



Hydraulic Capacity and Modeling Analysis Leitrim Community Development

Technical Memorandum

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Document History and Version Control

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1 Introduction

GeoAdvice Engineering Inc. (“GeoAdvice”) was retained by David Schaeffer Engineering Ltd. (“DSEL”) to size the proposed watermain network for the Leitrim Community development (“Development”) in the City of Ottawa, ON (“City”).

The development will have two (2) connections to the City’s water distribution system along Bank Street that will feed the proposed development. The connections used for modeling the proposed development were based on boundary conditions provided by the City on May 29, 2026 (refer to **Appendix C**).

The development site is shown in **Figure 1.1** on the following page, with the recommended watermain pipe diameter.

This memo describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoWater Pro (Autodesk software), a GIS water distribution system modeling and management software application.

The results presented in this memo are based on the analysis of steady state simulations. The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the watermain while maintaining a residual pressure of 20 psi at the hydrant. No extended period simulations were completed in this analysis to assess the water quality or to assess the hydraulic impact on storage and pumping.



2 Modeling Considerations

2.1 Watermain Configuration

The watermain network was modeled based on drawings prepared by DSEL and provided to GeoAdvice on June 14, 2026.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a preliminary site grading plan at road level, which was prepared by DSEL and provided to GeoAdvice on June 14, 2026.

2.3 Consumer Demands

The residential demands for the development were provided by DSEL as summarized in **Table 2.1** and were uniformly distributed to all junctions within the development.

Detailed demand calculations are provided in **Appendix A**.

Table 2.1: Development Water Demands

Scenario	Demand (L/s)
Average Day Demand (ADD)	5.02
Max Day Demand (MDD)	12.55
Peak Hour Demand (PHD)	27.61

2.4 Fire Flow Demand

Fire flow demands are typically determined in accordance with the Fire Underwriters Survey's Water Supply for Public fire Protection guideline (2020). FUS calculations are based on the types of building, floor area, number of storeys, construction class, occupancy class and exposure factor. At this time, there is not enough information about the building construction details to complete FUS calculations.

As agreed with DSEL, the following required fire flows were assumed:

- Single Family Residential: 250 L/s
- Townhouse: 250 L/s
- Duplex: 250 L/s
- Park and National Heritage System: 250 L/s

FUS calculations should be completed once detailed drawings become available to validate the required fire flow assumptions. The FUS fire flows may vary from those assumed in this memo.



Fire flow simulations were completed at each node. The locations of nodes do not necessarily represent hydrant locations. Details of the required fire flows within the development are shown in **Appendix B**.

2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following locations:

- Connection 1: Bank Street
- Connection 2: Bank Street & Sora Way

The two (2) connections to the proposed development are illustrated in **Figure 1.1**.

Boundary conditions were provided for Peak Hour (PHD), Maximum Day plus Fire (MDD+FF) and Average Day (high pressure check, ADD) demand conditions. The City boundary conditions were provided on May 29, 2026, summarized in **Table 2.2**, and details can be found in **Appendix C**.

Table 2.2: Boundary Conditions

City Scenario	Condition	Connection 1 HGL (m)	Connection 2 HGL (m)
Existing	Average Day (max. pressure)	154.8	154.8
	Peak Hour (min. pressure)	147.0	147.0
	Max Day + Fire Flow (250 L/s)	119.8	119.1
SUC	Average Day (max. pressure)	147.0	147.0
	Peak Hour (min. pressure)	142.0	141.9
	Max Day + Fire Flow (250 L/s)	127.7	127.2

To evaluate the proposed network under the most stringent operating conditions, the hydraulic analysis was conducted utilizing a combination of the **bold** boundary conditions highlighted in **Table 2.2**. This approach aggregates the lowest available Hydraulic Grade Line (HGL) values across the different city scenarios to establish a highly conservative, worst-case scenario for system evaluation.



3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

Pipe characteristics of internal diameter (ID) and Hazen-Williams C factors were assigned in the model according to the City of Ottawa Design Guidelines for PVC watermain material. Pipe characteristics used for the development are outlined in **Table 3.1** below.

Table 3.1: Model Pipe Characteristics

Nominal Diameter (mm)	ID PVC (mm)	Hazen Williams C-Factor (/)
250	250	110
300	297	120

3.2 Pressure Requirements

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). Pressure requirements are outlined in **Table 3.2**.

Table 3.2: Pressure Requirements

Demand Condition	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Operating Pressure (maximum daily flow)	350	50	480	70
Peak Hour Demand (minimum allowable pressure)	276	40	-	-
Maximum Fixture Pressure (Ontario Building Code)	-	-	552	80
Maximum Distribution Pressure (minimum hour check)	-	-	552	80
Maximum Day Plus Fire	140	20	-	-



4 Hydraulic Capacity Analysis

The proposed watermains within the development were sized to satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for average day, peak hour and maximum day plus fire flow using InfoWater Pro.

4.1 Development Pressure Analysis

Modeled service pressures for the development are summarized in **Table 4.1**.

Table 4.1: Summary of Available Service Pressures

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
78 psi (539 kPa)	67 psi (464 kPa)

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point within the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi) and the minimum pressure at any point within the distribution system shall not fall below 270 kPa (40 psi).

As shown in **Table 4.1**, the modeled maximum pressure of 539 kPa (78 psi) under ADD slightly exceeds the City's preferred best-practice range but remains safely below the absolute maximum threshold of 552 kPa (80 psi). The minimum pressure of 464 kPa (67 psi) under PHD is well within the preferred operating range. Consequently, the system will maintain acceptable service pressures without the need for pressure reducing valves (PRVs) or booster facilities. Detailed maps illustrating the pressure modeling results can be found in **Appendix D**.

4.2 Development Fire Flow Analysis

Summary of the minimum available fire flow in the development is shown in **Table 4.2**.

Table 4.2: Summary of the Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow
250 L/s	302 L/s

As shown in **Table 4.2**, the fire flow requirements can be met at all junctions within the development.

Summaries of the residual pressures in the development are shown in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire.



Table 4.3: Summary of the Residual Pressures

Minimum Residual Pressure	Average Residual Pressure	Maximum Residual Pressure
25 psi (173 kPa)	30 psi (208 kPa)	34 psi (234 kPa)

As shown in **Table 4.3**, the minimum allowable pressure under fire flow conditions can be met at all junctions within the development.

The figure illustrating the fire flow results can be found in **Appendix E**.



Submission

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Appendix A Demand Calculations

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Project ID: 2026-082-DSE



BC Permit to Practice: 1000623
ON CofA Number: 100118603

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010



Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4	128	436
Semi-detached	2.7	-	0
Townhouse	2.7	244	659
Duplex	1.8	252	454
Apartment			0
Bachelor	1.4	-	0
1 Bedroom	1.4	-	0
2 Bedroom	2.1	-	0
3 Bedroom	3.1	-	0
Average	1.8	-	0

	Pop	Avg. Daily		Max Day		Peak Hour	
		m ³ /d	L/min	m ³ /d	L/min	m ³ /d	L/min
Total Domestic Demand	1549	433.7	301.2	1084.3	753.0	2385.5	1656.6

Institutional / Commercial / Industrial Demand

Property Type	Unit Rate	Units	Avg. Daily		Max Day		Peak Hour	
			m ³ /d	L/min	m ³ /d	L/min	m ³ /d	L/min
Commercial floor space	2.5 L/m ² /d	-	0.00	0.0	0.0	0.0	0.0	0.0
Office	75 L/9.3m ² /d	-	0.00	0.0	0.0	0.0	0.0	0.0
Restaurant*	125 L/seat/d	-	0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000 L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000 L/gross ha/d	-	0.00	0.0	0.0	0.0	0.0	0.0
Total I/CI Demand			0.0	0.0	0.0	0.0	0.0	0.0
Total Demand			433.7	301.2	1084.3	753.0	2385.5	1656.6

* Estimated number of seats at 1seat per 9.3m²



Appendix B Required Fire Flows

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Appendix C Boundary Conditions

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Boundary Conditions 4795 Bank Street– 2026

Provided Information

Scenario	Demand	
	L/min	L/s
Average Daily Demand	301.2	5.02
Maximum Daily Demand	753.0	12.55
Peak Hour	1,656.6	27.61
Fire Flow Demand #1	15,000.0	250.00

Location



Results

Existing Conditions

Connection 1 - Bank St.

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	154.8	87
Peak Hour	147.0	76
Max Day plus Fire Flow #1	119.8	37

¹ Ground Elevation = 93.9 m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	154.8	86
Peak Hour	147.0	75
Max Day plus Fire Flow #1	119.1	35

¹ Ground Elevation = 94.3 m

SUC

Connection 1 - Bank St.

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	147.0	76
Peak Hour	142.0	69
Max Day plus Fire Flow #1	127.7	48

¹ Ground Elevation = 93.9 m

Connection 2 - Bank St.

Demand Scenario	Head (m)	Pressure¹ (psi)
Maximum HGL	147.0	75
Peak Hour	141.9	68
Max Day plus Fire Flow #1	127.2	47

¹ Ground Elevation = 94.3 m

Notes

1. Any connection to a watermain 400 mm or larger should be approved by DWS as per the Water Design Guidelines Section 2.4 Review by Drinking Water Services.
2. As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:
 - If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
 - Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

Disclaimer

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



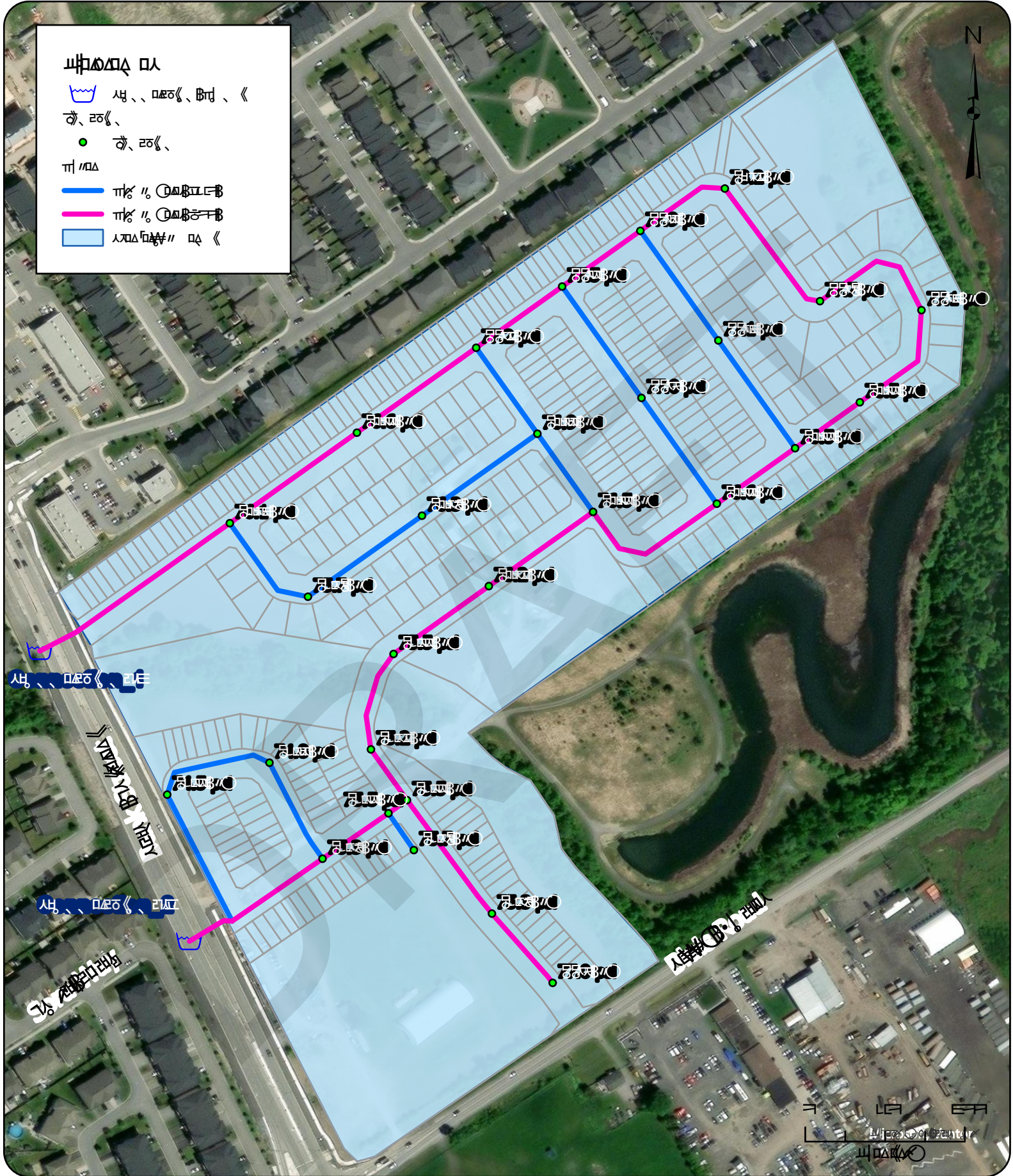
Appendix D Pressure Results

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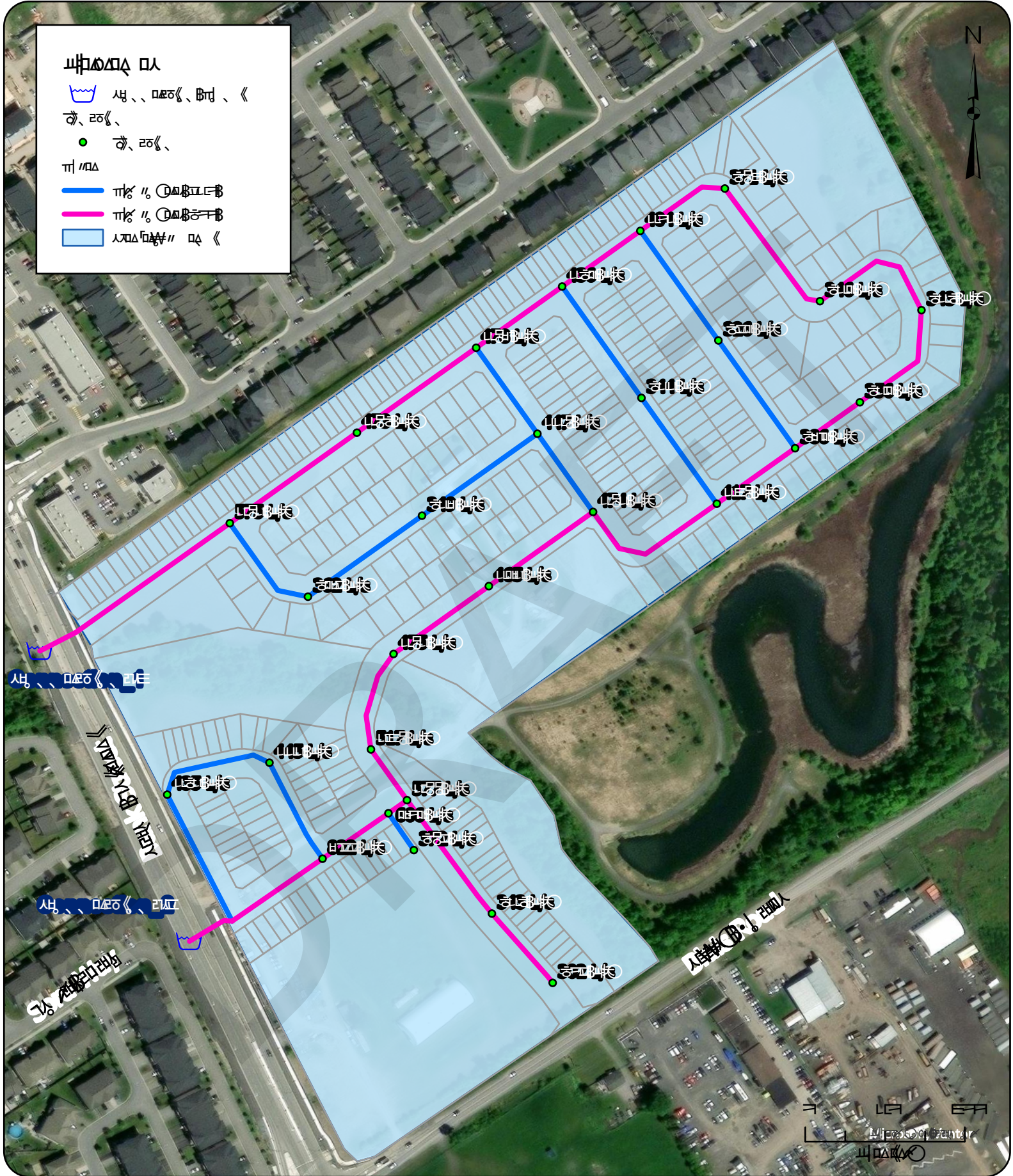
Appendix E MDD+FF Model Results

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1. The map shows the development area in blue. The blue line represents the 1st floor, and the pink line represents the 2nd floor. The blue shading represents the development area.

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