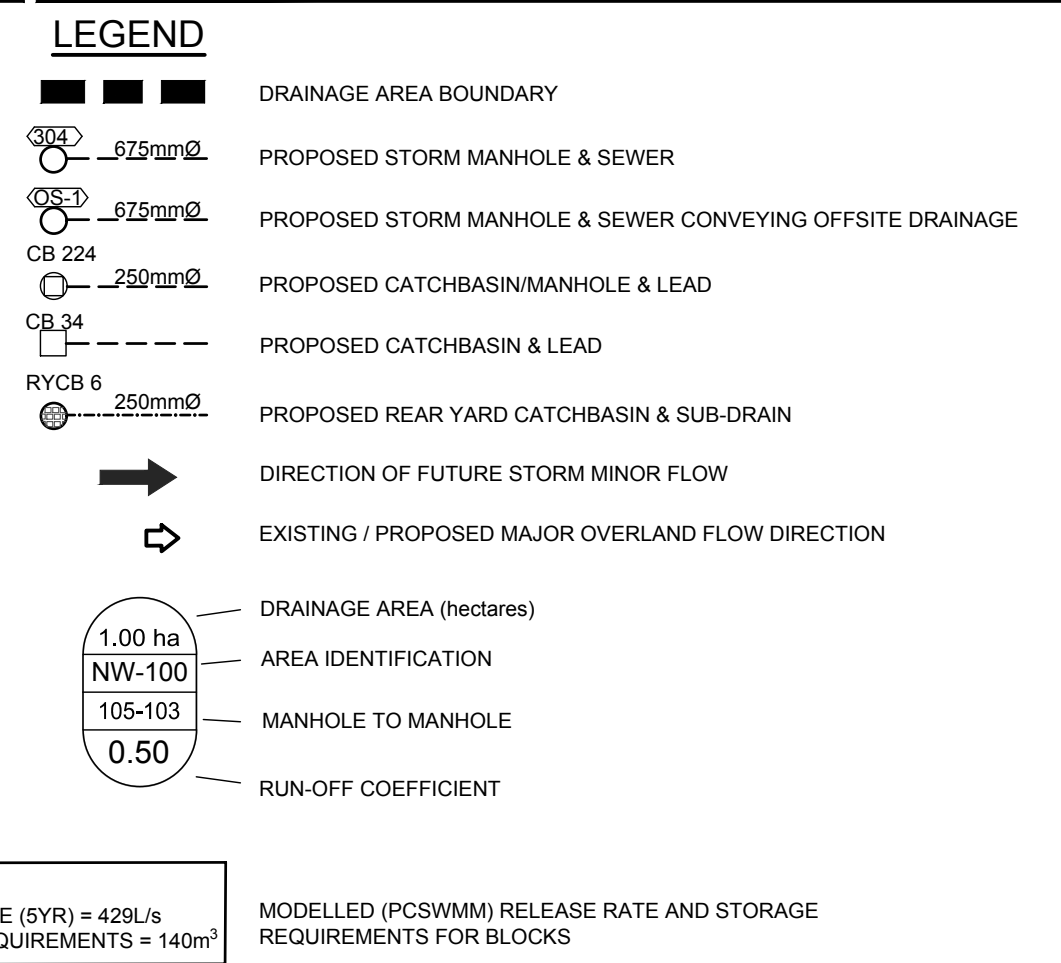
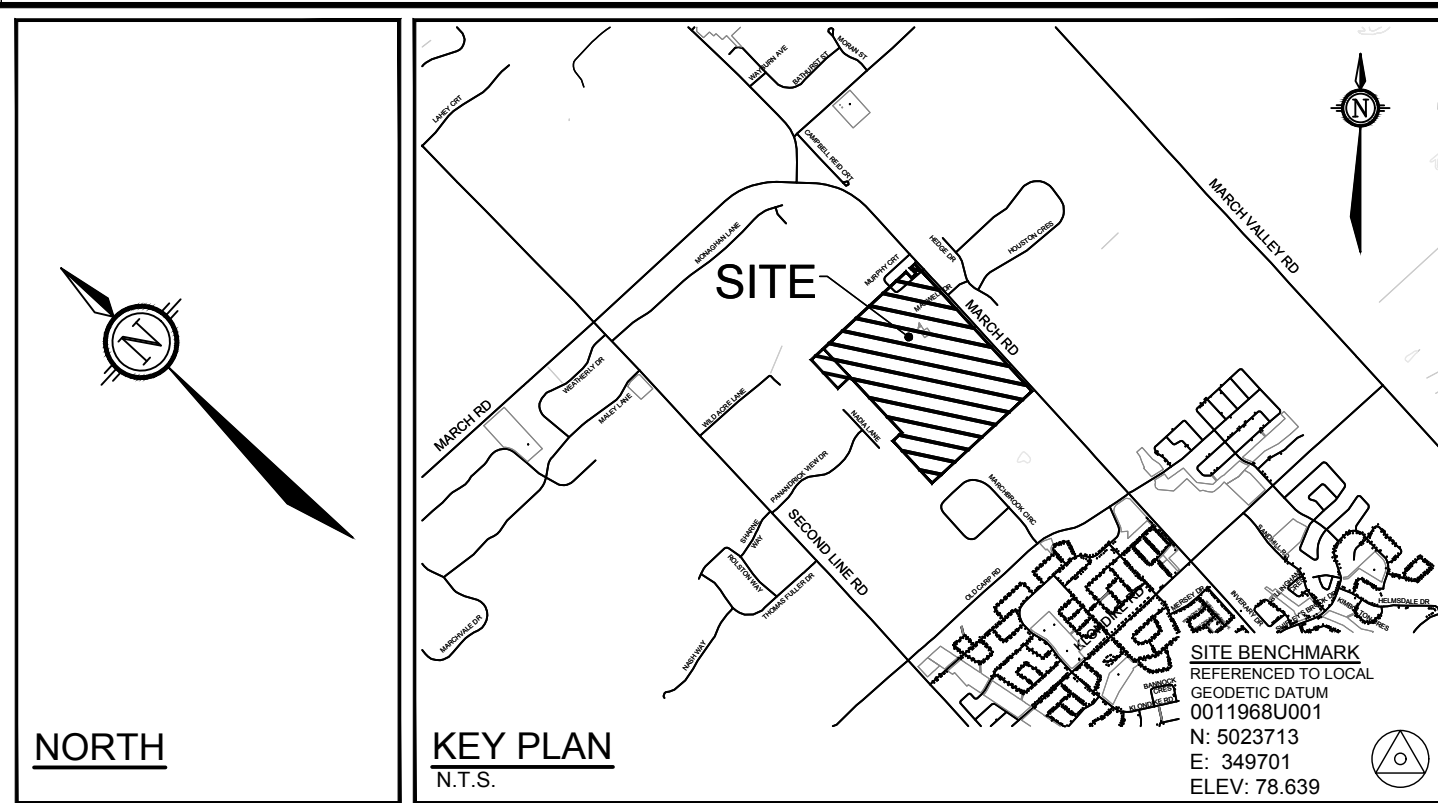
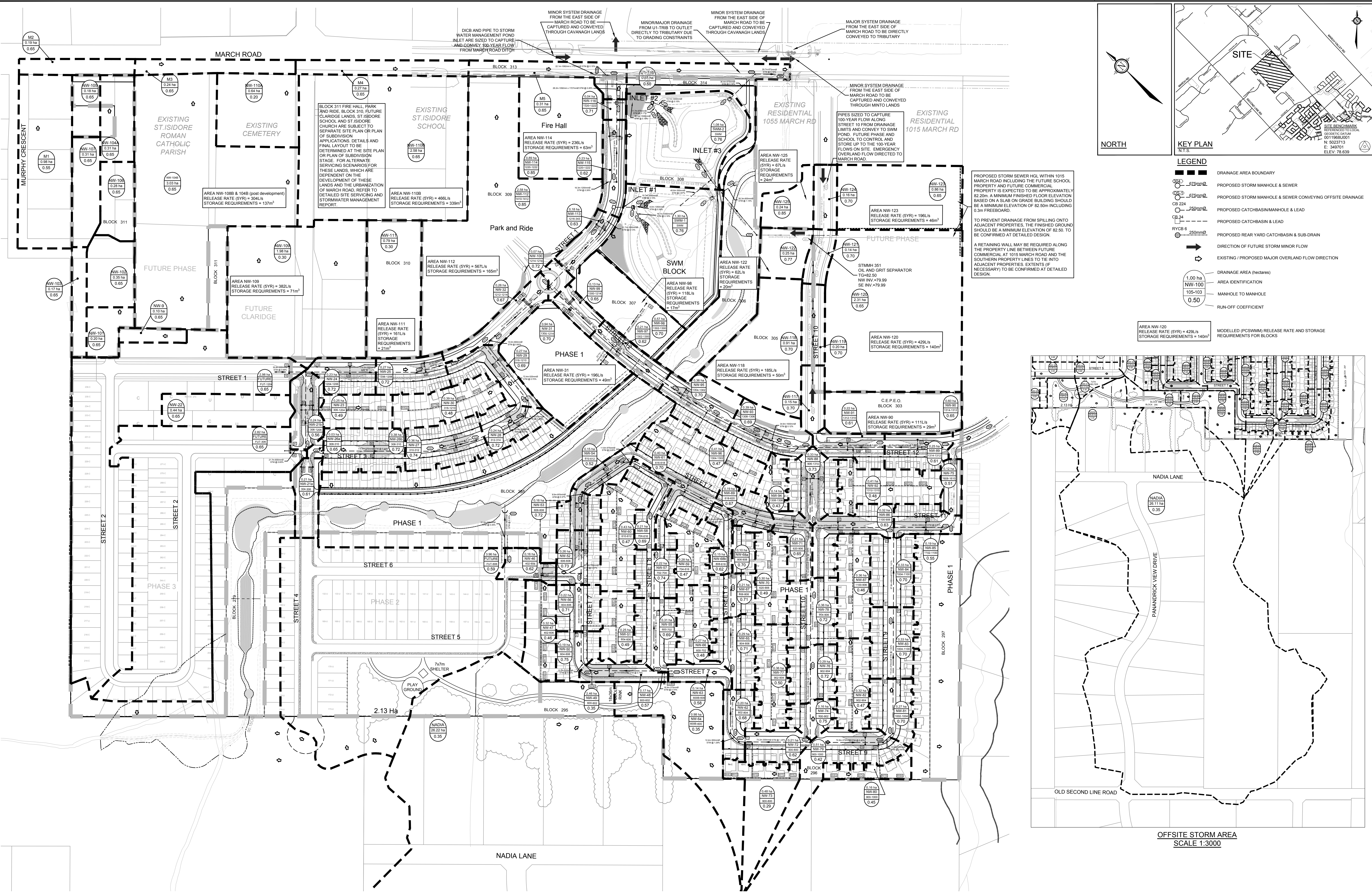
³ Inlet capture rate (max. flow through orifice) based on 1.75m of head (CB T/G - CB Inv. + 0.35m static ponding depth) for 100-year.

⁴ Required 100-year surface storage (max. volume) based on 0.35m static ponding depth.

MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr12hr (m)	HGL Elevation 100yr12hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.17	89.68	90.42	1.27	1.25
MH1004	87.62	87.17	90.25	87.52	87.58	87.92	88.61	1.09	1.03
MH1100	85.76	85.08	88.49	86.05	86.25	86.35	86.72	0.67	0.47
MH1102	85.96	85.66	88.50	86.17	86.37	86.47	86.92	0.75	0.55
MH1204	86.47	85.57	88.79	86.38	86.77	86.77			
MH1206	85.73	84.83	88.19	85.73	86.01	86.03	86.41	0.68	0.40
MH1208	85.48	84.58	88.08	85.38	85.67	85.78	86.18	0.80	0.51
MH1210	84.98	84.08	87.60	85.18	85.46	85.48	86.18	1.00	0.72
MH1212	84.86	83.96	87.37	85.02	85.31	85.32			
MH1214	83.66	82.01	86.96	84.38	84.71	84.68			
MH1216	83.56	81.91	85.15	84.38	84.64	84.68			
MH1218	83.46	81.81	85.30	84.38	84.62	84.68			
MH1220	81.14	79.94	84.43	81.87	82.14	82.17			
MH1222	80.86	79.36	82.81	81.87	82.04	82.17			
MH1224	89.59	79.59	82.10	81.87	82.04	89.89			
MH1300	83.77	82.27	87.33	84.82	85.15	85.12			
MH1302	83.87	82.37	87.53	85.02	85.33	85.32	86.12	1.10	0.79
MH1304	85.13	83.63	87.76	85.12	85.43	85.43	86.12	1.00	0.69
MH1306	85.18	83.68	87.68	85.22	85.52	85.52	86.22	1.00	0.70
MH1308	85.22	83.72	87.85	85.30	85.60	85.60	86.31	1.01	0.71
MH1310	85.29	83.79	88.05	85.37	85.67	85.67	86.31	0.94	0.64
MH1312	85.87	85.19	88.19	85.63	85.75	86.17	86.58	0.95	0.83
MH1314	86.05	85.52	88.15	85.85	85.87	86.35	86.66	0.81	0.79
MH1400	83.45	82.62	88.47	84.41	84.60	84.71			
MH1402	83.12	82.29	87.81	84.24	84.42	84.54			
MH1404	82.89	81.99	87.38	84.14	84.31	84.44			
MH1406	82.46	81.56	86.97	83.83	84.02	84.13			
MH1408	81.94	81.04	85.04	82.94	83.18	83.24			
MH1410	81.76	80.78	85.04	82.38	82.67	82.68			

116132 Kanata North - Northwest Quadrant
HGL Elevations - Scenario 2 (3hr Chicago)

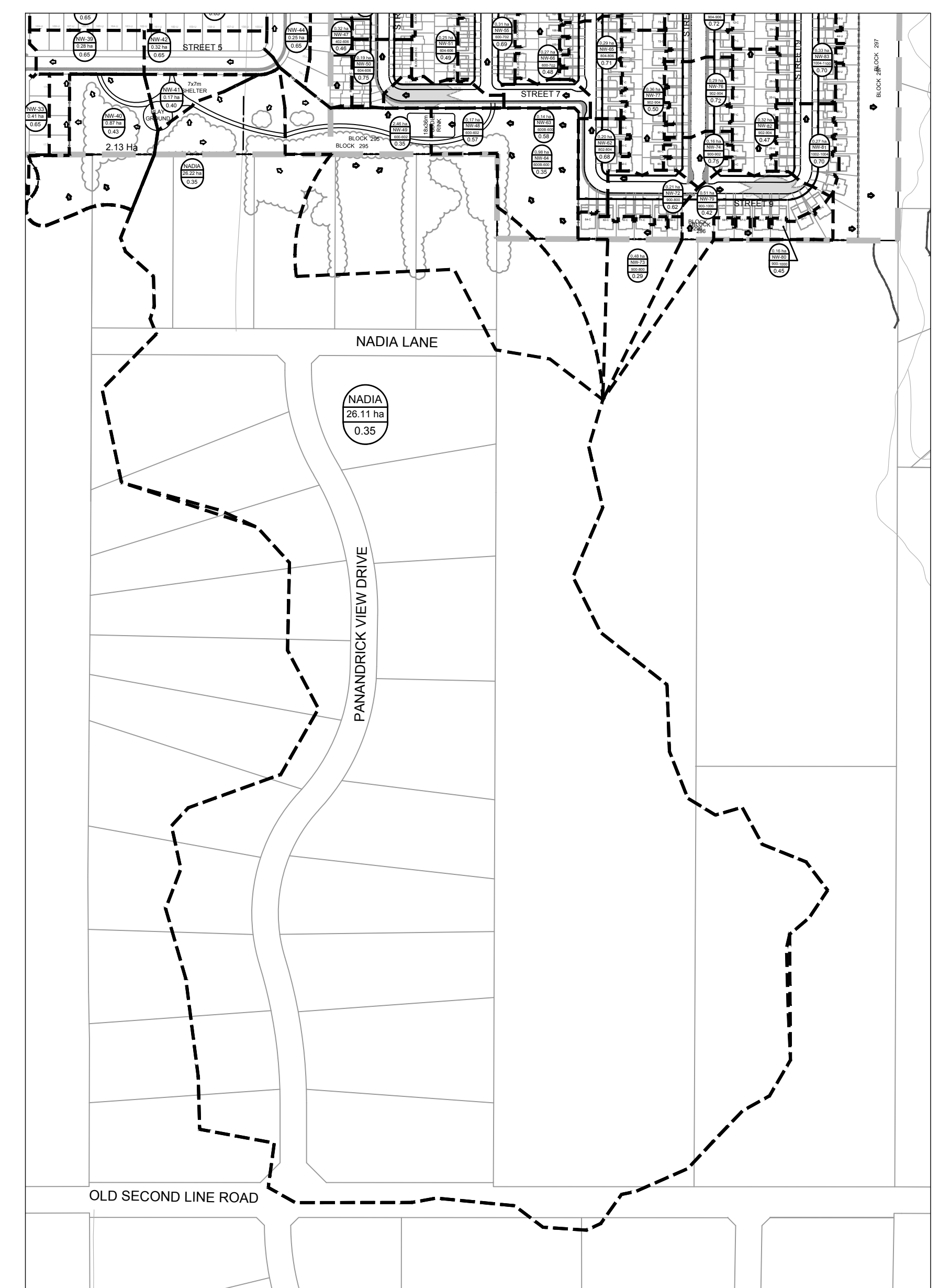
MH ID	Obvert Elevation (m)	MH Invert Elevation (m)	T/G Elevation (m)	HGL Elevation 100yr3hr (m)	HGL Elevation 100yr3hr+20% (m)	Min USF (m)	Design USF (m)	Clearance (100yr) (m)	Clearance (100yr+20%) (m)
MH1000	89.87	89.49	92.04	89.61	89.61	90.17	90.42	0.81	0.81
MH1002	89.38	89.00	92.03	89.15	89.16	89.68	90.42	1.27	1.26
MH1004	87.62	87.17	90.25	87.52	87.57	87.92	88.61	1.09	1.04
MH1100	85.76	85.08	88.49	86.01	86.20	86.31	86.72	0.71	0.52
MH1102	85.96	85.66	88.50	86.13	86.32	86.43	86.92	0.79	0.60
MH1204	86.47	85.57	88.79	86.36	86.67	86.77			
MH1206	85.73	84.83	88.19	85.70	85.88	86.03	86.41	0.71	0.53
MH1208	85.48	84.58	88.08	85.36	85.53	85.78	86.18	0.82	0.65
MH1210	84.98	84.08	87.60	85.16	85.30	85.46	86.18	1.02	0.88
MH1212	84.86	83.96	87.37	84.99	85.14	85.29			
MH1214	83.66	82.01	86.96	84.14	84.54	84.44			
MH1216	83.56	81.91	85.15	84.14	84.55	84.44			
MH1218	83.46	81.81	85.30	84.14	84.54	84.44			
MH1220	81.14	79.94	84.43	81.64	81.99	81.94			
MH1222	80.86	79.36	82.81	81.64	81.97	81.94			
MH1224	89.59	79.59	82.10	81.64	81.97	89.89			
MH1300	83.77	82.27	87.33	84.69	84.94	84.99			
MH1302	83.87	82.37	87.53	84.94	85.13	85.24	86.12	1.18	0.99
MH1304	85.13	83.63	87.76	85.06	85.24	85.43	86.12	1.06	0.88
MH1306	85.18	83.68	87.68	85.17	85.34	85.48	86.22	1.05	0.88
MH1308	85.22	83.72	87.85	85.26	85.43	85.56	86.31	1.05	0.88
MH1310	85.29	83.79	88.05	85.33	85.50	85.63	86.31	0.98	0.81
MH1312	85.87	85.19	88.19	85.63	85.65	86.17	86.58	0.95	0.93
MH1314	86.05	85.52	88.15	85.85	85.86	86.35	86.66	0.81	0.80
MH1400	83.45	82.62	88.47	84.34	84.53	84.64			
MH1402	83.12	82.29	87.81	84.18	84.35	84.48			
MH1404	82.89	81.99	87.38	84.07	84.24	84.37			
MH1406	82.46	81.56	86.97	83.75	83.94	84.05			
MH1408	81.94	81.04	85.04	82.84	83.07	83.14			
MH1410	81.76	80.78	85.04	82.27	82.53	82.57			
MH1412	81.43	80.23	84.59	81.74	82.08	82.04			
MH1414	80.03	79.05	81.20	79.60	79.61	80.33			



PROPOSED STORM SEWER HGL WITHIN 1015 MARCH ROAD INCLUDING THE FUTURE SCHOOL PROPERTY AND FUTURE COMMERCIAL PROPERTY IS EXPECTED TO BE APPROXIMATELY 82.20m. A MINIMUM FINISHED FLOOR ELEVATION BASED ON A SLAB ON GRADE BUILDING SHOULD BE A MINIMUM ELEVATION OF 82.50m INCLUDING 0.3m FREEBOARD.

TO PREVENT DRAINAGE FROM SPILLING ONTO ADJACENT PROPERTIES, THE FINISHED GROUND SHOULD BE A MINIMUM ELEVATION OF 82.50. TO BE CONFIRMED AT DETAILED DESIGN.

A RETAINING WALL MAY BE REQUIRED ALONG THE PROPERTY LINE BETWEEN FUTURE COMMERCIAL AT 1015 MARCH ROAD AND THE SOUTHERN PROPERTY LINES TO TIE INTO ADJACENT PROPERTIES. EXTENTS (IF NECESSARY) TO BE CONFIRMED AT DETAILED DESIGN.



REFER TO OFFSITE STORM AREA VIEW

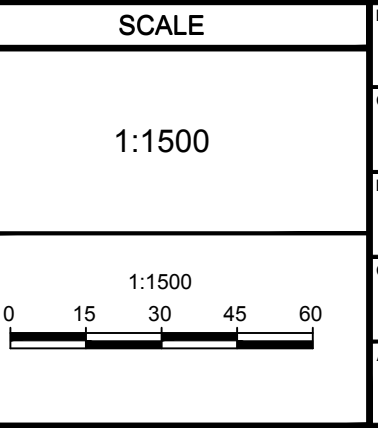
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REFER TO 116132-NL FOR ADDITIONAL NOTES

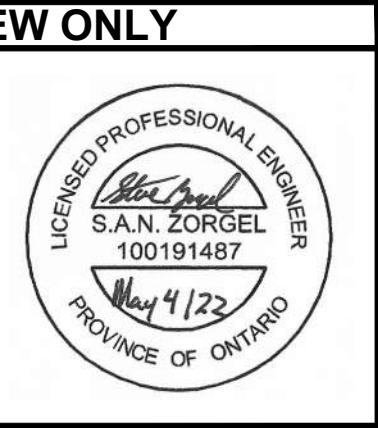
NOTE: THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

**PRELIMINARY
NOT FOR
CONSTRUCTION**

NO.	REVISION	DATE	BY
7	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 4/22	SAZ
6	ISSUED FOR CITY OF OTTAWA REVIEW	DEC 23/21	MSP
5	ISSUED TO MISSISSIPPI VALLEY CONSERVATION AUTHORITY FOR REVIEW	DEC 22/21	SAZ
4	REVISED AS PER CITY OF OTTAWA COMMENTS	NOV 13/20	MSP
3	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 8/20	MSP
2	REVISED AS PER CITY OF OTTAWA COMMENTS	MAY 13/19	MSP
1	ISSUED FOR DRAFT PLAN OF SUBDIVISION APPLICATION	JULY 23/18	MSP

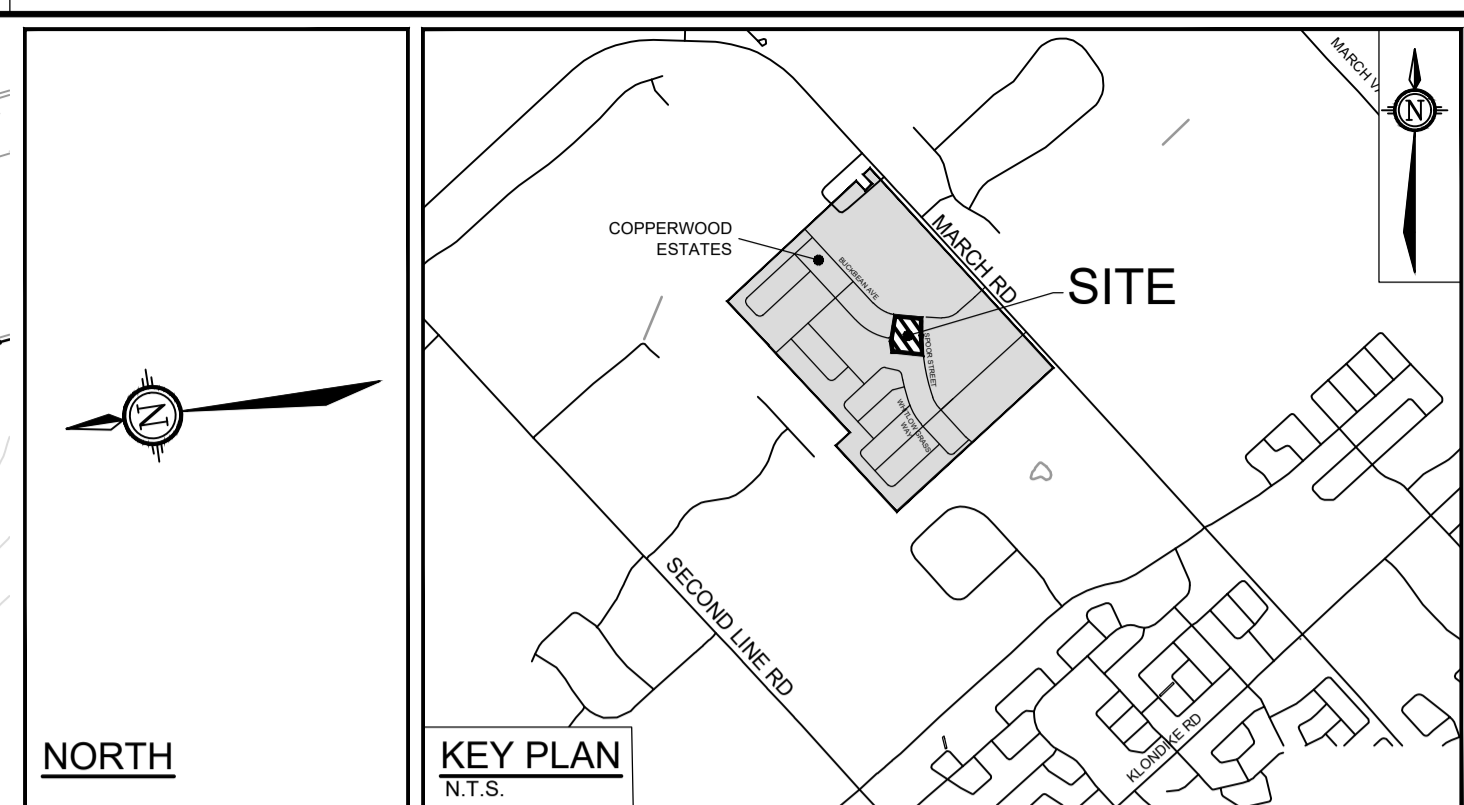
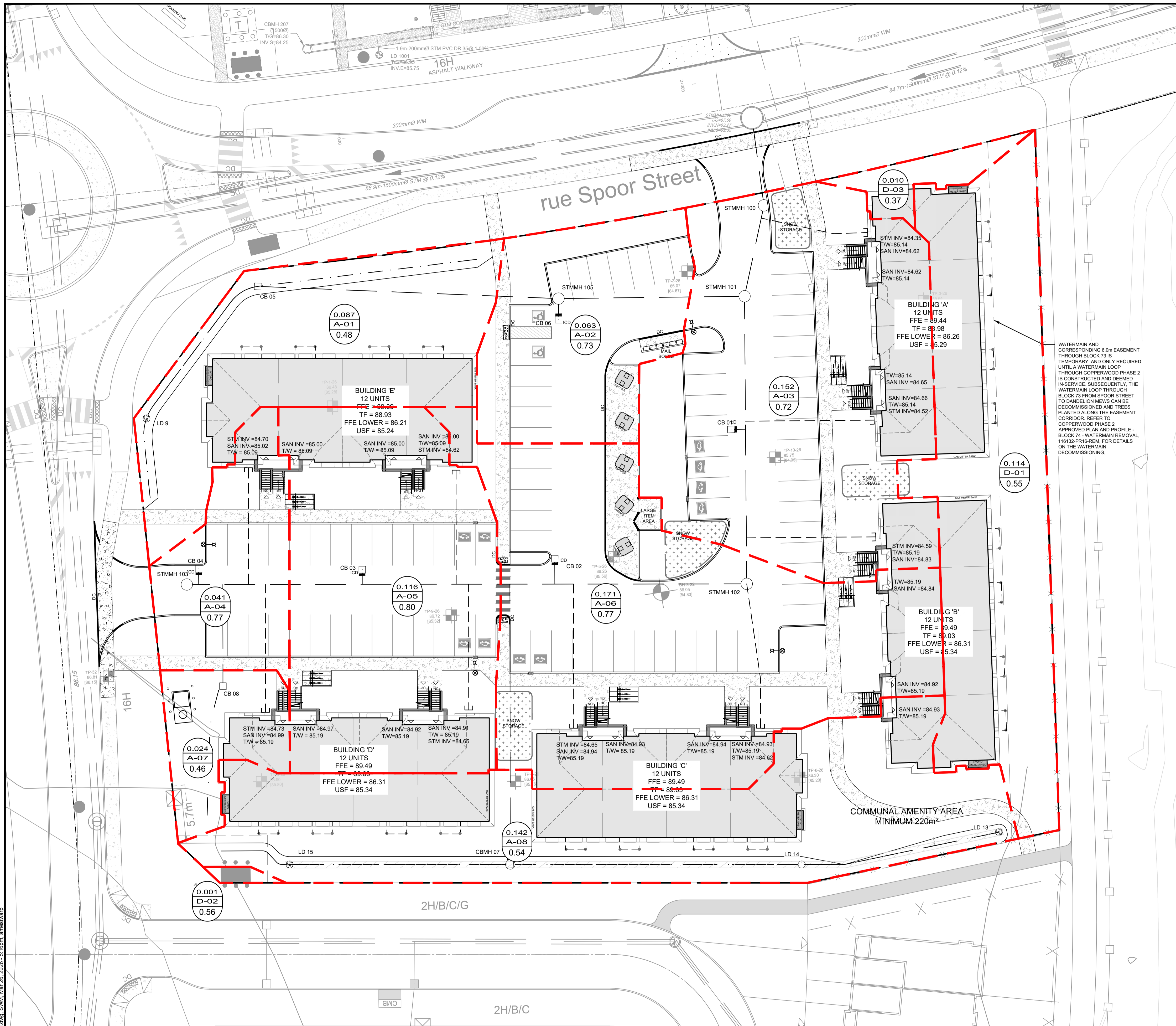


DESIGN	SCALE	FOR REVIEW ONLY
SAZ	1:1500	
DBB		
RBG		
SAZ		
MSP		



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Suite 200, 240 Michael Copland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone: (613) 254-9643
Facsimile: (613) 254-5867
Website: www.novatech-eng.com

CITY OF OTTAWA COPPERWOOD ESTATE 1053, 1075 AND 1145 MARCH ROAD		PROJECT NO: 116132-00
DRAWING NAME STORM DRAINAGE AREA PLAN PHASE 1		REV # REV #7
DRAWING NO: 116132-STM		



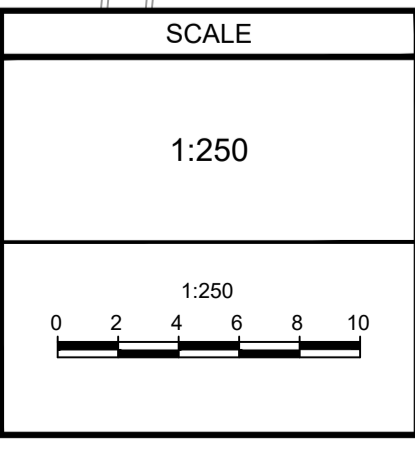
LEGEND

	SITE PROPERTY LINE		EXISTING STM MANHOLE
	MISC LEGAL LINE (EASEMENT, PROPERTY LINES) REFER TO LEGAL PLAN FOR DETAILS		EXISTING CATCHBASIN
	PROPOSED SIDEWALK		FENCE BY OTHERS
	PROPOSED CURB		EXISTING JOINT UTILITY
	PROPOSED DEPRESSED CURB		EXISTING HYDRO
	SWALE c/w SUBDRAIN		EXISTING UTILITY CROSSINGS
	PROPOSED STORM MANHOLE		EXISTING LIGHT STANDARD
	PROPOSED CATCHBASIN MANHOLE		EXISTING HYDRO INFRASTRUCTURE
	PROPOSED CATCHBASIN		
	PROPOSED CATCHBASIN c/w ICD		
	PROPOSED LANDSCAPE DRAIN		
	PROPOSED TRANSFORMER WITH BOLLARDS		

WATERMAIN AND CORRESPONDING 6.0m EASEMENT THROUGH BLOCK 73 IS TEMPORARY AND ONLY REQUIRED UNTIL A WATERMAIN LOOP THROUGH COPPERWOOD PHASE 2 IS CONSTRUCTED AND DEEMED IN SERVICE. SUBSEQUENTLY THE WATERMAIN LOOP THROUGH BLOCK 73 FROM SPOOR STREET TO DANIELSON MEWS CAN BE DECOMMISSIONED AND TREES PLANTED ALONG THE EASEMENT CORRIDOR. REFER TO COPPERWOOD PHASE 2 APPROVED PLAN AND PROFILE - BLOCK 73 - WATERMAIN REMOVAL, 116132-PR16-REM, FOR DETAILS ON THE WATERMAIN DECOMMISSIONING.

NOTE:
 THE POSITION OF ALL POLE LINES, CONDUITS, WATERMANS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

No.	REVISION	DATE	BY
1.	ISSUED FOR SPA	MAR 27/2026	ARM



FOR REVIEW ONLY

DESIGN	AM
CHECKED	ARM
DRAWN	AM
CHECKED	ARM
APPROVED	GJM

NOVATECH
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LOCATION 1100 SPOOR STREET, CITY OF OTTAWA COPPERWOOD ESTATES (BLOCK 73)	
DRAWING NAME STORM WATER MANAGEMENT PLAN	
PROJECT No.	125113
REV	REV #1
DRAWING No.	125113-SWM

STORM SEWER DESIGN SHEET



Novatech Project #: 125113
 Project Name: Block 73
 Date: 3/27/2026
 Input By: Anjush Musyaju, EIT
 Reviewed By: Anthony Mestwarp, P.Eng
 Drawing Reference: 125113-STM

Legend: Design Input by User
 As-Built Input by User
 Cumulative Cell
 Calculated Design Cell Output
 Calculated Uncontrolled Peak Flow Cell Output
 Design Input Restricted Peak Flow Cell
Reference: City of Ottawa - Sewer Design Guidelines (2012 and TBs)
 MOE - Design Guidelines for Sewage Works (2008)

Storm Design Event = 2 Year

Location				Flow							Design Capacity								
Street	Area ID	From MH	To MH	Area A (ha.)	Runoff Coefficient C	Indivi. 2.78 AC	Accum. 2.78 AC	Time of Conc. Tc (min.)	Rain Intensity I (mm/hr)	Total Uncontrolled Peak Flow Q (L/s)	Proposed Sewer Pipe Sizing / Design								
											Pipe Length (m)	Pipe Size (mm) and Material	Pipe ID Actual (m)	Roughness n	Design Grade So (%)	Capacity Qfull (L/s)	Full Flow Velocity (m/s)	Time of Flow (min.)	Q / Qfull
N/A	A4, A5, A6, A7, A8	103	102	0.49	0.69	0.95	0.95	10.00	76.81	73.1	70.5	375 PVC	0.381	0.013	0.30	100.2	0.88	1.34	72.9%
N/A	A3	102	101	0.15	0.72	0.31	1.26	11.34	72.03	90.5	36.2	450 CONC	0.4572	0.013	0.30	162.9	0.99	0.61	55.5%
N/A	A1, A2	105	101	0.15	0.59	0.25	0.25	10.00	76.81	19.0	23.4	300 PVC	0.3048	0.013	0.35	59.7	0.82	0.48	31.8%
N/A		101	100	0.00	0.00	0.00	1.50	11.95	70.06	105.3	11.7	450 PVC	0.4572	0.013	1.00	297.4	1.81	0.11	35.4%
Spoor Street		100	1300	0.00	0.00	0.00	1.50	12.05	69.73	104.8	11.1	450 PVC	0.4572	0.013	1.00	297.4	1.81	0.10	35.2%
Totals				0.80							152.9								

Demand Equation / Parameters

1. $Q = 2.78 ACI$

Definitions

Q = Peak flow in litres per second (L/s)
 A = Area in hectares (ha)
 C = Weighted runoff coefficient (increased by 25% for 100-year)
 I = Rainfall intensity in millimeters per hour (mm/hr)

Rainfall intensity is based on City of Ottawa IDF data presented in the City of Ottawa - Sewer Design Guidelines

Capacity Equation

$Q_{full} = 1000 \cdot (1/n) \cdot A_p \cdot R^{2/3} \cdot S_o^{0.5}$

Definitions

Q full = Capacity (L/s)
 n = Manning coefficient of roughness (0.013)
 A_p = Pipe flow area (m²)
 R = Hydraulic Radius of wetted area (dia./4 for full pipes)
 S_o = Pipe slope/gradient

TABLE 1A: Post-Development Runoff Coefficient "C" - D-01

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀
Total	Roof	0.050	1.00	0.55	0.58
0.114	Soft	0.064	0.20		

Runoff Coefficient Equation
 $C = (A_{hard} \times 0.9 + A_{soft} \times 0.2) / A_{Tot}$
 * Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

TABLE 1B: Post-Development D-01 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Shirleys Brook	0.114	0.55	10	13.5	18.3	32.9

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$
 Where:

C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 2A: Post-Development Runoff Coefficient "C" - D-02

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀
Total	Hard	0.001	0.90	0.53	0.60
0.001	Soft	0.001	0.20		

Runoff Coefficient Equation
 $C = (A_{hard} \times 0.9 + A_{soft} \times 0.2) / A_{Tot}$
 * Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

TABLE 2B: Post-Development D-02 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Dandelion Mews	0.001	0.53	10	0.2	0.2	0.4

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$
 Where:

C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 3A: Post-Development Runoff Coefficient "C" - D-03

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀
Total	Hard	0.002	0.90	0.37	0.43
0.010	Soft	0.007	0.20		

Runoff Coefficient Equation
 $C = (A_{hard} \times 0.9 + A_{soft} \times 0.2) / A_{Tot}$
 * Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

TABLE 3B: Post-Development D-03 Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.010	0.37	10	0.8	1.0	2.1

Time of Concentration Tc= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$
 Where:

C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 4A: Post-Development Runoff Coefficient "C" - A-01 (CB 05)

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation $C = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$ * Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event
Total	Hard	0.004	0.90	0.48	0.52	
0.087	Roof	0.027	1.00			
	Soft	0.056	0.20			

TABLE 4B: Post-Development A-01 (CB 05) Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.087	0.48	10	9.0	12.2	22.5

Time of Concentration T_c= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 $Q = 2.78 \times C \times I \times A$
 Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
 5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
 2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

TABLE 5A: Post-Development Runoff Coefficient "C" - A-02 (CB 06)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.048	0.90	0.73	1.00	0.82
0.063	Roof	0.000	0.90		1.00	
	Soft	0.015	0.20		0.25	

TABLE 5B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.063 =Area (ha)
 0.73 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	21.57	9.9	11.66	0.00
	5	103.57	13.36	9.9	3.45	1.03
	10	76.81	9.91	9.9	0.00	0.00
	15	61.77	7.97	9.9	-1.94	-1.75
	20	52.03	6.71	9.9	-3.20	-3.84

TABLE 5C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.063 =Area (ha)
 0.73 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	29.72	13.44	16.28	0.00
	5	141.18	18.21	13.44	4.77	1.43
	10	104.19	13.44	13.44	0.00	0.00
	15	83.56	10.78	13.44	-2.66	-2.40
	20	70.25	9.06	13.44	-4.38	-5.26

TABLE 5D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.063 =Area (ha)
 0.82 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	57.59	18.50	39.09	0.00
	5	242.70	35.06	18.50	16.56	4.97
	10	178.56	25.80	18.50	7.30	4.38
	15	142.89	20.64	18.50	2.14	1.93
	20	119.95	17.33	18.50	-1.17	-1.41

TABLE 5E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-02 (CB 06)

0.063 =Area (ha)
 0.82 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	0	478.34	69.10	19.0	50.10	0.00
	5	291.24	42.07	19.0	23.07	6.92
	10	214.27	30.95	19.0	11.95	7.17
	15	171.47	24.77	19.0	5.77	5.19
	20	143.94	20.79	19.0	1.79	2.15

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

TABLE 5F: Catchbasin - A-02 (CB 06)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-06	610X610	0.37	87.13	85.63

TABLE 5G: Storage Provided - A-02 (CB 06)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.13	0.000	0.370	0.00
87.15	0.020	6.032	0.06
87.2	0.070	37.733	1.16
87.25	0.120	88.505	4.31
87.3	0.170	145.037	10.15
87.35	0.220	209.784	19.02
87.4	0.270	289.392	32.66
87.43	0.300	342.903	41.87

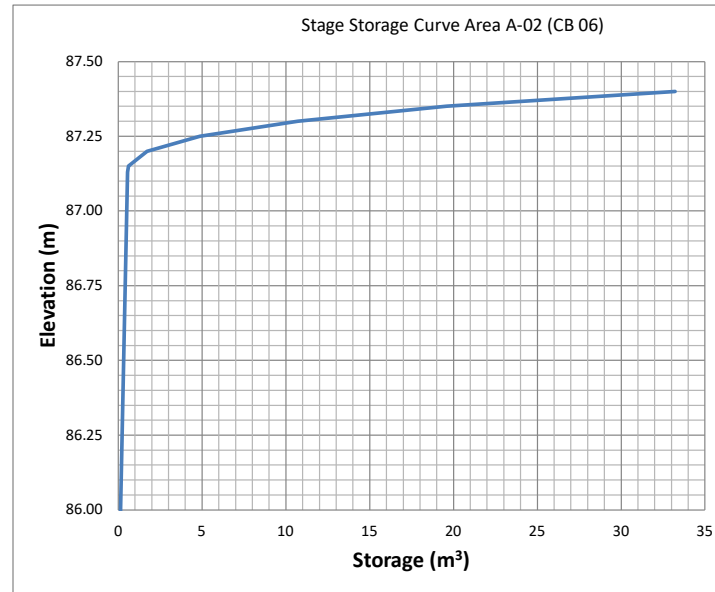
TABLE 5H: Storage Provided - A-02 (CB 06)

Storage Table					
Elevation (m)	System Depth (m)	CB-06 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.63	0.00	0.00	0.00	0.00	0.00
87.130	1.50	0.56	0.56	0.00	0.56
87.150	1.52	0.56	0.56	0.06	0.62
87.200	1.57	0.56	0.56	1.16	1.72
87.250	1.62	0.56	0.56	4.31	4.87
87.300	1.67	0.56	0.56	10.15	10.71
87.350	1.72	0.56	0.56	19.02	19.58
87.400	1.77	0.56	0.56	32.66	33.21
87.430	1.80	0.56	0.56	41.87	42.43

TABLE 5I: Orifice Sizing information - A-02 (CB 06)

Control Device		Oriface Plate		83 mm			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	9.91	0.45	86.12	200	0.00	0.0054	83.0
1:5 Year	13.44	0.83	86.50	200.00	0.00	0.0054	83.0
1:100 Year	18.50	1.57	87.24	200.00	4.38	0.0054	83.0
1:100 + 20 Year	19.00	1.60	87.27	200.00	7.17	0.0055	83.0

The design Head is calculated based on the centre of the orifice at the bottom of the pipe



Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh) \times 0.5$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

TABLE 6A: Post-Development Runoff Coefficient "C" - A-03 (CB 01)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.077	0.90	0.72	1.00	0.79
0.152	Roof	0.032	1.00		1.00	
	Soft	0.043	0.20		0.25	

TABLE 6B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.152 =Area (ha)
 0.72 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	51.18	23.5	27.68	0.00
	5	103.57	31.70	23.5	8.20	2.46
	10	76.81	23.50	23.5	0.00	0.00
	15	61.77	18.90	23.5	-4.60	-4.14
	20	52.03	15.92	23.5	-7.58	-9.09

TABLE 6C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.152 =Area (ha)
 0.72 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	70.54	25.75	44.79	0.00
	5	141.18	43.21	25.75	17.46	5.24
	10	104.19	31.89	25.75	6.14	3.68
	15	83.56	25.57	25.75	-0.18	-0.16
	20	70.25	21.50	25.75	-4.25	-5.10

TABLE 6D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.152 =Area (ha)
 0.79 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	132.92	27.00	105.92	0.00
	5	242.70	80.93	27.00	53.93	16.18
	10	178.56	59.54	27.00	32.54	19.52
	15	142.89	47.65	27.00	20.65	18.58
	20	119.95	40.00	27.00	13.00	15.60

TABLE 6E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-03

0.152 =Area (ha)
 0.79 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	5	291.24	97.11	27.2	69.96	20.99
	10	214.27	71.45	27.2	44.30	26.58
	15	171.47	57.18	27.2	30.03	27.02
	20	143.94	48.00	27.2	20.85	25.01
	25	124.62	41.55	27.2	14.40	21.60

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

TABLE 6F: Catchbasin - A-03 (CB 01)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.15	85.35

TABLE 6G: Storage Provided - A-03 (CB 01)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.15	0.000	0.370	0.00
87.2	0.050	20.621	0.52
87.25	0.100	62.321	2.60
87.3	0.150	125.924	7.30
87.35	0.200	201.994	15.50
87.4	0.250	279.001	27.53
87.45	0.300	363.361	44.00

TABLE 6H: Storage Provided - A-03 (CB 01)

Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.35	0.00	0.00	0.00	0.00	0.00
87.150	1.80	0.67	0.67	0.00	0.67
87.200	1.85	0.67	0.67	0.52	1.19
87.250	1.90	0.67	0.67	2.60	3.27
87.300	1.95	0.67	0.67	7.30	7.97
87.350	2.00	0.67	0.67	15.50	16.17
87.400	2.05	0.67	0.67	27.53	28.20
87.450	2.10	0.67	0.67	44.00	44.67

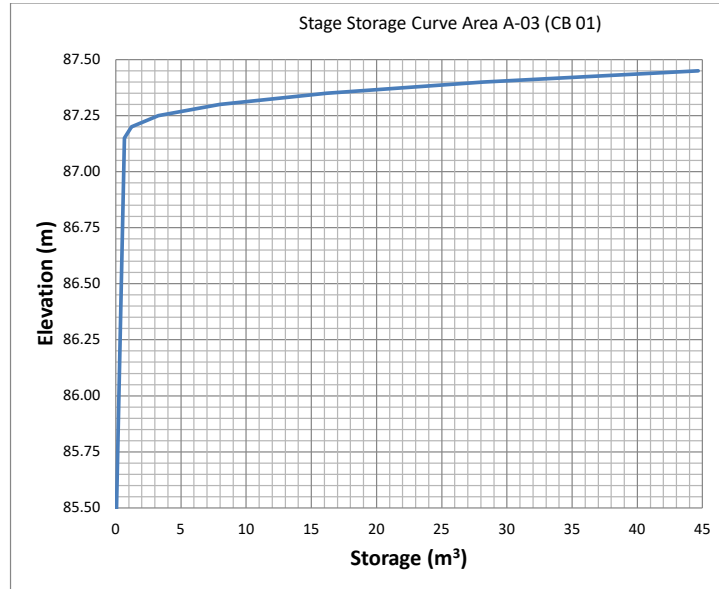


TABLE 6I: Orifice Sizing information - A-03 (CB 01)

Control Device							
		Oriface Plate		94 mm			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m³)	Area (m²)	Equivalent Dia. (mm)
1:2 Year	23.5	1.55	86.95	200	0.00	0.0069	94.0
1:5 Year	25.75	1.86	87.26	200.00	3.68	0.0069	94.0
1:100 Year	27.00	1.97	87.37	200.00	19.52	0.0070	94.0
1:100 + 20 Year	27.2	2.00	87.39	200.00	27.02	0.0070	94.0

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh)^{0.5}$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

TABLE 7A: Post-Development Runoff Coefficient "C" - A-04 (CB 04)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C_{avg}	"C" + 25%	$*C_{avg}$
Total	Hard	0.028	0.90	0.77	1.00	0.85
0.041	Roof	0.005	1.00		1.00	
	Soft	0.008	0.20		0.25	

TABLE 7B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.041 =Area (ha)
 0.77 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	14.71	6.8	7.95	0.00
	5	103.57	9.11	6.8	2.35	0.71
	10	76.81	6.76	6.8	0.00	0.00
	15	61.77	5.43	6.8	-1.33	-1.19
	20	52.03	4.58	6.8	-2.18	-2.62

TABLE 7C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.041 =Area (ha)
 0.77 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	20.27	9.17	11.10	0.00
	5	141.18	12.42	9.17	3.25	0.97
	10	104.19	9.17	9.17	0.00	0.00
	15	83.56	7.35	9.17	-1.82	-1.64
	20	70.25	6.18	9.17	-2.99	-3.59

TABLE 7D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.041 =Area (ha)
 0.85 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	38.65	12.00	26.65	0.00
	5	242.70	23.53	12.00	11.53	3.46
	10	178.56	17.31	12.00	5.31	3.19
	15	142.89	13.86	12.00	1.86	1.67
	20	119.95	11.63	12.00	-0.37	-0.44

TABLE 7E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-04 (CB 04)

0.041 =Area (ha)
 0.85 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	0	478.34	46.38	12.2	34.18	0.00
	5	291.24	28.24	12.2	16.04	4.81
	10	214.27	20.78	12.2	8.58	5.15
	15	171.47	16.63	12.2	4.43	3.98
	20	143.94	13.96	12.2	1.76	2.11

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{hard} \times 0.9 + A_{soft} \times 0.2) / A_{Tot}$$

$$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25) / A_{Tot}$$

TABLE 7F: Catchbasin - A-04 (CB 04)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB 04	610X610	0.37	87.05	85.55

TABLE 7G: Storage Provided - A-04 (CB 04)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area (m ²)	Storage Volume (m ³)
87.05	0.000	0.370	0.00
87.1	0.050	13.496	0.35
87.15	0.100	39.093	1.66
87.18	0.130	58.415	3.12
87.23	0.180	90.538	6.85

Above Spill elevation

TABLE 7H: Storage Provided - A-04 (CB 04)

Storage Table					
Elevation (m)	System Depth (m)	CB 04 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.55	0.00	0.00	0.00	0.00	0.00
87.050	1.50	0.56	0.56	0.00	0.56
87.100	1.55	0.56	0.56	0.35	0.90
87.150	1.60	0.56	0.56	1.66	2.22
87.180	1.63	0.56	0.56	3.12	3.68
87.230	1.68	0.56	0.56	6.85	7.41

Above Spill elevation

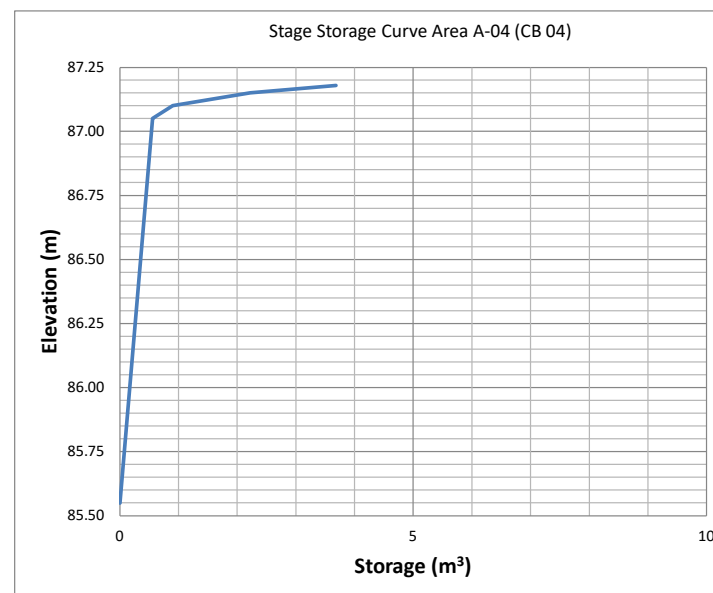


TABLE 7I: Orifice Sizing information - A-04 (CB 04)

Control Device							
LMF		105					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	6.76	0.50	86.15	200	0.00	0.0035	67.0
1:5 Year	9.17	0.88	86.53	200.00	0.00	0.0036	67.0
1:100 Year	12.00	1.52	87.17	200.00	3.19	0.0035	67.0
1:100 + 20 Year	12.2	1.55	87.20	200.00	5.15	0.0036	67.0

The design Head is calculated based on the centre of the outlet pipe

Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh)^{0.5}$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²
 h is the head of water above the orifice centre in m
 d is the diameter of the orifice in m

TABLE 8A: Post-Development Runoff Coefficient "C" - A-05 (CB 03)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.056	0.90	0.80	1.00	0.86
0.116	Roof	0.038	1.00		1.00	
	Soft	0.022	0.20		0.25	

TABLE 8B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
0.80 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	43.05	19.8	23.28	0.00
	5	103.57	26.66	19.8	6.89	2.07
	10	76.81	19.77	19.8	0.00	0.00
	15	61.77	15.90	19.8	-3.87	-3.48
	20	52.03	13.39	19.8	-6.38	-7.65

TABLE 8C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
0.80 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	59.33	26.82	32.51	0.00
	5	141.18	36.34	26.82	9.52	2.86
	10	104.19	26.82	26.82	0.00	0.00
	15	83.56	21.51	26.82	-5.31	-4.78
	20	70.25	18.09	26.82	-8.73	-10.48

TABLE 8D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
0.86 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	110.06	29.00	81.06	0.00
	5	242.70	67.01	29.00	38.01	11.40
	10	178.56	49.30	29.00	20.30	12.18
	15	142.89	39.45	29.00	10.45	9.41
	20	119.95	33.12	29.00	4.12	4.94

TABLE 8E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-05 (CB 03)

0.116 =Area (ha)
0.86 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	0	478.34	132.07	29.3	102.82	0.00
	5	291.24	80.41	29.3	51.16	15.35
	10	214.27	59.16	29.3	29.91	17.95
	15	171.47	47.34	29.3	18.09	16.28
	20	143.94	39.74	29.3	10.49	12.59

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{\text{hard}} \times 0.9 + A_{\text{soft}} \times 0.2) / A_{\text{Tot}}$$

$$C_{100} = (A_{\text{hard}} \times 1.0 + A_{\text{soft}} \times 0.25) / A_{\text{Tot}}$$

TABLE 8F: Catchbasin - A-05 (CB 03)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.17	85.67

TABLE 8G: Storage Provided - A-05 (CB 03)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.17	0.000	0.370	0.00
87.20	0.030	9.481	0.15
87.25	0.080	36.105	1.29
87.3	0.130	78.912	4.16
87.35	0.180	144.220	9.74
87.38	0.210	193.106	14.80
87.4	0.230	228.972	19.02

Above Spill Elevation

TABLE 8H: Storage Provided - A-05 (CB 03)

Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.67	0.00	0.00	0.00	0.00	0.00
87.170	1.50	0.56	0.56	0.00	0.56
87.200	1.53	0.56	0.56	0.15	0.71
87.250	1.58	0.56	0.56	1.29	1.85
87.300	1.63	0.56	0.56	4.16	4.72
87.350	1.68	0.56	0.56	9.74	10.30
87.380	1.71	0.56	0.56	14.80	15.36
87.400	1.73	0.56	0.56	19.02	19.58

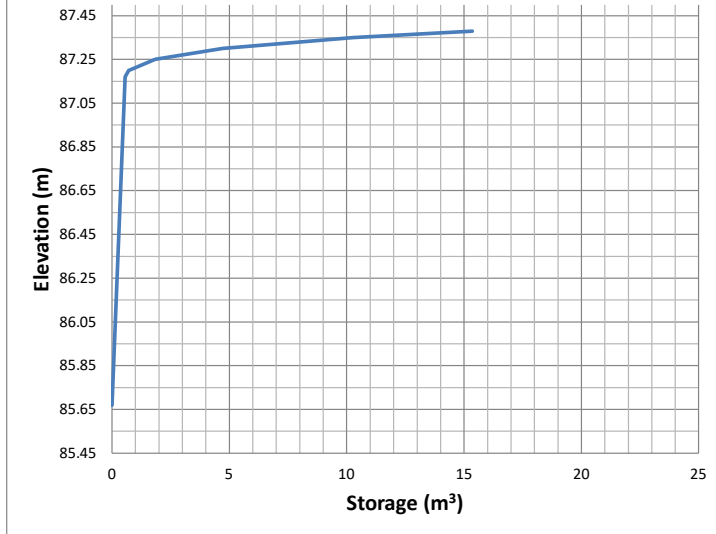
Above Spill Elevation

TABLE 8I: Orifice Sizing information - A-05 (CB 03)

Control Device		Orifice Plate		102 mm			
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	19.77	0.78	86.5	200.00	0.00	0.0082	102.0
1:5 Year	26.82	1.43	87.15	200.00	0.00	0.0082	102.0
1:100 Year	29.00	1.64	87.36	200.00	12.18	0.0082	102.0
1:100 + 20 Year	29.3	1.67	87.39	200.00	17.95	0.0082	102.0

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

Stage Storage Curve Area - A-05 (CB 03)



Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh) \times 0.5$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

TABLE 9A: Post-Development Runoff Coefficient "C" - A-06 (CB 02)

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.092	0.90	0.77	1.00	0.83
0.171	Roof	0.041	1.00		1.00	
	Soft	0.038	0.20		0.25	

TABLE 9B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.77 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	0	167.22	61.01	28.0	32.99	0.00
	5	103.57	37.78	28.0	9.76	2.93
	10	76.81	28.02	28.0	0.00	0.00
	15	61.77	22.53	28.0	-5.49	-4.94
	20	52.03	18.98	28.0	-9.04	-10.85

TABLE 9C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.77 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	0	230.48	84.08	31.50	52.58	0.00
	5	141.18	51.50	31.50	20.00	6.00
	10	104.19	38.01	31.50	6.51	3.91
	15	83.56	30.48	31.50	-1.02	-0.92
	20	70.25	25.63	31.50	-5.87	-7.05

TABLE 9D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.83 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	0	398.62	157.71	32.75	124.96	0.00
	5	242.70	96.02	32.75	63.27	18.98
	10	178.56	70.64	32.75	37.89	22.74
	15	142.89	56.53	32.75	23.78	21.41
	20	119.95	47.46	32.75	14.71	17.65

TABLE 9E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-06 (CB 02)

0.171 =Area (ha)
 0.83 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	0	478.34	189.25	33.0	156.25	0.00
	5	291.24	115.23	33.0	82.23	24.67
	10	214.27	84.77	33.0	51.77	31.06
	15	171.47	67.84	33.0	34.84	31.36
	20	143.94	56.95	33.0	23.95	28.74

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{hard} \times 0.9 + A_{soft} \times 0.2) / A_{Tot}$$

$$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25) / A_{Tot}$$

TABLE 9F: Catchbasin - A-06 (CB 02)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
CB-02	610X610	0.37	87.10	85.60

TABLE 9G: Storage Provided - A-06 (CB 02)

Area A-06: Above Ground Ponding			
Elevation (m)	Ponding Depth (m)	Area* (m ²)	Storage Volume (m ³)
87.10	0.000	0.370	0.00
87.15	0.050	13.345	0.34
87.2	0.100	42.554	1.74
87.25	0.150	92.026	5.10
87.3	0.200	150.322	11.16
87.35	0.250	218.943	20.40
87.4	0.300	303.976	34.81

TABLE 9H: Storage Provided - A-06 (CB 02)

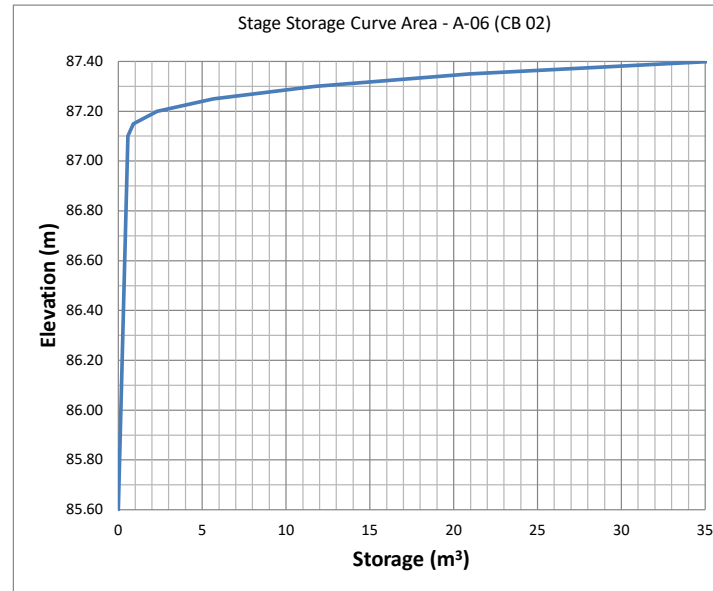
Storage Table					
Elevation (m)	System Depth (m)	CB-02 Volume (m ³)	Underground Volume (m ³)*	Ponding Volume (m ³)	Total Volume (m ³)
85.60	0.00	0.00	0.00	0.00	0.00
87.100	1.50	0.56	0.56	0.00	0.56
87.150	1.55	0.56	0.56	0.34	0.90
87.200	1.60	0.56	0.56	1.74	2.30
87.250	1.65	0.56	0.56	5.10	5.66
87.300	1.70	0.56	0.56	11.16	11.72
87.350	1.75	0.56	0.56	20.40	20.95
87.400	1.80	0.56	0.56	34.81	35.36

TABLE 9I: Orifice Sizing information - A-06 (CB 02)

Control Device							
Oriface Plate		108 mm					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	28.02	1.25	86.9	200	0.00	0.0091	108.0
1:5 Year	31.50	1.57	87.22	200.00	3.91	0.0092	108.0
1:100 Year	32.75	1.70	87.36	200.00	22.74	0.0091	108.0
1:100 + 20 Year	33.0	1.73	87.39	200.00	31.06	0.0091	108.0

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

Stage Storage Curve Area - A-06 (CB 02)



Orifice Control Sizing

$$Q = 0.62 \times A \times (2gh) \times 0.5$$

Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²

h is the head of water above the orifice centre in m

d is the diameter of the orifice in m

TABLE 10A: Post-Development Runoff Coefficient "C" - A-07 (CB 08)

Area	Surface	Ha	"C"	C _{avg}	*C ₁₀₀	Runoff Coefficient Equation
Total	Hard	0.001	0.90	0.47	0.50	C = (A _{hard} x 0.9 + A _{soft} x 0.2)/A _{Tot}
0.023	Roof	0.007	1.00			
	Soft	0.015	0.20			

* Runoff Coefficient increases by 25% up to a maximum value of 1.00 for the 100-Year event

TABLE 10B: Post-Development - A-07 (CB 08) Flows

Outlet Options	Area (ha)	C _{avg}	Tc (min)	Q _{2 Year} (L/s)	Q _{5 Year} (L/s)	Q _{100 Year} (L/s)
Spoor Street	0.023	0.47	10	2.3	3.1	5.8

Time of Concentration T_c= 10 min
 Intensity (2 Year Event) I₂= 76.81 mm/hr
 Intensity (5 Year Event) I₅= 104.19 mm/hr
 Intensity (100 Year Event) I₁₀₀= 178.56 mm/hr

Equations:
 Flow Equation
 Q = 2.78 x C x I x A

Where:
 C is the runoff coefficient
 I is the rainfall intensity, City of Ottawa IDF
 A is the total drainage area

100 year Intensity = 1735.688 / (Time in min + 6.014)^{0.820}
 5 year Intensity = 998.071 / (Time in min + 6.053)^{0.814}
 2 year Intensity = 732.951 / (Time in min + 6.199)^{0.810}

TABLE 11A: Post-Development Runoff Coefficient "C" - A-02

Area	Surface	Ha	5 Year Event		100 Year Event	
			"C"	C _{avg}	"C" + 25%	*C _{avg}
Total	Hard	0.006	0.90	0.54	1.00	0.58
0.143	Roof	0.056	1.00		1.00	
	Soft	0.081	0.20		0.25	

TABLE 11B: 2 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07)

0.143 =Area (ha)
0.54 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
2 YEAR	5	103.57	22.38	5.9	16.48	4.94
	10	76.81	16.59	5.9	10.69	6.42
	15	61.77	13.34	5.9	7.44	6.70
	20	52.03	11.24	5.9	5.34	6.41
	25	45.17	9.76	5.9	3.86	5.79

TABLE 11C: 5 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07)

0.143 =Area (ha)
0.54 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
5 YEAR	5	141.18	30.50	7.250	23.25	6.98
	10	104.19	22.51	7.250	15.26	9.16
	15	83.56	18.05	7.250	10.80	9.72
	20	70.25	15.18	7.250	7.93	9.51
	25	60.90	13.16	7.250	5.91	8.86

TABLE 11D: 100 YEAR EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07)

0.143 =Area (ha)
0.58 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR	5	242.70	55.55	12.50	43.05	12.91
	10	178.56	40.87	12.50	28.37	17.02
	15	142.89	32.70	12.50	20.20	18.18
	20	119.95	27.45	12.50	14.95	17.94
	25	103.85	23.77	12.50	11.27	16.90

TABLE 11E: 100 YEAR + 20% EVENT QUANTITY STORAGE REQUIREMENT - A-08 (CBMH 07)

0.143 =Area (ha)
0.58 = C

Return Period	Time (min)	Intensity (mm/hr)	Flow Q (L/s)	Allowable Runoff (L/s)*	Net Flow to be Stored (L/s)	Storage Req'd (m ³)
100 YEAR + 20	10	214.27	49.04	13.3	35.79	21.47
	15	171.47	39.24	13.3	25.99	23.39
	20	143.94	32.94	13.3	19.69	23.63
	25	124.62	28.52	13.3	15.27	22.91
	30	110.24	25.23	13.3	11.98	21.57

Equations:

Flow Equation

$$Q = 2.78 \times C \times I \times A$$

Where:

C is the runoff coefficient

I is the rainfall intensity, City of Ottawa IDF

A is the total drainage area

Runoff Coefficient Equation

$$C_s = (A_{hard} \times 0.9 + A_{soft} \times 0.2)/A_{Tot}$$

$$C_{100} = (A_{hard} \times 1.0 + A_{soft} \times 0.25)/A_{Tot}$$

* Allowable run-off is 50% of the actual flow to calculate the required volume as per city of Ottawa Guidelines for underground storage

TABLE 11F: Catchbasin - A-08 (CBMH 07)

Structures	Size Dia.(mm)	Area (m ²)	T/G	Inv OUT
LD 15	300	0.07	87.35	85.97
CBMH -7	1200	1.13	87.55	86.63
LD 14	300	0.07	87.91	86.06
LD 13	300	0.07	87.3	86.32

TABLE 11G: Underground Storage (Perforated Pipe) - A-08 (CBMH 07)

MH to MH (U/S to D/S)	Pipe Data			Trench Dimensions				Storage Volumes (m ³)		
	Up Stream Invert (m)	Downstream Invert (m)	Pipe Dia. (mm)	Length ¹ (m)	Height ² (m)	Width (m)	Porosity	Perf. Pipe	Stone ³	TOTAL
LD15 - CB 07	85.87	85.69	250	27.05	0.55	0.85	0.3	1.33	3.4	4.7
LD 13 - LD 14	86.32	86.07	250	25	0.55	0.85	0.3	1.23	3.1	4.4
LD 14 - CB 07	86.06	85.69	250	35.95	0.55	0.85	0.3	1.76	4.5	6.3
Total Length (North) =			69.1	Total Storage (North) =				4.3	11.0	15.4

¹ Length is structure wall to structure wall
² Height of trench does not include 0.15m of clearstone below the subdrain.
³ Based on 30% porosity in the clear stone

TABLE 11H: Storage Provided - A-08 (CBMH 07)

Area A-05: Above Ground Ponding							
Elevation (m)	LD 15 Ponding Depth (m)	LD 15 Area* (m ²)	CBMH -7 Ponding Depth (m)	CBMH -7 Area* (m ²)	LD 13 Ponding Depth (m)	LD 13 Area* (m ²)	Storage Volume (m ³)
87.3	-	-	-	-	0.000	0.071	0.00
87.35	0.000	0.071	-	-	0.050	0.669	0.02
87.4	0.050	2.563	-	-	0.100	2.536	0.16
87.45	0.100	10.257	-	-	0.150	4.581	0.66
87.5	0.150	20.643	-	-	0.200	8.521	1.76
87.55	0.200	34.889	0.000	0.372	0.250	13.981	3.71
87.59	0.240	47.704	0.040	11.530	0.290	19.853	6.28

TABLE 11I: Storage Provided - A-08 (CBMH 07)

Storage Table									
Elevation (m)	System Depth (m)	LD 13 Volume (m ³)	LD 14 Volume (m ³)	CBMH -7 Volume (m ³)	LD 15 Volume (m ³)	Pipe Volume (m ³)	Underground Volume (m ³) ³	Ponding Volume (m ³)	Total Volume (m ³)
85.630	0.00	0.000	0.000	0.000	0.00	0.00	0.00	0.00	0.00
86.620	0.99	0.021	0.040	1.120	0.05	15.37	16.59	0.00	16.59
86.770	1.14	0.032	0.050	1.289	0.06	-	16.79	0.00	16.79
86.920	1.29	0.042	0.061	1.459	0.07	-	17.00	0.00	17.00
87.070	1.44	0.053	0.071	1.629	0.08	-	17.20	0.00	17.20
87.220	1.59	0.064	0.082	1.798	0.09	-	17.40	0.00	17.40
87.300	1.67	0.069	0.088	1.889	0.09	-	17.51	0.00	17.51
87.350	1.72	-	0.091	1.945	0.10	-	17.57	0.02	17.59
87.400	1.77	-	0.095	2.002	-	-	17.63	0.16	17.79
87.450	1.82	-	0.098	2.058	-	-	17.69	0.66	18.35
87.500	1.87	-	0.102	2.115	-	-	17.75	1.76	19.51
87.550	1.92	-	0.105	2.171	-	-	17.81	3.71	21.52
87.590	1.96	-	0.108	-	-	-	17.81	6.28	24.09

TABLE 11J: Orifice Sizing information - A-08 (CBMH 07)

Control Device							
Orifice Plate		94 mm					
Design Event	Flow (L/S)	Head (m)	Elev (m)	Outlet dia. (mm)	Volume (m ³)	Area (m ²)	Equivalent Dia. (mm)
1:2 Year	11.80	0.38	86.06	250	6.70	0.0070	94.0
1:5 Year	14.50	0.57	86.25	250.00	9.72	0.0070	94.0
1:100 Year	25.00	1.75	87.43	250.00	18.18	0.0069	94.0
1:100 + 20 Year	26.50	1.90	87.58	250.00	23.63	0.0070	94.0

The design Head is calculated based on the centre of the orifice at the bottom of the pipe

Orifice Control Sizing
 $Q = 0.62 \times A \times \sqrt{2gh}$
 Q is the release rate in m³/s

A is the orifice area in m²

g is the acceleration due to gravity, 9.81 m/s²
 h is the head of water above the orifice centre in m
 d is the diameter of the orifice in m

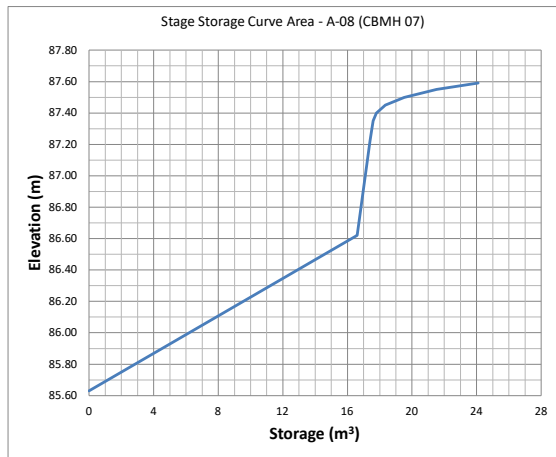
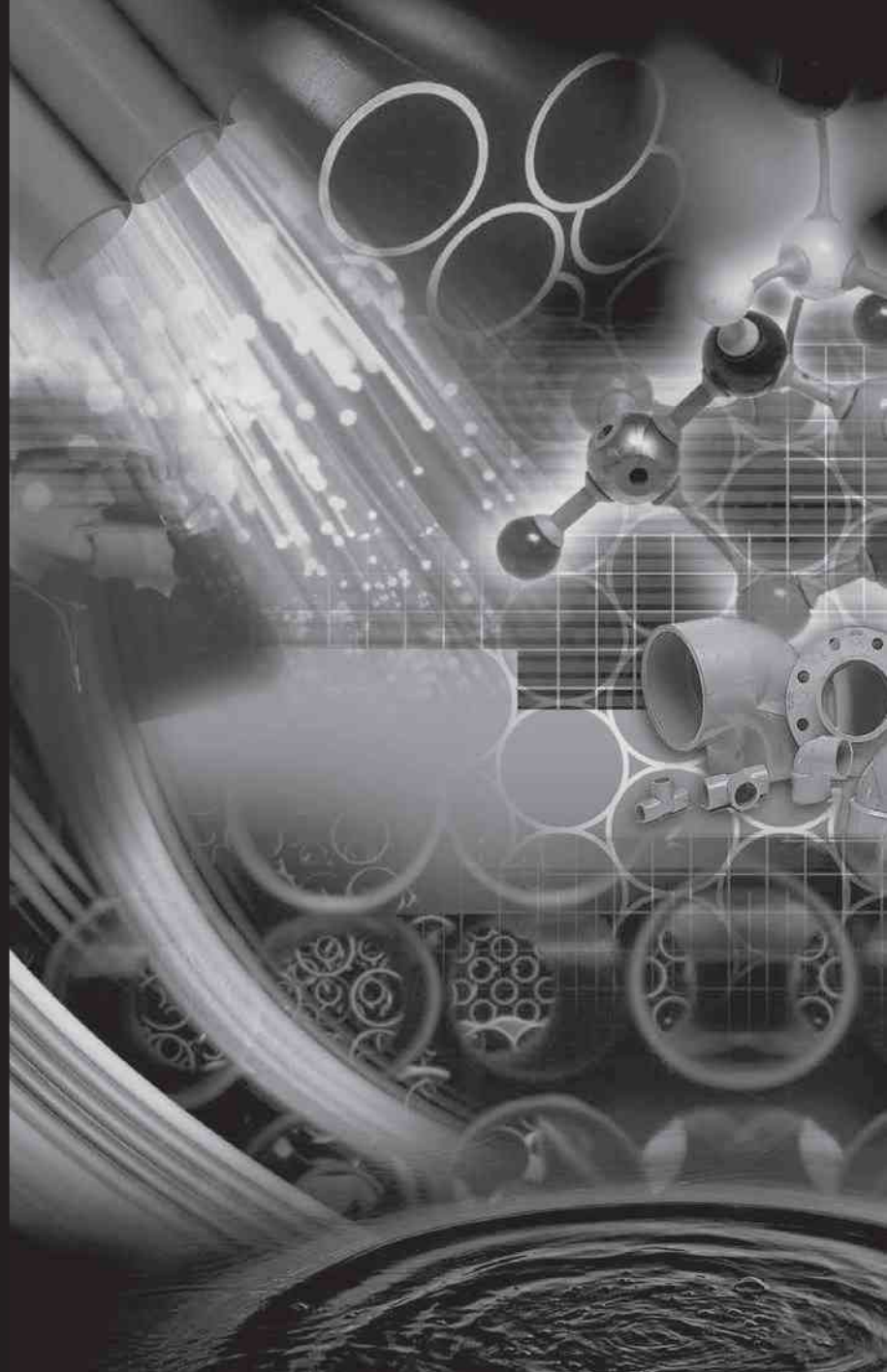


Table 12: Post-Development Stormwater Management Summary

Area ID	Area (ha)	1:5 Year Weighted Cw	1:100 Year Weighted Cw	Control Device		Outlet Location	2 Year Storm Event			5 Year Storm Event			100 Year Storm Event			Max. Vol. Provided (cu.m.)	
							Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)	Release (L/s)	Head (m)	Req'd Vol (cu.m)		
D-01	0.114	0.55	0.58	N/A		Shirleys Brook	13.50	N/A	N/A	18.30	N/A	N/A	32.90	N/A	N/A	N/A	
D-02	0.001	0.53	0.60	N/A		Dandelion Mews	0.20	N/A	N/A	0.20	N/A	N/A	0.40	N/A	N/A	N/A	
D-03	0.010	0.37	0.60	N/A		Spoor Street	0.80	N/A	N/A	1.00	N/A	N/A	2.10	N/A	N/A	N/A	
A-01 (CB 05)	0.087	0.48	0.76	N/A		Spoor Street	9.00	N/A	N/A	12.20	N/A	N/A	22.50	N/A	N/A	N/A	
A-02 (CB 06)	0.063	0.73	0.64	Oriface Plate	83.00	Spoor Street	9.91	0.449	0.00	13.44	0.829	0.00	18.50	1.571	4.38	33.21	
A-03 (CB 01)	0.152	0.72	0.74	Oriface Plate	94	Spoor Street	23.50	1.55	0.00	25.75	1.86	3.68	27.00	1.97	19.52	44.67	
A-04 (CB 04)	0.041	0.77	0.85	LMF	105.00	Spoor Street	6.76	0.50	0.00	9.17	0.88	0.00	12.00	1.52	3.19	3.68	
A-05 (CB 03)	0.116	0.80	0.86	Oriface Plate	102.00	Spoor Street	19.77	0.78	0.00	26.82	1.43	0.00	29.00	1.64	12.18	15.36	
A-06 (CB 02)	0.171	0.77	0.83	Oriface Plate	108.00	Spoor Street	28.02	1.25	0.00	31.50	1.57	3.91	32.75	1.70	22.74	35.36	
A-07 (CB 08)	0.023	0.47	0.50	N/A		Spoor Street	2.30	N/A	N/A	3.10	N/A	N/A	5.80	N/A	N/A	N/A	
A-08 (CBMH 07)	0.143	0.54	0.58	Oriface Plate	94.00	Spoor Street	11.80	0.38	6.70	14.50	0.57	9.72	25.00	1.75	18.183	24.09	
Post-Development Total	0.92	0.66	0.72				125.56		6.70	155.98		17.31	207.95		80.19	156.38	
Total Allowable Release Rate										196.00			210.00				

Volume III: TEMPEST INLET CONTROL DEVICES

Municipal Technical
Manual Series



SECOND EDITION

LMF (Low to Medium Flow) ICD

HF (High Flow) ICD

MHF (Medium to High Flow) ICD



IPEX

by aliaxis

IPEX Tempest™ Inlet Control Devices

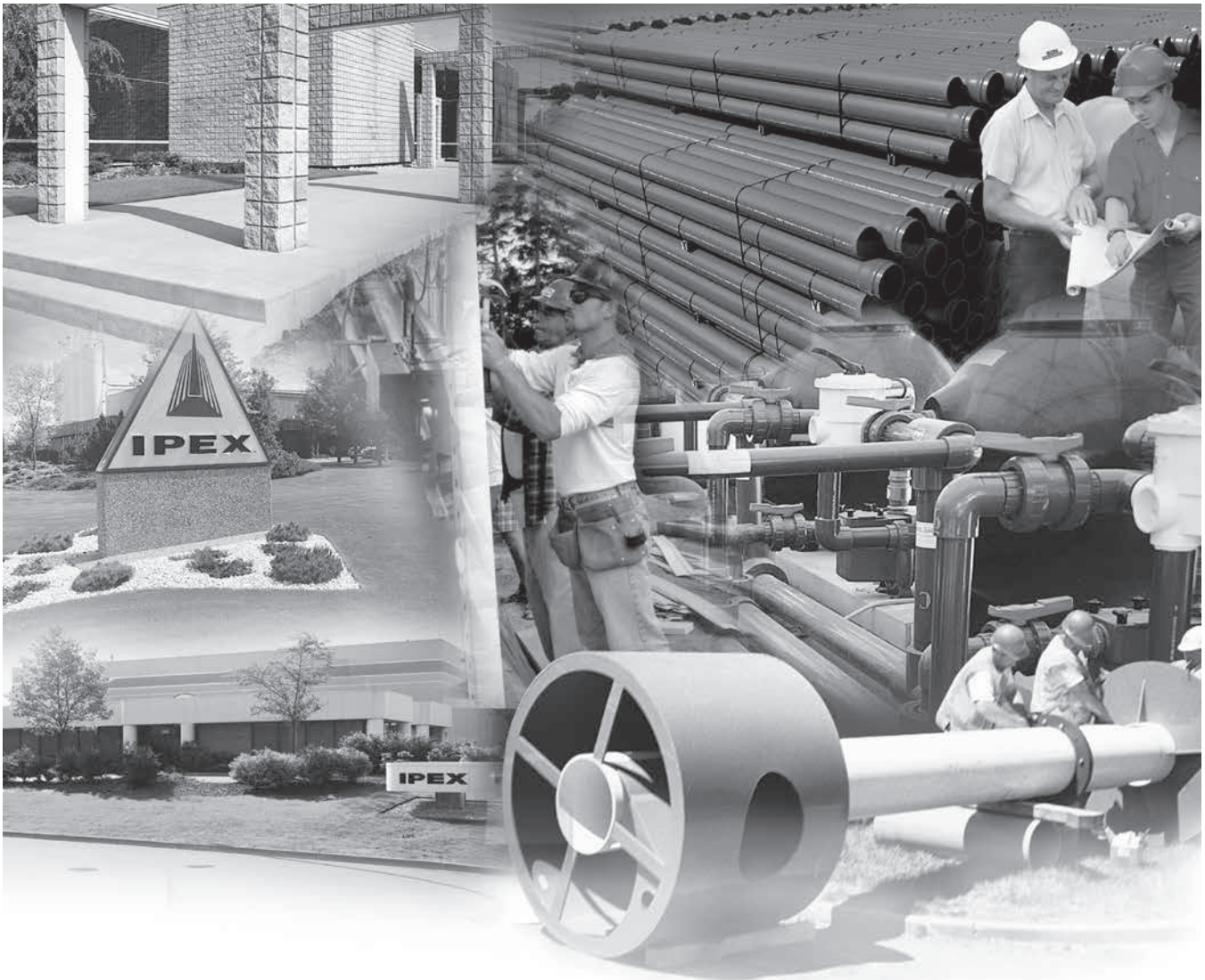
Municipal Technical Manual Series

Vol. I, 2nd Edition

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ABOUT IPEX

At IPEX, we have been manufacturing non-metallic pipe and fittings since 1951. We formulate our own compounds and maintain strict quality control during production. Our products are made available for customers thanks to a network of regional stocking locations throughout North America. We offer a wide variety of systems including complete lines of piping, fittings, valves and custom-fabricated items.

More importantly, we are committed to meeting our customers' needs. As a leader in the plastic piping industry, IPEX continually develops new products, modernizes manufacturing facilities and acquires innovative process technology. In addition, our staff take pride in their work, making available to customers their extensive thermoplastic knowledge and field experience. IPEX personnel are committed to improving the safety, reliability and performance of thermoplastic materials. We are involved in several standards committees and are members of and/or comply with the organizations listed on this page.

For specific details about any IPEX product, contact our customer service department.

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TEMPEST INLET CONTROL DEVICES Technical Manual

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PRODUCT INFORMATION: TEMPEST LOW, MEDIUM FLOW (LMF) ICD

Purpose

To control the amount of storm water runoff entering a sewer system by allowing a specified flow volume out of a catch basin or manhole at a specified head. This approach conserves pipe capacity so that catch basins downstream do not become uncontrollably surcharged, which can lead to basement floods, flash floods and combined sewer overflows.

Product Description

Our LMF ICD is designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter and larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 14 preset flow curves, the LMF ICD has the ability to provide flow rates: 2lps – 17lps (31gpm – 270gpm)

Product Function

The LMF ICD vortex flow action allows the LMF ICD to provide a narrower flow curve using a larger orifice than a conventional orifice plate ICD, making it less likely to clog. When comparing flows at the same head level, the LMF ICD has the ability to restrict more flow than a conventional ICD during a rain event, preserving greater sewer capacity.

Product Construction

Constructed from durable PVC, the LMF ICD is light weight 8.9 Kg (19.7 lbs).

Product Applications

Will accommodate both square and round applications:

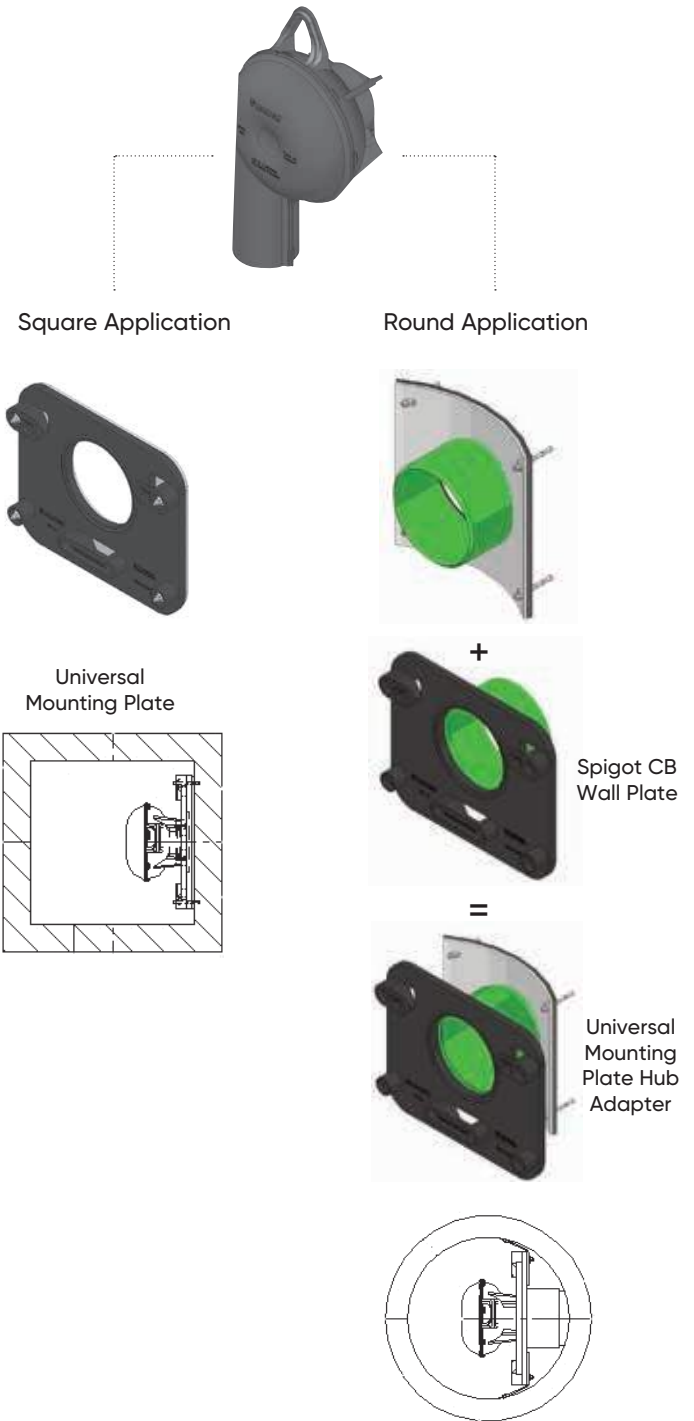


Chart 1: LMF 14 Preset Flow Curves

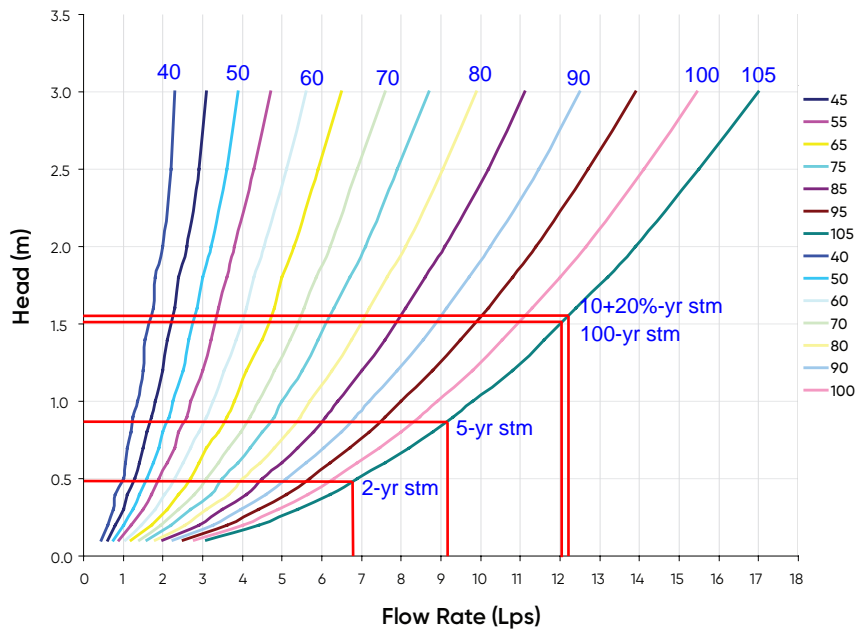
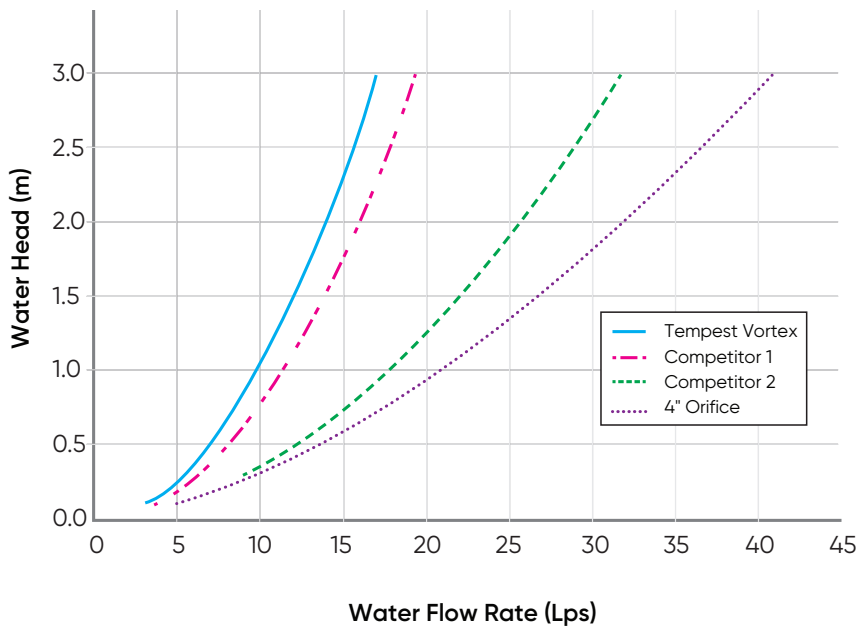


Chart 2: LMF Flow vs. ICD Alternatives



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST LMF ICD into a Square Catch Basin:

STEPS:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device.
2. Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the universal mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
6. From the ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST LMF ICD into a Round Catch Basin:

STEPS:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
2. Use the spigot catch basin wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
3. Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
4. Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
5. Install the CB spigot wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot wall plate and the catch basin wall.
6. Apply solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the universal mounting plate hub adapter should touch the catch basin wall.
7. From ground above using a reach bar, lower the ICD device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the mounting plate and has created a seal.



WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut back the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at ipexna.com.
- Call your IPEX representative for more information or if you have any questions about our products.

PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook will be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above must not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices will consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

PRODUCT INFORMATION: TEMPEST HF & MHF ICD

Product Description

Our HF, HF Sump and MHF ICD's are designed to accommodate catch basins or manholes with sewer outlet pipes 6" in diameter or larger. Any storm sewer larger than 12" may require custom modification. However, IPEX can custom build a TEMPEST device to accommodate virtually any storm sewer size.

Available in 5 preset flow curves, these ICDs have the ability to provide constant flow rates: 9lps (143 gpm) and greater

Product Function

TEMPEST HF (High Flow): designed to manage moderate to higher flows 15 L/s (240 gpm) or greater and prevent the propagation of odour and floatables. With this device, the cross-sectional area of the device is larger than the orifice diameter and has been designed to limit head losses. The HF ICD can also be ordered without flow control when only odour and floatable control is required.

TEMPEST HF (High Flow) Sump: The height of a sewer outlet pipe in a catch basin is not always conveniently located. At times it may be located very close to the catch basin floor, not providing enough sump for one of the other TEMPEST ICDs with universal back plate to be installed. In these applications, the HF Sump is offered. The HF Sump offers the same features and benefits as the HF ICD; however, is designed to raise the outlet in a square or round catch basin structure. When installed, the HF sump is fixed in place and not easily removed. Any required service to the device is performed through a clean-out located in the top of the device which can be often accessed from ground level.

TEMPEST MHF (Medium to High Flow):

The MHF plate or plug is designed to control flow rates 9 L/s (143 gpm) or greater. It is not designed to prevent the propagation of odour and floatables.

Product Construction

The HF, HF Sump and MHF ICDs are built to be light weight at a maximum weight of 6.8 Kg (14.6 lbs).

Product Applications

The HF and MHF ICD's are available to accommodate both square and round applications:



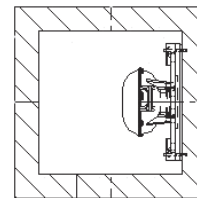
HF ICD



MHF ICD

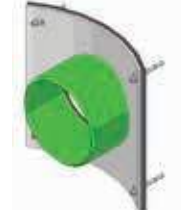
Square Application

Universal Mounting Plate

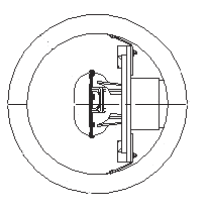


Round Application

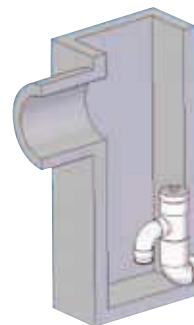
Spigot CB Wall Plate



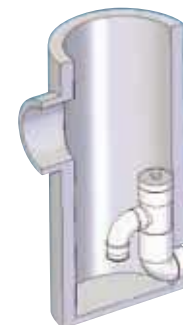
Universal Mounting Plate Hub Adapter



The HF Sump is available to accommodate low to no sump applications in both square and round catch basins:

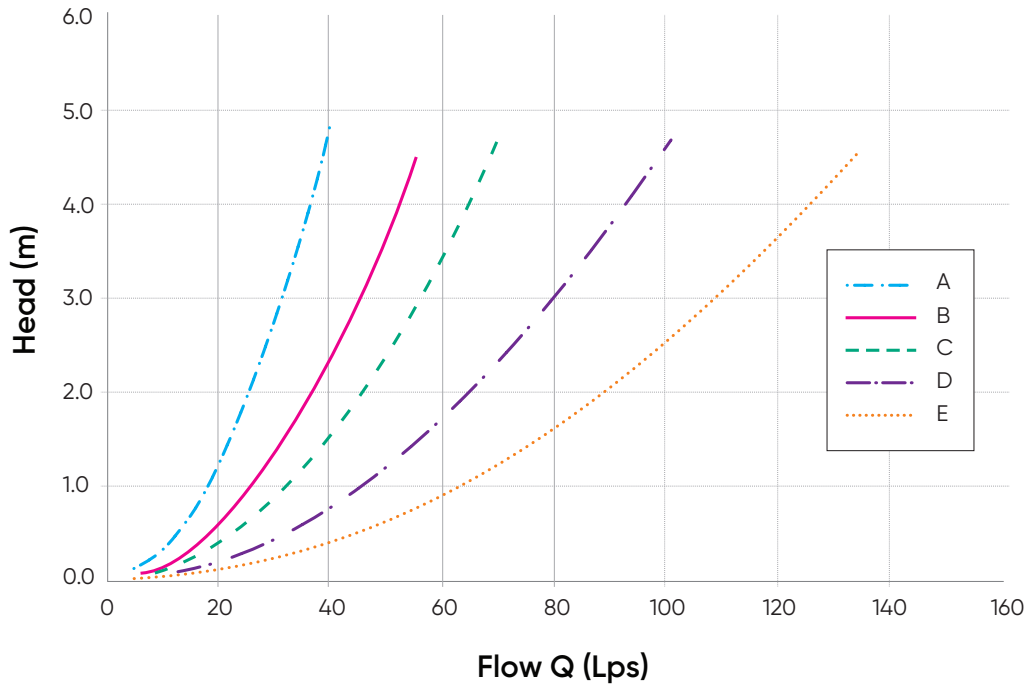


Square Catch Basin



Round Catch Basin

Chart 3: HF & MHF Preset Flow Curves



PRODUCT INSTALLATION

Instructions to assemble a TEMPEST HF or MHF ICD into a Square Catch Basin:

- Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers, (4) nuts, universal mounting plate, ICD device
- Use the mounting wall plate to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
- Use an impact drill with a 3/8" concrete bit to make the four holes at a minimum of 1-1/2" depth up to 2-1/2". Clean the concrete dust from the holes.
- Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
- Install the universal wall mounting plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the wall mounting plate and the catch basin wall.
- From the ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the universal wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF or MHF ICD into a Round Catch Basin:

STEPS:

- Materials and tooling verification.
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level and marker.
 - Material: (4) concrete anchor 3/8 x 3-1/2, (4) washers and (4) nuts, spigot CB wall plate, universal mounting plate hub adapter, ICD device.
- Use the round catch basin spigot adaptor to locate and mark the hole (4) pattern on the catch basin wall. You should use a level to ensure that the plate is at the horizontal.
- Use an impact drill with a 3/8" concrete bit to make the four holes at a depth between 1-1/2" to 2-1/2". Clean the concrete dust from the holes.
- Install the anchors (4) in the holes by using a hammer. Thread the nuts on the top of the anchors to protect the threads when you hit the anchors with the hammer. Remove the nuts from the ends of the anchors.
- Install the spigot CB wall plate on the anchors and screw the 4 nuts in place with a maximum torque of 40 N.m (30 lbf-ft). There should be no gap between the spigot CB wall plate and the catch basin wall.
- Put solvent cement on the hub of the universal mounting plate, hub adapter and the spigot of the CB wall plate, then slide the hub over the spigot. Make sure the universal mounting plate is at the horizontal and its hub is completely inserted onto the spigot. Normally, the corners of the hub adapter should touch the catch basin wall.
- From ground above using a reach bar, lower the device by hooking the end of the reach bar to the handle of the ICD device. Align the triangular plate portion into the mounting wall plate. Push down the device to be sure it has centered in to the wall mounting plate and has created a seal.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
- Call your IPEX representative for more information or if you have any questions about our products.

Instructions to assemble a TEMPEST HF Sump into a Square or Round Catch Basin:

STEPS:

1. Materials and tooling verification:
 - Tooling: impact drill, 3/8" concrete bit, torque wrench for 9/16" nut, hand hammer, level, mastic tape and metal strapping
 - Material: (2) concrete anchor 3/8 x 3-1/2, (2) washers, (2) nuts, HF Sump pieces (2).
2. Apply solvent cement to the spigot end of the top half of the sump. Apply solvent cement to the hub of the bottom half of the sump. Insert the spigot of the top half of the sump into the hub of the bottom half of the sump.
3. Install the 8" spigot of the device into the outlet pipe. Use the mastic tape to seal the device spigot into the outlet pipe. You should use a level to be sure that the fitting is standing at the vertical.
4. Use an impact drill with a 3/8" concrete bit to make a series of 2 holes along each side of the body throat. The depth of the hole should be between 1-1/2" to 2-1/2". Clean the concrete dust from the 2 holes.
5. Install the anchors (2) in the holes by using a hammer. Put the nuts on the top of the anchors to protect the threads when you hit the anchors. Remove the nuts from the ends of the anchors.
6. Cut the metal strapping to length and connect each end of the strapping to the anchors. Screw the nuts in place with a maximum torque of 40 N.m (30 lbf-ft). The device should be completely flush with the catch basin wall.

WARNING

- Verify that the outlet pipe doesn't protrude into the catch basin. If it does, cut down the pipe flush to the catch basin wall.
- The solvent cement which is used in this installation is to be approved for PVC.
- The solvent cement should not be used below 0°C (32°F) or in a high humidity environment. Refer to the IPEX solvent cement guide to confirm the required curing time or visit the IPEX Online Solvent Cement Training Course available at www.ipexinc.com.
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PRODUCT TECHNICAL SPECIFICATION

General

Inlet control devices (ICD's) are designed to provide flow control at a specified rate for a given water head level and also provide odour and floatable control where specified. All ICD's will be IPEX Tempest or approved equal.

All devices shall be removable from a universal mounting plate. An operator from street level using only a T-bar with a hook shall be able to retrieve the device while leaving the universal mounting plate secured to the catch basin wall face. The removal of the TEMPEST devices listed above shall not require any unbolting or special manipulation or any special tools.

High Flow (HF) Sump devices shall consist of a removable threaded cap which can be accessible from street level with out entry into the catchbasin (CB). The removal of the threaded cap shall not require any special tools other than the operator's hand.

ICD's shall have no moving parts.

Materials

ICD's are to be manufactured from Polyvinyl Chloride (PVC) or Polyurethane material, designed to be durable enough to withstand multiple freeze-thaw cycles and exposure to harsh elements.

The inner ring seal will be manufactured using a Buna or Nitrile material with hardness between Duro 50 and Duro 70.

The wall seal is to be comprised of a 3/8" thick Neoprene Closed Cell Sponge gasket which is attached to the back of the wall plate.

All hardware will be made from 304 stainless steel.

Dimensioning

The Low Medium Flow (LMF), High Flow (HF) and the High Flow (HF) Sump shall allow for a minimum outlet pipe diameter of 200mm with a 600mm deep Catch Basin sump.

Installation

Contractor shall be responsible for securing, supporting and connecting the ICD's to the existing influent pipe and catchbasin/manhole structure as specified and designed by the Engineer.

NOTES

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Appendix E
Impacts to Copperwood System

MEMORANDUM

DATE: MARCH 20, 2026

TO: ANTHONY MESTWARP

FROM: MELANIE SCHROEDER

RE: COPPERWOOD BLOCK 73
MEDIUM DENSITY DEVELOPMENT
STORMWATER IMPACTS OF BLOCK 73 ON OVERALL
SUBDIVISION MODEL (PCSWMM)
NOVATECH PROJECT NO.: 125113

CC: GREG MACDONALD

INTRODUCTION AND BACKGROUND

This memo has been prepared to summarize the findings of this analysis in support of the detailed SWM design for Block 73 of the Copperwood Estates Subdivision, as described in the *Copperwood Block 73 Servicing and Stormwater Management Report*, prepared by Novatech, revised March 20, 2026.

Copperwood Estates Subdivision PCSWMM Model

Novatech prepared a dual-drainage PCSWMM model of the Copperwood Estates Subdivision in support of the detailed design of Phase 1. The subdivision PCSWMM model has been updated for the detailed design of Phase 2 and submitted in January of 2026 and is in the approval process. The updated subdivision model included a conceptual stormwater management design for Block 73, consisting of on-site storage and a controlled release rate to the storm sewer on Spoor Street.

Block 125

The detailed design of Block 125, which is located across Spoor Street from Block 73, was provided in the *Copperwood Flats Block 125 Servicing and Stormwater Management Report* prepared by Novatech, revised August 19, 2025. The impacts of Block 125 on the adjacent Copperwood Estate Subdivision and Shirley's Brook were evaluated through an update of the Copperwood Estates PCSWMM model and the HEC-RAS model of Shirley's Brook Tributary 2 to reflect proposed drainage patterns for Block 125. The updated model reflecting the detailed design of Block 125 has been used in the analysis of Block 73 to ensure the cumulative changes for both sites do not have any adverse impacts on the surrounding development and Shirley's Brook.

Block 73

The detailed stormwater management design and drainage patterns for Block 73 (formerly Block 284) has some differences from the conceptual design. The primary difference is that some areas of the site will have direct runoff to Dandelion Place, Spoor Street, and Shirley's Brook. The detailed SWM design for Block 73 was incorporated into the overall subdivision PCSWMM model to

evaluate the impacts of the direct runoff areas on the surrounding subdivision and Shirley's Brook Tributary 2.

Impacts to the 100-year floodplain for the Shirley's Brook Tributary 2 due to the additional direct runoff from Block 73 and Block 125 were evaluated using HEC-RAS. The steady-state flow data in the Tributary 2 HEC-RAS model from the *Shirley's Brook Tributary 2 Flood & Erosion Hazard Mapping Revisions* (Novatech, August 2025) was revised to account for the additional direct runoff from Blocks 73 and 125.

PCSWMM MODEL

The detailed design for Block 73 has a single controlled minor system outlet to Spoor Street and three (3) direct runoff areas. The detailed design for Block 73 was incorporated into the overall Copperwood Estates PCSWMM model as follows:

Catchment Areas & Parameters

- Drainage areas A-01 to A-08 and D-01 to D-03 were added to replace subcatchment NW-31.
 - Subcatchment parameters representing the proposed grading and drainage design for Block 73 were assigned based on **Drawing 125113-SWM**.

Controlled Runoff (to Spoor Street Sewer)

- The controlled areas A-01 to A-08 were modelled as follows:
 - The internal pipe network for Block 73 was not included in the model. On-site storage and controlled minor system flows are modelled with a single storage node and orifice.
 - This storage node represents the available storage volume of 152.8 m³ as noted in the *Copperwood Block 73 Servicing and Stormwater Management Report* (Novatech, March 2026).
 - The minor system outlet was modelled using a single orifice sized to match the combined 100-year release rate from the proposed on-site ICDs:
 - Block 73 SWM report: $Q_{100} = 173.3 \text{ L/s}$
 - Updated Copperwood Estates Model: $Q_{100} = 172.9 \text{ L/s}$
 - A major system spill was added above the 100-year maximum storage elevation to represent major system spills during events exceeding the 100-year storm event.

Direct Runoff

- Direct runoff Areas were modelled as follows:
 - Area D-01 (0.114 ha) directed to CB19/CB20 on Spoor Street.
 - Area D-02 (0.001 ha) directed to CB96/CB95 on Dandelion Place.
 - Area D-03 (0.010 ha) directed to a new outfall representing Tributary 2.

MODEL RESULTS

The updated subdivision model was run and compared to the original model. It should be noted that both Buckbean Avenue and Spoor Street are collector roads, while Dandelion Place is a local road.

ICD Sizing

The results show minimal downstream impacts within the Copperwood Estates Subdivision resulting from the updated model. As part of the Block 125 design, the two 94mm diameter ICDs at CB5/CB6

were proposed be upsized to 102mm diameter ICDs. It should be confirmed that these ICDs were replaced, since there will be ponding in the 5-year storm on Buckbean Avenue at CB5/CB6 if the ICDs remain 94mm diameter. A summary of the ICD sizing is as follows:

- The ICDs at CB5/CB6 are two 94mm diameter ICDs.
 - 5-year ponding at this location is 0.01m.
 - 100-year ponding at this location is 0.18m.
- If the ICDs at CB5/CB6 are upsized to 102mm.
 - Ponding at this location is 0.00m in the 5-year.
 - 100-year ponding at this location is 0.18m which is below the maximum of 0.35m.

Ponding Depths & HGL

A comparison of modelled ponding depths and HGL elevations between the Phase 1 PCSWMM model and the updated model reflecting the detailed design of Block 125 are provided in **Tables 1 and 2**.

Table 1: Ponding Comparison (3-hour Chicago Storm Distribution)

Scenario	Location	T/G (m)	2-year		5-year		100-year				100-year + 20%			
			Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Elev. (m)	Depth (m)	Velocity (m/s)	Velocity x Depth (m ² /s)	Elev. (m)	Depth (m)	Velocity (m/s)	Velocity x Depth (m ² /s)
Previous Model	CB2/CB1 ⁽³⁾	82.30	82.31	0.01	82.32	0.02	82.33	0.03	0.18	0.01	82.33	0.03	0.20	0.01
	CB3/CB4 ⁽²⁾	82.76	81.81	0.00	82.44	0.00	82.90	0.14	0.00	0.00	82.95	0.19	0.00	0.00
	CB5/CB6 ⁽²⁾	84.92	84.17	0.00	84.93	0.01	85.10	0.18	0.58	0.10	85.15	0.23	0.57	0.13
	CB7/CB8 ⁽³⁾	86.20	86.22	0.02	86.23	0.03	86.24	0.04	0.58	0.02	86.24	0.04	0.76	0.03
	CB19/CB20 ⁽²⁾	87.36	86.30	0.00	86.94	0.00	87.47	0.11	0.00	0.00	87.65	0.29	0.59	0.17
	CB21/CB22 ⁽²⁾	87.67	86.80	0.00	87.27	0.00	87.84	0.17	0.00	0.00	87.90	0.23	0.00	0.00
	CB94/CB93 ⁽¹⁾	87.92	87.60	0.00	88.00	0.08	88.09	0.17	0.21	0.04	88.10	0.18	0.21	0.04
	CB96/CB95 ⁽¹⁾	87.27	86.53	0.00	87.35	0.08	87.57	0.30	0.14	0.04	87.61	0.34	0.17	0.06
	CB155-158/ 9-10 ⁽³⁾	86.70	86.72	0.02	86.73	0.03	86.74	0.04	0.86	0.03	86.76	0.06	1.15	0.07
CB159-162/ CB17-18 ⁽³⁾	86.65	86.66	0.01	86.67	0.02	86.68	0.03	0.25	0.01	86.68	0.03	0.27	0.01	
Updated Model with Block 125 and Block 73	CB2/CB1 ⁽³⁾	82.30	82.31	0.01	82.32	0.02	82.33	0.03	0.18	0.01	82.33	0.03	0.20	0.01
	CB3/CB4 ⁽²⁾	82.76	81.81	0.00	82.44	0.00	82.90	0.14	0.00	0.00	82.95	0.19	0.00	0.00
	CB5/CB6 ⁽²⁾	84.92	84.08	0.00	84.84	0.00	85.10	0.18	0.00	0.00	85.15	0.23	0.00	0.00
	CB7/CB8 ⁽³⁾	86.20	86.22	0.02	86.23	0.03	86.24	0.04	0.67	0.03	86.25	0.05	0.75	0.04
	CB19/CB20 ⁽²⁾	87.36	86.51	0.00	87.36	0.00	87.51	0.15	0.00	0.00	87.61	0.25	0.00	0.00
	CB21/CB22 ⁽²⁾	87.67	86.80	0.00	87.27	0.00	87.84	0.17	0.00	0.00	87.90	0.23	0.00	0.00
	CB94/CB93 ⁽¹⁾	87.92	87.60	0.00	88.00	0.08	88.09	0.17	0.21	0.04	88.10	0.18	0.21	0.04
	CB96/CB95 ⁽¹⁾	87.27	86.53	0.00	87.35	0.08	87.57	0.30	0.14	0.04	87.61	0.34	0.17	0.06

Scenario	Location	T/G (m)	2-year		5-year		100-year				100-year + 20%				
			Elev.	Depth	Elev.	Depth	Elev.	Depth	Velocity	Velocity x Depth	Elev.	Depth	Velocity	Velocity x Depth	
			(m)	(m)	(m)	(m)	(m)	(m)	(m/s)	(m ² /s)	(m)	(m)	(m/s)	(m ² /s)	
	CB155-158/ 9-10 ⁽³⁾	86.70	86.72	0.02	86.73	0.03	86.74	0.04	0.86	0.03	86.76	0.06	1.16	0.07	
	CB159-162/ CB17-18 ⁽³⁾	86.65	86.66	0.01	86.67	0.02	86.68	0.03	0.21	0.01	86.68	0.03	0.23	0.01	
Diff.	CB2/CB1 ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CB3/CB4 ⁽²⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CB5/CB6 ⁽²⁾	0	-0.09	0	-0.09	-0.01	0	0	-0.58	-0.10	0	0	-0.57	-0.13	
	CB7/CB8 ⁽³⁾	0	0	0	0	0	0	0	0.09	0	0.01	0.01	-0.01	0.01	
	CB19/CB20 ⁽²⁾	0	0.21	0	0.42	0	0.04	0.04	0	0	-0.04	-0.04	-0.59	-0.17	
	CB21/CB22 ⁽²⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CB94/CB93 ⁽¹⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CB96/CB95 ⁽¹⁾	0	0	0	0	0	0	0	0	0	0	0	0	0	
	CB155-158/ 9- 10 ⁽³⁾	0	0	0	0	0	0	0	0	0	0	0	0	0.01	0
	CB159-162/ CB17-18 ⁽³⁾	0	0	0	0	0	0	0	0	-0.04	0	0	0	-0.04	0

⁽¹⁾ In-sag CBs sized for 2-year

⁽²⁾ In-sag CBs sized for 5-year

⁽³⁾ On-Grade CBs sized for 5-year

Table 2: HGL Comparison (3-hour Chicago Storm Distribution)

MH ID	100-year HGL (m)		
	Previous Model	Updated Model with Block 73	Difference
MH312	85.70	85.69	-0.01
MH314	85.54	85.54	0.00
MH316	85.46	85.47	0.01
MH937	84.14	84.13	-0.01
MH1210	85.17	85.18	0.01
MH1212	85.00	85.02	0.02
MH1214	84.14	84.13	-0.01
MH1216	84.14	84.13	-0.01
MH1218	84.14	84.13	-0.01
MH1300	84.59	84.53	-0.06
MH1302	84.81	84.75	-0.06

Ponding depths (Table 1) are largely unchanged. The 100-year ponding depth at CB 5/6 has reduced by 1cm due to the larger diameter ICDs allowing slightly more flow into the minor system. The 100-

year ponding depth at CB 19/20 has increased by 1cm because of the additional direct runoff from Block 73.

The model revisions for Block 73 have had minimal impact on the 100-year HGL elevations in the storm sewers. There is a 1cm increase to the HGL elevations at MH316 and MH1212.

SWMF Storage Volumes and Release Rates

Table 3 provides a comparison of the 100-year storage volumes and release rates from the Copperwood Estates SWM facility following the updates for Block 73. The model results demonstrate that there will be no impact to the performance of the SWM facility resulting from the Block 73 updates. The 100-year water level and active storage volume for the upper cell decreased very slightly, while the 100-year release rate remained the same. There are no impacts to the lower cell of the SWMF.

Table 3: SWMF Comparison (12-hour SCS Storm Distribution)

Scenario	Upper Pond			Lower Pond		
	100-yr HGL (m)	100-year Volume (m ³)	100-year Outflow (L/s)	100-yr HGL (m)	100-year Volume (m ³)	100-year Outflow (L/s)
Previous Model	84.38	24,584	149	81.87	16,715	113
Updated Model with Block 73	84.37	24,539	149	81.87	16,715	113

Direct Runoff Area to Shirley’s Brook

The Copperwood Estates subdivision model (PCSWMM) does not include any direct runoff areas to Shirley’s Brook from Block 73. The direct runoff area from D-03 is 0.114 ha with an imperviousness of 50% (runoff coefficient of 0.55). The peak 100-year runoff to Shirley’s Brook from Block 73 is 50 L/s. The direct runoff from Block 73 will enter the watercourse in advance of the peak from the upstream drainage area and will have a negligible impact on the watercourse.

This direct runoff area is consistent with the overall design intent for the Copperwood Estates Subdivision, with rear yard drainage from residential areas backing onto Tributary 2 conveyed overland to the watercourse. Shirley’s Brook Tributary 2 has an upstream drainage area of approximately 445 ha at March Road. The additional 0.114 ha of direct runoff from Block 73 to Shirley’s Brook represent a negligible increase to the overall drainage area.

HEC-RAS MODEL

The Shirley’s Brook Tributary 2 Flood & Erosion Hazard Mapping Revisions (Novatech, August 2025) revised the Shirley’s Brook HEC-RAS model to reflect post-development conditions, including and the watercourse realignment through the Copperwood Estates Subdivision. The flow data in the HEC-RAS model was updated to account for the direct runoff to Shirley’s Brook.

The modelled 100-year outflows from the Copperwood Estates SWM Ponds were effectively unchanged following the updates for Block 73. The only required change to the HEC-RAS flow data is to include the additional direct runoff from Block 73 (50 L/s for the 100-year event). This flow was added to the flow change location between Goldenseal Road and Spoor Street.

It should be noted that the direct runoff from Block 125 to Shirley’s Brook (28 L/s) was also incorporated into the HEC-RAS model. These flows were added to the flow change location between Spoor Street and March Road.

While the direct runoff from Block 73 will enter the watercourse in advance of the peak flow from the upstream area, a conservative analysis was done by assuming the peak flows are coincidental. The steady-state peak flow in the HEC-RAS model upstream of Spoor Street was increased by 50 L/s, which raised the 100-year HGL in Tributary 2 by 1 to 2cm between Goldenseal Avenue and Spoor Street. There was also a 1cm increase immediately downstream (10 to 15m downstream) of the Spoor Street crossing. The 100-year floodplain will remain confined within the 40m stream corridor and will not have any negative impacts on the surrounding development.

There are increases of 1cm to the HGL at some cross-sections between Spoor Street and March Road, but this is impacted mostly by the Block 125 direct runoff area. The 1cm decrease in HGL at the cross-section immediate downstream of March Road is also due to the Block 125 direct runoff. As with the HGL between Goldenseal Avenue and Spoor Street, the 100-year floodplain between Spoor Street and March Road will remain confined within the 40m stream corridor and will not have any negative impacts on the surrounding development.

CONCLUSIONS

The PCSWMM results from the updated model which includes the detailed design of Block 73 indicate that there are minor changes to storm sewer HGL elevations and ponding depths above CBs.

There will be no increase to maximum water levels or outflows from the Copperwood Estates SWMF resulting from the detailed design of Block 73.

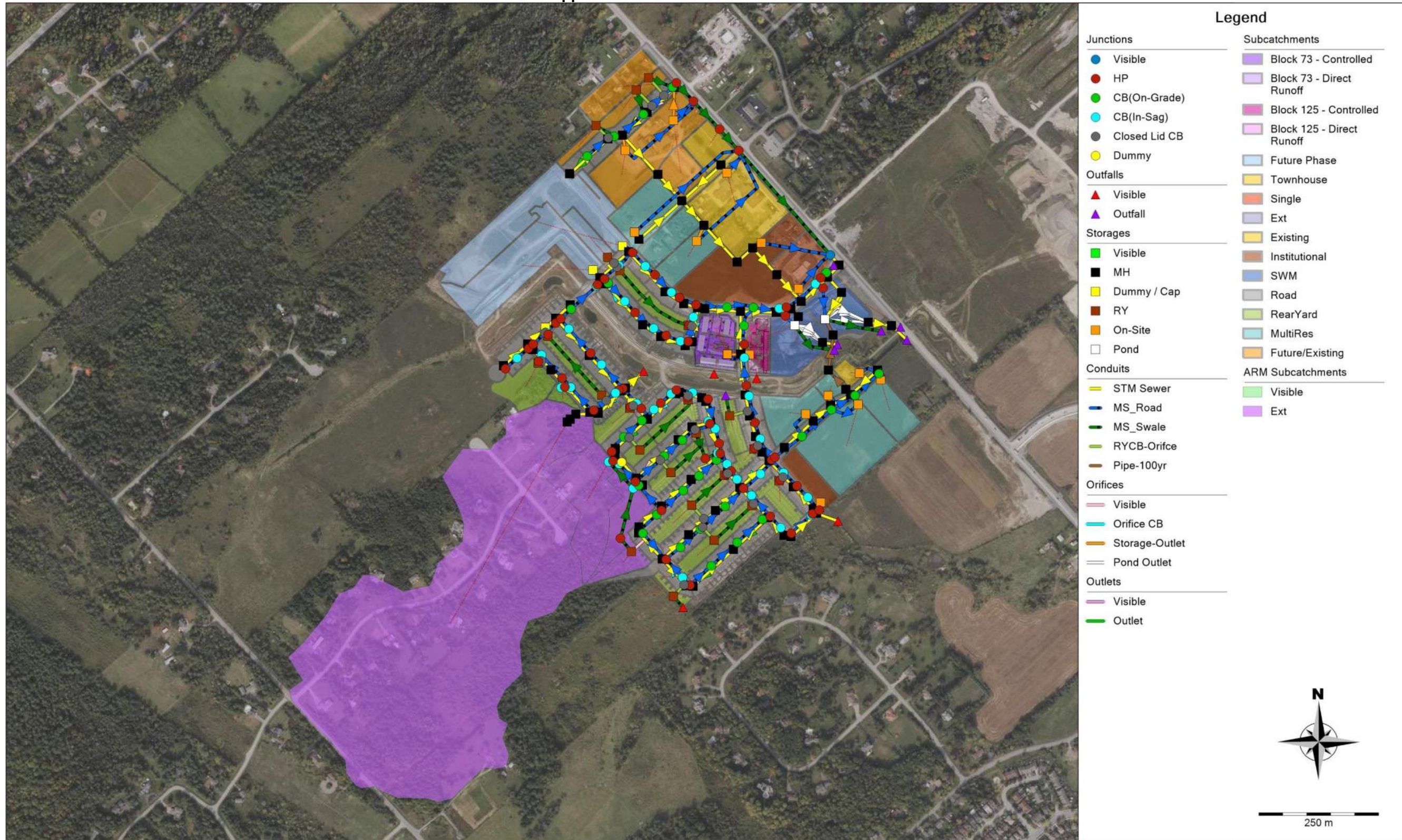
The additional direct runoff to Shirley's Brook Tributary 2 is negligible and will have minimal impact on the floodplain elevations in the watercourse.

The updated model indicates that there will be no adverse impacts to the function of the stormwater management system for the Copperwood Estate Subdivision or the receiving watercourse.

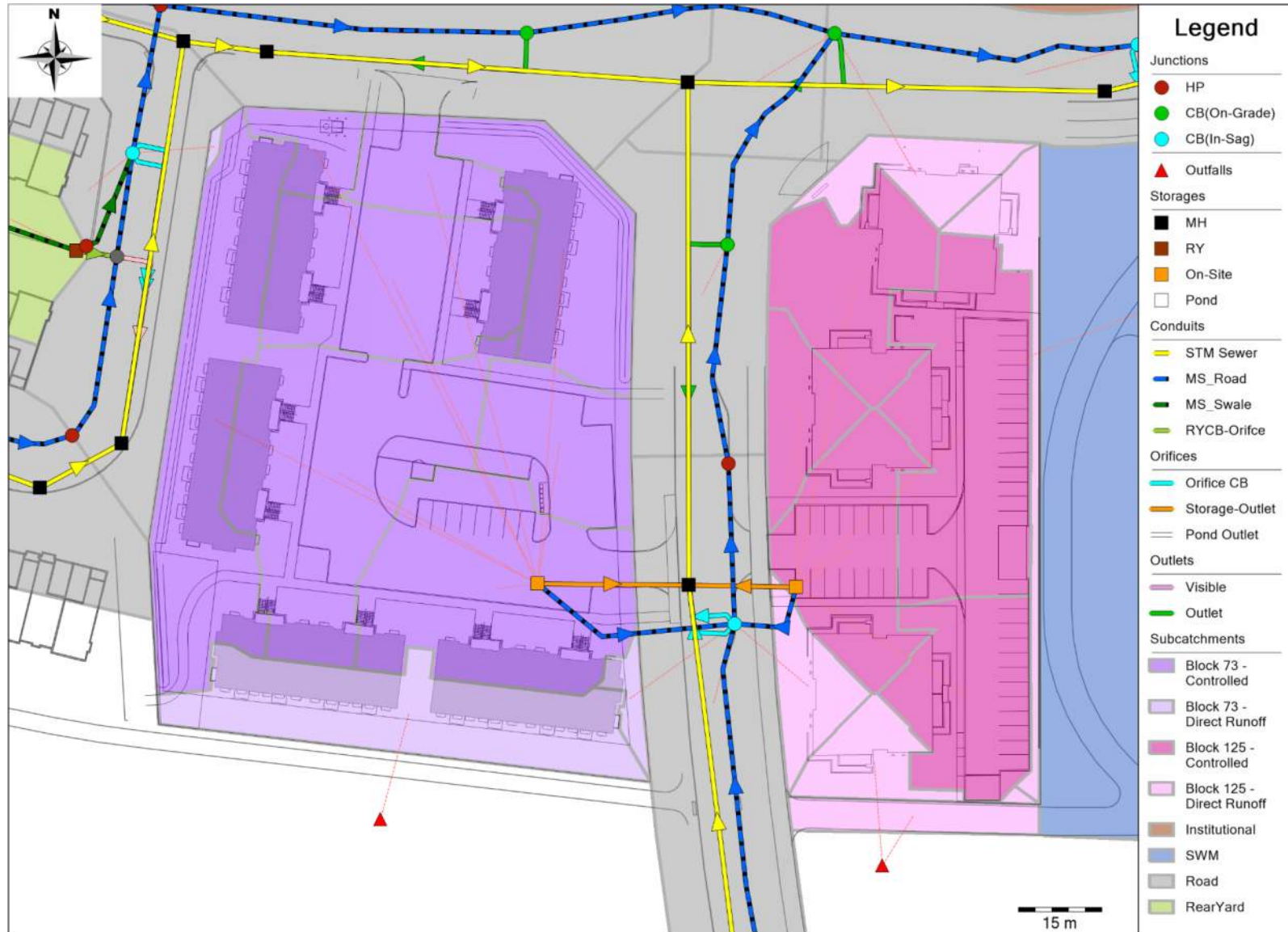
Attachments

- Model Schematic
- PCSWMM model files (digital)
- HEC-RAS Profiles
- HEC-RAS model files (digital)

Overall Copperwood Estates Subdivision - Model Schematic



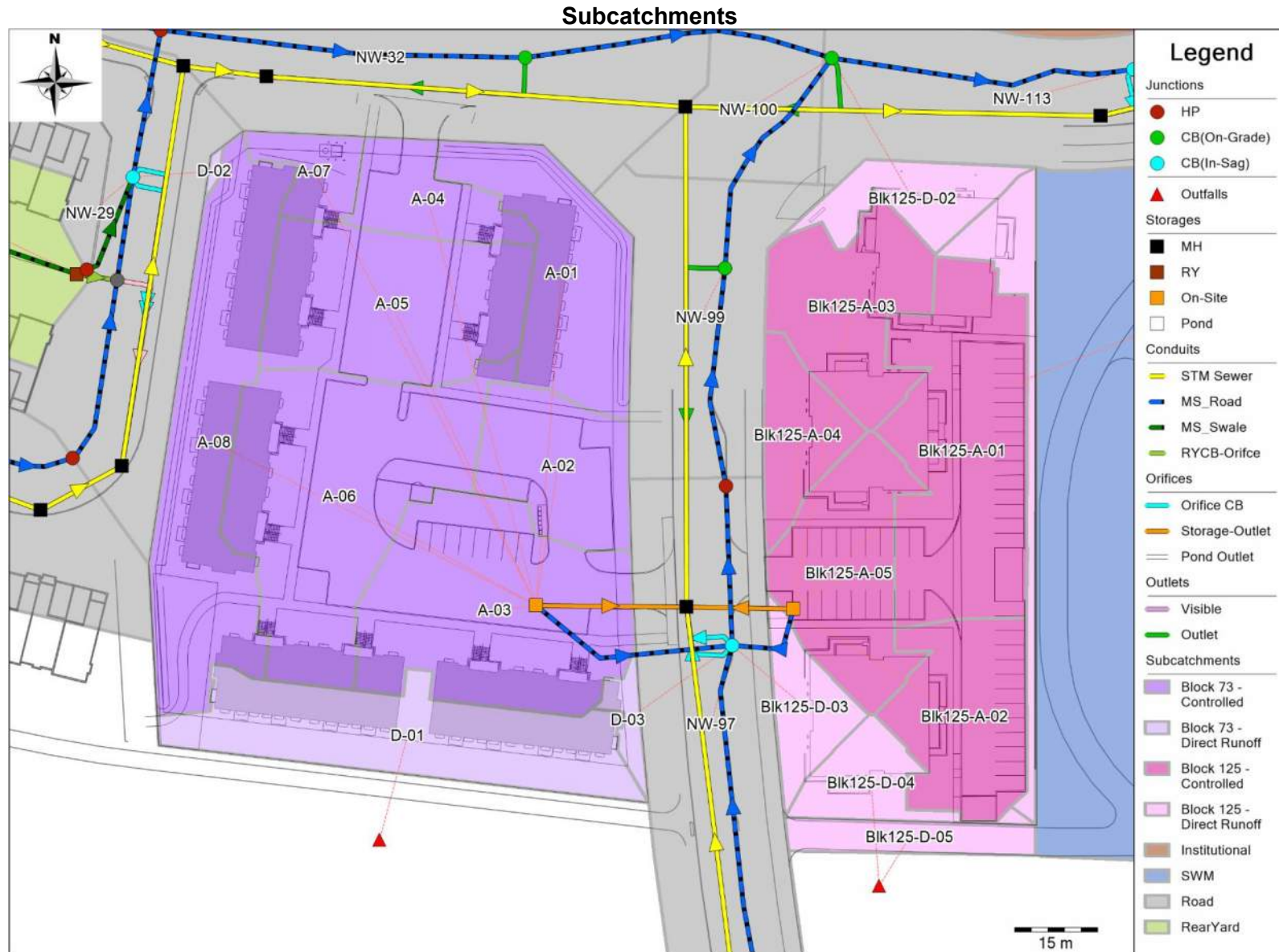
Block 73 Model Schematic



Date: 2026-03-13

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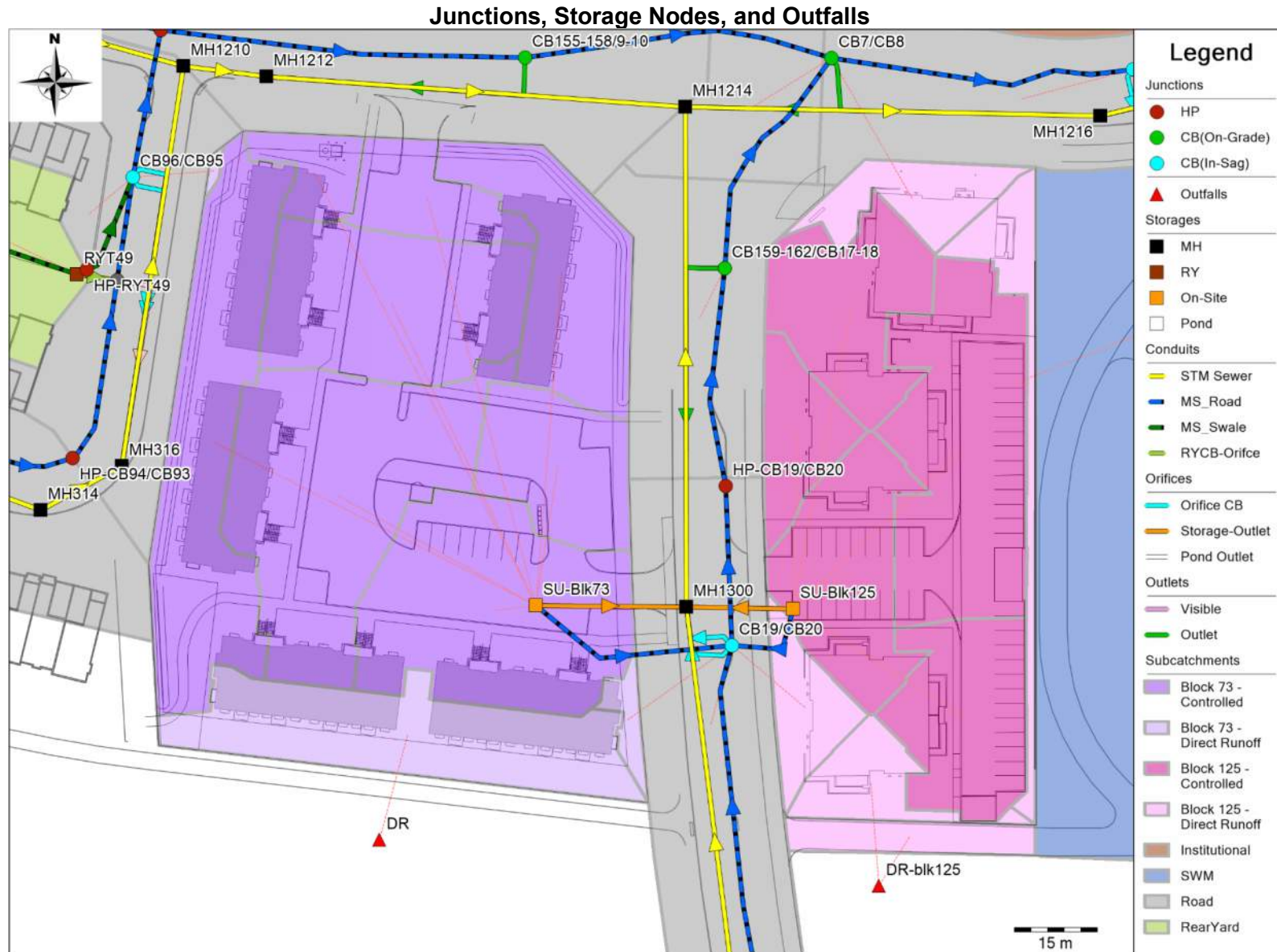
Copperwood Block 73 (125113)
PCSWMM Model Schematics



Date: 2026-03-13

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**Copperwood Block 73 (125113)
PCSWMM Model Schematics**



Date: 2026-03-13

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HEC-RAS Profile Comparison - Shirley's Brook

