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Proposed Residential Development 640 White Lake Road and 000 Van Dusen Drive Arnprior, ON

Serviceability & Stormwater Management Report

**PROPOSED RESIDENTIAL DEVELOPMENT
640 WHITE LAKE ROAD AND 000 VAN DUSEN DRIVE
ARNPRIOR, ON**

**SERVICEABILITY AND STORMWATER
MANAGEMENT REPORT**

Prepared by:

NOVATECH

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Kanata, Ontario
K2M 1P6

February 3, 2021
Amended March 31, 2021
Amended June 14, 2023
Amended June 27, 2024

Ref: R-2020-144
Novatech File No. 120051

June 27, 2024

Arnprior Developments Inc. and Tartan Madawaska Inc.
38 Colonnade Road North
Ottawa, ON
K2E 7J6

**Attention: Ms. Melissa Cote, MCIP, RPP
Director, Land Development**

Dear Melissa:

**Re: Serviceability and Stormwater Management Report
Proposed Residential Development
640 White Lake Road & 000 Van Dusen Drive, Arnprior, ON
Novatech File No.: 120051**

Please find enclosed the Serviceability and Stormwater Management Report for the proposed residential developments located along White Lake Road and Van Dusen Drive in the Town of Arnprior. This report addresses the approach to site servicing and stormwater management and is submitted in support of Zoning and Subdivision applications for 640 White Lake Road as well as Zoning and Subdivision applications for 000 Van Dusen Drive. The report has been revised to reflect a new draft plan for the 000 Van Dusen lands.

Please contact the undersigned should you have any questions or require additional information.

Yours truly,

NOVATECH



Greg MacDonald, P.Eng.
Director, Land Development and Public Sector Infrastructure

EXECUTIVE SUMMARY

Arnprior Developments Inc. and Tartan Madawaska Inc. plan to develop the properties located at 640 White Lake Road (Area 37) and 000 Van Dusen Drive (Area 1) in Arnprior, Ontario. The property at 640 White Lake Road will consist of approximately 272 residential units while the property at 000 Van Dusen Drive will consist of approximately 281 residential units.

Site Location



Both properties will be serviced by a sanitary sewer pump station located in the east corner of Area 1 as illustrated in the above figure. A gravity sanitary sewer will be constructed along Van Dusen Drive from Area 37 to convey its sanitary sewage to the pump station. Dual force mains will be constructed along Van Dusen Drive to convey flows from both areas back to the existing sanitary sewer on Bev Shaw Parkway at White Lake Road.

Both sites will be serviced with local 150 mm - 200 mm diameter watermains. Dual 300 mm diameter watermains will be constructed along Van Dusen Drive from Bev Shaw Parkway and White Lake Road to provide redundancy to Area 1.

A stormwater management facility will be constructed in the southeast corner of Area 1 adjacent to Lake Madawaska. Stormwater flows from Area 37 will be conveyed by a 1350 mm diameter storm sewer southerly along Van Dusen Drive to the stormwater management facility.

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- Appendix C: Preliminary Sanitary Sewage Calculations
- Appendix D: Preliminary Water Demands, FUS Calculations, Municipal Hydrant Data
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1.0 INTRODUCTION

Novatech has been retained by Arnprior Developments Inc. (640 White Lake Road) and Tartan Madawaska Inc. (000 Van Dusen Drive) to review the serviceability of the proposed developments along White Lake Road and Van Dusen Drive in Arnprior, Ontario. This report is submitted in support of re-zoning and subdivision applications for both properties.

1.1 Site Description, Location and Topography

The subject sites are currently identified as Area 37 (White Lake Road) and Area 1 (Van Dusen Drive) in the Town of Arnprior's Water and Wastewater Management Plan. Refer to **Figure 6-1** in **Appendix A** for reference. Area 37 is 14.6 hectares and is currently designated as low/medium residential per Official Plan Amendment No. 3. Area 1 is 24.90 hectares and is designated as Low/Medium Density Residential in Schedule A of the Town of Arnprior Official Plan. Area 37 is zoned mixed use commercial/employment and Area 1 is zoned future development. Both properties will require a zoning by-law amendment. Refer to **Figure 1** for site locations.

Figure 1 – Key Plan



1.1.1 Topography and Drainage

The topography of Area 37 is relatively flat, however the elevation across the site drops approximately 2.6m from 108.6m near the intersection of White Lake Road and Van Dusen Drive to 106.0m near the northeast property corner. A drainage ditch runs along the east property line and flows along Bev Shaw Parkway across Highway 417 into the Madawaska River downstream of the Arnprior Generating Station. As a result, stormwater runoff from Area 37 currently drains towards the northeast and is collected by a drainage ditch prior to discharging to Lake Madawaska.

The topography of Area 1 generally slopes gradually from northwest to southeast from about 106.6m at Van Dusen Drive to 104.50 m at the top of the bank of Lake Madawaska. The high-water elevation on Lake Madawaska at this location was determined to be 99.06 metres through correspondence with Ontario Power Generation, the operators of the Arnprior Generating Station located just downstream. This level fluctuates daily by about 150 mm and seasonally by about 1 metre. **Refer to Appendix B – Correspondence.**

A portion of the agricultural lands west of Area 1 (primarily Area 13) slopes towards the south and flows overland into Lake Madawaska.

1.1.2 Geotechnical Investigation

Geotechnical investigations performed by Paterson Group show that the soils in Area 37 and Area 1 to consist of silty clay. Bedrock was not recorded at typical servicing depths. Refer to the following reports:

- Area 37: 'Preliminary Geotechnical Investigation – Proposed Commercial Development – White Lake Road, Arnprior, Ontario' written by Paterson Group dated July 10, 2007
- Area 1: 'Geotechnical Investigation – Proposed Residential Development – 0184 Lands - Van Dusen Drive, Arnprior, Ontario' written by Paterson Group dated August 10, 2020.

2.0 SITE SERVICING

The **Town of Arnprior Water and Wastewater Master Plan** prepared by Stantec in 2013, serves as a comprehensive review of the Town's existing municipal infrastructure and its future needs over the (then) short term (2016), midterm (2021) and long-term (2031). The calculations and analysis in the Stantec report considers Area 37 as commercial land and Area 1 as residential land (as per the current zoning).

Development of the subject lands will occur over several years. Anticipated phasing of the development is summarized in **Table 1 – Projected Development Phasing**.

Table 1 Projected Development Phasing

Phase	Year	Number Units	Site
I	2024 – 2026	110	Area 1 or 37
II	2026 – 2029	162	Area 1 or 37
	2029 - 2032	138	Area 1 or 37
III	2032 – 2035	143	Area 1
TOTAL	2024 - 2035	553	Area 37 = 272 Units Area 1 = 281 Units

This report addresses the serviceability of the subject sites with respect to sanitary sewage, water demands, storm drainage and stormwater management as proposed residential developments.

2.1 Sanitary Servicing

There is an existing 450mm dia. municipal sanitary sewer in Bev Shaw Parkway which is the nearest point of connection for the proposed developments. Based on a review of the as-built plans provided by the Town of Arnprior, this sewer flows into a 600mm diameter sanitary sewer in Vanjumar Road, on the west side of White Lake Road. The 450mm diameter sanitary sewer in Bev Shaw Parkway terminates approximately 180m east of White Lake Road and has an invert elevation of 105.7m (approximately 2.0m below the existing roadway). Refer to **Figure 5-8** in **Appendix A** for the location of sanitary sewers.

As indicated in the **Town of Arnprior Water and Wastewater Master Plan**, sanitary flows from Area 37 were intended to be directed into the sanitary sewer in Bev Shaw Parkway. The full buildout of Area 37 was not expected until the year 2031 according to **Figure 6-3** in **Appendix A**. Sanitary flows from Area 1 were not accounted for in the future development plans up to the year 2031.

2.1.1 Sanitary Servicing

To service the two developments a sanitary sewer will be constructed along Van Dusen Drive to convey flows from Area 37 and Area 1 to a pump station located in the east corner of Area 1. Flows from both Areas 1 and 37 would then be pumped through 2200 m of dual 200 mm dia. force mains to connect to the existing sanitary sewer on Bev Shaw Parkway.

From discussions with officials from the Town of Arnprior Area 7 (which is located west of Van Dusen Drive fronting White Lake Road) is not identified as a growth area within the next 20 years. However, the Town advised that this could change depending on growth trends and development activity. To accommodate this area the sizing of the sanitary sewer on Van Dusen Drive would require either slightly steeper slopes or an increase in pipe size from 250 mm diameter to 300 mm diameter. Additional works within the pump station would either require replacing the pumps in the future or oversizing the wet well to accommodate a future third pump. Replacement of the generator for this potential future growth may also be necessary. This is something the Town will need to consider in the future.

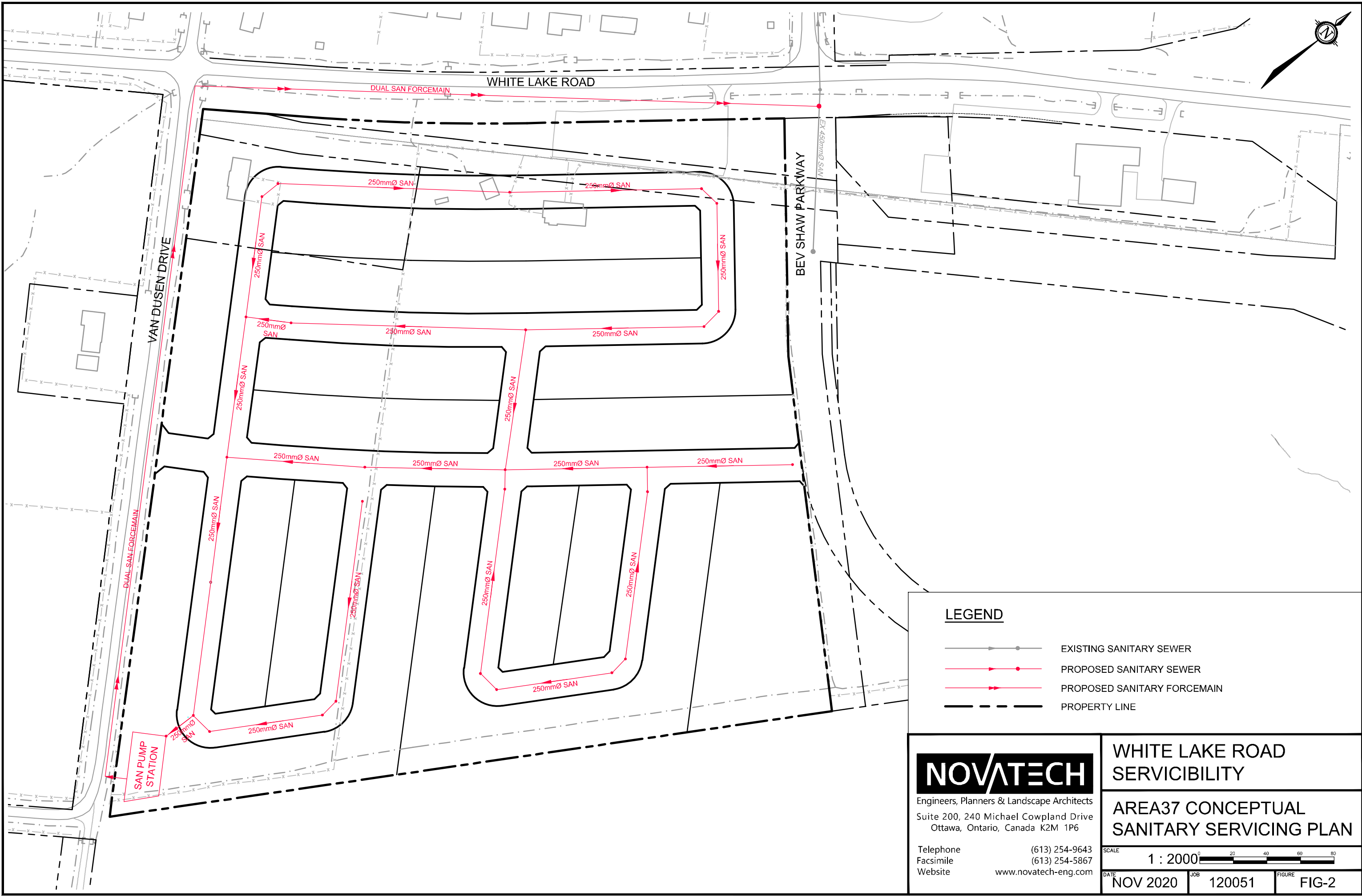
Area 13 has been identified as “Airport Restricted” due to its location relative to the Arnprior Airport runways and likely will not be developed in the future.

Other sanitary options which were considered included providing separate pump stations for both Area 1 and Area 37 with force mains to the outlet at the corner of Bev Shaw Parkway and White Lake Road as illustrated in **Figure 2** and **Figure 3**. These options were disqualified due to the additional capital cost and additional operation and maintenance costs for two pump stations rather than one.





The preferred sanitary servicing approach for Area 1 and Area 37 is shown in **Figure 4**. The overall Van Dusen drainage area is shown below in **Figure 5 – Overall Sanitary Van Dusen Area**.

Cost estimates of the options evaluated are provided in **Appendix F**.

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LEGEND

-  EXISTING SANITARY SEWER
-  PROPOSED SANITARY SEWER
-  PROPOSED SANITARY FORCEMAIN
-  PROPERTY LINE

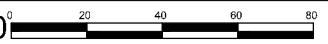


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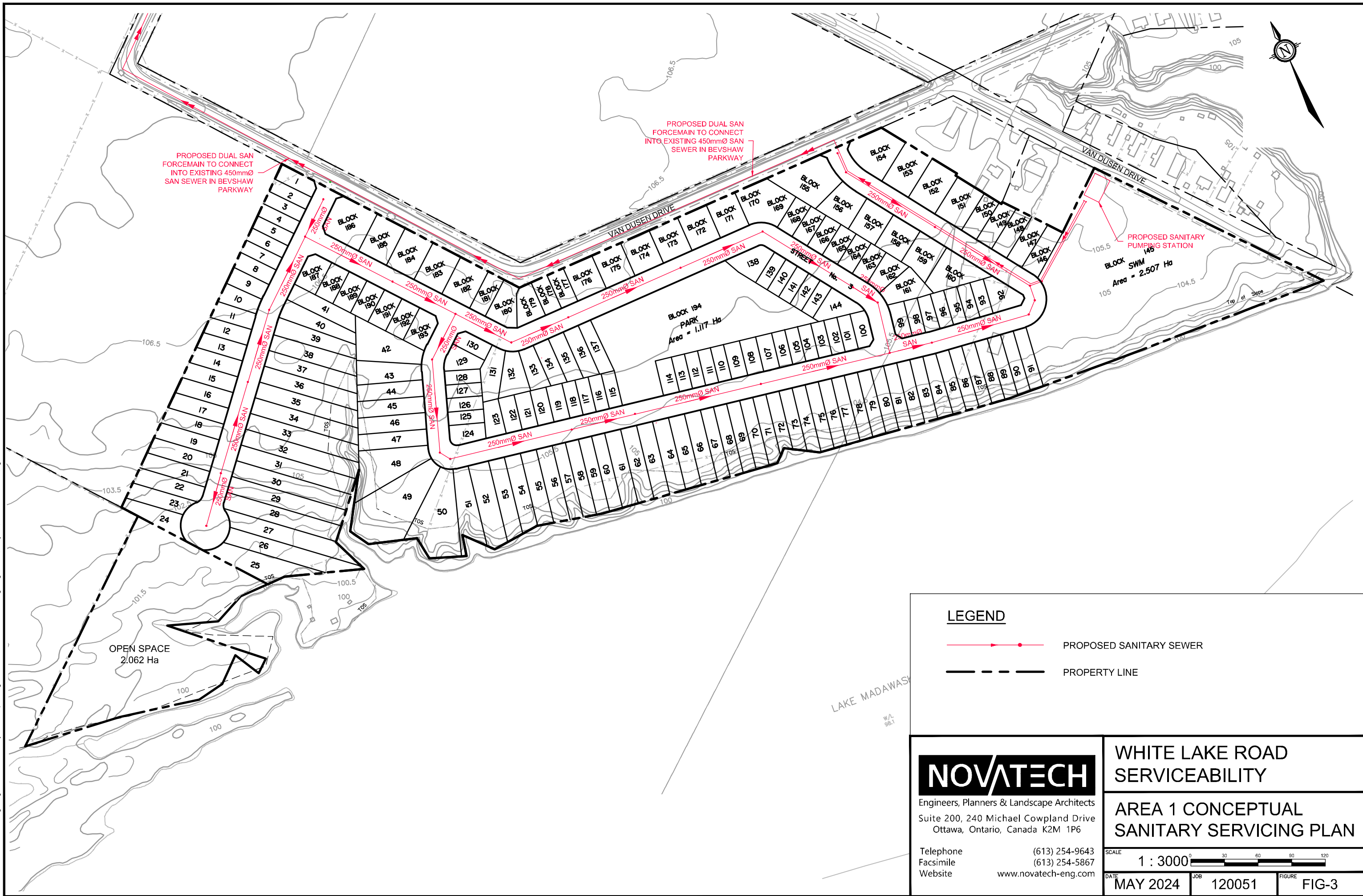
**WHITE LAKE ROAD
SERVICIBILITY**

**AREA37 CONCEPTUAL
SANITARY SERVICING PLAN**

SCALE 1 : 2000 

DATE NOV 2020 JOB 120051 FIGURE FIG-2

M:\2020\120051\CAD\Design\Figures\Serviceability\New Report\Figures\120051-Area 1 Servicing.dwg, FIG-3, May 30, 2024 - 12:11am, rgood





PROPOSED DUAL SAN FORCEMAIN TO CONNECT INTO EXISTING 450mmØ SAN SEWER IN BEVSHAW PARKWAY

PROPOSED DUAL SAN FORCEMAIN TO CONNECT INTO EXISTING 450mmØ SAN SEWER IN BEVSHAW PARKWAY

PROPOSED SANITARY PUMPING STATION

LEGEND

-  PROPOSED SANITARY SEWER
-  PROPERTY LINE



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WHITE LAKE ROAD SERVICEABILITY
AREA 1 CONCEPTUAL SANITARY SERVICING PLAN

SCALE 1 : 3000 

DATE MAY 2024 JOB 120051 FIGURE FIG-3

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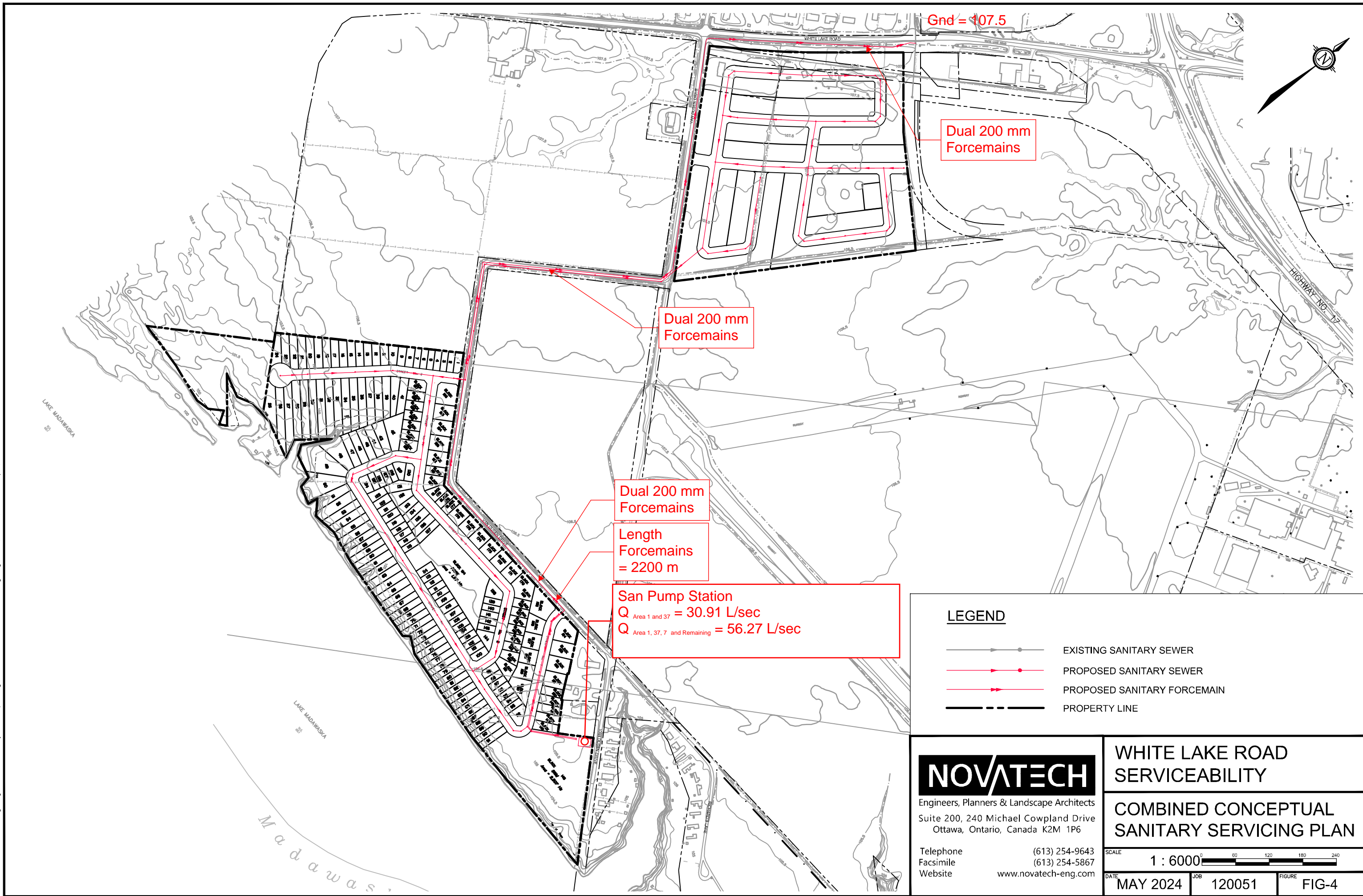
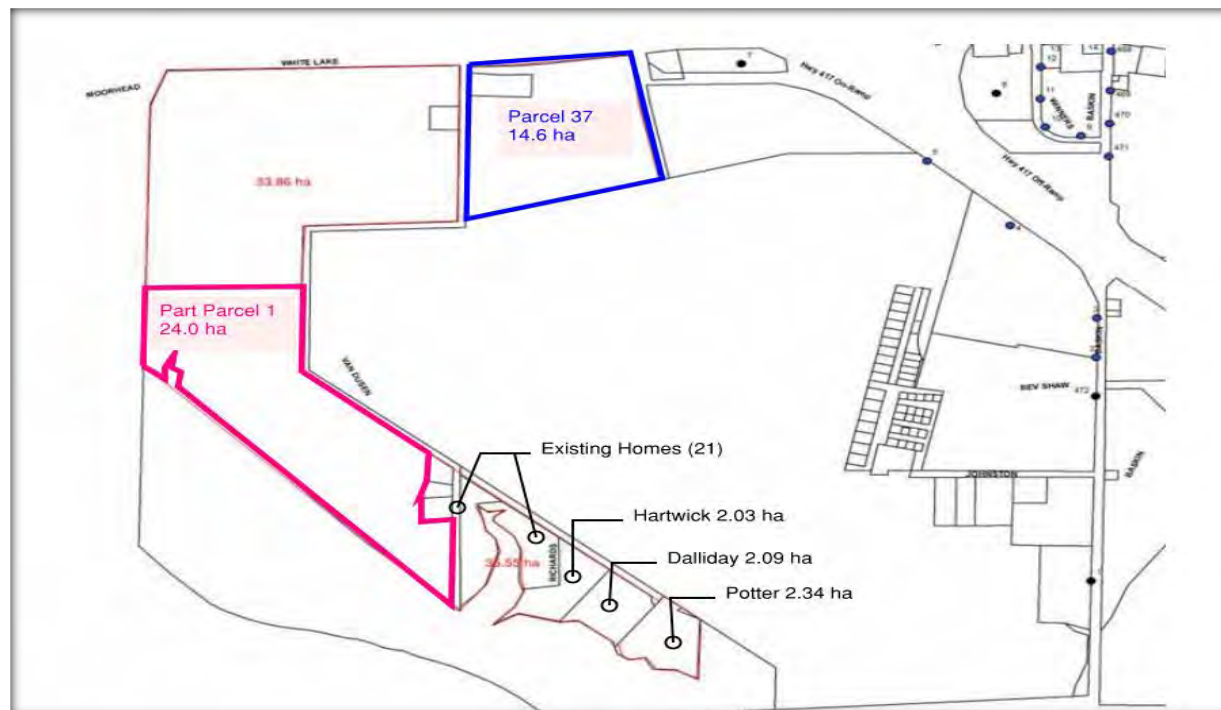


Figure 5 – Overall Van Dusen Sanitary Drainage Area

2.1.2 Sanitary Sewage Flows

The **Town of Arnprior Water and Wastewater Master Plan¹** provides sanitary sewage allotments for future development up to the year 2031. There were no sanitary flows from Area 1 accounted for up to the year 2031. A summary of the Area 37 sanitary sewage is in **Table 2**.

Table 2: Sanitary Sewage Allotment Area 37

Land Use	Site Area (ha)	Average Flow (L/s)*	Peaking Factor	Peak Flow (L/s)
Allotted Sanitary Flows (75% by year 2021)				
Commercial	10.65 ha	2.09	1.5	3.14
Extraneous Flow		-	-	2.98
Total				6.13
Allotted Sanitary Flows (100% by year 2031)				
Commercial	14.2 ha	2.79	1.5	4.19
Extraneous Flow				3.98
Total				8.17

*Average Commercial Flow = 17,000 L/ha/day (per Table 7-2 of the Stantec Master Plan¹)

The proposed theoretical sanitary flows for the proposed residential developments at Area 37 and Area 1 were calculated based on Ministry of the Environment (MOE) and City of Ottawa design criteria. **Table 3** summarizes the proposed sanitary flows for Area 37, Area 1 and the remaining tributary area shown in **Figure 5**.

Table 3: Proposed Sanitary Flows

Land Use	Site Area (ha)	Population	Average Flow (L/s)*	Peaking Factor	Peak Flow (L/s)
Area 37 Proposed Sanitary Flows					
Residential	14.6 ha	831	2.69	3.28	8.83
Extraneous Flow		-	-	-	4.82
Total					
Area 1 Proposed Sanitary Flows					
Residential	24.90 ha	860	2.78	3.27	9.12
Extraneous Flow		-	-	-	8.22
Total					
Remaining Areas per Figure 5					
Residential	11.2 ha	350	1.13	3.44	3.89
Industrial (7)	13.8 ha		2.71	1.00	2.71
Extraneous Flow	25.0 ha				8.25
Total					14.85

*Average Residential Flow = 280L/c/day City of Ottawa Design Guidelines

*Average Industrial Flow = 17,000 L/ha/day PF = 1.0

Refer to **Appendix C** for detailed sanitary sewage calculations.

The Water and Wastewater Master Plan is currently being updated by the Town's consultant. From discussions with the Town, the existing infrastructure is available to service the planned growth for the next 20 years including the growth of Area 37 and Area 1 as noted in Table 3 above.

2.2 Water Servicing

There is an existing 300mm dia. municipal watermain in Bev Shaw Parkway. The municipal watermain crosses White Lake Road into Vanjumar Road to the west. The watermain also extends east along Bev Shaw Parkway and crosses under Highway 17 to connect to Concession 12 / Baskin Drive East. The watermain along Bev Shaw Parkway is typically at a depth of 2.0m below the surface. Refer to **Figure 5-2** in **Appendix A** for location of watermains.

2.2.1 Water Servicing

Area 37 can be serviced directly from the existing 300mm dia. municipal watermain in Bev Shaw Parkway. The development will be serviced internally by 300mm and 200mm diameter watermains. The proposed 300mm diameter watermain would be constructed from Bev Shaw Parkway through the site to Van Dusen Drive and loop back up White Lake Road to the existing municipal watermain at Bev Shaw Parkway and White Lake Road. This watermain loop would provide redundancy for the Area 37 development and provide a connection point for other developments on Van Dusen Drive. This servicing approach is consistent with the **Town of Arnprior Water and Wastewater Master Plan** where a future 300mm dia. watermain loop (2031) was planned around a commercial development at Area 37. Refer to **9-5** in **Appendix A** for schematic layout.

There is currently no municipal watermain in Van Dusen Drive fronting the Area 1 development. To service the development, it is proposed to construct approximately 850m of 300mm diameter watermain along Van Dusen Drive to the Area 1 development. To provide redundancy (2 feeds) a dual watermain would be constructed from Area 37 to Area 1. Valves would be strategically placed on both Bev Shaw Parkway and Van Dusen Drive to provide a second feed to the Area 1 subdivision. Refer to **Figure 6** and **Figure 7**.

The internal roadways within the Area 1 development will be serviced by 200mm diameter watermain. The conceptual water servicing network for Area 1 is shown in **Figure 7**.

2.2.2 Water Demands

Preliminary domestic water demands were calculated for both Area 1 and 37 as residential developments. The theoretical water demands were calculated based on criteria from Ministry of the Environment (MOE) 'Design Guidelines for Drinking Water Systems' and from the **Town of Arnprior Water and Wastewater Master Plan¹**. Refer to **Appendix D** for detailed domestic water demand calculations. **Table 4** summarizes the theoretical water demands for each development.

Table 4: Domestic Water Demands

Land Use	Site Area (ha) or Residential Unit Count	Design Population	Average Demand (L/s)*	Max Day Demand (L/s)	Peak Hour Demand (L/s)
Proposed Residential Development Area 37					
Townhouses / Semis	134	362	1.26	3.14	6.91
Single Family Homes	138	469	1.63	4.07	8.96
Total	272	831	2.89	7.21	15.87
Proposed Residential Development Area 1					
Townhouses / Semis	137	370	1.28	3.20	7.04
Single Family Homes	144	490	1.70	4.25	9.35
Total	281	860	2.92	7.45	16.39

*Average Residential Demand = 300L/c/day (per Table 7-1 of the Stantec Master Plan¹)

The fire flow demands for the proposed developments were calculated using the Fire Underwriters Survey (FUS) Guidelines. The worst-case scenario for each unit type was assumed to determine the maximum required fire flows. Refer to **Appendix D** for detailed fire flow calculations. **Table 5** summarizes fire flow requirements for the developments.

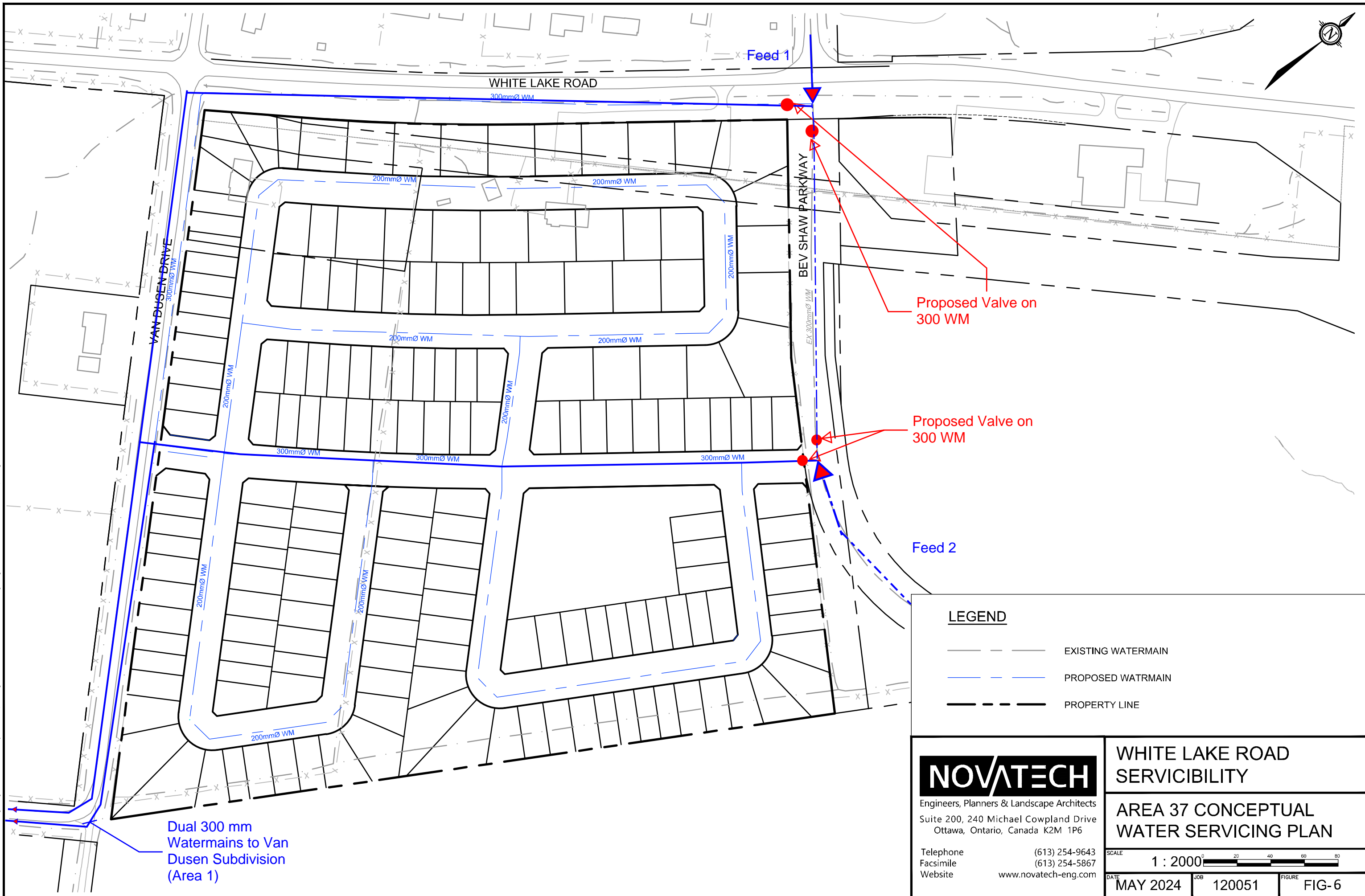
Table 5: Fire Flow Demands

Unit Type	Construction Type	Total Floor Area (m ²)	Fire Flow (L/s)
Townhouses	Wood Frame	*360	133
Single Family Homes	Wood Frame	240	117

*Townhouse total floor area based on 2 units separated by 2 hr. firewall

Based on a review of the **Town of Arnprior Water and Wastewater Master Plan**, the predicted fire flow available within the watermain network in the vicinity of the subject site is anticipated to be greater than 125 L/s. The municipal network modelling results considers the increasing population and the proposed watermain network upgrades including the 300mm diameter watermain loop at Area 37. Refer to **Figures 9-6, 9-7 and 9-8** in **Appendix A** for more information.

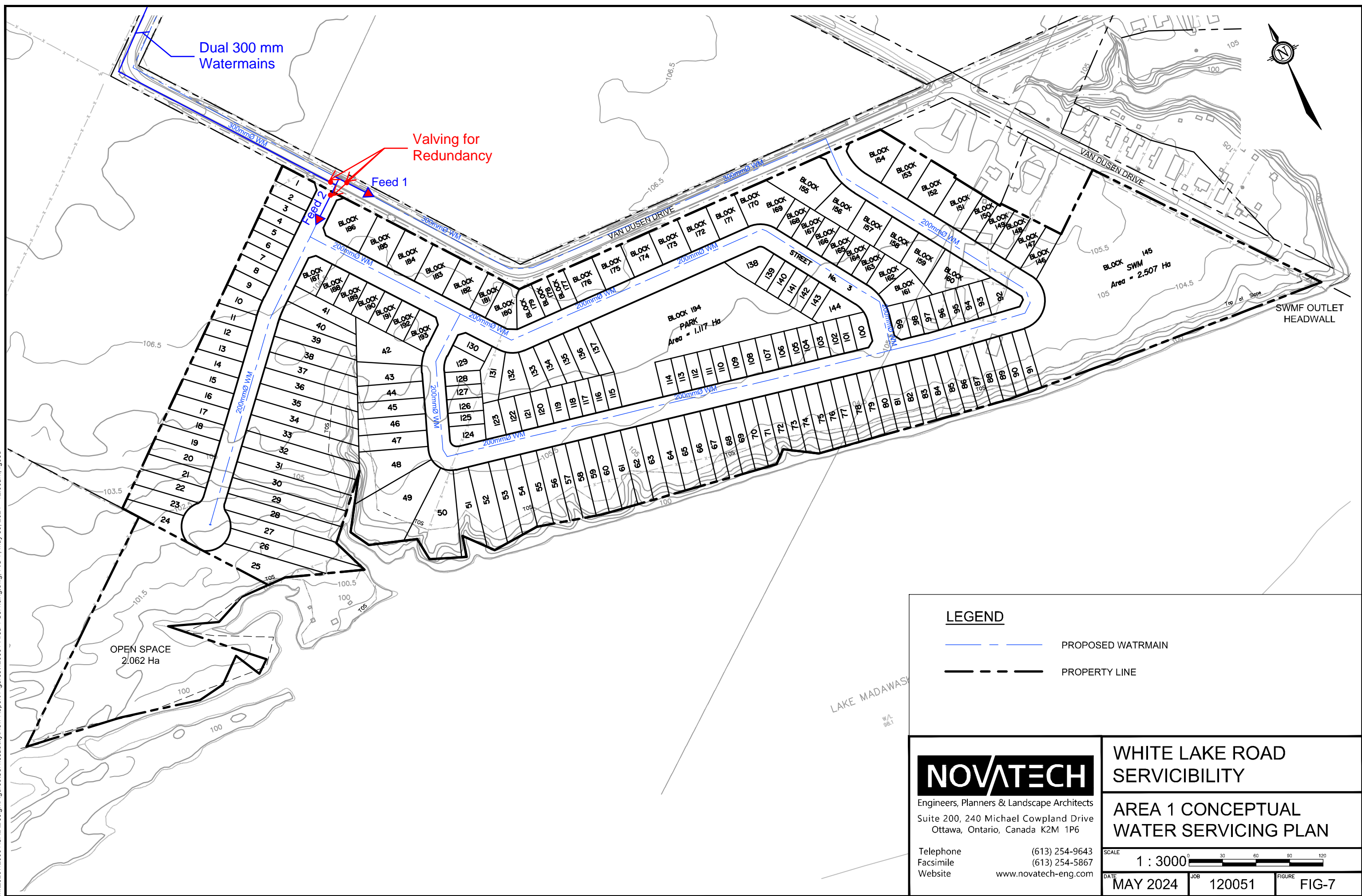
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Dual 300 mm
Watermains to Van
Dusen Subdivision
(Area 1)

LEGEND	
	EXISTING WATERMAIN
	PROPOSED WATERMAIN
	PROPERTY LINE
Engineers, Planners & Landscape Architects Suite 200, 240 Michael Cowpland Drive Ottawa, Ontario, Canada K2M 1P6	
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Website	www.novatech-eng.com
WHITE LAKE ROAD SERVICIBILITY	
AREA 37 CONCEPTUAL WATER SERVICING PLAN	
SCALE	1 : 2000
DATE	MAY 2024
JOB	120051
FIGURE	FIG-6

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LEGEND

- PROPOSED WATERMAIN
- PROPERTY LINE

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**WHITE LAKE ROAD
 SERVICIBILITY**

**AREA 1 CONCEPTUAL
 WATER SERVICING PLAN**

SCALE 1 : 3000

DATE MAY 2024 JOB 120051 FIGURE FIG-7

Recent hydrant pressure and flow test results (completed in 2018) provide conflicting information, yielding lower available fire flows of approximately 95-96 L/s. Based on the latest information available from the Town of Arnprior, the municipal watermain network may not be able to provide adequate water supply for firefighting purposes. There is an existing dry hydrant connection to Lake Madawaska at the end of Van Dusen Drive which the Town of Arnprior Fire Department uses to supplement municipal water supply to fight fires. If it is determined that additional water supply is required for firefighting purposes the stormwater management pond could be designed with a dry hydrant to provide an additional water source for firefighting purposes. It is recommended to collect updated hydrant flow data and update the Town's water model during the detailed design stage. Also, as noted in Section 2.1, the Town is currently updating its Water and Wastewater Master Plan which may provide more accurate information.

2.3 Storm Servicing and Stormwater Management

The subject sites are not located within the boundaries of any local conservation authority. Therefore, the sites consequently fall within the jurisdiction of the Ministry of Natural Resources and Forestry (MNRF).

2.3.1 Storm Servicing

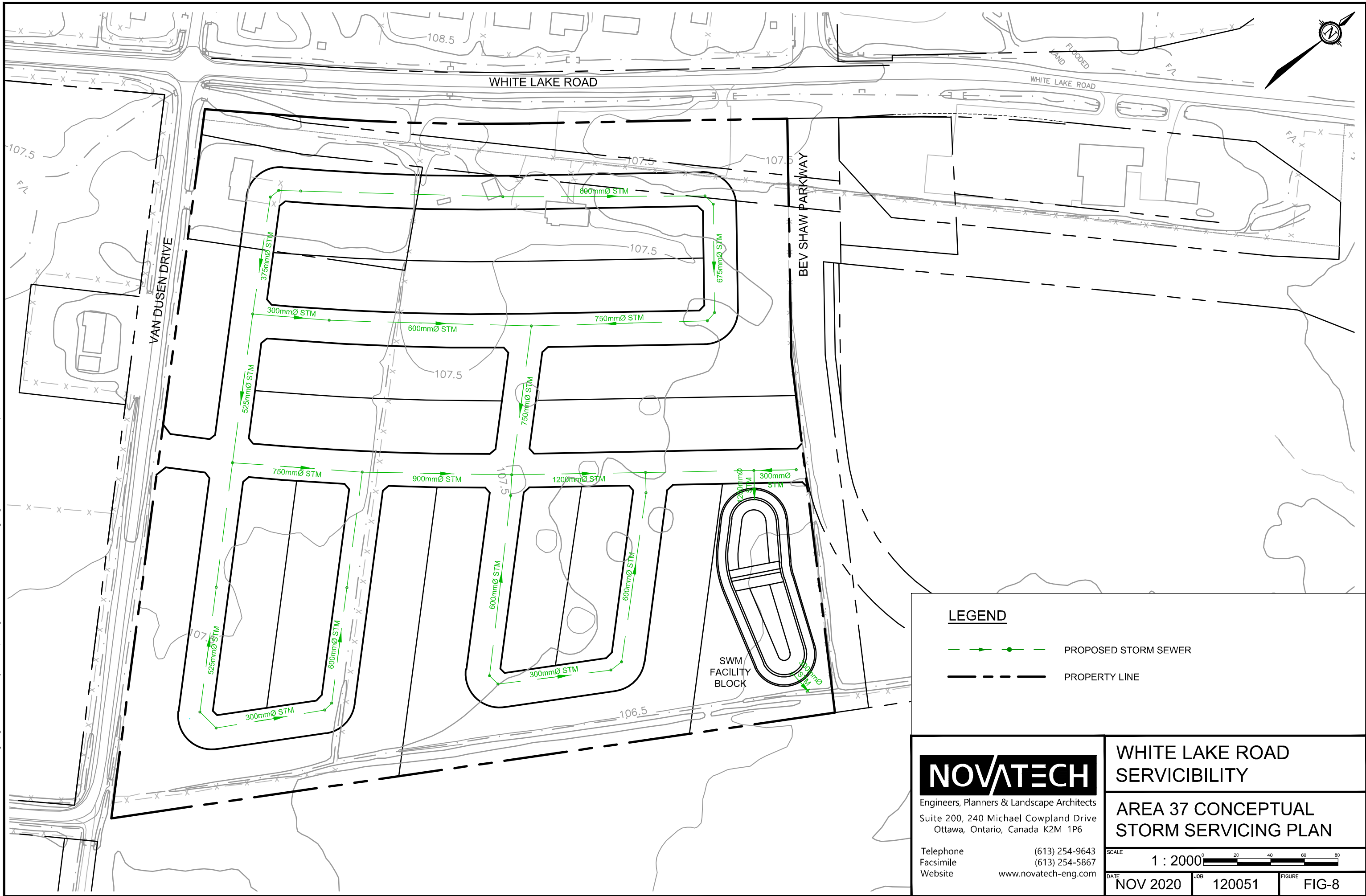
A stormwater management facility (SWMF) will be constructed in the southeast corner of Area 1 adjacent to Lake Madawaska to service both Area 1 and Area 37. A 1350 mm diameter storm sewer will be constructed along Van Dusen Drive from Area 37 to the Area 1 development and then to the SWMF. The SWMF will control and treat stormwater from Area 37 and Area 1 drainage areas, as well as runoff from Van Dusen Drive and pre-development flows from Area 7. An oil grit separator will be placed before the inlet to the forebay to provide additional water quality control before entering the stormwater management facility.

Other stormwater management options which were considered included providing separate stormwater facilities on each of Area 1 and Area 37. A stormwater management facility on Area 37 would require a significant grade raise, and significant additional cost, to provide cover on the storm sewers. This is because of the elevation of the outlet ditch on Bev Shaw Parkway which is shallow. Since a stormwater management facility will be required on Area 1 it would be feasible to oversize the facility to accept drainage from Area 37 as well.

Separate stormwater management facilities would also result in additional operation and maintenance costs. For these reasons they were disqualified. Cost estimates are provided in **Appendix F**. The separate stormwater management options which were considered are shown in **Figures 8** and **Figure 9**.

The proposed storm servicing strategy is shown in **Figure 10**. The conceptual SWM pond is shown in **Figure 11**.

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LEGEND

- PROPOSED STORM SEWER
- PROPERTY LINE

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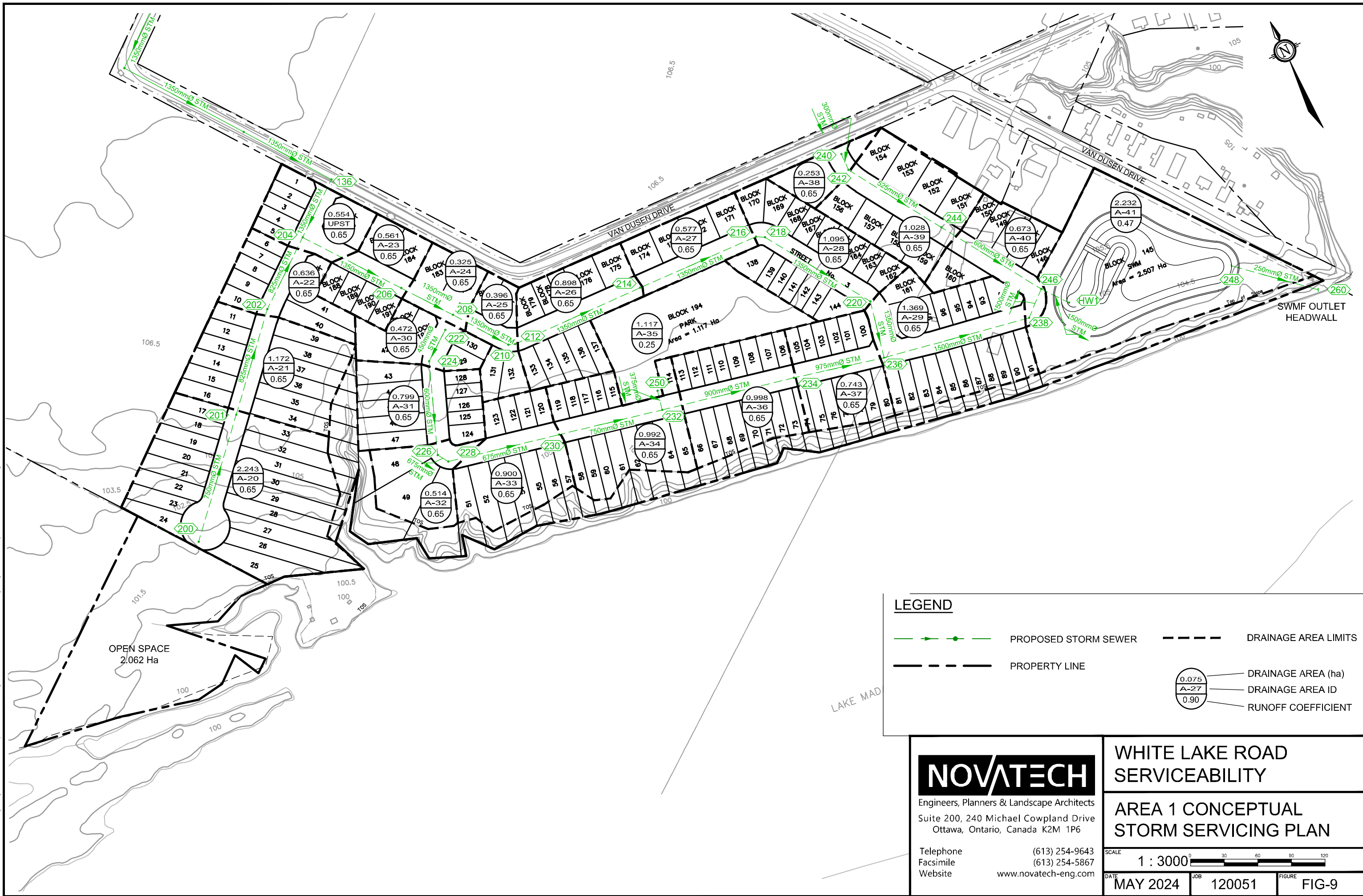
**WHITE LAKE ROAD
SERVICIBILITY**

**AREA 37 CONCEPTUAL
STORM SERVICING PLAN**

SCALE 1 : 2000

DATE NOV 2020 JOB 120051 FIGURE FIG-8

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LEGEND

- PROPOSED STORM SEWER
- DRAINAGE AREA LIMITS
- PROPERTY LINE
- DRAINAGE AREA (ha)
- DRAINAGE AREA ID
- RUNOFF COEFFICIENT

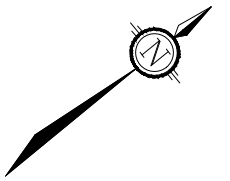
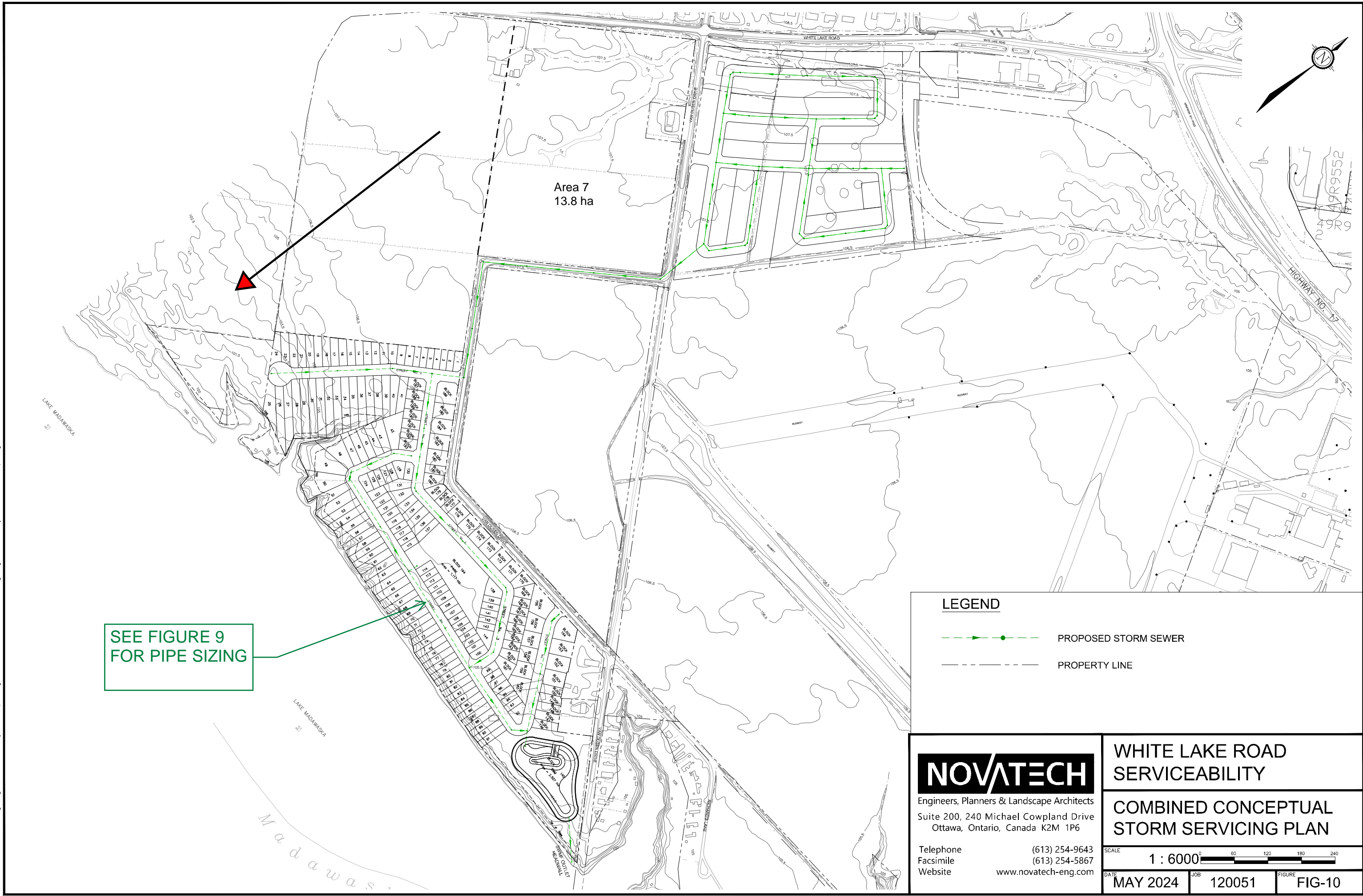
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WHITE LAKE ROAD SERVICEABILITY
AREA 1 CONCEPTUAL STORM SERVICING PLAN

SCALE 1 : 3000

DATE MAY 2024 JOB 120051 FIGURE FIG-9



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Area 7
13.8 ha

SEE FIGURE 9
FOR PIPE SIZING

LEGEND

-  PROPOSED STORM SEWER
-  PROPERTY LINE



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Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6

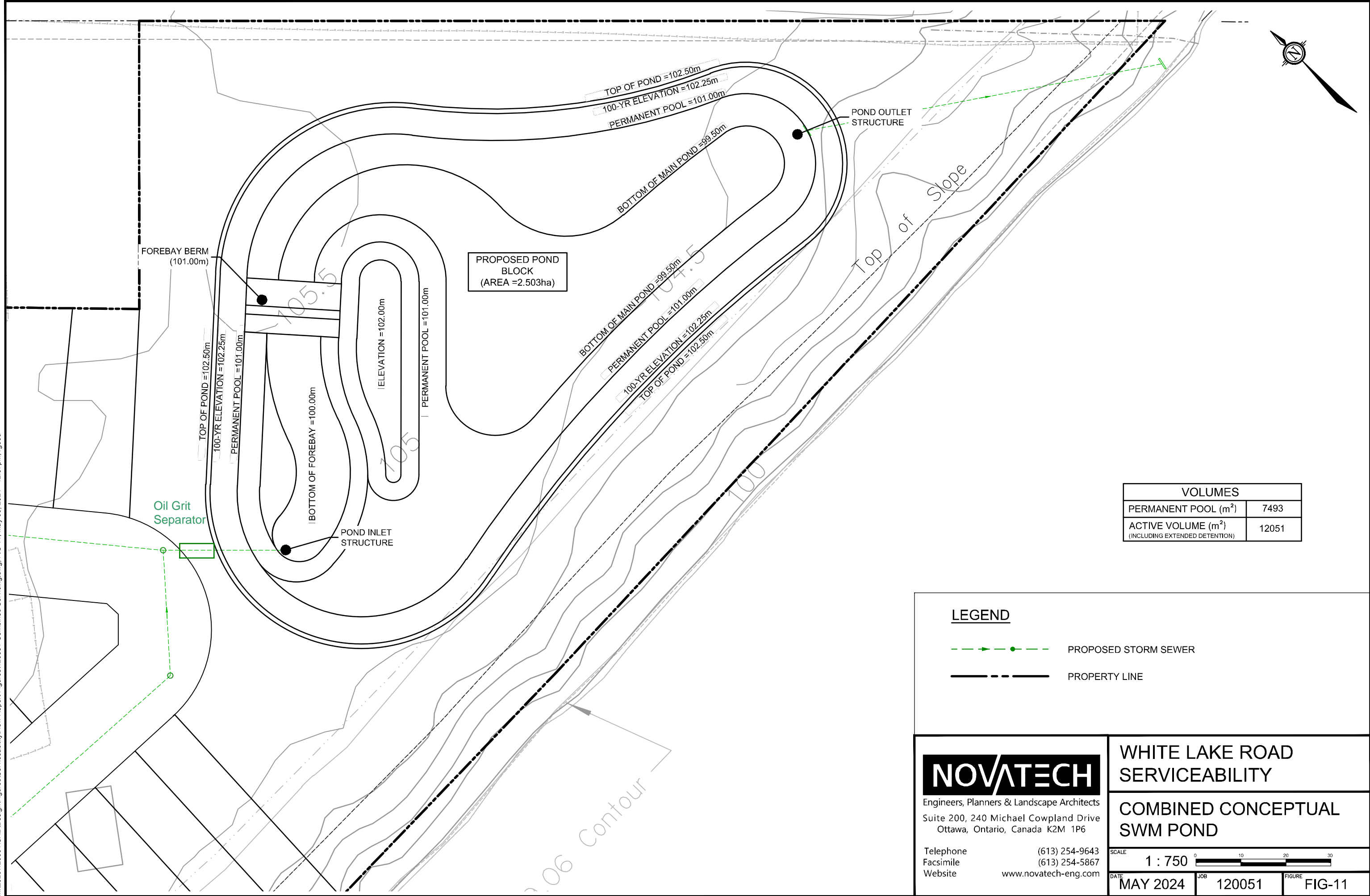
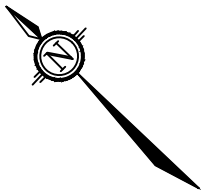
Telephone (613) 254-9643
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Website www.novatech-eng.com

**WHITE LAKE ROAD
SERVICEABILITY**

**COMBINED CONCEPTUAL
STORM SERVICING PLAN**

SCALE 1 : 6000 

DATE MAY 2024 JOB 120051 FIGURE FIG-10



M:\2020\120051\CAD\Design\Figures\Serviceability\New Report\Figures\120051-Combined Servicing.dwg, FIG 11, May 30, 2024 - 12:37pm, rgood

VOLUMES	
PERMANENT POOL (m ²)	7493
ACTIVE VOLUME (m ²) (INCLUDING EXTENDED DETENTION)	12051

LEGEND

- - - - - PROPOSED STORM SEWER
- PROPERTY LINE

<p>Engineers, Planners & Landscape Architects Suite 200, 240 Michael Cowpland Drive Ottawa, Ontario, Canada K2M 1P6</p> <p>Telephone (613) 254-9643 Facsimile (613) 254-5867 Website www.novatech-eng.com</p>	<p>WHITE LAKE ROAD SERVICEABILITY</p> <p>COMBINED CONCEPTUAL SWM POND</p>	
	<p>SCALE 1 : 750</p>	<p>DATE MAY 2024 JOB 120051 FIGURE FIG-11</p>

2.3.2 Storm Water Management Criteria

Stormwater management design criteria for the proposed developments will require approval by the Ministry of Natural Resources and Forestry (MNR). The SWM design criteria from the Ministry of the Environment (MOE) 'Stormwater Management Planning and Design Manual' were used for the proposed development and are as follows:

- Control post-development peak flow to pre-development conditions, up-to and including the 100-year storm event. Provide on-site water quantity control for all flow in excess of pre-development conditions.
- Provide on-site water quality control equivalent to an 'Enhanced' Level of Protection corresponding to a minimum 80% long-term TSS removal with at least 90% of the total rainfall being captured and treated, prior to releasing flows from the site.
- Minimize the impact on the downstream receiving watercourses by minimizing the potential erosion and volume of sediment entering the watercourses both on a temporary basis (during construction) and on a permanent basis.
- Provide guidelines to ensure that site preparation and construction is in accordance with the current Best Management Practices for Erosion and Sediment Control.

2.3.3 Stormwater Management Facility

A Stormwater Management Facility (i.e. wet pond) is proposed to service both Area 1 and 37.

2.3.4 SWMF Design Criteria

The proposed SWM facility is to be designed based on the following design criteria:

- Provide an 'Enhanced' level of water quality control (80% long-term TSS removal).
- Provide quantity control storage to control post-development peak flows to pre-development levels for all storms up-to and including the 100-year event.
- The SWM facility is to have minimum side slopes of 3:1 (H:V) or shallower.
- The recommended (minimum) side slopes for 1m above the permanent pool is to be 5:1 (H:V) or shallower.
- The sediment forebay is to be sized to promote the settling of sediment and account for a minimum of 10 years of sediment accumulation to reduce frequent maintenance.
- Guardrails conforming to provincial standards are to be installed at the inlet and outlet structures of the SWM facilities.
- Grilles are to be placed on the inlet and outlet headwalls.

2.3.5 Conceptual Design (Hydrologic Modelling)

The PCSWMM hydrologic and hydraulic model was used to estimate pre-development and post-development peak flows (quantity control targets) and determine approximate active storage requirements and release rates for the proposed SWM Facility.

The pre-development and post-development drainage areas were delineated based on the proposed development boundaries. The storage requirements are based on meeting pre-development peak flows generated for this area. Refer to **Appendix E** for model schematics and model results.

Design Storms

The design storms are based on City of Ottawa design storms. Storm distributions include the 4-hour Chicago and 12-hour SCS Type II storm distribution. Design storms were used for the 2-year, 5-year and 100-year return periods (i.e. storm events). The 4-hour Chicago 25 mm event was also used to model a quality event.

Model Parameters

Pre-development conditions were established using data collected through the latest aerial photography (refer to **Figure 1**), and the latest topographic mapping and geotechnical investigations / surficial soils information (Paterson Group, July 2007 and Paterson Group, August 2020).

The pre-development catchments were modelled using the Nash Unit Hydrograph (NASHYD) routine with the following parameters:

- The CN values were calculated based on review of the geotechnical soil classification and the “standard” CN values associated with cover and soil type.
- The Ia values were estimated based on CN values.
- The number of linear reservoirs (N) was estimated to be N = 3.0, which is typical for catchments within Ontario.
- Time of concentration values were calculated using the Airport Method.

Post-development catchments were modelled based on the proposed residential land use assuming a percent impervious of 70%. The percent of the total impervious area that has no depression storage (i.e., roofs) was estimated to be 40%. The flow lengths for the developed areas were set as the longest estimated pipe run prior to entering a SWM pond or leaving the site.

Runoff from Area 37 will be controlled to the post-development 5-year flow in the sewer in Van Dusen Drive prior to reaching Area 1. It is assumed that the runoff from events greater than the 5-year up to the 100-year event will be stored in surface ponding in the road sags of the subdivision. The model assumed that there will be 100 m³/ha of surface ponding available. Runoff from Van Dusen Drive between Area 37 and Area 1, in addition to the undeveloped runoff from Area 7, will also be collected by the sewer in Van Dusen Drive prior to reaching Area 1. The SWMF in Area 1 will provide quantity and quality control for Area 1, Area 37, Van Dusen Drive and the pre-development flow from Area 7.

Infiltration losses for the post-development catchments were modeled using Horton’s infiltration equation, which defines the infiltration capacity of soil over the duration of a precipitation event using a decay function that ranges from an initial maximum infiltration rate to a minimum rate as the storm progresses. The following default values specified in the City of Ottawa Sewer Design Guidelines (October 2012) were used for all catchments.

Horton’s Equation:	Initial infiltration rate: $f_o = 76.2$ mm/hr
$f(t) = f_c + (f_o - f_c)e^{-k(t)}$:	Final infiltration rate: $f_c = 13.2$ mm/hr
	Decay Coefficient: $k = 4.14$ /hr
Depression Storage (pervious areas):	4.67 mm
Depression Storage (impervious areas):	1.57 mm

A summary of the pre-development and post-development model parameters and model output for the 100-year (4-hour Chicago and 12-hour SCS) storm events are provided in **Appendix E**.

Water Quality Treatment

The required permanent pool and extended detention volumes for an 'Enhanced' level of treatment (80% TSS removal) based on an assumed 48% overall imperviousness for the developed area is presented in **Table 6**.

Table 6: Required Permanent Pool & Extended Detention Volumes

Drainage Area	Proposed Impervious	Required Treatment Volume	Required Permanent Pool Volume	Required Ext. Detention Volume*
47.40	48%	172 m ³ /ha	6,257	1,896

*Extended detention storage volume is based on MOE criteria of 40 m³/ha to be released over a period of 24-48 hrs.

Peak Flows and Storage Requirements

For quantity control, the storage requirements were estimated based on controlling post-development peak flows to pre-development levels for the 25mm, 2-year, 5-year, and 100-year storm events. Storage requirements were greatest using the 12-hour SCS storm distribution.

Table 7: Storage Requirements for SWM Facility (12-hour SCS Storm Distribution)

Drainage Area (ha)	SWMF Storage Requirements							
	m ³				m ³ /ha			
	Ext. Det.	2-yr	5-yr	100-yr	Ext. Det.	2-yr	5-yr	100-yr
47.40	1,896	5,067	5,765	7,563	40	300	341	447

Pre-development and controlled post-development peak flows are presented in **Table 8**.

Table 8: Summary of Pre-Development and Post-Development Peak Flows

Drainage Area (ha)	Scenario	Peak Flow (L/s)						
		4-hour Chicago Storm				12-hour SCS Type II Storm		
		25mm	2-yr	5-yr	100-yr	2-yr	5-yr	100-yr
47.40	PRE	451	842	1,491	3,711	899	1,573	3,689
	POST	105	410	992	3,364	591	1,269	3,656

2.3.6 SWMF Components

The following section describes the typical criteria and components that will be determined during detailed design of the SWM Facility. If the SWM Facility is located within the existing 100-year floodplain, the active storage volumes would be calculated above the 100-year flood elevation. The final pond configurations will be determined during detailed design.

Inlet Structure

The inlet structure may include a flow splitter consisting of a low-flow pipe to direct runoff from smaller storm events to the sediment forebay, and a high-flow pipe to direct peak flows from larger storm events directly into the main cell of the pond. This is to prevent re-suspension of settled material in the forebay. The low-flow and high-flow pipes will be separated by an internal concrete bypass weir inside the inlet structure.

The configuration of the internal bypass weir is based on the maximum depth of flow in the inlet structure during the 25mm (4-hour Chicago) storm event. Flows during this storm event will be directed to the forebay via the low-flow pipe. During larger storm events, flows will spill over the top of the weir and be directed into the main cell of the pond via the high-flow pipe.

Outlet Structure & Overflow Spillway

The SWM Facility will have an extended detention outlet for water quality control, a quantity control outlet to provide peak flow control for storm events up to and including the 100-year event, and an overflow spillway for storms greater than the 100-year event. The perimeter berm would be depressed at this location to create a broad crested weir as an overflow spillway. The overflow spillway would convey peak flows and runoff volumes that exceed the maximum active storage volume into a designated outlet channel and to Lake Madawaska.

Sediment Forebay

The sediment forebay will be sized using design guidelines provided in the *MOE SWM Planning and Design Manual (MOE, March 2003)* with respect to the calculated dispersion length and required width / depth. The recommended length to width ratio is 8:1 and the minimum depth of the forebay is 1.0m. A submerged rock check dam or clay berm, set 0.30m below the normal water level, will be installed to separate the forebay from the main cell of the facility.

Extended Detention and Quantity Control

Extended detention is to be provided for the first 40 m³/ha of active storage to allow for the settling of suspended sediment in the facility. The provided extended detention volume is to be released over a 24 to 48-hour period. The extended detention release rate is typically controlled by an orifice set at an invert elevation at the Normal Water Level (NWL) of the stormwater management facility. The quantity control outlet from the stormwater management facility will consist of a weir set at an elevation above the NWL to control flows during larger storm events.

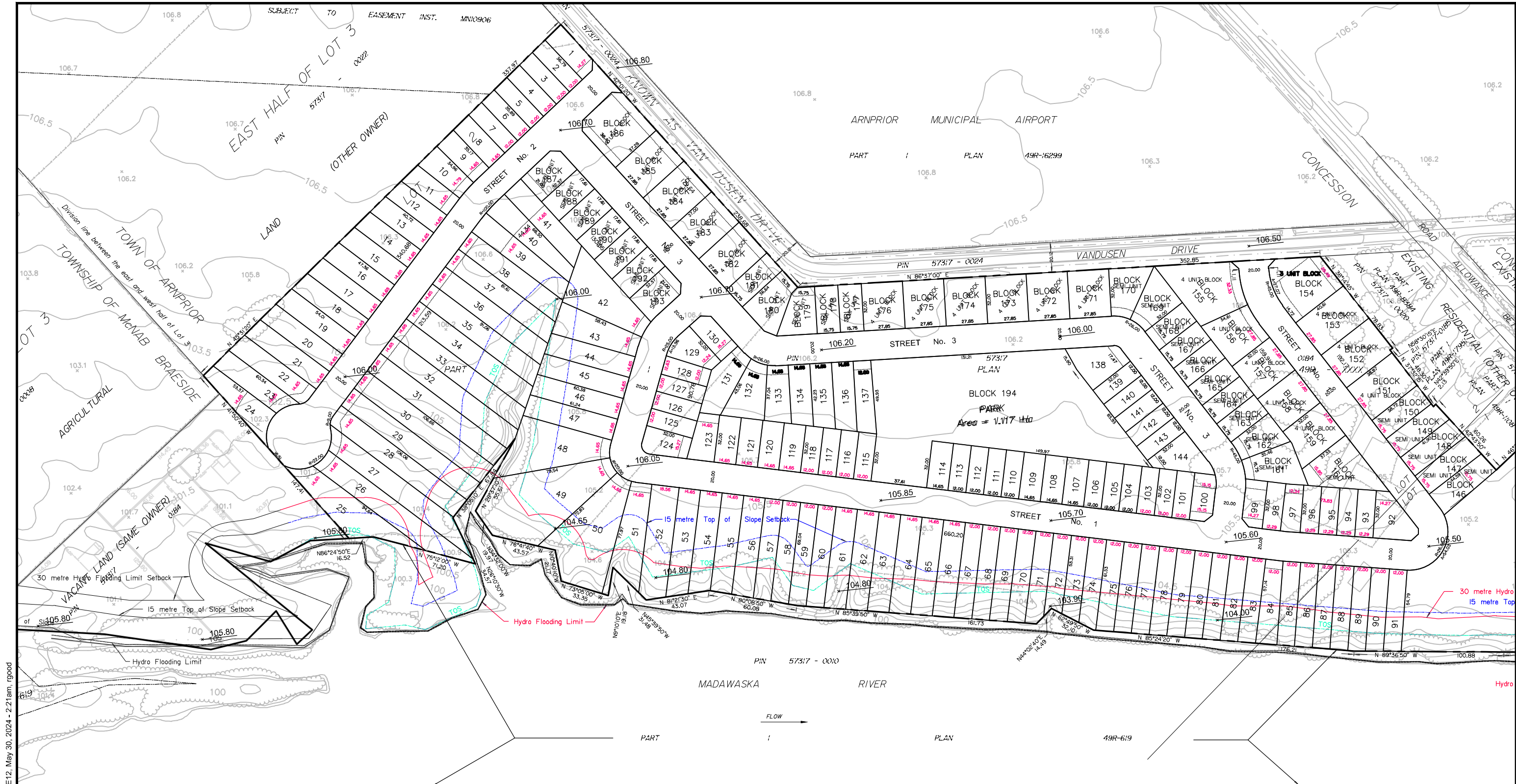
Service Road

The SWMF block will be sized to accommodate a service road so that the pond forebay and inlet/outlet structures will be accessible for inspection and maintenance.


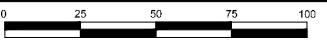
3.0 CONCEPTUAL GRADING PLAN AREA 1

Figure 12 – Conceptual Grading Plan Area 1 illustrates preliminary grading of the roadways and top of slope adjacent to the Madawaska Lake.

The top of slope along Lake Madawaska encroaches inwards at several locations. It is proposed to regrade the affected lots to provide for a more consistent and straightened top of slope along the rear yards. All re-grading would be above the recorded high-water level of 99.06 m, thereby not affecting flood plain storage. Discussions with the geotechnical engineer indicates that this would be a feasible approach which should not affect the slope stability. Further analysis and



M:\2020\120051\CAD\Design\120051-BP-DP.dwg, FIGURE12, May 30, 2024 - 2:21am, rgood

 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	WHITE LAKE ROAD	
	CONCEPTUAL GRADING	
SCALE 1 : 2500' 		
DATE	JOB	FIGURE
MAY 2024	120051	FIG-12

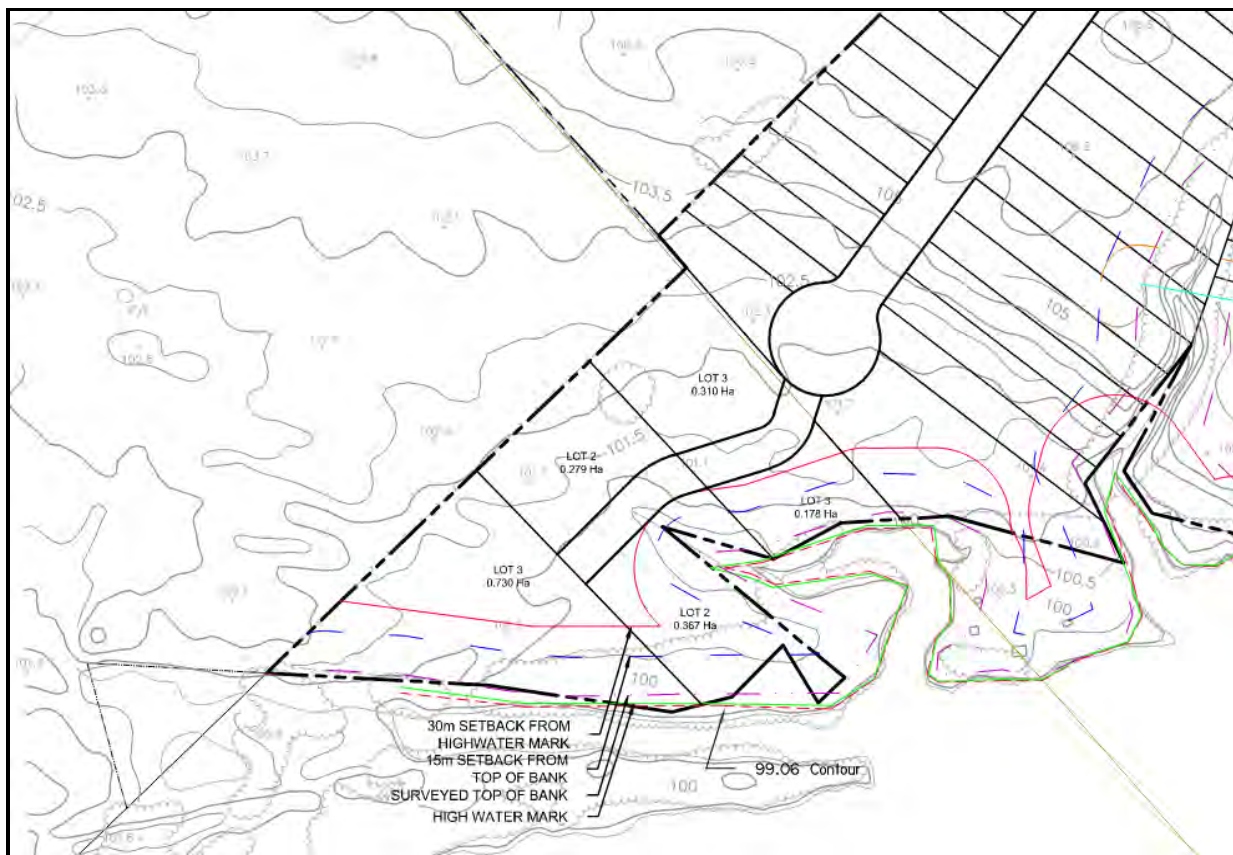
input from the geotechnical engineer will be provided in support of the grading revisions during detailed design.

4.0 McNab Braeside Lands

Figure 13 shows lands in McNab Braeside just outside of the Town of Arnprior. Potential development of these lands would include a private road servicing 3 lots. Potential servicing options of these lands would include:

- Option 1 : Service each lot with a private well and septic system.
- Option 2: Service each lot with an extension of the watermain from the subdivision lands in Arnprior and a private sanitary septic system for each lot. This would require an agreement between the Town and County over water infrastructure crossing the boundary.

Figure 13 Lots in McNab Braeside



5.0 UTILITIES

The following provides a summary of the utilities in the existing area.

Rogers

Rogers does not have service in the immediate area. The closest service they have is on the other side of the highway and they have no means of getting across the cloverleaf.

Bell

There was no response from Bell. However, Bell services the subdivision on the north side of White Lake Road so it is believed that they would extend it across White Lake Road.

Telus

Telus does not provide service in the Arnprior Area

Enbridge

Enbridge confirmed that they can extend gas to both 640 White Lake Road and 000 Van Dusen.

Hydro One

Hydro One has 3 phase power on White Lake Road of which they can extend to both properties. They would extend 3 phase overhead to each property. A ballpark cost estimate of \$350,000 to extend to 640 White Lake Road and another \$490,000 to extend to 000 Van Dusen Drive is provided based on poles every 40 m and the cost per pole including overhead wires being approximately \$35,000 per pole. It is believed some of these costs may be recoverable once an Offer to Connect is prepared by Hydro One. **Figure 14** illustrates the extension of Hydro One plant.

Currently Van Dusen Drive is a rural cross section south of White Lake Road. As part of the development, it is expected that the Town of Arnprior will want certain improvements to this roadway including an 8.5 m wide asphalt driving surface. Utilities within the roadway cross section, as described in previous sections of this report, will include the following:

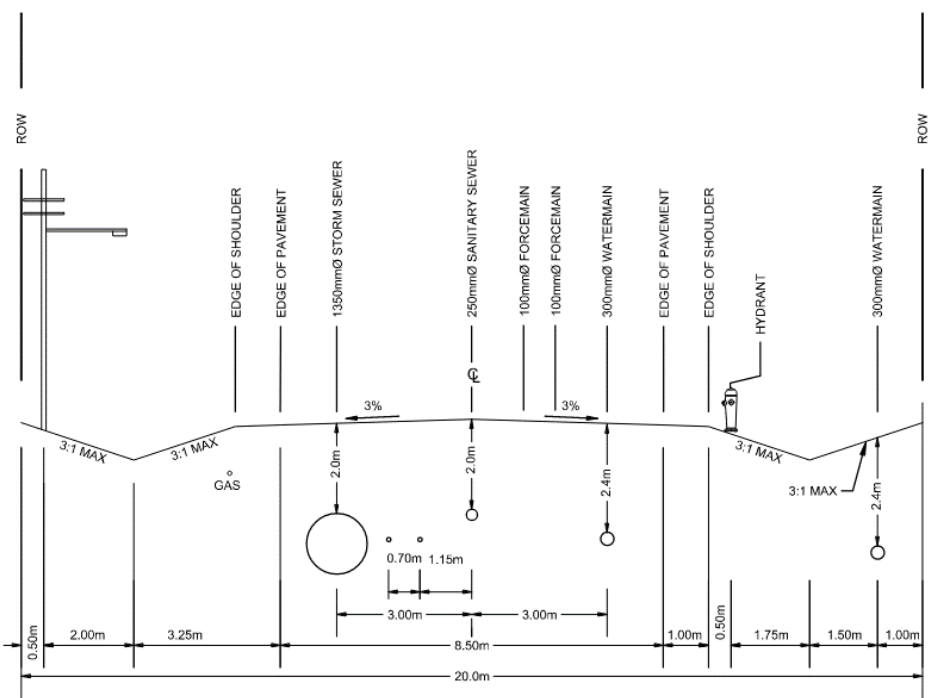
- A 1350 mm diameter storm sewer
- A 250 mm diameter sanitary sewer
- Dual 200 mm diameter forcemains
- Dual 300 mm diameter watermains
- Enbridge gas main
- Overhead Hydro and Bell

Figure 15 illustrates a rural cross section and placement of utilities.

Figure 14 Hydro One Extension of Servies



Figure 15 Van Dusen Drive Rural Cross Section



20.0m R.O.W. CROSS SECTION
 VAN DUSEN RURAL CROSS SECTION

6.0 COSTING

Table 9 below summarizes the capital costs of the recommended servicing solution. Detailed cost estimates are included in **Appendix F**.

Table 9: Estimated Servicing Costs

Infrastructure	Estimated Costs of Recommended Servicing Solution
Traffic Mgmt.	\$70,000
Earthworks	\$800,500
Watermain	\$2,422,800
Sanitary Sewer	\$2,246,500
Sanitary Pump Station	\$3,292,500
Storm Sewers	\$5,119,975
Stormwater Pond	\$1,695,850
Roads	\$3,799,435
Off Site Watermain	\$1,123,400
Off Site Sanitary	\$464,500
Off Site Storm Sewer	\$1,430,400
Utilities	\$1,196,970
Vanjumar/White Lake Intersection	\$300,000
Hydro One Fees for Local Distribution	\$634,100
Extend Hydro/Communications Overhead along Van Dusen	\$840,000
Upgrade Van Dusen to Rural Cross Section (Road Works Only)	\$1,672,100
Provisional	\$100,000
TOTAL	\$27,209,030.00
Number Units	553 (272 + 281)

Notes:

1. Above are hard costs only. Soft costs are not included.

7.0 CONCLUSION

The conclusions of this report are as follows:

- The recommended sanitary servicing approach will include the construction of a municipal gravity sanitary sewer in Van Dusen Drive, a municipal pump station in Area 1 and dual force mains on Van Dusen Drive to Bev Shaw Parkway.
- Water Servicing will be provided from the existing 300mm diameter watermain in Bev Shaw Parkway. Area 1 and Area 37 will be serviced internally by 150 mm - 200mm diameter watermains. Dual 300mm diameter watermains will be constructed in Van Dusen Drive to service Area 1 with redundancy.
- The Master Plan indicates that there is adequate pressure and flow to meet the required domestic water demands and fire requirements. Conflicting hydrant test data provides some uncertainty in the available fire flow. A dry hydrant at the end of Van Dusen Drive can be used to supplement the municipal water system to provide adequate water for firefighting, if required. During detailed design updated hydrant test data and water modeling is recommended.
- The recommended storm servicing approach will include the construction of a 1350 mm diameter storm sewer along Van Dusen Drive to convey drainage to a stormwater management facility in Area 1, sized for both Area 1 and 37 as well as pre-development flow from Area 7 and flows from Van Dusen Drive.
- Quantity control of stormwater will be implemented to control post-development flows to pre-development levels, achieved by storing water in the stormwater management facility.
- Quality control of stormwater will be implemented to an enhanced level of treatment, e.g. 80% TSS removal. This will be primarily achieved through the design of the stormwater management facility. An Oil Grit Separator will be constructed on the inlet sewer to the facility to further enhance water quality.
- An overland flow route will be provided.
- The alignment along the top of slope along Lake Madawaska will be straightened to provide for more uniform back yards.
- Erosion and sediment control measures will be implemented during construction.
- An opportunity to develop lots in McNab Braeside has been presented with two servicing options. The preferred Option 2 would entail extension of watermain from the Arnprior subdivision and construction of private sewage septic systems.

NOVATECH

Prepared by:



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Director
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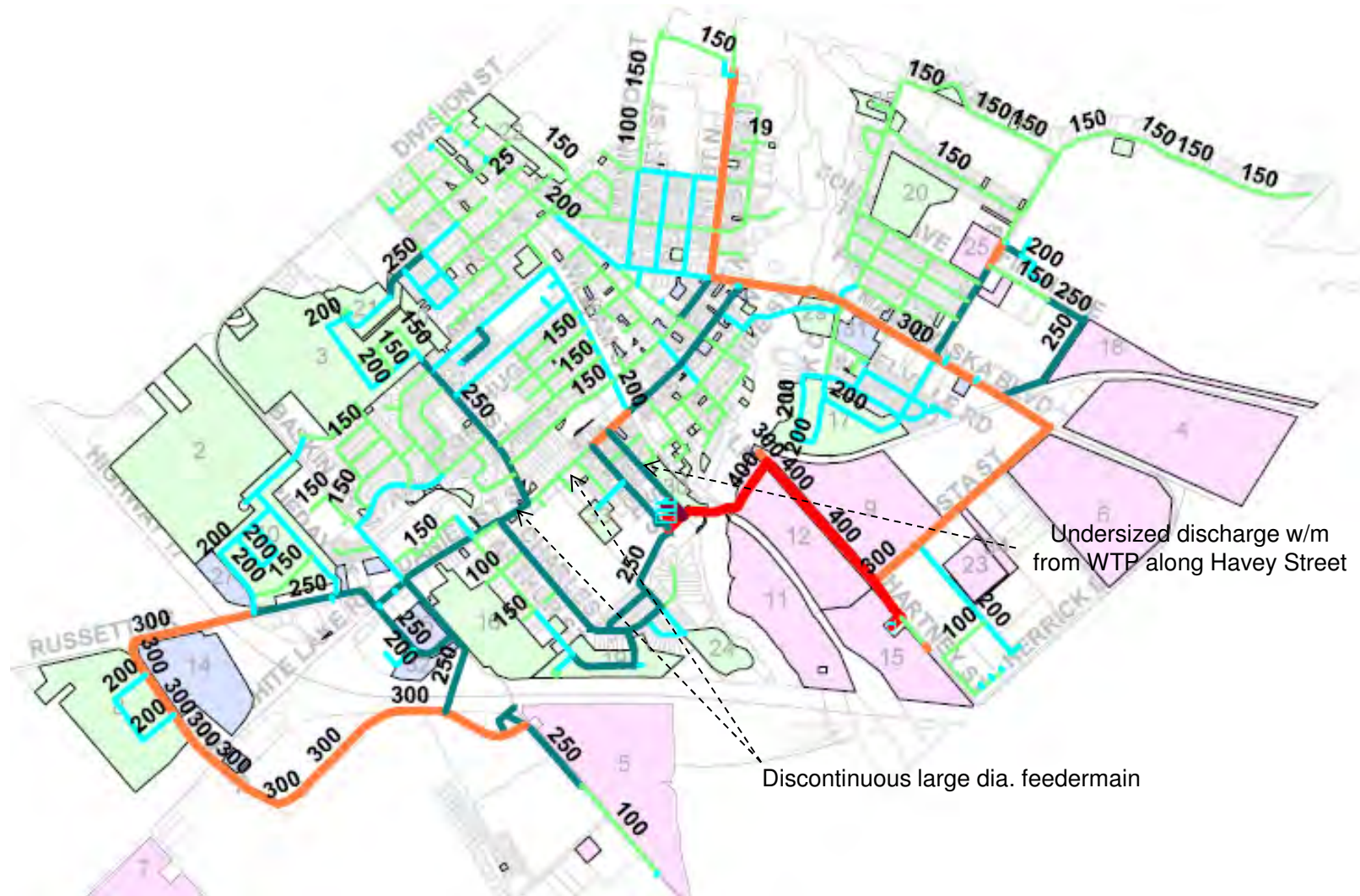
Melanie Schroeder, P.Eng.
Project Engineer
Water Resources



Michael Petepiece, P.Eng
Senior Project Manager
Water Resources

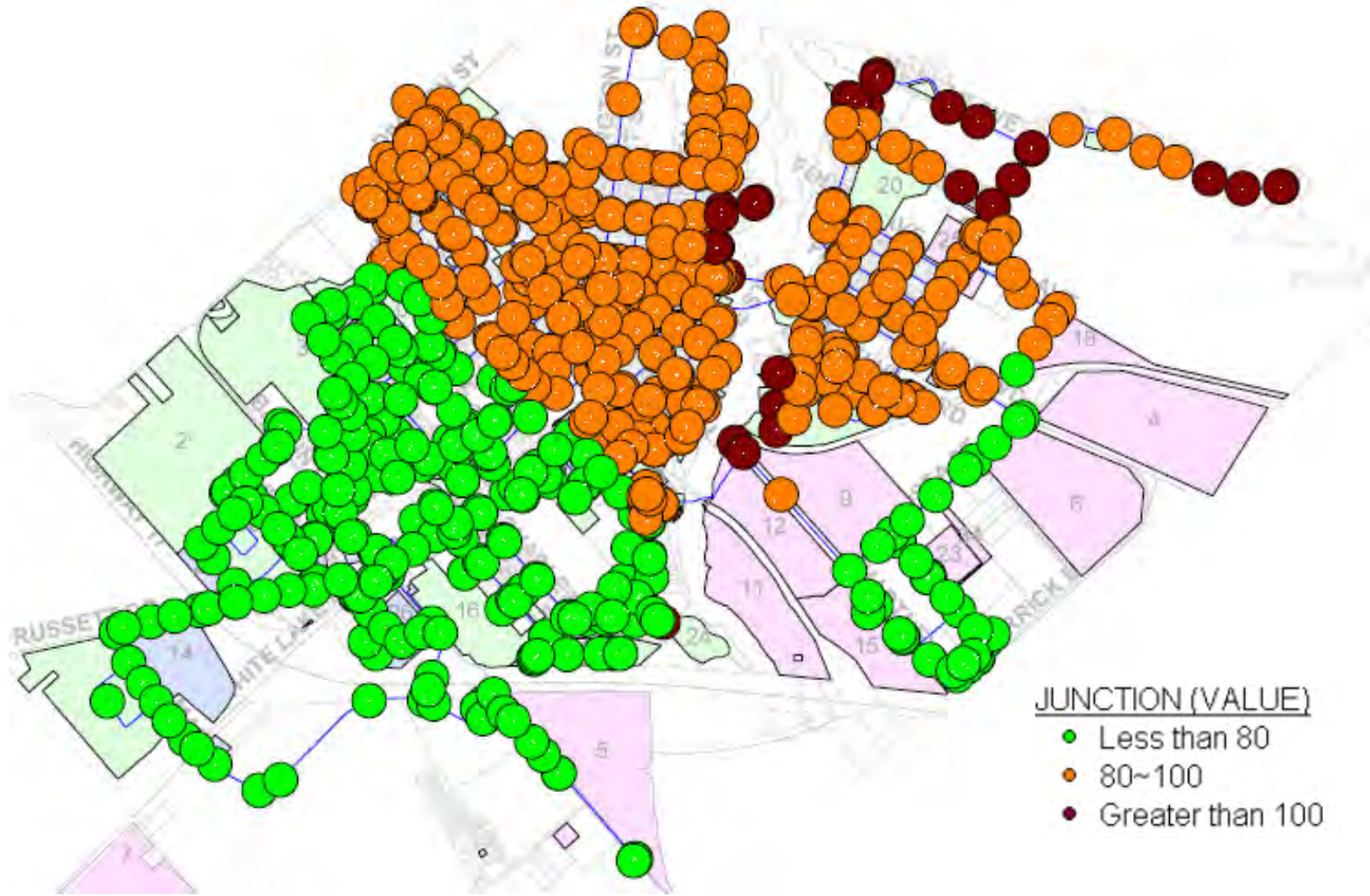
APPENDIX A

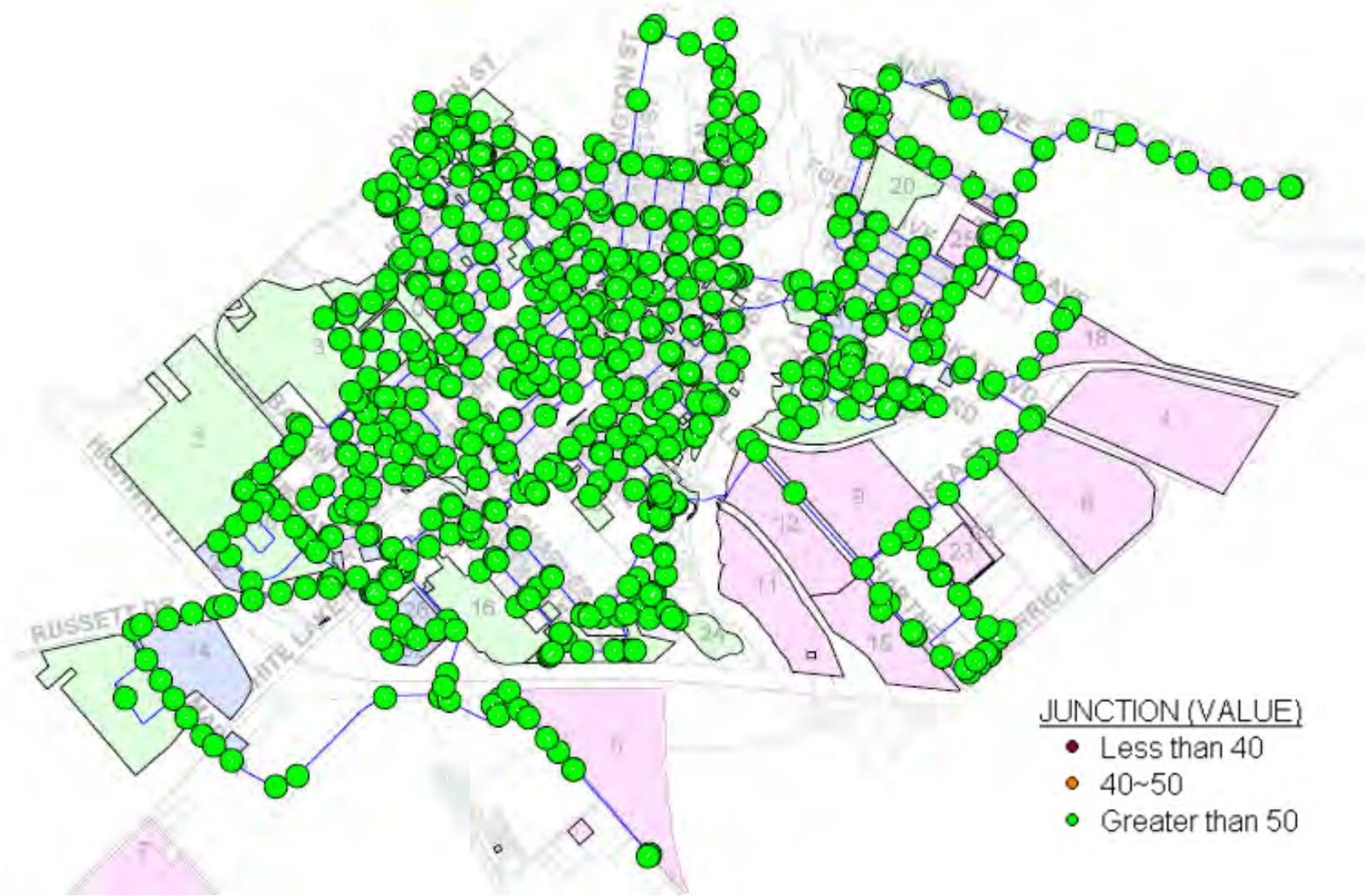
Excerpts from the Town of Arnprior Water and Wastewater Master Plan



Town of Arnprior
 Water and Wastewater Master Plan

Figure No.
5-2
 Title Existing W/M Diameters





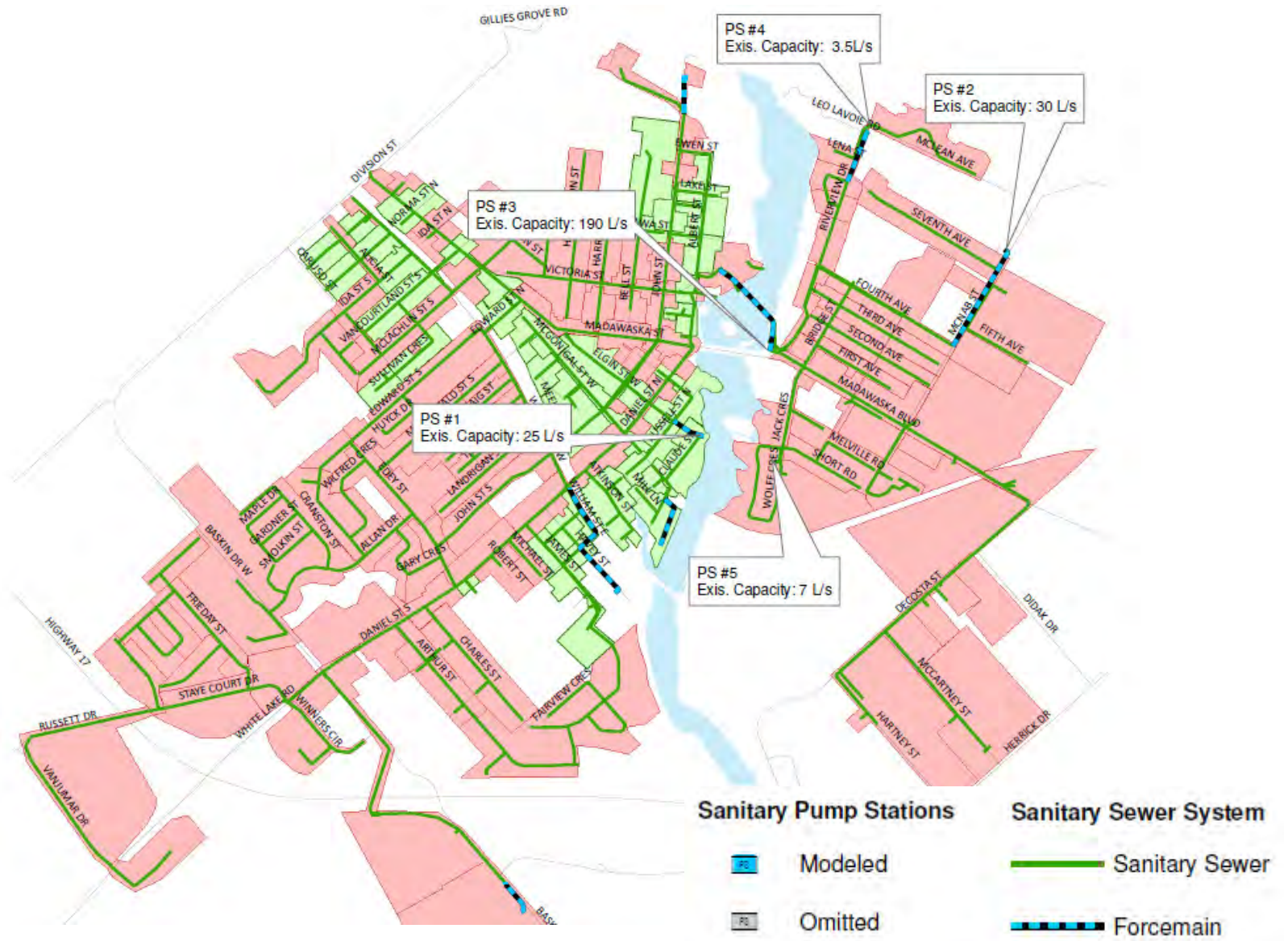
JUNCTION (VALUE)
 ● Less than 40
 ● 40~50
 ● Greater than 50



Town of Arnprior
Water and Wastewater Master Plan

Figure No.
5-5

Title **Existing MXDY Fire Flows (L/s)**

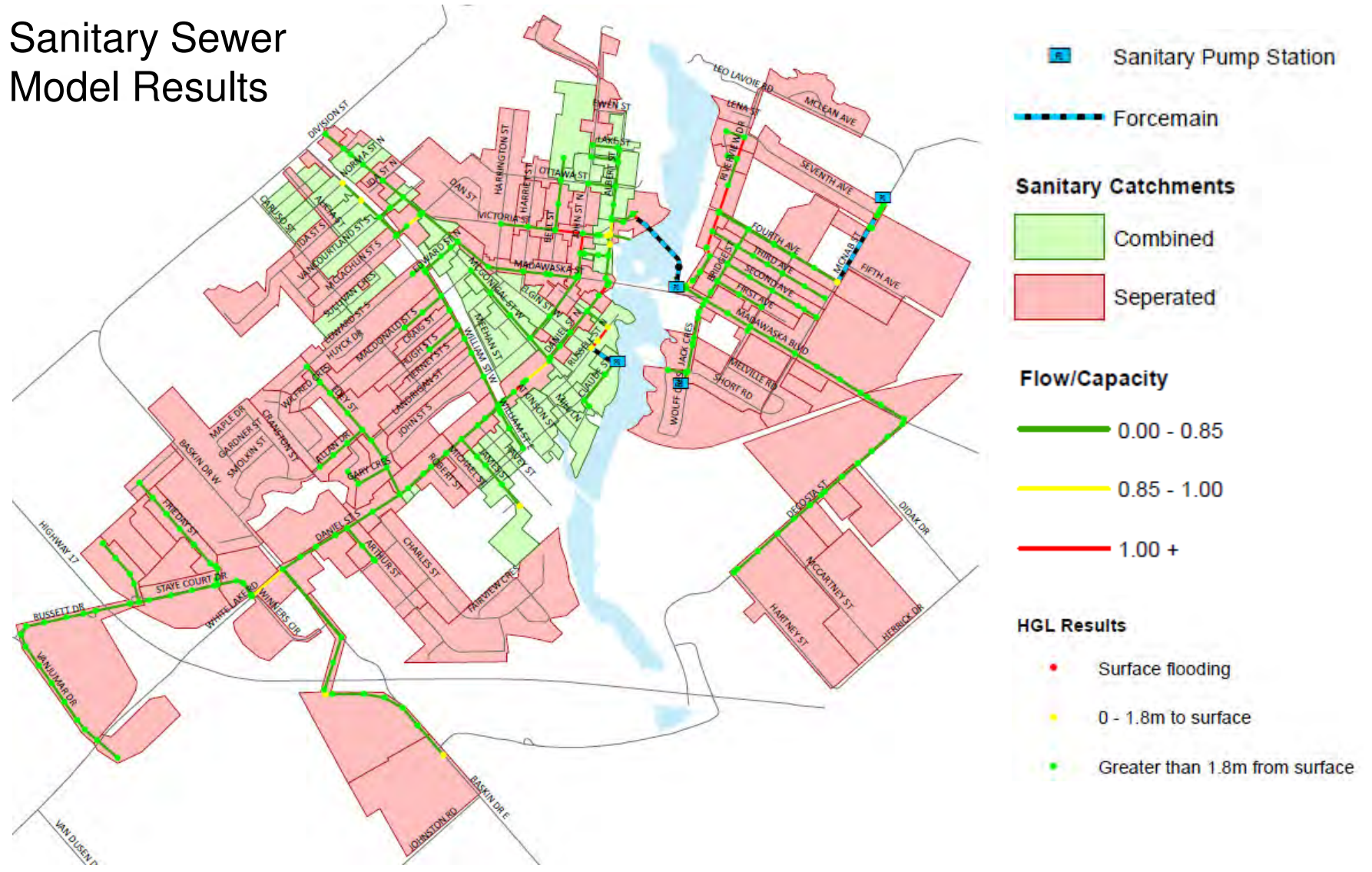


**Town of Arnprior
Water and Wastewater Master Plan**

Figure No.
5-7

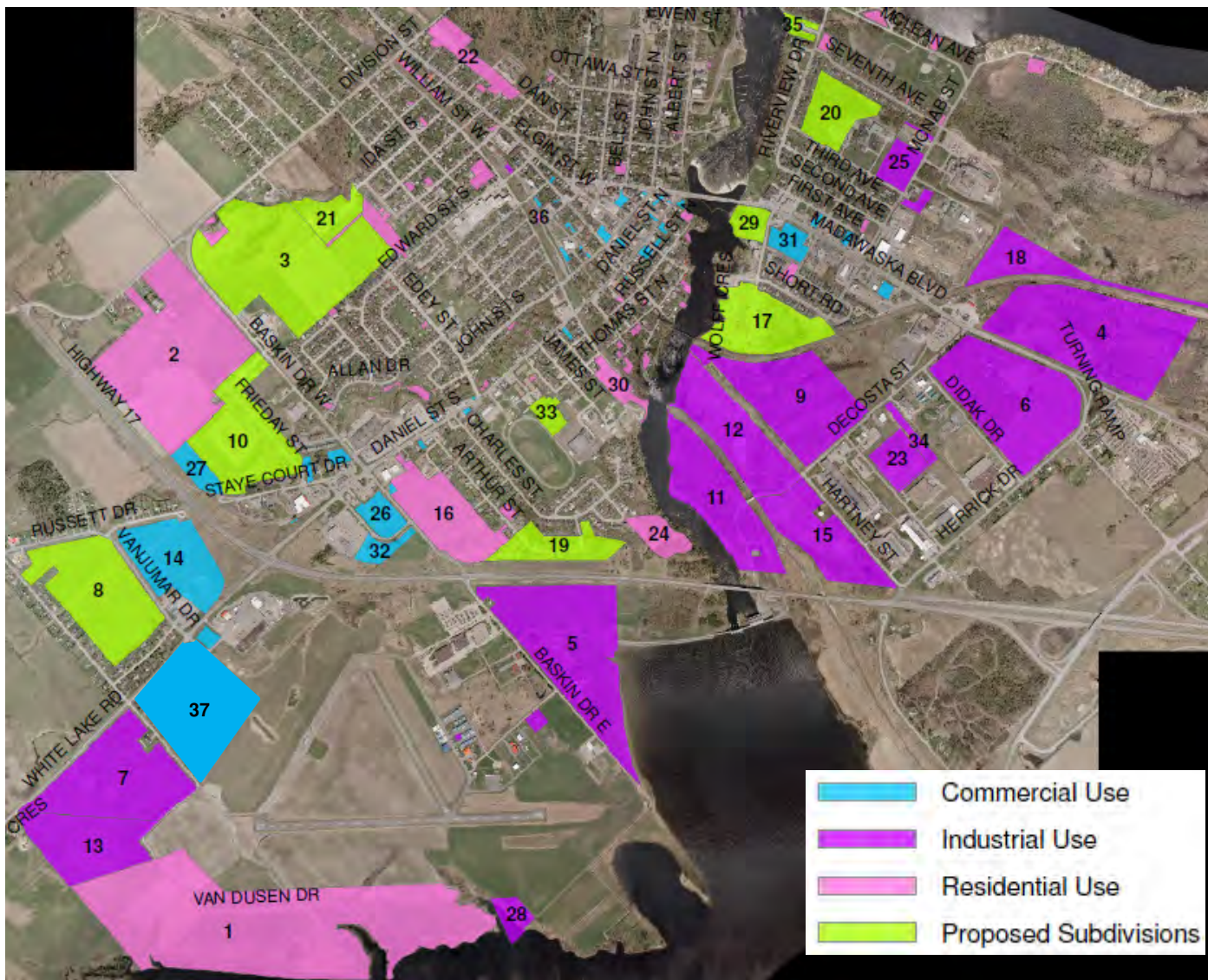
Title **Existing Sanitary Pumping Stations**

Sanitary Sewer Model Results



Town of Arnprior
Water and Wastewater Master Plan

Figure No. **5-8**
Title **Sanitary - Existing 25-Year SCS II**



Town of Arnprior
Water and Wastewater Master Plan

Figure No.
6-1
Title Proposed Development

Figure 1.0 ID (GIS)	Comment/Name	Area (ha)	Land Use	Proposed Subdivision?	Known Populations (Proposed Subdivisions Only)	Build out			
						Total Population	Residential Area (ha)	Industrial Area (ha)	Commercial Area (ha)
1	Verch/Potter	20.9	Residential		0	941	20.9	0	0
2	Campbell Farm	27	Residential		0	1215	27	0	0
3	Callahan	26.81	Residential	Subdivision	1296.5	1297	26.81	0	0
4	Vacant Industrial Lands #2	20.6	Comm/Res	HC/Res	0	675	15	0	5.6
5	Reid/OPG/Boese	14.2	Industrial		0	0	0	14.2	0
6	Vacant Industrial Lands #1	20.2	Industrial		0	0	0	20.2	0
7	O'Neil Farm	17.73	Industrial		0	0	0	17.73	0
8	Pegasus	16.79	Residential	Subdivision	984	984	16.79	0	0
9	Sandvik Steel (contamin.)	16.22	Industrial		0	0	0	16.22	0
10	Campbellbrook	13.57	Residential	Subdivision	644	644	13.57	0	0
11	Hydro	13.21	Industrial		0	0	0	13.21	0
12	Hydro	11.97	Industrial		0	0	0	11.97	0
13	Airport Restricted	10.95	Industrial		0	0	0	10.95	0
14	Stinson Fuels	10.41	Commercial		0	0	0	0	10.41
15	Capital Asphalt/Sullivans	8	Industrial		0	0	0	8	0
16	RC Church- for High School?	10.14	Residential		0	457	10.14	0	0
17	Campanale	9.72	Residential	Subdivision	436.5	437	9.72	0	0
18	Miller-storage	6.57	Industrial		0	0	0	6.57	0
19	River Ridge IV & V	5.73	Residential	Subdivision	232	232	5.73	0	0
20	4th Ave - draft approved	5.72	Residential	Subdivision	260	260	5.72	0	0
21	Jed Creek II & III	3.81	Residential	Subdivision	171	171	3.81	0	0
22	Vydon Acres	3.2	Residential		0	144	3.2	0	0
23	Canada Hydro Components	3.32	Industrial		0	0	0	3.32	0
24	Will only be 1 sfd - EP lands	0	Residential		0	0	0	0	0
25	Whitten	2.47	Industrial		0	0	0	2.47	0
26	Loblaws	2.25	Commercial		0	0	0	0	2.25
27	RES	2.02	Residential	Subdivision	118.8	119	2.02	0	0
28	Unknown	1.98	Industrial		0	0	0	1.98	0
29	Rockcliffe Cove - 132 condos	1.95	Residential	Subdivision	90	90	1.95	0	0
30	Girotti	1.79	Residential		0	81	1.79	0	0
31	Kimmel	1.77	Commercial		0	0	0	0	1.77
32	Loblaws	1.6	Commercial		0	0	0	0	1.6
33	McEwan	1.48	Residential	Subdivision	67.5	68	1.48	0	0
34	Plaintree - parking area	1.3	Industrial		0	0	0	1.3	0
35	Smith	0.82	Residential	Subdivision	36	36	0.82	0	0
36	Aff. Housing Meehan/Hugh	0.1	Residential	Subdivision	31	31	0.1	0	0
37	White Lake Road/Bev Shaw Parkway	14.2	Commercial		0	0	0	0	14.2
TOTALS =		330.5 ha			4,367 ppl	7,882 ppl	166.55 ha	128.12 ha	35.83 ha

**Town of Arnprior
Water and Wastewater Master Plan**

Figure No. **6-2**
Title **Proposed Developments (>1 ha)**

Figure 1.0 ID (GIS)	Comment/Name	Residential				Industrial				Commercial			
		Dec 2011 Built %	2016 (Short) Pop %	2021 (Mid) Pop %	2031 (Long) Pop %	Dec 2011 Built Area %	2016 (Short) Area %	2021 (Mid) Area %	2031 (Long) Area %	Dec 2011 Built Area %	2016 (Short) Area %	2021 (Mid) Area %	2031 (Long) Area %
1	Verch/Potter	0%	0%	0%	0%								
2	Campbell Farm	0%	5%	25%	50%								
3	Callahan	0%	28%	75%	100%								
4	Vacant Industrial Lands #2	0%	5%	40%	100%					0%	0%	50%	100%
5	Reid/OPG/Boese					0%	0%	50%	100%				
6	Vacant Industrial Lands #1					0%	0%	0%	50%				
7	O'Neil Farm					0%	0%	0%	50%				
8	Pegasus	0%	45%	100%	100%								
9	Sandvik Steel (contamin.)					0%	0%	0%	0%				
10	Campbellbrook	74%	26%	26%	26%								
11	Hydro					0%	0%	0%	0%				
12	Hydro					0%	0%	0%	0%				
13	Airport Restricted					0%	0%	0%	0%				
14	Stinson Fuels									0%	0%	50%	100%
15	Capital Asphalt/Sullivans					0%	50%	75%	100%				
16	RC Church- for High School?	0%	0%	0%	0%								
17	Campanale	90%	10%	10%	10%								
18	Miller-storage					0%	0%	0%	0%				
19	River Ridge IV & V	82%	18%	18%	18%								
20	4th Ave - draft approved	0%	100%	100%	100%								
21	Jed Creek II & III	85%	15%	15%	15%								
22	Vydon Acres	0%	0%	100%	100%								
23	Canada Hydro Components					0%	100%	100%	100%				
24	N/A	0%	0%	0%	0%								
25	Whitten					0%	0%	100%	100%				
26	Loblaws									0%	0%	50%	100%
27	OP CHANGE TO RES!	0%	10%	100%	100%								
28	Unknown (OPG?)					0%	0%	0%	0%				
29	Rockcliffe Cove - 132 condos	0%	20%	80%	100%								
30	Girotti	0%	0%	50%	100%								
31	Kimmel									0%	0%	50%	100%
32	Loblaws									0%	0%	50%	100%
33	McEwan	90%	10%	10%	10%								
34	Plaintree - parking area					0%	0%	0%	0%				
35	Smith	60%	40%	40%	40%								
36	Aff. Housing Meehan/Hugh	0%	100%	100%	100%								
37	White Lake Road/Bev Shaw Parkway									0%	50%	75%	100%

Figure No. **6-3**
 Title **Timing of Proposed Development**

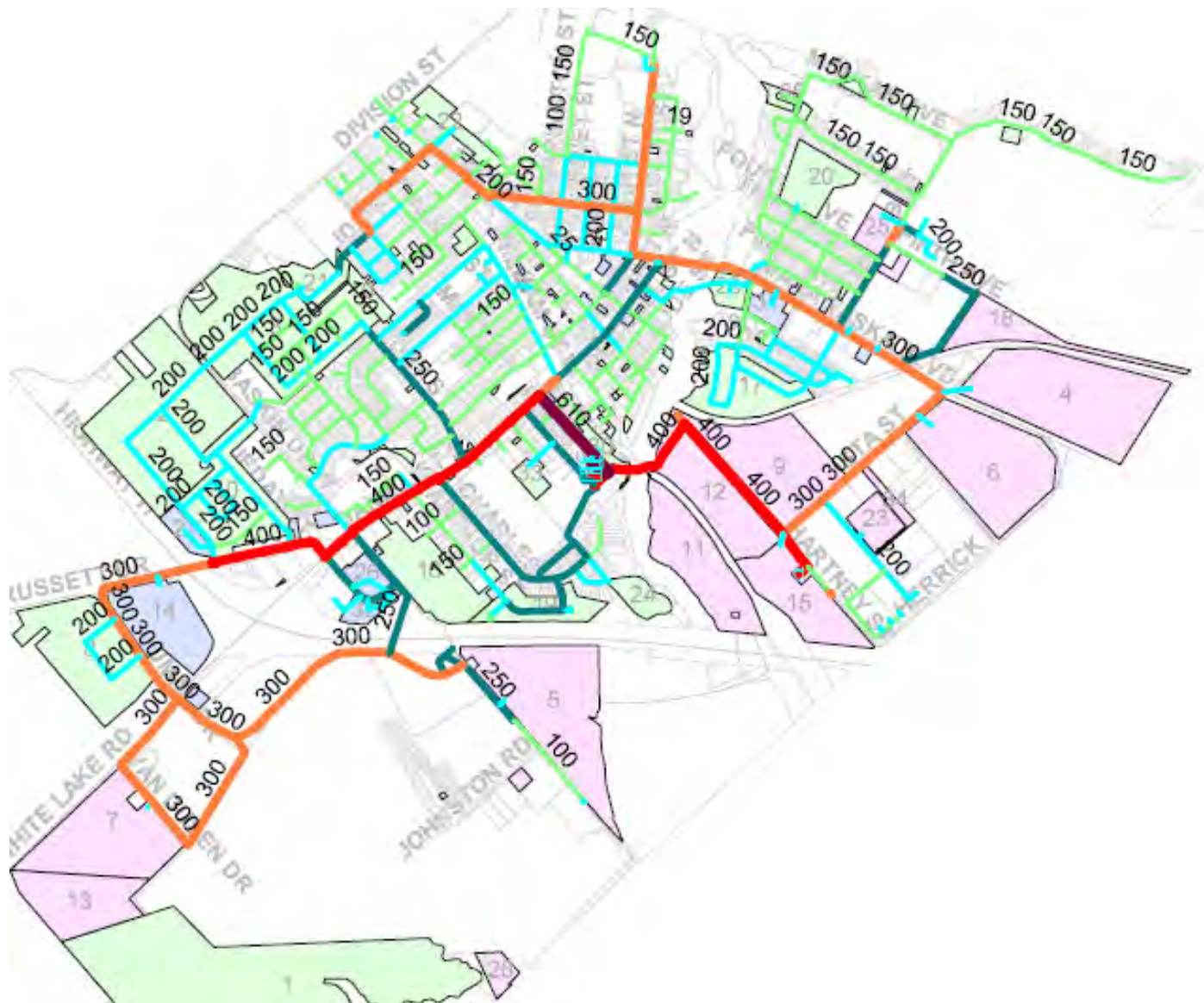




Town of Arnprior
Water and Wastewater Master Plan

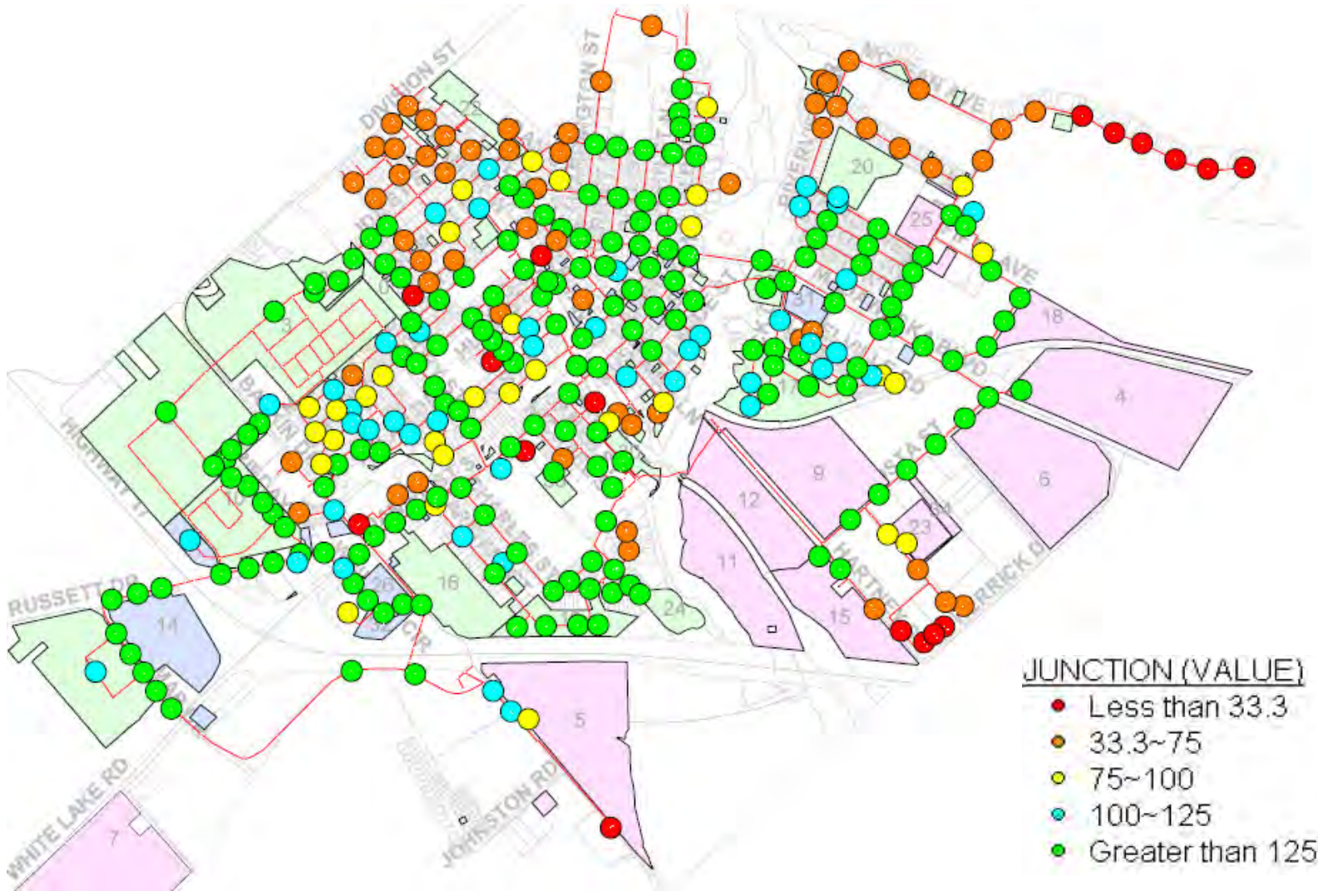
Figure No.
9-4

Title Proposed New W/M (dia. in mm)



**Town of Arnprior
Water and Wastewater Master Plan**

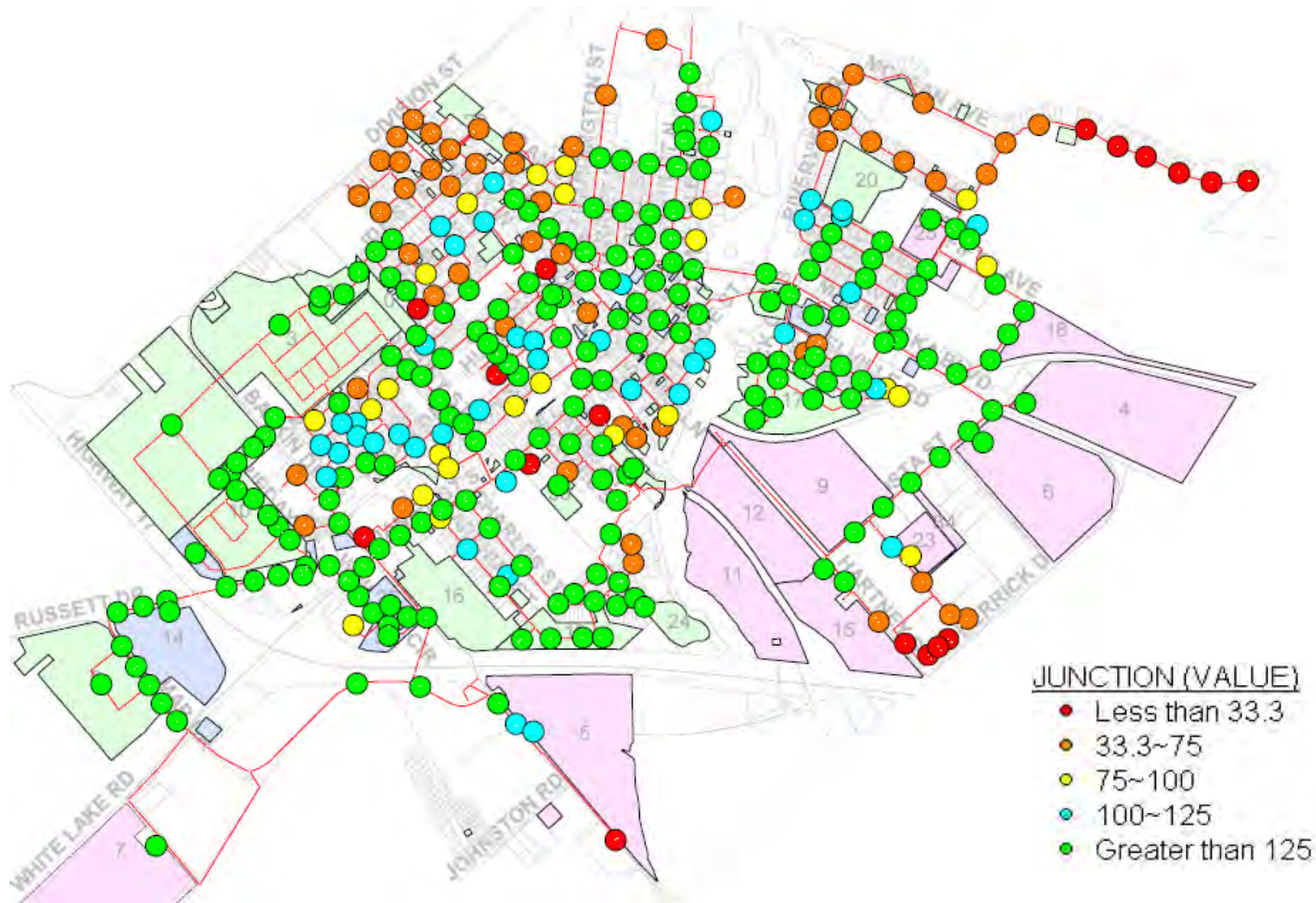
Figure No. **9-5**
Title **Future All W/M (dia. in mm)**



- JUNCTION (VALUE)**
- Less than 33.3
 - 33.3~75
 - 75~100
 - 100~125
 - Greater than 125

**Town of Arnprior
Water and Wastewater Master Plan**

Figure No. **9-6**
Title **2016 Available Fire Flows (L/s)**



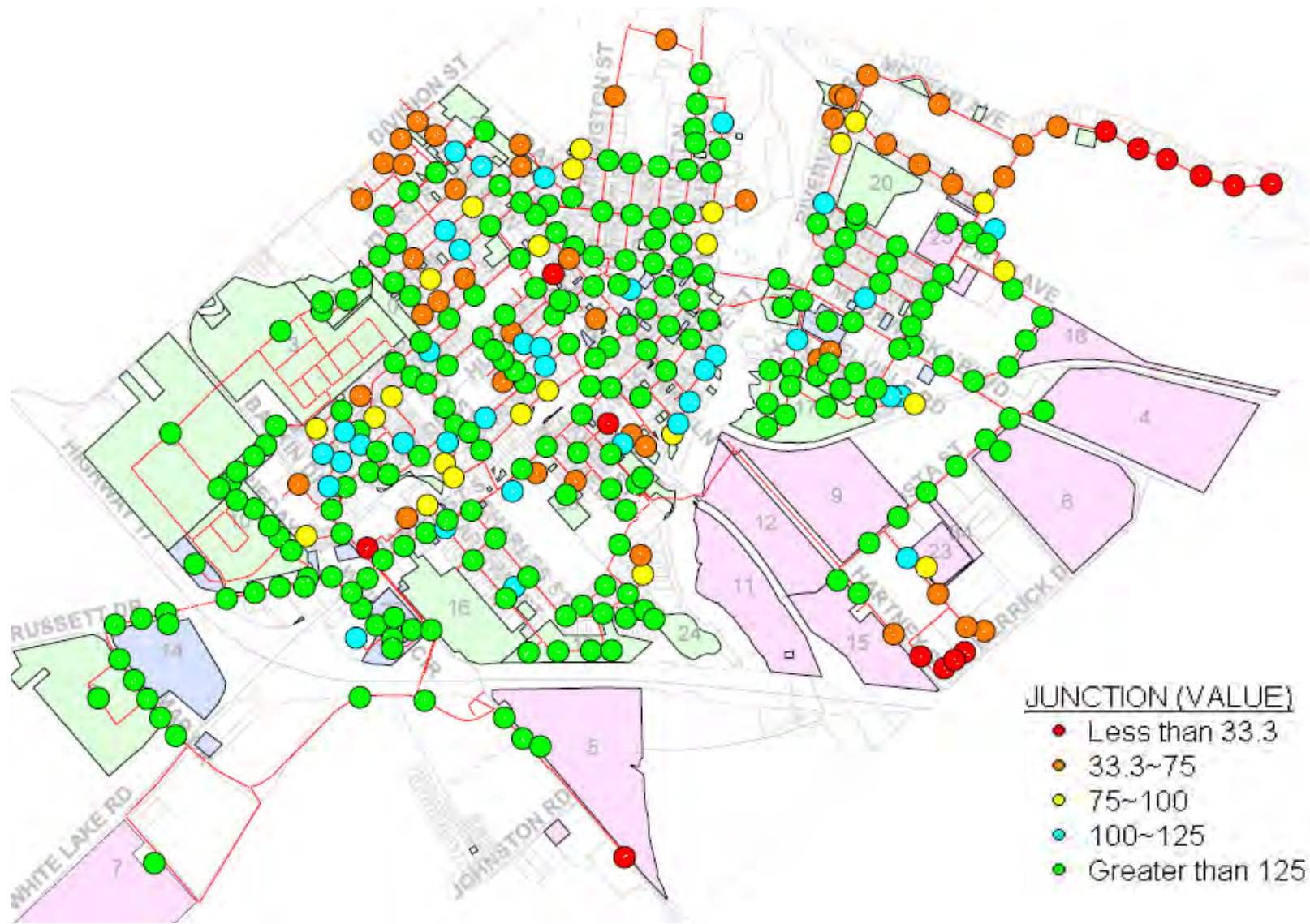
JUNCTION (VALUE)

- Less than 33.3
- 33.3~75
- 75~100
- 100~125
- Greater than 125

**Town of Arnprior
Water and Wastewater Master Plan**

Figure No.
9-7

Title **2021 Available Fire Flows (L/s)**



- JUNCTION (VALUE)**
- Less than 33.3
 - 33.3~75
 - 75~100
 - 100~125
 - Greater than 125

**Town of Arnprior
Water and Wastewater Master Plan**

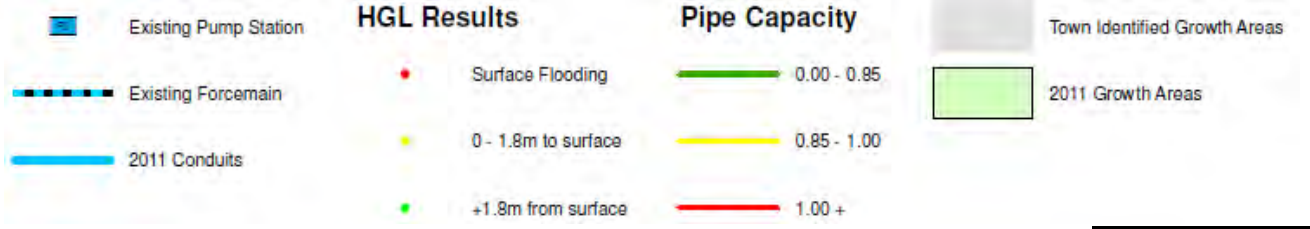
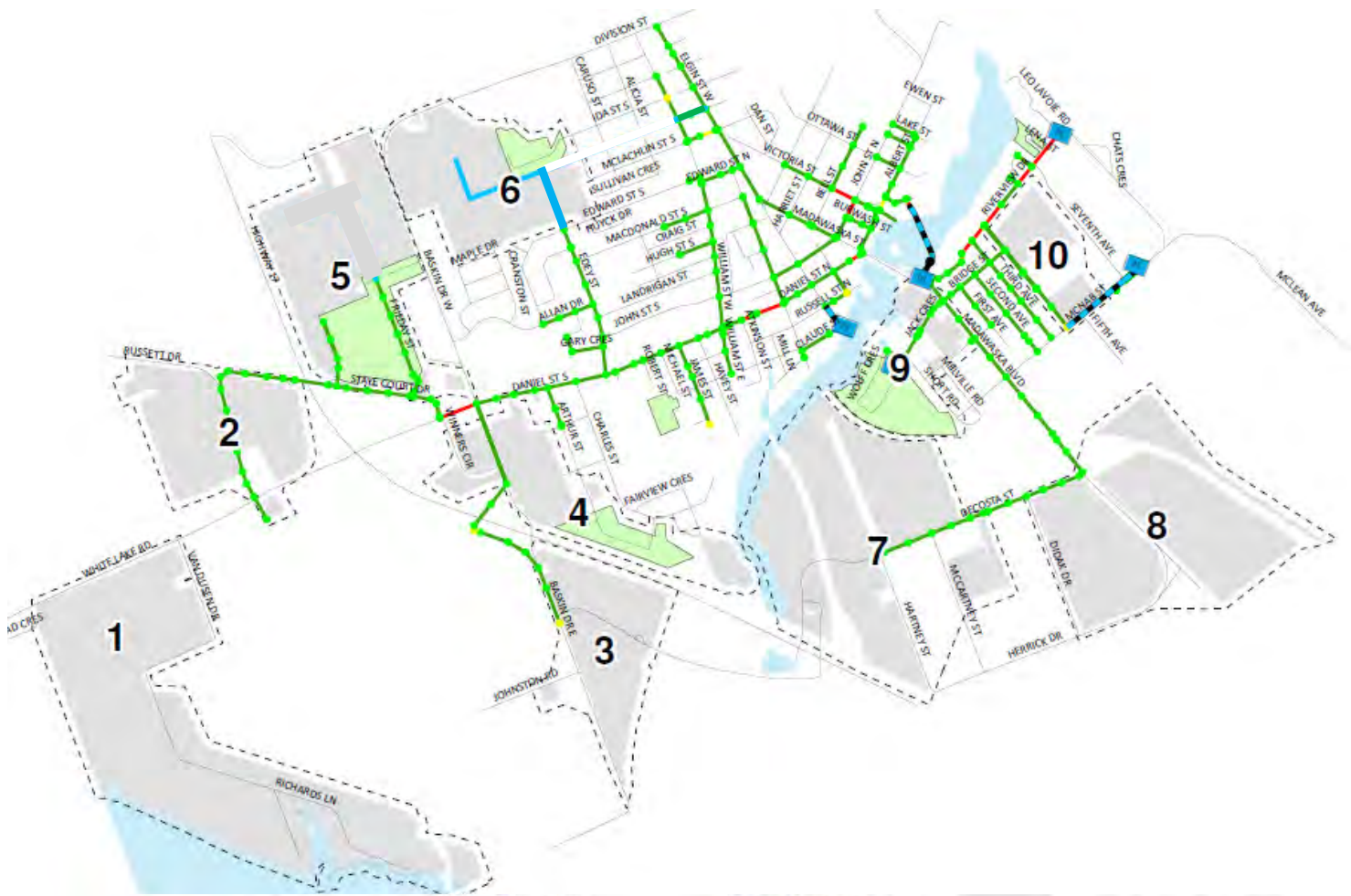
Figure No. **9-8**
Title **2031 Available Fire Flows (L/s)**



**Town of Arnprior
Water and Wastewater Master Plan**

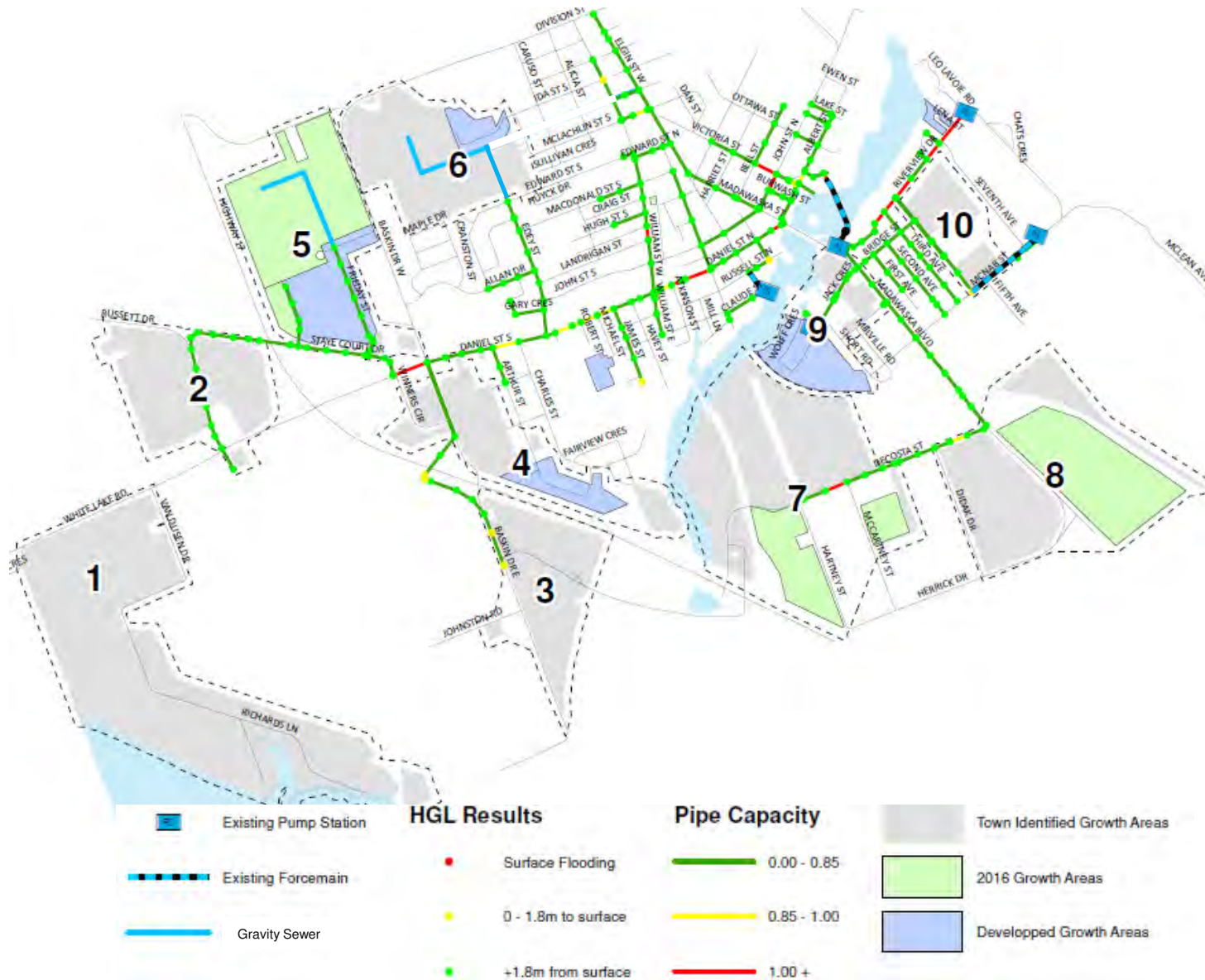
Figure No.
9-10

Title **Sewer – Existing Conditions**



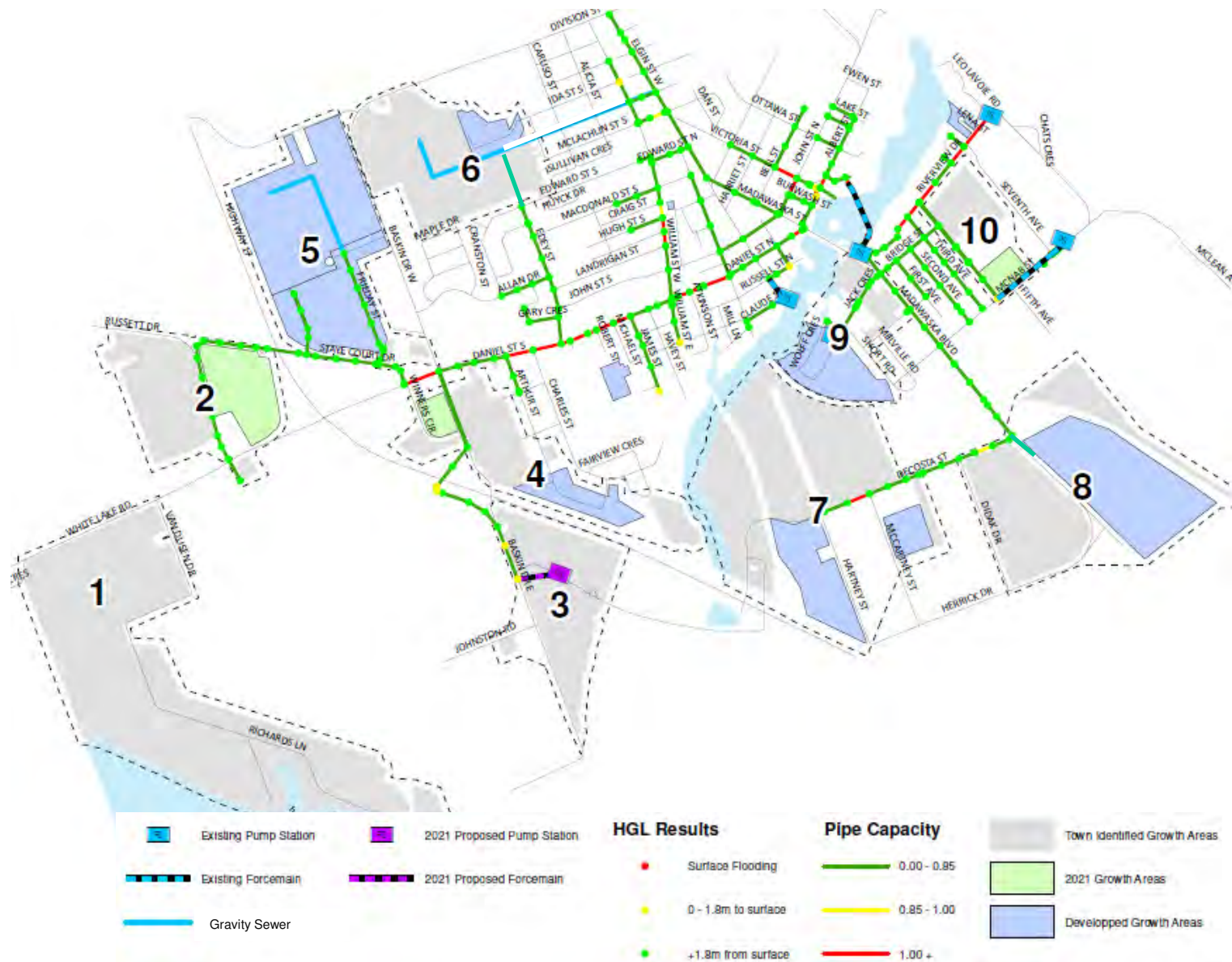
**Town of Arnprior
Water and Wastewater Master Plan**

Figure No.
9-11
Title **Sewers – 2011 Conditions**



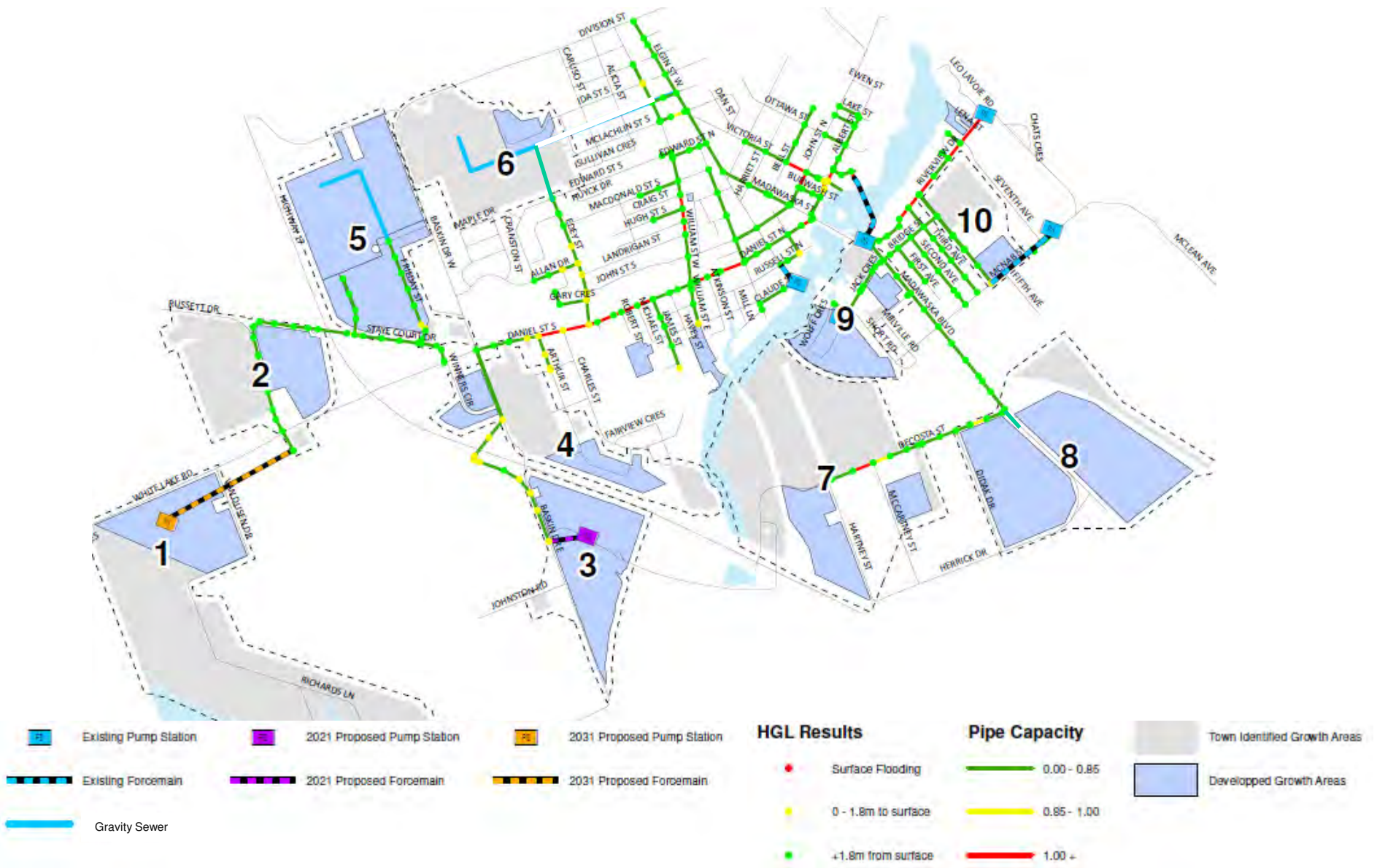
**Town of Arnprior
Water and Wastewater Master Plan**

Figure No.
9-12
Title **Sewers – 2016 Conditions**



**Town of Arnprior
Water and Wastewater Master Plan**

Figure No. **9-13**
Title **Sewers – 2021 Conditions**



**Town of Arnprior
Water and Wastewater Master Plan**

Figure No. **9-14**
Title **Sewers – 2031 Conditions**

Year	Name of Street/Project	Length of pipe (m)			Ind. Proj. Total	Group Total
		Pipe Diameter (mm)				
		300	400	600		

2016	Daniel 1 (Havey to Charles)		564		\$563,830	\$1,240,930
	Havey (WTP to Daniel)			451	\$677,100	
						\$1,240,930

2021	Daniel 2 (Charles to Staye Court)		616		\$615,530	\$615,530
						\$615,530

2031	Staye Court (Daniel to Hwy 17)		519		\$519,110	\$1,595,743
	Victoria (John to Elgin)	669			\$501,998	
	Elgin (Victoria to Norma)	344			\$257,873	
	Norma (Elgin to Caruso)	422			\$316,763	
	Caruso (Norma to Ida)	80			\$48,240	\$48,240
	White Lake/Vandusen (see Figure)	1920			\$1,152,108	\$1,152,108
						\$2,796,091

Total:	\$4,652,551
---------------	--------------------

Year	Area	Wastewater Infrastructure Description	Ind. Proj. Total	Group Total
2016	5	575m of 300mm diameter sewer (on privately owned land) to connect into the existing 300mm diameter sewer located along Frieday Street	\$345,000	\$345,000
	8	150m of 375mm diameter sewer along Madawaska Blvd to existing 600mm diameter existing sewer at the corner of Madawaska Boulevard and DeCosta Street	\$112,500	\$112,500
				\$457,500
2021	3	New 8.3L/s pump station and approximately 100m of 100mm diameter forcemain (both on privately owned land) tied into the existing 400mm diameter trunk sewer located along Baskin Drive East	\$323,947	\$323,947
				\$323,947
2031	1	New 10L/s pump station and approximately 670m of 100mm diameter forcemain (270 on privately owned land & 400m on new road alignment or White Lake Rd) tied into the existing 400mm diameter trunk sewer located along Vanjumar Drive	\$283,870	\$432,610
			\$59,940	
			\$88,800	
	3	Increase of the pump station capacity noted above in 2021 from 8 L/s to 15 L/s	\$74,264	\$74,264
				\$506,874

Total:	\$1,288,320
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APPENDIX B
Correspondence

From: John Steckly <jsteckly@arnprior.ca>
Sent: Thursday, September 17, 2020 10:14 AM
To: Greg MacDonald
Subject: RE: White Lake road Lands
Attachments: StecklyJULY162020_ALnotes_20200826.pdf

Hi Greg,

I don't believe I ever responded to these specific questions. See responses in blue below.

As noted in our call this week, I have also attached our preliminary comments to your due diligence letter. As discussed, further modelling is required to determine answers to the ultimate questions, however as a starting point I would suggest that the letter be amended to account for these preliminary comments.



John Steckly, A.Sc.T.
General Manager, Operations
Town of Arnprior
105 Elgin Street W.
Arnprior ON K7S 0A8
(613)623-4231 ext. 1831
jsteckly@arnprior.ca
www.arnprior.ca
[@arnprior](#)

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Please consider the environment before printing this e-mail.*

We are OPEN for business, however due to the COVID-19 pandemic and in line with recommendations from local health units we are not allowing the public to enter our offices. We ask you to please call or e-mail for assistance with your query. Please visit www.arnprior.ca. We thank you for your patience during this time, and appreciate the role you play in keeping our community safe.

From: Greg MacDonald [<mailto:g.Macdonald@novatech-eng.com>]
Sent: August-26-20 10:49 AM
To: John Steckly <jsteckly@arnprior.ca>
Subject: White Lake road Lands

Hi John,

Are you able to answer the questions below on watermains?

Water

- A new 300 mm watermain loop around the site (Area 37) is planned for 2031. ***Is this loop required for development of Area 37 or is it required for the remaining lands to the south, e.g. Areas 7, 13 and 1? Required for area 37 as well.***
- Figure 10-1 of the Master Plan outlines future watermain works. ***Has the watermain on Daniel, from the WTP to Charles, been upgraded? Yes.***
- ***Has the watermain on Daniel from Charles to Stave Court been upgraded (originally planned for 2021)? No. Town shows this project in 2023 in long range financial plan.***
- ***And has the watermain from Stave Court to Hwy 7 been upgraded (originally planned for 2031)? No.***

Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: HUGHES Jordan -RG&PWRMRKT <jordan.hughes@opg.com>
Sent: Wednesday, October 28, 2020 2:30 PM
To: Greg MacDonald; Baker, Tania (MNRF); Castro, Victor (MECP)
Cc: Cote, Joff (MNRF); Koopman, Kaitlyn (MNRF); Pierre Dufresne; Matthew Hrehoriak
Subject: RE: Proposed Development in Arnprior

Hello Greg,

In response to your questions outlined below, our operating range is quite limited at Arnprior GS and spans an elevation range of 98.76 m to 99.06 m throughout the entire year. The maximum elevation on record for Arnprior Headwater is only that of 99.08 m and that was achieved in April of 1995. It is not expected that the Arnprior elevations will deviate from these limits even in the event of a high or low flow condition given they are the regulated operational constraints as specified within the Madawaska Water Management Plan.

In terms of your location, it would not be anticipated that levels would be much higher than the maximum operating limit of 99.06 m given the proximity to the station itself. As for inundation mapping, the information we have typically pertains to the Probable Maximum Flood scenario and therefore not necessarily information that we typically provide outside of the immediate stakeholders within the river system. I would suggest you consult with the municipality as it relates to floodplain mapping for the area and all applicable requirements associated with the proposed development. Let me know if you have any additional questions.

Kind regards,

Jordan Hughes
First Line Manager – Operating (Acting)

Ontario Power Generation
613-932-3072 ext. 3695 | 613-847-1923 | jordan.hughes@opg.com

From: Greg MacDonald <g.Macdonald@novatech-eng.com>
Sent: Tuesday, October 27, 2020 12:19 PM
To: Baker, Tania (MNRF) <tania.baker@ontario.ca>; Castro, Victor (MECP) <Victor.Castro@ontario.ca>
Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>; Pierre Dufresne <pdufresne@tartanland.on.ca>; HUGHES Jordan - RG&PWRMRKT <jordan.hughes@opg.com>; Matthew Hrehoriak <m.hrehoriak@novatech-eng.com>
Subject: RE: Proposed Development in Arnprior

***** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. *****

Thanks Tania. Jordan, please let me know if you need any further information from us, in addition to below.

Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: Baker, Tania (MNRF) <tania.baker@ontario.ca>

Sent: Tuesday, October 27, 2020 12:15 PM

To: Greg MacDonald <g.Macdonald@novatech-eng.com>; Castro, Victor (MECP) <Victor.Castro@ontario.ca>

Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>; Pierre Dufresne <pdufresne@tartanland.on.ca>; HUGHES Jordan - EASTERNOPS <jordan.hughes@opg.com>

Subject: RE: Proposed Development in Arnprior

Hopefully Jordan can help get you in touch with the right person at OPG for Arnprior GS headpond elevation levels and/or headpond inundation mapping.

Jordan Hughes

Technical Officer – Water Management

Ontario Power Generation

613-932-3072 ext. 3695 | 613-847-1923 | jordan.hughes@opg.com

Tania

Tania L. Baker

Management Biologist, Pembroke District

Ontario Ministry of Natural Resources and Forestry

613-401-8412

From: Greg MacDonald <g.Macdonald@novatech-eng.com>

Sent: October 27, 2020 12:06 PM

To: Baker, Tania (MNRF) <tania.baker@ontario.ca>; Castro, Victor (MECP) <Victor.Castro@ontario.ca>

Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>; Pierre Dufresne <pdufresne@tartanland.on.ca>

Subject: RE: Proposed Development in Arnprior

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Thanks so much

Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: Baker, Tania (MNRF) <tania.baker@ontario.ca>
Sent: Tuesday, October 27, 2020 10:20 AM
To: Greg MacDonald <g.Macdonald@novatech-eng.com>; Castro, Victor (MECP) <Victor.Castro@ontario.ca>
Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>
Subject: RE: Proposed Development in Arnprior

This property is close enough to the dam to potentially have a similar high water mark. You can usually see the high water on a property by looking at the shoreline for 'top of bank' indicators (changes in vegetation, ledges / edges tend to form at HWM), but this may reflect the typical operating range rather than the maximum level in some instances.

I believe there are also survey techniques that can be used to confirm where the dam max elevation falls on the subject property. Inundation modeling / mapping may also be available from OPG since this is in the head pond of their facility. Elevation information for upper extent of the OPG head pond may help make this determination.

Consideration of the max potential flood plain elevation may also be available from the official plan for this area.

It is wise to avoid developing and infilling the floodplain; apply the minimum 30 m development setback to the max head pond or floodplain level or confirmed HWM for the property.

I'll see if I can find an OPG contact number for you.

Tania Baker

Tania L. Baker
Management Biologist, Pembroke District
Ontario Ministry of Natural Resources and Forestry
613-401-8412

From: Greg MacDonald <g.Macdonald@novatech-eng.com>
Sent: October 27, 2020 9:37 AM
To: Castro, Victor (MECP) <Victor.Castro@ontario.ca>; Baker, Tania (MNRF) <tania.baker@ontario.ca>
Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>
Subject: RE: Proposed Development in Arnprior

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Would you have information on high water levels upstream of the AGS. According to the Madawaska River Management Plan, pg. 186, the absolute maximum water level at the Arnprior Generating Station (Dam) is 99.06 m. Would you have high water levels just upstream of the dam, in the vicinity of Van Dusen Drive per the attached snip below? Your help would be most appreciated.



Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: Castro, Victor (MECP) <Victor.Castro@ontario.ca>

Sent: Wednesday, August 19, 2020 3:15 PM

To: Baker, Tania (MNRF) <tania.baker@ontario.ca>; Greg MacDonald <g.Macdonald@novatech-

eng.com>

Cc: Cote, Joff (MNRF) <joff.cote@ontario.ca>; Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>

Subject: RE: Proposed Development in Arnprior

Hi Greg,

My input to your questions are in red below:

- Is a storm outlet connection to the Madawaska permitted? **An Environmental Compliance Approval is required from my ministry for the construction of a stormwater management facility.**
- Is stormwater quantity control required given that the development would be directly adjacent to the Madawaska and immediately upstream of the Arnprior power generating dam **Both quantity and quality control measures are required.**
- I would assume that quality control of stormwater runoff will be required, e.g. 80 % TSS removal **Yes 80% TSS removal is appropriate for this receiving waterbody.**

Victor Castro
Supervisor (A)
Water Resources Unit
Technical Support Section
Eastern Region
(613) 561-9511

From: Baker, Tania (MNRF) <tania.baker@ontario.ca>

Sent: Wednesday, August 19, 2020 12:51 PM

To: Greg MacDonald <g.Macdonald@novatech-eng.com>

Cc: Castro, Victor (MECP) <Victor.Castro@ontario.ca>; Cote, Joff (MNRF) <joff.cote@ontario.ca>;

Koopman, Kaitlyn (MNRF) <Kaitlyn.Koopman@ontario.ca>

Subject: FW: Proposed Development in Arnprior

Hi Greg,

Your assumptions are correct.

Stormwater discharge into a natural water body should be a last resort.

Adequate infiltration, attenuation, and collection measures should be worked into development proposal to minimize how much stormwater will make it to Madawaska River.

Water quality controls and treatments (e.g. settling basins, degreasing, etc) as specified are required for all stormwater discharge into any waterbody supporting fish habitat.

Have forwarded your request on to others that may have additional advice!

Tania

Tania L. Baker
Management Biologist, Pembroke District
Ontario Ministry of Natural Resources and Forestry

From: Greg MacDonald <g.Macdonald@novatech-eng.com>
Sent: August 19, 2020 12:30 PM
To: Baker, Tania (MNRF) <tania.baker@ontario.ca>
Cc: MNRF PEM (MNRF) <MNRF.PEM@ontario.ca>
Subject: RE: Proposed Development in Arnprior

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Hi Tania,

I have not received a reply on my request for information on a development in Arnprior adjacent to the Madawaska Lake near Van Dusen Drive. I am looking for stormwater management criteria – I understand this location is within your mandate as it is not within the Conservation Authorities jurisdiction. The information I am looking for is as follows:

- Is a storm outlet connection to the Madawaska permitted?
- Is stormwater quantity control required given that the development would be directly adjacent to the Madawaska and immediately upstream of the Arnprior power generating dam
- I would assume that quality control of stormwater runoff will be required, e.g. 80 % TSS removal

Below is the location plan.



Greg MacDonald, P. Eng.
Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: Baker, Tania (MNRF) <rania.baker@ontario.ca>
Sent: Friday, July 24, 2020 4:11 PM
To: Greg MacDonald <g.Macdonald@novatech-eng.com>
Cc: MNRF PEM (MNRF) <MNRF.PEM@ontario.ca>
Subject: RE: Proposed Development in Arnprior

Hi Greg,

Your request has been forwarded to our general district email.

Someone will be in touch about your request.

Tania

Tania L. Baker
Management Biologist, Pembroke District
Ontario Ministry of Natural Resources and Forestry

From: Greg MacDonald <g.Macdonald@novatech-eng.com>
Sent: July 24, 2020 3:26 PM
To: Baker, Tania (MNRF) <rania.baker@ontario.ca>
Subject: FW: Proposed Development in Arnprior

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Good afternoon, Tania. The email I just sent to Kirby was returned with your name as contact person. I am hoping you can help me out with my request below.

Regards,

Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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From: Greg MacDonald
Sent: Friday, July 24, 2020 3:24 PM

To: 'kirby.punt@ontario.ca' <kirby.punt@ontario.ca>

Subject: Proposed Development in Arnprior

Good afternoon, Kirby. We are looking at a property in Arnprior for a client of ours, subject parcel is in general area shown below. The lands are tributary to the Madawaska River upstream of the Arnprior GS. AS such, we would be planning on discharging stormwater into the Madawaska River at the VanDusen Drive location. This area is outside of the MVCA so I believe it is under the jurisdiction of MNRF. In this regard, we are looking for input from MNRF with regards to the stormwater management requirements, e.g. do we need to implement on site SWM to control post development storm flows given that we are so close to the river and that river levels are controlled by the dam downstream. Also, what level of water quality control would be applicable? I am assuming enhanced level or 80 % TSS. Your assistance in this matter would be greatly appreciated.

Regards,



Greg MacDonald, P. Eng.

Director, Land Development and Public Sector Infrastructure

NOVATECH Engineers, Planners & Landscape Architects

240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

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July 20, 2020

Town of Arnprior
105 Elgin Street West
Arnprior, ON K7S 0A8

Attention: Mr. John Steckly, A.Sc.T.
General Manager, Operations

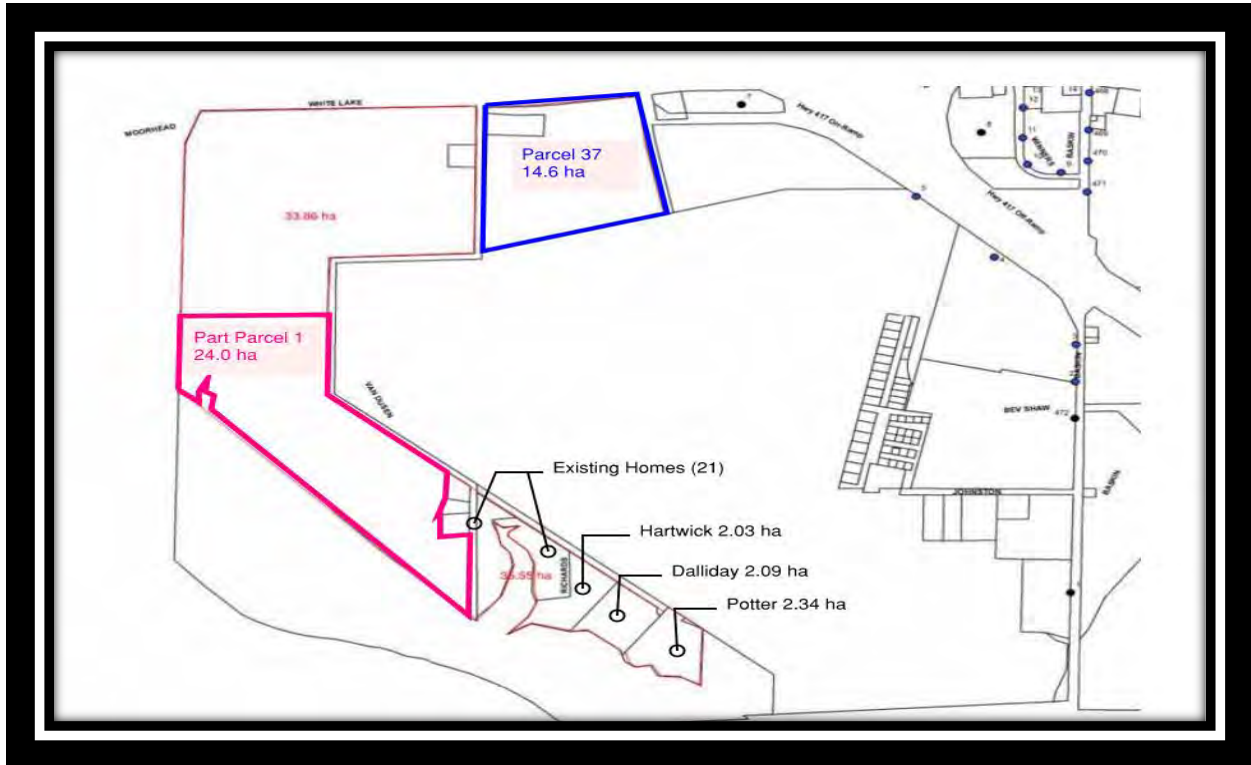
Dear Sir:

Re: White Lake Road and VanDusen Drive Lands (Area 37 and Part Area 1)

We have been retained by Tartan Homes to undertake due diligence on two parcels of land located south of White Lake Road along Van Dusen Drive, as shown in Figure 1.

Figure 1 Subject Properties (Area 37 and Part of Area 1)





Servicing of the subject lands (Water and Sanitary) is discussed in the Town of Arnprior Water and Wastewater Master Plan prepared by Stantec dated June 14, 2013. It is intended to develop both parcels as residential. Preliminary developments statistics are provided in Table 1 below and compared to the data contained in the Master Plan.

Table 1 Preliminary Development Statistics

Area	Master Plan		Preliminary Proposed Development Stats.	
	Area	Pop	Area	Pop
Area 37	14.6	0 ¹	14.6	732
Part Area 1	20.9 ²	941	24.9	1136
Remaining Area 1			11.20	350

Notes

1. Peak Sanitary Flow Commercial = 9.13 L/sec. Peak Sanitary Flow Residential = 12.66 L/s. Increase in sanitary flows from commercial use to residential use Area 37 = 3.53 L/sec.
2. Total land area of Area 1 = 36.1 ha per Figure 1 (24.9 + 4.70 + 2.03 + 2.09 + 2.34)

Our understanding of the servicing requirements for these properties is provided below.

Water

- Area 37 would be serviced to the existing 300 mm watermain on Bev Shaw Parkway.

← Calc'd based on reported pops (flows not reported in WWMP)

- A new 300 mm watermain loop around the site (Area 37) is planned for 2031. **Is this loop required for development of Area 37 or is it required for the remaining lands to the south, e.g. Areas 7, 13 and 1?**
- Figure 10-1 of the Master Plan outlines future watermain works. **Has the watermain on Daniel, from the WTP to Charles, been upgraded?**
- **Has the watermain on Daniel from Charles to Staye Court been upgraded (originally planned for 2021)?**
- **And has the watermain from Staye Court to Hwy 7 been upgraded (originally planned for 2031)?**
- **Will these works be required to support development of Areas 37 and part of Area 1?**

Sanitary

- There is an existing 450 mm diameter sanitary sewer on Bev Shaw Parkway which terminates opposite the Antrim Truck Stop. The invert of this sewer is 105.68 m from as-builts.

Due to topography it will not be possible to service all of Area 37 by gravity. A pump station will be required.

The Master Plan shows a pump station to be located on Parcel 7/13. This pump station should be sized to service Area 1,7,13 and 37 and should be a municipal pump station.

Does not include development of Area 1. & only includes 75% development of Area 37.

Just Areas 1, 7 & 13 to the PS (10L/s)

- The Master Plan identifies sections of sanitary sewers along Daniel Street which capacity is being exceeded, however surcharge is below 1.5 meters from surface for all scenarios up to 2031.

- For Area 37, a change in land use from commercial to residential will result in an increase in peak sanitary flow of 3.53 L/sec. **Does the existing sanitary sewer system have capacity for this additional flow of 3.53 L/sec?**

For Area 1, the Master Servicing Study allocates a population of 941 persons for an area of 20.9 ha, or peak sanitary flow of 16.80 L/sec using City of Ottawa sewer criteria. **Does this mean that the existing sanitary system is capable of accepting these flows from Area 1?**

Area 1 was not to be developed in 2021 or 2031 & therefore not included in model.

Area 37 had 4.83L/s (75% dev) in 2021. Now has 12.66L/s. Diff of 7.83L/s.

Preliminary development statistics for the Verch lands (outlined in pink in Figure 1) results a population of 1136 persons over an area of 24.9 ha, or peak sanitary flow of 20.03 L/sec. This would result in an additional 3.23 L/sec (20.03 – 16.80). **Does the existing sanitary system have capacity for these flows?**

Results in an additional ~20.03L/s (to be confirmed) actually, as 0 L/s accounted for previously.

- A sanitary pump station will be required to service the lands along VanDusen Drive southeast of White Lake Road. This station should ideally be a municipal station funded through development charges. Total tributary area is provided in Table 2.

Table 2 Pump Station Tributary Area

Parcel (See Fig. 1)	Land Use	Area (ha)	Population	Peak San Flow Res. (L/sec)	Peak San Flow Ind. (L/sec.)
37	Res.	14.6	732	12.03	0
7 and 13	Industrial	33.8	0	0	22.60
Part Area1 (Verch)	Res	24.9	1136	19.40	0

50% of 17.7ha = 8.87ha & 0% of 10.95ha = 0ha

75% of 14.2 = 10.65ha

0% of 20.9 = 0ha

Remaining Area 1	Res.	11.2	350	7.14	0
TOTAL		84.5	2,218	38.57	22.60

* Residential Peak Factor of 3.04 used based on population of 2,218 and K=0.80.

* Per capita flow of 280 L/cap/day and I/I of 0.33 L/sec/ha used.

* Average Industrial Flow = 10,000 L/ha/day. PF = 6.56/A^{0.19}

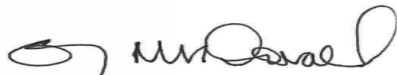
- It is understood that the Town has looked at the option of relieving the surcharge in the Daniel Street sewer by diverting flows from Allan Street and Eady Street to MacDonald Street through construction of a larger (375 mm dia.) and deeper sewer from MH 990 (Allan and Edward) to McGonigal Street, or a length of approximately 920 meters. **Will portions of this work be required to allow development of Area 37 and Area 1? Will it be included in the development charge review?**

To summarize, we would like to know what flows the existing sanitary sewer system can accept at this time without triggering any upgrades. We would also like to know what works will be required to accept the remaining development flows in Area 37 and Area 1 and whether the works will be included in the next development charge review. Similarly, we would like to know if any watermain upgrades are required for the development of these lands. We are available to meet with you and your consultant at your convenience to discuss the above.

Should you have any questions on the above, you can reach me at 613-890-9705.

Yours truly,

Novatech



Greg MacDonald, P.Eng.

Director, Land Development and Public Sector Infrastructure

c.c. Pierre Dufresne, Tartan

2021 already worsened HGLs along Daniel. What LOS is the Town willing to accept? Note that 2021 only included 75% of prev A37 area & 0% of prev A1 area.

Existing now ~ = 2021 and HGLs are high along Daniel already. Saw worsened HGLs when including Fairgrounds & Callahan 3 update. Are those approved? What is the Town willing to accept with respect to LOS? Model should be updated to reflect existing developments.

APPENDIX C

Preliminary Sanitary Sewage Calculations

WHITE LAKE ROAD SUBDIVISION - SERVICEABILITY STUDY

SANITARY SEWER ANALYSIS

	Area 37			Area 1	Units
	Allotted Flow (By Year 2021)	Allotted Flow (By Year 2031)	Proposed Flow (Year 2020)	Proposed Flow (Year 2020)	
Residential					
Number of Townhouses / Semi Detached			134	137	
Number of Persons per Townhouse / Semi			2.7	2.7	
Number of Single Family Homes (SFH)			138	144	
Number of Persons per SFH			3.4	3.4	
Design Population			831	860	
Average Daily Flow per resident			280	280	L/c/day
Peak Factor (Harmon Formula)			3.28	3.27	
Peak Residential Flow			8.83	9.12	L/s
Commercial					
Total Site Area w/ Commercial Zoning	10.65	14.2			ha
Average Commercial Daily Demand	17000	17000			L/ha/day
Peaking Factor	1.5	1.5			
Peak Commercial Flows	3.14	4.19			L/s
Extraneous Flow					
Site Area	10.65	14.2	14.6	24.9	ha
Infiltration Allowance	0.28	0.28	0.33	0.33	L/s/ha
Peak Extraneous Flows	2.98	3.98	4.82	8.22	L/s
Total Peak Sanitary Flow	6.13	8.17	13.65	17.34	L/s

Notes:

Allotted flows calculated from criteria in Town of Arnprior Water and Wastewater Master Plan (Stantec 2013)

Proposed Flows calculated using Criteria from MOE and City of Ottawa design criteria

APPENDIX D

Preliminary Water Demands, FUS Calculations, Municipal Hydrant Test data

WHITE LAKE ROAD SUBDIVISION - SERVICEABILITY STUDY
DOMESTIC WATER ANALYSIS

	Area 37			Area 1	Units
	Commercial Demands (By Year 2021)	Commercial Demands (By Year 2031)	Proposed Residential Demands	Proposed Residential Demands	
Residential					
Number of Townhouses / Semi Detached			134	137	
Number of Persons per Townhouse / Semi			2.7	2.7	
Number of Single Family Homes (SFH)			138	144	
Number of Persons per SFH			3.4	3.4	
Design Population			831	860	
Average Daily Flow per resident			300	300	L/c/day
Average Day Demand			2.89	2.99	L/s
Max Day Demand (2.5 x avg. day)			7.21	7.47	L/s
Peak Hour Demand (2.2 x max. day)			15.87	16.42	L/s
Commercial					
Total Site Area w/ Commercial Zoning	10.65	14.2			ha
Average Commercial Daily Demand	10000	10000			L/ha/day
Average Day Demand	1.23	1.64			L/s
Max Day Demand (1.5 x avg. day)	1.85	2.47			L/s
Peak Hour Demand (1.8 x max. day)	3.33	4.44			L/s
Total Peak Water Demand	3.33	4.44	15.87	16.42	L/s

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Engineers, Planners & Landscape Architects

Novatech Project #: 120051
 Project Name: White Lake Road
 Date: 25/03/2020
 Input By: Matt Hrehoriak
 Reviewed By: Greg MacDonald

Legend

Input by User
 No Information or Input Required

Building Description: Single Family House
 Wood frame

Step	Input		Value Used	Total Fire Flow (L/min)		
Base Fire Flow						
1	Construction Material		Multiplier			
	Coefficient related to type of construction C	Wood frame	Yes	1.5	1.5	
		Ordinary construction		1		
		Non-combustible construction		0.8		
		Modified Fire resistive construction (2 hrs)		0.6		
Fire resistive construction (> 3 hrs)			0.6			
2	Floor Area					
	A	Building Footprint (m ²)	120	240		
		Number of Floors/Storeys	2			
		Area of structure considered (m ²)				
F	Base fire flow without reductions		5,000			
		$F = 220 C (A)^{0.5}$				
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		Reduction/Surcharge			
	(1)	Non-combustible		-25%	-15%	
		Limited combustible	Yes	-15%		
		Combustible		0%		
		Free burning		15%		
Rapid burning			25%			
4	Sprinkler Reduction		Reduction			
	(2)	Adequately Designed System (NFPA 13)		-30%		
		Standard Water Supply		-10%		
		Fully Supervised System		-10%		
Cumulative Total			0%	0		
5	Exposure Surcharge (cumulative %)		Surcharge			
	(3)	North Side	10.1 - 20 m	15%	3,188	
		East Side	0 - 3 m	25%		
		South Side	20.1 - 30 m	10%		
		West Side	0 - 3 m	25%		
Cumulative Total			75%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	7,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	117
				or	USGPM	1,849
7	Storage Volume		Hours	2		
			m ³	840		

FUS - Fire Flow Calculations

As per 1999 Fire Underwriter's Survey Guidelines



Engineers, Planners & Landscape Architects

Novatech Project #: 120051

Project Name: White Lake Road

Date: 25/03/2020

Input By: Matt Hrehoriak

Reviewed By: Greg MacDonald

Legend

Input by User

No Information or Input Required

Building Description: Townhouses (2hr firewall every 2nd unit)

Wood frame

Step	Input		Value Used	Total Fire Flow (L/min)		
Base Fire Flow						
1	Construction Material		Multiplier	1.5		
	Coefficient related to type of construction C	Wood frame	Yes		1.5	
		Ordinary construction			1	
		Non-combustible construction			0.8	
		Modified Fire resistive construction (2 hrs)			0.6	
Fire resistive construction (> 3 hrs)			0.6			
2	Floor Area		360	6,000		
	A	Building Footprint (m ²)			180	
		Number of Floors/Storeys			2	
		Area of structure considered (m ²)				
F	Base fire flow without reductions					
Reductions or Surcharges						
3	Occupancy hazard reduction or surcharge		Reduction/Surcharge	5,100		
	(1)	Non-combustible			-25%	
		Limited combustible	Yes		-15%	
		Combustible			0%	
		Free burning			15%	
Rapid burning			25%			
4	Sprinkler Reduction		Reduction	0		
	(2)	Adequately Designed System (NFPA 13)			-30%	
		Standard Water Supply			-10%	
		Fully Supervised System			-10%	
Cumulative Total			0%			
5	Exposure Surcharge (cumulative %)		Surcharge	3,060		
	(3)	North Side	20.1 - 30 m		10%	
		East Side	2Hr Fire Wall		10%	
		South Side	10.1 - 20 m		15%	
		West Side	0 - 3 m		25%	
Cumulative Total			60%			
Results						
6	(1) + (2) + (3)	Total Required Fire Flow, rounded to nearest 1000L/min		L/min	8,000	
		(2,000 L/min < Fire Flow < 45,000 L/min)		or	L/s	133
				or	USGPM	2,114
7	Storage Volume	Required Duration of Fire Flow (hours)		Hours	2	
		Required Volume of Fire Flow (m ³)		m ³	960	



Water Hydrant Flows



The Town of Arnprior does not guarantee the accuracy, adequacy, completeness, or usefulness of any information. The Town of Arnprior does not warrant the completeness, timeliness, or positional, thematic, and attribute accuracy of the GIS data. The GIS data, cartographic products, and associated applications are not legal representations of the depicted data. GIS data is derived from public records that are constantly undergoing revision. Under no circumstances should GIS products be used for final design purposes. The Town of Arnprior provides this information on an "as is" basis without warranty of any kind, express or implied, including but not limited to warranties of merchantability or fitness for a particular purpose, and assumes no responsibility for anyone's use of the information.

0 220 440 880
Meters

Sept 2018

TOTAL NUMBER OF TESTS	350	# OF TESTS COMPLETED	292	PROJECT % COMPLETION	83.4%
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TOWN OF ARNPRIOR

2018 Fire Flow Testing Program

~Total Vol. (m3)

3100

Week Ending

21-Jun-18

TEST INFORMATION			TEST HYDRANT INFORMATION						FLOW HYDRANT(S) INFORMATION						TOTAL		
Date	Time	Test #	Test Hydrant #	Static Pressure	Residual Pressure	% Drop	Fire Flow Rating @ 20 PSI		Hydrant #	# of Ports Flowed	Pitot Pressure	Discharge Flow	Hydrant #	# of Ports Flowed	Pitot Pressure	Discharge Flow	Total Flow
				PSI	PSI	PSI	AVL. FLOW	COLOUR			PSI	USGPM			PSI	USGPM	USGAL
5/29/18	9:15 AM	1	449	65.0	64.8	0.4	46004	BLUE	447	2	28.6	1502	446	2	18.6	1211	2713
5/29/18	9:15 AM	1	Unknown	70.0	69.0	1.4	22560	BLUE	447	2	28.6	1502	446	2	18.6	1211	2714
5/29/18	9:44	2	462	62.8	42.8	31.8	885	ORANGE	460	1	17.4	587	0	0	0.0	0	587
5/29/18	9:54	3	460	64.4	26.9	58.3	585	ORANGE	459	1	14.5	534	0	0	0.0	0	534
5/29/18	10:14	4	446	67.0	52.5	21.7	4360	BLUE	445	2	18.3	1202	444	2	15.7	1112	2315
5/29/18	10:14	4	447	68.8	64.2	6.6	8347	BLUE	445	2	18.3	1202	444	2	15.7	1112	2315
5/29/18	10:29	5	444	68.6	38.7	43.5	2729	BLUE	443	2	15.5	1107	442	2	12.4	990	2098
5/29/18	10:29	5	445	67.9	47.9	29.5	3360	BLUE	443	2	15.5	1107	442	2	12.4	990	2098
5/29/18	10:57	6	442	69.8	42.6	39.0	2776	BLUE	439	2	17.8	1186	437	1	33.8	816	2002
5/29/18	10:57	6	443	70.3	47.7	32.2	3080	BLUE	439	2	17.8	1186	437	1	33.8	816	2002
5/29/18	11:37	7	440	77.9	49.4	36.6	1986	BLUE	441	2	23.3	1355	0	0	0.0	0	1355
5/29/18	11:37	7	439	76.6	50.1	34.6	2040	BLUE	441	2	23.3	1355	0	0	0.0	0	1355
5/30/18	9:10	1	184	75.3	44.2	41.4	1617	BLUE	188	2	17.8	1186	0	0	0.0	0	1186
5/30/18	9:10	1	183	80.1	58.4	27.2	2052	BLUE	188	2	17.8	1186	0	0	0.0	0	1186
5/30/18	9:31	2	189	72.7	39.2	46.2	1504	BLUE	190	2	17.6	1179	0	0	0.0	0	1179
5/30/18	9:31	2	188	76.4	33.2	56.5	1361	GREEN	190	2	17.6	1179	0	0	0.0	0	1179
5/30/18	9:46	3	192	75.9	42.4	44.1	1631	BLUE	191	2	19.4	1237	0	0	0.0	0	1237
5/30/18	9:46	3	193	81.3	55.9	31.2	1992	BLUE	191	2	19.4	1237	0	0	0.0	0	1237
5/30/18	10:11	4	191	71.5	32.3	54.8	1346	GREEN	195	2	17.1	1161	0	0	0.0	0	1161
5/30/18	10:11	4	190	69.5	30.7	55.9	1324	GREEN	195	2	17.1	1161	0	0	0.0	0	1161
5/30/18	10:28	5	196	71.7	35.0	51.2	1379	GREEN	531	2	16.7	1146	0	0	0.0	0	1146
5/30/18	10:28	5	195	73.3	36.7	49.9	1404	GREEN	531	2	16.7	1146	0	0	0.0	0	1146
5/30/18	10:51	6	532	62.8	45.7	27.3	1261	GREEN	533	1	30.0	769	0	0	0.0	0	769
5/30/18	10:51	6	531	67.7	50.7	25.1	1342	GREEN	533	1	30.0	769	0	0	0.0	0	769
5/30/18	11:23	7	204	76.0	22.9	69.9	385	RED	205	1	7.1	374	0	0	0.0	0	374
5/30/18	11:23	7	201	73.7	31.6	57.1	426	RED	205	1	7.1	374	0	0	0.0	0	374
5/30/18	11:38	8	202	78.3	17.7	77.4	404	RED	206	1	8.6	413	0	0	0.0	0	413
5/30/18	1:22	9	181	80.8	37.6	53.5	1465	GREEN	180	2	18.8	1218	0	0	0.0	0	1218

FLOWMETRIX

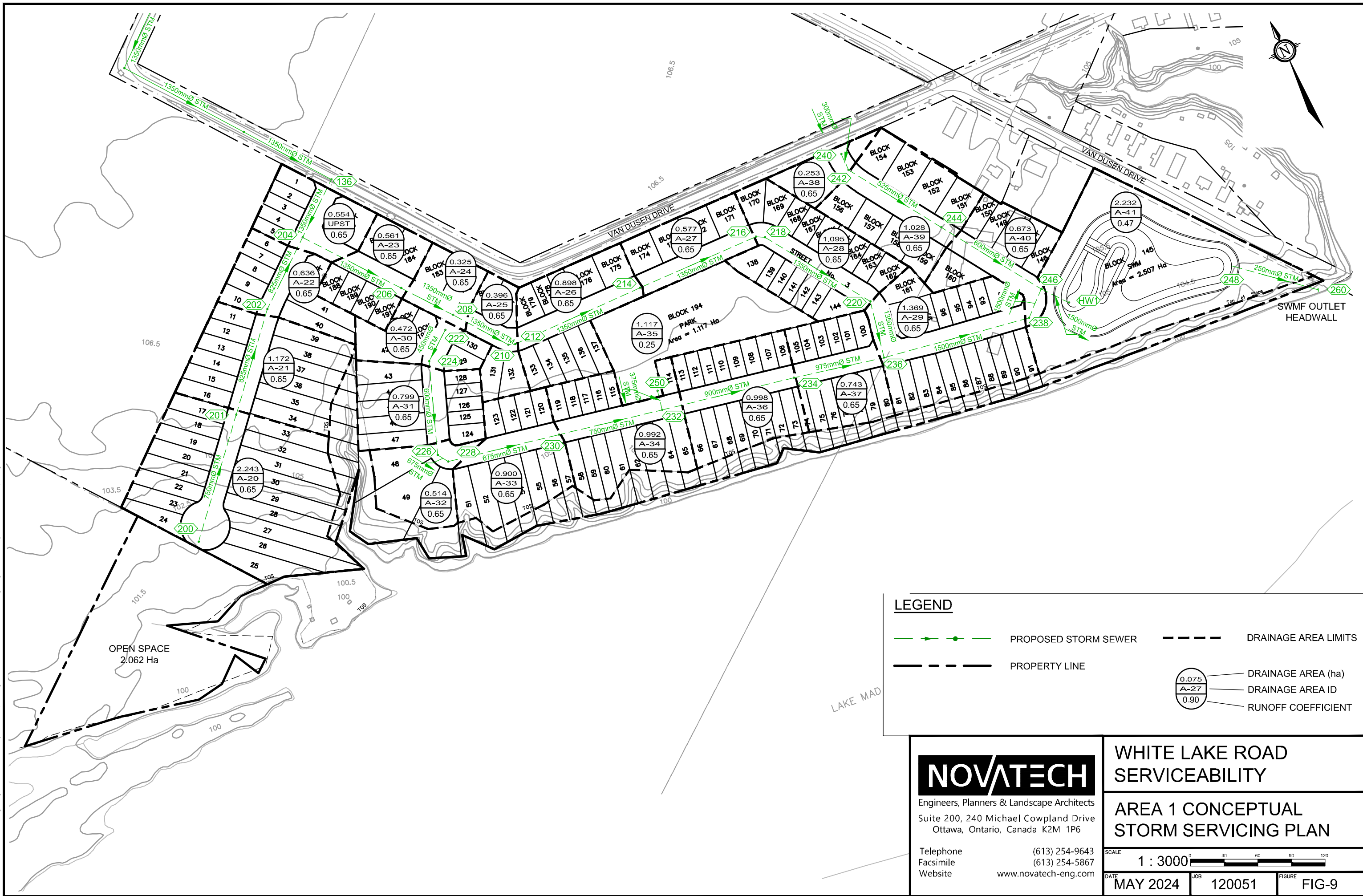
TECHNICAL SERVICES INC.

FIRE FLOW TESTING
WEEKLY OVERVIEW



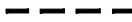

6/5/18	1:09	10	120	60.6	34.5	43.0	1501	BLUE	122	2	17.7	1182	0	0	0.0	0	1182
6/5/18	1:09	10	119	60.5	37.2	38.5	1592	BLUE	122	2	17.7	1182	0	0	0.0	0	1182
6/5/18	1:21	11	122	59.4	32.3	45.6	1408	GREEN	123	2	16.8	1150	0	0	0.0	0	1150
6/5/18	1:36	12	118	60.2	35.8	40.6	1521	BLUE	120	2	17.1	1161	0	0	0.0	0	1161
6/5/18	1:36	12	496	61.6	37.7	38.8	1567	BLUE	120	2	17.1	1162	0	0	0.0	0	1162
6/5/18	1:51	13	495	59.8	34.3	42.6	1609	BLUE	496	2	20.3	1265	0	0	0.0	0	1265
6/5/18	1:51	13	491	59.6	34.8	41.6	1627	BLUE	496	2	20.3	1265	0	0	0.0	0	1265
6/5/18	2:04	14	116	58.3	37.3	36.1	1758	BLUE	117	2	20.5	1272	0	0	0.0	0	1272
6/5/18	2:04	14	115	58.4	38.3	34.4	1804	BLUE	117	2	20.5	1272	0	0	0.0	0	1272
6/5/18	2:20	15	117	58.9	33.7	42.9	1529	BLUE	116	2	18.6	1211	0	0	0.0	0	1211
6/5/18	2:34	16	492	56.9	32.7	42.5	1475	GREEN	493	2	17.5	1175	0	0	0.0	0	1175
6/5/18	2:34	16	494	54.3	33.7	37.9	1548	BLUE	493	2	17.5	1175	0	0	0.0	0	1175
6/5/18	2:45	17	493	59.2	33.4	43.6	1522	BLUE	492	2	18.7	1215	0	0	0.0	0	1215
6/5/18	2:57	18	490	58.6	33.8	42.3	1577	BLUE	491	2	19.5	1242	0	0	0.0	0	1242
6/5/18	2:57	18	489	59.4	35.3	40.6	1619	BLUE	491	2	19.5	1242	0	0	0.0	0	1242
6/5/18	3:17	19	488	56.8	35.2	38.0	1633	BLUE	487	2	19.0	1224	0	0	0.0	0	1224
6/5/18	3:17	19	486	57.3	35.9	37.3	1653	BLUE	487	2	19.0	1224	0	0	0.0	0	1224
6/5/18	3:28	20	487	58.7	36.7	37.4	1642	BLUE	488	2	18.6	1210	0	0	0.0	0	1210
6/5/18	3:28	20	114	51.8	35.7	31.1	1747	BLUE	488	2	18.6	1210	0	0	0.0	0	1210
6/5/18	3:40	21	110	57.5	36.7	36.2	1389	GREEN	109	2	12.9	1011	0	0	0.0	0	1011
6/5/18	3:40	21	108	51.8	35.7	31.1	1460	GREEN	109	2	12.9	1011	0	0	0.0	0	1011
6/5/18	3:50	22	112	58.5	37.1	36.6	1851	BLUE	110	2	23.0	1347	0	0	0.0	0	1347
6/5/18	3:50	22	109	58.0	36.2	37.6	1819	BLUE	110	2	23.0	1347	0	0	0.0	0	1347
6/5/18	4:01	23	113	58.2	38.0	34.6	1655	BLUE	112	2	17.4	1171	0	0	0.0	0	1171
6/6/18	9:30	1	106	57.4	33.7	41.4	1450	GREEN	105	2	16.3	1134	0	0	0.0	0	1134
6/6/18	9:30	1	107	56.9	34.2	39.9	1475	GREEN	105	2	16.3	1134	0	0	0.0	0	1134
6/6/18	9:41	2	104	57.0	33.4	41.4	1413	GREEN	103	2	15.6	1109	0	0	0.0	0	1109
6/6/18	9:41	2	105	56.0	32.7	41.6	1403	GREEN	103	2	15.6	1109	0	0	0.0	0	1109
6/6/18	10:00	3	103	55.4	33.9	38.8	1565	BLUE	102	2	18.1	1196	0	0	0.0	0	1196
6/6/18	10:00	3	101	54.7	33.5	38.7	1560	BLUE	102	2	18.1	1195	0	0	0.0	0	1195
6/6/18	10:10	4	100	55.3	32.9	40.6	1517	BLUE	101	2	17.9	1188	0	0	0.0	0	1188
6/6/18	10:10	4	102	55.6	32.9	40.8	1515	BLUE	101	2	17.9	1188	0	0	0.0	0	1188
6/6/18	10:22	5	505	53.7	41.8	22.1	1460	GREEN	506	1	35.1	832	0	0	0.0	0	832
6/6/18	10:22	5	504	52.1	42.7	18.1	1615	BLUE	506	1	35.1	832	0	0	0.0	0	832
6/6/18	10:32	6	506	56.0	41.0	26.7	1270	GREEN	507	1	31.7	791	0	0	0.0	0	791
6/6/18	10:32	6	505	56.4	41.5	26.4	1281	GREEN	507	1	31.7	791	0	0	0.0	0	791
6/6/18	10:43	7	516	52.5	29.1	44.6	1233	GREEN	508	2	13.5	1033	0	0	0.0	0	1033
6/6/18	10:43	7	507	52.4	29.4	43.9	1243	GREEN	508	2	13.5	1033	0	0	0.0	0	1033
6/6/18	10:53	8	515	50.1	40.4	19.4	2244	BLUE	516	2	18.8	1218	0	0	0.0	0	1218
6/6/18	10:53	8	508	50.5	38.9	22.9	2056	BLUE	516	2	18.8	1218	0	0	0.0	0	1218
6/6/18	11:03	9	511	60.1	39.5	34.3	1801	BLUE	512	2	20.0	1257	0	0	0.0	0	1257

APPENDIX E
IDF Curves and Preliminary SWM Calculations

M:\2020\120051\CAD\Design\Figures\Serviceability\New Report\Figures\120051-Area 1 Servicing.dwg, FIG-9, May 30, 2024 - 2:05pm, rgood



LEGEND

-  PROPOSED STORM SEWER
-  PROPERTY LINE
-  DRAINAGE AREA LIMITS
-  DRAINAGE AREA (ha)
DRAINAGE AREA ID
RUNOFF COEFFICIENT

NOVATECH

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

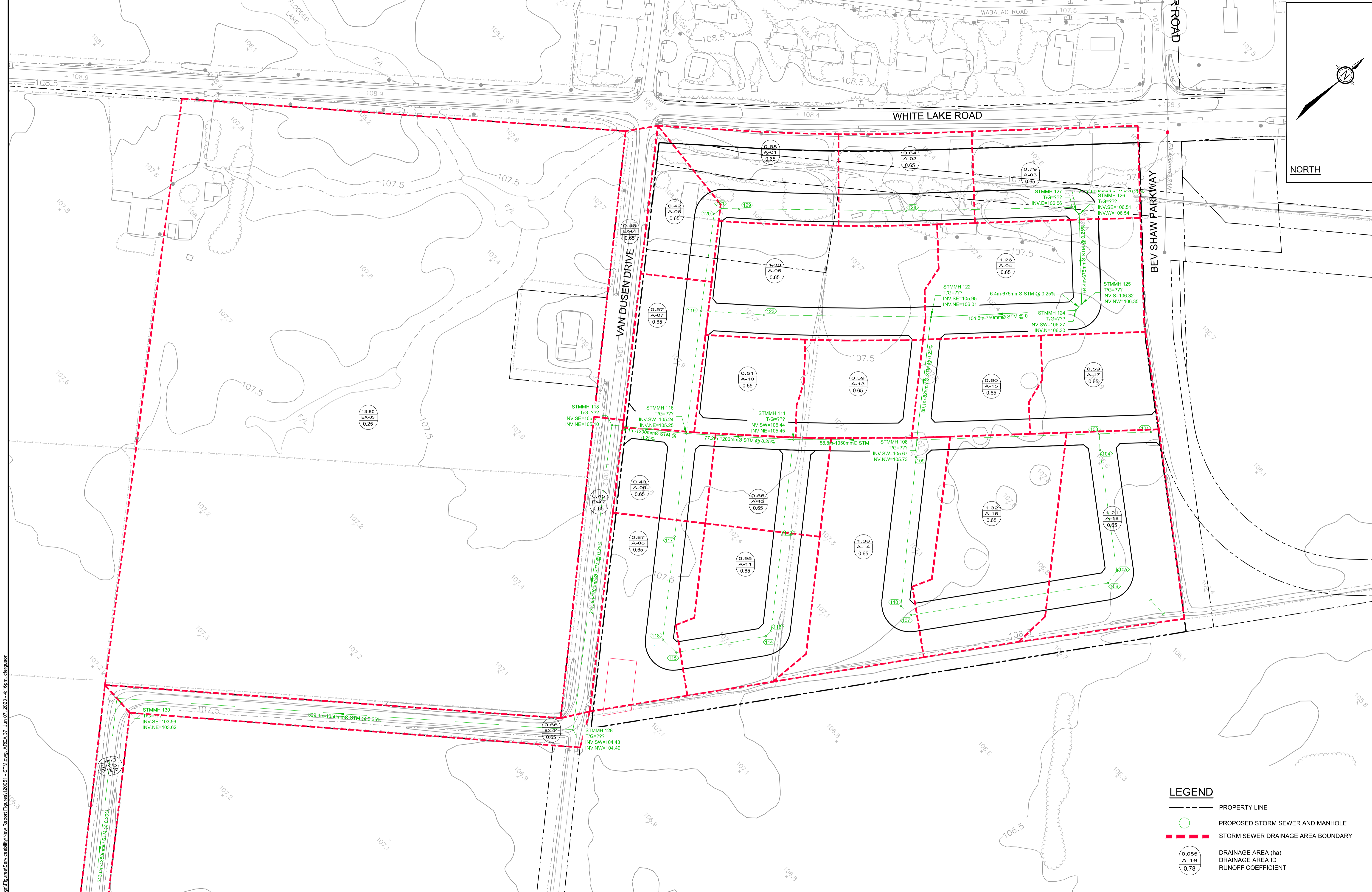
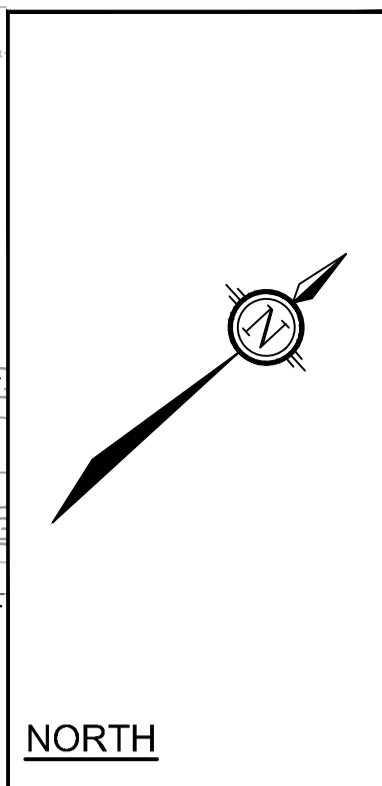
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

**WHITE LAKE ROAD
SERVICEABILITY**

**AREA 1 CONCEPTUAL
STORM SERVICING PLAN**

SCALE 1 : 3000

DATE MAY 2024 JOB 120051 FIGURE FIG-9



LEGEND

- PROPERTY LINE
- PROPOSED STORM SEWER AND MANHOLE
- STORM SEWER DRAINAGE AREA BOUNDARY
- | |
|-------|
| 0.085 |
| A-16 |
| 0.78 |

 DRAINAGE AREA (ha)
DRAINAGE AREA ID
RUNOFF COEFFICIENT

I:\projects\2018\20051\20051\CAD\Design\Figures\Accessibility\New Report\Figures\Area 37 Jun 07 2023 - 4.18pm.dwg
 20051-STM-2



SCALE
1:1250

NOVATECH
 Engineers, Planners & Landscape Architects
 Suite 200, 240 Michael Cowpland Drive
 Ottawa, Ontario, Canada K2M 1R6
 Telephone: (613) 254-9643
 Facsimile: (613) 254-5867
 Website: www.novatech-eng.com

LOCATION ARNPRIOR, ONTARIO 000 VAN DUSEN DRIVE & 640 WHITE LAKE ROAD	PROJECT No. 120051
DRAWING NAME STORM DRAINAGE AREA PLAN	DATE JUN 2023
	DRAWING No. 120051-STM-2

Project: 647 White Lake Road Lands and 000 Van Duen Drive
 Location: Arnprior, Ontario
 Client: Tartan Homes

DATE: June 1, 2023
 REV: May 29, 2024



Storm Sewer Design Sheet

LOCATION			FLOW				PROPOSED SEWER															
STREET	FROM	TO	AREA ID	R= 0.25	R= 0.55	R= 0.65	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	NOMINAL SIZE (mm)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull	
640 White Lake Road																						
	121	129						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	13.1	71.41	0.98	0.22	71.41	0.00	
	129	128	A01			0.680		1.23	1.23	10.22	103.03	126.60	450	457.2	0.25	120.0	148.87	0.91	2.21	22.27	0.85	
	128	127	A02			0.640		1.16	2.39	12.43	92.89	221.57	600	609.6	0.25	120.0	320.60	1.10	1.82	99.03	0.69	
	127	126						0.00	2.39	14.25	86.05	205.25	600	609.6	0.25	7.0	320.60	1.10	0.11	115.36	0.64	
	126	125	A03			0.790		1.43	3.81	14.36	85.68	326.69	675	685.8	0.25	64.4	438.91	1.19	0.90	112.22	0.74	
	125	124						0.00	3.81	15.26	82.71	315.37	675	685.8	0.25	6.4	438.91	1.19	0.09	123.54	0.72	
	124	122	A04			1.260		2.28	6.09	15.35	82.43	501.97	750	762.0	0.25	104.6	581.29	1.27	1.37	79.33	0.86	
	119	123						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	45.7	71.41	0.98	0.78	71.41	0.00	
	123	122	A05			1.300		2.35	2.35	10.78	100.25	235.50	600	609.6	0.30	120.0	351.20	1.20	1.66	115.71	0.67	
	122	108						0.00	8.44	16.72	78.37	661.37	825	838.2	0.25	89.2	749.51	1.36	1.10	88.13	0.88	
	121	120						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	6.4	71.41	0.98	0.11	71.41	0.00	
	120	119	A06			0.420		0.76	0.76	10.11	103.62	78.64	375	381.0	0.35	70.2	108.32	0.95	1.23	29.68	0.73	
	119	116	A07			0.570		1.03	1.79	11.34	97.60	174.60	525	533.4	0.25	89.1	224.55	1.00	1.48	49.95	0.78	
	115	118						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	13.5	71.41	0.98	0.23	71.41	0.00	
	118	117	A08			0.870		1.57	1.57	10.23	102.99	161.91	525	533.4	0.25	74.7	224.55	1.00	1.24	62.64	0.72	
	117	116	A09			0.430		0.78	2.35	11.47	97.02	227.91	600	609.6	0.25	74.7	320.60	1.10	1.13	92.70	0.71	
	115	114						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	65.3	71.41	0.98	1.11	71.41	0.00	
	114	113						0.00	0.00	11.11	98.66	0.00	300	304.8	0.50	5.8	71.41	0.98	0.10	71.41	0.00	
	113	112	A11			0.950		1.72	1.72	11.21	98.20	168.57	600	609.6	0.25	69.2	320.60	1.10	1.05	152.03	0.53	
	112	111	A12			0.560		1.01	2.73	12.26	93.59	255.36	600	609.6	0.25	69.2	320.60	1.10	1.05	65.24	0.80	
	107	110						0.00	0.00	10.00	104.19	0.00	300	304.8	0.50	7.1	71.41	0.98	0.12	71.41	0.00	
	110	109	A14			1.380		2.49	2.49	10.12	103.56	258.24	600	609.6	0.25	107.8	320.60	1.10	1.64	62.37	0.81	
	109	108						0.00	2.49	11.76	95.74	238.74	600	609.6	0.25	12.3	320.60	1.10	0.19	81.86	0.74	
	107	106	A16			1.320		2.39	2.39	10.00	104.19	248.53	525	533.4	0.50	144.0	317.57	1.42	1.69	69.04	0.78	
	106	105						0.00	2.39	11.69	96.04	229.07	525	533.4	0.50	8.0	317.57	1.42	0.09	88.49	0.72	
	105	104	A18			1.210		2.19	4.57	11.78	95.63	437.18	750	762.0	0.25	88.5	581.29	1.27	1.16	144.12	0.75	
	104	103						0.00	4.57	12.94	90.85	415.35	750	762.0	0.25	12.1	581.29	1.27	0.16	165.94	0.71	
	101	103	A17			0.590		1.07	1.07	10.00	104.19	111.08	450	450.0	0.35	38.0	168.84	1.06	0.60	57.76	0.66	
	103	108	A15			0.600		1.08	6.72	10.60	101.14	679.87	825	838.2	0.25	132.0	749.51	1.36	1.62	69.63	0.91	
	108	111	A13			0.590		1.07	18.72	17.82	75.43	1412.15	1050	1066.8	0.25	90.0	1425.83	1.59	0.94	13.69	0.99	
	111	116	A10			0.510		0.92	22.37	18.76	73.10	1635.19	1200	1219.2	0.25	77.5	2035.70	1.74	0.74	400.51	0.80	
	116	118						0.00	26.51	19.50	71.36	1891.77	1200	1219.2	0.25	54.0	2035.70	1.74	0.52	143.93	0.93	
Van Dusen Drive	118	128	EXT			0.910		1.64	28.15	20.02	70.21	1976.65	1200	1219.2	0.25	208.0	2035.70	1.74	1.99	59.05	0.97	
	128	130	EXT	13.800		0.660		10.78	38.94	22.01	66.13	2574.89	1350	1371.6	0.25	318.0	2786.90	1.88	2.81	212.00	0.92	
	130	136				0.450		0.81	39.75	24.82	61.18	2432.01	1350	1371.6	0.20	216.0	2492.68	1.69	2.14	60.66	0.98	

LOCATION							FLOW					PROPOSED SEWER									
STREET	FROM	TO	AREA ID	R= 0.25	R= 0.55	R= 0.65	R= 0.65	INDIV 2.78 AR	ACCUM 2.78 AR	TIME OF CONC.	RAINFALL INTENSITY I	PEAK FLOW Q (l/s)	NOMINAL SIZE (mm)	PIPE SIZE (mm)	PIPE SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	FULL FLOW VELOCITY (m/s)	TIME OF FLOW (min.)	EXCESS CAPACITY (l/s)	Q/Qfull
000 Van Dusen																					
	200	201	A20			2.243		4.05	4.05	10.00	104.19	422.25	750	762.0	0.25	118.3	581.29	1.27	1.55	159.04	0.73
	201	202	A21			1.172		2.12	6.17	11.55	96.67	596.44	825	838.2	0.25	98.0	749.51	1.36	1.20	153.07	0.80
	202	204	A22			0.636		1.15	7.32	11.21	98.20	718.76	825	838.2	0.30	71.4	821.04	1.49	0.80	102.29	0.88
	136	204	UPST			0.554		1.00	40.75	26.96	57.94	2361.07	1350	1371.6	0.30	55.1	3052.89	2.06	0.44	691.82	0.77
	204	206	A23			0.561		1.01	49.08	27.40	57.31	2813.08	1350	1371.6	0.30	98.8	3052.89	2.06	0.80	239.82	0.92
	206	208	A24			0.325		0.59	49.67	28.20	56.22	2792.61	1350	1371.6	0.30	52.0	3052.89	2.06	0.42	260.28	0.91
	208	210	A25			0.396		0.72	50.39	28.62	55.67	2804.90	1350	1371.6	0.30	56.1	3052.89	2.06	0.45	248.00	0.92
	210	212	A25					0.00	50.39	29.07	55.08	2775.40	1350	1371.6	0.30	6.2	3052.89	2.06	0.05	277.50	0.91
	212	214	A26			0.898		1.62	52.01	29.12	55.02	2861.48	1350	1371.6	0.30	122.0	3052.89	2.06	0.99	191.42	0.94
	214	216	A27			0.577		1.04	53.05	30.11	53.80	2853.96	1350	1371.6	0.30	112.9	3052.89	2.06	0.91	198.93	0.93
	216	218	A28			1.095		1.98	55.03	31.02	52.72	2900.97	1350	1371.6	0.30	8.2	3052.89	2.06	0.07	151.93	0.95
	218	220				0.000		0.00	55.03	31.09	52.64	2896.78	1350	1371.6	0.30	110.0	3052.89	2.06	0.89	156.11	0.95
	220	236				0.000		0.00	55.03	31.97	51.64	2841.61	1350	1371.6	0.30	51.7	3052.89	2.06	0.42	211.28	0.93
	222	224	A30			0.472		0.85	0.85	10.00	104.19	88.87	450	457.2	0.25	31.4	148.87	0.91	0.58	59.99	0.60
	224	226	A31			0.799		1.44	2.30	10.58	101.24	232.49	600	609.6	0.25	84.0	320.60	1.10	1.28	88.11	0.73
	226	228	A32			0.514		0.93	3.22	11.85	95.33	307.39	675	685.8	0.25	55.0	438.91	1.19	0.77	131.51	0.70
	228	230	A33			0.900		1.63	4.85	12.63	92.11	446.78	675	685.8	0.30	101.7	480.80	1.30	1.30	34.02	0.93
	230	232	A34			0.992		1.79	6.64	13.93	87.18	579.27	750	762.0	0.30	94.6	636.77	1.39	1.13	57.51	0.91
	250	232	A35	1.117				0.78	0.78	10.00	104.19	80.89	375	381.0	0.25	17.6	91.55	0.80	0.37	10.66	0.88
	232	234	A36			0.998		1.80	9.22	15.06	83.37	768.93	900	914.4	0.25	120.8	945.25	1.44	1.40	176.32	0.81
	234	236	A37			0.743		1.34	10.57	16.46	79.12	835.94	975	990.6	0.25	82.5	1170.16	1.52	0.91	334.21	0.71
	236	238	A29			1.369		2.47	68.07	32.39	51.18	3483.89	1500	1524.0	0.25	134.0	3690.98	2.02	1.11	207.08	0.94
	238	246	A40			0.000		0.00	68.07	33.50	50.01	3404.44	1500	1524.0	0.25	27.9	3690.98	2.02	0.23	286.53	0.92
	240	242	A38			0.253		0.46	0.46	10.00	104.19	47.65	300	304.8	0.25	15.5	50.49	0.69	0.37	2.85	0.94
	242	244	A39			1.028		1.86	2.32	10.37	102.26	236.74	525	533.4	0.30	97.3	245.99	1.10	1.47	9.25	0.96
	244	246	A-40			0.673		1.22	3.53	11.85	95.35	336.74	600	609.6	0.30	97.3	351.20	1.20	1.35	14.46	0.96
	246	HW1				0.000		0.00	71.60	33.73	49.78	3564.22	1500	1524.0	0.25	27.4	3690.98	2.02	0.23	126.75	0.97

14.917 33.887

Definitions

Q = 2.78 AIR
Q = Peak Flow, in Litres per second (L/s)
A = Area in hectares (ha)
I = Rainfall Intensity (mm/h)

Notes:

- 1) Ottawa Rainfall-Intensity Curve
- 2) Min Velocity = 0.80 m/sec.

White Lake Road (120051) Pre-Development Model Parameters

Time to Peak Calculations

(Airport Formula)

Existing Conditions

Area ID	Area (ha)	C	Slope (%)	Length (m)	Tc (min)	Tp (min)
Area 1	16.91	0.25	2.4	250	33	20
Area 37	14.67	0.25	0.5	440	75	45
Area 7	13.80	0.25	0.2	430	93	56

$$T_c = \frac{3.26 (1.1 - C) L^{0.5}}{S_w^{0.33}}$$

Weighted Curve Number Calculations

Soil type 'D'

Area ID	Land Use 1	Area	CN	Land Use 2	Area	CN	Weighted CN
Area 1	Row Crops	89%	85	Farmstead	11%	86	85.1
Area 37	Row Crops	80%	85	Farmstead	20%	86	85.2
Area 7	Row Crops	97%	85	Farmstead	3%	86	85.0

Weighted IA Calculations

Area ID	Land Use 1	Area	IA	Land Use 2	Area	IA	Weighted IA
Area 1	Row Crops	89%	9.0	Farmstead	11%	8.3	8.9
Area 37	Row Crops	80%	9.0	Farmstead	20%	8.3	8.8
Area 7	Row Crops	97%	9.0	Farmstead	3%	8.3	8.9

White Lake Road (120051)
Post-Development Model Parameters



Area ID	Catchment Area (ha)	Runoff Coefficient (C)	Percent Impervious (%)	No Depression (%)	Flow Path Length (m)	Equivalent Width (m)	Average Slope (%)
Area 1	16.91	0.65	64%	40%	1000	169.10	2%
Area 37	14.67	0.65	64%	40%	500	293.40	2%
EX-01	0.46	0.65	64%	0%	210	21.90	2%
EX-02	0.45	0.65	64%	0%	220	20.45	2%
EX-03 (Area 7)	13.80	0.25	7%	0%	430	320.93	23%
EX-04	0.66	0.65	64%	0%	330	20.00	2%
EX-05	0.45	0.65	64%	0%	220	20.45	2%
TOTAL:	47.40	0.53	48%				

White Lake Road (120051)
Design Storm Time Series Data
4-hour Chicago Design Storms



C25mm-4.stm		C2-4.stm		C5-4.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0	0:00	0	0:00	0
0:10	1.51	0:10	2.05	0:10	2.68
0:20	1.75	0:20	2.37	0:20	3.1
0:30	2.07	0:30	2.81	0:30	3.68
0:40	2.58	0:40	3.5	0:40	4.58
0:50	3.46	0:50	4.69	0:50	6.15
1:00	5.39	1:00	7.3	1:00	9.61
1:10	13.44	1:10	18.21	1:10	24.17
1:20	56.67	1:20	76.81	1:20	104.19
1:30	17.77	1:30	24.08	1:30	32.04
1:40	9.12	1:40	12.36	1:40	16.34
1:50	6.14	1:50	8.32	1:50	10.96
2:00	4.65	2:00	6.3	2:00	8.29
2:10	3.76	2:10	5.09	2:10	6.69
2:20	3.17	2:20	4.29	2:20	5.63
2:30	2.74	2:30	3.72	2:30	4.87
2:40	2.43	2:40	3.29	2:40	4.3
2:50	2.18	2:50	2.95	2:50	3.86
3:00	1.98	3:00	2.68	3:00	3.51
3:10	1.81	3:10	2.46	3:10	3.22
3:20	1.68	3:20	2.28	3:20	2.98
3:30	1.56	3:30	2.12	3:30	2.77
3:40	1.47	3:40	1.99	3:40	2.6
3:50	1.38	3:50	1.87	3:50	2.44
4:00	1.31	4:00	1.77	4:00	2.31

**White Lake Road (120051)
Design Storm Time Series Data
4-hour Chicago Design Storms**



C100-4.stm		C100-4+20%.stm	
Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr
0:00	0	0:00	0
0:10	4.39	0:10	5.27
0:20	5.07	0:20	6.08
0:30	6.05	0:30	7.26
0:40	7.54	0:40	9.05
0:50	10.16	0:50	12.19
1:00	15.97	1:00	19.16
1:10	40.65	1:10	48.78
1:20	178.56	1:20	214.27
1:30	54.05	1:30	64.86
1:40	27.32	1:40	32.78
1:50	18.24	1:50	21.89
2:00	13.74	2:00	16.49
2:10	11.06	2:10	13.27
2:20	9.29	2:20	11.15
2:30	8.02	2:30	9.62
2:40	7.08	2:40	8.5
2:50	6.35	2:50	7.62
3:00	5.76	3:00	6.91
3:10	5.28	3:10	6.34
3:20	4.88	3:20	5.86
3:30	4.54	3:30	5.45
3:40	4.25	3:40	5.1
3:50	3.99	3:50	4.79
4:00	3.77	4:00	4.52

White Lake Road (120051)
Design Storm Time Series Data
SCS Design Storms



S2-12.stm		S5-12.stm		S100-12.stm	
Duration	Intensity	Duration	Intensity	Duration	Intensity
min	mm/hr	min	mm/hr	min	mm/hr
0:00	0.00	0:00	0	0:00	0
0:30	1.27	0:30	1.69	0:30	2.82
1:00	0.59	1:00	0.79	1:00	1.31
1:30	1.10	1:30	1.46	1:30	2.44
2:00	1.10	2:00	1.46	2:00	2.44
2:30	1.44	2:30	1.91	2:30	3.19
3:00	1.27	3:00	1.69	3:00	2.82
3:30	1.69	3:30	2.25	3:30	3.76
4:00	1.69	4:00	2.25	4:00	3.76
4:30	2.29	4:30	3.03	4:30	5.07
5:00	2.88	5:00	3.82	5:00	6.39
5:30	4.57	5:30	6.07	5:30	10.14
6:00	36.24	6:00	48.08	6:00	80.38
6:30	9.23	6:30	12.25	6:30	20.47
7:00	4.06	7:00	5.39	7:00	9.01
7:30	2.71	7:30	3.59	7:30	6.01
8:00	2.37	8:00	3.15	8:00	5.26
8:30	1.86	8:30	2.47	8:30	4.13
9:00	1.95	9:00	2.58	9:00	4.32
9:30	1.27	9:30	1.69	9:30	2.82
10:00	1.02	10:00	1.35	10:00	2.25
10:30	1.44	10:30	1.91	10:30	3.19
11:00	0.93	11:00	1.24	11:00	2.07
11:30	0.85	11:30	1.12	11:30	1.88
12:00	0.85	12:00	1.12	12:00	1.88

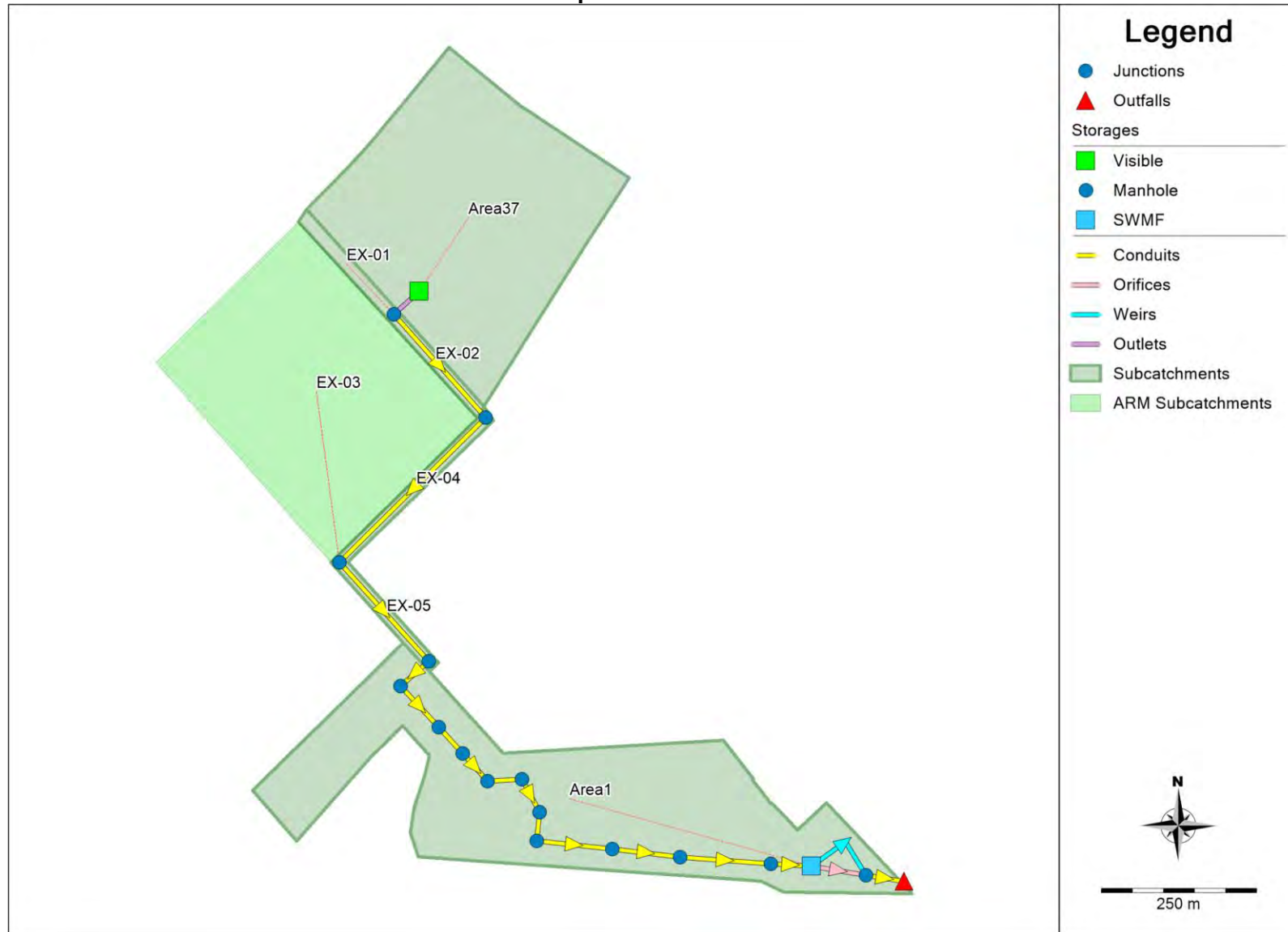
Pre-Development – Model Schematic



Date: 2020-11-20

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Post-Development – Model Schematic



Date: 2020-11-20

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White Lake Road (120051)

Pre-Development Model Results - 100-year 4-hour Chicago Storm Event

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.5.3406

This is a new version of ARM - your feedback and suggestions are solicited.
 Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time: 11/13/2020 00:00:00
 Simulation end time: 11/15/2020 00:00:00
 Runoff wet weather time steps: 300 seconds
 Report time steps: 60 seconds
 Number of data points: 2881

 Unit Hydrographs Runoff Method

Time after Peak Subcatchment (min)	Peak UH Flow (m ³ /s/mm)	UH Depth (mm)	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)
Areal 148	Nash IUH 0.06935	1		Raingage	16.91	33	22
Area37 300	Nash IUH 0.02647	1		Raingage	14.67	75	50
EX-03 (Area7) 363	Nash IUH 0.02008	1		Raingage	13.8	93	62

 ARM Runoff Summary

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff (10 ⁶ ltr)	Peak Runoff (LPS)	Runoff Coeff (fraction)
Areal	76.002	35.646	40.349	6.823	1573.228	0.531
Area37	76.002	35.435	40.559	5.95	762.452	0.534
EX-03 (Area7)	76.002	35.773	40.225	5.551	604.182	0.529

Areal	76.002	35.646	40.349	6.823	1573.228	0.531
Area37	76.002	35.435	40.559	5.95	762.452	0.534
EX-03 (Area7)	76.002	35.773	40.225	5.551	604.182	0.529

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

 Element Count

Number of rain gages 1
 Number of subcatchments ... 4
 Number of nodes 2
 Number of links 0
 Number of pollutants 0
 Number of land uses 0

 Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage	03-C4hr-100yr	INTENSITY	10 min.

 Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EX-01	0.46	46.00	64.00	2.0000	Raingage	MADAWASKA
EX-02	0.45	45.00	64.00	2.0000	Raingage	MADAWASKA
EX-04	0.66	66.00	64.00	2.0000	Raingage	MADAWASKA
EX-05	0.45	45.00	64.00	2.0000	Raingage	MADAWASKA

White Lake Road (120051)

Pre-Development Model Results - 100-year 4-hour Chicago Storm Event

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DITCH	OUTFALL	106.00	0.00	0.0	
MADAWASKA	OUTFALL	100.00	0.00	0.0	

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units LPS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing NO
 Water Quality NO
Infiltration Method HORTON
Surcharge Method EXTRAN
Starting Date 11/13/2020 00:00:00
Ending Date 11/15/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00

Runoff Quantity Continuity Volume Depth
 hectare-m mm

Total Precipitation 0.154 76.002
Evaporation Loss 0.000 0.000
Infiltration Loss 0.036 18.038
Surface Runoff 0.116 57.524
Final Storage 0.002 1.005
Continuity Error (%) -0.744

Volume Volume
Flow Routing Continuity hectare-m 10^6 ltr

Dry Weather Inflow 0.000 0.000
Wet Weather Inflow 0.116 1.162
Groundwater Inflow 0.000 0.000
RDII Inflow 0.000 0.000
External Inflow 1.832 18.324
External Outflow 1.949 19.486
Flooding Loss 0.000 0.000
Evaporation Loss 0.000 0.000
Exfiltration Loss 0.000 0.000
Initial Stored Volume 0.000 0.000
Final Stored Volume 0.000 0.000
Continuity Error (%) 0.000

Subcatchment Runoff Summary

Peak Runoff		Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff
Runoff Coeff		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Subcatchment		LPS							
EX-01		76.00	0.00	0.00	18.04	47.99	9.54	57.52	0.26
175.63	0.757								

White Lake Road (120051)

Pre-Development Model Results - 100-year 4-hour Chicago Storm Event

EX-02		76.00	0.00	0.00	18.04	47.99	9.54	57.52	0.26
171.81	0.757								
EX-04		76.00	0.00	0.00	18.04	47.99	9.54	57.52	0.38
251.99	0.757								
EX-05		76.00	0.00	0.00	18.04	47.99	9.54	57.52	0.26
171.81	0.757								

Analysis begun on: Fri Jun 9 13:44:40 2023
Analysis ended on: Fri Jun 9 13:44:40 2023
Total elapsed time: < 1 sec

White Lake Road (120051)

Pre-Development Model Results - 100-year 12-hour SCS Storm Event

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.5.3406

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time: 11/13/2020 00:00:00
Simulation end time: 11/15/2020 00:00:00
Runoff wet weather time steps: 300 seconds
Report time steps: 60 seconds
Number of data points: 2881

Unit Hydrographs Runoff Method

Time after Peak Subcatchment (min)	Peak UH Flow (m ³ /s/mm)	UH Depth (mm)	Runoff Method	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)
Areal 148	Nash IUH 0.06935	1		Raingage	16.91	33	22
Area37 300	Nash IUH 0.02647	1		Raingage	14.67	75	50
EX-03 (Area7) 363	Nash IUH 0.02008	1		Raingage	13.8	93	62

ARM Runoff Summary

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff (10 ⁶ ltr)	Peak Runoff (LPS)	Runoff Coeff (fraction)
Areal	93.91	38.098	55.801	9.436	1704.948	0.594
Area37	93.91	37.858	56.046	8.222	880.009	0.597
EX-03 (Area7)	93.91	38.249	55.652	7.68	703.968	0.593

Areal	93.91	38.098	55.801	9.436	1704.948	0.594
Area37	93.91	37.858	56.046	8.222	880.009	0.597
EX-03 (Area7)	93.91	38.249	55.652	7.68	703.968	0.593

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

Element Count

Number of rain gages 1
Number of subcatchments ... 4
Number of nodes 2
Number of links 0
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage	07-S12hr-100yr	INTENSITY	30 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
EX-01	0.46	46.00	64.00	2.0000	Raingage	MADAWASKA
EX-02	0.45	45.00	64.00	2.0000	Raingage	MADAWASKA
EX-04	0.66	66.00	64.00	2.0000	Raingage	MADAWASKA
EX-05	0.45	45.00	64.00	2.0000	Raingage	MADAWASKA

White Lake Road (120051)

Pre-Development Model Results - 100-year 12-hour SCS Storm Event

Node Summary

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
DITCH	OUTFALL	106.00	0.00	0.0	
MADAWASKA	OUTFALL	100.00	0.00	0.0	

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units LPS
Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing NO
 Water Quality NO
Infiltration Method HORTON
Surcharge Method EXTRAN
Starting Date 11/13/2020 00:00:00
Ending Date 11/15/2020 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Wet Time Step 00:05:00
Dry Time Step 00:05:00

Runoff Quantity Continuity Volume Depth
 hectare-m mm

Total Precipitation 0.190 93.910
Evaporation Loss 0.000 0.000
Infiltration Loss 0.048 23.717
Surface Runoff 0.140 69.484
Final Storage 0.002 1.005
Continuity Error (%) -0.315

Flow Routing Continuity Volume Volume
 hectare-m 10^6 ltr

Dry Weather Inflow 0.000 0.000
Wet Weather Inflow 0.140 1.404
Groundwater Inflow 0.000 0.000
RDII Inflow 0.000 0.000
External Inflow 2.534 25.338
External Outflow 2.674 26.742
Flooding Loss 0.000 0.000
Evaporation Loss 0.000 0.000
Exfiltration Loss 0.000 0.000
Initial Stored Volume 0.000 0.000
Final Stored Volume 0.000 0.000
Continuity Error (%) 0.000

Subcatchment Runoff Summary

Peak Runoff		Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff
Runoff Coeff		mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Subcatchment									
LPS									
EX-01		93.91	0.00	0.00	23.72	59.32	10.16	69.48	0.32
91.15	0.740								

White Lake Road (120051) Pre-Development Model Results - 100-year 12-hour SCS Storm Event

EX-02		93.91	0.00	0.00	23.72	59.32	10.16	69.48	0.31
89.17	0.740								
EX-04		93.91	0.00	0.00	23.72	59.32	10.16	69.48	0.46
130.78	0.740								
EX-05		93.91	0.00	0.00	23.72	59.32	10.16	69.48	0.31
89.17	0.740								

Analysis begun on: Thu Jun 8 16:59:24 2023
Analysis ended on: Thu Jun 8 16:59:24 2023
Total elapsed time: < 1 sec

White Lake Road (120051) Post-Development Model Results - 100-year 4-hour Chicago Storm Event

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.5.3406

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time: 11/13/2020 00:00:00
Simulation end time: 11/15/2020 00:00:00
Runoff wet weather time steps: 300 seconds
Report time steps: 60 seconds
Number of data points: 2881

Unit Hydrographs Runoff Method

Time after Peak Subcatchment (min)	Peak UH Flow Runoff Method (m ³ /s/mm)	UH Depth (mm)	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)
EX-03 363	Nash IUH 0.02008	1	Raingage	13.8	93	62

ARM Runoff Summary

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10 ⁶ ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-03	76.002	35.773	40.225	5.551	604.182	0.529

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

Element Count

Number of rain gages 1
Number of subcatchments ... 6
Number of nodes 18
Number of links 18
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage	03-C4hr-100yr	INTENSITY	10 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Area1	16.91	169.10	64.00	2.0000	Raingage	SWMF
Area37	14.67	293.40	64.00	2.0000	Raingage	STORE-Area37
EX-01	0.46	21.91	64.00	2.0000	Raingage	MH118
EX-02	0.45	20.45	64.00	2.0000	Raingage	MH128
EX-04	0.66	20.00	64.00	2.0000	Raingage	MH130
EX-05	0.45	20.45	64.00	2.0000	Raingage	MH136

Node Summary

White Lake Road (120051) Post-Development Model Results - 100-year 4-hour Chicago Storm Event

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	100.50	2.00	0.0	
MADAWASKA	OUTFALL	100.45	1.00	0.0	
MH118	STORAGE	105.04	2.16	0.0	
MH128	STORAGE	104.43	2.26	0.0	
MH130	STORAGE	103.56	2.89	0.0	
MH136	STORAGE	103.07	2.27	0.0	
MH204	STORAGE	102.89	2.27	0.0	
MH206	STORAGE	102.66	2.22	0.0	
MH208	STORAGE	102.46	2.27	0.0	
MH209	STORAGE	102.28	2.24	0.0	
MH210	STORAGE	102.08	2.27	0.0	
MH211	STORAGE	101.91	2.23	0.0	
MH216	STORAGE	101.73	2.27	0.0	
MH217	STORAGE	101.36	2.22	0.0	
MH223	STORAGE	101.02	2.22	0.0	
MH224	STORAGE	100.50	2.22	0.0	
STORE-Area37	STORAGE	106.50	1.75	0.0	
SWMF	STORAGE	99.50	3.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	MADAWASKA	CONDUIT	5.0	1.0001	0.0350
MH118-128	MH118	MH128	CONDUIT	221.3	0.2485	0.0130
MH128-130	MH128	MH130	CONDUIT	329.4	0.2459	0.0130
MH130-136	MH130	MH136	CONDUIT	213.6	0.2013	0.0130
MH136-204	MH136	MH204	CONDUIT	60.3	0.1990	0.0130
MH204-206	MH204	MH206	CONDUIT	89.7	0.2453	0.0130
MH206-208	MH206	MH208	CONDUIT	56.6	0.2474	0.0130
MH208-209	MH208	MH209	CONDUIT	60.0	0.2500	0.0130
MH209-210	MH209	MH210	CONDUIT	55.4	0.2527	0.0130
MH210-211	MH210	MH211	CONDUIT	60.2	0.2492	0.0130
MH211-216	MH211	MH216	CONDUIT	46.0	0.2609	0.0130
MH216-217	MH216	MH217	CONDUIT	121.4	0.2965	0.0130
MH217-223	MH217	MH223	CONDUIT	109.7	0.3008	0.0130

MH223-224	MH223	MH224	CONDUIT	145.4	0.3508	0.0130
MH224-SWMF	MH224	SWMF	CONDUIT	50.0	0.4000	0.0130
OR1	SWMF	J1	ORIFICE			
W1	SWMF	J1	WEIR			
OUT-Area37	STORE-Area37	MH118	OUTLET			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	1.00	4.00	0.55	7.00	1	7636.27
MH118-128	CIRCULAR	1.20	1.13	0.30	1.20	1	1943.75
MH128-130	CIRCULAR	1.35	1.43	0.34	1.35	1	2646.90
MH130-136	CIRCULAR	1.35	1.43	0.34	1.35	1	2394.92
MH136-204	CIRCULAR	1.35	1.43	0.34	1.35	1	2381.16
MH204-206	CIRCULAR	1.35	1.43	0.34	1.35	1	2643.45
MH206-208	CIRCULAR	1.35	1.43	0.34	1.35	1	2654.68
MH208-209	CIRCULAR	1.35	1.43	0.34	1.35	1	2668.87
MH209-210	CIRCULAR	1.35	1.43	0.34	1.35	1	2683.28
MH210-211	CIRCULAR	1.35	1.43	0.34	1.35	1	2664.43
MH211-216	CIRCULAR	1.35	1.43	0.34	1.35	1	2726.27
MH216-217	CIRCULAR	1.35	1.43	0.34	1.35	1	2906.69
MH217-223	CIRCULAR	1.35	1.43	0.34	1.35	1	2927.59
MH223-224	CIRCULAR	1.35	1.43	0.34	1.35	1	3161.26
MH224-SWMF	CIRCULAR	1.35	1.43	0.34	1.35	1	3375.89

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units LPS

White Lake Road (120051)

Post-Development Model Results - 100-year 4-hour Chicago Storm Event

Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 11/13/2020 00:00:00
 Ending Date 11/15/2020 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 2.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm

Total Precipitation	2.554	76.002
Evaporation Loss	0.000	0.000
Infiltration Loss	0.713	21.233
Surface Runoff	1.830	54.468
Final Storage	0.021	0.632
Continuity Error (%)	-0.436	

	Volume	Volume
Flow Routing Continuity	hectare-m	10 ⁶ ltr

Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	1.830	18.297
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.555	5.551
External Outflow	2.350	23.502
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.773	7.730
Final Stored Volume	0.811	8.112
Continuity Error (%)	-0.114	

 Highest Continuity Errors

 Node MH118 (1.04%)

 Time-Step Critical Elements

 Link C1 (12.36%)

 Highest Flow Instability Indexes

 Link OUT-Area37 (16)

 Routing Time Step Summary

 Minimum Time Step : 0.50 sec
 Average Time Step : 1.92 sec
 Maximum Time Step : 2.00 sec
 Percent in Steady State : 0.00
 Average Iterations per Step : 2.00
 Percent Not Converging : 0.00
 Time Step Frequencies :
 2.000 - 1.516 sec : 91.08 %
 1.516 - 1.149 sec : 6.27 %

White Lake Road (120051)

Post-Development Model Results - 100-year 4-hour Chicago Storm Event

1.149 - 0.871 sec : 2.64 %
 0.871 - 0.660 sec : 0.00 %
 0.660 - 0.500 sec : 0.01 %

 Subcatchment Runoff Summary

Peak Runoff	Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff
Runoff Coeff	mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Subcatchment LPS								
Areal 4090.75	76.00	0.00	0.00	22.09	48.27	5.30	53.57	9.06
Area37 4389.96	76.00	0.00	0.00	20.52	48.37	6.89	55.25	8.11
EX-01 159.99	76.00	0.00	0.00	18.94	48.04	8.53	56.57	0.26
EX-02 155.54	76.00	0.00	0.00	19.01	48.04	8.46	56.49	0.25
EX-04 214.59	76.00	0.00	0.00	19.70	48.01	7.74	55.75	0.37
EX-05 155.54	76.00	0.00	0.00	19.01	48.04	8.46	56.49	0.25

 Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
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J1	JUNCTION	0.10	0.70	101.20	0 02:05	0.70
MADAWASKA	OUTFALL	0.10	0.70	101.15	0 02:05	0.70
MH118	STORAGE	0.07	1.81	106.85	0 01:38	1.81
MH128	STORAGE	0.06	1.45	105.88	0 01:40	1.45
MH130	STORAGE	0.10	1.58	105.14	0 01:59	1.58
MH136	STORAGE	0.10	1.40	104.47	0 01:59	1.40
MH204	STORAGE	0.08	1.18	104.07	0 02:00	1.18
MH206	STORAGE	0.08	1.24	103.90	0 02:00	1.24
MH208	STORAGE	0.09	1.34	103.80	0 02:00	1.34
MH209	STORAGE	0.09	1.33	103.61	0 02:01	1.33
MH210	STORAGE	0.09	1.32	103.40	0 02:01	1.32
MH211	STORAGE	0.10	1.33	103.24	0 02:01	1.33
MH216	STORAGE	0.08	1.02	102.75	0 02:02	1.02
MH217	STORAGE	0.08	1.14	102.50	0 02:03	1.14
MH223	STORAGE	0.20	1.29	102.31	0 02:03	1.29
MH224	STORAGE	0.71	1.53	102.03	0 02:03	1.53
STORE-Area37	STORAGE	0.05	1.68	108.18	0 01:39	1.68
SWMF	STORAGE	1.71	2.26	101.76	0 02:05	2.26

 Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	3364.18	0 02:05	0	23.5	0.001
MADAWASKA	OUTFALL	0.00	3364.19	0 02:05	0	23.5	0.000
MH118	STORAGE	159.99	2406.74	0 01:27	0.26	8.36	1.052
MH128	STORAGE	155.54	2524.31	0 01:29	0.254	8.53	-0.191
MH130	STORAGE	616.46	2680.15	0 01:28	5.92	14.5	-0.613
MH136	STORAGE	155.54	2561.33	0 01:31	0.254	14.8	-0.079
MH204	STORAGE	0.00	2562.77	0 01:31	0	14.8	0.046
MH206	STORAGE	0.00	2535.87	0 01:31	0	14.8	-0.065
MH208	STORAGE	0.00	2524.19	0 02:00	0	14.8	-0.012
MH209	STORAGE	0.00	2523.79	0 02:00	0	14.8	-0.008
MH210	STORAGE	0.00	2523.51	0 02:00	0	14.8	-0.010

White Lake Road (120051)

Post-Development Model Results - 100-year 4-hour Chicago Storm Event

ID	Type	Volume	Avg	Evap	Exfil	Time	Max	Outflow
MH211	STORAGE	0.00	2523.20	0	02:00	0	14.8	0.026
MH216	STORAGE	0.00	2522.97	0	02:01	0	14.8	0.319
MH217	STORAGE	0.00	2520.72	0	02:01	0	14.8	0.037
MH223	STORAGE	0.00	2514.99	0	02:02	0	14.8	-0.306
MH224	STORAGE	0.00	2512.78	0	02:03	0	14.8	0.030
STORE-Area37	STORAGE	4389.96	4389.96	0	01:30	8.1	8.1	0.009
SWMF	STORAGE	4090.75	5459.73	0	01:33	9.06	31.5	0.002

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
MH118	0.000	3	0	0	0.002	84	0 01:38	2388.18
MH128	0.000	3	0	0	0.002	64	0 01:40	2464.20
MH130	0.000	3	0	0	0.002	55	0 01:59	2501.11
MH136	0.000	5	0	0	0.002	62	0 01:59	2562.77
MH204	0.000	4	0	0	0.001	52	0 02:00	2535.87
MH206	0.000	4	0	0	0.001	56	0 02:00	2524.19
MH208	0.000	4	0	0	0.002	59	0 02:00	2523.79
MH209	0.000	4	0	0	0.002	60	0 02:01	2523.51
MH210	0.000	4	0	0	0.001	58	0 02:01	2523.20

MH211	0.000	4	0	0	0.002	60	0 02:01	2522.97
MH216	0.000	3	0	0	0.001	45	0 02:02	2520.72
MH217	0.000	4	0	0	0.001	51	0 02:03	2514.99
MH223	0.000	9	0	0	0.001	58	0 02:03	2512.78
MH224	0.001	32	0	0	0.002	69	0 02:03	2512.31
STORE-Area37	0.010	1	0	0	0.971	66	0 01:39	2260.00
SWMF	9.576	41	0	0	15.041	65	0 02:05	3364.18

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
MADAWASKA	98.75	199.47	3364.19	23.502
System	98.75	199.47	3364.19	23.502

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	3364.19	0 02:05	1.55	0.44	0.70
MH118-128	CONDUIT	2388.18	0 01:26	2.18	1.23	1.00
MH128-130	CONDUIT	2464.20	0 01:28	1.88	0.93	1.00
MH130-136	CONDUIT	2501.11	0 01:59	1.75	1.04	1.00
MH136-204	CONDUIT	2562.77	0 01:31	1.94	1.08	0.91
MH204-206	CONDUIT	2535.87	0 01:31	2.10	0.96	0.89
MH206-208	CONDUIT	2524.19	0 02:00	2.02	0.95	0.93
MH208-209	CONDUIT	2523.79	0 02:00	1.85	0.95	0.98
MH209-210	CONDUIT	2523.51	0 02:00	1.85	0.94	0.96

White Lake Road (120051)

Post-Development Model Results - 100-year 4-hour Chicago Storm Event

MH210-211	CONDUIT	2523.20	0	02:00	1.78	0.95	0.97
MH211-216	CONDUIT	2522.97	0	02:01	1.99	0.93	0.85
MH216-217	CONDUIT	2520.72	0	02:01	2.32	0.87	0.80
MH217-223	CONDUIT	2514.99	0	02:02	2.37	0.86	0.90
MH223-224	CONDUIT	2512.78	0	02:03	1.98	0.79	0.98
MH224-SWMP	CONDUIT	2512.31	0	02:03	1.79	0.74	1.00
OR1	ORIFICE	146.25	0	01:51			1.00
W1	WEIR	3219.91	0	02:05			0.30
OUT-Area37	DUMMY	2260.00	0	01:23			

 Flow Classification Summary

Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class								
		Up Dry	Down Dry	Sub Dry	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl	
C1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.17	0.00
MH118-128	1.00	0.00	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
MH128-130	1.00	0.00	0.00	0.00	0.17	0.00	0.00	0.83	0.11	0.00
MH130-136	1.00	0.00	0.00	0.00	0.13	0.00	0.00	0.87	0.00	0.00
MH136-204	1.00	0.00	0.00	0.00	0.03	0.00	0.00	0.97	0.00	0.00
MH204-206	1.00	0.00	0.00	0.00	0.37	0.00	0.00	0.62	0.00	0.00
MH206-208	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
MH208-209	1.00	0.01	0.00	0.00	0.13	0.00	0.00	0.86	0.00	0.00
MH209-210	1.00	0.01	0.00	0.00	0.08	0.00	0.00	0.91	0.00	0.00
MH210-211	1.00	0.01	0.00	0.00	0.20	0.01	0.00	0.78	0.00	0.00
MH211-216	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
MH216-217	1.00	0.01	0.00	0.00	0.25	0.00	0.00	0.75	0.01	0.00
MH217-223	1.00	0.01	0.00	0.00	0.97	0.00	0.00	0.02	0.91	0.00
MH223-224	1.00	0.00	0.01	0.00	0.99	0.00	0.00	0.00	0.02	0.00
MH224-SWMP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

 Conduit Surcharge Summary

Conduit	Hours Full			Hours Above Full	Hours Capacity
	Both Ends	Upstream	Dnstream	Normal Flow	Limited
MH118-128	0.50	0.60	0.51	0.60	0.50
MH128-130	0.48	0.48	0.55	0.01	0.01
MH130-136	0.01	0.57	0.01	0.54	0.01
MH136-204	0.01	0.55	0.01	0.56	0.01
MH223-224	0.01	0.01	0.55	0.01	0.01
MH224-SWMP	0.52	0.56	0.98	0.01	0.44

Analysis begun on: Fri Jun 9 13:35:35 2023
 Analysis ended on: Fri Jun 9 13:35:37 2023
 Total elapsed time: 00:00:02

White Lake Road (120051)

Post-Development Model Results - 100-year 12-hour SCS Storm Event

ALTERNATIVE RUNOFF METHOD (ARM) - PCSWMM VERSION 7.5.3406

This is a new version of ARM - your feedback and suggestions are solicited.
Create a ticket, post on the PCSWMM feature request forum, or email us directly!

Simulation start time: 11/13/2020 00:00:00
Simulation end time: 11/15/2020 00:00:00
Runoff wet weather time steps: 300 seconds
Report time steps: 60 seconds
Number of data points: 2881

Unit Hydrographs Runoff Method

Time after Peak Subcatchment (min)	Peak UH Flow Runoff Method (m ³ /s/mm)	UH Depth (mm)	Raingage	Area (ha)	Time of Concentration (min)	Time to Peak (min)
EX-03 363	Nash IUH 0.02008	1	Raingage	13.8	93	62

ARM Runoff Summary

Subcatchment	Total Precip (mm)	Total Losses (mm)	Total Runoff (mm)	Total Runoff 10 ⁶ ltr	Peak Runoff LPS	Runoff Coeff (fraction)
EX-03	93.91	38.249	55.652	7.68	703.968	0.593

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

Element Count

Number of rain gages 1
Number of subcatchments ... 6
Number of nodes 18
Number of links 18
Number of pollutants 0
Number of land uses 0

Raingage Summary

Name	Data Source	Data Type	Recording Interval
Raingage	07-Sl2hr-100yr	INTENSITY	30 min.

Subcatchment Summary

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
Area1	16.91	169.10	64.00	2.0000	Raingage	SWMF
Area37	14.67	293.40	64.00	2.0000	Raingage	STORE-Area37
EX-01	0.46	21.91	64.00	2.0000	Raingage	MH118
EX-02	0.45	20.45	64.00	2.0000	Raingage	MH128
EX-04	0.66	20.00	64.00	2.0000	Raingage	MH130
EX-05	0.45	20.45	64.00	2.0000	Raingage	MH136

Node Summary

White Lake Road (120051)

Post-Development Model Results - 100-year 12-hour SCS Storm Event

Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
J1	JUNCTION	100.50	2.00	0.0	
MADAWASKA	OUTFALL	100.45	1.00	0.0	
MH118	STORAGE	105.04	2.16	0.0	
MH128	STORAGE	104.43	2.26	0.0	
MH130	STORAGE	103.56	2.89	0.0	
MH136	STORAGE	103.07	2.27	0.0	
MH204	STORAGE	102.89	2.27	0.0	
MH206	STORAGE	102.66	2.22	0.0	
MH208	STORAGE	102.46	2.27	0.0	
MH209	STORAGE	102.28	2.24	0.0	
MH210	STORAGE	102.08	2.27	0.0	
MH211	STORAGE	101.91	2.23	0.0	
MH216	STORAGE	101.73	2.27	0.0	
MH217	STORAGE	101.36	2.22	0.0	
MH223	STORAGE	101.02	2.22	0.0	
MH224	STORAGE	100.50	2.22	0.0	
STORE-Area37	STORAGE	106.50	1.75	0.0	
SWMF	STORAGE	99.50	3.00	0.0	

Link Summary

Name	From Node	To Node	Type	Length	%Slope	Roughness
C1	J1	MADAWASKA	CONDUIT	5.0	1.0001	0.0350
MH118-128	MH118	MH128	CONDUIT	221.3	0.2485	0.0130
MH128-130	MH128	MH130	CONDUIT	329.4	0.2459	0.0130
MH130-136	MH130	MH136	CONDUIT	213.6	0.2013	0.0130
MH136-204	MH136	MH204	CONDUIT	60.3	0.1990	0.0130
MH204-206	MH204	MH206	CONDUIT	89.7	0.2453	0.0130
MH206-208	MH206	MH208	CONDUIT	56.6	0.2474	0.0130
MH208-209	MH208	MH209	CONDUIT	60.0	0.2500	0.0130
MH209-210	MH209	MH210	CONDUIT	55.4	0.2527	0.0130
MH210-211	MH210	MH211	CONDUIT	60.2	0.2492	0.0130
MH211-216	MH211	MH216	CONDUIT	46.0	0.2609	0.0130
MH216-217	MH216	MH217	CONDUIT	121.4	0.2965	0.0130
MH217-223	MH217	MH223	CONDUIT	109.7	0.3008	0.0130

MH223-224	MH223	MH224	CONDUIT	145.4	0.3508	0.0130
MH224-SWMF	MH224	SWMF	CONDUIT	50.0	0.4000	0.0130
OR1	SWMF	J1	ORIFICE			
W1	SWMF	J1	WEIR			
OUT-Area37	STORE-Area37	MH118	OUTLET			

Cross Section Summary

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
C1	TRAPEZOIDAL	1.00	4.00	0.55	7.00	1	7636.27
MH118-128	CIRCULAR	1.20	1.13	0.30	1.20	1	1943.75
MH128-130	CIRCULAR	1.35	1.43	0.34	1.35	1	2646.90
MH130-136	CIRCULAR	1.35	1.43	0.34	1.35	1	2394.92
MH136-204	CIRCULAR	1.35	1.43	0.34	1.35	1	2381.16
MH204-206	CIRCULAR	1.35	1.43	0.34	1.35	1	2643.45
MH206-208	CIRCULAR	1.35	1.43	0.34	1.35	1	2654.68
MH208-209	CIRCULAR	1.35	1.43	0.34	1.35	1	2668.87
MH209-210	CIRCULAR	1.35	1.43	0.34	1.35	1	2683.28
MH210-211	CIRCULAR	1.35	1.43	0.34	1.35	1	2664.43
MH211-216	CIRCULAR	1.35	1.43	0.34	1.35	1	2726.27
MH216-217	CIRCULAR	1.35	1.43	0.34	1.35	1	2906.69
MH217-223	CIRCULAR	1.35	1.43	0.34	1.35	1	2927.59
MH223-224	CIRCULAR	1.35	1.43	0.34	1.35	1	3161.26
MH224-SWMF	CIRCULAR	1.35	1.43	0.34	1.35	1	3375.89

NOTE: The summary statistics displayed in this report are based on results found at every computational time step, not just on results from each reporting time step.

Analysis Options

Flow Units LFS

White Lake Road (120051)

Post-Development Model Results - 100-year 12-hour SCS Storm Event

Process Models:
 Rainfall/Runoff YES
 RDII NO
 Snowmelt NO
 Groundwater NO
 Flow Routing YES
 Ponding Allowed NO
 Water Quality NO
 Infiltration Method HORTON
 Flow Routing Method DYNWAVE
 Surcharge Method EXTRAN
 Starting Date 11/13/2020 00:00:00
 Ending Date 11/15/2020 00:00:00
 Antecedent Dry Days 0.0
 Report Time Step 00:01:00
 Wet Time Step 00:05:00
 Dry Time Step 00:05:00
 Routing Time Step 2.00 sec
 Variable Time Step YES
 Maximum Trials 8
 Number of Threads 4
 Head Tolerance 0.001500 m

	Volume	Depth
Runoff Quantity Continuity	hectare-m	mm

Total Precipitation	3.155	93.910
Evaporation Loss	0.000	0.000
Infiltration Loss	0.908	27.034
Surface Runoff	2.230	66.379
Final Storage	0.021	0.634
Continuity Error (%)	-0.146	

	Volume	Volume
Flow Routing Continuity	hectare-m	10 ⁶ ltr

Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	2.230	22.300
Groundwater Inflow	0.000	0.000

RDII Inflow	0.000	0.000
External Inflow	0.768	7.680
External Outflow	2.955	29.550
Flooding Loss	0.000	0.000
Evaporation Loss	0.000	0.000
Exfiltration Loss	0.000	0.000
Initial Stored Volume	0.773	7.730
Final Stored Volume	0.824	8.237
Continuity Error (%)	-0.206	

 Time-Step Critical Elements

 Link C1 (18.03%)

 Highest Flow Instability Indexes

 Link OUT-Area37 (13)

 Routing Time Step Summary

Minimum Time Step	:	0.50 sec
Average Time Step	:	1.90 sec
Maximum Time Step	:	2.00 sec
Percent in Steady State	:	0.00
Average Iterations per Step	:	2.01
Percent Not Converging	:	0.00
Time Step Frequencies	:	
2.000 - 1.516 sec	:	89.89 %
1.516 - 1.149 sec	:	6.85 %
1.149 - 0.871 sec	:	3.24 %
0.871 - 0.660 sec	:	0.01 %
0.660 - 0.500 sec	:	0.01 %

White Lake Road (120051)

Post-Development Model Results - 100-year 12-hour SCS Storm Event

Subcatchment Runoff Summary

Peak Runoff		Total Precip	Total Runon	Total Evap	Total Infil	Imperv Runoff	Perv Runoff	Total Runoff	Total Runoff
Subcatchment LPS	Coeff	mm	mm	mm	mm	mm	mm	mm	10^6 ltr
Area1		93.91	0.00	0.00	27.93	59.58	5.89	65.47	11.07
2526.10	0.697								
Area37		93.91	0.00	0.00	26.29	59.63	7.54	67.18	9.85
2414.38	0.715								
EX-01		93.91	0.00	0.00	24.65	59.29	9.20	68.50	0.32
84.27	0.729								
EX-02		93.91	0.00	0.00	24.72	59.29	9.13	68.42	0.31
81.97	0.729								
EX-04		93.91	0.00	0.00	25.43	59.26	8.41	67.67	0.45
114.36	0.721								
EX-05		93.91	0.00	0.00	24.72	59.29	9.13	68.42	0.31
81.97	0.729								

Node Depth Summary

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
J1	JUNCTION	0.12	0.73	101.23	0 06:44	0.73
MADAWASKA	OUTFALL	0.12	0.73	101.18	0 06:45	0.73
MH118	STORAGE	0.10	1.68	106.72	0 06:32	1.68
MH128	STORAGE	0.09	1.40	105.83	0 06:33	1.40
MH130	STORAGE	0.14	1.57	105.13	0 06:34	1.57
MH136	STORAGE	0.14	1.40	104.47	0 06:34	1.40

MH204	STORAGE	0.12	1.17	104.06	0 06:37	1.17
MH206	STORAGE	0.12	1.24	103.90	0 06:37	1.24
MH208	STORAGE	0.13	1.34	103.80	0 06:38	1.34
MH209	STORAGE	0.13	1.33	103.61	0 06:38	1.33
MH210	STORAGE	0.13	1.31	103.39	0 06:38	1.31
MH211	STORAGE	0.14	1.33	103.24	0 06:38	1.33
MH216	STORAGE	0.11	1.03	102.76	0 06:40	1.03
MH217	STORAGE	0.11	1.15	102.51	0 06:41	1.15
MH223	STORAGE	0.24	1.31	102.33	0 06:41	1.31
MH224	STORAGE	0.75	1.54	102.04	0 06:42	1.54
STORE-Area37	STORAGE	0.05	1.50	108.00	0 06:32	1.50
SWMF	STORAGE	1.74	2.28	101.78	0 06:44	2.28

Node Inflow Summary

Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
J1	JUNCTION	0.00	3655.57	0 06:44	0	29.6	0.001
MADAWASKA	OUTFALL	0.00	3655.57	0 06:45	0	29.5	0.000
MH118	STORAGE	84.27	2298.49	0 06:21	0.315	10.2	0.225
MH128	STORAGE	81.97	2349.48	0 06:22	0.308	10.5	-0.027
MH130	STORAGE	717.95	2486.95	0 06:32	8.13	18.6	-0.307
MH136	STORAGE	81.97	2530.42	0 06:32	0.308	18.9	-0.092
MH204	STORAGE	0.00	2529.84	0 06:33	0	19	0.021
MH206	STORAGE	0.00	2526.58	0 06:33	0	19	-0.007
MH208	STORAGE	0.00	2523.50	0 06:34	0	19	-0.014
MH209	STORAGE	0.00	2522.32	0 06:34	0	19	0.004
MH210	STORAGE	0.00	2521.58	0 06:35	0	19	-0.011
MH211	STORAGE	0.00	2520.82	0 06:35	0	19	0.013
MH216	STORAGE	0.00	2520.26	0 06:35	0	19	0.095
MH217	STORAGE	0.00	2513.96	0 06:38	0	18.9	-0.056
MH223	STORAGE	0.00	2500.89	0 06:39	0	19	-0.108
MH224	STORAGE	0.00	2491.79	0 06:40	0	19	0.032
STORE-Area37	STORAGE	2414.38	2414.38	0 06:30	9.85	9.85	-0.003

White Lake Road (120051)

Post-Development Model Results - 100-year 12-hour SCS Storm Event

SWMF STORAGE 2526.10 4893.27 0 06:30 11.1 37.7 0.004

Node Surcharge Summary

No nodes were surcharged.

Node Flooding Summary

No nodes were flooded.

Storage Volume Summary

Storage Unit	Average Volume 1000 m3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
MH118	0.000	4	0	0	0.002	78	0 06:32	2273.28
MH128	0.000	4	0	0	0.002	62	0 06:33	2241.04
MH130	0.000	5	0	0	0.002	54	0 06:34	2481.75
MH136	0.000	6	0	0	0.002	62	0 06:34	2529.84
MH204	0.000	5	0	0	0.001	52	0 06:37	2526.58
MH206	0.000	5	0	0	0.001	56	0 06:37	2523.50
MH208	0.000	6	0	0	0.002	59	0 06:38	2522.32
MH209	0.000	6	0	0	0.002	59	0 06:38	2521.58
MH210	0.000	6	0	0	0.001	58	0 06:38	2520.82
MH211	0.000	6	0	0	0.002	60	0 06:38	2520.26
MH216	0.000	5	0	0	0.001	45	0 06:40	2513.96
MH217	0.000	5	0	0	0.001	52	0 06:41	2500.89
MH223	0.000	11	0	0	0.001	59	0 06:41	2491.79
MH224	0.001	34	0	0	0.002	69	0 06:42	2490.33
STORE-Area37	0.000	0	0	0	0.112	8	0 06:32	2220.79

SWMF 9.926 43 0 0 15.236 66 0 06:44 3655.57

Outfall Loading Summary

Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
MADAWASKA	97.66	250.31	3655.57	29.550
System	97.66	250.31	3655.57	29.550

Link Flow Summary

Link	Type	Maximum Flow LPS	Time of Max Occurrence days hr:min	Maximum Veloc m/sec	Max/ Full Flow	Max/ Full Depth
C1	CONDUIT	3655.57	0 06:45	1.58	0.48	0.73
MH118-128	CONDUIT	2273.28	0 06:22	2.05	1.17	1.00
MH128-130	CONDUIT	2241.04	0 06:22	1.77	0.85	1.00
MH130-136	CONDUIT	2481.75	0 06:37	1.74	1.04	1.00
MH136-204	CONDUIT	2529.84	0 06:33	1.87	1.06	0.91
MH204-206	CONDUIT	2526.58	0 06:33	2.03	0.96	0.89
MH206-208	CONDUIT	2523.50	0 06:34	1.93	0.95	0.93
MH208-209	CONDUIT	2522.32	0 06:34	1.78	0.95	0.98
MH209-210	CONDUIT	2521.58	0 06:35	1.79	0.94	0.96
MH210-211	CONDUIT	2520.82	0 06:35	1.78	0.95	0.97
MH211-216	CONDUIT	2520.26	0 06:35	1.98	0.92	0.85
MH216-217	CONDUIT	2513.96	0 06:38	2.26	0.86	0.80
MH217-223	CONDUIT	2500.89	0 06:39	2.20	0.85	0.91
MH223-224	CONDUIT	2491.79	0 06:40	1.75	0.79	0.99
MH224-SWMF	CONDUIT	2490.33	0 06:40	1.74	0.74	1.00

White Lake Road (120051) Post-Development Model Results - 100-year 12-hour SCS Storm Event

ORI	ORIFICE	146.25	0	06:31	1.00
W1	WEIR	3512.27	0	06:44	0.32
OUT-Area37	DUMMY	2220.79	0	06:21	

Flow Classification Summary

Conduit	Adjusted /Actual Length	-----		Fraction of Time in Flow Class -----						
		Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
C1	1.00	0.01	0.00	0.00	0.99	0.00	0.00	0.00	0.16	0.00
MH118-128	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.97	0.00	0.00
MH128-130	1.00	0.01	0.00	0.00	0.24	0.00	0.00	0.74	0.17	0.00
MH130-136	1.00	0.01	0.00	0.00	0.21	0.00	0.00	0.78	0.00	0.00
MH136-204	1.00	0.01	0.00	0.00	0.04	0.00	0.00	0.95	0.00	0.00
MH204-206	1.00	0.01	0.00	0.00	0.53	0.00	0.00	0.45	0.00	0.00
MH206-208	1.00	0.01	0.00	0.00	0.09	0.00	0.00	0.90	0.00	0.00
MH208-209	1.00	0.01	0.00	0.00	0.21	0.00	0.00	0.78	0.00	0.00
MH209-210	1.00	0.01	0.00	0.00	0.09	0.00	0.00	0.90	0.00	0.00
MH210-211	1.00	0.01	0.00	0.00	0.34	0.02	0.00	0.63	0.00	0.00
MH211-216	1.00	0.01	0.00	0.00	0.02	0.00	0.00	0.96	0.00	0.00
MH216-217	1.00	0.02	0.00	0.00	0.40	0.00	0.00	0.59	0.01	0.00
MH217-223	1.00	0.02	0.00	0.00	0.89	0.00	0.00	0.09	0.82	0.00
MH223-224	1.00	0.00	0.02	0.00	0.98	0.00	0.00	0.00	0.09	0.00
MH224-SWMP	1.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00

Conduit Surcharge Summary

Conduit	-----			Hours	Hours
	Both Ends	Hours Full Upstream	Hours Full Dnstream	Above Full Normal Flow	Capacity Limited
MH118-128	0.20	0.38	0.21	0.38	0.20

MH128-130	0.13	0.13	0.30	0.01	0.01
MH130-136	0.01	0.33	0.01	0.28	0.01
MH136-204	0.01	0.28	0.01	0.32	0.01
MH223-224	0.01	0.01	0.53	0.01	0.01
MH224-SWMP	0.56	0.56	1.21	0.01	0.39

Analysis begun on: Fri Jun 9 13:38:23 2023
 Analysis ended on: Fri Jun 9 13:38:25 2023
 Total elapsed time: 00:00:02

Required Storage Volumes (Quality)

Drainage Area	47.40	ha
% Impervious:	48%	
Runoff Coef.	0.53	
<i>Enhanced protection (80% TSS removal):</i>		
<i>Treatment Volume</i>	172	m3/ha
<i>Extended Detention Storage:</i>		
	40	m3/ha required
	1,896	m3 required
<i>Perm Pool:</i>		
	132	m3/ha required
	6,257	m3 required
	7,492	m3 provided
	158.1	m3/ha provided
<i>100Yr Active Storage</i>		
	12,075	m3 required
<i>incl. Extended Detention</i>	12,075	m3 provided
<i>Extended Detention:</i>		
	43.89	L/s average
	109.72	L/s max (2.5 x avg)
(% impervious was calculated as the average imperviousness for the drainage areas tributary to the SWM facility)		

Required Forebay Length and Width

Parameters:

Length to width ratio of forebay, $r =$	8.0:1
Peak outflow rate during 25 mm storm, $Q_p =$	0.110 m ³ /s (24hr ext. det)
Target particle size =	150 μm
Settling velocity, $V_s =$	0.0003 m/s

Forebay Settling Length, Dist

$$Dist = \sqrt{\frac{rQ_p}{V_s}}$$

$$= 54 \text{ m}$$

Check Dispersion Length, Dist₂

Desired velocity in forebay, $V_f =$	0.5 m/s
Inlet flow rate, $Q_{5yr} =$	2.083 m ³ /s
Depth in forebay, $d =$	1.50 m

$$Dist_2 = \frac{8Q}{dV_f}$$

$$= 22 \text{ m}$$

Therefore, the settling length of 54 m governs the design.

Required Length	= 54 m
Provided Length	= 56 m

Minimum Forebay width:

Length of Forebay, L =	54 m
Minimum width, W =	L/8
W =	6.8 m

Required Width	= 6.8 m
Provided Width	= 25.0 m

APPENDIX F

Cost Estimate of Preferred Servicing Solution

640 WHITE LAKE AND 00 VAN DUSEN

Summary of Costs

NO	ITEM	640 White Lake	00 Van Dusen	Total
1	General	\$ 35,000.00	\$ 35,000.00	\$ 70,000.00
2	Earthworks	\$ 397,000.00	\$ 403,500.00	\$ 800,500.00
3	Watermain	\$ 1,398,550.00	\$ 1,024,250.00	\$ 2,422,800.00
4	Sanitary Sewer	\$ 1,107,000.00	\$ 1,139,500.00	\$ 2,246,500.00
5	Sanitary Pump Station	\$ 1,622,391.30	\$ 1,670,108.70	\$ 3,292,500.00
6	Local Storm Sewer	\$ 2,062,063.00	\$ 3,137,912.00	\$ 5,199,975.00
6a	Oversized Storm Through Van Dusen	\$ 582,412.00	\$ (582,412.00)	\$ -
7	Stormwater Management Pond	\$ 626,820.51	\$ 1,069,029.49	\$ 1,695,850.00
8	Roads	\$ 1,893,820.00	\$ 1,905,615.00	\$ 3,799,435.00
9	Utilities	\$ 542,520.00	\$ 654,450.00	\$ 1,196,970.00
10	Provisional	\$ 50,000.00	\$ 50,000.00	\$ 100,000.00
11	1350 mm dia Storm Sewer Along Van Dusen	\$ 1,430,400.00		\$ 1,430,400.00
12	Dual 300 mm dia Watermain on Van Dusen	\$ -	\$ 1,123,400.00	\$ 1,123,400.00
13	250 mm dia Sanitary Sewer on Van Dusen	\$ 464,500.00		\$ 464,500.00
14	Hydro Charges	\$ 314,200.00	\$ 319,900.00	\$ 634,100.00
15	.Allowance White Lake/Vanjumar	\$ 150,000.00	\$ 150,000.00	\$ 300,000.00
	Subtotal	\$ 12,676,676.81	\$ 12,100,253.19	\$ 24,776,930.00
	30 % Soft Costs and Construction Contingency (1. 13 only)			\$7,152,849.00
	TOTAL			\$31,929,779.00

NO	ITEM	640 White Lake	00 Van Dusen	Total
	Length of Road			3975
	Cost Per Metre of Road			\$8,032.65
	Number of Units			553
	Cost Per Unit			\$57,739.20
	Frontage (m)			
	Cost per Metre Frontage			
	Frontage (ft)			
	Cost per Foot Frontage			

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION A - General (Site Area = 24.9 ha)					
1	Traffic Management	1.0	LS	\$5,000.00	\$ 5,000.00
2	Erosion and Sediment Control - Implementation, Monitoring and Removal	1.0	LS	\$30,000.00	\$ 30,000.00
SUBTOTAL - SECTION A					\$ 35,000.00
SECTION B - Site Preparation & Earthworks					
1	Clearing and Grubbing	1.0	LS	\$5,000.00	\$ 5,000.00
2	Topsoil Stripping Right of Ways	39,500.0	m ²	\$3.00	\$ 118,500.00
3	Earth Excavation and Grading				
	a) Imported Fill Subgrade (1.0 m)	0.0	m ³	\$15.00	\$ -
	b) Imported Fill Lots (.75 m)	0.0	m ³	\$15.00	\$ -
	c) Engineered Fill Under Foundations	0.0	m ³	\$45.00	\$ -
4	Lot Grading	280.0	ea	\$1,000.00	\$ 280,000.00
5	Retaining Wall	0.0	m ²	\$600.00	\$ -
6	Safety Railing on wall	0.0	m	\$150.00	\$ -
7	Noise Wall	0.0	m	\$450.00	\$ -
SUBTOTAL - SECTION B					\$ 403,500.00
SECTION C - Watermain					
1	Watermain				
	a) 200mm dia. PVC Class 150 DR18	1775.0	m	\$250.00	\$ 443,750.00
	b) 50 mm dia Copper	200.0	m	\$120.00	\$ 24,000.00
2	VVB and VC				
	a) 200mm dia. VVB	18.0	ea	\$4,000.00	\$ 72,000.00
	b) 300 mm dia. VC	0.0	ea	\$7,000.00	\$ -
3	Fire Hydrants				

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	a) Hydrant c/w valve, valve box and lead	16.0	ea	\$8,500.00	\$ 136,000.00
5	Water Services (Mainline to 5.0 m past curb)	2.0	ea flusher	\$25,000.00	\$ 50,000.00
	a) 19mm dia. c/w standpost, Type K Copper	280.0	ea	\$1,000.00	\$ 280,000.00
6	Connection to Existing	1.0	ea	\$3,500.00	\$ 3,500.00
7	Connection Charges	1.0	LS	\$15,000.00	\$15,000.00
SUBTOTAL - SECTION C				\$ 1,024,250.00	
SECTION D - Sanitary Sewer					
1	Sanitary Sewer				
	a) 250mm dia. PVC SDR 35	1975.0	m	\$300.00	\$ 592,500.00
2	Sanitary Maintenance Holes				
	a) 1200mm dia.	27.0	ea	\$7,500.00	\$ 202,500.00
3	Sanitary Services (Mainline to 5.0 m past curb)				
	a) 135mm dia. PVC SDR28	280.0	ea	\$1,000.00	\$ 280,000.00
4	Discharge Chamber Connection to Bev Shaw San	1.0	ea	\$25,000.00	\$ 25,000.00
5	CCTV Inspection (x2)	1975.0	m	\$20.00	\$ 39,500.00
SUBTOTAL - SECTION D				\$ 1,139,500.00	
SECTION E - Sanitary Pump Station					
1	Pump Station	1.0	LS	\$2,000,000.00	\$ 2,000,000.00
2	Instrumentation and Controls	1.0	LS	\$400,000.00	\$ 400,000.00
3	Dual 150 mm Forcemains incl reinstatement	2100.0	m	\$425.00	\$ 892,500.00
SUBTOTAL - SECTION E				\$ 3,292,500.00	

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION F - Storm Sewer					
1	Storm Sewer				
	a) 1500 mm dia	189.3	m	\$1,500.00	\$ 283,950.00
	b) 1350 mm dia	673.0	m	\$1,350.00	\$ 908,550.00
	c) 975 mm dia	203.3	m	\$700.00	\$ 142,310.00
	d) 825 mm dia	287.7	m	\$650.00	\$ 187,005.00
	e) 675 mm dia	338.0	m	\$450.00	\$ 152,100.00
	f) 525 mm dia	128.7	m	\$350.00	\$ 45,045.00
	f) 375 mm dia	118.6	m	\$320.00	\$ 37,952.00
2	Storm Maintenance Holes				
	a) 3000mm dia.	5.0	ea	\$30,000.00	\$ 150,000.00
	b) 2400mm dia.	7.0	ea	\$25,000.00	\$ 175,000.00
	c) 1800mm dia.	2.0	ea	\$15,000.00	\$ 30,000.00
	d) 1500 mm dia.	6.0	ea	\$10,000.00	\$ 60,000.00
	e) 1200 mm dia.	6.0	ea	\$7,500.00	\$ 45,000.00
3	Catch Basins				
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010	32.0	ea	\$3,600.00	\$ 115,200.00
4	Rear Yard Drainage Systems				
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm	22.0	ea	\$3,500.00	\$ 77,000.00
	b) RYCB Lead, 250mm dia. PVC SDR 35	860.0	m	\$140.00	\$ 120,400.00
	c) Rearyard Perforated Pipe, 250mm dia. c/w filter sock	1440.0	m	\$175.00	\$ 252,000.00
	d) Elbows and Tees	60.0	ea	\$400.00	\$ 24,000.00
5	Inlet Control Device	32.0	ea	\$500.00	\$ 16,000.00
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)				
	a) 135mm dia. PVC SDR 28	280.0	ea	\$1,000.00	\$ 280,000.00
7	CCTV Inspection (x2)	1820.0	m	\$20.00	\$ 36,400.00
SUBTOTAL - SECTION F					\$ 3,137,912.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION G - Stormwater Management Facility					
1	Excavation and Move Fill to Boulevards	55000.0	m3	\$20.00	\$ 1,100,000.00
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	1.0	ea	\$30,000.00	\$ 30,000.00
3	Low Flow Outlet				
	i) 375mm dia. (PVC SDR-35)	30.0	m	\$500.00	\$ 15,000.00
	ii) 1200mm Manhole 904 Inc. ICD	1.0	ea	\$5,500.00	\$ 5,500.00
	iii) Headwall (OPSD 804.030)	1.0	ea	\$25,000.00	\$ 25,000.00
	iv) Rip-Rap at Outlet(OPSD 810.010)	50.0	m2	\$45.00	\$ 2,250.00
4	High Flow Outlet				
	i) 1200mm x 900mm Box Culverts	10.0	m	\$7,000.00	\$ 70,000.00
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	100.0	m2	\$45.00	\$ 4,500.00
	iii) Pond Overflow Rip Rap	500.0	m2	\$45.00	\$ 22,500.00
	iv) Permeable Rock Check Dam	1.0	ea	\$15,000.00	\$ 15,000.00
5	Access Road (City of Ottawa SC26)				
	i) 400mm Granular 'B'	240.0	m2	\$25.00	\$ 6,000.00
	ii) 150mm Gran 'A'	240.0	m2	\$15.00	\$ 3,600.00
6	Hydroseeding	4600.0	m2	\$2.50	\$ 11,500.00
7	600mm Thick Clay Liner - Native (Provisional)	10000	m2	\$25.00	\$ 250,000.00
8	600mm Granular B Type II on bottom of forebays	3000	m2	\$20.00	\$ 60,000.00
9	Landscape allowance	1	LS	\$75,000.00	\$ 75,000.00
SUBTOTAL - SECTION G					\$ 1,695,850.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION H - Road Works (L= 1975 m; 8.5 asphalt width)					
1	Granular B, Type II (400mm)	20,300.0	m ²	\$20.00	\$ 406,000.00
2	Granular A (150mm)	17,340.0	m ²	\$10.00	\$ 173,400.00
3	Asphalt				
	a) 40mm Base Course (SP 19.0mm, PG 58-34)	17,340.0	m ²	\$18.00	\$ 312,120.00
	b) 40mm Surface Course (SP 12.5mm, PG 58-34)	17,340.0	m ²	\$22.00	\$ 381,480.00
4	Curb	3,950.0	m	\$75.00	\$ 296,250.00
5	1.8 m Sidewalk One Side	3,555.0	m ²	\$75.00	\$ 266,625.00
6	Iron Work Adjustments (base to final lift)	119.0	ea	\$460.00	\$ 54,740.00
7	Signage				
	a) Temporary Street Signage	12.0	ea	\$500.00	\$ 6,000.00
	b) Permanent Street Signage	12.0	ea	\$750.00	\$ 9,000.00
SUBTOTAL - SECTION H					\$ 1,905,615.00
SECTION I - Utilities					
1	Utility Trenching c/w sand bedding & backfill				
	a) Boulevard	3950.0	m	\$35.00	\$ 138,250.00
	b) Service Drop Offs	280.0	ea	\$110.00	\$ 30,800.00
3	Concrete Encased Road Crossings c/w Duct (regardless of No. of ducts)				
	a) Joint Utility	14.0	ea	\$2,500.00	\$ 35,000.00
4	Duct (supply and placement)				
	a) Hydro and Comm Duct (100mm PVC DB2)	13800.0	m	\$6.00	\$ 82,800.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	b) Streetlight Duct (76mm PVC)	4000.0	m	\$6.00	\$ 24,000.00
5	Transformer Pad	30.0	ea	\$3,500.00	\$ 105,000.00
6	Street Lights				
	a) Pole and Luminaire	46.0	ea	\$4,500.00	\$ 207,000.00
	b) Street Light Wiring (3 x #8 RWU)	2300.0	m	\$12.00	\$ 27,600.00
7	Street Light Disconnects	4.0	ea	\$1,000.00	\$ 4,000.00
SUBTOTAL - SECTION I					\$ 654,450.00
SECTION J - Provisionals					
1	Provisional	1	LS	\$50,000.00	\$ 50,000.00
SUBTOTAL - SECTION J					\$ 50,000.00
TOTAL					\$ 13,338,577.00

Van Dusen		
Singles		137
Semis and Towns		<u>143</u>
		280
Hydro Fees	\$ 205,500.00	
	\$ 114,400.00	
White Lake	\$ 319,900.00	
Singles		138
Semis and Towns		<u>134</u>
		272
Hydro Fees	\$ 207,000.00	
	\$ 107,200.00	
	\$ 314,200.00	

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION A - General (Site Area = 14.3 ha)					
1	Traffic Management	1.0	LS	\$5,000.00	\$ 5,000.00
2	Erosion and Sediment Control - Implementation, Monitoring and Removal	1.0	LS	\$30,000.00	\$ 30,000.00
SUBTOTAL - SECTION A				\$ 35,000.00	
SECTION B - Site Preparation & Earthworks					
1	Clearing and Grubbing	1.0	LS	\$5,000.00	\$ 5,000.00
2	Topsoil Stripping Right of Ways	40,000.0	m ²	\$3.00	\$ 120,000.00
3	Earth Excavation and Grading				
	a) Imported Fill Subgrade (1.0 m)	20,000.0	m ³	\$15.00	
	b) Imported Fill Lots (.75 m)	81,500.0	m ³	\$15.00	
	c) Lot Grading	272.0	ea	\$1,000.00	\$ 272,000.00
	d) Engineered Fill Under Foundations	0.0	m ³	\$45.00	\$ -
5	Retaining Wall	0.0	m ²	\$600.00	\$ -
6	Safety Railing on wall	0.0	m	\$150.00	\$ -
7	Noise Wall Along	0.0	m	\$450.00	\$ -
SUBTOTAL - SECTION B				\$ 397,000.00	
SECTION C - Watermain					
1	Watermain				
	a) 200mm dia. PVC Class 150 DR18	1600.0	m	\$250.00	\$ 400,000.00
	b) 300 mm dia	990.0	m	\$525.00	\$ 519,750.00
2	VVB and VC				
	a) 200mm dia. VVB	14.0	ea	\$4,000.00	\$ 56,000.00
	b) 300 mm dia. VC	3.0	ea	\$7,000.00	\$ 21,000.00
3	Fire Hydrants				

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	a) Hydrant c/w valve, valve box and lead	14.0	ea	\$7,700.00	\$ 107,800.00
5	Water Services (Mainline to 5.0 m past curb)				
	a) 19mm dia. c/w standpost, Type K Copper	272.0	ea	\$1,000.00	\$ 272,000.00
6	Connection to Existing	2.0	ea	\$3,500.00	\$ 7,000.00
7	Connection Charges	1.0	LS	\$15,000.00	\$15,000.00
SUBTOTAL - SECTION C					\$ 1,398,550.00
SECTION D - Sanitary Sewer					
1	Sanitary Sewer				
	a) 250mm dia. PVC SDR 35	2000.0	m	\$300.00	\$ 600,000.00
2	Sanitary Maintenance Holes				
	a) 1200mm dia.	26.0	ea	\$7,500.00	\$ 195,000.00
3	Sanitary Services (Mainline to 5.0 m past curb)				
	a) 135mm dia. PVC SDR28	272.0	ea	\$1,000.00	\$ 272,000.00
4	Discharge Chamber Connection Bev Shaw		ea	\$25,000.00	\$ -
5	CCTV Inspection (x2)	2000.0	m	\$20.00	\$ 40,000.00
SUBTOTAL - SECTION D					\$ 1,107,000.00
SECTION E - Sanitary Pump Station					
1	Pump Station	1.0	LS	\$1,200,000.00	
2	Instrumentation and Controls	1.0	LS	\$400,000.00	
3	Dual 150 mm Forcemains incl reinstatement	150.0	m	\$425.00	
SUBTOTAL - SECTION E					\$ -

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION F - Storm Sewer					
1	Storm Sewer				
	a) 1200 mm dia	221.3	m	\$1,200.00	\$ 265,560.00
	b) 825 mm dia	221.2	m	\$650.00	\$ 143,780.00
	c) 750 mm dia	193.1	m	\$600.00	\$ 115,860.00
	d) 600 mm dia	663.1	m	\$390.00	\$ 258,609.00
	e) 525 mm dia	315.8	m	\$350.00	\$ 110,530.00
	f) 450 mm dia	385.1	m	\$320.00	\$ 123,232.00
2	Storm Maintenance Holes				
	a) 3000mm dia.	1.0	ea	\$30,000.00	\$ 30,000.00
	b) 2400mm dia.	2.0	ea	\$25,000.00	\$ 50,000.00
	c) 1800mm dia.	4.0	ea	\$15,000.00	\$ 60,000.00
	d) 1500 mm dia.	5.0	ea	\$10,000.00	\$ 50,000.00
	e) 1200 mm dia.	16.0	ea	\$7,500.00	\$ 120,000.00
3	Catch Basins				
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010	32.0	ea	\$3,600.00	\$ 115,200.00
4	Rear Yard Drainage Systems				
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm	18.0	ea	\$3,000.00	\$ 54,000.00
	b) RYCB Lead, 250mm dia. PVC SDR 35	720.0	m	\$140.00	\$ 100,800.00
	c) Rearyard Perforated Pipe, 250mm dia. , c/w filter sock	1190.0	m	\$110.00	\$ 130,900.00
	d) Elbows and Tees	48.0	ea	\$350.00	\$ 16,800.00
5	Inlet Control Device	16.0	ea	\$300.00	\$ 4,800.00
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)				
	a) 135mm dia. PVC SDR 28	272.0	ea	\$1,000.00	\$ 272,000.00
7	Connection to Existing Strom Sewer	0.0	ea	\$2,500.00	\$ -
8	CCTV Inspection (x2)	1999.6	m	\$20.00	\$ 39,992.00
SUBTOTAL - SECTION F					\$ 2,062,063.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION G - Stormwater Management Facility					
1	Excavation and Move Fill to Boulevards	20000.0	m3	\$20.00	
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	1.0	ea	\$30,000.00	
3	Low Flow Outlet				
	i) 375mm dia. (PVC SDR-35)	30.0	m	\$500.00	
	ii) 1200mm Manhole 904 Inc. ICD	1.0	ea	\$5,500.00	
	iii) Headwall (OPSD 804.030)	1.0	ea	\$25,000.00	
	iv) Rip-Rap at Outlet(OPSD 810.010)	50.0	m2	\$45.00	
4	High Flow Outlet				
	i) 1200mm x 900mm Box Culverts	10.0	m	\$7,000.00	
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	100.0	m2	\$45.00	
	iii) Pond Overflow Rip Rap	500.0	m2	\$45.00	
	iv) Permeable Rock Check Dam	1.0	ea	\$15,000.00	
5	Access Road (City of Ottawa SC26)				
	i) 400mm Granular 'B'	240.0	m2	\$25.00	
	ii) 150mm Gran 'A'	240.0	m2	\$15.00	
6	Hydroseeding	3100.0	m2	\$2.50	
7	600mm Thick Clay Liner - Native (Provisional)	5000	m2	\$25.00	
8	600mm Granular B Type II on bottom of forebays	600	m2	\$20.00	
9	Landscape allowance	1	LS	\$75,000.00	
SUBTOTAL - SECTION G					\$ -

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION H - Road Works (L= 2000 m; 8.5 asphalt width)					
1	Granular B, Type II (400mm)	20,000.0	m ²	\$20.00	\$ 400,000.00
2	Granular A (150mm)	17,000.0	m ²	\$10.00	\$ 170,000.00
3	Asphalt				
	a) 40mm Base Course (SP 19.0mm, PG 58-34)	17,000.0	m ²	\$18.00	\$ 306,000.00
	b) 40mm Surface Course (SP 12.5mm, PG 58-34)	17,000.0	m ²	\$22.00	\$ 374,000.00
4	Curb	4,000.0	m	\$75.00	\$ 300,000.00
5	1.8 m Sidewalk One Side	3,600.0	m ²	\$75.00	\$ 270,000.00
6	Iron Work Adjustments (base to final lift)	117.0	ea	\$460.00	\$ 53,820.00
7	Signage				
	a) Temporary Street Signage	16.0	ea	\$500.00	\$ 8,000.00
	b) Permanent Street Signage	16.0	ea	\$750.00	\$ 12,000.00
SUBTOTAL - SECTION H					\$ 1,893,820.00
SECTION I - Utilities					
1	Utility Trenching c/w sand bedding & backfill				
	a) Boulevard	4000.0	m	\$35.00	\$ 140,000.00
	b) Service Drop Offs	272.0	ea	\$110.00	\$ 29,920.00
3	Concrete Encased Road Crossings c/w Duct (regardless of No. of ducts)				
	a) Joint Utility	10.0	ea	\$2,500.00	\$ 25,000.00
4	Duct (supply and placement)				
	a) Hydro and Comm Duct (100mm PVC DB2)	15000.0	m	\$6.00	\$ 90,000.00
	b) Streetlight Duct (76mm PVC)	1700.0	m	\$6.00	\$ 10,200.00
5	Transformer Pad	20.0	ea	\$3,500.00	\$ 70,000.00
6	Street Lights				
	a) Pole and Luminaire	34.0	ea	\$4,500.00	\$ 153,000.00
	b) Street Light Wiring (3 x #8 RWU)	1700.0	m	\$12.00	\$ 20,400.00
7	Street Light Disconnects	4.0	ea	\$1,000.00	\$ 4,000.00
SUBTOTAL - SECTION I					\$ 542,520.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION J - Provisionals					
1	Provisional	1	LS	\$50,000.00	\$ 50,000.00
SUBTOTAL - SECTION J					\$ 50,000.00
TOTAL					\$ 7,485,953.00

This spreadsheet is White Lake services through Van Dusen re: SWMF and Pump Station

singles 138	138	
towns 112 semis 22	<u>134</u>	7.3 m includes separation between blocks
	272	
Adjustment for parkland (5% of 14.6 ha)		Hydro
.73 ha x 15 units/ha = 11 units	138	\$ 207,000.00
	134	\$ 107,200.00
Adjustment to frontage		\$ 314,200.00
7300 m2 / 32 m = 228 m loss forntage		

No	ITEM	EST. QTY	UNIT	UNIT RATE	TOTAL AMOUNT	640 WHITE LAKE ROAD	00 VAN DUSEN ROAD
SECTION C - Watermain							
1	Watermain incl reinstatement and traffic						
	a) 200mm dia. PVC Class 150 DR18		m	\$250.00	\$ -		
	b) 300 mm dia (Dual for redundancy)	1540.0	m	\$650.00	\$ 1,001,000.00		
2	VVB and VC						
	a) 200mm dia. VVB		ea	\$4,000.00	\$ -		
	b) 300 mm dia. VC	8.0	ea	\$7,000.00	\$ 56,000.00		
3	Fire Hydrants						
	a) Hydrant c/w valve, valve box and lead	7.0	ea	\$7,700.00	\$ 53,900.00		
5	Water Services (Mainline to 5.0 m past curb)						
	a) 19mm dia. c/w standpost, Type K Copper		ea	\$1,000.00	\$ -		
6	Connection to Existing	1.0	ea	\$5,000.00	\$ 5,000.00		
7	Connection Charges	1.0	LS	\$7,500.00	\$7,500.00		
SUBTOTAL - SECTION C					\$ 1,123,400.00		\$ 1,123,400.00
SECTION D - Sanitary Sewer							
1	Sanitary Sewer incl reinstatement						
	a) 250mm dia. PVC SDR 35	850.0	m	\$450.00	\$ 382,500.00		
2	Sanitary Maintenance Holes						
	a) 1200mm dia.	8.0	ea	\$7,500.00	\$ 60,000.00		
3	Sanitary Services (Mainline to 5.0 m past curb)						
	a) 135mm dia. PVC SDR28		ea	\$1,000.00	\$ -		
4	Connection	1.0	ea	\$5,000.00	\$ 5,000.00		
5	CCTV Inspection (x2)	850.0	m	\$20.00	\$ 17,000.00		
SUBTOTAL - SECTION D					\$ 464,500.00	\$ 464,500.00	\$ -
SECTION E - Sanitary Pump Station							
1	Pump Station	1.0	LS	\$2,000,000.00	\$ 2,000,000.00		
2	Instrumentation and Controls	1.0	LS	\$400,000.00	\$ 400,000.00		
3	Dual 200 mm Forcemains incl reinstatement	2100.0	m	\$425.00	\$ 892,500.00		
SUBTOTAL - SECTION E					\$ 3,292,500.00	\$ 1,622,391.30	\$ 1,670,108.70

No	ITEM	EST. QTY	UNIT	UNIT RATE	TOTAL AMOUNT	640 WHITE LAKE ROAD	00 VAN DUSEN ROAD
SECTION F - Storm Sewer							
1	Storm Sewer incl reinstatement						
	a) 1350mm dia (MH 118 - MH136)	820.0	m	\$1,450.00	\$ 1,189,000.00		
	b) Outlet Ditch Complete with Rip Rap		m	\$200.00	\$ -	\$ -	
	c) DICB		ea	\$15,000.00	\$ -	\$ -	
					\$ -		
					\$ -		
					\$ -		
2	Storm Maintenance Holes						
	a) 3000mm dia.	5.0	ea	\$30,000.00	\$ 150,000.00		
	b) 2400mm dia.	3.0	ea	\$25,000.00	\$ 75,000.00		
	c) 1800mm dia.		ea	\$15,000.00	\$ -		
	d) 1500 mm dia.		ea	\$10,000.00	\$ -		
	e) 1200 mm dia.		ea	\$7,500.00	\$ -		
3	Catch Basins						
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010		ea	\$3,600.00	\$ -		
4	Rear Yard Drainage Systems						
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm		ea	\$3,000.00	\$ -		
	b) RYCB Lead, 250mm dia. PVC SDR 35		m	\$140.00	\$ -		
	c) Rearyard Perforated Pipe, 250mm dia. HDPE, c/w filter sock		m	\$110.00	\$ -		
	d) Elbows and Tees		ea	\$350.00	\$ -		
5	Inlet Control Device		ea	\$300.00	\$ -		
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)						
	a) 135mm dia. PVC SDR 28		ea	\$1,000.00	\$ -		
7	Connection to Existing Strom Sewer		ea	\$2,500.00	\$ -		
8	CCTV Inspection (x2)	820.0	m	\$20.00	\$ 16,400.00		
SUBTOTAL - SECTION F					\$ 1,430,400.00	\$ 1,430,400.00	\$ -

No	ITEM	EST. QTY	UNIT	UNIT RATE	TOTAL AMOUNT	640 WHITE LAKE ROAD	00 VAN DUSEN ROAD
SECTION G - Stormwater Management Facility							
1	Excavation and Move Fill to Boulevards	55000.0	m3	\$20.00	\$ 1,100,000.00		
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	1.0	ea	\$30,000.00	\$ 30,000.00		
3	Low Flow Outlet						
	i) 375mm dia. (PVC SDR-35)	30.0	m	\$500.00	\$ 15,000.00		
	ii) 1200mm Manhole 904 Inc. ICD	1.0	ea	\$5,500.00	\$ 5,500.00		
	iii) Headwall (OPSD 804.030)	1.0	ea	\$25,000.00	\$ 25,000.00		
	iv) Rip-Rap at Outlet(OPSD 810.010)	50.0	m2	\$45.00	\$ 2,250.00		
4	High Flow Outlet						
	i) 2 -1200mm x 900mm Box Culverts	10.0	m	\$7,000.00	\$ 70,000.00		
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	100.0	m2	\$45.00	\$ 4,500.00		
	iii) Pond Overflow Rip Rap	500.0	m2	\$45.00	\$ 22,500.00		
	iv) Permeable Rock Check Dam	1.0	ea	\$15,000.00	\$ 15,000.00		
5	Access Road (City of Ottawa SC26)						
	i) 400mm Granular 'B'	240.0	m2	\$25.00	\$ 6,000.00		
	ii) 150mm Gran 'A'	240.0	m2	\$15.00	\$ 3,600.00		
6	Hydroseeding	4600.0	m2	\$2.50	\$ 11,500.00		
7	600mm Thick Clay Liner - Native (Provisional)	10000	m2	\$25.00	\$ 250,000.00		
8	600mm Granular B Type II on bottom of forebays	3000	m2	\$20.00	\$ 60,000.00		
9	Landscape allowance	1	LS	\$75,000.00	\$ 75,000.00		
SUBTOTAL - SECTION G					\$ 1,695,850.00	\$ 626,820.51	\$ 1,069,029.49

No	ITEM	EST. QTY	UNIT	UNIT RATE	TOTAL AMOUNT	640 WHITE LAKE ROAD	00 VAN DUSEN ROAD
SECTION H - Extend 300 mm Watermain from White lake Road (Verch Land On Its Own)							
1	Watermain incl reinstatement						
	a) 200mm dia. PVC Class 150 DR18		m	\$250.00	\$ -		
	b) 300 mm dia	2800.0	m	\$650.00	\$ 1,820,000.00		
2	VVB and VC						
	a) 200mm dia. VVB		ea	\$4,000.00	\$ -		
	b) 300 mm dia. VC	7.0	ea	\$7,000.00	\$ 49,000.00		
3	Fire Hydrants						
	a) Hydrant c/w valve, valve box and lead	12.0	ea	\$7,700.00	\$ 92,400.00		
5	Water Services (Mainline to 5.0 m past curb)						
	a) 19mm dia. c/w standpost, Type K Copper		ea	\$1,000.00	\$ -		
6	Connection to Existing	1.0	ea	\$5,000.00	\$ 5,000.00		
7	Connection Charges	1.0	LS	\$6,500.00	\$6,500.00		
SUBTOTAL - SECTION H					\$ 1,972,900.00	\$ -	\$ 1,972,900.00

	640 White Lake Units	00 Van Dusen Units	Total
	272	280	552
Pump Station	% 49%	% 51%	
Area	14.6	24.9	39.5
SWMF	% 37%	% 63%	

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION A - General (Site Area = 24.9 ha)					
1	Traffic Management	1.0	LS	\$25,000.00	\$ 25,000.00
2	Erosion and Sediment Control - Implementation, Monitoring and Removal	1.0	LS	\$30,000.00	\$ 30,000.00
SUBTOTAL - SECTION A				\$ 55,000.00	
SECTION B - Site Preparation & Earthworks					
1	Clearing and Grubbing	0.0	LS	\$5,000.00	\$ -
2	Topsoil Stripping Right of Ways	6,400.0	m ²	\$3.00	\$ 19,200.00
3	Earth Excavation and Grading				
	a) Right of Way	11,760.0	m ³	\$25.00	\$ 294,000.00
	b) Imported Fill Lots (.75 m)	0.0	m ³	\$15.00	\$ -
	c) Engineered Fill Under Foundations	0.0	m ³	\$45.00	\$ -
4	Lot Grading	0.0	ea	\$1,000.00	\$ -
5	Retaining Wall	0.0	m ²	\$600.00	\$ -
6	Safety Railing on wall	0.0	m	\$150.00	\$ -
7	Noise Wall	0.0	m	\$450.00	\$ -
SUBTOTAL - SECTION B				\$ 313,200.00	
SECTION C - Watermain					
1	Watermain				
	a) 200mm dia. PVC Class 150 DR18	0.0	m	\$250.00	\$ -
	b) 50 mm dia Copper	0.0	m	\$120.00	\$ -
2	VVB and VC				
	a) 200mm dia. VVB	0.0	ea	\$4,000.00	\$ -
	b) 300 mm dia. VC	0.0	ea	\$7,000.00	\$ -
3	Fire Hydrants				

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	a) Hydrant c/w valve, valve box and lead	0.0	ea	\$8,500.00	\$ -
5	Water Services (Mainline to 5.0 m past curb)	0.0	ea flusher	\$25,000.00	\$ -
	a) 19mm dia. c/w standpost, Type K Copper	0.0	ea	\$1,000.00	\$ -
6	Connection to Existing	0.0	ea	\$3,500.00	\$ -
7	Connection Charges	0.0	LS	\$15,000.00	\$0.00
SUBTOTAL - SECTION C					\$ -
SECTION D - Sanitary Sewer					
1	Sanitary Sewer				
	a) 250mm dia. PVC SDR 35	0.0	m	\$300.00	\$ -
2	Sanitary Maintenance Holes				
	a) 1200mm dia.	0.0	ea	\$7,500.00	\$ -
3	Sanitary Services (Mainline to 5.0 m past curb)				
	a) 135mm dia. PVC SDR28	0.0	ea	\$1,000.00	\$ -
4	Discharge Chamber Connection to Bev Shaw San	0.0	ea	\$25,000.00	\$ -
5	CCTV Inspection (x2)	0.0	m	\$20.00	\$ -
SUBTOTAL - SECTION D					\$ -
SECTION E - Sanitary Pump Station					
1	Pump Station	0.0	LS	\$2,000,000.00	\$ -
2	Instrumentation and Controls	0.0	LS	\$400,000.00	\$ -
3	Dual 150 mm Forcemains incl reinstatement	0.0	m	\$425.00	\$ -
SUBTOTAL - SECTION E					\$ -

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION F - Storm Sewer					
1	Storm Sewer				
	a) 1500 mm dia	0.0	m	\$1,500.00	\$ -
	b) 1350 mm dia	0.0	m	\$1,350.00	\$ -
	c) 1200 mm dia	0.0	m	\$1,200.00	\$ -
	c) 750 mm dia	0.0	m	\$650.00	\$ -
	d) 600 mm dia	0.0	m	\$390.00	\$ -
	e) 525 mm dia	0.0	m	\$350.00	\$ -
	f) 450 mm dia	0.0	m	\$320.00	\$ -
2	Storm Maintenance Holes				
	a) 3000mm dia.	0.0	ea	\$30,000.00	\$ -
	b) 2400mm dia.	0.0	ea	\$25,000.00	\$ -
	c) 1800mm dia.	0.0	ea	\$15,000.00	\$ -
	d) 1500 mm dia.	0.0	ea	\$10,000.00	\$ -
	e) 1200 mm dia.	0.0	ea	\$7,500.00	\$ -
3	Catch Basins				
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010	0.0	ea	\$3,600.00	\$ -
4	Rear Yard Drainage Systems				
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm	0.0	ea	\$3,500.00	\$ -
	b) RYCB Lead, 250mm dia. PVC SDR 35	0.0	m	\$140.00	\$ -
	c) Rearyard Perforated Pipe, 250mm dia. c/w filter sock	0.0	m	\$175.00	\$ -
	d) Elbows and Tees	0.0	ea	\$400.00	\$ -
5	Inlet Control Device	32.0	ea	\$500.00	\$ 16,000.00
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)				
	a) 135mm dia. PVC SDR 28	0.0	ea	\$1,000.00	\$ -
7	Connection to Existing Storm Sewer	0.0	ea	\$2,500.00	\$ -
8	CCTV Inspection (x2)	0.0	m	\$20.00	\$ -
SUBTOTAL - SECTION F					\$ 16,000.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION G - Stormwater Management Facility					
1	Excavation and Move Fill to Boulevards	0.0	m3	\$20.00	\$ -
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	0.0	ea	\$30,000.00	\$ -
3	Low Flow Outlet				
	i) 375mm dia. (PVC SDR-35)	0.0	m	\$500.00	\$ -
	ii) 1200mm Manhole 904 Inc. ICD	0.0	ea	\$5,500.00	\$ -
	iii) Headwall (OPSD 804.030)	0.0	ea	\$25,000.00	\$ -
	iv) Rip-Rap at Outlet(OPSD 810.010)	0.0	m2	\$45.00	\$ -
4	High Flow Outlet				
	i) 1200mm x 900mm Box Culverts	0.0	m	\$7,000.00	\$ -
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	0.0	m2	\$45.00	\$ -
	iii) Pond Overflow Rip Rap	0.0	m2	\$45.00	\$ -
	iv) Permeable Rock Check Dam	0.0	ea	\$15,000.00	\$ -
5	Access Road (City of Ottawa SC26)				
	i) 400mm Granular 'B'	0.0	m2	\$25.00	\$ -
	ii) 150mm Gran 'A'	0.0	m2	\$15.00	\$ -
6	Hydroseeding	0.0	m2	\$2.50	\$ -
7	600mm Thick Clay Liner - Native (Provisional)	0	m2	\$25.00	\$ -
8	600mm Granular B Type II on bottom of forebays	0	m2	\$20.00	\$ -
9	Landscape allowance	0	LS	\$75,000.00	\$ -
SUBTOTAL - SECTION G					\$ -

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION H - Upgrade Van Dusen to 8.5 asphalt Rural Cross Section L = 1600 m					
1	Granular B, Type II (450mm)	16,800.0	m ²	\$20.00	\$ 336,000.00
2	Granular A (150mm)	16,800.0	m ²	\$10.00	\$ 168,000.00
3	Asphalt				
	a) 40mm Base Course (SP 19.0mm, PG 58-34)	13,600.0	m ²	\$18.00	\$ 244,800.00
	b) 40mm Surface Course (SP 12.5mm, PG 58-34)	13,600.0	m ²	\$22.00	\$ 299,200.00
4	Ditching	3,200.0	m	\$25.00	\$ 80,000.00
5	Hydroseeding	20,480.0	m ²	\$5.00	\$ 102,400.00
6	Iron Work Adjustments (base to final lift)	0.0	ea	\$460.00	\$ -
7	Signage				
	a) Temporary Street Signage	6.0	ea	\$500.00	\$ 3,000.00
	b) Permanent Street Signage	6.0	ea	\$750.00	\$ 4,500.00
SUBTOTAL - SECTION H					\$ 1,237,900.00
SECTION I - Utilities					
1	Utility Trenching c/w sand bedding & backfill				
	a) Boulevard		m	\$35.00	\$ -
	b) Service Drop Offs		ea	\$110.00	\$ -
3	Concrete Encased Road Crossings c/w Duct (regardless of No. of ducts)				
	a) Joint Utility		ea	\$2,500.00	\$ -
4	Duct (supply and placement)				
	a) Hydro and Comm Duct (100mm PVC DB2)		m	\$6.00	\$ -

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	b) Streetlight Duct (76mm PVC)		m	\$6.00	\$ -
5	Transformer Pad		ea	\$3,500.00	\$ -
6	Street Lights				
	a) Pole and Luminaire		ea	\$4,500.00	\$ -
	b) Street Light Wiring (3 x #8 RWU)		m	\$12.00	\$ -
7	Street Light Disconnects		ea	\$1,000.00	\$ -
SUBTOTAL - SECTION I					\$ -
SECTION J - Provisionals					
1	Provisional	1	LS	\$50,000.00	\$ 50,000.00
SUBTOTAL - SECTION J					\$ 50,000.00
TOTAL					\$ 1,672,100.00

Van Dusen				
Singles		137	White Lake	440
Semis and Towns		<u>143</u>	Van Dusen	1160
		280	Total	1600
Hydro Fees	\$ 205,500.00			
	\$ 114,400.00			
White Lake	\$ 319,900.00			
Singles		138		
Semis and Towns		<u>134</u>		
		272		
Hydro Fees	\$ 207,000.00			
	\$ 107,200.00			
	\$ 314,200.00			

No	Description	Total Cost	Area 37 Share	Area 1 Share	Area 37 Cost if It Serviced on its	Net
1	Extend Sanitary Sewer Down Van dusen to Common PS to S	\$ 464,500.00	\$ 464,500.00	\$ -	\$ -	\$ 464,500.00
2	Construction of Common Pump Station for Area 37 and Area 1 at south end of Van Dusen	\$ 3,292,500.00	\$ 1,622,391.30	\$ 1,670,108.70	\$ 1,663,750.00	\$ (41,358.70)
3	Construction of 1350 dia storm sewer south on Van Dusen to Common SWMF on Area 1 Lands (end of Van Dusen)	\$ 1,430,400.00	\$ 1,430,400.00	\$ -	\$ 1,522,500.00	\$ (92,100.00)
4	Common SWMF on Area 1 Lands (adjacent to end of Van Dusen) to Service both Areas 37 and Area 1	\$ 1,695,850.00	\$ 626,820.51	\$ 1,069,029.49	\$ 819,100.00	\$ (192,279.49)
5	Reinstatement of Van Dusen Drive	\$ 6,500.00	\$ -	\$ -	\$ -	\$ -
						\$ 138,761.81

Notes

Savings for common pump station would also be realized when Remainder of Area 1 lands develop.

Pump Station would also benefit other lands owners, e.g. balance of Area 1 lands, Area 7 and Area 13.

These areas would contribute to 50 % of the benefitting area. Pump Station and Forecemains should be a DC Item.

1350 storm sewer south along Van Dusen sized for predevelopment flow from adjacent property north of Verch lands.

Cost Estimates of Other Options Considered

NO.	ITEM	TOTAL AMOUNT
1	General	\$ 35,000.00
2	Earthworks	\$ 1,884,100.00
3	Watermain	\$ 1,327,050.00
4	Sanitary Sewer	\$ 1,039,700.00
5	Sanitary Pump Station	\$ 1,663,750.00
6	Storm Sewer	\$ 1,833,150.00
7	Stormwater Management Pond	\$ 819,100.00
8	Roads	\$ 1,718,160.00
9	Utilities	\$ 525,880.00
10	Provisional	\$ 50,000.00
11	Hydro Charges (\$1500/single; \$800/town)	\$ 278,200.00
12	Allowance for Intersection Improvements White Lake/Vanjumar	\$ 150,000.00
	Subtotal	\$ 11,324,090.00
	30 % Soft Costs and Construction Contingency (1. 10 only)	\$3,268,767.00
	TOTAL	\$14,592,857.00
	Length of Road	1940
	Cost Per Metre of Road	\$7,522.09
	Number of Units	284
	Cost Per Unit	\$51,383.30
	Frontage (m)	2545
	Cost per Metre Frontage	\$5,733.93
	Frontage (ft)	8350
	Cost per Foot Frontage	\$1,747.70

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION A - General (Site Area = 14.3 ha)					
1	Traffic Management	1.0	LS	\$5,000.00	\$ 5,000.00
2	Erosion and Sediment Control - Implementation, Monitoring and Removal	1.0	LS	\$30,000.00	\$ 30,000.00
SUBTOTAL - SECTION A				\$ 35,000.00	
SECTION B - Site Preparation & Earthworks					
1	Clearing and Grubbing	1.0	LS	\$5,000.00	\$ 5,000.00
2	Topsoil Stripping Right of Ways	36,200.0	m ²	\$3.00	\$ 108,600.00
3	Earth Excavation and Grading				
	a) Imported Fill Subgrade (1.0 m)	20,000.0	m ³	\$15.00	\$ 300,000.00
	b) Imported Fill Lots (.75 m)	81,500.0	m ³	\$15.00	\$ 1,222,500.00
	c) Lot Grading	248.0	m ²	\$1,000.00	\$ 248,000.00
	d) Engineered Fill Under Foundations	0.0	m ³	\$45.00	\$ -
5	Retaining Wall	0.0	m ²	\$600.00	\$ -
6	Safety Railing on wall	0.0	m	\$150.00	\$ -
7	Noise Wall Along	0.0	m	\$450.00	\$ -
SUBTOTAL - SECTION B				\$ 1,884,100.00	
SECTION C - Watermain					
1	Watermain				
	a) 200mm dia. PVC Class 150 DR18	1410.0	m	\$250.00	\$ 352,500.00
	b) 300 mm dia	990.0	m	\$525.00	\$ 519,750.00
2	VVB and VC				
	a) 200mm dia. VVB	14.0	ea	\$4,000.00	\$ 56,000.00
	b) 300 mm dia. VC	3.0	ea	\$7,000.00	\$ 21,000.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
3	Fire Hydrants				
	a) Hydrant c/w valve, valve box and lead	14.0	ea	\$7,700.00	\$ 107,800.00
5	Water Services (Mainline to 5.0 m past curb)				
	a) 19mm dia. c/w standpost, Type K Copper	248.0	ea	\$1,000.00	\$ 248,000.00
6	Connection to Existing	2.0	ea	\$3,500.00	\$ 7,000.00
7	Connection Charges	1.0	LS	\$15,000.00	\$15,000.00
SUBTOTAL - SECTION C					\$ 1,327,050.00
SECTION D - Sanitary Sewer					
1	Sanitary Sewer				
	a) 250mm dia. PVC SDR 35	1810.0	m	\$300.00	\$ 543,000.00
2	Sanitary Maintenance Holes				
	a) 1200mm dia.	25.0	ea	\$7,500.00	\$ 187,500.00
3	Sanitary Services (Mainline to 5.0 m past curb)				
	a) 135mm dia. PVC SDR28	248.0	ea	\$1,000.00	\$ 248,000.00
4	Discharge Chamber Connection Bev Shaw	1.0	ea	\$25,000.00	\$ 25,000.00
5	CCTV Inspection (x2)	1810.0	m	\$20.00	\$ 36,200.00
SUBTOTAL - SECTION D					\$ 1,039,700.00
SECTION E - Sanitary Pump Station					
1	Pump Station	1.0	LS	\$1,200,000.00	\$ 1,200,000.00
2	Instrumentation and Controls	1.0	LS	\$400,000.00	\$ 400,000.00
3	Dual 150 mm Forcemains incl reinstatement	150.0	m	\$425.00	\$ 63,750.00
SUBTOTAL - SECTION E					\$ 1,663,750.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION F - Storm Sewer					
1	Storm Sewer				
	a) 1200 mm dia	165.0	m	\$1,200.00	\$ 198,000.00
	b) 825 mm dia	85.0	m	\$650.00	\$ 55,250.00
	c) 750 mm dia	275.0	m	\$600.00	\$ 165,000.00
	d) 600 mm dia	245.0	m	\$390.00	\$ 95,550.00
	e) 525 mm dia	745.0	m	\$350.00	\$ 260,750.00
	f) 450 mm dia	295.0	m	\$320.00	\$ 94,400.00
2	Storm Maintenance Holes				
	a) 3000mm dia.	1.0	ea	\$30,000.00	\$ 30,000.00
	b) 2400mm dia.	2.0	ea	\$25,000.00	\$ 50,000.00
	c) 1800mm dia.	2.0	ea	\$15,000.00	\$ 30,000.00
	d) 1500 mm dia.	5.0	ea	\$10,000.00	\$ 50,000.00
	e) 1200 mm dia.	13.0	ea	\$7,500.00	\$ 97,500.00
3	Catch Basins				
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010	32.0	ea	\$3,600.00	\$ 115,200.00
4	Rear Yard Drainage Systems				
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm	18.0	ea	\$3,000.00	\$ 54,000.00
	b) RYCB Lead, 250mm dia. PVC SDR 35	720.0	m	\$140.00	\$ 100,800.00
	c) Rearyard Perforated Pipe, 250mm dia. , c/w filter sock	1190.0	m	\$110.00	\$ 130,900.00
	d) Elbows and Tees	48.0	ea	\$350.00	\$ 16,800.00
5	Inlet Control Device	16.0	ea	\$300.00	\$ 4,800.00
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)				
	a) 135mm dia. PVC SDR 28	248.0	ea	\$1,000.00	\$ 248,000.00
7	Connection to Existing Strom Sewer	0.0	ea	\$2,500.00	\$ -
8	CCTV Inspection (x2)	1810.0	m	\$20.00	\$ 36,200.00
SUBTOTAL - SECTION F					\$ 1,833,150.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION G - Stormwater Management Facility					
1	Excavation and Move Fill to Boulevards	20000.0	m3	\$20.00	\$ 400,000.00
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	1.0	ea	\$30,000.00	\$ 30,000.00
3	Low Flow Outlet				
	i) 375mm dia. (PVC SDR-35)	30.0	m	\$500.00	\$ 15,000.00
	ii) 1200mm Manhole 904 Inc. ICD	1.0	ea	\$5,500.00	\$ 5,500.00
	iii) Headwall (OPSD 804.030)	1.0	ea	\$25,000.00	\$ 25,000.00
	iv) Rip-Rap at Outlet(OPSD 810.010)	50.0	m2	\$45.00	\$ 2,250.00
4	High Flow Outlet				
	i) 1200mm x 900mm Box Culverts	10.0	m	\$7,000.00	\$ 70,000.00
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	100.0	m2	\$45.00	\$ 4,500.00
	iii) Pond Overflow Rip Rap	500.0	m2	\$45.00	\$ 22,500.00
	iv) Permeable Rock Check Dam	1.0	ea	\$15,000.00	\$ 15,000.00
5	Access Road (City of Ottawa SC26)				
	i) 400mm Granular 'B'	240.0	m2	\$25.00	\$ 6,000.00
	ii) 150mm Gran 'A'	240.0	m2	\$15.00	\$ 3,600.00
6	Hydroseeding	3100.0	m2	\$2.50	\$ 7,750.00
7	600mm Thick Clay Liner - Native (Provisional)	5000	m2	\$25.00	\$ 125,000.00
8	600mm Granular B Type II on bottom of forebays	600	m2	\$20.00	\$ 12,000.00
9	Landscape allowance	1	LS	\$75,000.00	\$ 75,000.00
SUBTOTAL - SECTION G					\$ 819,100.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION H - Road Works (L= 1810 m; 8.5 asphalt width)					
1	Granular B, Type II (400mm)	18,100.0	m ²	\$20.00	\$ 362,000.00
2	Granular A (150mm)	15,385.0	m ²	\$10.00	\$ 153,850.00
3	Asphalt				
	a) 40mm Base Course (SP 19.0mm, PG 58-34)	15,385.0	m ²	\$18.00	\$ 276,930.00
	b) 40mm Surface Course (SP 12.5mm, PG 58-34)	15,385.0	m ²	\$22.00	\$ 338,470.00
4	Curb	3,620.0	m	\$75.00	\$ 271,500.00
5	1.8 m Sidewalk One Side	3,258.0	m ²	\$75.00	\$ 244,350.00
6	Iron Work Adjustments (base to final lift)	111.0	ea	\$460.00	\$ 51,060.00
7	Signage				
	a) Temporary Street Signage	16.0	ea	\$500.00	\$ 8,000.00
	b) Permanent Street Signage	16.0	ea	\$750.00	\$ 12,000.00
SUBTOTAL - SECTION H					\$ 1,718,160.00
SECTION I - Utilities					
1	Utility Trenching c/w sand bedding & backfill				
	a) Boulevard	3600.0	m	\$35.00	\$ 126,000.00
	b) Service Drop Offs	248.0	ea	\$110.00	\$ 27,280.00
3	Concrete Encased Road Crossings c/w Duct (regardless of No. of ducts)				
	a) Joint Utility	10.0	ea	\$2,500.00	\$ 25,000.00
4	Duct (supply and placement)				
	a) Hydro and Comm Duct (100mm PVC DB2)	15000.0	m	\$6.00	\$ 90,000.00
	b) Streetlight Duct (76mm PVC)	1700.0	m	\$6.00	\$ 10,200.00
5	Transformer Pad	20.0	ea	\$3,500.00	\$ 70,000.00
6	Street Lights				
	a) Pole and Luminaire	34.0	ea	\$4,500.00	\$ 153,000.00
	b) Street Light Wiring (3 x #8 RWU)	1700.0	m	\$12.00	\$ 20,400.00
7	Street Light Disconnects	4.0	ea	\$1,000.00	\$ 4,000.00
SUBTOTAL - SECTION I					\$ 525,880.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION J - Provisionals					
1	Provisional	1	LS	\$50,000.00	\$ 50,000.00
SUBTOTAL - SECTION J					\$ 50,000.00
TOTAL					\$ 10,895,890.00

This spreadsheet is for White Lake Servicing on its own with a SWMF occupying 1.8 ha (Loss of 24 units; 190 m road)

singles 138	114			
towns 112 semis 22	<u>134</u>			
	248			
Adjustment for parkland (5% of 14.6 ha)		Hydro		
.73 ha x 15 units/ha = 11 units		114 \$	171,000.00	
		134 \$	107,200.00	
Adjustment to frontage		\$	278,200.00	
7300 m2 / 32 m = 228 m loss forntage				

00 Van Dusen Drive (On Its Own)

Summary of Costs

NO.	ITEM	TOTAL AMOUNT
1	General	\$ 35,000.00
2	Earthworks	\$ 403,500.00
3	Watermain	\$ 1,011,450.00
3a	Dual 300 mm dia Watermain Along Van Dusen from White Lake	\$ 1,972,900.00
4	Sanitary Sewer	\$ 1,139,500.00
5	Sanitary Pump Station	\$ 2,792,500.00
6	Storm Sewer	\$ 2,555,500.00
7	Stormwater Management Pond	\$ 1,323,350.00
8	Roads	\$ 1,906,075.00
9	Utilities	\$ 654,450.00
10	Provisional	\$ 50,000.00
11	Hydro Charges (\$1500/single; \$800/town)	\$ 319,900.00
12	Potential Contribution to Signals at Van Dusen/White Lake	\$ 150,000.00
	Subtotal	\$ 14,314,125.00
	30 % Soft Costs and Construction Contingency (1. 13 only)	\$4,153,267.50
	TOTAL	\$18,467,392.50
	Length of Road	2300
	Cost Per Metre of Road	\$8,029.30
	Number of Units	346
	Cost Per Unit	\$53,373.97
	Frontage (m)	2940
	Cost per Metre Frontage	\$6,281.43
	Frontage (ft)	9646
	Cost per Foot Frontage	\$1,914.58

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION A - General (Site Area = 24.9 ha)					
1	Traffic Management	1.0	LS	\$5,000.00	\$ 5,000.00
2	Erosion and Sediment Control - Implementation, Monitoring and Removal	1.0	LS	\$30,000.00	\$ 30,000.00
SUBTOTAL - SECTION A					\$ 35,000.00
SECTION B - Site Preparation & Earthworks					
1	Clearing and Grubbing	1.0	LS	\$5,000.00	\$ 5,000.00
2	Topsoil Stripping Right of Ways	39,500.0	m ²	\$3.00	\$ 118,500.00
3	Earth Excavation and Grading				
	a) Imported Fill Subgrade (1.0 m)	0.0	m ³	\$15.00	\$ -
	b) Imported Fill Lots (.75 m)	0.0	m ³	\$15.00	\$ -
	c) Engineered Fill Under Foundations	0.0	m ³	\$45.00	\$ -
	d) Lot Grading	280.0	ea	\$1,000.00	\$ 280,000.00
5	Retaining Wall	0.0	m ²	\$600.00	\$ -
6	Safety Railing on wall	0.0	m	\$150.00	\$ -
7	Noise Wall	0.0	m	\$450.00	\$ -
SUBTOTAL - SECTION B					\$ 403,500.00
SECTION C - Watermain					
1	Watermain				
	a) 200mm dia. PVC Class 150 DR18	1775.0	m	\$250.00	\$ 443,750.00
	b) 50 mm dia Copper	200.0	m	\$120.00	\$ 24,000.00
2	VVB and VC				
	a) 200mm dia. VVB	18.0	ea	\$4,000.00	\$ 72,000.00
	b) 300 mm dia. VC	0.0	ea	\$7,000.00	\$ -
3	Fire Hydrants				

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
	a) Hydrant c/w valve, valve box and lead	16.0	ea	\$7,700.00	\$ 123,200.00
4	Flusher Hydrants	2.0	ea	\$25,000.00	\$ 50,000.00
5	Water Services (Mainline to 5.0 m past curb)				
	a) 19mm dia. c/w standpost, Type K Copper	280.0	ea	\$1,000.00	\$ 280,000.00
6	Connection to Existing	1.0	ea	\$3,500.00	\$ 3,500.00
7	Connection Charges	1.0	LS	\$15,000.00	\$15,000.00
SUBTOTAL - SECTION C					\$ 1,011,450.00
SECTION D - Sanitary Sewer					
1	Sanitary Sewer				
	a) 250mm dia. PVC SDR 35	1975.0	m	\$300.00	\$ 592,500.00
2	Sanitary Maintenance Holes				
	a) 1200mm dia.	27.0	ea	\$7,500.00	\$ 202,500.00
3	Sanitary Services (Mainline to 5.0 m past curb)				
	a) 135mm dia. PVC SDR28	280.0	ea	\$1,000.00	\$ 280,000.00
4	Discharge Chamber Connection to Bev Shaw San	1.0	ea	\$25,000.00	\$ 25,000.00
5	CCTV Inspection (x2)	1975.0	m	\$20.00	\$ 39,500.00
SUBTOTAL - SECTION D					\$ 1,139,500.00
SECTION E - Sanitary Pump Station					
1	Pump Station	1.0	LS	\$1,500,000.00	\$ 1,500,000.00
2	Instrumentation and Controls	1.0	LS	\$400,000.00	\$ 400,000.00
3	Dual 150 mm Forcemains incl reinstatement in blvd	2100.0	m	\$425.00	\$ 892,500.00
SUBTOTAL - SECTION E					\$ 2,792,500.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION F - Storm Sewer					
1	Storm Sewer				
	a) 1500 mm dia	0.0	m	\$1,500.00	\$ -
	b) 1350 mm dia	30.0	m	\$1,350.00	\$ 40,500.00
	c) 1200 mm dia	205.0	m	\$1,200.00	\$ 246,000.00
	d) 1050 mm dia	160.0	m	\$1,100.00	\$ 176,000.00
	e) 975 mm dia	345.0	m	\$1,000.00	\$ 345,000.00
	f) 900 mm dia	150.0	m	\$900.00	\$ 135,000.00
	g) 750 mm dia	225.0	m	\$600.00	\$ 135,000.00
	h) 600 mm dia	480.0	m	\$390.00	\$ 187,200.00
	i) 525 mm dia	220.0	m	\$350.00	\$ 77,000.00
	j) 450 mm dia	160.0	m	\$320.00	\$ 51,200.00
2	Storm Maintenance Holes				
	a) 3000mm dia.	1.0	ea	\$30,000.00	\$ 30,000.00
	b) 2400mm dia.	4.0	ea	\$25,000.00	\$ 100,000.00
	c) 1800mm dia.	7.0	ea	\$15,000.00	\$ 105,000.00
	d) 1500 mm dia.	2.0	ea	\$10,000.00	\$ 20,000.00
	e) 1200 mm dia.	13.0	ea	\$7,500.00	\$ 97,500.00
3	Catch Basins				
	a) 600mm x 600mm PCC c/w lead & subdrain as per OPSD 705.010	32.0	ea	\$3,600.00	\$ 115,200.00
4	Rear Yard Drainage Systems				
	a) Rear Yard Catch Basin (RYCB), 600mm x 600mm	22.0	ea	\$3,000.00	\$ 66,000.00
	b) RYCB Lead, 250mm dia. PVC SDR 35	860.0	m	\$140.00	\$ 120,400.00
	c) Rearyard Perforated Pipe, 250mm dia. c/w filter sock	1440.0	m	\$110.00	\$ 158,400.00
	d) Elbows and Tees	60.0	ea	\$350.00	\$ 21,000.00
5	Inlet Control Device	32.0	ea	\$300.00	\$ 9,600.00
6	Storm Services (Foundation Drainage Sewer to 5.0m past curb)				
	a) 135mm dia. PVC SDR 28	280.0	ea	\$1,000.00	\$ 280,000.00
7	Connection to Existing Storm Sewer	0.0	ea	\$2,500.00	\$ -
8	CCTV Inspection (x2)	1975.0	m	\$20.00	\$ 39,500.00
SUBTOTAL - SECTION F					\$ 2,555,500.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION G - Stormwater Management Facility					
1	Excavation and Move Fill to Boulevards	40000.0	m3	\$20.00	\$ 800,000.00
2	Inlet Concrete Headwall (OPSD 804.030) Inc. Rip Rap	1.0	ea	\$30,000.00	\$ 30,000.00
3	Low Flow Outlet				
	i) 375mm dia. (PVC SDR-35)	30.0	m	\$500.00	\$ 15,000.00
	ii) 1200mm Manhole 904 Inc. ICD	1.0	ea	\$5,500.00	\$ 5,500.00
	iii) Headwall (OPSD 804.030)	1.0	ea	\$25,000.00	\$ 25,000.00
	iv) Rip-Rap at Outlet(OPSD 810.010)	50.0	m2	\$45.00	\$ 2,250.00
4	High Flow Outlet				
	i) 1200mm x 900mm Box Culverts	10.0	m	\$7,000.00	\$ 70,000.00
	ii) Rip-Rap at Outlet Ditch (OPSD 810.010)	100.0	m2	\$45.00	\$ 4,500.00
	iii) Pond Overflow Rip Rap	500.0	m2	\$45.00	\$ 22,500.00
	iv) Permeable Rock Check Dam	1.0	ea	\$15,000.00	\$ 15,000.00
5	Access Road (City of Ottawa SC26)				
	i) 400mm Granular 'B'	240.0	m2	\$25.00	\$ 6,000.00
	ii) 150mm Gran 'A'	240.0	m2	\$15.00	\$ 3,600.00
6	Hydroseeding	3600.0	m2	\$2.50	\$ 9,000.00
7	600mm Thick Clay Liner - Native (Provisional)	8000	m2	\$25.00	\$ 200,000.00
8	600mm Granular B Type II on bottom of forebays	2000	m2	\$20.00	\$ 40,000.00
9	Landscape allowance	1	LS	\$75,000.00	\$ 75,000.00
SUBTOTAL - SECTION G					\$ 1,323,350.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION H - Road Works (L= 1975m; 8.5 asphalt width)					
1	Granular B, Type II (400mm)	20,300.0	m ²	\$20.00	\$ 406,000.00
2	Granular A (150mm)	17,340.0	m ²	\$10.00	\$ 173,400.00
3	Asphalt				
	a) 40mm Base Course (SP 19.0mm, PG 58-34)	17,340.0	m ²	\$18.00	\$ 312,120.00
	b) 40mm Surface Course (SP 12.5mm, PG 58-34)	17,340.0	m ²	\$22.00	\$ 381,480.00
4	Curb	3,950.0	m	\$75.00	\$ 296,250.00
5	1.8 m Sidewalk One Side	3,555.0	m ²	\$75.00	\$ 266,625.00
6	Iron Work Adjustments (base to final lift)	120.0	ea	\$460.00	\$ 55,200.00
7	Signage				
	a) Temporary Street Signage	12.0	ea	\$500.00	\$ 6,000.00
	b) Permanent Street Signage	12.0	ea	\$750.00	\$ 9,000.00
SUBTOTAL - SECTION H					\$ 1,906,075.00
SECTION I - Utilities					
1	Utility Trenching c/w sand bedding & backfill				
	a) Boulevard	3950.0	m	\$35.00	\$ 138,250.00
	b) Service Drop Offs	280.0	ea	\$110.00	\$ 30,800.00
3	Concrete Encased Road Crossings c/w Duct (regardless of No. of ducts)				
	a) Joint Utility	14.0	ea	\$2,500.00	\$ 35,000.00
4	Duct (supply and placement)				
	a) Hydro and Comm Duct (100mm PVC DB2)	13800.0	m	\$6.00	\$ 82,800.00
	b) Streetlight Duct (76mm PVC)	4000.0	m	\$6.00	\$ 24,000.00
5	Transformer Pad	30.0	ea	\$3,500.00	\$ 105,000.00
6	Street Lights				
	a) Pole and Luminaire	46.0	ea	\$4,500.00	\$ 207,000.00
	b) Street Light Wiring (3 x #8 RWU)	2300.0	m	\$12.00	\$ 27,600.00
7	Street Light Disconnects	4.0	ea	\$1,000.00	\$ 4,000.00
SUBTOTAL - SECTION I					\$ 654,450.00

ITEM NO.	ITEM	EST. QUANTITY	UNIT	UNIT RATE	TOTAL AMOUNT
SECTION J - Provisionals					
1	Provisional	1	LS	\$50,000.00	\$ 50,000.00
SUBTOTAL - SECTION J					\$ 50,000.00
TOTAL					\$ 11,871,325.00

singles 137
 towns 125 semis 18 143
 280
 Hydro Charges \$ 319,900.00

Adjustment for parkland (5% of 24,9 ha)
 1.25 ha x 15 units/ha = 19units

Adjustment to frontage
 12500 m2 / 32 m = 390 m loss forntage