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Stormwater Management Report and Servicing Brief

Palladium Resort Development Limited Partnership
2775 & 2785 Palladium Drive & Block 244
Ottawa, ON

Prepared for:

Palladium Resort Development Limited Partnership
2962 Carp Road
Ottawa, ON
K0A 1L0

Attention: Tim Eisner

LRL File No.: 240720

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5430 Canotek Road | Ottawa, ON, K1J 9G2 | info@lrl.ca | www.lrl.ca | (613) 842-3434

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1 INTRODUCTION AND SITE DESCRIPTION

LRL Associates Ltd. was retained by Palladium Resort Development Limited Partnership to complete a Stormwater Management Analysis and Servicing Brief for the development at 2775 & 2785 Palladium Drive located in Ottawa, ON.

The subject property is legally described as Concession 1 Lot 2, Blocks 243 and 251 Registered Plan 4M-1687, and Block 244, registered Plan 4M-25, geographic township of Huntley in the City of Ottawa. The subject lots are zoned IM (Mixed Industrial under bylaw 2026-50). The three properties are being developed and are included in this report. Blocks 243 & 251 represent 2775 and 2785 Palladium drive. These properties are **1.6 Ha** each and are being combined into one **3.2 Ha** property located on the east side of Culdaff St. Block 244 is located to the west of Culdaff Road and is approximately **1.99 Ha.** In addition, we would like to note that the subject property is located with the 195 Huntmar Drive development area and part of the Kanata West Concept Plan.



Figure 1: Arial View of Proposed Development

The proposed development at Block 243/251consists of a 7-storey Hotel, a 2-storey Family Entertainment Centre, an indoor waterpark with slide tower and a 1 storey support building for the

waterpark complete with parking area. The development of the parcel west of Culdaff Road, Block 244, consist of an outdoor event and parking area.

The first floor of the hotel and family entertainment centre includes hospitality rooms, hotel lobby reception and check-in, fitness centre, gift shop and kitchen & concession area, approximately 4,545 m². The hotel area second floor includes rooms and the second floor of the family entertainment centre includes kitchen, restaurant, and administration area, approximately 2,780 m². The third floor and additional floors are hotel rooms are an area of approximately 2,043 m² per floor. The water park floor area and support building are approximately 10,112 m². For further details, refer to the Site Plan included in ***Appendix B.***

This design will demonstrate conformance with the design criteria of the City of Ottawa, the DSEL 195 Huntmar design brief (July 2020), DSEL Functional Servicing Report (FSR) (May 2019), and the Kanata West Master Servicing Study (KWMSS) (June 2016), background studies. It should also be noted that the 195 Huntmar Drive design was completed with stormwater management provided by J.F. Sabourin and Associates Inc, watermain analysis completed by GeoAdvice Engeinering Inc, and geotechnical analysis completed by Paterson Group Inc.

This report has also been prepared in consideration of the terms and conditions noted above and with the civil drawings prepared for the new development. Should there be any changes in the design features, which may relate to the stormwater and servicing considerations, LRL Associates Ltd. should be advised to review the report recommendations.

2 BACKGROUND STUDIES AND GUIDELINES

The following guidelines were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**
  City of Ottawa, SDG002, October 2012
    - Technical Bulleting ISDTB-2014-01
      City of Ottawa, February 5, 2014
    - Technical Bulleting PIEDTB-2016-01
      City of Ottawa, September 6, 2016
    - Technical Bulleting ISTB-2018-01
      City of Ottawa, March 21, 2018
    - Technical Bulleting ISTB-2018-04
      City of Ottawa, June 27, 2018
    - Technical Bulleting ISTB-2019-02
      City of Ottawa, July 8, 2019
- **City of Ottawa Design Guidelines – Water Distribution**
  City of Ottawa, WDG001, July 2010

  - Technical Bulleting ISD-2010-2
    City of Ottawa, December 15, 2010
  - Technical Bulleting ISDTB-2014-02
    City of Ottawa, May 27, 2014
  - Technical Bulleting ISDTB-2018-02
    City of Ottawa, March 21, 2018
  - Technical Bulleting ISDTB-2021-03
    City of Ottawa, August 18, 2021
  - Technical Bulleting IWSTB-2024-05
    City of Ottawa, November 18, 2024

- DESL – Functional Servicing Report 2325483 Ontario LTD. 195 Huntmar Drive, City of Ottawa, Project No.: 12-624, May 2019 Rev 3.
- DSEL – Design Brief for 2325483 Ontario LTD. 195 Huntmar Drive, City of Ottawa, Project No.: 12-624, July 2020 2nd submission.
- GeoAdvice Engineering Inc., Hydraulic Capacity and Modeling Analysis, 195 Huntmar Drive Subdivision Development, Final Report, December 20, 2019 R3.
- Kanata West Master Servicing Study (KWMSS) volume 1 of 2, Stantec Consulting Ltd, Cumming Cockburn Limited, IBI June 16, 2006.
- Kanata West Master Servicing Study (KWMSS) volume 2 of 2, Stantec Consulting Ltd, Cumming Cockburn Limited, IBI June 16, 2006.
- Paterson Group, Permeameter Test Investigation, Proposed Mixed-Use Development, 195 Huntmar Drive – Ottawa, June 18, 2020.
- DSEL – Memorandum, 195 Huntmar Development (D07-16-16-0011) Summary of Low Impact Development Measures, July 9, 2020.
- DSEL – Design Brief for Stormwater Management Pond 7 for the 195 Huntmar Drive Subdivision, City of Ottawa, Project No. 12-624, Revised July 2020.

3 EXISTING INFRASTRUCTURE AND DRAINAGE DESCRIPTION

The subject property is located within the 195 Huntmar Drive property boundary, located within the Kanata West Concept Plan (KWCP) area and subject to the Kanata West Master Servicing Study (KWMSS).

The existing infrastructure listed below were designed as part of the 195 Huntmar Drive servicing, FSR, and KWMSS and included the development of the three parcels detailed within this servicing report, Block 244, 243 and 251.

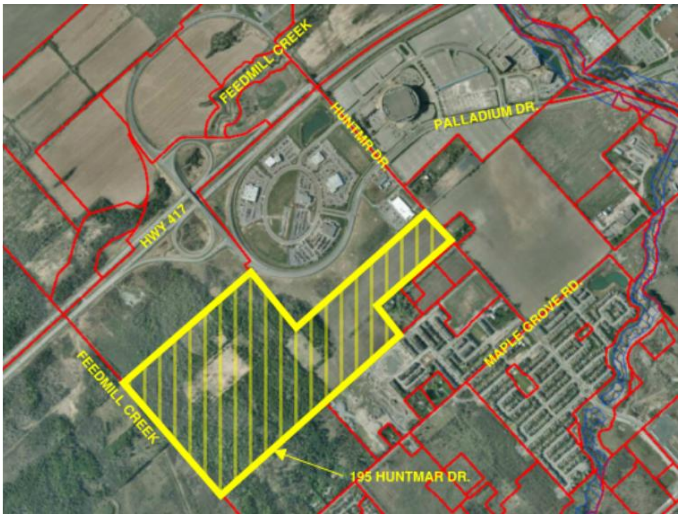


Figure 2: 195 Huntmar Drive property boundary

Culdaff Road

- 300mm diameter PVC watermain. (*Currently a dead-end extension from Derreen Ave*).
- 2 – 200mm diameter PVC water stubs extend from the Culdaff Rd watermain to the subject property, site 243 and 251.
- 1 – 200mm diameter PVC water stubs extend from the Culdaff Rd watermain to the subject property, site 244.
- 250mm diameter PVC sanitary sewer.
- 2 – 250mm diameter PVC sanitary stubs extend from the Culdaff Rd sanitary sewer main to the subject property, site 243 and 251. (*City of Ottawa MHSA76096, MHSA76099*)
- 1 – 250mm diameter PVC sanitary stubs extend from the Culdaff Rd sanitary sewer main to the subject property, site 244. (*City of Ottawa MHSA76100*)
- 825mm and 975mm diameter concrete storm sewer.
- 2 –750mm diameter concrete storm sewer stubs extend from the Culdaff Rd storm sewer to the subject property, site 243 and 251. (*City of Ottawa MHSA84407, MHSA84411*)

Stormwater Management Pond 7

The Kanata West Stormwater Management (SWM) Facility 7 (Pond 7) is located within the City of Ottawa in the 195 Huntmar Drive subdivision with discharge to the Feedmill Creek watercourse. The existing pond is located to the west of block 244.

As set out in the FSR, KWMSS, and DSEL Design Brief, Pond 7 is to provide quantity and quality treatment for 41.73 ha of the 195 Huntmar Drive development. Pond 7 outlets to Feedmill Creek and provides an Enhanced Level of quality control for the 41.73 Ha area.

One of the pond inlet sewers is located along the south property line between the existing townhouse block and block 244. The sewer is a 1650mm diameter concrete sewer and extends from Culdaff Rd to Pond 7, complete with a 3m wide bottom overland flow route swale located

above the sewer. (*MHST84403 to MHST84404*) An 825mm diameter storm stub is extended into block 244 for servicing. (*MHST84406)*

The pond outlet is a750mm concrete storm sewer located in a 6m easement (not registered) extending from the pond east towards Palladium Drive, along the north property line of the development between parcels 244 & 251 and the MTO lands to the north. (*MHST84430 through MHST84435*)

Watermain Looping Option:
A shown on the City of Ottawa as-builts a 200mm diameter PVC watermain extends from Utility Place, north through the walkway located in Block 234 and then follows the property line between the Pond 7 parcel the Block 244. The watermain dead ends at the MTO lands. The watermain is located within the Pond 7 parcel.

4 CONSULTATION AND REGULATORY APPROVALS

4.1 City of Ottawa pre-consultation

A pre-consultation meeting for the proposed development was held on February 5, 2025 with the City of Ottawa.

Engineering Servicing City Pre-consultation comments:

- Two water services will be required when the water demand is expected to be 50m^3/d or more.
- Water looping will be required when the water demand is expected to be 50m^3/d or more.
- A downstream assessment will be needed if the site exceeds the allotted sanitary capacity designated for the site.
- The Culdaff Rd storm sewer system leads to the stormwater management pond.
- A 750mm diameter concrete sewer is located along the north property boundary of the site. The site shall not be connected to this sewer. A 6m wide easement is to be provided to the City, if one has not been provided.
- The need for an MECP ECA is to be confirmed with the MECP.

Regulatory approvals are included in ***Appendix A.***

4.2 MTO pre-consultation

On May 11, 2026, a pre-consultation request was submitted to the Ministry of Transportation (MTO), and a response was received on May 20, 2026. The letter has been included in ***Appendix A.***

Under the authority of Public Transportation and Highway Information Act (PTHIA), the MTO controls all land use within 45m of highway right-of-way and the area within 395m of the centre point of the highway intersection and any intersecting roads.

The stormwater management design must conform to the MTO requirements that post-development flow to the highway drainage system to not exceed pre-development flows.

5 GEOTECHNICAL CONSIDERATIONS

A revised geotechnical investigation was completed by LRL Engineering Ltd dated June 30th, 2026.

The subsurface profile generally consists of topsoil and localized loam overlying variable layers of fill, sand and silt, sandy silt, silty sand, silty clay, clayey silt, clay, and silt. Fill materials were encountered in portions of the site to depths of approximately 0.8 to 2.2 m below ground surface (bgs). Limestone bedrock or practical auger refusal was encountered between approximately 2.5 m and 9.2 m bgs, with Rock Quality Designation (RQD) values ranging from 66 to 100%, indicating fair to excellent rock quality. Laboratory testing indicated generally low-permeability native soils with limited infiltration potential.

Groundwater levels measured during the investigation ranged from approximately 1.75 m to 4.85 m bgs, although several boreholes remained dry. Groundwater levels are expected to fluctuate seasonally.

The geotechnical assessment identified a permissible grade raise limit of 3.0 m above existing grade and concluded that the proposed buildings can be supported on conventional shallow foundations bearing on competent native soils. Estimated total settlements are expected to be less than 25 mm, and liquefaction is not considered a concern.

The report also provides recommendations for foundations, structural fill, excavation and trenching, groundwater control, pipe bedding and backfill, slab-on-grade construction, pavement design, drainage, and corrosion protection, which will be incorporated into the detailed design and construction phases.

6 PROPOSED DEVELOPMENT

The proposed development consists of two parcels located on the east and west side of Culdaff Road. The east parcel (243/251) will be developed as one building with different usages which include a 7-storey hotel, a 2-storey family entertainment centre, a 1-storey support building, and an indoor water park, complete with parking area. The west parcel will be developed as a parking area and outdoor event space.

For additional detail of the proposed development, refer to the Site Plan & Architectural Floor Plans prepared by McRobie Architects included in ***Appendix B***.

7 SCOPE OF WORK

As per applicable guidelines, the scope of work includes the following:

Stormwater management

- Calculate the allowable stormwater release rate.
- Calculate the anticipated post-development stormwater release rates.
- Demonstrate how the target quantity and quality control objectives will be achieved.

Water services

- Calculate the expected water supply demand at average and peak conditions.

- Calculate the required fire flow as per the Fire Underwriters Survey (FUS) method.
- Confirm the adequacy of water supply and pressure during peak flow and fire flow.
- Describe the proposed water distribution network and connection to the existing system.

Sanitary services

- Describe the existing sanitary sewers available to receive wastewater from the proposed buildings.
- Calculate peak flow rates from the proposed development.
- Describe the proposed sanitary sewer system.

8 WATER SUPPLY AND FIRE PROTECTION

The subject property lies within the City of Ottawa's 3W pressure zone as shown in the City of Ottawa Water Distribution Mapping.

According to the City of Ottawa Water Distribution Guidelines (Technical Bulletin ISTB-2021-03), since the subject site is anticipated to have a water demand higher then 50m^3/d or more, it is required to be serviced by two water service laterals, separated by an isolation valve, for redundancy and to avoid creation of a vulnerable service area. Hence, the proposed development in Block 243/251 will be serviced by two (2) 200 mmØ service laterals connected to the 305 mmØ watermain within Culdaff Road. Servicing Plan C401 included in **Appendix F** depicts the location of the dual water service connection

Table 1 below summarizes the City of Ottawa Design Guidelines design parameters employed in the preparation of the water demand estimate.

Table 1: City of Ottawa Design Guidelines – Water Design Parameters

Average Day Demand	
Residential	280 L/c/d
Industrial - Light	35,000 L/gross ha/d
Industrial - Heavy	55,000 L/gross ha/d
Commercial Office Space	75 L/9.3m2/d
Hotel	225 L/Bed/d
Maximum Daily Demand	
Residential	2.5 x avg. day
Industrial	1.5 x avg. day
Commercial	1.5 x avg. day
Institutional	1.5 x avg. day
Maximum Hour Demand	
Residential	2.2 x max. day
Industrial	1.8 x max. day
Commercial	1.8 x max. day
Institutional	1.8 x max. day

8.1 Existing Water Supply Services and Fire Hydrant Coverage

The 195 Huntmar Drive design and Hydraulic Capacity and Modeling Analysis concluded that the ultimate watermain layout that services the area includes a 300mm watermain extension on Palladium Drive from Huntmar Drive and a loop connection point to the 400mm diameter water on Huntmar Drive, as shown in **Figure 3**.

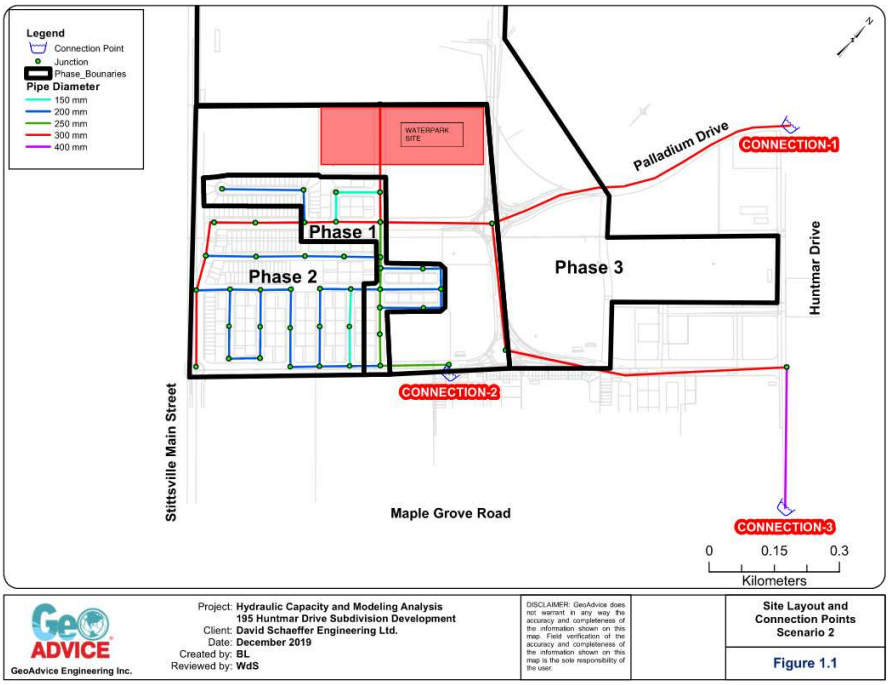


Figure 3: Hydraulic Capacity and Medeling Connection Points

The existing water demands assumed the waterpark lands to be commercial and employment with an average daily demand of 50,000 L/ha/d and a fire flow assumed to be 250 L/s. **Table 2** details the 195 Huntmar Drive calculated water demands per the Hydraulic Capacity and Modelling Analysis Final report. A copy of the report has been provided in ***Appendix C***.

Table 2: 195 Huntmar Drive Designed Demands

Design Parameter	**Demands*** West of Culdaff Rd Block 244 – Area 1.99ha *Junction ID J-10*	**Demands*** East of Culdaff Rd Block 251/243/242 – Area 5.89ha *Junction ID J-34*
	(L/s)	**(L/s)**
Average Daily Demand	1.27	3.75
Max Day	1.91	5.62
Peak Hour	3.44	10.12
Min Hour 0.5x Avg. Day	0.64	1.87
**Demands taken from Hydraulic Capacity and Modelling Analysis 195 Huntmar Drive Subdivision Development, Final Report, dated December 20, 2019, David Schaeffer Engineering Ltd. Located in Appendix C of the 195 Huntmar Drive design Brief.*		

8.2 Water Supply Servicing Design

8.2.1 Domestic Water Demand

A 305 mm diameter watermain was constructed from Dereen Avenue, north along Culdaff Road and capped at the MTO lands. Two (2) 203 mm diameter watermain stubs were installed at the property line to service both 2775 (Block 243) and 2785 (Block 251) Palladium Dr. In addition, an existing 203 mm diameter watermain was constructed from Unity Place north through the multi-use pathway and then continues north along the east pond property line of Pond 7 and is then capped at the MTO lands.



Figure 4: Existing Water supply

Anticipated population demands have been calculated from the architectural floor plan drawings completed by McRobie Architects. The proposed development is anticipated to include a 7-story Hotel with 236 Beds, complete with first floor hospitality rooms, fitness centre, and lobby. A 2-storey family entertainment centre with gifts shop on the first floor and a restaurant, kitchen area, and administration area on the second floor. The remainder of the development includes a 1,227 s.m. support building and a 6,643 s.m. indoor water park.

Per **Table 1** the hotel rooms were calculated at 225 L/bed space/d, and the hotel first floor, the entertainment centre, and the support building were calculated at 28,000 L/ha/d. The indoor waterpark demand required taking the average water usages from a similar waterpark located in Dallas Texas. **Table 3** below summarizes the year water usages from the Dallas Texas water park. It should be noted that the Dallas water park is an 80,000 square foot indoor/outdoor waterpark with the longest lazy river in Texas and an outdoor wave pool. This is much larger than the proposed Ottawa waterpark. In addition, the Dallas pools are drained daily during March break and daily for the summer months, June/July/August.

Table 3: Dallas Texas Yearly Water Usage

2024					
Weekdays					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
24,342	92,145	1.07	189,292	716,548	8.29
Weekends					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
30,040	113,715	1.32	104,522	395,659	4.59
2023					
Weekdays					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
27,089	102,544	1.19	116,569	441,261	5.11
Weekends					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
42,172	159,637	1.85	192,767	729,702	8.45
2022					
Weekdays					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
24,520	92,895	1.08	159,249	602,822	6.98
Weekends					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
32,062	121,368	1.40	97,144	367,730	4.26
2021					
Weekdays					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
250,098	76,079	0.88	86,849	328,759	3.81
Weekends					
Average Day Demand			**Maximum Daily Demand**		
US Gallons/day	**L/d**	**L/s**	**US Gallons/day**	**L/d**	**L/s**
27,114	102,641	1.19	165,131	625,088	7.24

The required water supply for the building areas has been calculated using the following formula:

Where,

$$\boldsymbol{Q = (q \times AorP \times M)}$$

q = average water consumption unit rate (L/gross ha/day)
A or P = area (ha for industrial space and m^2 for office space) or Design population (capita)
M = Peak factor

The following factors were used in calculations as per *Table 4.2* in the City of Ottawa Design Guidelines;

- Maximum Daily Demand Factor = **1.5**
- Peak Hour Demand Factor = **1.8**

Using the above-mentioned factors and design parameters listed in **Table 1**, total anticipated demands were calculated as follows:

- Average daily domestic water demand is **2.04** L/s,
- Maximum daily demand is **3.06** L/s, and
- Maximum hourly is **5.51** L/s.

Water demand calculations are located in **Appendix C.**

8.2.2 Fire Flow Demands

The estimated fire flow for the proposed buildings was calculated in accordance with *IWSTB-2024-05*. The parameters such as Type of construction, Occupancy type, Sprinkler Protection were provided by the Architect.

The Fire Underwriters Survey 2020 was used to calculate the fire flow demand for the site. The total effective area considers the hotel ground floor, second floor and 50% of the 5 additional floors, the ground floor and second floor of the entertainment centre, the support building floor area, and the waterpark floor area.

The estimated fire flow for the proposed building was calculated in accordance with *ISTB-2018-02*. The following parameters were provided by the Architect:

- Type of construction – Non-Combustible Construction (Type II);
- Occupancy type – Limited Combustible; and
- Sprinkler Protection – Automatic Sprinkler System.

The estimated fire flow demand was estimated to be **14,000 L/min**. There are three (3) existing and two (2) proposed fire hydrants located in proximity to the proposed building that are available

to provide the required fire flow demands. Refer to ***Appendix C*** for fire flow calculations and ***Appendix F*** for *Site Servicing Plan C.401* for fire hydrant locations.

Table 4 below summarizes the aggregate fire flow of the contributing hydrants in proximity to the proposed building based on Table 18.5.4.3 of *ISTB-2018-02*.

Table 4: Fire Protection Summary Table

Building	Fire Flow Demand (L/min)	Ex Fire Hydrants(s) within 75m	Available Combined Fire Flow (L/min)
Proposed Development	14,000	3	17,034

The total available fire flow from the contributing hydrants is equal to **17,034 L/min**, which is sufficient to provide adequate fire flow for the proposed development. A certified fire protection system specialist will need to be employed to design the building's fire suppression system and confirm the actual fire flow demand.

8.2.3 Boundary Conditions

The City of Ottawa was contacted to obtain boundary conditions associated the calculated water demand. At this time the boundary conditions have not been provided. The boundary condition request has been included in ***Appendix C***.

9 SANITARY SERVICE

9.1 Existing Sanitary Sewer Services

The site is within the Kanata West Pump Station (KWPS) catchment area. A 250mm diameter sanitary sewer extends on Culdaff Road to the MTO lands. Two (2) 250mm diameter stubs extend from the sewer main to service the two properties 2775 & 2785 Palladium Rd (Block 243/251). A 250mm diameter stub has also been provided for Block 244.

The following request has also been made to the City of Ottawa. The 195 Huntmar Dr. design report delineated the sanitary drainage areas as detailed in **Figure 5.** The corresponding sanitary sewer design sheets summarize the flows from the delineated area as follows:

- MTO lands (21.99ha) = Total Flow 17.97 L/s
- Block 244 (1.99ha) = Total Flow 1.62 L/s
- Block 251 (1.6ha) = Total Flow 1.35 L/s
- Block 243 (1.6ha) = Total Flow 1.35 L/s

Existing sewer design sheets have been provided in ***Appendix E.*** The 21.99Ha MTO lands includes the HWY 417 off ramp and cloverleaf which will not be commercially developed. When removing these areas, the MTO lands decrease to approximately 16.2Ha. In additional the DSEL Functional Servicing Report for 2325483 Ontario Ltd, 195 Huntmar Drive, dated May 2019 Rev 3

Appendix A, storm servicing drawings sizes the MTO lands to be 16.5ha. This decreases in area would create additional capacity in the sewer which increase the allowable capacity within the Culdaff Rd sanitary sewer system.

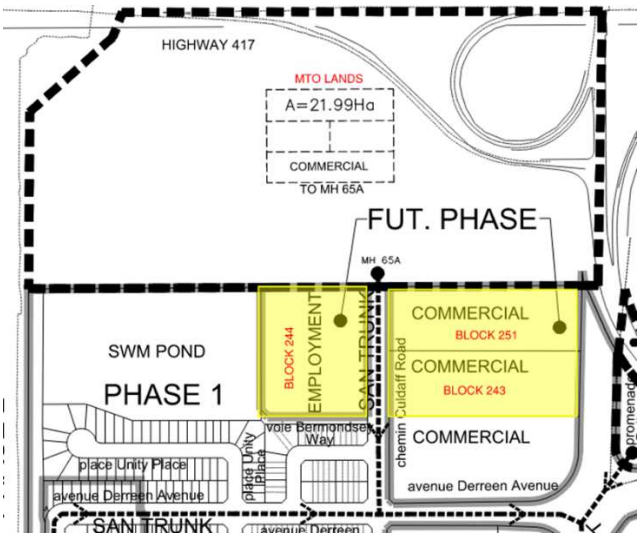


Figure 5: DSEL Sanitary Drainage Areas

9.2 Sanitary Sewer Servicing Design

We have requested with the city that the development (243/251 as one parcel of land) have two sanitary service laterals, one connection to each of the existing sanitary stubs for the east side of Culdaff Rd.

The sanitary sewer service to the north end of the Culdaff Rd sewer, MHSA76096 to MHSA76097, would provide servicing to the hotel and the family entertainment centre, 1.66 Ha. The wet flow for this area was calculated to be 5.08 L/s. The parameters used to calculate the anticipated flows for this outlet were 225L/bed/d, a commercial & Institutional flow of 28,000 L/ha/day as per the City of Ottawa Design Guidelines, and an infiltration allowance of 0.33 L/ha/s.

The sanitary sewer service to the south end of the Culdaff Rd sewer, MHSA76099 to MHSA76092, would provide servicing to the support building and the waterpark. The wet flow for the area (1.66 Ha) was calculated to be 1.64 L/s. The waterpark average daily demand was assumed to be 100,000 L/day, derived from the Dallas Texas waterpark. In the absence of a facility specific water balance from the mechanical design team, a conservative return factor of 40% was applied to this demand to estimate the domestic sanitary flow from the waterpark. The wet flow for the waterpark was calculated to be 0.46L/s.

The west side of Culdaff Rd, Block 244 (1.99 Ha), was allocated parameters used to calculate the anticipated flows as commercial & Institutional flow of 28,000 L/ha/day per the City of Ottawa

Design Guidelines, and an infiltration allowance of 0.33 L/ha/s. The wet flow for this area was calculated to be 1.62 L/s.

Refer to LRL drawing *Site Servicing Plan C.401*, included in ***Appendix E*****,** for the proposed sanitary servicing.

Downstream, the cumulative flow from the development area and future MTO lands total 21.69 L/s at the Bermondsey Way and Culdaff Rd MHSA76092. This sewer has a full-flow capacity of 32.57 L/s, yielding a Q/Qfull ratio of 0.67. As the downstream municipal sewer are operating at approximately 67% of full capacity under post-development conditions, the existing sanitary sewer system has significant reserve capacity to support the proposed development, and no concerns are anticipated with respect to sanitary servicing. Details of the sanitary flow calculations are provided in ***Appendix D*****.**

10 STORMWATER MANAGEMENT

10.1 Existing Stormwater Infrastructure

The subject property is located within the 195 Huntmar Drive property boundary, within the Kanata West Concept Plan (KWCP) area, and is subject to the Kanata West Master Servicing Study (KWMSS).

The development is part of the Pond 7 - Feedmill Creek drainage area. The existing stormwater management facility (Pond 7) is located on the west side of Block 244 and outlets to Feedmill Creek. Existing storm sewer infrastructure along Culdaff Rd includes two stubs to service Block 243 and 251. From Culdaff Rd the storm sewer flows through a 1650mm diameter concrete sewer which outlets to Pond 7. The 1650mm diameter sewer is located within a service easement along the south property line of Block 244. An existing 825 mm diameter storm sewer stub allows for the servicing of the west property (Block 244).

10.2 Design Criteria

The stormwater management criteria for this development are based on the Kanate West Master Servicing Study (KWMSS), 195 Huntmar Drive Design Brief and Functional Servicing Report, pre- and consultation with City of Ottawa officials, City's 'Ottawa Design Guidelines Sewer', Second Edition, document no. SDG002, October 2012, City of Ottawa, including technical bulletins: ISDTB-2014-01, PIEDTB-2016-01, ISTB 2018-01, ISTB-2018-04, ISTB-2019-02.

Pond 7 was designed to receive all stormwater runoff from the 195 Huntmar Drive development. This includes Block 243/251 and Block 244 The Functional Servicing Report storm servicing drawing has been included in ***Appendix E***. The estimated imperviousness for Pond 7 drainage area was designed at a 70% impervious.

The 195 Huntmar Drive storm sewer design sheet designed Block 244, 243 and 251 at the 2-year storm event with a runoff coefficient of 0.80, providing the restricted flow requirement, 340L/s, 273

L/s and 272L/s, for the ultimate design of the blocks. The storm sewer design sheet has been provided in ***Appendix E***.

Per the Feedmill Creek Stormwater Management Criteria Study a target 5mm retention volume is to be met for the site through Low Impact Development (LID).

10.3 Watershed Areas

10.3.1 Pre-development Drainage

In pre-development conditions, drainage from the subject sites are depicted by existing catchment areas ECA-01 (west Block 244) and ECA-01A (east Block 243/251). The stormwater runoff from both the west and east sites drains uncontrolled toward the south.

10.3.2 Post-development

The site has been analyzed as east (Block 243/152) and west (Block 244), and post-development catchments have been determined for each.

The west site is 1.99 Ha and is divided into a total of twenty-three (23) controlled and uncontrolled catchment areas. Refer to Post-development Watershed Plan C702B included in ***Appendix F***. **Table 5** below summarize post-development drainage areas. Refer to ***Appendix D*** for storm sewer calculations.

Table 5: Post – Development Drainage Areas of the West property

Watershed	C = 0.20	C = 0.90	Total Area (ha)	Combined C
CA-01B (controlled)	0.151	0.000	0.151	0.20
CA-02B (controlled)	0.000	0.039	0.039	0.90
CA-03B (controlled)	0.000	0.052	0.052	0.90
CA-04B (controlled)	0.000	0.050	0.050	0.90
CA-05B (controlled)	0.057	0.000	0.057	0.20
CA-06B (controlled)	0.004	0.066	0.070	0.86
CA-07B (controlled)	0.016	0.111	0.127	0.81
CA-08B (controlled)	0.160	0.000	0.160	0.20
CA-09B (controlled)	0.006	0.079	0.085	0.85
CA-10B (controlled)	0.016	0.113	0.129	0.81
CA-11B (controlled)	0.017	0.112	0.129	0.81
CA-12B (controlled)	0.017	0.110	0.127	0.81
CA-13B (controlled)	0.007	0.047	0.054	0.82

CA-14B (controlled)	0.007	0.045	0.051	0.81
CA-15B (controlled)	0.001	0.072	0.073	0.89
CA-16B (controlled)	0.001	0.070	0.071	0.89
CA-17B (controlled)	0.027	0.034	0.061	0.59
CA-18B (controlled)	0.024	0.036	0.060	0.62
CA-19B (controlled)	0.022	0.039	0.061	0.65
CA-20B (controlled)	0.021	0.040	0.061	0.66
CA-21B (uncontrolled)	0.168	0.000	0.168	0.20
CA-22B (uncontrolled)	0.078	0.000	0.078	0.20
CA-23B (uncontrolled)	0.080	0.001	0.081	0.21
Total	**0.878**	**1.115**	**1.994**	**0.59**

The east site 3.32 Ha is divided into a total of thirty-seven (37) controlled and un-controlled catchment areas. Refer to Post-development Watershed Plan C702A included in ***Appendix F***. **Table 6** below summarize post-development drainage areas. Refer to ***Appendix D*** for storm sewer calculations.

Table 6: Post – Development Drainage Areas of the East property

Watershed	C = 0.20	C = 0.90	Total Area (ha)	Combined C
CA-01A (controlled)	0.000	0.027	0.027	0.90
CA-02A (controlled)	0.008	0.063	0.071	0.83
CA-03A (controlled)	0.012	0.036	0.048	0.73
CA-04A (controlled)	0.017	0.037	0.053	0.68
CA-05A (controlled)	0.052	0.081	0.133	0.63
CA-06A (controlled)	0.002	0.031	0.034	0.85
CA-07A (controlled)	0.013	0.068	0.081	0.79
CA-100A (controlled)	0.000	0.153	0.153	0.90
CA-08A (controlled)	0.000	0.058	0.058	0.90
CA-09A (controlled)	0.014	0.050	0.064	0.75
CA-101A (controlled)	0.000	0.249	0.249	0.90
CA-10A (controlled)	0.010	0.068	0.077	0.81

CA-102A (controlled)	0.000	0.409	0.409	0.90
CA-11A (controlled)	0.014	0.041	0.055	0.72
CA-12A (controlled)	0.011	0.039	0.050	0.74
CA-13A (controlled)	0.000	0.061	0.061	0.90
CA-14A (controlled)	0.005	0.145	0.150	0.88
CA-15A (controlled)	0.004	0.145	0.149	0.88
CA-16A (controlled)	0.003	0.063	0.066	0.87
CA-17A (controlled)	0.004	0.058	0.062	0.85
CA-18A (controlled)	0.120	0.130	0.249	0.56
CA-19A (controlled)	0.011	0.067	0.078	0.80
CA-20A (controlled)	0.085	0.159	0.244	0.66
CA-21A (controlled)	0.080	0.000	0.080	0.20
CA-22A (controlled)	0.062	0.000	0.062	0.20
CA-23A (controlled)	0.009	0.054	0.062	0.80
CA-24A (controlled)	0.014	0.028	0.042	0.67
CA-25A (controlled)	0.028	0.020	0.048	0.49
CA-26A (controlled)	0.028	0.020	0.048	0.50
CA-27A (controlled)	0.039	0.020	0.060	0.44
CA-28A (controlled)	0.009	0.023	0.032	0.70
CA-29A (controlled)	0.007	0.023	0.030	0.74
CA-30A (controlled)	0.009	0.024	0.033	0.70
CA-31A (controlled)	0.006	0.023	0.029	0.76
CA-32A (uncontrolled)	0.045	0.000	0.045	0.20
CA-33A (uncontrolled)	0.020	0.003	0.023	0.29
CA-34A (uncontrolled)	0.102	0.000	0.102	0.20
CA-35A (uncontrolled)	0.005	0.003	0.007	0.46
Total	**0.841**	**2.471**	**3.322**	**0.72**

10.4 Stormwater Management Design

The Rational method has been used to calculate the peak flow rate from the proposed site.

$$Q = 2.78CIA$$

where,

Q = Peak Flow (L/s)
C = Runoff Coefficient
I = Rainfall Intensity (mm/hr), determined from the City of Ottawa IDF curves
A = Area (ha)

The modified Rational method is used to quantify storage volume required for quantity control for the proposed development. Refer to **Appendix E** for runoff and storage calculations. For additional details, refer to Post-development Watershed Plan C702 (**Appendix F**).

Table 7 and 8 summarizes post-development release rates, required storage and available storage within the site. Refer to Drawings C601 and C702 in ***Appendix E*** for detailed layouts of Ponding extents, Spillover elevations, and Overland flow routing.

Three designated emergency overflow outlets for extreme events have been designed to discharge overland flow to Culdaff Rd.Refer to Drawing C301A & C301B in ***Appendix E*** for the location of the emergency overflow points.

10.4.1 West Stormwater Management Design

Runoff from 1.666 ha of the total 1.99 hy West site area is captured by a catch basins and catch basin manholes system that conveys the controlled site runoff to the existing 825 mm diameter storm sewer stub located on at the south property line, MHST84406 to MHAT84404, and then the 1650 mm diameter concrete storm sewer outletting to Pond 7.

An area of 0.328 ha drains uncontrolled toward the north, south, and west limits of the site, ultimately discharging to Pond 7.

Table 7: Summary of Post-development Release Rates and Storage Volumes - West

Watersheds	Area (ha)	Release Rate (L/s)			Storage Required (m^3)			*Total Storage Provided (m^3)
		100-yr	5-yr	2-yr	100-yr	5-yr	2-yr	
Controlled (CA-01B to CA-20B)	1.666	298.87	298.87	149.44	235.41	62.68	88.73	679.19
Uncontrolled (CA-21B to CA-23B)	0.328	41.13	24.00	17.69	N/A	N/A	N/A	N/A

Total	**1.994**	**340.0**	**322.87**	**167.13**	**235.41**	**62.68**	**88.73**	**679.19**

Stormwater quantity control for the west site is provided through an ICD outlet at proposed STM MH 18B controlling the 100-year storm event to 298.97L/s and providing the design 679 m^3 of storage through ponding above the proposed CBMH structures.

10.4.2 East Stormwater Management Design

Although two (2) storm outlet subs were provided for Block 243 and 251, the two properties are being design as one property and only one of the storm stubs will be used for a storm service. The norther most storm service will be used.

Runoff from 3.14 ha of the total 3.32 ha East site area is captured by a catch basins and catch basin manholes system that conveys the controlled site runoff to the existing 750 mm diameter storm sewer stub, MHST84411 to MHAT84409, and then the Culdaff Rd storm sewer, outletting to Pond 7.

An area of 0.170 ha drains uncontrolled toward the north, south, and west limits of the site, ultimately discharging to Pond 7.

Table 8: Summary of Post-development Release Rates and Storage Volumes - East

Watersheds	**Area (ha)**	**Release Rate (L/s)**			**Storage Required (m^3)**			***Total Storage Provided (m^3)**
		100-yr	**5-yr**	**2-yr**	**100-yr**	**5-yr**	**2-yr**	
Controlled (CA-01A to CA-31A)	3.144	522.56	522.56	261.28	583.67	198.81	220.90	**608.29**
Uncontrolled (CA-32A to CA-34A)	0.170	22.44	13.09	9.65	N/A	N/A	N/A	**N/A**
Total	**3.315**	**545.00**	**535.66**	**270.93**	**583.67**	**198.81**	**220.90**	**608.29**

Stormwater quantity control for the east site is provided through an ICD outlet at proposed STM MH 28A controlling the 100-year storm event to 522.56 L/s and providing the design 608.29 m^3 of storage through ponding above the proposed CBMH structures.

10.5 Low Impact Design

Consistent with the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018), a 5 mm target retention volume is to be achieved for the site through the implementation of Low Impact Development (LID) measures.

Site plan level LID measures — such as infiltration trenches and biofilters — will be implemented for the Block 243/251 and Block 244 development as per the 195 Huntmar Drive development,

consistent with the approach outlined in the Water Budget Report (JFSA, July 2020) and the Summary of Low Impact Development Measures (DSEL, July 2020).

Block 243 & Block 251

The proposed stormwater management strategy provides on-site capture and infiltration of runoff from both asphalt and landscaped areas. Based on the contributing drainage areas, the calculated runoff capture volume is approximately 17.7 m³ from the asphalt surface area (11,270 m²) and 37.5 m³ from the landscaped area (8,033 m²), resulting in a total required infiltration volume of 55.2 m³.

A proposed infiltration gallery measuring 2.0 m wide × 22.7 m long × 1.9 m deep provides approximately 34.5 m³ of storage within the clearstone reservoir (assuming 40% void space). After accounting for the volume occupied by the 300 mm diameter perforated subdrain (approximately 1.6 m³), the net storage volume of the gallery is 32.9 m³.

The combined available infiltration volume across the site and infiltration gallery is estimated to be 88.1 m³, which exceeds the calculated runoff capture requirement and provides additional storage capacity for stormwater management.

Block 244

The proposed stormwater management strategy provides on-site capture and infiltration of runoff from both asphalt and landscaped areas. Based on the contributing drainage areas, the calculated runoff capture volume is approximately 16.8 m³ from the asphalt surface area (10,719 m²) and 39.9 m³ from the landscaped area (8,547 m²), resulting in a total required infiltration volume of 56.7 m³.

A proposed infiltration gallery measuring 2.5 m wide × 45.7 m long × 2.0 m deep provides approximately 91.4 m³ of storage within the clearstone reservoir (assuming 40% void space). After accounting for the volume occupied by the 300 mm diameter perforated subdrain (approximately 3.2 m³), the net storage volume of the gallery is 88.2 m³.

The combined available infiltration volume across the site and infiltration gallery is estimated to be 144.9 m³, which exceeds the calculated runoff capture requirement and provides additional storage capacity for stormwater management.

11 Ministry of Transportation (MTO) Lands

The vacant lands located to the north of development Blocks 244 and 251 are owned by the Ministry of Transportation (MTO). Under pre-development conditions, a 6 m wide granular pathway runs along the north property lines of Block 244 and Block 251, directly south of the MTO lands, within an unregistered 6 m wide City of Ottawa easement. This easement accommodates the Pond 7 – 750 mm outlet sewer, and City requirements prohibit private structures within sewer easements.

As a result of this restriction, two small contributing areas — CA-23B (0.082 ha) and CA-34A (0.102 ha) — will drain toward the MTO lands under post-development conditions. Given the limited size of these areas, the resulting flows are minor and will not adversely affect the

undeveloped MTO lands. All remaining stormwater runoff from Blocks 244 and 251 is directed away from the MTO lands and toward Pond 7.

Pond 7 has been designed to accommodate the development in accordance with its original design parameters, and the pond outlet flow will not increase as a result of this development.

We would also like to note that the Ministry's stated requirement is that post-development flows to the highway drainage system not exceed pre-development flows. The flows from CA-23B and CA-34A discharge to vacant MTO land, and not directly to a highway right-of-way or highway drainage infrastructure.

12 Erosion and Sediment Control

During construction, erosion and sediment control (ESC) measures will be implemented to minimize the migration of sediment from the site. These measures will include the installation of sediment control fencing along the site perimeter where runoff has the potential to leave the property, inlet protection (silt sacks) within affected catch basins and manholes, and a stabilized construction entrance/mud mat to reduce tracking of sediment onto adjacent roadways.

All ESC measures will be installed, monitored, and maintained throughout construction in accordance with Ontario Provincial Standard Specification (OPSS) 577. Refer to LRL Associates Drawing C.101 in ***Appendix E*** for erosion and sediment control details.

13 Conclusion

This Stormwater Management and Servicing Report for the proposed development at 2775 & 2785 Palladium Drive (Blocks 243/251) and Block 244, Ottawa, ON, presents the rationale and details of the servicing requirements for the subject property.

In accordance with the report objectives, the servicing requirements for the development are summarized below:

Water Service

- The proposed development (Block 243/251) will be serviced by two (2) 200 mmØ water service laterals connected to the existing 305 mmØ watermain within Culdaff Road, per the City of Ottawa's dual-service and looping requirements (Technical Bulletin ISTB-2021-03) for demands exceeding 50 m³/d.
- Total anticipated domestic water demand was calculated to be 2.04 L/s (average day), 3.06 L/s (maximum day), and 5.51 L/s (maximum hour).
- The required fire flow was calculated to be 14,000 L/min using the FUS method (per IWSTB-2024-05/ISTB-2018-02), based on Non-Combustible (Type II) construction, Limited Combustible occupancy, and an automatic sprinkler system.
- The available combined fire flow from three existing hydrants within 75 m of the development is 17,034 L/min, which is sufficient to meet the calculated fire flow demand.

Sanitary Service

- The development will be serviced via two sanitary laterals connecting to the existing 250 mm diameter sanitary stubs on Culdaff Road: the north connection servicing the hotel and family entertainment centre, and the south connection servicing the support building and waterpark. Block 244 will be serviced via its own existing 250 mm diameter sanitary stub.
- The calculated wet wastewater flows are 5.08 L/s (hotel/entertainment centre), 1.64 L/s (support building/waterpark, including 0.46 L/s from the waterpark), and 1.62 L/s (Block 244).
- The cumulative downstream flow, including future MTO lands, is 21.69 L/s at Bermondsey Way and Culdaff Road (MHSA76092), representing approximately 67% of the sewer's 32.57 L/s full-flow capacity. The existing sanitary system therefore has sufficient reserve capacity to support the proposed development, with no concerns anticipated.

Stormwater Management

- The site has been analyzed as two catchments — East (Block 243/251, 3.32 ha) and West (Block 244, 1.99 ha) — with post-development watersheds allocated for each.
- Quantity control for the East site is provided via an ICD outlet at proposed STM MH 28A, restricting the 100-year event to 522.56 L/s and providing 608.29 m³ of storage through ponding above the proposed CBMH structures.
- Quantity control for the West site is provided via an ICD outlet at proposed STM MH 18B, restricting the 100-year event to approximately 299 L/s and providing 679 m³ of storage through ponding above the proposed CBMH structures.
- Both sites ultimately discharge to Pond 7, which provides quantity control and Enhanced Level quality treatment for the broader 41.73 ha 195 Huntmar Drive tributary area, outletting to Feedmill Creek.
- Consistent with the Feedmill Creek Stormwater Management Criteria Study, a 5 mm target retention volume will be achieved through site-level Low Impact Development (LID) measures — including infiltration trenches and biofilters — implemented for both Block 243/251 and Block 244.
- Three designated emergency overflow outlets have been provided to convey extreme-event overland flow to Culdaff Road.

14 REPORT CONDITIONS AND LIMITATIONS

The report conclusions are applicable only to this specific project described in the preceding pages. Any changes, modifications or additions will require a subsequent review by LRL Associates Ltd. to ensure compatibility with the recommendations contained in this document.

If you have any questions or comments, please contact the undersigned.

Prepared by:
LRL Associates Ltd.







Maxime Longtin
Civil Designer

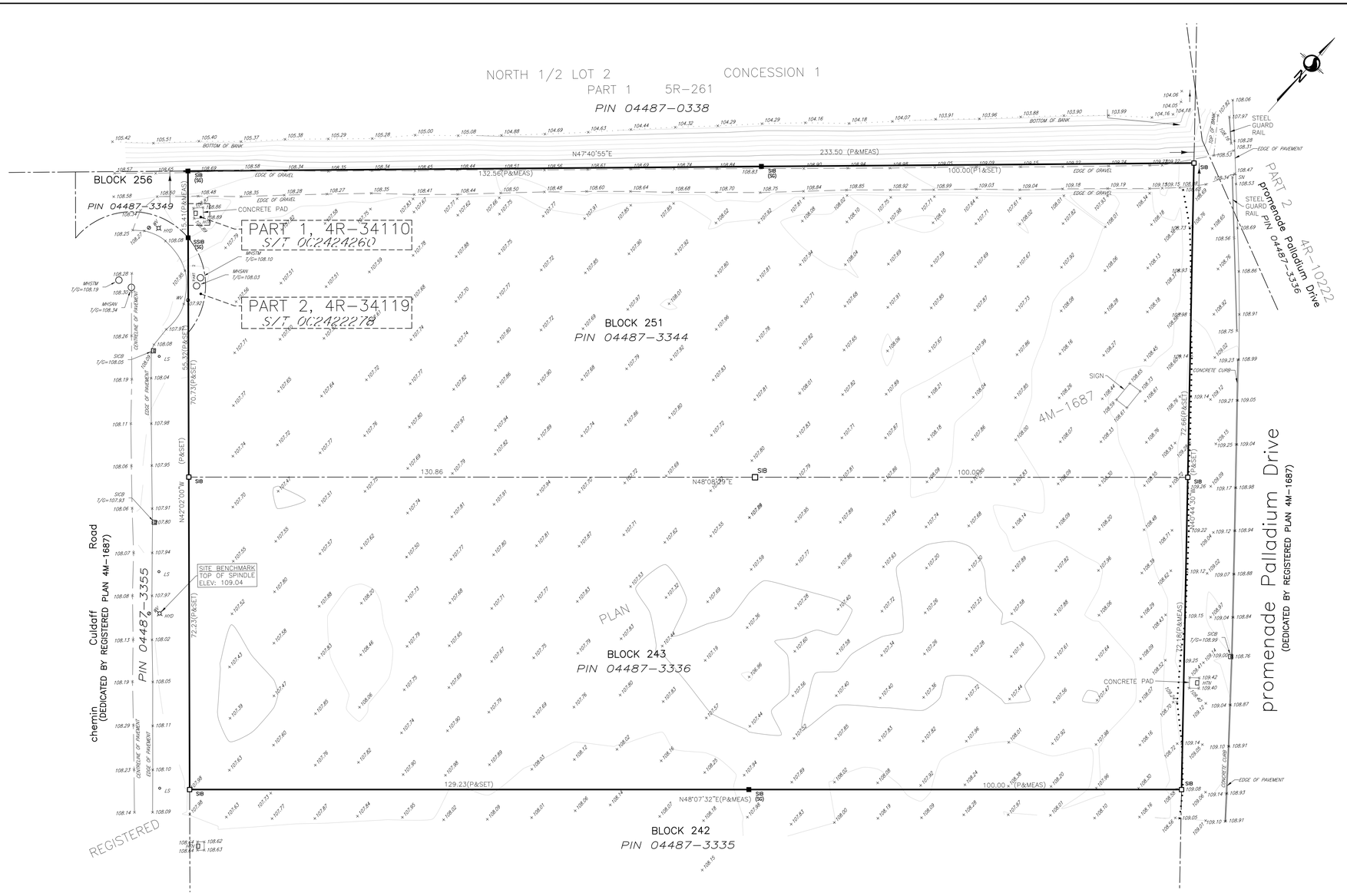
Kelly Paradis, PMP, P.Eng.
Civil Engineer

APPENDIX A

Correspondence / Regulatory Approvals / Topographical

ASSOCIATION OF ONTARIO LAND SURVEYORS
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V-21297

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In accordance with Regulation 1026, Section 29(3)



Stantec

Stantec Geomatics Ltd.
300-1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

TOPOGRAPHIC PLAN OF SURVEY OF
BLOCKS 243 AND 251
REGISTERED PLAN 4M-1687

(GEOGRAPHIC TOWNSHIP OF HUNTLEY)

CITY OF OTTAWA

Scale 1:500

10 0 10 20 30 METRES

Stantec Geomatics Ltd.

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METRIC CONVERSION

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

GRID SCALE CONVERSION

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999935.

BEARING NOTE

BEARINGS ARE GRID, DERIVED FROM CAN-NET VRS NETWORK GPS OBSERVATIONS ON NCC HORIZONTAL CONTROL MONUMENTS 19773035 AND 19680191, CENTRAL MERIDIAN, 76° 30' WEST LONGITUDE MTM ZONE 9, NAD83 (ORIGINAL).

19773035 N:5006060.42 E:324888.04
19680191 N:5033564.26 E:388064.94

ELEVATION NOTE

ELEVATIONS SHOWN HEREON ARE GEODETIC (CGVD-1928:1978) AND ARE DERIVED FROM VERTICAL CONTROL MONUMENT No. 88V502 HAVING AN ELEVATION OF 106.039.

LEGEND

■	DENOTES	FOUND MONUMENTS
□	"	SET MONUMENTS
IB	"	IRON BAR
IBΦ	"	ROUND IRON BAR
SIB	"	STANDARD IRON BAR
SSIB	"	SHORT STANDARD IRON BAR
CC	"	CUT CROSS
CP	"	CONCRETE PIN
WIT	"	WITNESS
PIN	"	PROPERTY IDENTIFICATION NUMBER
M/MEAS	"	MEASURED
PROP	"	PROPORTIONED
OU	"	ORIGIN UNKNOWN
STANTEC	"	STANTEC GEOMATICS LTD.
P	"	REGISTERED PLAN 4M-1687
SICB	"	SIDE INLET CB
HTN	"	HYDRO TRANSFORMER
LS	"	LIGHT STANDARD
MHSA	"	MAINTENANCE HOLE SANITARY
MHST	"	MAINTENANCE HOLE STORM
SN	"	SIGN
WV	"	WATER VALVE

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 20th DAY OF MAY , 2022.

Jan. 23, 2023
DATE

FRANCIS LAU
ONTARIO LAND SURVEYOR

DRAWN: TMT CHECKED: FL PM: FL FIELD: CA PROJECT No.: 161614584-111

23 January 2023 11:52 AM

ELEVATION NOTES

1. Elevations shown are geodetic and are referred to the CGVD28 geodetic datum, derived from City of Ottawa benchmark No. 019680013 having an elevation of 77.204 metres.
2. It is the responsibility of the user of this information to verify that the job benchmark has not been altered or disturbed and that it's relative elevation and description agrees with the information shown on this drawing.

UTILITY NOTES

1. This drawing cannot be accepted as acknowledging all of the utilities and it will be the responsibility of the user to contact the respective utility authorities for confirmation.
2. Only visible surface utilities were located.
3. Some features may have been derived from available records or similar data sources and have not been located (or visible) during the Field Survey. These sources are disclosed on the face of the plan where applicable.
4. Invert Elevations are derived from those shown within geoOttawa.
5. A field location of underground plant by the pertinent utility authority is mandatory before any work involving breaking ground, probing, excavating etc.

Notes & Legend

	Denotes	
—□—	"	Survey Monument Planted
—■—	"	Survey Monument Found
SIB	"	Standard Iron Bar
SSIB	"	Short Standard Iron Bar
PB	"	Plastic Bar
Meas.	"	Measured
(AOG)	"	Annis, O'Sullivan, Vollebekk Ltd.
(PI)	"	Registered Plan 4M-1687
○ MH-ST	"	Maintenance Hole (Storm Sewer)
○ MH-S	"	Maintenance Hole (Sanitary)
○ LS	"	Light Standard
□ CB	"	Catch Basin
□ CBI	"	Catch Basin Inlet
FH	"	Fire Hydrant
WV	"	Water Valve
BF	"	Board Fence
▫ TB-B	"	Bell Terminal Box

	Denotes	
+ 65.00	"	Location of Elevations
+ 65.00*	"	Top of Concrete Curb Elevation
H-T	"	Hydro Transformer on Concrete Pad
△ S	"	Sign

Bearings are grid, derived from Can-Net 2016 Real Time Network GPS observations, MTM Zone 9 (76°30' West Longitude) NAD-83 (original).

Primary Contour Interval = 1.00 metres
Secondary Contour Interval = 0.25 metres.

TOPOGRAPHIC PLAN OF SURVEY OF

BLOCK 244, REGISTERED PLAN 4M-1687 CITY OF OTTAWA

Surveyed by Annis, O'Sullivan, Vollebekk Ltd.

Scale 1 : 300

12 9 6 3 0 6 12 Metres

Metric

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

Surveyor's Certificate

I CERTIFY THAT :

1. This survey and plan are correct and in accordance with the Surveys Act, the Surveyors Act and the regulations made under them.
2. The survey was completed on the 1st day of May, 2026.

May 6, 2026
Date

Andrew Handspiker
Ontario Land Surveyor

LOT 2 CONCESSION I (HUNTLEY)
PART 1 PLAN 5R - 261
PIN 04487 - 0338

N 47° 40' 55" E (Reference Bearing)
128.27 (PI)&Meas.

PART 19 PLAN 4R-34109
PIN 04487-3349
BLOCK 256

PART 21 PLAN 4R-34109

PART 1 PLAN 4R-34119
SUBJECT TO EASEMENT
INST. OC2422278

PART 5 PLAN 4R-34110
SUBJECT TO EASEMENT
INST. OC2424260

PART 2 PLAN 4R-34119

PART 1 PLAN 4R-35406

PART 2 PLAN 4R-35406

BLOCK 245
REGISTERED PLAN 4M - 1687
PIN 04487 - 3338

BLOCK 244

BLOCK 251

BLOCK 243

BLOCK 242

BLOCK 235
PIN 04487 - 3328

BLOCK 223 PLAN 4R - 34161

BLOCK 222 PLAN 4R - 34201

BLOCK 221 PLAN 4R - 34164

LOT 9

LOT 8

LOT 7

Culdaff Road
PIN 04487 - 3355

chemin Edmin
PIN 04487 - 3337

Edge of Asphalt

Approximate Crown of Road

Concrete Curb

Depressed Curb

Asphalt Walkway

Gravel

Gravel ±0.5 Northwest

Gravel ±0.3 Southeast

N42°00'50"W (PI)&Meas. 147.21

N42° 02' 00" W (PI)&Meas. 140.76

N68°12'13"W 11.61 (PI)&Meas.

N47°58'25"E 120.09 (PI)&Meas.

26.00 (PI)&Meas.

15.28 (PI)&Meas.

9.00 (PI)&Meas.

5.00

Job Benchmark
FH Top of Spindle
Elevation = 109.04

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ANNIS, O'SULLIVAN, VOLLEBEKK LTD.
14 Concourse Gate, Suite 500
Nepean, Ont. K2E 7S6
Phone: (613) 727-0850 / Fax: (613) 727-1079
Email: Nepean@aovltd.com
Ontario Land Surveyors

Job No. N-24864_Verevas_Blk244 4M-687_O_F | FS

File No.: PC2025-0008

February 26, 2025

Tim Eisner
Planner, JFSA
Via email: teisner@jfsa.com

Subject: **Pre-Consultation: Meeting Feedback**
Proposed Zoning By-law Application – 2775 and 2785 Palladium Drive

Please find below information regarding next steps as well as consolidated comments from the above-noted pre-consultation meeting held on February 5, 2025.

Pre-Consultation Preliminary Assessment

1 ☐	**2** ☒	**3** ☐	**4** ☐	**5** ☐

One (1) indicates that considerable major revisions are required while five (5) suggests that the proposal appears to meet the City's key land use policies and guidelines. This assessment is purely advisory and does not consider technical aspects of the proposal or in any way guarantee application approval.

Next Steps

1. A review of the proposal and materials submitted for the above-noted pre-consultation has been undertaken. Please provide your next submission together with the necessary Forms, studies and/or plans to planningcirculations@ottawa.ca, copy to: Kimberley Baldwin, Nishant Dave and Krishon Walker.

2. In your subsequent submission, please ensure that all comments or issues detailed herein are addressed. A detailed cover letter stating how each issue has been addressed is requested with the submission materials. Please coordinate the numbering of your responses within the cover letter with the comment number(s) herein.

3. Please note, if your development proposal changes significantly in scope, design, or density it is recommended that a subsequent pre-consultation application be submitted.

Supporting Information and Material Requirements

1. The attached **Study and Plan Identification List** outlines the information and material that has been identified, during this phase of pre-consultation, as either required (R) or advised (A) as part of a future complete application submission.

a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.

Consultation with Technical Agencies

1. You are encouraged to consult with technical agencies early in the development process and throughout the development of your project concept. A list of technical agencies and their contact information is enclosed.

Proposed Development

The proposal is for an indoor waterpark [amusement centre] (approx. 5500 m2) with an accessory restaurant (approx. 1000m2), support buildings (approx. 3800m2), and a 7-storey hotel. 422 parking spaces are required. The applicant's pre-consultation form notes that a Zoning By-law Amendment and Site Plan Control application will be required. The lot area is 33,197sq m.

Planning

Comments:

Official Plan Policies

1. The site is situated in the Suburban West Transect

    i. The east portion of the site abutting Palladium Drive, to a depth of 120 metres, is designated Minor Corridor

    ii. The west portion of the site abutting Culdaff is designated Mixed Industrial

2. In the Suburban Transect, along Minor Corridors, mid-rise buildings, between 5 to 7 storeys, may be considered through a rezoning. [Policy 5.4.1]

3. Provide rationale for how the proposed built form will provide 'appropriate transitions in height, use of land, site design and development character through the site, to where the Corridor designation meets abutting designations.' [Policy 6.2.1]

4. In Corridors, access shall generally be provided from a side street

5. In the Minor Corridor designation, development may include commercial uses which are meant to mainly serve local markets [Policy 6.2.2]. Similarly, the Mixed Industrial policies may permit commercial services that are of a scale that cater to a local neighbourhood clientele, including recreational, health and fitness uses and other service commercial uses. [Policy 6.5.3]. Please demonstrate how the

proposed uses will serve the local area and help achieve the 15-minute neighborhood objectives.

6. The policies in the Plan do not specifically address a large-scale entertainment, restaurant and hotel uses with surface parking under any designation within the Official Plan. That said, staff are of the opinion that of all the designations, the Mixed Industrial designation appears to be the best fit.

    i. Staff are recommending that the applicant submit an Official Plan Amendment to establish a new Area-Specific Policy for the proposed facility. An OPA would help the City assess the unique proposal and any mitigation measures that may be required. Please see Policy 12.3 for guidance and respond to the following:

        - How will the proposed uses impact mobility in the surrounding area? Please evaluate all potential access points and traffic fow for all transportaion modes, including vehicles, pedestrians, cyclist, and public transit.

        - Are there any opportunities to secure a secondary access through the undeveloped sites to the south?

        - Has your client considered any alternate sites within the City of Ottawa which are also designated Mixed Industrial that may already have multiple access points?

7. Both the Minor Corridor and Mixed Industrial designations prohibit uses that are likely to generate noise, fumes, or high levels of truck traffic impacts. Please demonstrate how the proposed uses will ensure no adverse impact on the adjacent properties designated Neighbourhood. [Policies 6.2.1 and 6.5.2]

8. Both the Minor Corridor and Mixed Industrial designations contain policies that support cycling and pedestrian facility upgrades where they are not currently available. [Policies 6.2.1 and 6.5.3]

    i. Please demonstrate how the proposal will improve cycling and pedestrian connections to/from the site.

Zoning By-law

9. The site is zoned IP (Business Park Industrial Zone)

    i. A hotel is a permitted use in this zone.

    ii. A restaurant is also a permitted use, provided it does not exceed 300m^2 of gross floor area. The proposed restaurant size (approximately 1000m^2) would require relief from Section 205 (2) (c) of the Zoning By-law.

iii. A zoning by-law amendment would be required to permit an amusement centre use in this zone.

iv. In this zone, there is a provision which limits the total cumulative gross floor area of commercial service uses (for example, 'recreational and athletic facility' use) to a maximum of 2,999m^2. Zoning relief would be required to permit the proposed 10,000m^2 mixed-use commercial building.

10. Staff note that the adjacent properties to the south are zoned General Mixed Use [Urban Exception 2654]. It is anticipated that the proposed amusement centre use would draw visitors from a broader area. Upon review of both the IP and GM zones, staff are of the opinion that a GM zone would be more appropriate zone to contemplate the proposal.

    i. The intent of the IP zone, among others, is to permit 'office and light industrial uses' and a 'variety of complementary uses such as recreational, health and fitness uses and service commercial uses [eg restaurant], …'to serve the employees' and "the general public in the immediate vicinity, and passing traffic".

    ii. The intent of the GM zone, among others, is to 'permit uses that are often large and serve or draw from broader areas than the surrounding community and which may generate traffic, noise or other impacts, provided the anticipated impacts are adequately mitigated or otherwise addressed".

    iii. A GM zone would require a site-specific exception to address the following:

        - To permit 'amusement centre' and 'hotel' uses.

        - To amend the maximum building height

11. It is understood that the proposed building may have slides on the exterior of the building. Staff recommend a site-specific provision which recognizes a slide as a permitted projection and subject to Section 64 and 65 of the Zoning By-law.

General comments:

12. Given the site's proximity to the highway, the applicant is encouraged consult with the Ministry of Transportation and Infrastructure Ontario as early as possible to understand any provincial requirements or restrictions that may relate to the subject site.

13. Consider internalizing the waste management to the interior of the building, especially at the southwest side of the site, closest to the zones which permit residential uses.

Economic Development Services

14. The Economic Development Services team is assessing this project's eligibility for the City's High Economic Impact Projects Program. Please complete the following intake form to assist us in our evaluation.

Urban Design

Comments:

15. As part of a formal submission, urban design staff require an Urban Design Brief (terms of reference attached), architectural drawings (including a Site Plan and Building Elevations), and a Landscape Plan.

16. As suggested at the meeting, flipping the hotel to the northern portion of the site might help increase visibility to the site from the highway as well as light access for the development parcel to the south.

17. If possible, the height of the hotel should be reduced to 6 storeys as there is sufficient space on site to accommodate a longer building at the 6 storey scale.

Feel free to contact Nader Kadri, Urban Design Planner, for follow-up questions.

Engineering

Comments:

General

18. The Servicing Study Guidelines for Development Applications are available at the following address: https://ottawa.ca/en/planning-development-and-construction/residential-property-regulations/development-application-review-process/development-application-submission/planning-application-submission-information-and-materials#section-3a671b1e-7fb3-4018-97f8-b5933fb3951a

19. Servicing and site works shall be in accordance with the following documents and their associated technical bulletins, if applicable:
    i. Ottawa Sewer Design Guidelines (October 2012)
    ii. Ottawa Design Guidelines – Water Distribution (2010)
    iii. City of Ottawa Low Impact Development Technical Guidance Report – Implementation in Areas with Potential Hydrogeological Constraints (February 2021)
    iv. Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)

v. City of Ottawa Slope Stability Guidelines for Development Applications (2012)

vi. City of Ottawa Accessibility Design Standards (November 2015)

vii. Ottawa Standard Tender Documents (latest version)

viii. Ontario Provincial Standards for Roads & Public Works (latest version)

20. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at geoinformation@ottawa.ca or by phone at (613) 580-2424 x.44455).

21. The Kanata West Master Servicing Study, the Carp River Subwatershed study, and the 195 Huntmar subdivision documents are to be followed for various targets and criteria. Some items may be specified below, but others may be found in the documents themselves. All requirements are to be addressed in the submission documents.

Watermain

22. There is a 305mm diameter PVC watermain available on Culdaff Rd fronting the site.

23. If the site's water demand is expected to be 50 m^3/d or more, then two water services will be required as per City of Ottawa Water Distribution Guidelines.

24. Watermain looping will be required if the Culdaff Rd watermain is expected to have more than 50 m^3/d demand in total. Please include this assessment in the Adequacy of Services report and Site Servicing report.

25. Water Boundary condition requests must include the location of the service (map or plan with connection location(s) indicated) and the expected loads required by the proposed development, including calculations. Please provide the following information:

    i. Location of service

    ii. Type of development and the amount of fire flow required (as per FUS).

        - If C value < 1.0, please note that correspondence from the designing architect will be required confirming the building material.

        - Average daily demand: ___ l/s.

        - Maximum daily demand: ___l/s.

        - Maximum hourly daily demand: ___ l/s.

Sanitary

26. There is a 250mm diameter PVC sanitary sewer on Culdaff Rd.

27. Given the nature of the development including an indoor water park, assessment of the downstream sanitary sewer many be required, potentially up to the Kanata West Pump Station to ensure there are no HGL concerns for any properties expected to connect to this system. Downstream assessment is only needed if the site exceeds the allotted sanitary capacity previously designated for the site in the subdivision documents.

Storm

28. There is an 825mm diameter concrete storm sewer on Culdaff Rd available for connection for this site. This storm sewer leads to the subdivision stormwater management pond. Please refer to the subdivision documents to determine if any on-site stormwater management quantity and/or quality control is required, that is not already provided by the subdivision stormwater management pond.

29. There is also a 750mm diameter concrete storm sewer located along the north property boundary of the site, on-site. The 750mm diameter sewer is the outlet pipe for the subdivision stormwater management pond. The 750mm diameter storm sewer on-site is not to be connected to and a 6m wide easement is to be provided to the City, if one has not been provided to the City already.

30. On-site infiltration targets are required as per subdivision agreement conditions. Please refer to the subdivision, and potentially higher-level documents, to the determine the infiltration requirements for this site.

MECP ECA

31. An MECP Environmental Compliance Approval for Industrial Sewage Works may be required for the proposed development. A Ministry contact has been provided. Please confirm if an ECA will be required. Please note Industrial ECAs are to go to the MECP via Direct Submission, and after the City has technically approved the site plan application documents.

    a. For I/C/I applications, please conect Shannon Hamilton-Browne at (613) 521-3450 or Shannon.Hamilton-Browne@ontario.ca.

Feel free to contact Gabrielle Schaeffer, Senior Engineer - Infrastructure Applications, for follow-up questions.

Noise

Comments:

32. Stationary Noise Impact Study required if there will be any exposed mechanical equipment due to the proximity to neighboring noise sensitive land uses.

Feel free to contact Josiane Gervais, TPM, for follow-up questions.

Transportation

Comments:

33. Follow Transportation Impact Assessment Guidelines:

    i. Note that the TIA Guidelines have been updated, the changes are available on the City's website.

    ii. A Transportation Impact Assessment is required. Please submit the Scoping/Forecasting report to josiane.gervais@ottawa.ca at your earliest convenience, or as part of the Phase 2 pre-con package. The applicant is responsible to submit the Scoping Report prior to application and must allow for a 14 day circulation period.

    iii. Regarding peak hours to be analyzed, the Scoping Report must provide the proposed peak hour and justification, as required. During the pre-consultation meeting it was noted the applicant has sister sites that are operational. Data from these sites may be used to support proposed peak hours.

    iv. The Strategy Report (including Synchro files) must be submitted with the formal submission to deem complete. The applicant is strongly encouraged to submit the Strategy Report to the TPM prior to formal submission and allow for a 14 day circulation period.

    v. If an RMA is required to support the proposed development, the functional plan and/or RMA plans must be submitted with the formal submission to deem complete. Request base mapping asap if RMA is required, contact Engineering Services

34. ROW Protection:

    i. Ensure that the development proposal complies with the Right-of-Way protection requirements of the Official Plan's Schedule C16.

    ii. Any requests for exceptions to ROW protection requirements must be discussed with Transportation Planning and concurrence provided by Transportation Planning management.

iii. Where applicable, ROW and corner triangles must be unincumbered and conveyed at no cost to the City. Note that conveyance of the ROW/corner triangle will be required prior to registration of the SP agreement. Additional information on the conveyance process can be provided upon request.

35. No access onto Palladium Dr is permitted.

36. Note that Culdaff is identified as a local on the OP Schedule C4, but is sized and designed as a collector.

37. Despite clear throat length requirements not typically required for accesses on local roads, strong consideration should be given to provide adequate clear throat lengths due to the nature of the site proposed.

38. As the proposed site is commercial and for general public use, AODA legislation applies.

    i. Ensure all crosswalks located internally on the site provide a TWSI at the depressed curb, per requirements of the Integrated Accessibility Standards Regulation under the AODA.

    ii. Clearly define accessible parking stalls and ensure they meet AODA standards (include an access aisle next to the parking stall and a pedestrian curb ramp at the end of the access aisle, as required).

    iii. Please consider using the City's Accessibility Design Standards, which provide a summary of AODA requirements.

39. On site plan:

    i. Ensure site accesses meets the City's Private Approach Bylaw.

    ii. Show all details of the roads abutting the site; include such items as pavement markings, signage, accesses, on-street parking, and/or sidewalks.

    iii. Turning movement diagrams required for all accesses showing the largest vehicle to access/egress the site.

    iv. Turning movement diagrams required for internal movements (loading areas, garbage).

    v. Show all curb radii measurements; ensure that all curb radii are reduced as much as possible and fall within TAC guidelines (Figure 8.5.1).

    vi. Show dimensions for site elements (i.e. lane/aisle widths, access width and throat length, parking stalls, sidewalks, pedestrian pathways, etc.)

vii. Sidewalk and cycle track are to be constructed along Culdaff frontage. Sidewalk is to be continuous across access as per City Specification 7.1.

viii. Sidewalk and cycling infrastructure along Palladium Dr would be DC eligible.

Feel free to contact Josiane Gervais, Transportation Project Manager, for follow-up questions.

Environment

Comments:

40. The subdivision that created this parcel undertook an Environmental Impact Statement (EIS) and identified the Feedmill Creek and the riparian lands as a significant natural feature. This feature is over 120 m from this proposed development, as such an up-dated EIS is required at this time scoped to address the species at risk.

41. Species at risk – the EIS completed for the subdivision did identify several species at risk and implemented several mitigation measures through the subdivision approval. Since the EIS was prepared in 2018 there have been an number of changes to the species listed.

42. The EIS for the subdivision (EIS and TCR Proposed Mixed Use Development Kanata West Lands a report for 2325483 Ontario by Muncaster Environmental Planning (revised May 2018) should be reviewed and the recommendations implemented including:

    i. As part of the landscape plan for each Block the developers are encouraged to plant a mix of native species such as sugar maple, red maple, tamarack, white spruce, white cedar, red oak, bur oak, bitternut hickory and basswood. To maximize the success of the plantings, it is strongly encouraged that stock from a local seed base be utilized. Due to the clay soils tree and shrub species that have a high water demand are generally not recommended. These species include willows, poplars, Manitoba maple and elm.

    ii. Given the location of the proposal, please implement the wildlife oriented mitigation measures are detailed in the City's Protocol for Wildlife Protection during Construction (City of Ottawa, 2015). Contractors are to review in detail and understand the City's Protocol for Wildlife Protection during Construction prior to commencement of construction.

    iii. The contractor is to be aware of the potential Species at Risk in the vicinity of the site including Blanding's turtle, barn swallow and butternut. Although unlikely since the subdivision is in the advanced stages of development, any Species at Risk sightings are to be immediately

reported to the contractor administrator/ City project manager and the Ministry of Environment, Consevration and Parks and work that may impact the species suspended immediately.

43. Bird-Safe Design Guidelines – Please review and incorporate bird safe design elements. Some of the risk factors include glass and related design traps such as corner glass and fly-through conditions, ventilation grates and open pipes, landscaping, light pollution. More guidance and solutions are available in the guidelines which can be found here: https://documents.ottawa.ca/sites/documents/files/birdsafedesign_guidelines_en.pdf

44. Please consider if there are features that can be added reduce the urban heat island effect (see OP 10.3.3). For example, this impact can be reduced by adding large canopy trees, green roofs or vegetation walls, or incorporating building with low heat absorbing materials.

Feel free to contact Matthew Hayley, Environmental Planner, for follow-up questions.

Forestry

Comments:

45. Tree Removal Requirements

    i. A tree permit will be required if there are trees on site that are greater than 10cm in diameter. Please contact the Planning Forester if a tree permit is required

46. Tree Planting Requirements

47. Minimum Setbacks

    i. Maintain 1.5m from sidewalk, MUP/cycle track, water service laterals.

    ii. Maintain 2.5m from curb.

    iii. Coniferous species require a minimum 4.5m setback from curb, sidewalk, or MUP/cycle track/pathway.

48. Maintain 7.5m between large growing trees, and 4m between small growing trees. Park or open space planting should consider 10m spacing, except where otherwise approved in naturalization / afforestation areas.

49. Adhere to Ottawa Hydro's planting guidelines (species and setbacks) when planting around overhead primary conductors.

50. Tree specifications

    i. Minimum stock size: 50mm tree caliper for deciduous, 200cm height for coniferous.

    ii. Maximize the use of large deciduous species wherever possible to maximize future canopy coverage.

51. Tree planting on city property shall be in accordance with the City of Ottawa's Tree Planting Specification; if possible, include watering and warranty as described in the specification.

52. No root barriers, dead-man anchor systems, or planters are permitted.

53. No tree stakes unless necessary

54. Hard surface planting

    i. If there are hard surface plantings, a planting detail must be provided.

    ii. Curb style planter are highly recommended.

    iii. No grates are to be used and if guards are required, City of Ottawa standard (which can be provided) shall be used.

55. Trees are to be planted at grade.

56. Soil Volume - Please demonstrate as per the Landscape Plan Terms of Reference that the available soil volumes for new plantings will meet or exceed the following:

Tree Type/Size	Single Tree Soil Volume (m3)	Multiple Tree Soil Volume (m3/tree)
Ornamental	15	9
Columnar	15	9
Small	20	12
Medium	25	15
Large	30	18
Conifer	25	15

57. Sensitive Marine Clay - Please follow the City's 2017 Tree Planting in Sensitive Marine Clay guidelines.

58. The city requests that consideration be given to planting native species wherever there is a high probability of survival to maturity.

59. Efforts shall be made to provide as much future canopy cover as possible at a site level, through tree planting and tree retention. The Landscape Plan shall show/document that the proposed tree planting and retention will contribute to the City's overall canopy cover over time. Please provide a projection of the future canopy cover for the site to 40 years.

60. Page 7 of the Landscape Plan Terms of Reference requires applicants to submit a digital, georeferenced CAD or GIS file of the final approved LP. Please follow this link to review the submission requirements: https://documents.ottawa.ca/sites/documents/files/landscape_tor_en.pdf . The file can be sent to the Planning Forester or Planning File Lead.

Feel free to contact Mark Richardson, Planning Forester, for follow-up questions.

Parkland

Comments:

61. Please confirm if parkland dedication was provided during the subdivision process.

62. If not, parkland dedication is applicable – for commercial and industrial uses at rate of 2% of the gross land area, as per the Parkland Dedication By-law No. 2022-280

Feel free to contact Diane Emmerson, Parks Planner, for follow-up questions.

Submission Requirements and Fees

1. Please submit the following applications:
   - Official Plan Amendment [recommended]
   - Zoning By-law Amendment (Major)
   - Site Plan Control (Complex)

   a. Additional information regarding fees related to planning applications can be found here.
2. The attached **Study and Plan Identification List** outlines the information and material that has been identified as either required (R) or advised (A) as part of a future complete application submission.

   a. The required plans and studies must meet the City's Terms of Reference (ToR) and/or Guidelines, as available on Ottawa.ca. These ToR and Guidelines outline the specific requirements that must be met for each plan or study to be deemed adequate.

3. All of the above comments or issues should be addressed to ensure the effectiveness of the application submission review.

Should there be any questions, please do not hesitate to contact myself or the contact identified for the above areas / disciplines.

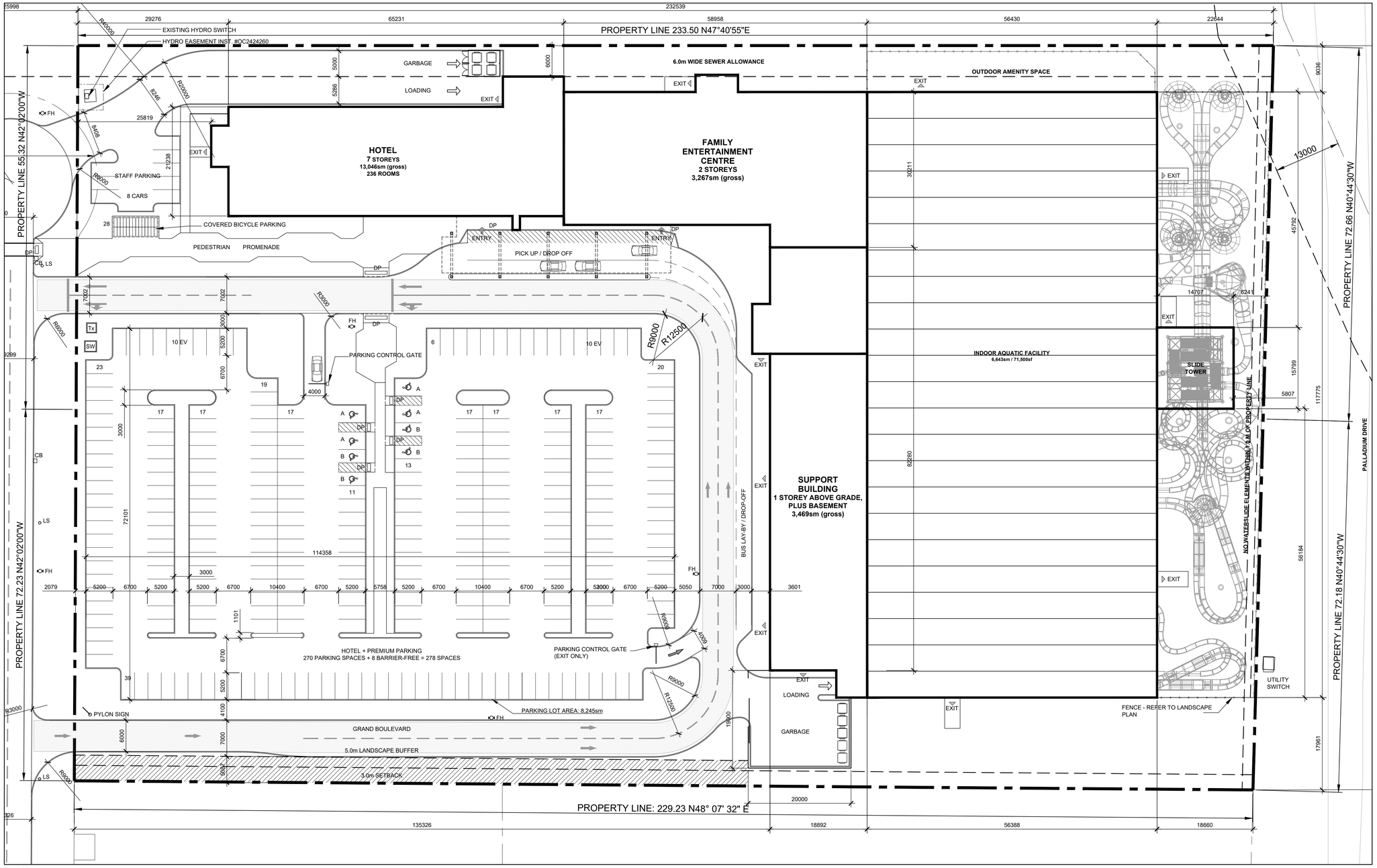
Yours Truly,
Kimberley Baldwin

Encl. Plans and Studies List

c.c. Nishant Dave, Planner (Support)
Gabi Schaeffer, Infrastructure Project Manager
Rubina Rasool, Infrastructure Project Manager (Support)
Josiane Gervais, Transportation Project Manager
Nader Kadri, Urban Design
Matthew Hayley, Environmental Planner
Mark Richardson, Forester
Diane Emmerson, Parks Planner

APPENDIX B

Site Plan and Architectural Floor Plans



01 SITE PLAN - EAST SECTOR

SP-A01 SCALE: 1:400

02 RESEVED

SP-A01 SCALE: NTS

03 LEGEND

SP-A01 SCALE: NTS

- ENTRY — BUILDING ENTRANCE
- EXIT — BUILDING EXIT
- BARRIER-FREE CURB RAMP WITH TACTILE WALKING SURFACE INDICATORS
- TYPE A BARRIER-FREE PARKING SPACE WITH PAINTED ACCESSIBLE AISLE
- TYPE B BARRIER-FREE PARKING SPACE WITH PAINTED ACCESSIBLE AISLE
- VEHICULAR TRAFFIC DIRECTION INDICATOR
- PAINTED LINES IN PARKING LOT
- DP — DEPRESSED CONCRETE CURB
- GB — GARBAGE BIN
- FH — FIRE HYDRANT
- FDC — FIRE DEPARTMENT CONNECTION
- HP — HYDRO POLE
- HP/LS — HYDRO POLE/LIGHT STANDARD
- SW / Tx — PAD-MOUNT TRANSFORMER & SWITCHGEAR
- 5M LANDSCAPE BUFFER
- 6M FIREFIGHTING ACCESS ROUTE
- PROPERTY LINE
- SETBACK
- FENCE

04 SITE INFORMATION & BUILDING DATA

SP-A01 SCALE: NTS

SITE INFORMATION

SITE AREA: 53,236sm / 5.3ha

WEST SECTOR PARKING LOT:
AREA: 12,577sm
LANDSCAPING: 2,071sm (16.5%)

EAST SECTOR PARKING LOT:
AREA: 8,245sm
LANDSCAPING: 1,279sm (15.5%)

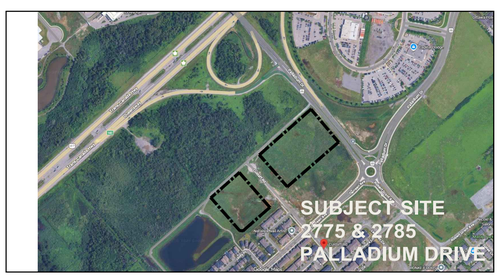
BUILDING DATA:

AREA CALCULATIONS:

Hotel:	13,046sm / 140,425sf
FEC:	3,267sm / 35,165sf
Support:	3,469sm / 37,340sf
Waterpark:	6,643sm / 71,505sf
TOTAL	26,425sm / 284,435sf

05 LOCATION PLAN

SP-A01 SCALE: NTS



841 X 1189 – PLOT A1

P:\Projects_2024\24-210\3000 Design Documents\3300 Drawings\3350 Drawings\3351 ACAD\Site Plan 2026-07-15.dwg, 2026-07-15

MCROBIE
ARCHITECTS + INTERIOR DESIGNERS

ARCHITECT & INTERIOR DESIGNER
MCROBIE ARCHITECTS + INTERIOR DESIGNERS INC.

STRUCTURAL ENGINEER
LRL ENGINEERING

MECHANICAL & ELECTRICAL ENGINEER
LRL ENGINEERING

CIVIL ENGINEER
LRL ENGINEERING

PLANNING CONSULTANT
JFSA CANADA

TRAFFIC ENGINEER
CGH TRANSPORTATION

LANDSCAPE ARCHITECT
NAK DESIGNS

WATERPARK BUILDING
OPENAIRE INC.

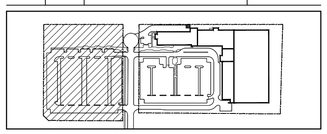
WATERPARK AQUATICS SYSTEMS
MARTIN AQUATICS

WATERPARK INTERIOR LANDSCAPING
EDSA

North

Revisions

No.	By	Description	Date
03	JT	SITE PLAN APPLICATION	2026-07-15
02	JT	ISSUED FOR PRICING	2026-06-26
01	JT	ISSUED FOR DISCUSSION	2026-06-26



KEY PLAN - EAST SECTOR

Project

OTTAWA INDOOR AQUATIC & RECREATION FACILITY

2775 & 2785 PALLADIUM DRIVE, OTTAWA ON

Drawing

SITE PLAN EAST SECTOR

Scale 1:400

Drawn IEW

Checked

Stamp

ONTARIO ASSOCIATION OF ARCHITECTS
JILL TROWER
LICENCE 5833

Project No. 24-210

Drawing No. SP-A01

Date JUN. 2026

ZONING REVIEW BASED ON 2026-250

SCHEDULE A1 - TRANSECTS
Area E - Suburban

DESIGNATION:
CURRENT: IM - (MIXED INDUSTRIAL ZONE)
PROPOSED: IM[XXXX] - (MIXED INDUSTRIAL ZONE)

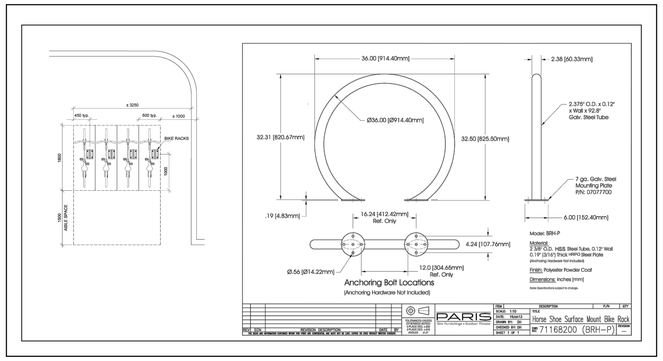
SCHEDULE A4 - TRANSIT STATIONS
Not applicable - more than 600m to the nearest transit station

PROPOSED USES:
Hotel
Restaurant
Indoor Entertainment Facility
Parking Lot

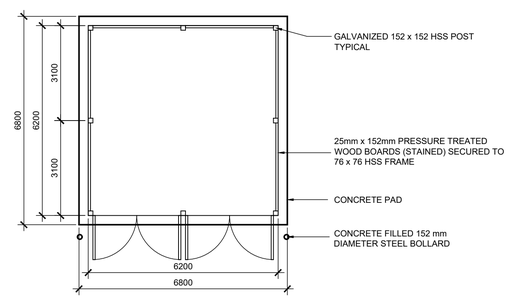
TABLE 1003 - IM ZONE PROVISIONS

	Required	Proposed	
MINIMUM LOT AREA:	1,000sm	53,236sm	
MINIMUM LOT WIDTH:	No minimum		
SETBACKS:	**Required**	**Proposed**	
Front yard:	3.0m	25.8m	
Interior side yard:	3.0m	6.0m	
Rear yard:	3.0m	7.137m	
MAX. BUILDING HEIGHT:	**Required**	**Proposed**	
Abutting N1-6, INZ:	11m	N/A	
All other cases:	22m	26.31m	Hotel - top of parapet
LOT COVERAGE:	**Required**	**Proposed**	
Maximum:	65%	21.9%	
WIDTH OF LANDSCAPING:	**Required**	**Proposed**	
Abutting N1-6, INZ:	3m	6m	
All other cases:	no minimum		
PART 6 - PARKING	**Required**	**Proposed**	
Total spaces:		704	
Barrier free spaces:		20	
BICYCLE PARKING	**Required**	**Proposed**	
Short term bicycles:	58	58	
Inclusive bicycles:	3	3	

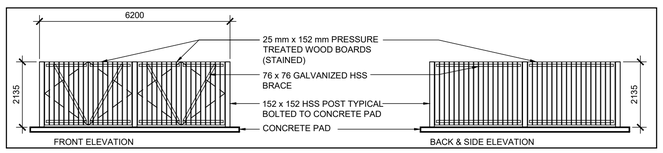
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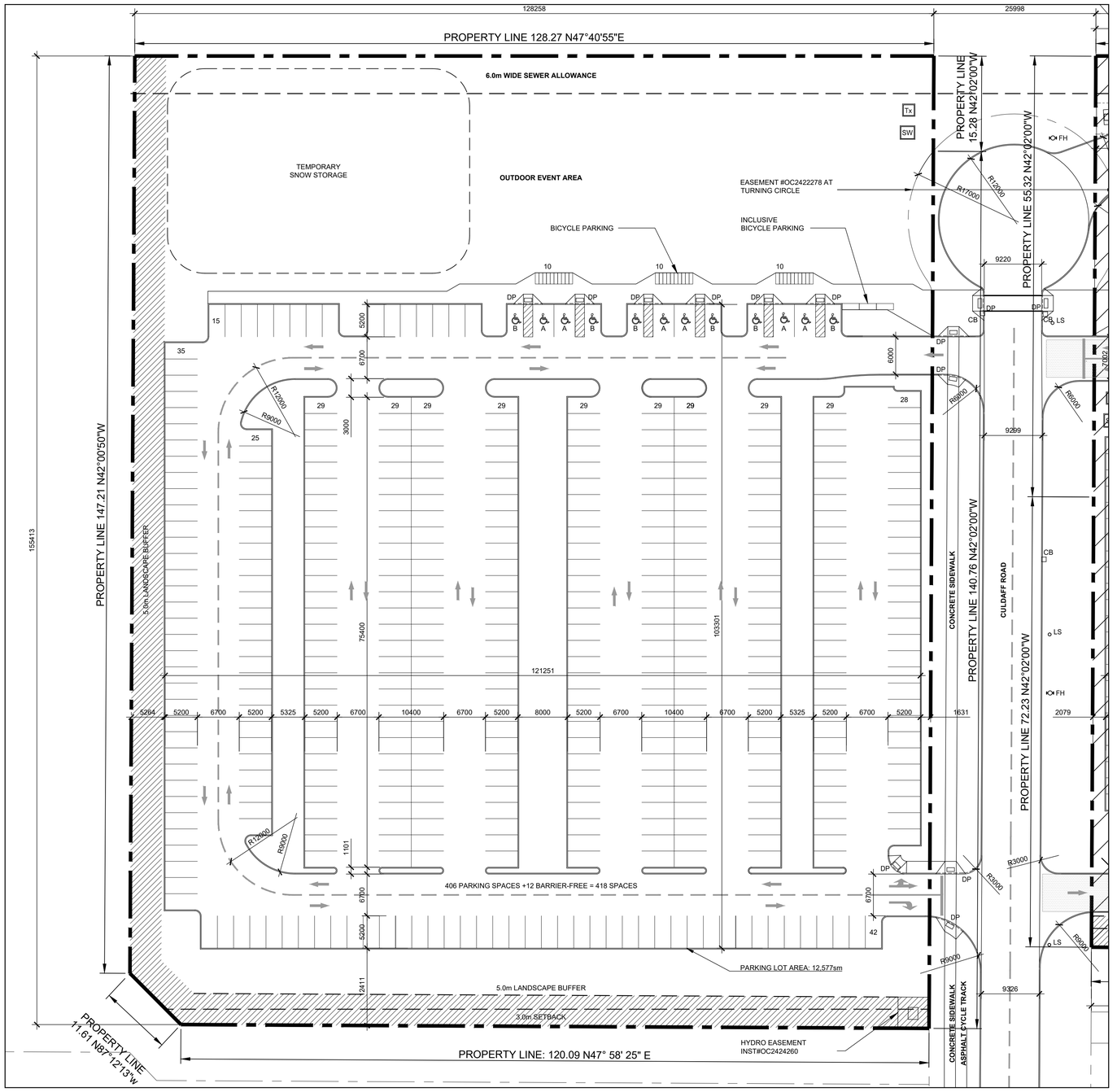
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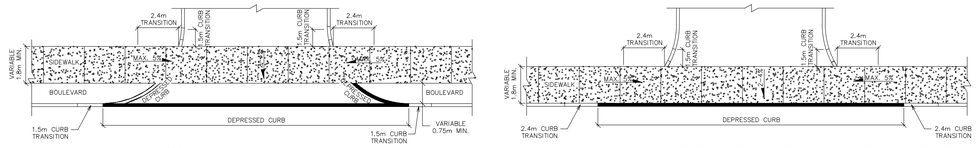
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SP-A02 SCALE: NTS



04 GARBAGE ENCLOSURE ELEVATIONS
NTS SCALE: P-A02



05 SITE PLAN - WEST SECTOR
SP-A02 SCALE: 1:400



05 CITY OF OTTAWA STANDARD DETAIL SC7.1 CURB RETURN ENTRANCES
SP-A02 SCALE: NTS

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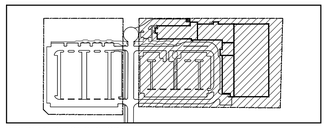
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WATERPARK INTERIOR LANDSCAPING
EDSA

North

Revisions

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02	JT	ISSUED FOR PRICING	2026-06-26
01	JT	ISSUED FOR DISCUSSION	2026-06-26



KEY PLAN - WEST SECTOR

Project

OTTAWA INDOOR AQUATIC & RECREATION FACILITY

2775 & 2785 PALLADIUM DRIVE, OTTAWA ON

Drawing

SITE PLAN WEST SECTOR

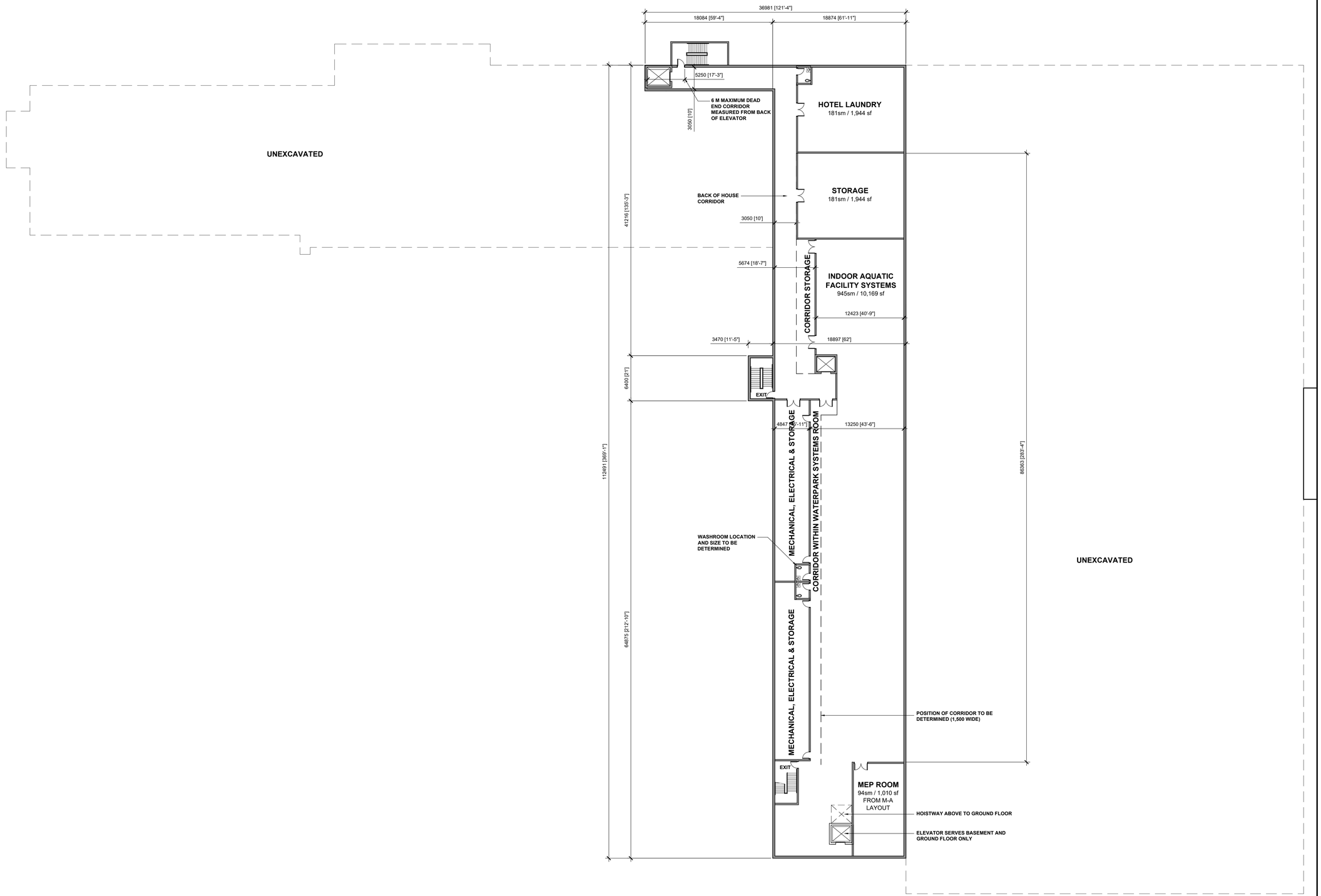
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841 X 1189 – PLOT A1



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10	JT	ISSUED FOR COORDINATION	2026-07-07
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8	IW	ISSUED FOR COORDINATION	2024-03-12
7	IW	ISSUED FOR COORDINATION	2024-06-13

Project

OTTAWA
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2775 & 2785 PALLADIUM DRIVE

Drawing

BASEMENT FLOOR PLAN

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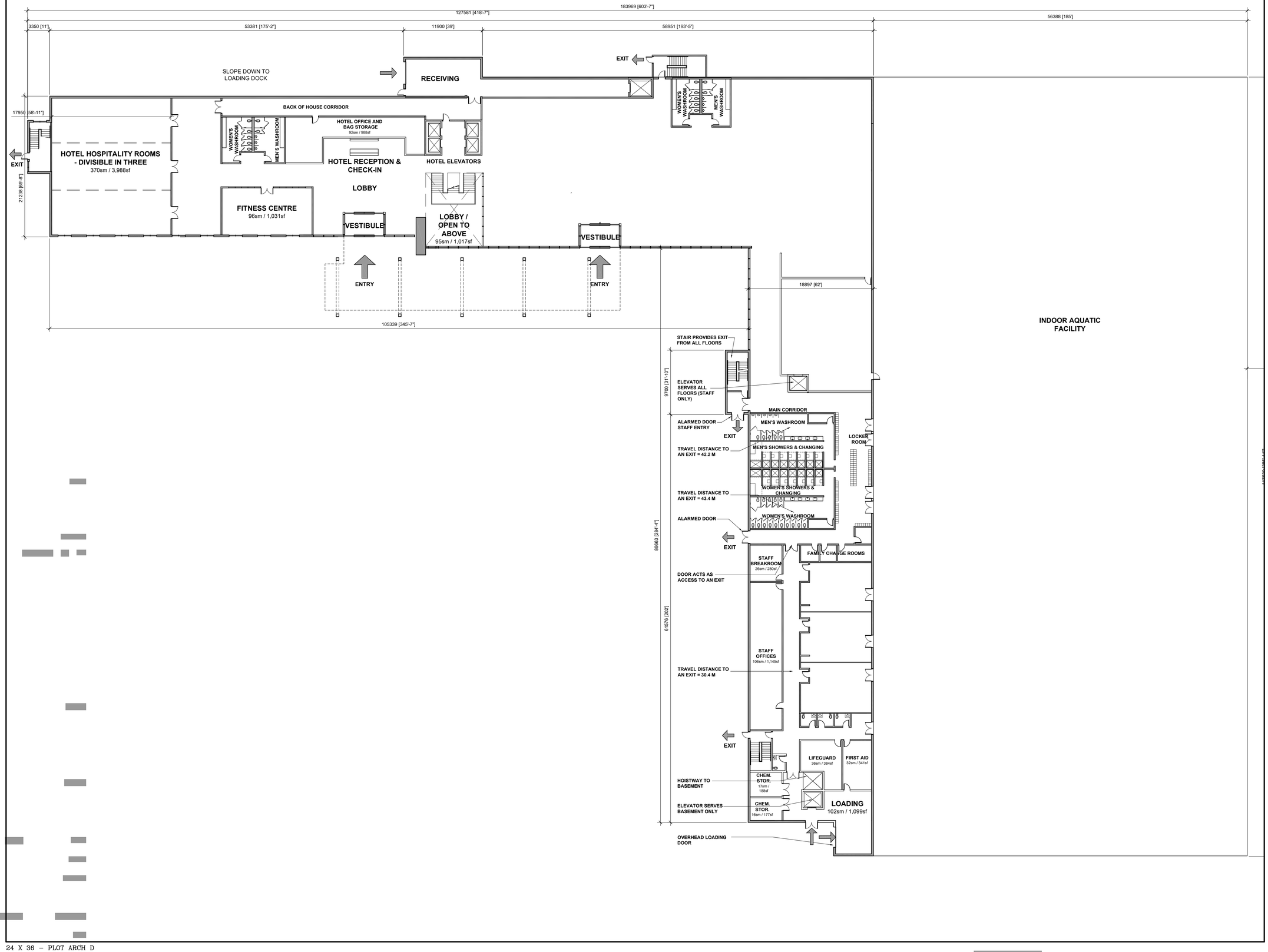
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24 X 36 - PLOT ARCH D



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11	JT	ISSUED FOR DISCUSSION	2026-06-15

Project

OTTAWA INDOOR AQUATIC & RECREATION FACILITY

2775 & 2785 PALLADIUM DRIVE

Drawing

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Scale 1:250

Drawn JCT

Checked

Stamp

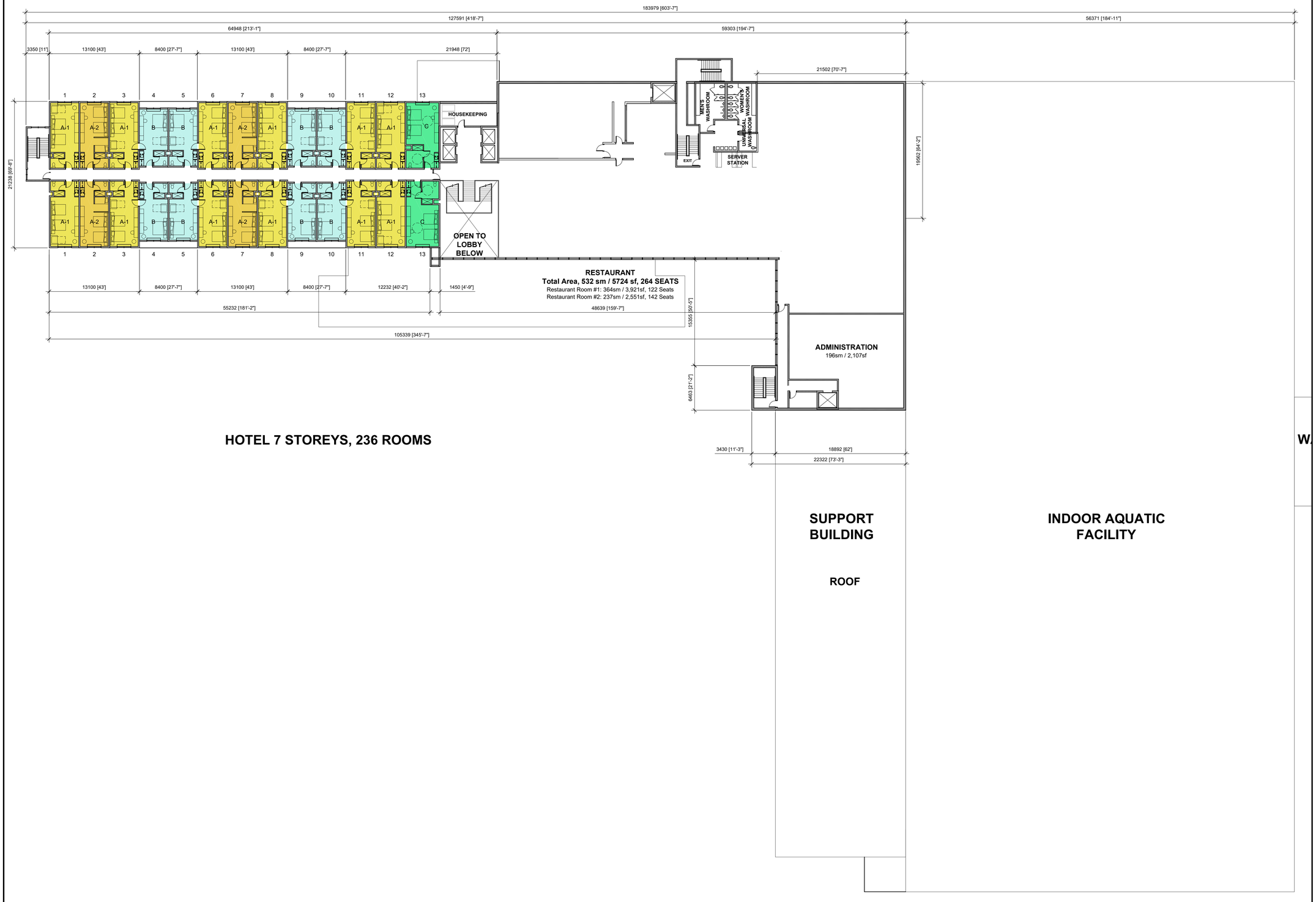
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Date MARCH 2025

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24 X 36 – PLOT ARCH D



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17	JT	ISSUED FOR REFERENCE	2026-07-15
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15	JT	ISSUED FOR COORDINATION	2026-07-07
14	JT	ISSUED FOR PRICING	2026-06-26
13	JT	ISSUED FOR DISCUSSION	2026-06-15

Project

OTTAWA
INDOOR AQUATIC &
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Drawing

SECOND FLOOR PLAN

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24 X 36 - PLOT ARCH D



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13	JT	ISSUED FOR REFERENCE	2026-07-15
12	JT	ISSUED FOR REFERENCE	2026-07-13
11	JT	ISSUED FOR COORDINATION	2026-07-07
10	JT	ISSUED FOR PRICING	2026-06-26
9	JT	ISSUED FOR DISCUSSION	2026-03-30
8	IW	ISSUED FOR DISCUSSION	2026-03-12
7	IW	ISSUED FOR COORDINATION	2025-06-13

Project

OTTAWA
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2775 & 2785 PALLADIUM DRIVE

Drawing

TYPICAL HOTEL
FLOOR PLAN

Scale
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Drawn
JT

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Project No.
24-210

Drawing No.
A103

Date
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24 X 36 – PLOT ARCH D

APPENDIX C

Water Demand Calculations

Hydraulic Capacity and Modeling Analysis 195 Huntmar Drive Subdivision Development

Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: December 20, 2019

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2019-102-DSE

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R0	December 12, 2019	Draft	Ben Loewen	Werner de Schaetzen
R1	December 19, 2019	Updated Draft	Ben Loewen	Werner de Schaetzen
R2	December 19, 2019	Final	Ben Loewen	Werner de Schaetzen
R3	December 20, 2019	Updated Final	Ben Loewen	Werner de Schaetzen

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1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed water main network for the 195 Huntmar Drive subdivision development ("Development") in the City of Ottawa, ON ("City").

The 195 Huntmar Drive subdivision development is located between Hwy 417 and Maple Grove Road adjacent to Huntmar Drive and the Palladium Autopark. The development site lies adjacent to the existing City of Ottawa 3W pressure zone. An existing 300 mm diameter trunk water main is located along Palladium Drive, within the Palladium Autopark, along Maple Grove Road, and a 400 mm diameter trunk main is located along the portion of Huntmar Drive east of the Development. Two water main stubs (300 mm and 400 mm diameter) are provided in close proximity to the Development**.** The 3W pressure zone network is operational within the existing residential neighbourhood (Mattamy Fairwinds) south of the 195 Huntmar Drive subdivision development with a 200 mm diameter water main stub connection.

There are 157 single detached dwellings, 350 traditional townhomes, 70 back-to-back townhomes, 143 apartments, five (5) commercial blocks, one (1) employment block, one (1) high school, one (1) District park, and one (1) parkette serviced as part of the 195 Huntmar Drive subdivision development. The MTO lands, to the north, will be serviced through the development water mains in the future and, therefore, have also been considered in this analysis.

The 195 Huntmar Drive subdivision development model will have three (3) connections to the City water distribution system:

- Connection 1: Huntmar Drive at Palladium Drive
- Connection 2: North end of existing Maestro Avenue
- Connection 3: Maple Grove Road at Huntmar Drive

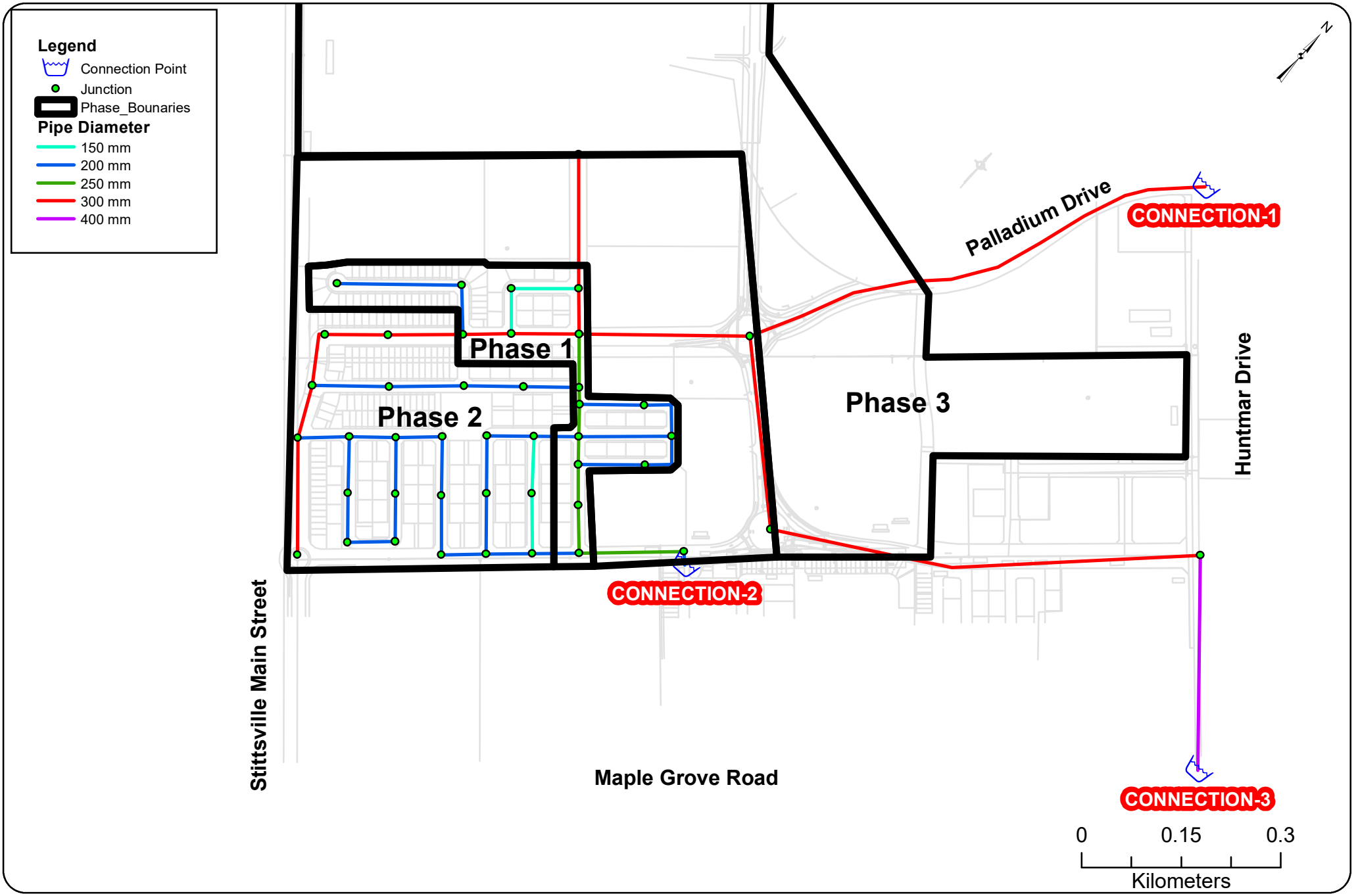
As agreed with DSEL, the following scenarios were considered for the 195 Huntmar Drive development to demonstrate the serviceability from the initial development to full buildout. The phases discussed in this report may be changed based on the timing of construction.

- **Connections 1, 2 and 3 (no 400 mm water main on Huntmar Drive)**
  - **Phase 1**
  - **Phases 1 and 2**
  - **Phases 1, 2 and 3**

The development site is shown in **Figure 1.1** with the final recommended pipe diameters and the phase delineations. Initial pipe diameters were based on the Master Servicing Study (MSS) pipe sizes used in the previous 195 Huntmar Drive report completed by GeoAdvice (February, 2019).

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

The results presented in this report 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 water main 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.



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
Created by: **BL**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

Site Layout and Connection Points Scenario 2

Figure 1.1

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on the pipe network layout provided by DSEL to GeoAdvice on January 21, 2019 and updated by DSEL on December 6, 2019.

2.2 Elevations

Elevations of the modeled junctions were assigned according to road grades provided by DSEL to GeoAdvice on December 11, 2019.

2.3 Consumer Demands

The residential density of 280 L/cap/d was used as per City of Ottawa technical bulletin ISTB 2018-01. The institutional rate of 50,000 L/ha/d was used based on detailed design of similar school sites in Ottawa. The park rate of 50,000 L/ha/d was used based on detailed design of similar parks in Ottawa. The parkette rate of 28,000 L/ha/d was conservatively assumed as "other commercial" as per the City of Ottawa 2010 Design Guidelines *Table 4.2 Consumption Rate for Subdivisions of 501 to 3,000 Persons*. The demand rate of 9,120 L/ha/d for the MTO Lands was taken based on the water demand rates and demand projections in the Kanata West Master Servicing Study (Stantec, CCL, IBI, June 2006). A 10% buffer was applied to population estimates and ICI areas, except for the apartment block, to account for any minor changes that may occur during the detailed design of the subdivision. Population for the apartment block is consistent with DSEL population assumptions. A summary of these rates relevant for this development is shown in **Table 2.1**.

Table 2.1: City of Ottawa Demand Factors

Demand Type	Amount	Units
Average Day Demand		
Residential	280	L/c/d
Institutional	50,000	L/ha/d
Commercial	50,000	L/ha/d
Park	50,000	L/ha/d
Parkette	28,000	L/ha/d
Maximum Daily Demand		
Residential	2.5 x avg. day	L/c/d
Commercial	1.5 x avg. day	L/ha/d
Institutional	1.5 x avg. day	L/ha/d
Peak Hour Demand		
Residential	2.2 x max. day	L/c/d
Commercial	1.8 x max. day	L/ha/d
Institutional	1.8 x max. day	L/ha/d
Minimum Hour Demand		
Residential	0.5 x avg. day	L/c/d
Commercial	0.5 x avg. day	L/ha/d
Institutional	0.5 x avg. day	L/ha/d

Table 2.2 - **Table 2.6** summarize the water demand calculations for the 195 Huntmar Drive subdivision development.

Table 2.2: Development Residential Population and Demand Calculations (Phase 1)

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	47	3.4	176	0.57	1.43	3.14	0.29
Traditional Townhouse	84	2.7	250	0.81	2.03	4.46	0.41
Back-to-Back Townhouse	70	2.7	208	0.67	1.69	3.71	0.34
Total	**201**		**634**	**2.05**	**5.14**	**11.30**	**1.03**

***City of Ottawa Design Guidelines**

Table 2.3: Development Residential Population and Demand Calculations (Phases 1 and 2)

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	157	3.4	588	1.91	4.76	10.48	0.95
Traditional Townhouse	350	2.7	1,040	3.37	8.43	18.54	1.69
Back-to-Back Townhouse	70	2.7	208	0.67	1.69	3.71	0.34
Apartment	143		445	1.44	3.61	7.93	0.72
Total	**720**		**2,281**	**7.39**	**18.48**	**40.66**	**3.70**

***City of Ottawa Design Guidelines**

Table 2.4: Development Non-Residential Population and Demand Calculation (Phases 1 and 2)

Land Use Type	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Commercial	11.26	7.17	10.75	19.35	3.58
Parkette	0.53	0.19	0.28	0.51	0.09
Total	**11.79**	**7.36**	**11.04**	**19.86**	**3.68**

Table 2.5: Development Residential Population and Demand Calculations (Phases 1, 2 and 3)

Dwelling Type	Number of Units	Persons Per Unit*	Population	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Single Detached	157	3.4	588	1.91	4.76	10.48	0.95
Traditional Townhouse	350	2.7	1,040	3.37	8.43	18.54	1.69
Back-to-Back Townhouse	70	2.7	208	0.67	1.69	3.71	0.34
Apartment	143		445	1.44	3.61	7.93	0.72
Total	**720**		**2,281**	**7.39**	**18.48**	**40.66**	**3.70**

***City of Ottawa Design Guidelines**

Table 2.6: Development Non-Residential Population and Demand Calculation (Phases 1, 2 and 3)

Land Use Type	Area (ha)	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)	Minimum Hour Demand (L/s)
Commercial	11.26	7.17	10.75	19.35	3.58
High School	7.46	4.75	7.12	12.82	2.37
Park	5.85	3.72	5.59	10.05	1.86
Parkette	0.53	0.19	0.28	0.51	0.09
MTO Lands	16.50	1.74	2.61	4.70	0.87
Total	**41.60**	**17.57**	**26.36**	**47.44**	**8.79**

Demands were grouped into demand polygons then uniformly distributed to the model nodes located within each polygon. Detailed calculations of demands as well as the illustrated allocation areas are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were completed in accordance with the Fire Underwriters Survey's (FUS) Water Supply for Public Fire Protection Guideline (1999) and City of Ottawa Technical Bulletin ISTB-2018-02. The required fire flow for single detached and traditional townhomes is 10,000 L/min (167 L/s) as per the FUS calculations. For the single detached dwellings where the 10,000 L/min cap could not be applied (i.e. where the minimum separation between the backs of adjacent buildings is less than ten (10) meters), the FUS calculations yielded a required fire flow of 217 L/s. The required fire flow for the back-to-back townhouse dwellings is 14,000 L/min (233 L/s) as per the FUS calculation. The FUS calculation for the back-to-back townhouse dwelling includes fire walls in the middle of each block.

At this time, there is not enough information available to calculate the required fire flows of the apartment block, commercial block, the high school and the parks. As such, the following required fire flows were assumed, based on similar information from previously completed projects, as agreed upon with DSEL:

- Apartment: 283 L/s
- Commercial/Employment: 250 L/s
- Institutional: 250 L/s
- Park: 250 L/s
- Parkette: 167 L/s

Finally, the required fire flow for the MTO Lands was taken as 13,000 L/min (217 L/s) based on Kanata West Master Servicing Study (Stantec, CCL, IBI, June 2006).

Fire flow simulations were completed at each model node in the 195 Huntmar Drive subdivision development. The locations of nodes do not necessarily represent hydrant locations.

Detailed FUS fire flow calculations as well as the illustrated spatial allocation of the required fire flows 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: Huntmar Drive at Palladium Drive
- Connection 2: North end of existing Maestro Avenue
- Connection 3: Maple Grove Road at Huntmar Drive

The above connection points are illustrated in **Figure 1.1**.

Multiple connection scenarios were provided by DSEL. Upon investigation, the scenario representing Connections 1, 2 and 3 is predicted to provide adequate servicing. The 400 mm Huntmar watermain and Connection 4 (Maple Grove Road at Stittsville Main Street) are expected to come online as part of future growth in the surrounding area. Based on the boundary conditions provided by the City, these additions are predicted to improve the site servicing conditions.

Boundary conditions were provided for Peak Hour, Maximum Day plus Fire and Minimum Hour (high pressure check) conditions.

Boundary conditions were provided by the City on November 28, 2019, and can be found in **Appendix C**.

Table 2.7 summarizes the “Scenario 2” boundary conditions used to size the 195 Huntmar Drive subdivision development water network.

Table 2.7: Future Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)	Connection 3 HGL (m)
Min Hour (max. pressure)	161.2	160.8	160.8
Peak Hour (min. pressure)	155.8	155.8	156.2
Max Day + Fire Flow (167 L/s)	151.2	149.5	155.6
Max Day + Fire Flow (217 L/s)*	146.6	143.5	154.2
Max Day + Fire Flow (233 L/s)*	145.6	142.4	153.9
Max Day + Fire Flow (250 L/s)*	144.6	141.1	153.5
Max Day + Fire Flow (283 L/s)	141.9	137.4	153.0

*Interpolated/extrapolated from the boundary conditions provided by the City of Ottawa.

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 water main 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 (/)
150	155	100
200	204	110
250	250	110
300	297	120
400	406	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 water mains within the development were sized to the minimum diameter which would satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for minimum hour, peak hour and maximum day plus fire flow using InfoWater.

Detailed pipe and junction model input data can be found in **Appendix D**.

4.1 Development Pressure Analysis

The modeling results indicate that the development can be adequately serviced by the proposed water main layout shown in **Figure 1.1**. Modeled service pressures for the development are summarized in **Table 4.1**.

Table 4.1: Summary of Available Service Pressures

Phase	Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
Phase 1	77.0 psi	66.5 psi
Phases 1 and 2	76.9 psi	65.6 psi
Phases 1, 2 and 3	76.9 psi	65.3 psi

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 50 psi and 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 80 psi. Based on the analysis results shown in **Table 4.1**, pressures do not exceed 80 psi.

Please refer to the GeoAdvice report *Hydraulic Capacity and Modeling Analysis 195 Huntmar Drive Subdivision Development (February, 2019)*, for the minimum required elevation for pressure reducing valves (PRVs) under the future boundary conditions.

Detailed pipe and junction result tables and maps can be found in **Appendix E**.

4.2 Development Fire Flow Analysis

4.2.1 Looped and Interim Dead-end Water mains

Summaries of the minimum available fire flows are shown below in **Table 4.2**. The results for junction J-30 are not presented in this section as this junction is located on a dead-end and will require the water main network sizing protocol referenced in the City of Ottawa Technical Bulletin *ISTB-2018-02* to meet the fire flow requirement of 167 L/s. Refer to **Section 4.2.2** for the fire flow analysis of junction J-30. For junctions J-04 and J-10, hydrant analyses were not completed. These dead-ends have sufficient available flow and are interim dead-ends which will be connected to adjacent developments in the future.

Table 4.2: Summary of Minimum Available Fire Flows

Phase	Required Fire Flow	Minimum Available Flow	Junction ID
Phase 1	167 L/s	203 L/s	J-33
	233 L/s	265 L/s	J-43
Phases 1 and 2	167 L/s	186 L/s	J-40
	217 L/s	236 L/s	J-11
	233 L/s	268 L/s	J-43
	250 L/s	264 L/s	J-10
	283 L/s	327 L/s	J-27
Phases 1, 2 and 3	167 L/s	186 L/s	J-40
	217 L/s	236 L/s	J-11
	233 L/s	268 L/s	J-43
	250 L/s	264 L/s	J-10
	283 L/s	327 L/s	J-27

As shown in **Table 4.2**, the model predicts that the fire flow requirements can be met throughout the 195 Huntmar Drive subdivision development (except for junction J-30, which is addressed in **Section 4.2.2**) with the proposed water main layout shown in **Figure 1.1**.

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

Table 4.3: Summary of Residual Pressures (MDD + FF)

Phase	Maximum Residual Pressure (psi)	Average Residual Pressure (psi)	Minimum Residual Pressure (psi)
Phase 1	26 psi	37 psi	52 psi
Phases 1 and 2	23 psi	37 psi	53 psi
Phases 1, 2 and 3	22 psi	37 psi	52 psi

As show in **Table 4.3**, the model predicts that the residual pressure requirements can be met throughout the 195 Huntmar Drive subdivision development with the proposed water main layout shown in **Figure 1.1**.

Detailed fire flow results and figures illustrating the fire flow results can be found in **Appendix F**.

4.2.2 Dead-end Water main

The water main network sizing protocol referenced in *Appendix I* of City of Ottawa Technical Bulletin *ISTB-2018-02* ("protocol") was applied to the design of the permanent dead-end water main junction J-30. This protocol determines the appropriate sizing of dead-end water mains and associated hydrants requirements. The protocol was only applied to Phase 1 which is the most conservative scenario since the inclusion of Phases 2 and 3 provides additional looping and increases network redundancy within the development.

Table 4.4 shows the fire flow simulation results obtained when applying the protocol and **Table 4.5** shows the proposed hydrants spacing. The proposed hydrants placement and the modeling results are shown in **Appendix G.** It is important to note that additional hydrants will be needed to comply with the City of Ottawa Guidelines (see **Section 5.3**).

Table 4.4: Fire Flow Split and Results (Junction J-30)

Hydrant ID	Flow at Hydrant	Residual Pressure
H-1	2,400 L/min	20 psi
H-2	3,800 L/min	21 psi
H-3	3,800 L/min	24 psi
Total	**10,000 L/min (167 L/s)**	**all ≥ 20 psi**

Table 4.5: Hydrant – Junction Distances

Junction ID	Distance to Hydrant		
	H-1	H-2	H-3
J-30	55 m	100 m	135 m

Table 4.4 shows that sufficient fire flow is possible at junction J-30 when hydrants H-1, H-2 and H-3 are flowing simultaneously. In addition, junction J-30 is within 150 m from H-1, H-2 and H-3.

5 Other Servicing Considerations

5.1 Water Supply Security

The City of Ottawa Design Guidelines allow single feed systems for developments up to a total average day demand of 50 m^3/day and require two (2) feeds if the development exceeds 50 m^3/day for supply security, according to Technical Bulletin ISDTB-2014-02.

The 195 Huntmar Drive subdivision development services a total average day demand of 2,157 m^3/day; as such, at least two (2) feeds are required. Three (3) connections were modeled as part of the analysis for the development. For the dead-end water main discussed in **Section 4.2.2**, the total average day demand is 49 m^3/day; as such, only one (1) feed is required.

5.2 Valves

No comment has been made in this technical memorandum with respect to exact placement of isolation valves within the distribution network for the 195 Huntmar Drive subdivision development other than to summarize the City of Ottawa Design Guidelines for number, location, and spacing of isolation valves:

- Tee intersection – two (2) valves
- Cross intersection – three (3) valves
- Valves shall be located 2 m away from the intersection
- 300 m spacing for 150 mm to 400 mm diameter valves
- Gate valves for 100 mm to 300 mm diameter mains
- Butterfly valves for 400 mm and larger diameter mains

Drain valves are not strictly required under the City of Ottawa Design Guidelines for water mains under 600 mm in diameter. The Guidelines indicate that “small diameter water mains shall be drained through hydrant via pumping if needed.”

Air valves are not strictly required under the City of Ottawa Design Guidelines for water mains up to and including 400 mm in diameter. The Guidelines indicate that air removal “can be accomplished by the strategic positioning of hydrant at the high points to remove the air or by installing or utilizing available 50 mm chlorination nozzles in 300 mm and 400 mm chambers.”

The detailed engineering drawings for the 195 Huntmar Drive subdivision development are expected to identify valves in accordance with the requirements noted above.

5.3 Hydrants

No comment has been made in this technical memorandum with respect to exact placement of hydrants within the distribution network for the 195 Huntmar Drive subdivision development other than junction J-30, as discussed in **Section 4.2.2**. The remaining hydrants will be required to meet the City of Ottawa Design Guidelines for maximum hydrant spacing:

- 125 m for single family unit residential areas on lots where frontage at the street line is 15 m or longer
- 110 m for single family unit residential areas on lots where frontage at the street line is less than 15 m and for residential areas zoned for row housing, doubles or duplexes
- 90 m for institutional, commercial, industrial, apartments and high-density areas

The detailed engineering drawings for the 195 Huntmar Drive subdivision development are expected to identify hydrants in accordance with the requirements noted above or to meet required fire flows.

5.4 Water Quality

The turnover rates of the water within the development network, calculated from the connections to the 195 Huntmar Drive development, are as follows:

- Phase 1: About 33 hours. Phase 1 ADD is 178 m^3/day.
- Phase 1 and 2: About 4 hours. Phases 1 and 2 ADD is 2,006 m^3/day.
- Phase 1, 2 and 3: About 4 hours. Phases 1, 2 and 3 ADD is 2,157 m^3/day.

The above rates are based on the volume of pipe within the development network and the development average day demand.

6 Conclusions

The hydraulic capacity and modeling analysis of the 195 Huntmar Drive subdivision development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between the following pressure for each phase:
    - Phase 1: 66.5 psi and 77.0 psi
    - Phases 1 and 2: 65.6 psi and 76.9 psi
    - Phases 1, 2 and 3: 65.3 psi and 76.9 psi
- The proposed water main network is able to deliver fire flows at all junctions, including J-30 which uses the water main network sizing protocol referenced in the City of Ottawa Technical Bulletin *ISTB-2018-02*.

Submission

Prepared by:

Ben Loewen, E.I.T.
Hydraulic Modeler/Project Engineer

Approved by:

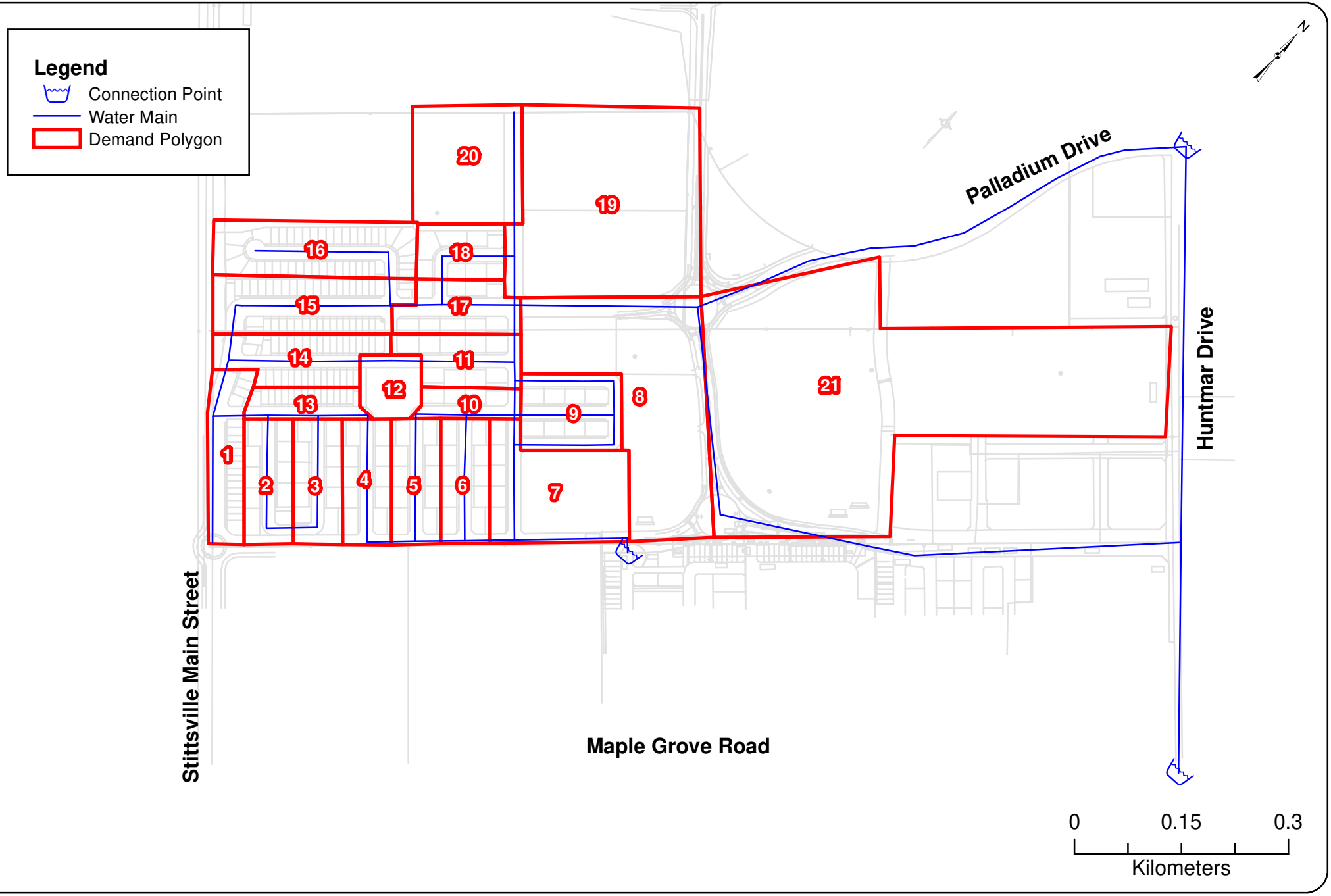
LICENSED PROFESSIONAL ENGINEER
W. B. F. de Schaetzen
PROVINCE OF ONTARIO

Dec 20, 2019

Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

ENGINEERS & GEOSCIENTISTS BRITISH COLUMBIA
OQM CERTIFIED
GeoADVICE

Appendix A Domestic Water Demand Calculations and Allocation



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Sudbivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
Created by: **BL**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

Demand Allocation

Figure A.1

Consumer Water Demands - Phase 1

Residential Demands

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type*	(L/c/d)	(L/d)	(L/s)				
Single Detached	47	3.4	176	280	49,280	0.57	1.43	167 & 217 **	3.14	0.29
Traditional Townhome	84	2.7	250		70,000	0.81	2.03	167	4.46	0.41
Back-to-Back Townhome	70	2.7	208		58,240	0.67	1.69	233**	3.71	0.34
Apartment†					-	-	-	283	-	-
Subtotal	**201**		**634**		**177,520**	**2.05**	**5.14**		**11.30**	**1.03**

Non-Residential Demands

Property Type	Area (ha)		Average Day Demand*			Max Day 1.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
			(L/ha/d)	(L/d)	(L/s)				
Commercial and Employment			50,000		-	-	250††	-	-
High School***			50,000		-	-	250††	-	-
Park			50,000		-	-	250††	-	-
Parkette			28,000		-	-	167††	-	-
MTO Lands†††			9,120	-	-	-	217	-	-
Subtotal	**-**			**-**	**-**	**-**		**-**	**-**

Total	**2.05**	**5.14**		**11.30**	**1.03**

*10% increase applied to account for refinements in concept plan

**Based on FUS fire flow calculation

***High School assumed as Institutional in absence of student population estimate.

†Unit count and population values provided by DSEL on October 23, 2019. Fire flow assumed at 283 L/s, as this is a typical conservative value. FUS calculations should be completed once further information is available.

††The required fire flow for ICI properties was assumed at 250 L/s. This is a typical conservative value and based on similar information from previously completed projects. FUS calculations should be completed once further information is available.

†††Area, demand rate and fire flow based on Kanata West MSS (Stantec, CCL, IBI, June 2006).

Domestic Demand Calculations and Allocation - Phase 1

Demand Polygon	Junction ID	Dwelling Type	Number of Units/Area	Population	Average Day Demand			Max Day (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
					L/c/d or L/ha/d	L/d	L/s			
7	J-27	Townhouse	22	65	280	9,152	0.11	0.26	0.58	0.05
	J-20					9,152	0.11	0.26	0.58	0.05
9	J-21	Back-to-Back Townhouse	70	208	280	19,413	0.22	0.56	1.24	0.11
	J-43					19,413	0.22	0.56	1.24	0.11
	J-44					19,413	0.22	0.56	1.24	0.11
15	J-22	Single Detached	3	11	280	3,146	0.04	0.09	0.20	0.02
16	J-25	Single Detached	44	165	280	23,071	0.27	0.67	1.47	0.13
	J-30					23,071	0.27	0.67	1.47	0.13
17	J-09	Townhouse	34	101	280	14,144	0.16	0.41	0.90	0.08
	J-35					14,144	0.16	0.41	0.90	0.08
18	J-33	Townhouse	28	83	280	23,296	0.27	0.67	1.48	0.13
Total:						**177,520**	**2.05**	**5.14**	**11.30**	**1.03**

Consumer Water Demands - Phases 1 and 2

Residential Demands

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type*	(L/c/d)	(L/d)	(L/s)				
Single Detached	157	3.4	588	280	164,640	1.91	4.76	167 & 217 **	10.48	0.95
Traditional Townhome	350	2.7	1,040		291,200	3.37	8.43	167	18.54	1.69
Back-to-Back Townhome	70	2.7	208		58,240	0.67	1.69	233**	3.71	0.34
Apartment†	143		445		124,600	1.44	3.61	283	7.93	0.72
Subtotal	**720**		**2,281**		**638,680**	**7.39**	**18.48**		**40.66**	**3.70**

Non-Residential Demands

Property Type	Area (ha)		Average Day Demand*			Max Day 1.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
			(L/ha/d)	(L/d)	(L/s)				
Commercial and Employment	11.26		50,000	619,300	7.17	10.75	250††	19.35	3.58
High School***			50,000	410,300		-	250††	-	-
Park			50,000	321,750		-	250††	-	-
Parkette	0.53		28,000	16,324	0.19	0.28	167††	0.51	0.09
MTO Lands†††			9,120	-		-	217	-	-
Subtotal	**11.79**			**1,367,674**	**7.36**	**11.04**		**19.86**	**3.68**

Total					**14.75**	**29.52**		**60.52**	**7.37**

*10% increase applied to account for refinements in concept plan

**Based on FUS fire flow calculation

***High School assumed as Institutional in absence of student population estimate.

†Unit count and population values provided by DSEL on October 23, 2019. Fire flow assumed at 283 L/s, as this is a typical conservative value. FUS calculations should be completed once further information is available.

††The required fire flow for ICI properties was assumed at 250 L/s. This is a typical conservative value and based on similar information from previously completed projects. FUS calculations should be completed once further information is available.

†††Area, demand rate and fire flow based on Kanata West MSS (Stantec, CCL, IBI, June 2006).

Domestic Demand Calculations and Allocation - Phases 1 and 2

Demand Polygon	Junction ID	Dwelling Type	Number of Units/Area	Population	Average Day Demand			Max Day (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
					L/c/d or L/ha/d	L/d	L/s			
1	J-04	Single Detached	20	75	280	10,487	0.12	0.30	0.67	0.06
	J-05					10,487	0.12	0.30	0.67	0.06
2	J-12	Townhouse	38	113	280	16,857	0.20	0.49	1.07	0.10
	J-13	Single Detached	2	7		16,857	0.20	0.49	1.07	0.10
3	J-14	Townhouse	42	125	280	17,472	0.20	0.51	1.11	0.10
	J-38					17,472	0.20	0.51	1.11	0.10
4	J-15	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-16					18,304	0.21	0.53	1.17	0.11
5	J-06	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-17					18,304	0.21	0.53	1.17	0.11
6	J-40	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-42					18,304	0.21	0.53	1.17	0.11
7	J-27	Townhouse	22	65	280	9,152	0.11	0.26	0.58	0.05
	J-20					9,152	0.11	0.26	0.58	0.05
	J-18	Condo	143	445	280	124,600	1.44	3.61	7.93	0.72
8	J-02	Commercial	3.38	-	50,000	185,900	2.15	3.23	5.81	1.08
9	J-21	Back-to-Back Townhouse	70	208	280	19,413	0.22	0.56	1.24	0.11
	J-43					19,413	0.22	0.56	1.24	0.11
	J-44					19,413	0.22	0.56	1.24	0.11
10	J-23	Townhouse	16	48	280	4,437	0.05	0.13	0.28	0.03
	J-26					4,437	0.05	0.13	0.28	0.03
	J-41					4,437	0.05	0.13	0.28	0.03
11	J-37	Townhouse	38	113	280	15,808	0.18	0.46	1.01	0.09
	J-31					15,808	0.18	0.46	1.01	0.09
12	J-32	Parkette	0.57	-	28,000	17,556	0.20	0.30	0.55	0.10
13	J-11	Single Detached	15	56	280	5,243	0.06	0.15	0.33	0.03
	J-08					5,243	0.06	0.15	0.33	0.03
	J-19					5,243	0.06	0.15	0.33	0.03
14	J-24	Single Detached	33	124	280	17,303	0.20	0.50	1.10	0.10
	J-36					17,303	0.20	0.50	1.10	0.10
15	J-07	Single Detached	43	161	280	15,031	0.17	0.43	0.96	0.09
	J-39					15,031	0.17	0.43	0.96	0.09
	J-22					15,031	0.17	0.43	0.96	0.09
16	J-25	Single Detached	44	165	280	23,071	0.27	0.67	1.47	0.13
	J-30					23,071	0.27	0.67	1.47	0.13
17	J-09	Townhouse	34	101	280	14,144	0.16	0.41	0.90	0.08
	J-35					14,144	0.16	0.41	0.90	0.08
18	J-33	Townhouse	28	83	280	23,296	0.27	0.67	1.48	0.13
19	J-34	Commercial	5.89	-	50,000	323,950	3.75	5.62	10.12	1.87
20	J-10	Employment	2.00	-	50,000	110,000	1.27	1.91	3.44	0.64
Total:						**2,006,354**	**14.75**	**29.52**	**60.52**	**7.37**

Consumer Water Demands - Phases 1, 2 and 3

Residential Demands

Dwelling Type	Number of Units	Population		Average Day Demand			Max Day 2.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 2.2 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		Persons per Unit	Population Per Dwelling Type*	(L/c/d)	(L/d)	(L/s)				
Single Detached	157	3.4	588	280	164,640	1.91	4.76	167 & 217 **	10.48	0.95
Traditional Townhome	350	2.7	1,040		291,200	3.37	8.43	167	18.54	1.69
Back-to-Back Townhome	70	2.7	208		58,240	0.67	1.69	233**	3.71	0.34
Apartment†	143		445		124,600	1.44	3.61	283	7.93	0.72
Subtotal	**720**		**2,281**		**638,680**	**7.39**	**18.48**		**40.66**	**3.70**

Non-Residential Demands

Property Type	Area (ha)		Average Day Demand*			Max Day 1.5 x Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.8 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
			(L/ha/d)	(L/d)	(L/s)				
Commercial and Employment	11.26		50,000	619,300	7.17	10.75	250††	19.35	3.58
High School***	7.46		50,000	410,300	4.75	7.12	250††	12.82	2.37
Park	5.85		50,000	321,750	3.72	5.59	250††	10.05	1.86
Parkette	0.53		28,000	16,324	0.19	0.28	167††	0.51	0.09
MTO Lands†††	16.50		9,120	150,480	1.74	2.61	217	4.70	0.87
Subtotal	**41.60**			**1,518,154**	**17.57**	**26.36**		**47.44**	**8.79**

Total					**24.96**	**44.84**		**88.10**	**12.48**

*10% increase applied to account for refinements in concept plan

**Based on FUS fire flow calculation

***High School assumed as Institutional in absence of student population estimate.

†Unit count and population values provided by DSEL on October 23, 2019. Fire flow assumed at 283 L/s, as this is a typical conservative value. FUS calculations should be completed once further information is available.

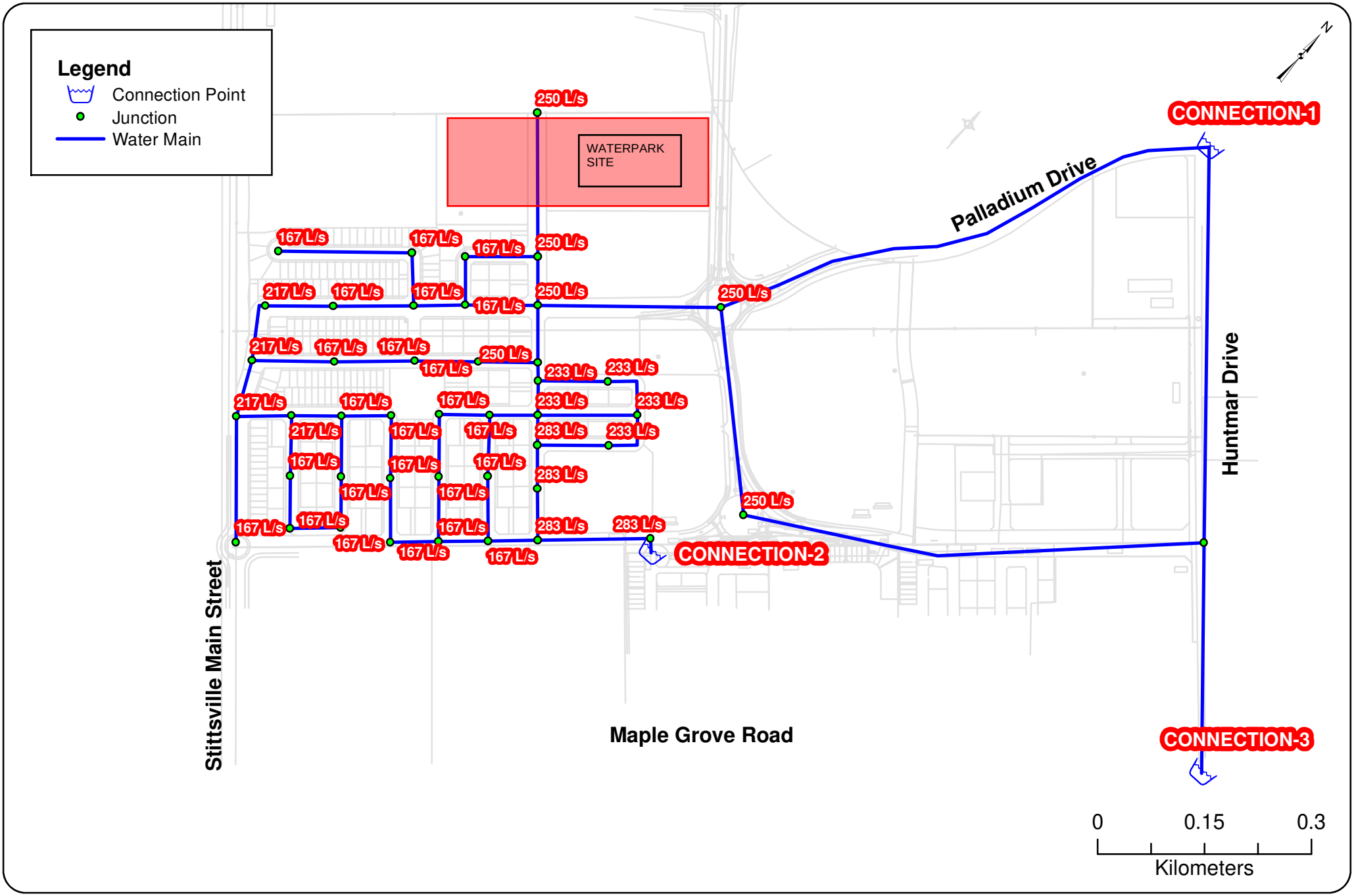
††The required fire flow for ICI properties was assumed at 250 L/s. This is a typical conservative value and based on similar information from previously completed projects. FUS calculations should be completed once further information is available.

†††Area, demand rate and fire flow based on Kanata West MSS (Stantec, CCL, IBI, June 2006).

Domestic Demand Calculations and Allocation - Phases 1, 2 and 3

Demand Polygon	Junction ID	Dwelling Type	Number of Units/Area	Population	Average Day Demand			Max Day (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
					L/c/d or L/ha/d	L/d	L/s			
1	J-04	Single Detached	20	75	280	10,487	0.12	0.30	0.67	0.06
	J-05					10,487	0.12	0.30	0.67	0.06
2	J-12	Townhouse	38	113	280	16,857	0.20	0.49	1.07	0.10
	J-13	Single Detached	2	7		16,857	0.20	0.49	1.07	0.10
3	J-14	Townhouse	42	125	280	17,472	0.20	0.51	1.11	0.10
	J-38					17,472	0.20	0.51	1.11	0.10
4	J-15	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-16					18,304	0.21	0.53	1.17	0.11
5	J-06	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-17					18,304	0.21	0.53	1.17	0.11
6	J-40	Townhouse	44	131	280	18,304	0.21	0.53	1.17	0.11
	J-42					18,304	0.21	0.53	1.17	0.11
7	J-27	Townhouse	22	65	280	9,152	0.11	0.26	0.58	0.05
	J-20					9,152	0.11	0.26	0.58	0.05
	J-18	Condo	143	445	280	124,600	1.44	3.61	7.93	0.72
8	J-02	Commercial	3.38	-	50,000	185,900	2.15	3.23	5.81	1.08
9	J-21	Back-to-Back Townhouse	70	208	280	19,413	0.22	0.56	1.24	0.11
	J-43					19,413	0.22	0.56	1.24	0.11
	J-44					19,413	0.22	0.56	1.24	0.11
10	J-23	Townhouse	16	48	280	4,437	0.05	0.13	0.28	0.03
	J-26					4,437	0.05	0.13	0.28	0.03
	J-41					4,437	0.05	0.13	0.28	0.03
11	J-37	Townhouse	38	113	280	15,808	0.18	0.46	1.01	0.09
	J-31					15,808	0.18	0.46	1.01	0.09
12	J-32	Parkette	0.57	-	28,000	17,556	0.20	0.30	0.55	0.10
13	J-11	Single Detached	15	56	280	5,243	0.06	0.15	0.33	0.03
	J-08					5,243	0.06	0.15	0.33	0.03
	J-19					5,243	0.06	0.15	0.33	0.03
14	J-24	Single Detached	33	124	280	17,303	0.20	0.50	1.10	0.10
	J-36					17,303	0.20	0.50	1.10	0.10
15	J-07	Single Detached	43	161	280	15,031	0.17	0.43	0.96	0.09
	J-39					15,031	0.17	0.43	0.96	0.09
	J-22					15,031	0.17	0.43	0.96	0.09
16	J-25	Single Detached	44	165	280	23,071	0.27	0.67	1.47	0.13
	J-30					23,071	0.27	0.67	1.47	0.13
17	J-09	Townhouse	34	101	280	14,144	0.16	0.41	0.90	0.08
	J-35					14,144	0.16	0.41	0.90	0.08
18	J-33	Townhouse	28	83	280	23,296	0.27	0.67	1.48	0.13
19	J-34	Commercial	5.89	-	50,000	323,950	3.75	5.62	10.12	1.87
20	J-10	Employment	2.00	-	50,000	110,000	1.27	1.91	3.44	0.64
	J-10	MTO Lands	16.50	_	9,120	150,480	1.74	2.61	4.70	0.87
21	J-28	Park	5.85	-	50,000	321,750	3.72	5.59	10.05	1.86
	J-28	School	7.46	-	50,000	410,300	4.75	7.12	12.82	2.37
Total:						**2,156,834**	**24.96**	**44.84**	**88.10**	**12.48**

Appendix B Required Fire Flows and FUS Calculations



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
Created by: **BL**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

Required Fire Flow

Figure B.1

FUS Required Fire Flow Calculation

Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.
Project: 2019-102-DSE
Development: 195 Huntmar Drive — Lots 31-47, Single Detached
Zoning: Single Family Residential
Date: December 19, 2019

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 2542 m^2

Note: ground floor area based on setbacks provided to GeoAdvice on October 24, 2019.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

Note: The single detached dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 17 units is considered in this calculation.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 5083 m^2 (Combined area of 17 units)

The total floor area in m^2 in the building being considered

F = 23,528 L/min **D = 24,000 L/min***

E. Occupancy

Occupancy content hazard	Limited Combustible	-15	% of **D**	**-3,600**	**L/min**	**E = 20,400 L/min**

F. Sprinkler Protection

Automatic sprinkler protection	None	0	% of **E**	**0**	**L/min**	**F = 20,400 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	3.1 to 10 m	31-60 m-storeys	Wood Frame or Non-Combustible	18%
East	20.1 to 30 m	0-30 m-storeys	Wood Frame or Non-Combustible	8%
North	20.1 to 30 m	Over 120 m-storeys	Wood Frame or Non-Combustible	10%
South	10.1 to 20 m	Over 120 m-storeys	Wood Frame or Non-Combustible	15%
			Total	**51%**

% of **E** **+ 10,404 L/min** **G = 30,804 L/min**

H. Wood Shake Charge No — **0 L/min** **H = 30,804 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.1. The single detached dwellings comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 195 Huntmar Drive development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

195 Huntmar Drive - FUS Required Fire Flow Summary

195 Huntmar Drive	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	5,083
Required Fire Flow (L/min)	24,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	18%
East (%)	8%
South (%)	10%
West (%)	15%
Total Exposure (%)	51%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

FUS Required Fire Flow Calculation

Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.
Project: 2019-102-DSE
Development: 195 Huntmar Drive — Lots 69, 70, 105, 106 Single Detached
Zoning: Single Family Residential
Date: December 19, 2019

Note: For other single detached lots that do not comply with the City of Ottawa Technical Bulletin ISDTB-2014-02 4.1, a similar fire flow as calculated below will be used.

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 634 m^2

Note: ground floor area based on setbacks provided to GeoAdvice on October 24, 2019.

Note: The single detached dwellings are separated by less than 3 m; therefore, they must be considered as one fire area. The combined area of 4 units is considered in this calculation.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 1267 m^2 (Combined area of 4 units)

The total floor area in m^2 in the building being considered

F = 11,746 L/min **D = 12,000 L/min***

E. Occupancy

Occupancy content hazard	Limited Combustible	-15	% of **D**	**-1,800**	**L/min**	**E = 10,200 L/min**

F. Sprinkler Protection

Automatic sprinkler protection	None	0	% of **E**	**0**	**L/min**	**F = 10,200 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	Beyond 45 m	0-30 m-storeys	Wood Frame or Non-Combustible	0%
East	3.1 to 10 m	61-90 m-storeys	Wood Frame or Non-Combustible	19%
North	30.1 to 45 m	31-60 m-storeys	Wood Frame or Non-Combustible	5%
South	30.1 to 45 m	31-60 m-storeys	Wood Frame or Non-Combustible	5%
			Total	**29%**

% of **E** **+ 2,958 L/min** **G = 13,158 L/min**

H. Wood Shake Charge No — **0 L/min** **H = 13,158 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.1. The single detached dwellings **do not** comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**13,000**	**L/min***
	217	**L/s**
Required Duration of Fire Flow	**2.75**	**Hrs**
Required Volume of Fire Flow	**2,145**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 195 Huntmar Drive development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

195 Huntmar Drive - FUS Required Fire Flow Summary

195 Huntmar Drive	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	1,267
Required Fire Flow (L/min)	12,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	0%
East (%)	19%
South (%)	5%
West (%)	5%
Total Exposure (%)	29%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	13,000
Total Required Fire Flow (L/s)	217

FUS Required Fire Flow Calculation

Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.
Project: 2019-102-DSE
Development: 195 Huntmar Drive — Block 173, Traditional Townhouse
Zoning: Multi Family Residential
Date: December 19, 2019

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 546 m^2

Note: ground floor area based on setbacks provided to GeoAdvice on October 24, 2019.

Note: The combined area of 5 units is considered in this calculation.

C. Number of Storeys: 2

Note: all buildings, including adjacent buildings, assumed to be 2 storeys.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 1093 m^2 (Combined area of 5 units)

The total floor area in m^2 in the building being considered

F = 10,909 L/min **D = 11,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,650 L/min** **E = 9,350 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 9,350 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	10.1 to 20 m	61-90 m-storeys	Wood Frame or Non-Combustible	14%
East	20.1 to 30 m	61-90 m-storeys	Wood Frame or Non-Combustible	9%
North	20.1 to 30 m	0-30 m-storeys	Wood Frame or Non-Combustible	8%
South	3.1 to 10 m	0-30 m-storeys	Wood Frame or Non-Combustible	17%
			Total	**48%**

% of **E** **+ 4,488 L/min** **G = 13,838 L/min**

H. Wood Shake Charge No — **0 L/min** **H = 13,838 L/min**

For wood shingle or shake roofs

The required fire flow exceeds the cap in the City of Ottawa Technical Bulletin ISDTB-2014-02 4.2. The townhouse dwellings comply with the provisions of the Bulletin; therefore, the required fire flow is:

Total Fire Flow Required	**10,000**	**L/min***
	167	**L/s**
Required Duration of Fire Flow	**2**	**Hrs**
Required Volume of Fire Flow	**1,200**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 195 Huntmar Drive development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

195 Huntmar Drive - FUS Required Fire Flow Summary

195 Huntmar Drive	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	1,093
Required Fire Flow (L/min)	11,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	14%
East (%)	9%
South (%)	8%
West (%)	17%
Total Exposure (%)	48%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	10,000
Total Required Fire Flow (L/s)	167

FUS Required Fire Flow Calculation

Fire Underwriters Survey, 1999.

Client: David Schaeffer Engineering Ltd.
Project: 2019-102-DSE
Development: 195 Huntmar Drive — Block 230, Back-to-Back Townhouse
Zoning: Multi Family Residential — **With fire wall located in the middle of the block**
Date: December 19, 2019

A. Type of Construction: Wood Frame Construction

B. Ground Floor Area: 387 m^2

Note: ground floor area based on setbacks provided to GeoAdvice on October 24, 2019.

Note: The combined area of 6 units is considered in this calculation.

C. Number of Storeys: 3

Note: all buildings assumed to be 2 storeys, except for the 3-storey condos.

D. Required Fire Flow*: $F = 220C\sqrt{A}$

C: Coefficient related to the type of construction — **C =** 1.5

A: Effective area — **A =** 1161 m^2 (Combined area of 6 units)

The total floor area in m^2 in the building being considered

F = 11,244 L/min **D = 11,000 L/min***

E. Occupancy

Occupancy content hazard: Limited Combustible — -15 % of **D** **-1,650 L/min** **E = 9,350 L/min**

F. Sprinkler Protection

Automatic sprinkler protection: None — 0 % of **E** **0 L/min** **F = 9,350 L/min**

G. Exposures

Side	Separation Distance	Length-Height Factor - Adjacent Structure	Construction Type - Adjacent Structure	Exposure
West	Fire Wall	31-60 m-storeys	Wood Frame or Non-Combustible	10%
East	3.1 to 10 m	31-60 m-storeys	Wood Frame or Non-Combustible	18%
North	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
South	10.1 to 20 m	31-60 m-storeys	Wood Frame or Non-Combustible	13%
			Total	**54%**

% of **E** **+ 5,049 L/min** **G = 14,399 L/min**

H. Wood Shake Charge — No — **0 L/min** **H = 14,399 L/min**

For wood shingle or shake roofs

Total Fire Flow Required	**14,000**	**L/min***
	233	**L/s**
Required Duration of Fire Flow	**3**	**Hrs**
Required Volume of Fire Flow	**2,520**	**m^3**

*Rounded to the nearest 1,000 L/min

The Total Required Fire Flow for the 195 Huntmar Drive development should be reviewed when drawings and site plans have been finalized. The Total Required Fire Flow may be reduced or increased depending on area, construction, occupancy, exposures, and level of sprinkler protection. If any of these items change the Total Required Fire Flow should be reviewed to determine the impact.

Consideration should be given for fire prevention during construction phases as the required fire flows during construction of buildings is substantially higher than after the buildings are occupied. This is due to exposed framing and inactive sprinkler systems. Fires starting in unprotected portion of buildings quickly become too strong for sprinkler systems in protected portion of buildings. As such, special precautions should be taken any time construction is occurring.

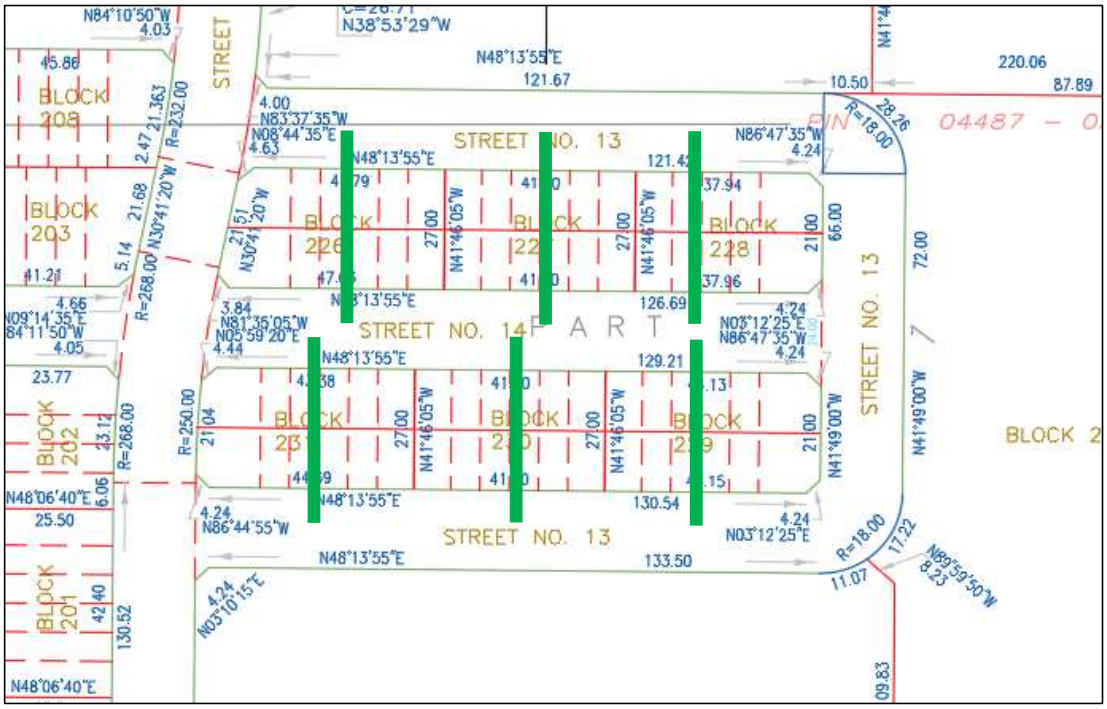
* The amount and rate of water application required in firefighting to confine and control the fires possible in a building or group of buildings which comprise essentially the same fire area by virtue of immediate exposure.

** Rounded to the nearest 1,000 L/min

195 Huntmar Drive - FUS Required Fire Flow Summary

195 Huntmar Drive	
Type of Construction	Wood Frame Construction
Construction Coefficient	1.5
Effective Total Area (m^2)	1,161
Required Fire Flow (L/min)	11,000
Occupancy Charge	-15
Sprinkler Protection Reduction	0
Exposure (%)	
North (%)	10%
East (%)	18%
South (%)	13%
West (%)	13%
Total Exposure (%)	54%
Wood Shake Charge (L/min)	0
Total Required Fire Flow (L/min)	14,000
Total Required Fire Flow (L/s)	233

Proposed Fire Wall Locations



Notes to calculations

Type of Construction	Coefficient	Unit
Wood Frame Construction	1.5	-
Ordinary Construction	1	-
Non-Combustible Construction	0.8	-
Fire Resistive Construction (< 2 hrs)	0.7	-
Fire Resistive Construction (> 2 hrs)	0.6	-

Occupancy Fire Hazard	Factor	Unit
Non-Combustible	-25	%
Limited Combustible	-15	%
Combustible	0	%
Free Burning	15	%
Rapid Burning	25	%

Sprinkler Protection	Factor	Unit
None	0	%
Automatic	-30	%
Automatic + Standard Supply	-40	%
Fully Supervised	-50	%
Fully Supervised + Fire Resistive	-70	%

Zoning
Single Family Residential
Multi Family Residential
Commercial
Institutional
Industrial

Wood Shake Charge	Factor	Unit
Yes	4000	L/min
No	0	L/min

Required Duration of Fire Flow	
Fire Flow Required (L/min)	Duration (hours)
2,000 or less	1.00
3000	1.25
4000	1.50
5000	1.75
6000	2.00
7000	2.00
8000	2.00
9000	2.00
10000	2.00
11000	2.25
12000	2.50
13000	2.75
14000	3.00
15000	3.25
16000	3.50
17000	3.75
18000	4.00
19000	4.25
20000	4.50
21000	4.75
22000	5.00
23000	5.25
24000	5.50
25000	5.75
26000	6.00
27000	6.25
28000	6.50
29000	6.75
30000	7.00
31000	7.25
32000	7.50
33000	7.75
34000	8.00
35000	8.25
36000	8.50
37000	8.75
38000	9.00
39000	9.25
40000 and over	9.50

Notes to calculations

Separation Distance	Length-Height Factor of Exposed Wall of Adjacent Structure	Construction of Exposed Wall of Adjacent Structure			
		Wood Frame or Non-Combustible	Ordinary or Fire-Resistive with Unprotected Openings	Ordinary or Fire-Resistive with Semi-Protected Openings	Ordinary or Fire-Resistive with Blank Wall
0.0 to 3 m	0-30 m-storeys	22%	21%	16%	0%
	31-60 m-storeys	23%	22%	17%	0%
	61-90 m-storeys	24%	23%	18%	0%
	91-120 m-storeys	25%	24%	19%	0%
	Over 120 m-storeys	25%	25%	20%	0%
3.1 to 10 m	0-30 m-storeys	17%	15%	11%	0%
	31-60 m-storeys	18%	16%	12%	0%
	61-90 m-storeys	19%	18%	14%	0%
	91-120 m-storeys	20%	19%	15%	0%
	Over 120 m-storeys	20%	19%	15%	0%
10.1 to 20 m	0-30 m-storeys	12%	10%	7%	0%
	31-60 m-storeys	13%	11%	8%	0%
	61-90 m-storeys	14%	13%	10%	0%
	91-120 m-storeys	15%	14%	11%	0%
	Over 120 m-storeys	15%	15%	12%	0%
20.1 to 30 m	0-30 m-storeys	8%	6%	4%	0%
	31-60 m-storeys	8%	7%	5%	0%
	61-90 m-storeys	9%	8%	6%	0%
	91-120 m-storeys	10%	9%	7%	0%
	Over 120 m-storeys	10%	10%	8%	0%
30.1 to 45 m	0-30 m-storeys	5%	5%	5%	0%
	31-60 m-storeys	5%	5%	5%	0%
	61-90 m-storeys	5%	5%	5%	0%
	91-120 m-storeys	5%	5%	5%	0%
	Over 120 m-storeys	5%	5%	5%	0%
Beyond 45 m	0-30 m-storeys	0%	0%	0%	0%
	31-60 m-storeys	0%	0%	0%	0%
	61-90 m-storeys	0%	0%	0%	0%
	91-120 m-storeys	0%	0%	0%	0%
	Over 120 m-storeys	0%	0%	0%	0%
Fire Wall	0-30 m-storeys	10%	10%	10%	10%
	31-60 m-storeys	10%	10%	10%	10%
	61-90 m-storeys	10%	10%	10%	10%
	91-120 m-storeys	10%	10%	10%	10%
	Over 120 m-storeys	10%	10%	10%	10%

Appendix C Boundary Conditions

Boundary Conditions - 195 Huntmar Drive

Provided Information:

Date Provided November-19

Scenario	Demand	
	L/min	L/s
Average Daily Demand	1,496	24.94
Maximum Daily Demand	2,686	44.77
Peak Hour	5,278	87.96
Fire Flow Demand #1	10,020	167.00
Fire Flow Demand #2	16,980	283.00

Scenario 1: Connections 1 and 2

Location:



Results:

Connection 1 - Palladium Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.0	81.8
Peak Hour	155.1	73.5
Max Day plus Fire 1	150.6	67.1
Max Day plus Fire 2	140.7	53.0

[1] Ground Elevation = 103.4m

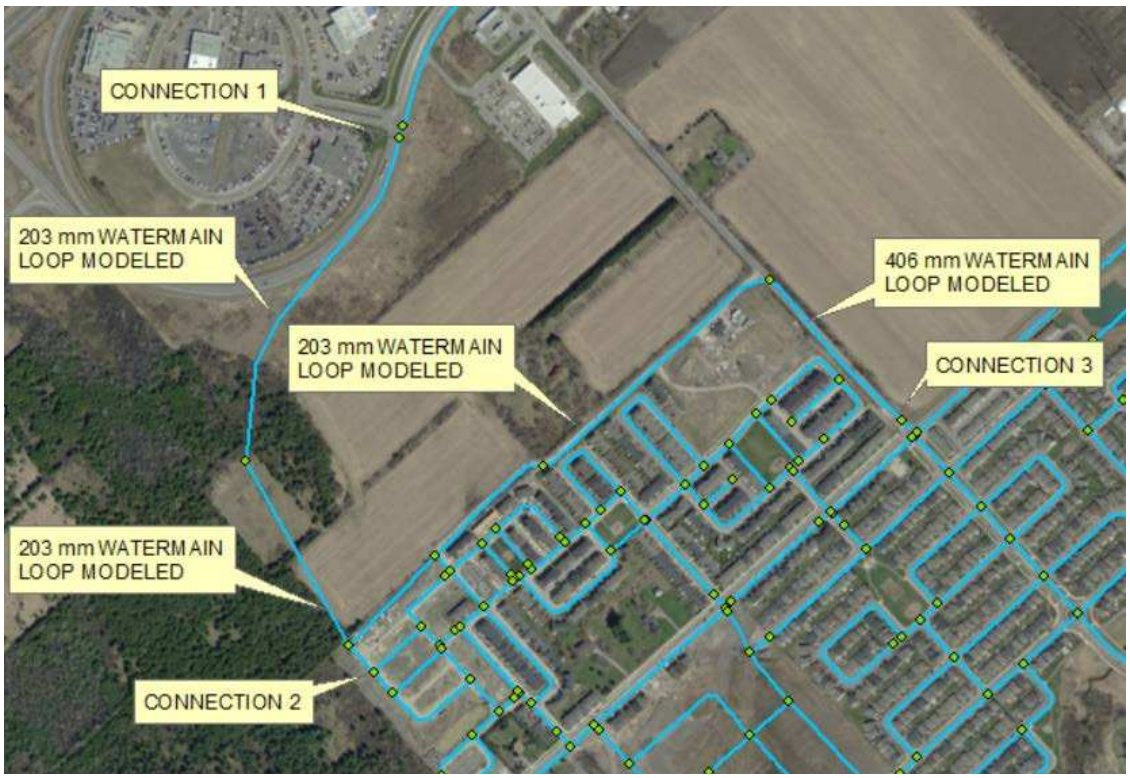
Connection 2 - Maestro Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.7	76.2
Peak Hour	155.0	68.0
Max Day plus Fire 1	145.8	54.9
Max Day plus Fire 2	128.3	30.0

[1] Ground Elevation = 107.2m

Scenario 2: Connections 1, 2 and 3

Location:



Results:

Connection 1 - Palladium Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	82.1
Peak Hour	155.8	74.5
Max Day plus Fire 1	151.2	67.8
Max Day plus Fire 2	141.9	54.7

[1] Ground Elevation = 103.4m

Connection 2 - Maestro Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	76.2
Peak Hour	155.8	69.1
Max Day plus Fire 1	149.5	60.2
Max Day plus Fire 2	137.4	43.0

[1] Ground Elevation = 107.2m

Connection 3 - Huntmar Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	83.9
Peak Hour	156.2	77.3
Max Day plus Fire 1	155.6	76.6
Max Day plus Fire 2	153.0	72.8

[1] Ground Elevation = 101.8m

Scenario 3: Connections 1, 2 and 4

Location:



Results:

Connection 1 - Palladium Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.2	82.0
Peak Hour	155.9	74.5
Max Day plus Fire 1	151.2	67.8
Max Day plus Fire 2	141.9	54.6

[1] Ground Elevation = 103.4m

Connection 2 - Maestro Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.7	76.2
Peak Hour	155.8	69.2
Max Day plus Fire 1	149.3	59.9
Max Day plus Fire 2	136.8	42.2

[1] Ground Elevation = 107.2m

Connection 4 - Stittsville Main Street

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.6	67.4
Peak Hour	156.1	61.0
Max Day plus Fire 1	154.7	58.9
Max Day plus Fire 2	150.5	53.0

[1] Ground Elevation = 113.2m

Scenario 4: Connections 1, 2, 3 and 4

Location:



Connection 1 - Palladium Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.3	82.2
Peak Hour	156.1	74.9
Max Day plus Fire 1	151.4	68.2
Max Day plus Fire 2	142.3	55.2

[1] Ground Elevation = 103.4m

Connection 2 - Maestro Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	76.2
Peak Hour	156.0	69.5
Max Day plus Fire 1	147.6	57.5
Max Day plus Fire 2	140.9	48.0

[1] Ground Elevation = 107.2m

Connection 3 - Huntmar Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	83.9
Peak Hour	156.3	77.4
Max Day plus Fire 1	155.8	76.7
Max Day plus Fire 2	153.2	73.1

[1] Ground Elevation = 101.8m

Connection 4 - Stittsville Main Street

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.6	67.4
Peak Hour	156.2	61.1
Max Day plus Fire 1	154.7	59.0
Max Day plus Fire 2	150.6	53.2

[1] Ground Elevation = 113.2m

Scenario 5: Connections 1, 2, 3 and 4

Location:



Connection 1 - Palladium Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.9	81.7
Peak Hour	156.1	74.9
Max Day plus Fire 1	152.7	70.0
Max Day plus Fire 2	145.4	59.6

[1] Ground Elevation = 103.4m

Connection 2 - Maestro Avenue

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.8	76.2
Peak Hour	156.0	69.5
Max Day plus Fire 1	151.1	62.5
Max Day plus Fire 2	141.4	48.6

[1] Ground Elevation = 107.2m

Connection 3 - Huntmar Drive

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.9	84.0
Peak Hour	156.3	77.4
Max Day plus Fire 1	156.0	77.7
Max Day plus Fire 2	154.9	75.5

[1] Ground Elevation = 101.8m

Connection 4 - Stittsville Main Street

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	160.6	67.4
Peak Hour	156.2	61.1
Max Day plus Fire 1	154.8	59.1
Max Day plus Fire 2	150.8	53.4

[1] Ground Elevation = 113.2m

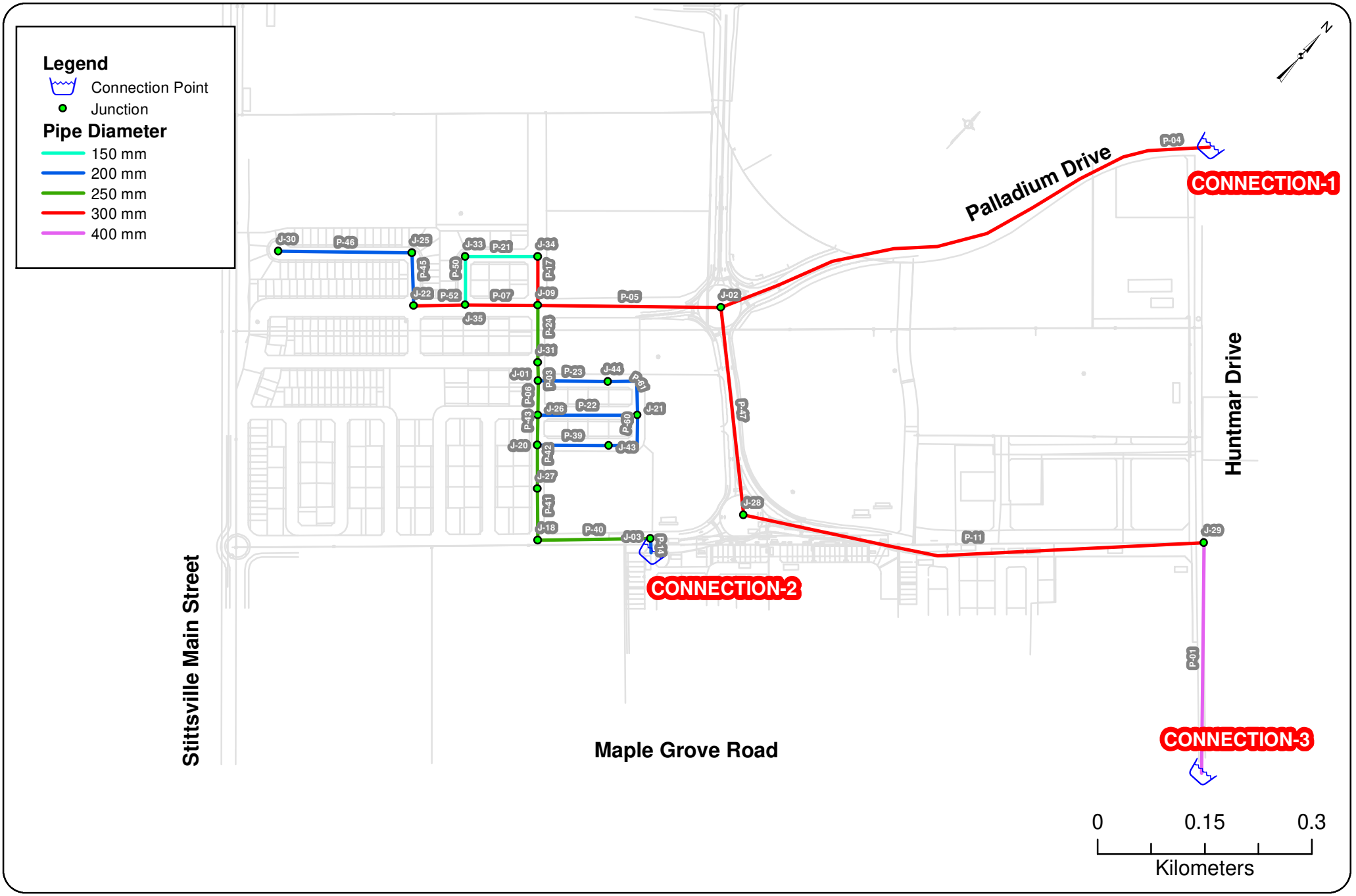
Notes:

1. For all scenarios, pressure reducing valve is required if the maximum pressure exceeds 80 psi.
2. For all scenarios, looping of the watermain is required to decrease vulnerability of the water system in case of breaks.

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 Pipe and Junction Model Inputs



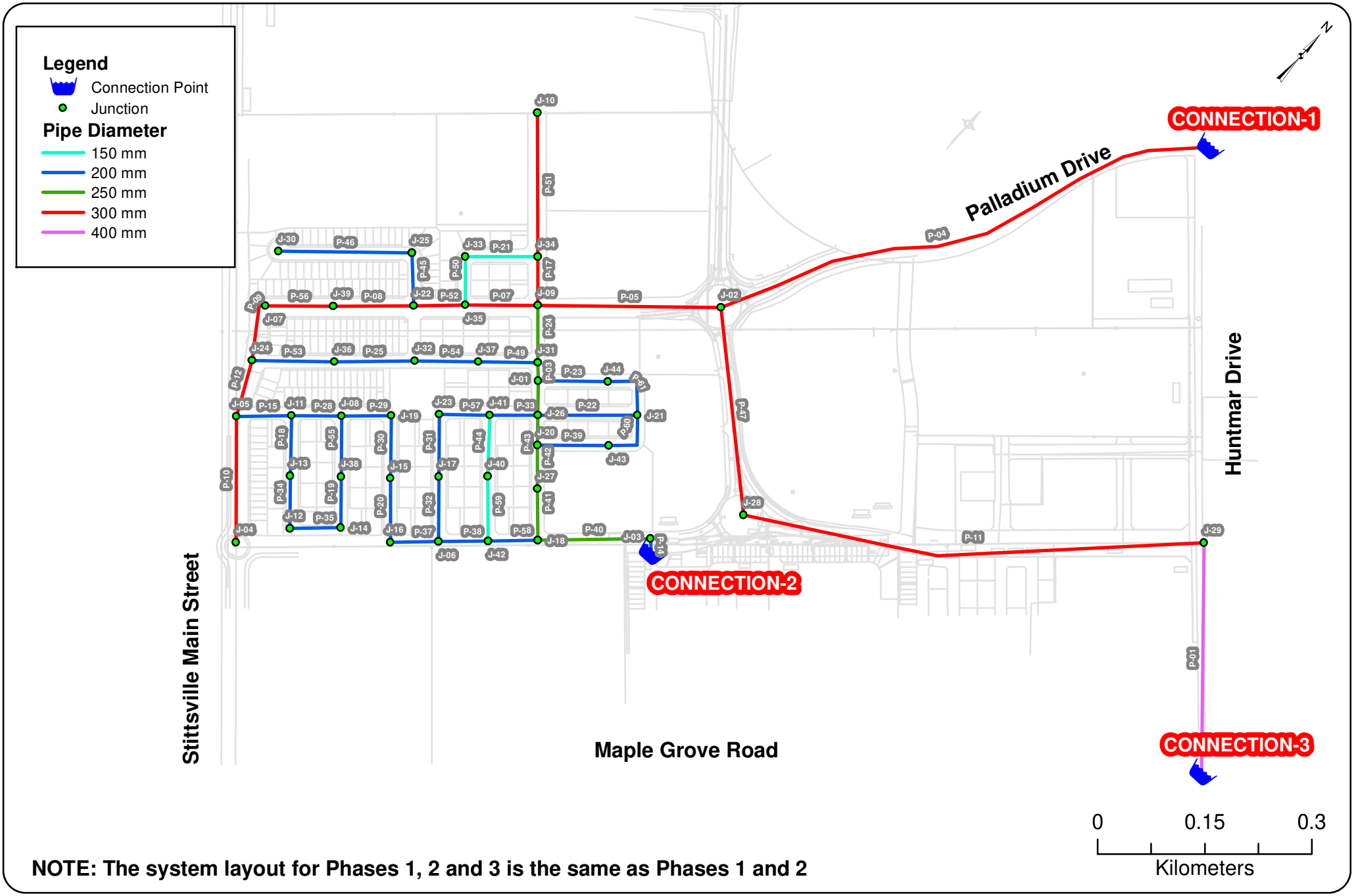
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
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System Layout
Phase 1

Figure D.1



NOTE: The system layout for Phases 1, 2 and 3 is the same as Phases 1 and 2

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System Layout
Phases 1 and 2

Figure D.2

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
P-01	J-29	RES-2	323.69	406	120
P-03	J-01	J-31	25.46	250	110
P-04	RES-1	J-02	731.70	297	120
P-05	J-02	J-09	257.05	297	120
P-06	J-26	J-01	48.39	250	110
P-07	J-09	J-35	101.56	297	120
P-08	J-22	J-39	112.73	297	120
P-09	J-07	J-24	86.96	297	120
P-10	J-05	J-04	176.13	297	120
P-11	J-29	J-28	652.61	297	120
P-12	J-05	J-24	81.64	297	120
P-14	RES-4	J-03	19.88	204	110
P-15	J-05	J-11	77.50	204	110
P-17	J-09	J-34	68.56	297	120
P-18	J-11	J-13	84.43	204	110
P-19	J-14	J-38	71.61	204	110
P-20	J-15	J-16	89.56	204	110
P-21	J-34	J-33	101.16	155	100
P-22	J-26	J-21	139.75	204	110
P-23	J-01	J-44	97.87	204	110
P-24	J-31	J-09	80.55	250	110
P-25	J-32	J-36	112.73	204	110
P-28	J-11	J-08	69.74	204	110
P-29	J-08	J-19	70.02	204	110
P-30	J-19	J-15	88.51	204	110
P-31	J-17	J-23	86.97	204	110
P-32	J-17	J-06	91.10	204	110
P-33	J-26	J-41	67.46	204	110
P-34	J-13	J-12	74.06	204	110
P-35	J-12	J-14	71.71	204	110
P-37	J-16	J-06	67.39	204	110
P-38	J-06	J-42	69.66	204	110
P-39	J-20	J-43	100.81	204	110

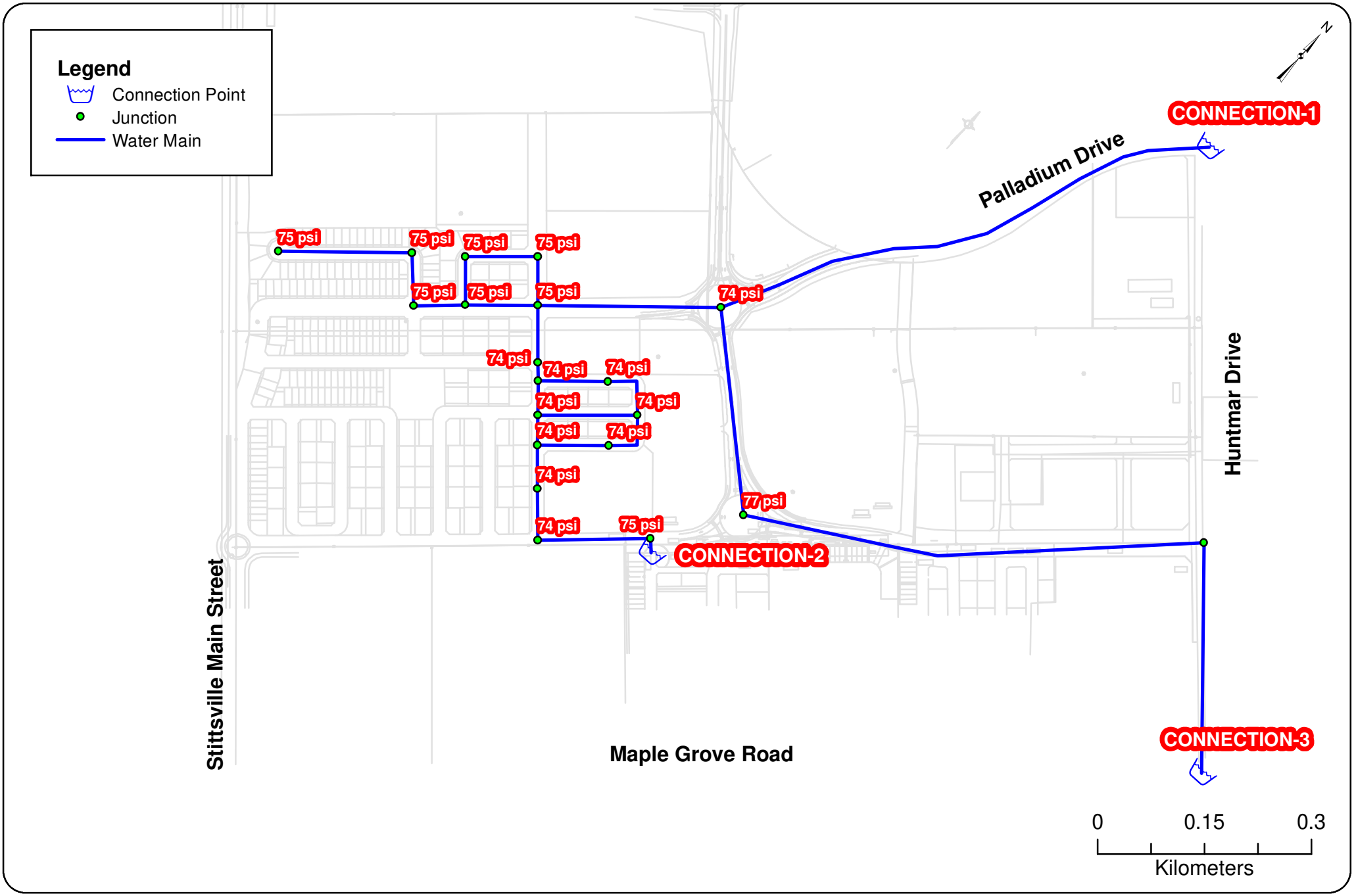
ID	Elevation (m)
J-01	108.72
J-02	109.04
J-03	107.88
J-04	109.05
J-05	108.75
J-06	109.17
J-07	108.51
J-08	108.81
J-09	108.48
J-10	108.18
J-11	108.81
J-12	109.11
J-13	108.86
J-14	109.18
J-15	109.05
J-16	109.25
J-17	109.02
J-18	108.99
J-19	108.84
J-20	108.79
J-21	108.74
J-22	108.21
J-23	108.87
J-24	108.73
J-25	107.86
J-26	108.76
J-27	108.89
J-28	106.76
J-29	104.48
J-30	108.28
J-31	108.72
J-32	108.30
J-33	108.36

Model Inputs

P-40	J-03	J-18	158.04	250	110
P-41	J-18	J-27	71.90	250	110
P-42	J-27	J-20	61.44	250	110
P-43	J-20	J-26	42.01	250	110
P-44	J-41	J-40	85.64	155	100
P-45	J-25	J-22	74.10	204	110
P-46	J-25	J-30	187.47	204	110
P-47	J-28	J-02	292.31	297	120
P-49	J-31	J-37	83.63	204	110
P-50	J-35	J-33	68.20	155	100
P-51	J-34	J-10	201.93	297	120
P-52	J-35	J-22	72.65	297	120
P-53	J-36	J-24	115.49	204	110
P-54	J-37	J-32	89.26	204	110
P-55	J-38	J-08	84.68	204	110
P-56	J-39	J-07	95.23	297	120
P-57	J-41	J-23	70.49	204	110
P-58	J-42	J-18	70.02	204	110
P-59	J-40	J-42	91.02	155	100
P-60	J-43	J-21	81.66	204	110
P-61	J-44	J-21	88.00	204	110

J-34	108.38
J-35	108.34
J-36	108.52
J-37	108.51
J-38	108.86
J-39	108.36
J-40	108.95
J-41	108.81
J-42	109.08
J-43	108.79
J-44	108.72

Appendix E MHD and PHD Model Results



GeoAdvice Engineering Inc.

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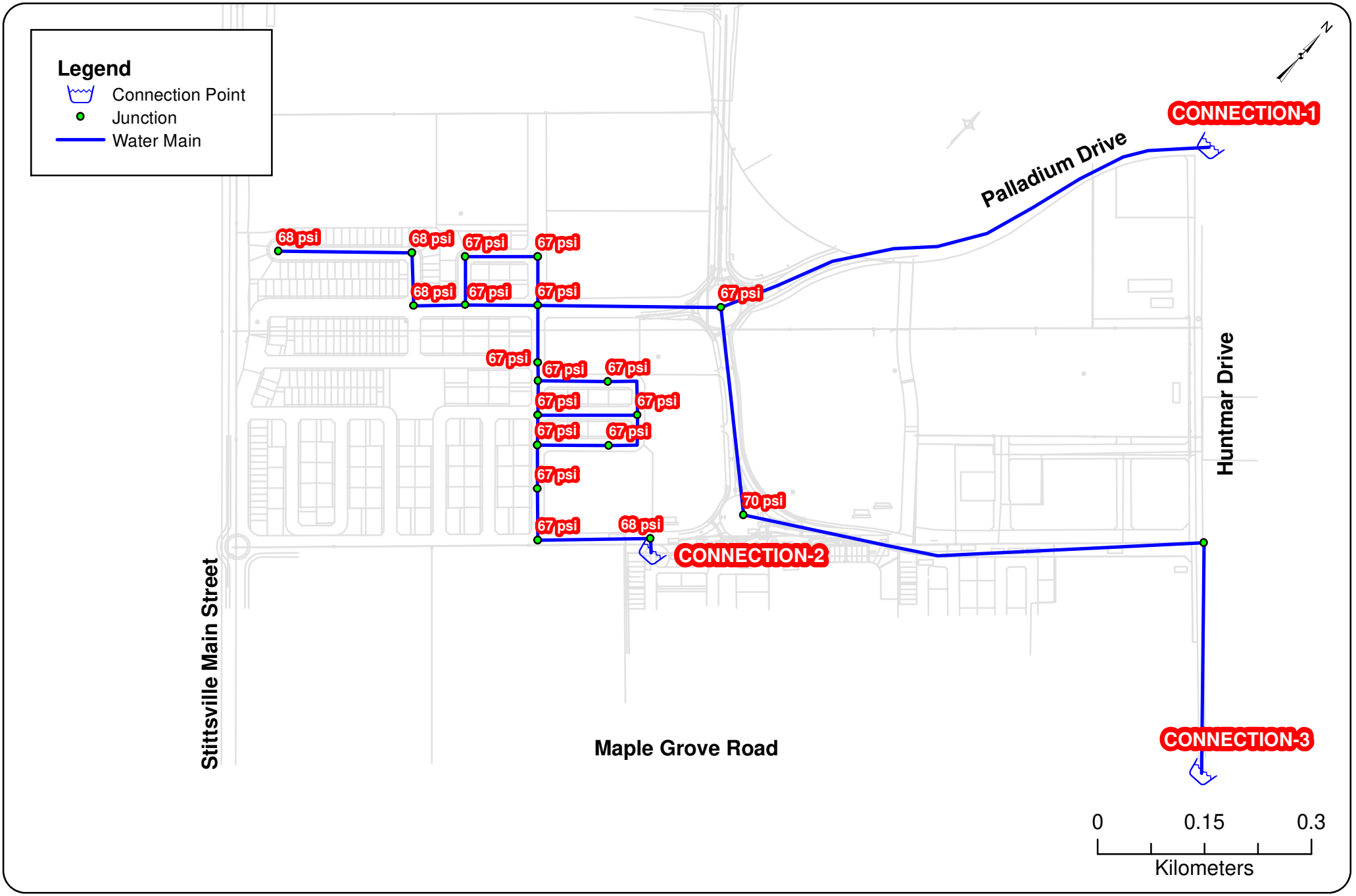
Minimum Hour Demand Pressure Results Phase 1

Figure E.1

Minimum Hour Demand Modeling Results - Phase 1

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	10.57	0.08	0.01	0.03
P-03	J-01	J-31	25.46	250	110	-8.32	0.17	0.01	0.21
P-04	RES-1	J-02	731.70	297	120	19.46	0.28	0.28	0.38
P-05	J-02	J-09	257.05	297	120	8.89	0.13	0.02	0.09
P-06	J-26	J-01	48.39	250	110	-6.44	0.13	0.01	0.13
P-07	J-09	J-35	101.56	297	120	0.41	0.01	0.00	0.00
P-11	J-29	J-28	652.61	297	120	-10.57	0.15	0.08	0.12
P-14	RES-4	J-03	19.88	204	110	-7.89	0.24	0.01	0.52
P-17	J-09	J-34	68.56	297	120	0.08	0.00	0.00	0.00
P-21	J-34	J-33	101.16	155	100	0.08	0.00	0.00	0.00
P-22	J-26	J-21	139.75	204	110	0.08	0.00	0.00	0.00
P-23	J-01	J-44	97.87	204	110	1.88	0.06	0.00	0.04
P-24	J-31	J-09	80.55	250	110	-8.32	0.17	0.02	0.21
P-39	J-20	J-43	100.81	204	110	-1.63	0.05	0.00	0.03
P-40	J-03	J-18	158.04	250	110	-7.89	0.16	0.03	0.19
P-41	J-18	J-27	71.90	250	110	-7.89	0.16	0.01	0.19
P-42	J-27	J-20	61.44	250	110	-7.94	0.16	0.01	0.20
P-43	J-20	J-26	42.01	250	110	-6.36	0.13	0.01	0.13
P-45	J-25	J-22	74.10	204	110	-0.26	0.01	0.00	0.00
P-46	J-25	J-30	187.47	204	110	0.13	0.00	0.00	0.00
P-47	J-28	J-02	292.31	297	120	-10.57	0.15	0.04	0.12
P-50	J-35	J-33	68.20	155	100	0.05	0.00	0.00	0.00
P-52	J-35	J-22	72.65	297	120	0.28	0.00	0.00	0.00
P-60	J-43	J-21	81.66	204	110	-1.74	0.05	0.00	0.03
P-61	J-44	J-21	88.00	204	110	1.77	0.05	0.00	0.03

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	161	74
J-02	0.00	109.04	161	74
J-03	0.00	107.88	161	75
J-09	0.08	108.48	161	75
J-18	0.00	108.99	161	74
J-20	0.05	108.79	161	74
J-21	0.11	108.74	161	74
J-22	0.02	108.21	161	75
J-25	0.13	107.86	161	75
J-26	0.00	108.76	161	74
J-27	0.05	108.89	161	74
J-28	0.00	106.76	161	77
J-30	0.13	108.28	161	75
J-31	0.00	108.72	161	74
J-33	0.13	108.36	161	75
J-34	0.00	108.38	161	75
J-35	0.08	108.34	161	75
J-43	0.11	108.79	161	74
J-44	0.11	108.72	161	74



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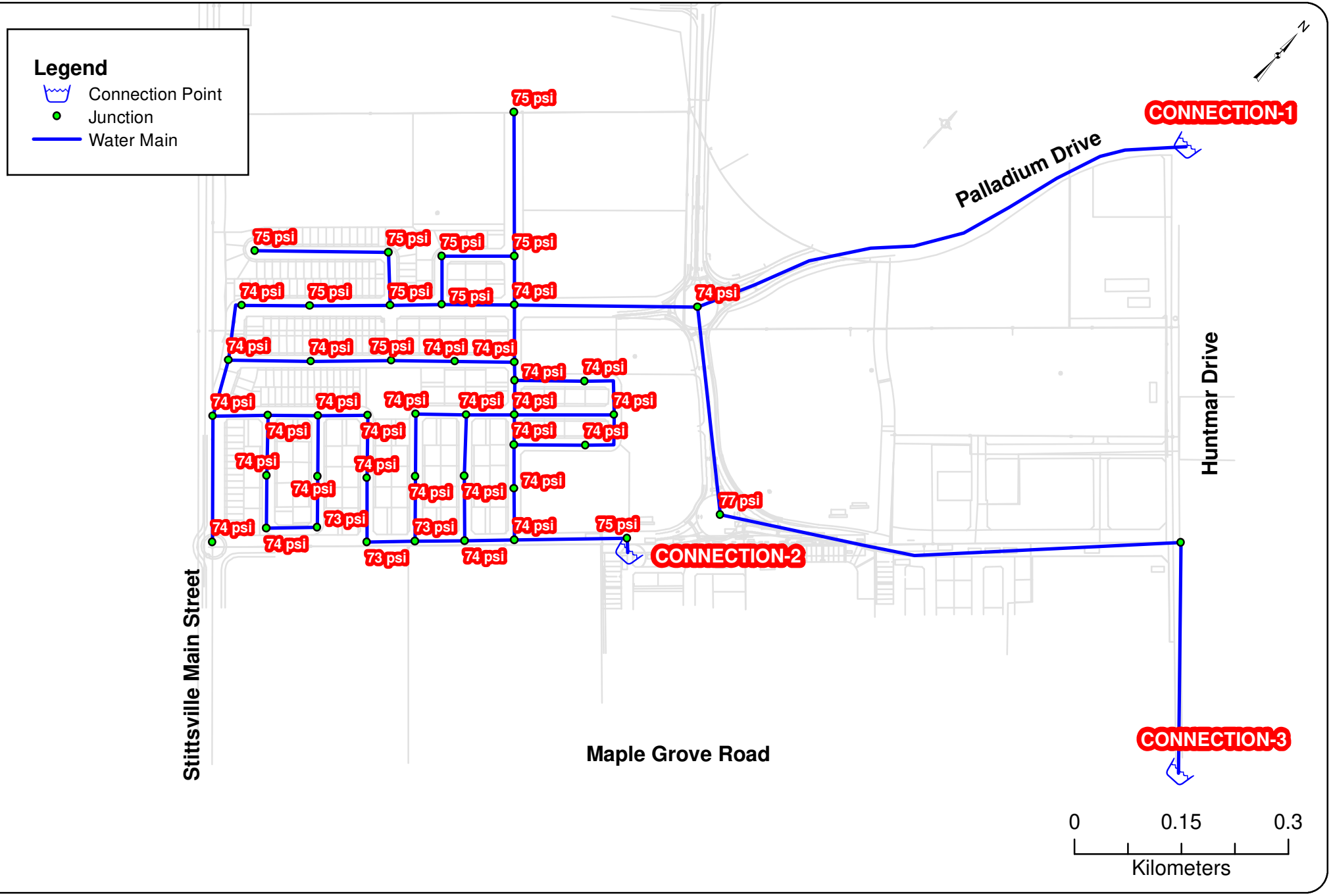
Peak Hour Demand Pressure Results Phase 1

Figure E.2

Peak Hour Demand Modeling Results - Phase 1

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	-18.64	0.14	0.02	0.08
P-03	J-01	J-31	25.46	250	110	-4.84	0.10	0.00	0.08
P-04	RES-1	J-02	731.70	297	120	-7.38	0.11	0.05	0.06
P-05	J-02	J-09	257.05	297	120	11.26	0.16	0.04	0.14
P-06	J-26	J-01	48.39	250	110	-3.11	0.06	0.00	0.03
P-07	J-09	J-35	101.56	297	120	4.65	0.07	0.00	0.03
P-11	J-29	J-28	652.61	297	120	18.64	0.27	0.23	0.35
P-14	RES-4	J-03	19.88	204	110	0.04	0.00	0.00	0.00
P-17	J-09	J-34	68.56	297	120	0.87	0.01	0.00	0.00
P-21	J-34	J-33	101.16	155	100	0.87	0.05	0.00	0.04
P-22	J-26	J-21	139.75	204	110	1.03	0.03	0.00	0.01
P-23	J-01	J-44	97.87	204	110	1.73	0.05	0.00	0.03
P-24	J-31	J-09	80.55	250	110	-4.84	0.10	0.01	0.08
P-39	J-20	J-43	100.81	204	110	0.96	0.03	0.00	0.01
P-40	J-03	J-18	158.04	250	110	0.04	0.00	0.00	0.00
P-41	J-18	J-27	71.90	250	110	0.04	0.00	0.00	0.00
P-42	J-27	J-20	61.44	250	110	-0.54	0.01	0.00	0.00
P-43	J-20	J-26	42.01	250	110	-2.08	0.04	0.00	0.02
P-45	J-25	J-22	74.10	204	110	-2.94	0.09	0.01	0.08
P-46	J-25	J-30	187.47	204	110	1.47	0.04	0.00	0.02
P-47	J-28	J-02	292.31	297	120	18.64	0.27	0.10	0.35
P-50	J-35	J-33	68.20	155	100	0.61	0.03	0.00	0.02
P-52	J-35	J-22	72.65	297	120	3.14	0.05	0.00	0.01
P-60	J-43	J-21	81.66	204	110	-0.28	0.01	0.00	0.00
P-61	J-44	J-21	88.00	204	110	0.49	0.01	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	156	67
J-02	0.00	109.04	156	67
J-03	0.00	107.88	156	68
J-09	0.90	108.48	156	67
J-18	0.00	108.99	156	67
J-20	0.58	108.79	156	67
J-21	1.24	108.74	156	67
J-22	0.20	108.21	156	68
J-25	1.47	107.86	156	68
J-26	0.00	108.76	156	67
J-27	0.58	108.89	156	67
J-28	0.00	106.76	156	70
J-30	1.47	108.28	156	68
J-31	0.00	108.72	156	67
J-33	1.48	108.36	156	67
J-34	0.00	108.38	156	67
J-35	0.90	108.34	156	67
J-43	1.24	108.79	156	67
J-44	1.24	108.72	156	67



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Minimum Hour Demand Pressure Results Phases 1 and 2

Figure E.3

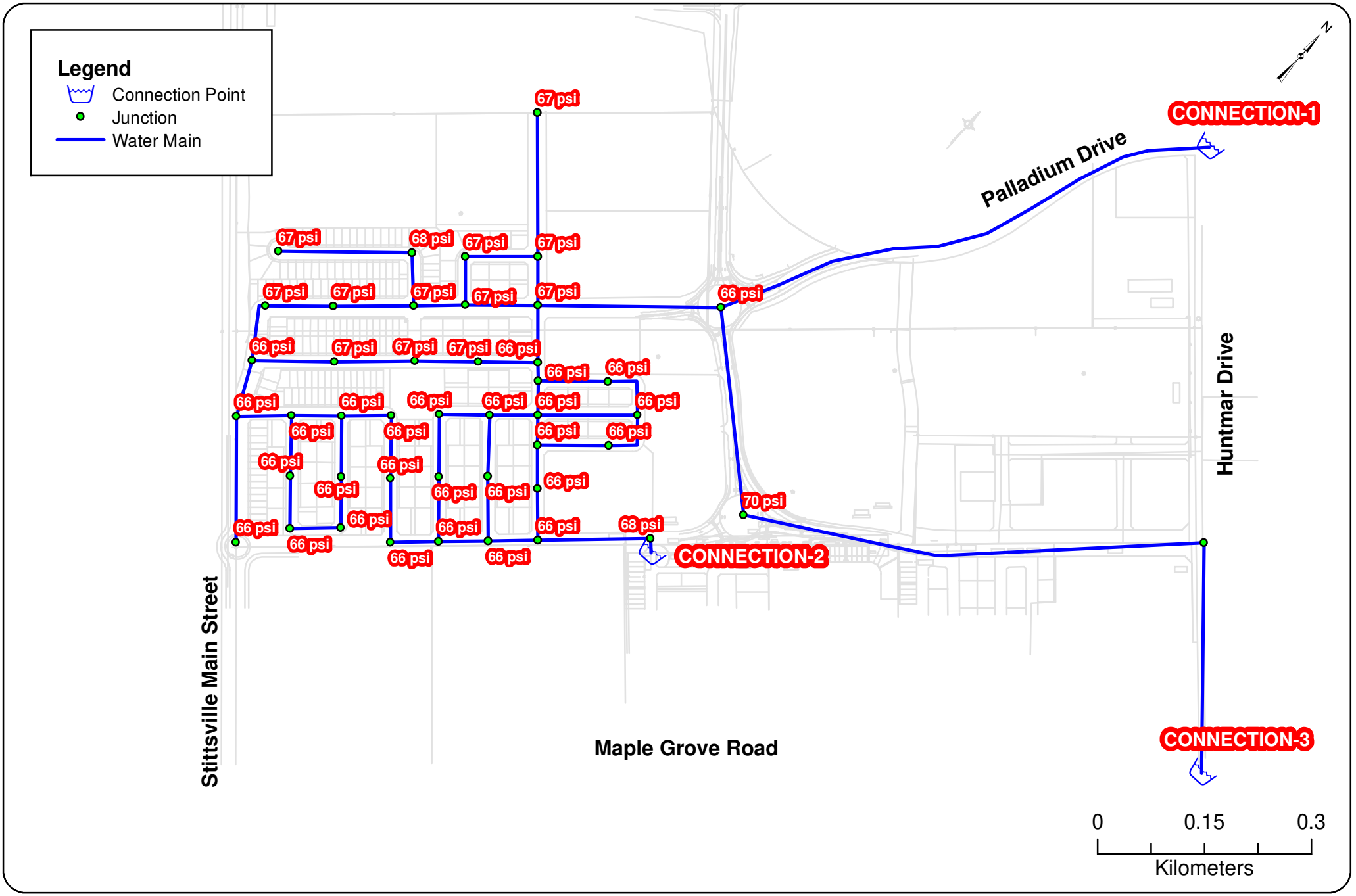
Minimum Hour Demand Modeling Results - Phases 1 and 2

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	8.34	0.06	0.01	0.02
P-03	J-01	J-31	25.46	250	110	-5.80	0.12	0.00	0.11
P-04	RES-1	J-02	731.70	297	120	21.07	0.30	0.32	0.44
P-05	J-02	J-09	257.05	297	120	11.66	0.17	0.04	0.15
P-06	J-26	J-01	48.39	250	110	-4.49	0.09	0.00	0.07
P-07	J-09	J-35	101.56	297	120	3.31	0.05	0.00	0.01
P-08	J-22	J-39	112.73	297	120	3.06	0.04	0.00	0.01
P-09	J-07	J-24	86.96	297	120	2.88	0.04	0.00	0.01
P-10	J-05	J-04	176.13	297	120	0.06	0.00	0.00	0.00
P-11	J-29	J-28	652.61	297	120	-8.34	0.12	0.05	0.08
P-12	J-05	J-24	81.64	297	120	-2.04	0.03	0.00	0.01
P-14	RES-4	J-03	19.88	204	110	-5.34	0.16	0.01	0.25
P-15	J-05	J-11	77.50	204	110	1.92	0.06	0.00	0.04
P-17	J-09	J-34	68.56	297	120	2.82	0.04	0.00	0.01
P-18	J-11	J-13	84.43	204	110	0.67	0.02	0.00	0.01
P-19	J-14	J-38	71.61	204	110	0.37	0.01	0.00	0.00
P-20	J-15	J-16	89.56	204	110	1.32	0.04	0.00	0.02
P-21	J-34	J-33	101.16	155	100	0.31	0.02	0.00	0.01
P-22	J-26	J-21	139.75	204	110	-0.17	0.01	0.00	0.00
P-23	J-01	J-44	97.87	204	110	1.31	0.04	0.00	0.02
P-24	J-31	J-09	80.55	250	110	-5.45	0.11	0.01	0.10
P-25	J-32	J-36	112.73	204	110	-0.64	0.02	0.00	0.00
P-28	J-11	J-08	69.74	204	110	1.23	0.04	0.00	0.02
P-29	J-08	J-19	70.02	204	110	1.46	0.04	0.00	0.02
P-30	J-19	J-15	88.51	204	110	1.43	0.04	0.00	0.02
P-31	J-17	J-23	86.97	204	110	-0.73	0.02	0.00	0.01
P-32	J-17	J-06	91.10	204	110	0.62	0.02	0.00	0.00
P-33	J-26	J-41	67.46	204	110	1.46	0.04	0.00	0.02
P-34	J-13	J-12	74.06	204	110	0.57	0.02	0.00	0.00
P-35	J-12	J-14	71.71	204	110	0.47	0.01	0.00	0.00
P-37	J-16	J-06	67.39	204	110	1.21	0.04	0.00	0.02
P-38	J-06	J-42	69.66	204	110	1.73	0.05	0.00	0.03
P-39	J-20	J-43	100.81	204	110	-0.81	0.02	0.00	0.01
P-40	J-03	J-18	158.04	250	110	-5.34	0.11	0.01	0.09
P-41	J-18	J-27	71.90	250	110	-3.89	0.08	0.00	0.05
P-42	J-27	J-20	61.44	250	110	-3.94	0.08	0.00	0.05
P-43	J-20	J-26	42.01	250	110	-3.18	0.06	0.00	0.04
P-44	J-41	J-40	85.64	155	100	0.66	0.04	0.00	0.02
P-45	J-25	J-22	74.10	204	110	-0.26	0.01	0.00	0.00
P-46	J-25	J-30	187.47	204	110	0.13	0.00	0.00	0.00
P-47	J-28	J-02	292.31	297	120	-8.34	0.12	0.02	0.08
P-49	J-31	J-37	83.63	204	110	-0.45	0.01	0.00	0.00
P-50	J-35	J-33	68.20	155	100	-0.18	0.01	0.00	0.00
P-51	J-34	J-10	201.93	297	120	0.64	0.01	0.00	0.00
P-52	J-35	J-22	72.65	297	120	3.41	0.05	0.00	0.02
P-53	J-36	J-24	115.49	204	110	-0.74	0.02	0.00	0.01
P-54	J-37	J-32	89.26	204	110	-0.54	0.02	0.00	0.00
P-55	J-38	J-08	84.68	204	110	0.27	0.01	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	161	74
J-02	1.08	109.04	161	74
J-03	0.00	107.88	161	75
J-04	0.06	109.05	161	74
J-05	0.06	108.75	161	74
J-06	0.11	109.17	161	73
J-07	0.09	108.51	161	74
J-08	0.03	108.81	161	74
J-09	0.08	108.48	161	74
J-10	0.64	108.18	161	75
J-11	0.03	108.81	161	74
J-12	0.10	109.11	161	74
J-13	0.10	108.86	161	74
J-14	0.10	109.18	161	73
J-15	0.11	109.05	161	74
J-16	0.11	109.25	161	73
J-17	0.11	109.02	161	74
J-18	0.72	108.99	161	74
J-19	0.03	108.84	161	74
J-20	0.05	108.79	161	74
J-21	0.11	108.74	161	74
J-22	0.09	108.21	161	75
J-23	0.03	108.87	161	74
J-24	0.10	108.73	161	74
J-25	0.13	107.86	161	75
J-26	0.03	108.76	161	74
J-27	0.05	108.89	161	74
J-28	0.00	106.76	161	77
J-30	0.13	108.28	161	75
J-31	0.09	108.72	161	74
J-32	0.10	108.30	161	75
J-33	0.13	108.36	161	75
J-34	1.87	108.38	161	75
J-35	0.08	108.34	161	75
J-36	0.10	108.52	161	74
J-37	0.09	108.51	161	74
J-38	0.10	108.86	161	74
J-39	0.09	108.36	161	75
J-40	0.11	108.95	161	74
J-41	0.03	108.81	161	74
J-42	0.11	109.08	161	74
J-43	0.11	108.79	161	74
J-44	0.11	108.72	161	74

Minimum Hour Demand Modeling Results - Phases 1 and 2

P-56	J-39	J-07	95.23	297	120	2.97	0.04	0.00	0.01
P-57	J-41	J-23	70.49	204	110	0.76	0.02	0.00	0.01
P-58	J-42	J-18	70.02	204	110	2.17	0.07	0.00	0.05
P-59	J-40	J-42	91.02	155	100	0.55	0.03	0.00	0.02
P-60	J-43	J-21	81.66	204	110	-0.92	0.03	0.00	0.01
P-61	J-44	J-21	88.00	204	110	1.20	0.04	0.00	0.02



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
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Reviewed by: **WdS**

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Peak Hour Demand Pressure Results Phases 1 and 2

Figure E.4

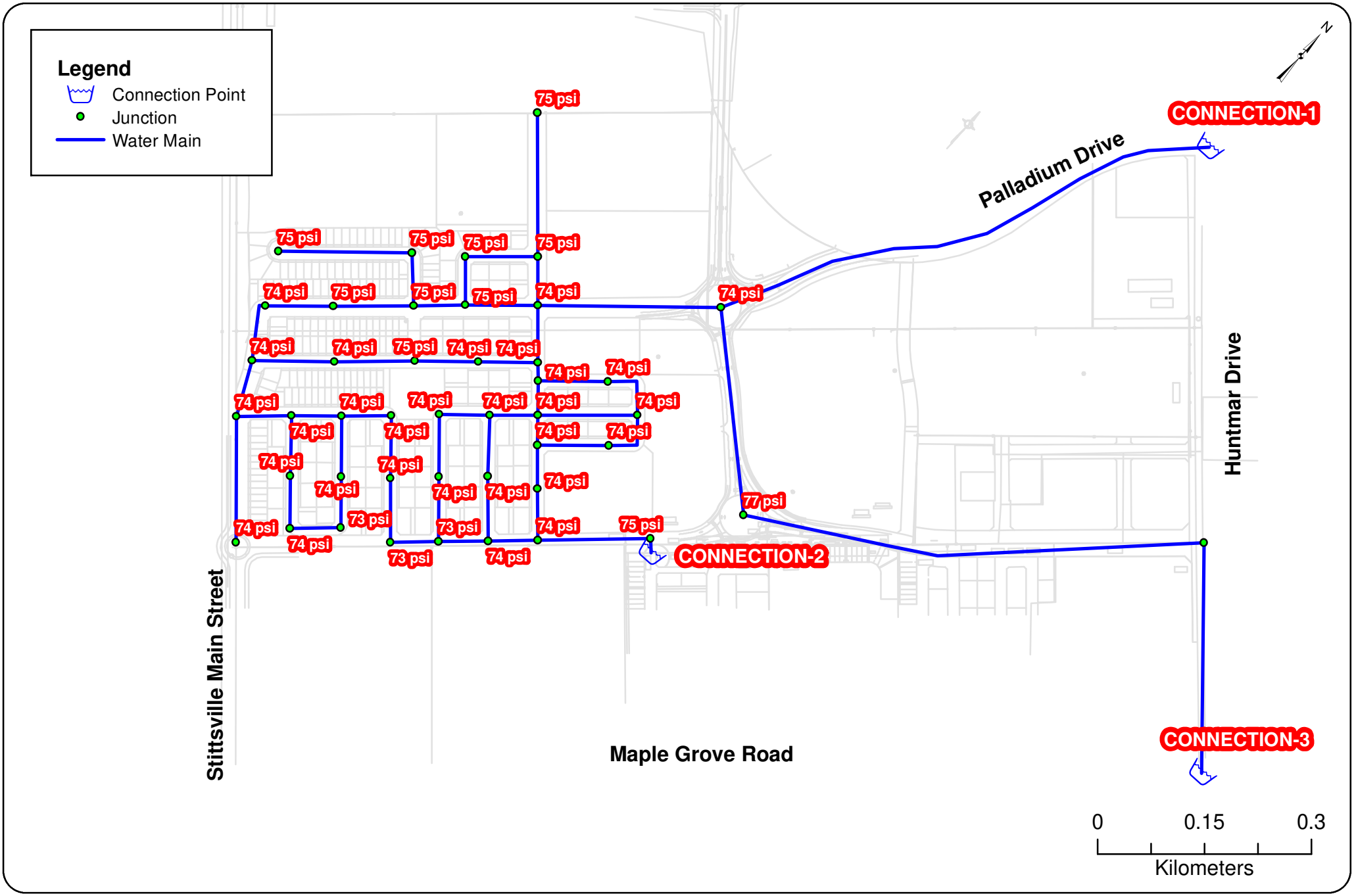
Peak Hour Demand Modeling Results - Phases 1 and 2

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	-23.26	0.18	0.04	0.11
P-03	J-01	J-31	25.46	250	110	1.36	0.03	0.00	0.01
P-04	RES-1	J-02	731.70	297	120	13.14	0.19	0.13	0.18
P-05	J-02	J-09	257.05	297	120	30.58	0.44	0.22	0.87
P-06	J-26	J-01	48.39	250	110	2.09	0.04	0.00	0.02
P-07	J-09	J-35	101.56	297	120	11.74	0.17	0.02	0.15
P-08	J-22	J-39	112.73	297	120	6.16	0.09	0.01	0.04
P-09	J-07	J-24	86.96	297	120	4.24	0.06	0.00	0.02
P-10	J-05	J-04	176.13	297	120	0.67	0.01	0.00	0.00
P-11	J-29	J-28	652.61	297	120	23.26	0.34	0.34	0.53
P-12	J-05	J-24	81.64	297	120	-4.51	0.07	0.00	0.03
P-14	RES-4	J-03	19.88	204	110	24.21	0.74	0.08	4.14
P-15	J-05	J-11	77.50	204	110	3.17	0.10	0.01	0.10
P-17	J-09	J-34	68.56	297	120	14.26	0.21	0.01	0.21
P-18	J-11	J-13	84.43	204	110	2.20	0.07	0.00	0.05
P-19	J-14	J-38	71.61	204	110	-1.05	0.03	0.00	0.01
P-20	J-15	J-16	89.56	204	110	-3.35	0.10	0.01	0.11
P-21	J-34	J-33	101.16	155	100	0.70	0.04	0.00	0.03
P-22	J-26	J-21	139.75	204	110	0.84	0.03	0.00	0.01
P-23	J-01	J-44	97.87	204	110	0.73	0.02	0.00	0.01
P-24	J-31	J-09	80.55	250	110	-3.68	0.07	0.00	0.05
P-25	J-32	J-36	112.73	204	110	2.47	0.08	0.01	0.06
P-28	J-11	J-08	69.74	204	110	0.64	0.02	0.00	0.00
P-29	J-08	J-19	70.02	204	110	-1.85	0.06	0.00	0.04
P-30	J-19	J-15	88.51	204	110	-2.18	0.07	0.00	0.05
P-31	J-17	J-23	86.97	204	110	-1.96	0.06	0.00	0.04
P-32	J-17	J-06	91.10	204	110	0.79	0.02	0.00	0.01
P-33	J-26	J-41	67.46	204	110	2.43	0.07	0.00	0.06
P-34	J-13	J-12	74.06	204	110	1.13	0.03	0.00	0.01
P-35	J-12	J-14	71.71	204	110	0.06	0.00	0.00	0.00
P-37	J-16	J-06	67.39	204	110	-4.52	0.14	0.01	0.18
P-38	J-06	J-42	69.66	204	110	-4.90	0.15	0.01	0.21
P-39	J-20	J-43	100.81	204	110	2.15	0.07	0.00	0.05
P-40	J-03	J-18	158.04	250	110	24.21	0.49	0.24	1.54
P-41	J-18	J-27	71.90	250	110	8.95	0.18	0.02	0.24
P-42	J-27	J-20	61.44	250	110	8.37	0.17	0.01	0.21
P-43	J-20	J-26	42.01	250	110	5.64	0.11	0.00	0.10
P-44	J-41	J-40	85.64	155	100	-0.09	0.00	0.00	0.00
P-45	J-25	J-22	74.10	204	110	-2.94	0.09	0.01	0.08
P-46	J-25	J-30	187.47	204	110	1.47	0.04	0.00	0.02
P-47	J-28	J-02	292.31	297	120	23.26	0.34	0.15	0.53
P-49	J-31	J-37	83.63	204	110	4.03	0.12	0.01	0.15
P-50	J-35	J-33	68.20	155	100	0.78	0.04	0.00	0.03
P-51	J-34	J-10	201.93	297	120	3.44	0.05	0.00	0.02
P-52	J-35	J-22	72.65	297	120	10.06	0.15	0.01	0.11
P-53	J-36	J-24	115.49	204	110	1.37	0.04	0.00	0.02
P-54	J-37	J-32	89.26	204	110	3.02	0.09	0.01	0.09
P-55	J-38	J-08	84.68	204	110	-2.16	0.07	0.00	0.05

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	155	66
J-02	5.81	109.04	156	66
J-03	0.00	107.88	156	68
J-04	0.67	109.05	155	66
J-05	0.67	108.75	155	66
J-06	1.17	109.17	155	66
J-07	0.96	108.51	155	67
J-08	0.33	108.81	155	66
J-09	0.90	108.48	155	67
J-10	3.44	108.18	155	67
J-11	0.33	108.81	155	66
J-12	1.07	109.11	155	66
J-13	1.07	108.86	155	66
J-14	1.11	109.18	155	66
J-15	1.17	109.05	155	66
J-16	1.17	109.25	155	66
J-17	1.17	109.02	155	66
J-18	7.93	108.99	155	66
J-19	0.33	108.84	155	66
J-20	0.58	108.79	155	66
J-21	1.24	108.74	155	66
J-22	0.96	108.21	155	67
J-23	0.28	108.87	155	66
J-24	1.10	108.73	155	66
J-25	1.47	107.86	155	68
J-26	0.28	108.76	155	66
J-27	0.58	108.89	155	66
J-28	0.00	106.76	156	70
J-30	1.47	108.28	155	67
J-31	1.01	108.72	155	66
J-32	0.55	108.30	155	67
J-33	1.48	108.36	155	67
J-34	10.12	108.38	155	67
J-35	0.90	108.34	155	67
J-36	1.10	108.52	155	67
J-37	1.01	108.51	155	67
J-38	1.11	108.86	155	66
J-39	0.96	108.36	155	67
J-40	1.17	108.95	155	66
J-41	0.28	108.81	155	66
J-42	1.17	109.08	155	66
J-43	1.24	108.79	155	66
J-44	1.24	108.72	155	66

Peak Hour Demand Modeling Results - Phases 1 and 2

P-56	J-39	J-07	95.23	297	120	5.20	0.08	0.00	0.03
P-57	J-41	J-23	70.49	204	110	2.24	0.07	0.00	0.05
P-58	J-42	J-18	70.02	204	110	-7.33	0.22	0.03	0.45
P-59	J-40	J-42	91.02	155	100	-1.26	0.07	0.01	0.08
P-60	J-43	J-21	81.66	204	110	0.91	0.03	0.00	0.01
P-61	J-44	J-21	88.00	204	110	-0.51	0.02	0.00	0.00



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
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Minimum Hour Demand Pressure Results Phases 1, 2 and 3

Figure E.5

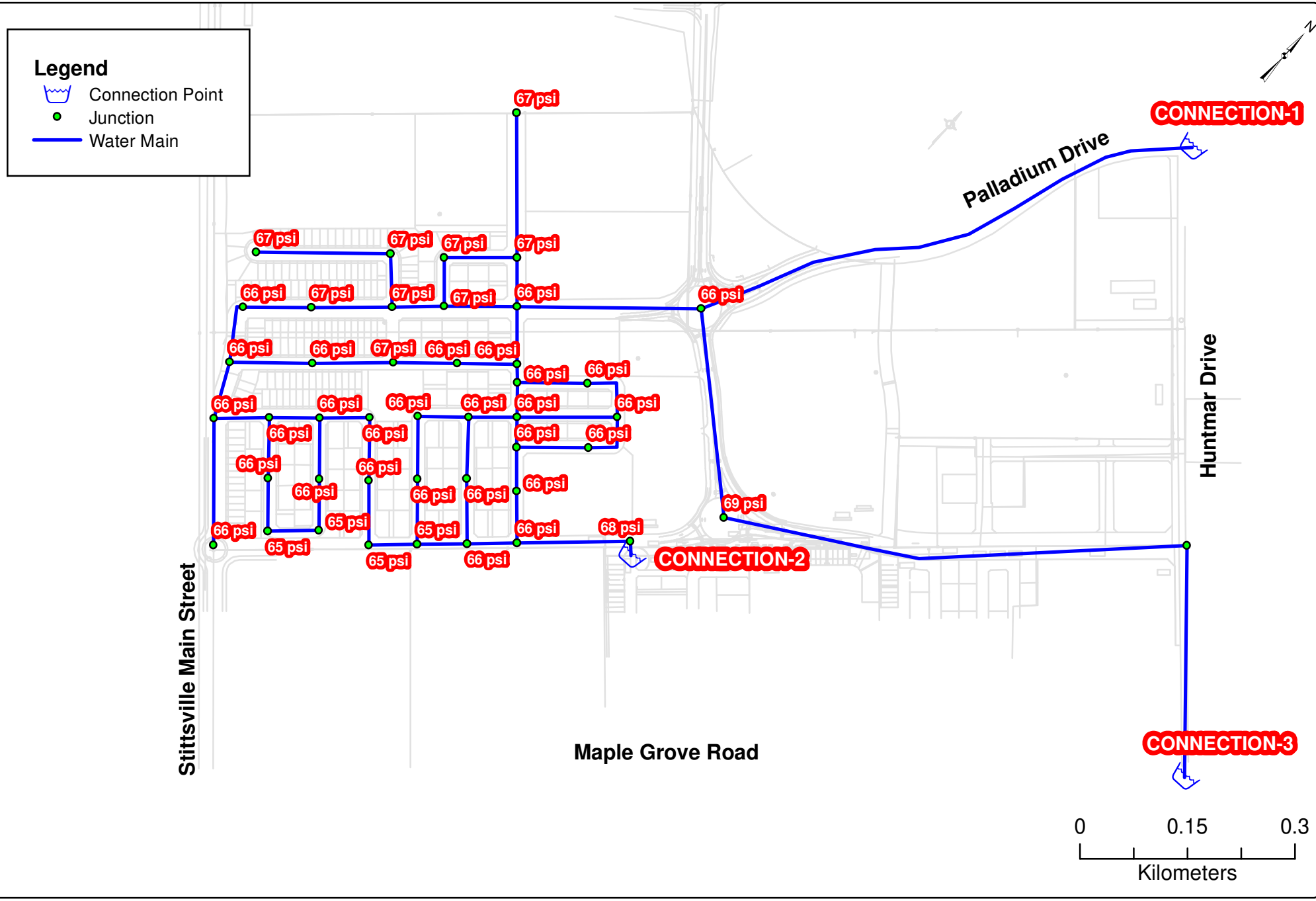
Minimum Hour Demand Modeling Results - Phases 1, 2 and 3

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	5.36	0.04	0.00	0.01
P-03	J-01	J-31	25.46	250	110	-4.14	0.08	0.00	0.06
P-04	RES-1	J-02	731.70	297	120	21.94	0.32	0.35	0.47
P-05	J-02	J-09	257.05	297	120	11.27	0.16	0.04	0.14
P-06	J-26	J-01	48.39	250	110	-3.19	0.07	0.00	0.04
P-07	J-09	J-35	101.56	297	120	2.98	0.04	0.00	0.01
P-08	J-22	J-39	112.73	297	120	2.32	0.03	0.00	0.01
P-09	J-07	J-24	86.96	297	120	2.14	0.03	0.00	0.01
P-10	J-05	J-04	176.13	297	120	0.06	0.00	0.00	0.00
P-11	J-29	J-28	652.61	297	120	-5.36	0.08	0.02	0.03
P-12	J-05	J-24	81.64	297	120	-1.58	0.02	0.00	0.00
P-14	RES-4	J-03	19.88	204	110	-3.21	0.10	0.00	0.10
P-15	J-05	J-11	77.50	204	110	1.46	0.04	0.00	0.02
P-17	J-09	J-34	68.56	297	120	4.15	0.06	0.00	0.02
P-18	J-11	J-13	84.43	204	110	0.53	0.02	0.00	0.00
P-19	J-14	J-38	71.61	204	110	0.23	0.01	0.00	0.00
P-20	J-15	J-16	89.56	204	110	0.86	0.03	0.00	0.01
P-21	J-34	J-33	101.16	155	100	-0.10	0.01	0.00	0.00
P-22	J-26	J-21	139.75	204	110	-0.09	0.00	0.00	0.00
P-23	J-01	J-44	97.87	204	110	0.95	0.03	0.00	0.01
P-24	J-31	J-09	80.55	250	110	-4.06	0.08	0.00	0.06
P-25	J-32	J-36	112.73	204	110	-0.36	0.01	0.00	0.00
P-28	J-11	J-08	69.74	204	110	0.90	0.03	0.00	0.01
P-29	J-08	J-19	70.02	204	110	1.00	0.03	0.00	0.01
P-30	J-19	J-15	88.51	204	110	0.97	0.03	0.00	0.01
P-31	J-17	J-23	86.97	204	110	-0.56	0.02	0.00	0.00
P-32	J-17	J-06	91.10	204	110	0.45	0.01	0.00	0.00
P-33	J-26	J-41	67.46	204	110	1.09	0.03	0.00	0.01
P-34	J-13	J-12	74.06	204	110	0.43	0.01	0.00	0.00
P-35	J-12	J-14	71.71	204	110	0.33	0.01	0.00	0.00
P-37	J-16	J-06	67.39	204	110	0.75	0.02	0.00	0.01
P-38	J-06	J-42	69.66	204	110	1.09	0.03	0.00	0.01
P-39	J-20	J-43	100.81	204	110	-0.53	0.02	0.00	0.00
P-40	J-03	J-18	158.04	250	110	-3.21	0.07	0.01	0.04
P-41	J-18	J-27	71.90	250	110	-2.59	0.05	0.00	0.02
P-42	J-27	J-20	61.44	250	110	-2.64	0.05	0.00	0.03
P-43	J-20	J-26	42.01	250	110	-2.16	0.04	0.00	0.02
P-44	J-41	J-40	85.64	155	100	0.47	0.02	0.00	0.01
P-45	J-25	J-22	74.10	204	110	-0.26	0.01	0.00	0.00
P-46	J-25	J-30	187.47	204	110	0.13	0.00	0.00	0.00
P-47	J-28	J-02	292.31	297	120	-9.60	0.14	0.03	0.10
P-49	J-31	J-37	83.63	204	110	-0.17	0.01	0.00	0.00
P-50	J-35	J-33	68.20	155	100	0.23	0.01	0.00	0.00
P-51	J-34	J-10	201.93	297	120	2.38	0.03	0.00	0.01
P-52	J-35	J-22	72.65	297	120	2.67	0.04	0.00	0.01
P-53	J-36	J-24	115.49	204	110	-0.46	0.01	0.00	0.00
P-54	J-37	J-32	89.26	204	110	-0.26	0.01	0.00	0.00
P-55	J-38	J-08	84.68	204	110	0.13	0.00	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	161	74
J-02	1.08	109.04	161	74
J-03	0.00	107.88	161	75
J-04	0.06	109.05	161	74
J-05	0.06	108.75	161	74
J-06	0.11	109.17	161	73
J-07	0.09	108.51	161	74
J-08	0.03	108.81	161	74
J-09	0.08	108.48	161	74
J-10	2.38	108.18	161	75
J-11	0.03	108.81	161	74
J-12	0.10	109.11	161	74
J-13	0.10	108.86	161	74
J-14	0.10	109.18	161	73
J-15	0.11	109.05	161	74
J-16	0.11	109.25	161	73
J-17	0.11	109.02	161	74
J-18	0.72	108.99	161	74
J-19	0.03	108.84	161	74
J-20	0.05	108.79	161	74
J-21	0.11	108.74	161	74
J-22	0.09	108.21	161	75
J-23	0.03	108.87	161	74
J-24	0.10	108.73	161	74
J-25	0.13	107.86	161	75
J-26	0.03	108.76	161	74
J-27	0.05	108.89	161	74
J-28	4.24	106.76	161	77
J-30	0.13	108.28	161	75
J-31	0.09	108.72	161	74
J-32	0.10	108.30	161	75
J-33	0.13	108.36	161	75
J-34	1.87	108.38	161	75
J-35	0.08	108.34	161	75
J-36	0.10	108.52	161	74
J-37	0.09	108.51	161	74
J-38	0.10	108.86	161	74
J-39	0.09	108.36	161	75
J-40	0.11	108.95	161	74
J-41	0.03	108.81	161	74
J-42	0.11	109.08	161	74
J-43	0.11	108.79	161	74
J-44	0.11	108.72	161	74

Minimum Hour Demand Modeling Results - Phases 1, 2 and 3

P-56	J-39	J-07	95.23	297	120	2.23	0.03	0.00	0.01
P-57	J-41	J-23	70.49	204	110	0.59	0.02	0.00	0.00
P-58	J-42	J-18	70.02	204	110	1.34	0.04	0.00	0.02
P-59	J-40	J-42	91.02	155	100	0.36	0.02	0.00	0.01
P-60	J-43	J-21	81.66	204	110	-0.64	0.02	0.00	0.00
P-61	J-44	J-21	88.00	204	110	0.84	0.03	0.00	0.01



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
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Reviewed by: **WdS**

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Peak Hour Demand Pressure Results Phases 1, 2 and 3

Figure E.6

Peak Hour Demand Modeling Results - Phases 1, 2 and 3

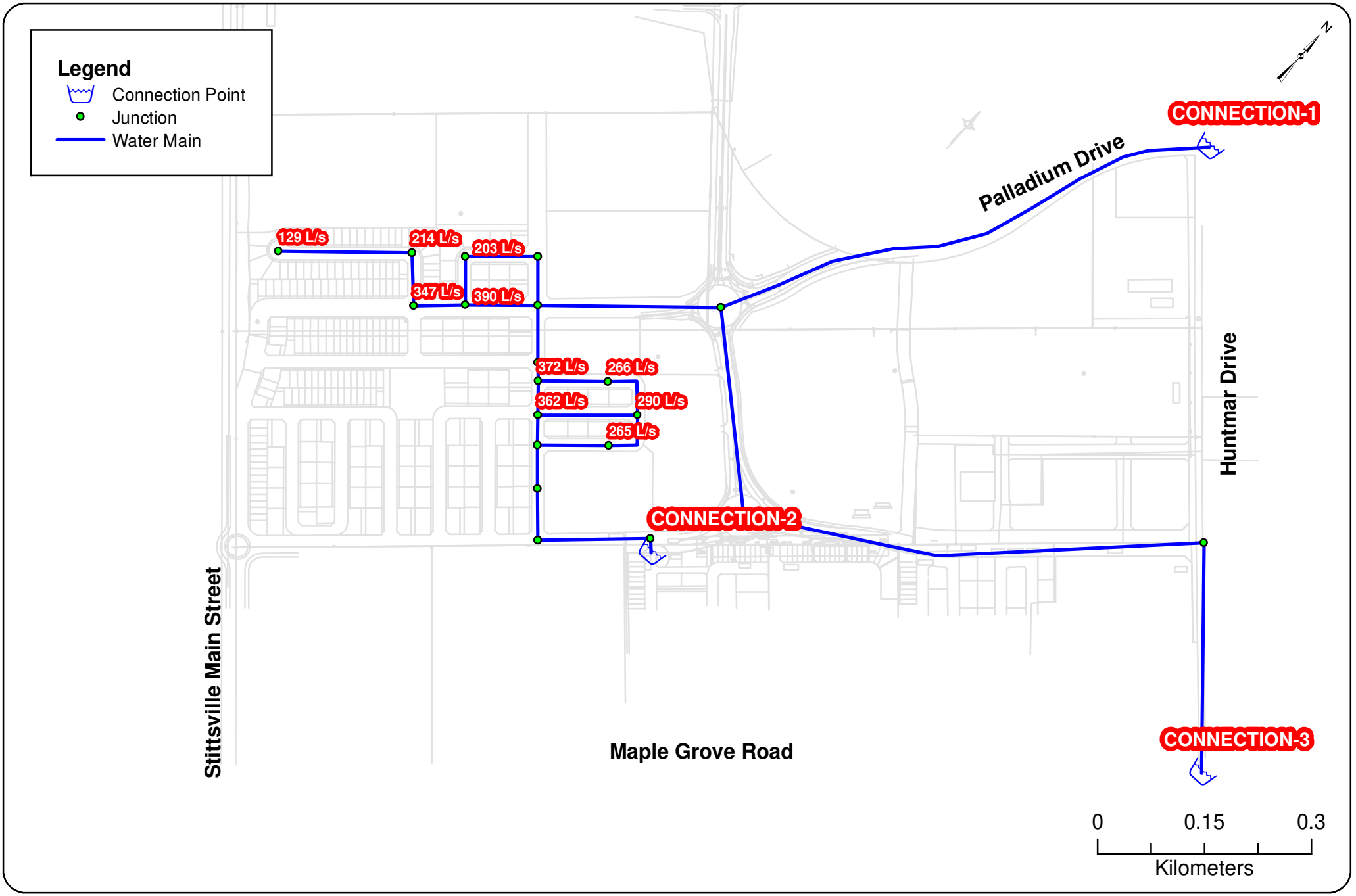
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/k-m)
P-01	J-29	RES-2	323.69	406	120	-33.76	0.26	0.07	0.23
P-03	J-01	J-31	25.46	250	110	7.16	0.15	0.00	0.16
P-04	RES-1	J-02	731.70	297	120	23.61	0.34	0.40	0.54
P-05	J-02	J-09	257.05	297	120	28.69	0.41	0.20	0.77
P-06	J-26	J-01	48.39	250	110	6.46	0.13	0.01	0.13
P-07	J-09	J-35	101.56	297	120	11.67	0.17	0.01	0.15
P-08	J-22	J-39	112.73	297	120	5.32	0.08	0.00	0.03
P-09	J-07	J-24	86.96	297	120	3.40	0.05	0.00	0.01
P-10	J-05	J-04	176.13	297	120	0.67	0.01	0.00	0.00
P-11	J-29	J-28	652.61	297	120	33.76	0.49	0.68	1.05
P-12	J-05	J-24	81.64	297	120	-3.72	0.05	0.00	0.02
P-14	RES-4	J-03	19.88	204	110	30.80	0.94	0.13	6.47
P-15	J-05	J-11	77.50	204	110	2.38	0.07	0.00	0.06
P-17	J-09	J-34	68.56	297	120	18.19	0.26	0.02	0.33
P-18	J-11	J-13	84.43	204	110	2.17	0.07	0.00	0.05
P-19	J-14	J-38	71.61	204	110	-1.08	0.03	0.00	0.01
P-20	J-15	J-16	89.56	204	110	-4.14	0.13	0.01	0.16
P-21	J-34	J-33	101.16	155	100	-0.07	0.00	0.00	0.00
P-22	J-26	J-21	139.75	204	110	1.27	0.04	0.00	0.02
P-23	J-01	J-44	97.87	204	110	-0.70	0.02	0.00	0.01
P-24	J-31	J-09	80.55	250	110	2.07	0.04	0.00	0.02
P-25	J-32	J-36	112.73	204	110	2.52	0.08	0.01	0.06
P-28	J-11	J-08	69.74	204	110	-0.12	0.00	0.00	0.00
P-29	J-08	J-19	70.02	204	110	-2.64	0.08	0.00	0.07
P-30	J-19	J-15	88.51	204	110	-2.97	0.09	0.01	0.08
P-31	J-17	J-23	86.97	204	110	-1.21	0.04	0.00	0.02
P-32	J-17	J-06	91.10	204	110	0.04	0.00	0.00	0.00
P-33	J-26	J-41	67.46	204	110	0.87	0.03	0.00	0.01
P-34	J-13	J-12	74.06	204	110	1.10	0.03	0.00	0.01
P-35	J-12	J-14	71.71	204	110	0.03	0.00	0.00	0.00
P-37	J-16	J-06	67.39	204	110	-5.31	0.16	0.02	0.25
P-38	J-06	J-42	69.66	204	110	-6.44	0.20	0.02	0.36
P-39	J-20	J-43	100.81	204	110	3.14	0.10	0.01	0.09
P-40	J-03	J-18	158.04	250	110	30.80	0.63	0.38	2.40
P-41	J-18	J-27	71.90	250	110	13.19	0.27	0.04	0.50
P-42	J-27	J-20	61.44	250	110	12.61	0.26	0.03	0.46
P-43	J-20	J-26	42.01	250	110	8.89	0.18	0.01	0.24
P-44	J-41	J-40	85.64	155	100	-0.90	0.05	0.00	0.04
P-45	J-25	J-22	74.10	204	110	-2.94	0.09	0.01	0.08
P-46	J-25	J-30	187.47	204	110	1.47	0.04	0.00	0.02
P-47	J-28	J-02	292.31	297	120	10.88	0.16	0.04	0.13
P-49	J-31	J-37	83.63	204	110	4.08	0.12	0.01	0.15
P-50	J-35	J-33	68.20	155	100	1.55	0.08	0.01	0.12
P-51	J-34	J-10	201.93	297	120	8.14	0.12	0.02	0.08
P-52	J-35	J-22	72.65	297	120	9.22	0.13	0.01	0.09
P-53	J-36	J-24	115.49	204	110	1.42	0.04	0.00	0.02
P-54	J-37	J-32	89.26	204	110	3.07	0.09	0.01	0.09
P-55	J-38	J-08	84.68	204	110	-2.19	0.07	0.00	0.05

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-01	0.00	108.72	155	66
J-02	5.81	109.04	155	66
J-03	0.00	107.88	156	68
J-04	0.67	109.05	155	66
J-05	0.67	108.75	155	66
J-06	1.17	109.17	155	65
J-07	0.96	108.51	155	66
J-08	0.33	108.81	155	66
J-09	0.90	108.48	155	66
J-10	8.14	108.18	155	67
J-11	0.33	108.81	155	66
J-12	1.07	109.11	155	65
J-13	1.07	108.86	155	66
J-14	1.11	109.18	155	65
J-15	1.17	109.05	155	66
J-16	1.17	109.25	155	65
J-17	1.17	109.02	155	66
J-18	7.93	108.99	155	66
J-19	0.33	108.84	155	66
J-20	0.58	108.79	155	66
J-21	1.24	108.74	155	66
J-22	0.96	108.21	155	67
J-23	0.28	108.87	155	66
J-24	1.10	108.73	155	66
J-25	1.47	107.86	155	67
J-26	0.28	108.76	155	66
J-27	0.58	108.89	155	66
J-28	22.88	106.76	155	69
J-30	1.47	108.28	155	67
J-31	1.01	108.72	155	66
J-32	0.55	108.30	155	67
J-33	1.48	108.36	155	67
J-34	10.12	108.38	155	67
J-35	0.90	108.34	155	67
J-36	1.10	108.52	155	66
J-37	1.01	108.51	155	66
J-38	1.11	108.86	155	66
J-39	0.96	108.36	155	67
J-40	1.17	108.95	155	66
J-41	0.28	108.81	155	66
J-42	1.17	109.08	155	66
J-43	1.24	108.79	155	66
J-44	1.24	108.72	155.21	66.09

Peak Hour Demand Modeling Results - Phases 1, 2 and 3

P-56	J-39	J-07	95.23	297	120	4.36	0.06	0.00	0.02
P-57	J-41	J-23	70.49	204	110	1.49	0.05	0.00	0.02
P-58	J-42	J-18	70.02	204	110	-9.68	0.30	0.05	0.76
P-59	J-40	J-42	91.02	155	100	-2.07	0.11	0.02	0.20
P-60	J-43	J-21	81.66	204	110	1.90	0.06	0.00	0.04
P-61	J-44	J-21	88.00	204	110	-1.94	0.06	0.00	0.04

Appendix F MDD+FF Model Results



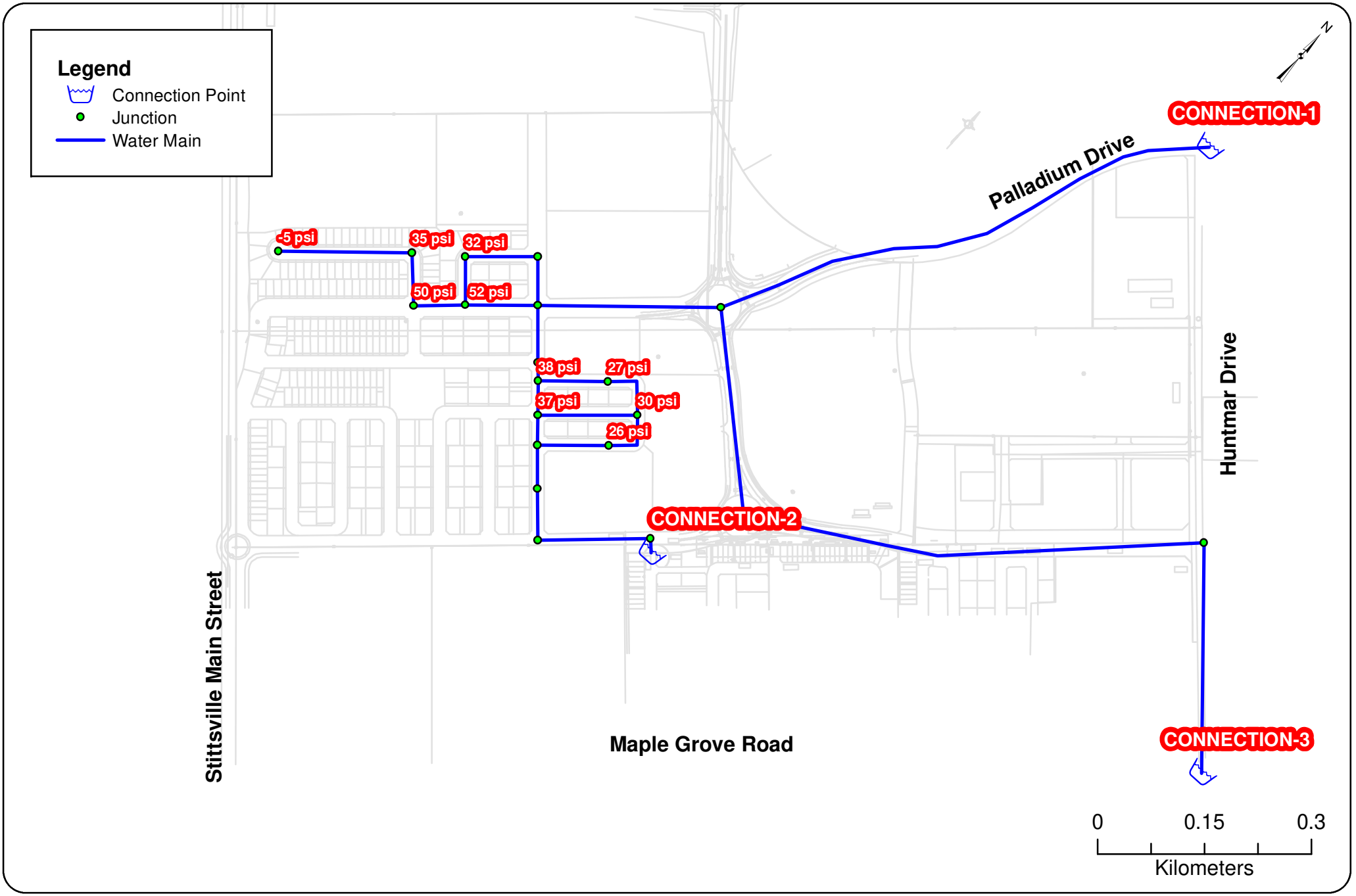
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
Created by: **BL**
Reviewed by: **WdS**

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Available Fire Flow Results @ 20 psi Phase 1

Figure F.1



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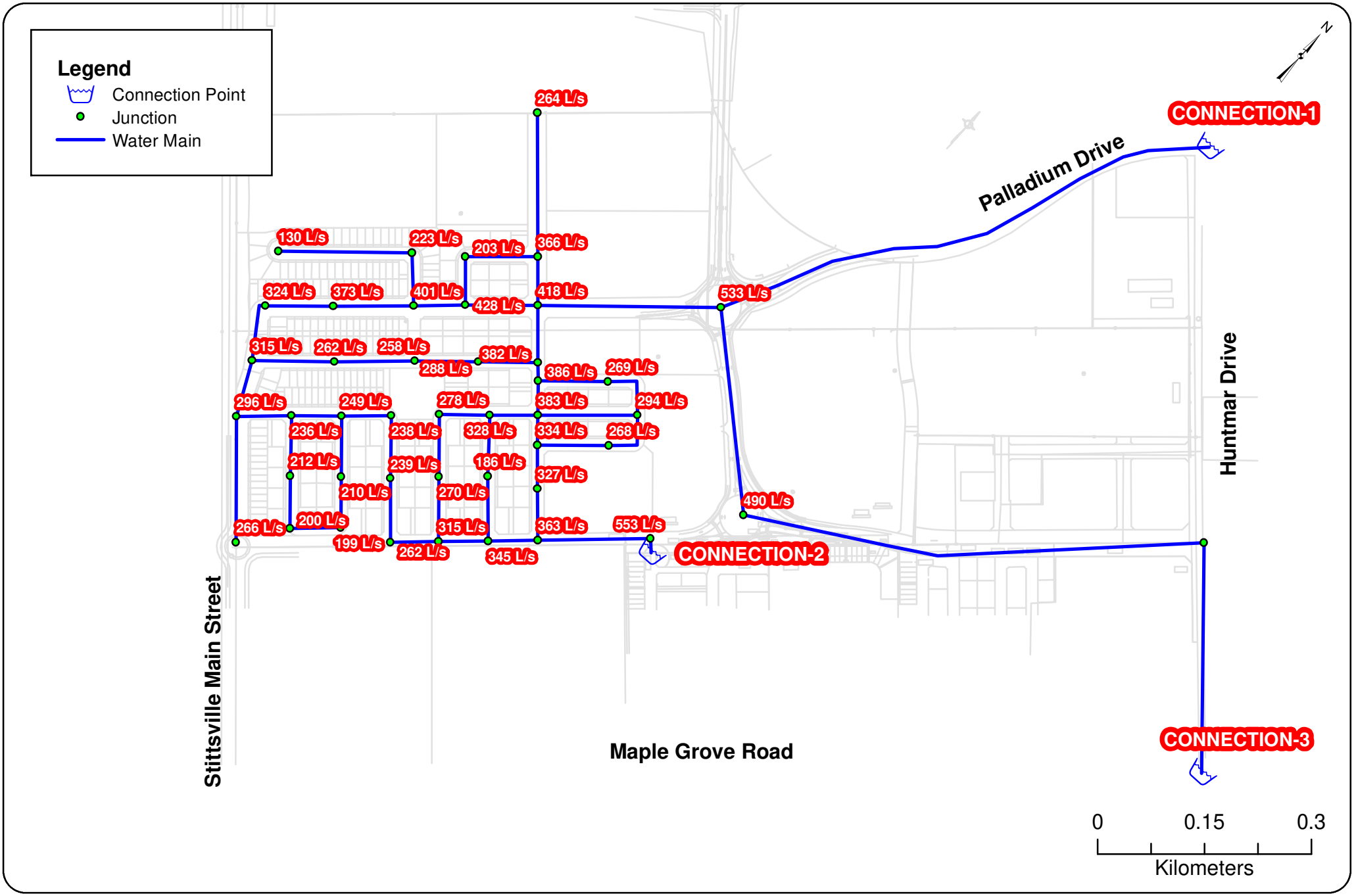
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Residual Pressure Results @ Required Fire Flow Phase 1

Figure F.2

Fire Flow Modeling Results - Phase 1

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-22	0.09	61	151	167	50	347	20
J-25	0.67	62	151	167	35	214	20
J-30	0.67	61	151	167	-5	129	20
J-33	0.67	61	151	167	32	203	20
J-35	0.41	61	151	167	52	390	20
J-01	0.00	52	145	233	38	372	20
J-21	0.56	51	145	233	30	290	20
J-26	0.00	51	145	233	37	362	20
J-43	0.56	51	145	233	26	265	20
J-44	0.56	52	145	233	27	266	20



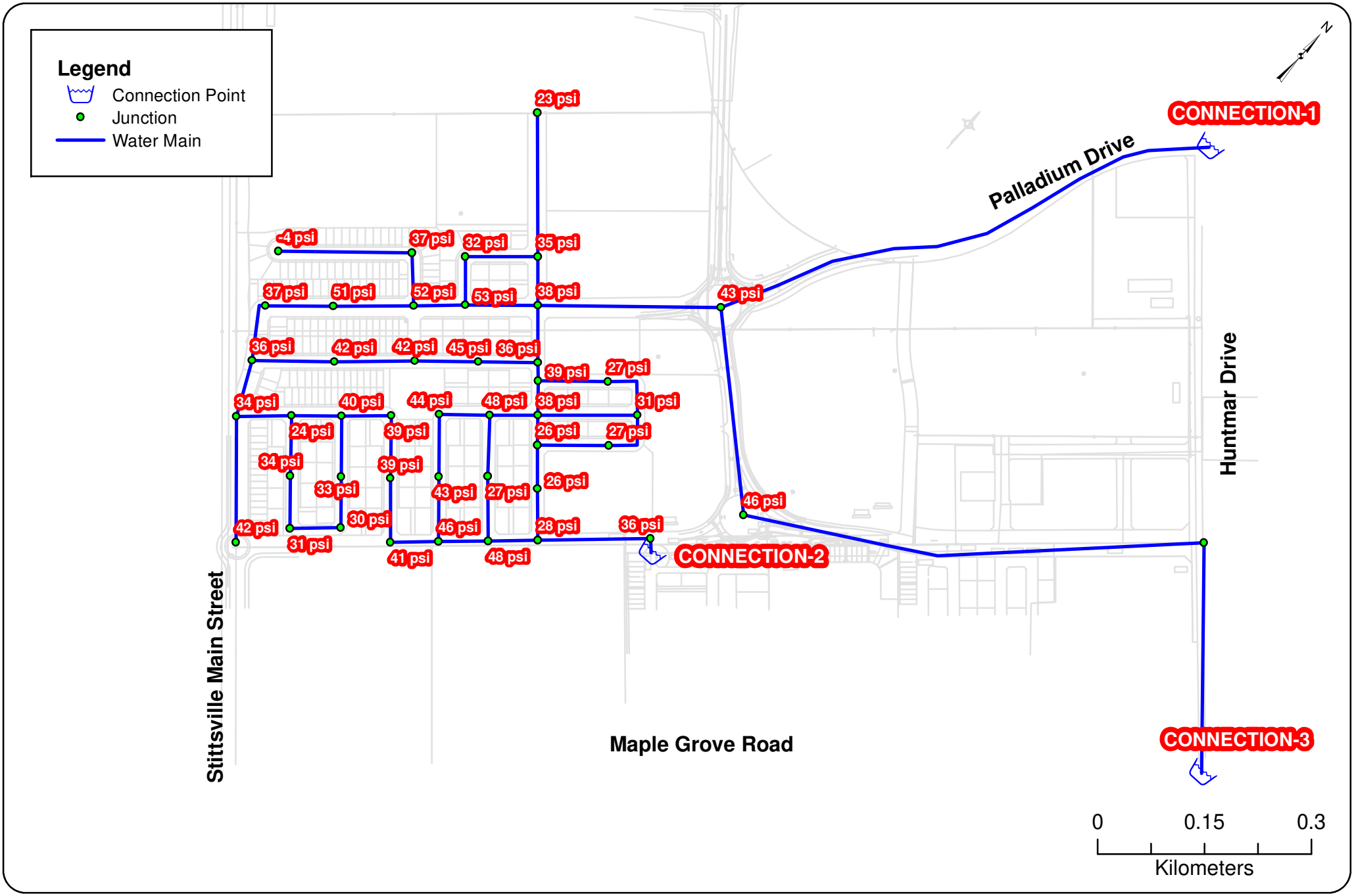
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Available Fire Flow Results @ 20 psi Phases 1 and 2

Figure F.3



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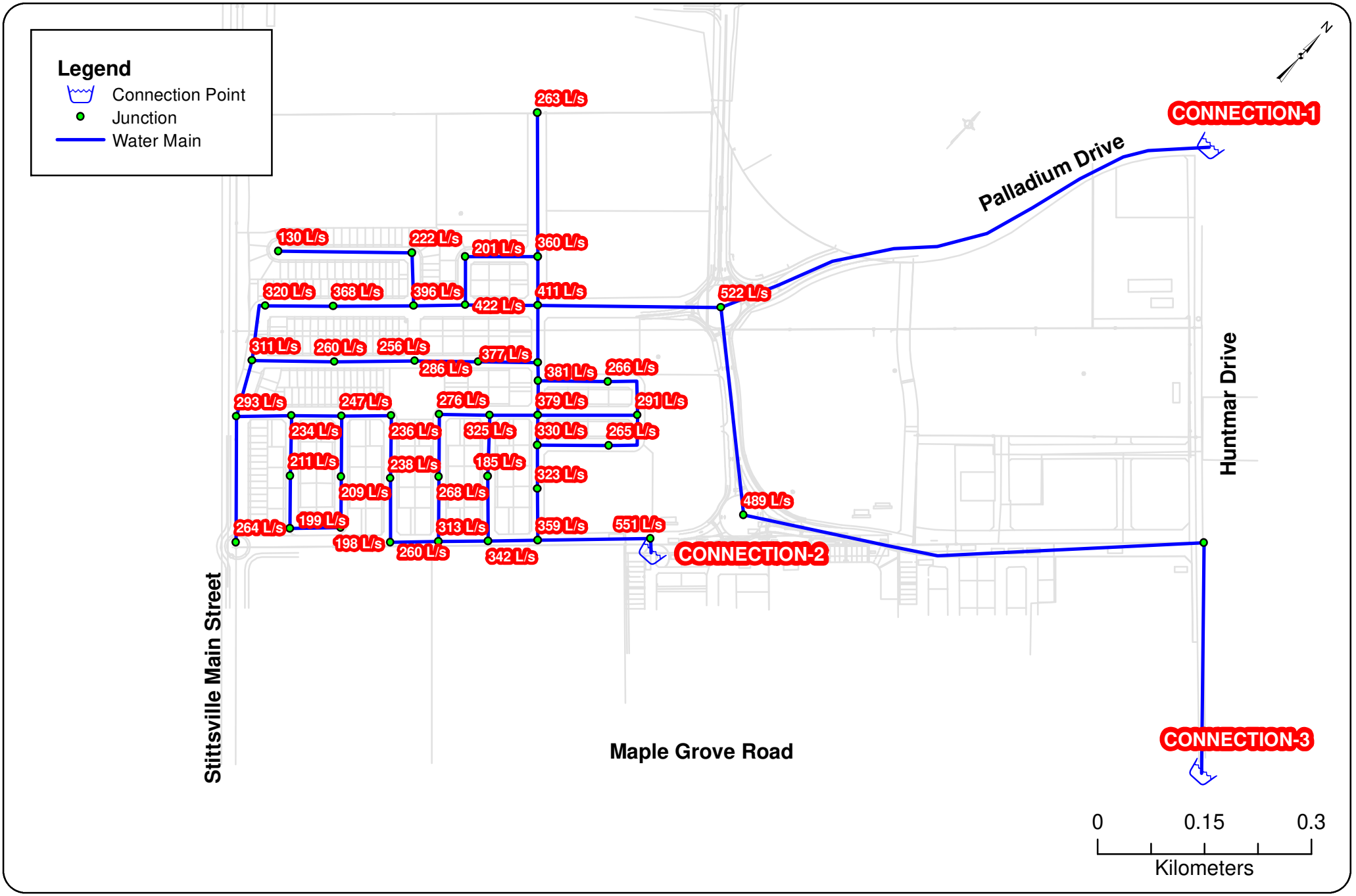
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Residual Pressure Results @ Required Fire Flow Phases 1 and 2

Figure F.4

Fire Flow Modeling Results - Phases 1 and 2

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-04	0.30	59	150	167	42	266	20
J-06	0.53	58	150	167	46	315	20
J-08	0.15	59	150	167	40	249	20
J-12	0.49	59	150	167	31	200	20
J-13	0.49	59	150	167	34	212	20
J-14	0.51	59	150	167	31	199	20
J-15	0.53	59	150	167	39	239	20
J-16	0.53	58	150	167	41	262	20
J-17	0.53	59	150	167	43	270	20
J-19	0.15	59	150	167	39	238	20
J-22	0.43	60	151	167	52	401	20
J-23	0.13	59	150	167	44	278	20
J-25	0.67	61	151	167	37	223	20
J-30	0.67	60	151	167	-4	130	20
J-32	0.30	60	150	167	42	258	20
J-33	0.67	60	151	167	32	203	20
J-35	0.41	60	151	167	53	428	20
J-36	0.50	60	150	167	42	262	20
J-37	0.46	60	150	167	45	288	20
J-38	0.51	59	150	167	33	210	20
J-39	0.43	60	150	167	51	373	20
J-40	0.53	59	150	167	27	186	20
J-41	0.13	59	150	167	48	328	20
J-42	0.53	58	150	167	48	345	20
J-05	0.30	52	145	217	34	296	20
J-07	0.43	53	146	217	37	324	20
J-11	0.15	52	145	217	24	236	20
J-24	0.50	52	145	217	36	315	20
J-01	0.00	50	144	233	39	386	20
J-21	0.56	50	144	233	31	294	20
J-26	0.13	50	144	233	38	383	20
J-43	0.56	50	144	233	27	268	20
J-44	0.56	50	144	233	27	269	20
J-02	3.23	51	145	250	43	533	20
J-09	0.41	50	144	250	38	418	20
J-10	1.91	50	144	250	23	264	20
J-28	0.00	58	147	250	46	490	20
J-31	0.46	49	143	250	36	382	20
J-34	5.62	50	144	250	35	366	20
J-03	0.00	43	138	283	37	553	20
J-18	3.61	43	139	283	28	363	20
J-20	0.26	44	140	283	26	334	20
J-27	0.26	44	140	283	26	327	20



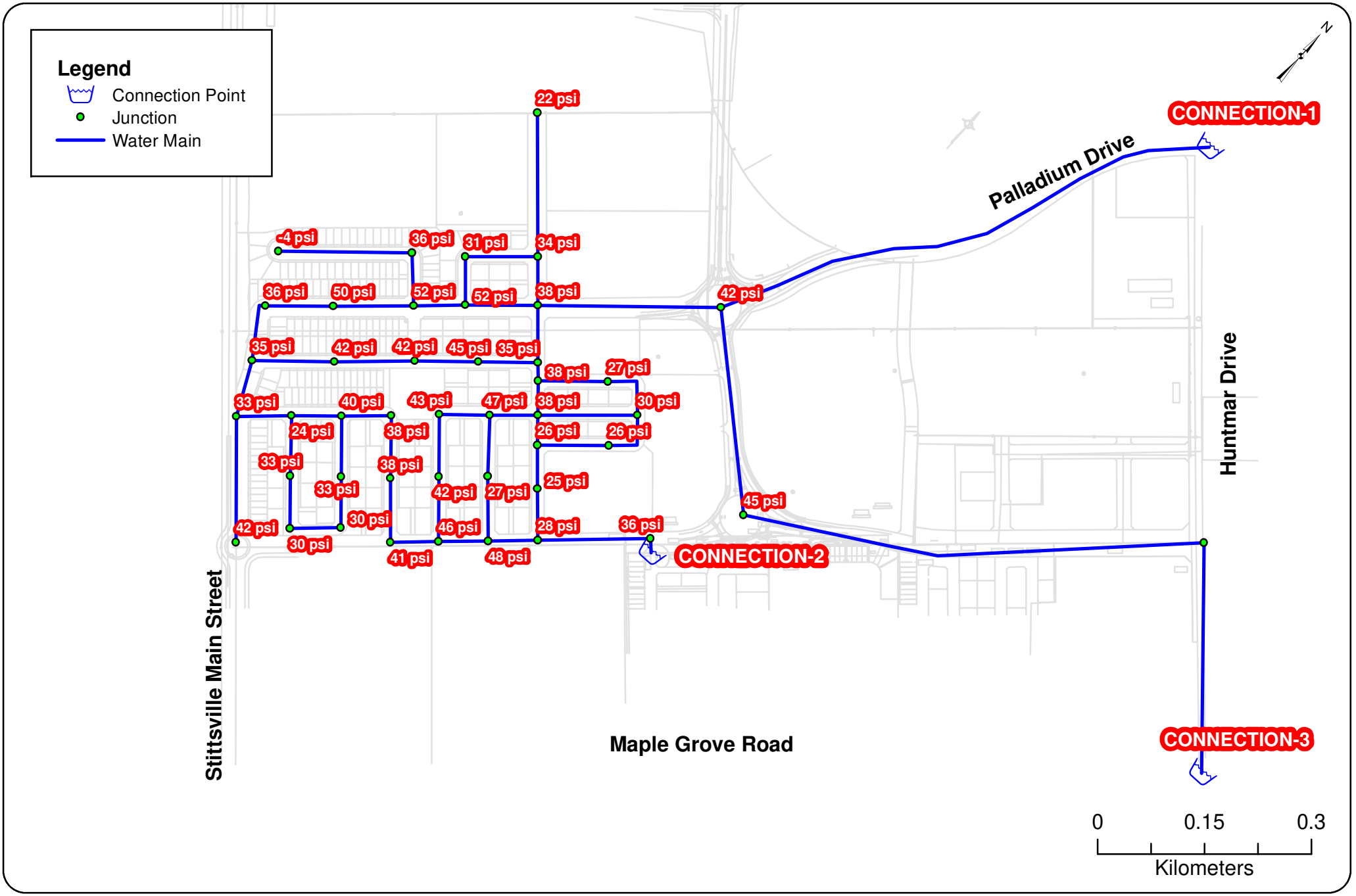
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
Date: **December 2019**
Created by: **BL**
Reviewed by: **WdS**

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Available Fire Flow Results @ 20 psi Phases 1, 2 and 3

Figure F.5



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Client: **David Schaeffer Engineering Ltd.**
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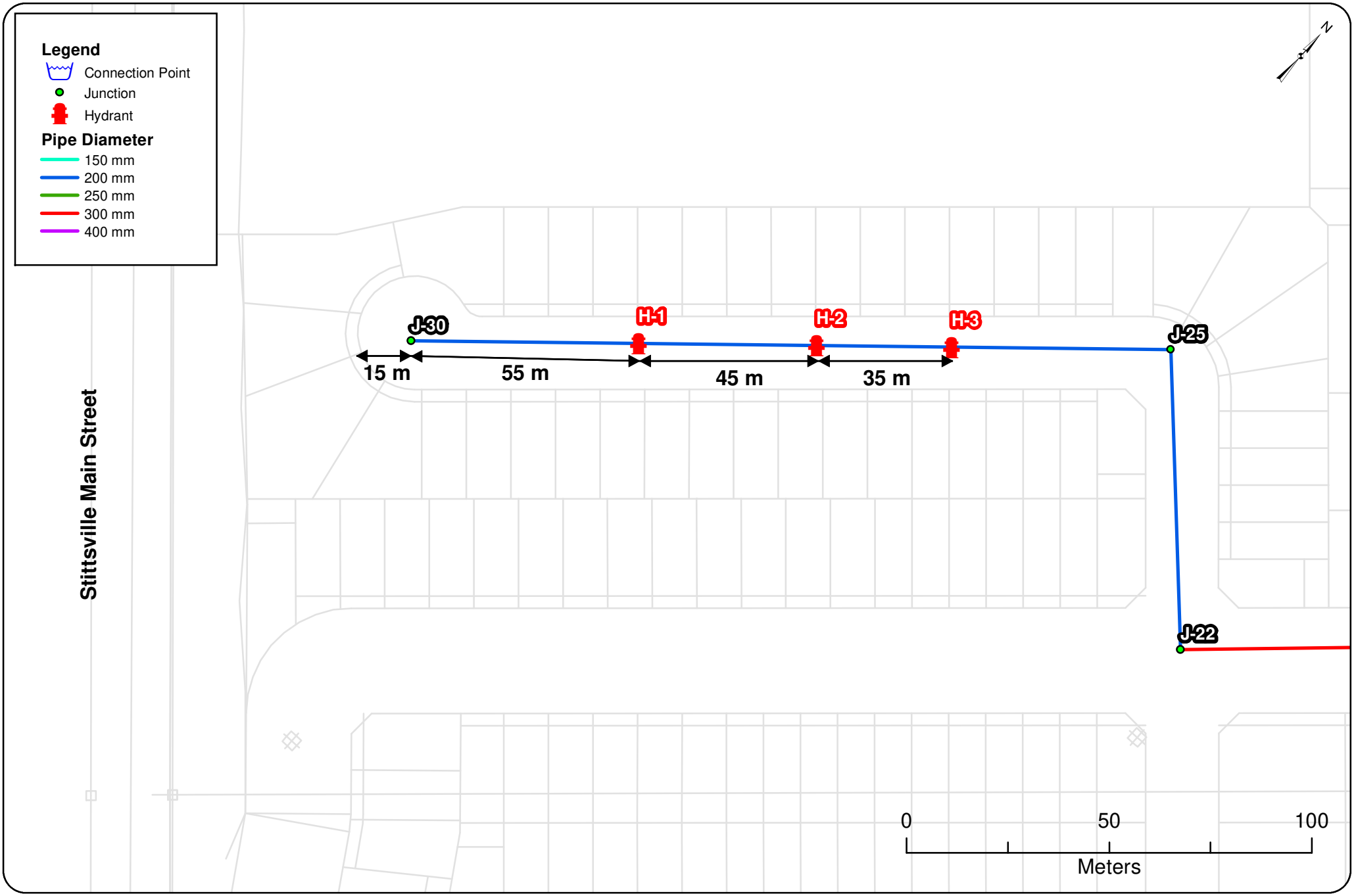
Residual Pressure Results @ Required Fire Flow Phases 1, 2 and 3

Figure F.6

Fire Flow Modeling Results - Phases 1, 2 and 3

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-04	0.30	59	150	167	42	264	20
J-06	0.53	58	150	167	46	313	20
J-08	0.15	59	150	167	40	247	20
J-12	0.49	58	150	167	30	199	20
J-13	0.49	59	150	167	33	211	20
J-14	0.51	58	150	167	30	198	20
J-15	0.53	58	150	167	38	238	20
J-16	0.53	58	150	167	41	260	20
J-17	0.53	58	150	167	42	268	20
J-19	0.15	59	150	167	38	236	20
J-22	0.43	60	150	167	52	396	20
J-23	0.13	59	150	167	43	276	20
J-25	0.67	60	150	167	36	222	20
J-30	0.67	60	150	167	-4	130	20
J-32	0.30	60	150	167	42	256	20
J-33	0.67	60	150	167	31	201	20
J-35	0.41	60	150	167	52	422	20
J-36	0.50	59	150	167	42	260	20
J-37	0.46	59	150	167	45	286	20
J-38	0.51	59	150	167	33	209	20
J-39	0.43	60	150	167	50	368	20
J-40	0.53	58	150	167	27	185	20
J-41	0.13	59	150	167	47	325	20
J-42	0.53	58	150	167	48	342	20
J-05	0.30	52	145	217	33	293	20
J-07	0.43	52	145	217	36	320	20
J-11	0.15	52	145	217	24	234	20
J-24	0.50	52	145	217	35	311	20
J-01	0.00	50	144	233	38	381	20
J-21	0.56	50	144	233	30	291	20
J-26	0.13	50	144	233	38	379	20
J-43	0.56	50	144	233	26	265	20
J-44	0.56	50	144	233	27	266	20
J-02	3.23	51	145	250	42	522	20
J-09	0.41	50	143	250	38	411	20
J-10	4.52	50	143	250	22	263	20
J-28	12.71	57	147	250	45	489	20
J-31	0.46	49	143	250	35	377	20
J-34	5.62	50	143	250	34	360	20
J-03	0.00	43	138	283	36	551	20
J-18	3.61	43	139	283	28	359	20
J-20	0.26	44	140	283	26	330	20
J-27	0.26	43	139	283	25	323	20

Appendix G Dead-End Water Main Fire Flow Validation



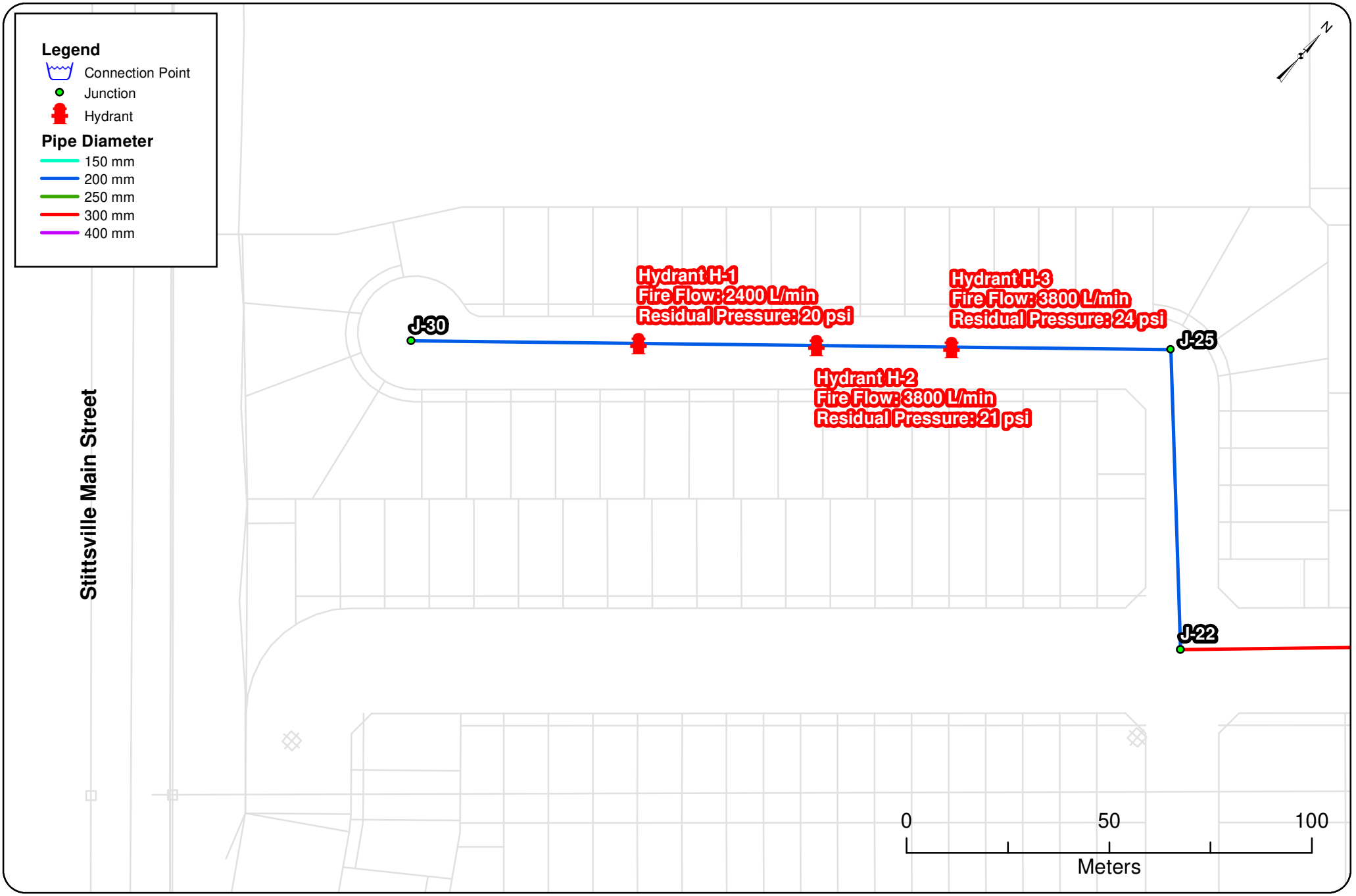
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis**
195 Huntmar Drive Subdivision Development
Client: **David Schaeffer Engineering Ltd.**
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Reviewed by: **WdS**

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Hydrant Spacing Summary

Figure G.1



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Dead End Watermain
Fire Flow Results
H-1, H-2 and H-3 Flowing Simultaneously

Figure G.2

Outlook

2775 and 2785 Palladium Boundary Conditions

From Kelly Paradis <kparadis@lrl.ca>
Date Mon 2026-06-01 2:16 PM
To Roy, Jean-Miguel <jean-miguel.roy@ottawa.ca>

Jean-Miguel,

I would like to request the boundary conditions for the above referenced site with the following water domestic demands and fire demands.

Please let me know if additional information is needed.

Water Demand based on the City of Ottawa Design Guidelines-Water Distribution, 2010

Industrial Demand

Property Type	Unit Rate	Area (ha)	Demand (L/d)
Hotel (225 L/Bed space/d)	**225**	**236**	**53100**
Entertainment Center [Other commercial space] (L/ha/d)	**28000**	**0.33**	**9147.6**
Support Building [Other commercial space] (L/ha/d)	**28000**	**0.35**	**9713.2**
Aquatic park Demands, *Average daily water per water usage bills at existing facilities.*			**100000**

Average Day Demand	**171,961**	**L/d**	**1.990**	**L/s**
Maximum Day Factor	1.5		(Design Guidelines-Water Distribution Table 4.2)	
Maximum Daily Demand	**257,941**	**L/d**	**2.985**	**L/s**
Peak Hour Factor	1.8		(Design Guidelines-Water Distribution Table 4.2)	
Maximum Hour Demand	**464,294**	**L/d**	**5.374**	**L/s**

TOTAL DEMAND				
Average Day Demand	**171,961**	**L/d**	**1.99**	**L/s**
Maximum Daily Demand	**257,941**	**L/d**	**2.99**	**L/s**
Maximum Hour Demand	**464,294**	**L/d**	**5.37**	**L/s**

Fire demands

- The two first floors for the hotel were used plus 50% of the remaining 4 floors.
- Separate distances
  - East - Palladium road >30m
  - West - Parking lot and pond >30m
  - South - Future Residential 3.1 to 10m
  - North - undeveloped MTO lands, assumed >30m

Fire Flow Calculations
LRL File No. 230778
Project: Proposed Development
Location: 4055 Russell Rd, Ottawa
Date: May 27, 2026
Method: Fire Underwriter's Survey (FUS)

BUILDING - A1

Step	Task	Term	Options	Multiplier	Choose:	Value	Unit	Fire Flow
			Construction Coefficient (C)					
1	Choose frame used for building	Coefficient C related to the type of construction	Wood Frame Construction (Type V)	1.5	Noncombustible Construction (Type II)	0.8		
			Mass Timber Construction (Type IV-A)	0.8				
			Mass Timber Construction (Type IV-B)	0.9				
			Mass Timber Construction (Type IV-C)	1.0				
			Mass Timber Construction (Type IV-D)	1.5				
			Ordinary Construction (Type III)	1.0				
			Noncombustible Construction (Type II)	0.8				
			Fire Resistive Construction (Type I)	0.6				
			Floor Gross Area (A)					
2	Total Effective Gross Floor Area = Hotel (Ground Floor 1530sm + 2nd floor 1301sm + Addition floors (4) 2043sm [use 50%]), Family Entertainment Center (3267sm), Waterpark (6643sm), Support Bldg (3469)					20,296	m^2	
3	Obtain fire flow before reductions	Required fire flow (rounded to nearest	Fire Flow = 220 x C x $A^{0.5}$				L/min	26,000
			Occupancy and Contents Adjustment					
4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Noncombustible	-25%	Limited combustible	-15%	L/min	22,100
			Limited combustible	-15%				
			Combustible	0%				
			Free burning	15%				
			Rapid burning	25%				
			Sprinkler Protection					
5	Choose reduction for sprinklers	Sprinkler reduction	Automatic sprinkler protection designed & installed in accordance with NFPA 13	-30%	True	-30%	L/min	11,050
			Water supply is standard for both the system and fire department hose lines	-10%	True	-10%		
			Fully supervised system	-10%	True	-10%		
			Exposure Adjustment					
6	Choose separation	Exposure distance	North side	>30m	0%	20%	L/min	15,470
			East side	>30m	0%			
			South side	3.1 to 10m	20%			
			West side	>30m	0%			
			Net Required Fire Flow					
7	Obtain fire flow and duration		Minimum required fire flow (rounded to nearest 1000)				L/min	15,000
			Minimum required fire flow				L/s	250.0
			Required duration of fire flow				hr	2

Kelly Paradis, P.Eng., PMP
Senior Manager of Civil Engineering
LRL ENGINEERING | INGÉNIERIE
C +1 343-549-8105 - **E** kparadis@lrl.ca'

*** I will be away on PTO starting June 3 and returning June 9th.*

Outlook

RE: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

From Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Date Sat 2026-06-20 11:01 AM
To Kelly Paradis <kparadis@lrl.ca>
Cc Virginia Johnson <vjohnson@lrl.ca>; Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Maxime Longtin <mlongtin@lrl.ca>

Thank you Kelly, I believe that is all we need on our end to process everything. I will touch base with your team if we need anything else!

Regards,
Jean-Miguel

From: Kelly Paradis <kparadis@lrl.ca>
Sent: June 18, 2026 3:03 PM
To: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Cc: Virginia Johnson <vjohnson@lrl.ca>; Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: Re: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

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Jean-Miguel,

See attached the sanitary design sheet from Append D of the DSEL servicing report and drawing.

Let me know if anything else is needed.

Kelly Paradis, P.Eng., PMP
Senior Manager of Civil Engineering
LRL ENGINEERING | INGÉNIERIE
C +1 343-549-8105 - **E** kparadis@lrl.ca'

From: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Sent: June 18, 2026 10:08 AM
To: Kelly Paradis <kparadis@lrl.ca>
Cc: Virginia Johnson <vjohnson@lrl.ca>; Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: RE: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

Hi Kelly,

I reviewed your water demands and have no additional comments. We will re-engage our conversations with internal SMEs about the preferred watermain looping configuration to achieve redundancy for your site.

Just one more question regarding the allowable sanitary release rates for your site. Could you please clarify how you've found the values shared in your May 26, 2026 email, as we found slightly different values in the design sheets (Block 243, 244, 256 & MTO Lands have a 1.05 l/s, 1.30 l/s, 1.04 l/s & 14.41 l/s allowable release rate respectively)? If you found those values in the 195 Huntmar Design Brief prepared by DSEL, could you please share that study with our team, and point us where in the study you found these allowable release rates?

Thank you Kelly.

Jean-Miguel

From: Kelly Paradis <kparadis@lrl.ca>
Sent: June 11, 2026 7:54 PM
To: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Cc: Virginia Johnson <vjohnson@lrl.ca>; Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: Re: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

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Jean-Miguel,

See attached and responses in green below.

If additional information is needed, please let me know.

Here is a link to the FUS. I wasn't able to attach the file for some reason. Please let me know if the link does not work.

240720 Ottawa Waterpark FUS 2026-06-11.pdf

Kelly Paradis, P.Eng., PMP
Senior Manager of Civil Engineering
LRL ENGINEERING | INGÉNIERIE
C +1 343-549-8105 - **E** kparadis@lrl.ca'

From: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Sent: Tuesday, June 02, 2026 12:28 PM
To: Kelly Paradis <kparadis@lrl.ca>
Cc: Virginia Johnson <vjohnson@lrl.ca>; Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Maxime Longtin <mlongtin@lrl.ca>
Subject: RE: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

Hi Kelly,

Thank you for providing your demands. I have a few comments/questions for your team before I can forward them to our IWS team that issues WBC:

- Is one of the proposed 7 floors for the hotel being used as a dinning / bar lounge? If so, these non-residential demands should be accounted for in your total anticipated demands for the hotel. Please revise your demands accordingly. The values have been updated to account for the non-residential "ground" floor.
- Could you kindly provide additional information about the anticipated use for the proposed entertainment center? The entertainment center includes a tickets and gift shop and arcade games.
- Could you please provide a proof of a water consumption bill received for one of the existing indoor waterpark facilities to support your proposed demands of 100,000 l/day?

Attached are yearly summary of the Dallas Epic Water park. An 80,000 square foot indoor/outdoor waterpark with the longest lazy river in Texas and an outdoor wave pool. This water park is 10,000 square feet larger than the Ottawa park and the Ottawa Park does not have the outdoor wave pool. In addition, the Dallas pools are drained daily during March break and daily for the summer months, June/July/August.

- With regards to the FUS calcs:
  - I am calculating a slightly higher total floor area (A) for the calculations: Waterpark (6,643 m2) + Support Building (3,469 m2) + Family Centre (3,267 m2) + Hotel (1,530 m2 + 1,301 m2 + 50% of remaining floors [10,215 m2 * 50%]). The total floor area I obtain is 21,318 m2. I believe in your calculations you only consider 50% of the above 4 floors, but since there are 7 floors total and the FUS asks to apply 50% to a maximum of eight floors (see snapshot provided below), I believe this values should be revised to account for 5 floors instead of 4. The values have been revised to reflect the 21,318 m2.
  - Unless there is a mistake with the scale on the site plan provided by your team, it is my understanding that the proposed buildings on this site are located 18 m away from the southern property line; therefore, it is my understanding that the exposure charge applied for the future residential developments to the south can be capped at 15% instead of 20%. What do you think? The distance is 17.5m the values have been updated to reflect this change.

2) For a building classified with a Construction Coefficient below 1.0:
   a) if any vertical openings in the building (ex. interconnected floor spaces, atria, elevators, escalators, etc.) are unprotected, consider the two largest adjoining floor areas plus 50% of all floors immediately above them up to a maximum of eight; or

Please note that once these demands are revised per the above comments, we will have internal discussions about the allowable sanitary release rate for your site and your proposal below.

Best Regards,

Jean-Miguel Roy

Project Manager, Infrastructure Approvals

Development and Building Services |

Direction générale des services de la planification, de l'aménagement et du bâtiment

110 Laurier Avenue West | 110 avenue Laurier Ouest

City of Ottawa | Ville d'Ottawa

613.580.2424 x 30902

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

From: Kelly Paradis <kparadis@lrl.ca>
Sent: May 26, 2026 6:21 AM
To: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Cc: Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Virginia Johnson <vjohnson@lrl.ca>
Subject: Re: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

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Hello Jean-Miguel,

I am working with Virginia on this file and can provide the following information.

The preliminary estimated water demands are as follows.

We are currently waiting for additional information from the architect to finalize the preliminary FUS demands.

Water Demand based on the City of Ottawa Design Guidelines-Water Distribution, 2010

Industrial Demand

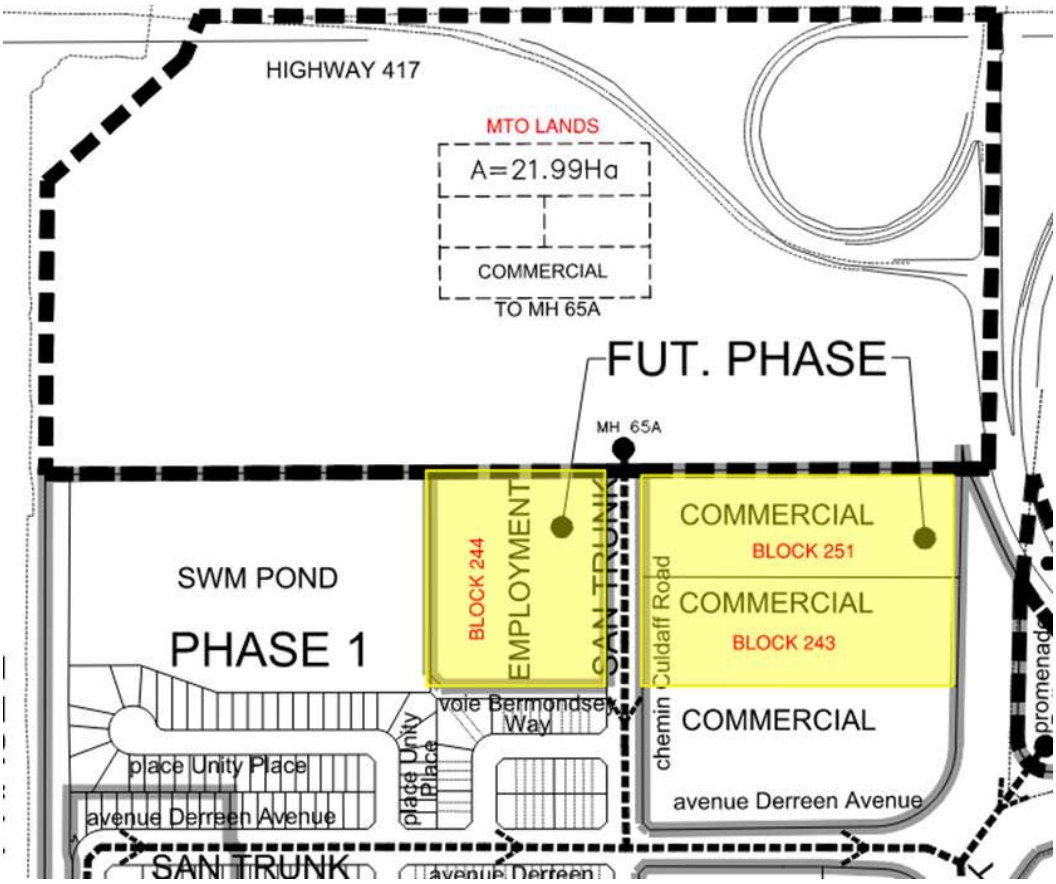
Property Type	Unit Rate	Area (ha)	Demand (L/d)
Hotel (225 L/Bed space/d)	225	236	53100
Entertainment Center [Other commercial space] (L/ha/d)	28000	0.33	9147.6
Support Building [Other commercial space] (L/ha/d)	28000	0.35	9713.2
Aquatic park Demands, *Average daily water per water usage bills at existing facilities.*			100000

Average Day Demand	**171,961**	**L/d**	**1.990**	**L/s**
Maximum Day Factor	1.5		(Design Guidelines-Water Distribution Table 4.2)	
Maximum Daily Demand	**257,941**	**L/d**	**2.985**	**L/s**
Peak Hour Factor	1.8		(Design Guidelines-Water Distribution Table 4.2)	
Maximum Hour Demand	**464,294**	**L/d**	**5.374**	**L/s**

TOTAL DEMAND				
Average Day Demand	**171,961**	**L/d**	**1.99**	**L/s**
Maximum Daily Demand	**257,941**	**L/d**	**2.99**	**L/s**
Maximum Hour Demand	**464,294**	**L/d**	**5.37**	**L/s**

We would also like to discuss the existing sanitary capacity for the existing 250mm dia PVC sanitary sewer located on Culdaff Rd. It appears that sewer design sheets account for a larger MTO land then is actually developable.

The DSEL Design Brief for 2325483 Ontario Ltd, 195 Huntmar Drive, dated July 2020 (2nd submission), delineates the drainage areas depicted in the image below.



Sanitary demands from sewer design sheets:

Commercial & Institutional Flow = 28000 L/ha/day

- MTO lands 21.99ha = Total Flow 17.97 L/s
- Block 244 (1.99ha) = Total Flow 1.62 L/s
- Block 251 (1.6ha) = Total Flow 1.35 L/s
- Block 243 (1.6ha) = Total Flow 1.35 L/s

It appears that the 21.99Ha MTO lands includes the HWY 417 off ramp and cloverleaf. When removing these areas that MTO lands decrease to approximately 16.2Ha. In additional the DSEL Functional Servicing Report for 2325483 Ontario Ltd, 195 Huntmar Drive, dated May 2019 Rev 3 Appendix A storm servicing drawings sizes the MTO lands to be 16.5ha. This decreases in area would create additional capacity in the sewer which we would like to discuss that availability of allocating this additional capacity to the aquatic development lands.

I will provide the fire demand calculations when they are completed. If there are any questions, please do not hesitate to reach out.

Thank you

Kelly Paradis, P.Eng., PMP
Senior Manager of Civil Engineering

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C +1 343-549-8105 - **E** kparadis@lrl.ca'

*** I will be away on PTO starting June 3 and returning June 9th.*

From: Roy, Jean-Miguel <Jean-Miguel.Roy@ottawa.ca>
Sent: May 20, 2026 10:58 AM
To: Virginia Johnson <vjohnson@lrl.ca>
Cc: Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Kelly Paradis <kparadis@lrl.ca>
Subject: RE: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

Hi Virginia,

We had our first internal meeting this morning to discuss potential watermain extension configurations. We've determined that knowing the approximate water demands for your site may influence our preferred configuration.

When you have a moment, could you please share your estimated water demands (including fire flow) for your site?

Thank you,

Jean-Miguel

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

From: Roy, Jean-Miguel
Sent: May 14, 2026 8:43 AM
To: Virginia Johnson <vjohnson@lrl.ca>
Cc: Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>; Tim Eisner <teisner@jfsa.com>; Kelly Paradis <kparadis@lrl.ca>
Subject: RE: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

Hi Virginia,

You mentioned below that you've reviewed various servicing studies dating back to 2019 that address the sanitary servicing for these three parcels. Could you please start by sharing your findings from the various studies with us?

I can look into the City's preferred water servicing approach while you provide us with your sanitary servicing findings for this property. I will schedule a meeting with internal stakeholders to hold this discussion about the watermain. Understanding that your water demands may be high, I could see benefit in sharing these with me ahead of the meeting (an approximation would be good enough for now).

I'm also getting up to speed on this file. It seems, per your email below, that parcel #3 is also under the same ownership. However, based on the latest Site Plan available to us (dated from the pre-con), it is not being developed. Could you please confirm what the intentions are with this parcel, as it may influence our decision process for the servicing? I would also appreciate if you could confirm that the Site Plan, dated January 13, 2025, is still the latest version. Otherwise, please provide your latest Site Plan to us.

Thank you,

Jean-Miguel Roy

Project Manager, Infrastructure Approvals

Development and Building Services |

Direction générale des services de la planification, de l'aménagement et du bâtiment

110 Laurier Avenue West | 110 avenue Laurier Ouest

City of Ottawa | Ville d'Ottawa

613.580.2424 x 30902

From: Virginia Johnson <vjohnson@lrl.ca>
Sent: Thursday, May 7, 2026 10:23
To: Rasool, Rubina <Rubina.Rasool@ottawa.ca>; Walker, Krishon <krishon.walker@ottawa.ca>
Cc: Tim Eisner <teisner@jfsa.com>; Kelly Paradis <kparadis@lrl.ca>
Subject: LRL 240720 - 2775 and 2785 Palladium File No.: PC2025-0008

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Hello,

As you may be aware, this project is currently advancing through detailed design, and am hoping you can assit in confirming key servicing parameters and obtaining a point of contact for ongoing coordination, as we understand Gabi Schaeffer is no longer assigned to this file. I know you, Rubina, were in a support role at the initial pre-consult, so please let me know if this is now your file.

There are two critical servicing items we need the city's input on:

1. SANITARY SEWER – ALLOTTED CAPACITY CONFIRMATION

We have reviewed various servicing studies dating back to 2019 that address sanitary servicing for each of the three parcels under development, however, as you know there are several different reports linked to this section of Kanata west. I assume the Kanata west pump station model is the governing constraint here.

Could you please confirm the allotted sanitary capacity previously designated for each of the three parcels?

Error! Filename not specified.

2. WATERMAIN – LOOPING STRATEGY FOR CULDAFF ROAD

As noted in the pre-consultation, watermain looping will be required if the Culdaff Road 305mm PVC watermain is anticipated to service more than 50 m^3/d in total demand across the development. To inform our design approach, we would appreciate the City's input on the preferred looping strategy for the existing dead-end condition on Culdaff Road. With the development to the south, has there been a servicing easement reserved for this? Is the City contemplating a secondary watermain connection running north along Culdaff Road as part of the looping solution?

Please do not hesitate to reach out if you require any additional information from our end to keep this moving rapidly.

Thanks,

Virginia Johnson, P.Eng.
Director of Civil Engineering

LRL ENGINEERING | INGÉNIERIE

Head Office – 5430 Canotek Rd., Ottawa, ON
Pembroke Office – 1344 Pembroke St W, Pembroke ON
C +1 613-915-9503 **E** vjohnson@lrl.ca

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Water Supply Calculations

LRL File No. : 240720
Project: Verevas Ottawa Waterpark
Location: Palladium Resort Development Limited Partnership
Date: 2026-07-08
Designed: K.P.
Checked:
Dwg Reference:

Water Demand based on the City of Ottawa Design Guidelines-Water Distribution, 2010

Industrial Demand

Property Type	Unit Rate	# of Beds	Demand (L/d)	Demand (L/s)	Max Demand (L/s)	Max Hour Demand (L/s)
Hotel (225 L/Bed space/d)	225	236	53100	0.615	0.922	1.659
Property Type	**Unit Rate**	**Area (ha)**				
Hotel ground floor [Other commercial space] (L/ha/d)	28000	0.15	4284	0.050	0.074	0.134
Entertainment Center [Other commercial space] (L/ha/d)	28000	0.33	9147.6	0.106	0.159	0.286
Support Building [Other commercial space] (L/ha/d)	28000	0.35	9713.2	0.112	0.169	0.304
Aquatic park Demands, *Average daily water per water usage bills at existing facilities.*			100000	1.157	1.736	3.125

Average Day Demand	**176,245**	**L/d**	**2.040**	**L/s**	
Maximum Day Factor	1.5		(Design Guidelines-Water Distribution Table 4.2)		
Maximum Daily Demand	**264,367**	**L/d**	**3.060**	**L/s**	
Peak Hour Factor	1.8		(Design Guidelines-Water Distribution Table 4.2)		
Maximum Hour Demand	**475,861**	**L/d**	**5.508**	**L/s**	

TOTAL DEMAND				
Average Day Demand	**176,245**	**L/d**	**2.04**	**L/s**
Maximum Daily Demand	**264,367**	**L/d**	**3.06**	**L/s**
Maximum Hour Demand	**475,861**	**L/d**	**5.51**	**L/s**

Water Service Pipe Sizing

Q = VA

Where: V = velocity (m/s)
A = area of pipe (m^2)
Q = flow rate (L/s)

Assuming a maximum velocity of 1.8m/s, the diameter of pipe is calculated as:

Minimum pipe diameter (d) =	$(4Q/\pi V)^{1/2}$		
=	0.062	m	
=	62	mm	
Proposed pipe diameter (d) =	**200**	mm	(to be confirmed with hydraulic pressure analysis)
=	**8**	Inches	

Fire Flow Calculations
LRL File No. 240720
Project: Proposed Development
Location: Palladium Resort Development Limited Partnership
Date: July 8, 2026
Method: Fire Underwriter's Survey (FUS)

BUILDING - A1

Step	Task	Term	Options	Multiplier	Choose:	Value	Unit	Fire Flow
Construction Coefficient (C)								
1	Choose frame used for building	Coefficient C related to the type of construction	Wood Frame Construction (Type V)	1.5	Noncombustible Construction (Type II)	**0.8**		
			Mass Timber Construction (Type IV-A)	0.8				
			Mass Timber Construction (Type IV-B)	0.9				
			Mass Timber Construction (Type IV-C)	1.0				
			Mass Timber Construction (Type IV-D)	1.5				
			Ordinary Construction (Type III)	1.0				
			Noncombustible Construction (Type II)	0.8				
			Fire Resistive Construction (Type I)	0.6				
Floor Gross Area (A)								
2	Total Effective Gross Floor Area = Hotel (Ground Floor 1530sm + 2nd floor 1301sm + Addition floors (5) 2043sm [use 50%]), Family Entertainment Center (Ground floor 1788sm+1479sm), Waterpark (6643sm), Support Bldg (3469)					**21,318**	m^2	
3	Obtain fire flow before reductions	Required fire flow (rounded to nearest 1000)	Fire Flow = 220 x C x $A^{0.5}$				L/min	**26,000**
Occupancy and Contents Adjustment								
4	Choose combustibility of contents	Occupancy hazard reduction or surcharge	Noncombustible	-25%	Limited combustible	**-15%**	L/min	**22,100**
			Limited combustible	-15%				
			Combustible	0%				
			Free burning	15%				
			Rapid burning	25%				
Sprinkler Protection								
5	Choose reduction for sprinklers	Sprinkler reduction	Automatic sprinkler protection designed & installed in accordance with NFPA 13	-30%	True	**-30%**	L/min	**11,050**
			Water supply is standard for both the system and fire department hose lines	-10%	True	**-10%**		
			Fully supervised system	-10%	True	**-10%**		
Exposure Adjustment								
6	Choose separation	Exposure distance	North side	>30m	0%	**15%**	L/min	**14,365**
			East side	>30m	0%			
			South side	10.1 to 20m	15%			
			West side	>30m	0%			
Net Required Fire Flow								
7	Obtain fire flow and duration				Minimum required fire flow (rounded to nearest 1000)		L/min	**14,000**
					Minimum required fire flow		L/s	**233.3**
					Required duration of fire flow		hr	**2**

APPENDIX D

Sanitary Calculations

SANITARY SEWER CALCULATION SHEET



Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION								COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Block 240 (Commercial)																													
	76A	77A						0.00				0.64	0.64		0.00		0.00	0.31	0.64	0.64	0.21	0.52	16.0	250	0.65	47.94	0.01	0.98	0.31
To avenue Derreen Avenue, Pipe 77A - 78A								0.00	0				0.64		0.00		0.00			0.64									
Block 241 (Commercial)																													
	74A	75A						0.00				1.06	1.06		0.00		0.00	0.52	1.06	1.06	0.35	0.87	15.5	250	0.65	47.94	0.02	0.98	0.37
To avenue Derreen Avenue, Pipe 75A - 77A								0.00	0				1.06		0.00		0.00			1.06									
Block 244 (Employment)																													
	68A	70A PARKING AREA						0.00				1.99	1.99		0.00		0.00	0.97	1.99	1.99	0.66	1.62	15.0	250	0.65	47.94	0.03	0.98	0.45
To chemin Culdaff Road, Pipe 70A - 72A								0.00	0				1.99		0.00		0.00			1.99									
Block 243 (Commercial)																													
	69A	70A						0.00				1.60	1.60		0.00		0.00	0.78	1.60	1.60	0.53	1.31	15.0	250	0.65	47.94	0.03	0.98	0.42
To chemin Culdaff Road, Pipe 70A - 72A								0.00	0				1.60		0.00		0.00			1.60									
Block 256 (Commercial)																													
BLOCK 251	66A	67A						0.00				1.59	1.59		0.00		0.00	0.77	1.59	1.59	0.52	1.30	15.0	250	0.65	47.94	0.03	0.98	0.42
To chemin Culdaff Road, Pipe 67A - 70A								0.00	0				1.59		0.00		0.00			1.59									
Block 233 (Servicing Block)																													
Contribution From cours Curraglass Walk, Pipe 30A - 33A								1.42	139				0.00		0.00		0.00		1.42	1.42									
Contribution From cours Curraglass Walk, Pipe 32A - 33A								1.15	120				0.00		0.00		0.00		1.15	1.15									
	33A	34A	0.01				0	2.58	259	3.48	2.92		0.00		0.00		0.00	0.00	0.01	2.58	0.85	3.78	12.0	200	0.40	20.74	0.18	0.66	0.50
	34A	37A	0.05				0	2.63	259	3.48	2.92		0.00		0.00		0.00	0.00	0.05	2.63	0.87	3.79	60.5	200	0.45	22.00	0.17	0.70	0.52
To terrasse Crossway Terrace, Pipe 37A - 39A								2.63	259				0.00		0.00		0.00			2.63									
terrasse Crossway Terrace																													
	35A	36A	0.49	12	12		41	0.49	41	3.67	0.49		0.00		0.00		0.00	0.00	0.49	0.49	0.16	0.65	63.5	200	0.65	26.44	0.02	0.84	0.35
	36A	37A	0.53	15	15		51	1.02	92	3.60	1.07		0.00		0.00		0.00	0.00	0.53	1.02	0.34	1.41	77.5	200	0.70	27.44	0.05	0.87	0.45
Contribution From Block 223, Pipe 34A - 37A								2.63	259				0.00		0.00		0.00		2.63	2.63									
	37A	39A	0.19	4	4		14	3.84	365	3.43	4.06		0.00		0.00		0.00	0.00	0.19	3.84	1.27	5.33	46.5	250	0.30	32.57	0.16	0.66	0.49
Contribution From Block 236 (Park), Pipe 38A - 39A								0.00	0				0.00		0.00		0.53		0.53	0.53	0.17	0.17	11.0	200	0.65	26.44	0.01	0.84	0.23
	400A	640A	0.67	23		23	63	0.67	63	3.63	0.74		0.00		0.00		0.00	0.00	0.67	0.67	0.22	0.96	94.5	200	0.65	26.44	0.04	0.84	0.40
	640A	641A						0.67	63	3.63	0.74		0.00		0.00		0.00	0.00	0.00	0.67	0.22	0.96	2.5	200	1.00	32.80	0.03	1.04	0.46
	39A	40A	0.39	13		13	35	4.23	400	3.42	4.43		0.00		0.00		0.53	0.09	0.39	4.76	1.57	6.09	79.0	250	0.30	32.57	0.19	0.66	0.51
	40A	641A						4.23	400	3.42	4.43		0.00		0.00		0.53	0.00	0.00	4.76	1.57	6.00	89.5	250	0.30	32.57	0.18	0.66	0.51
	641A	64A						4.90	463	3.39	5.09		0.00		0.00		0.53	0.00	0.00	5.43	1.79	6.88	6.0	250	0.30	32.57	0.21	0.66	0.52
To chemin Culdaff Road, Pipe 64A - 73A								4.90	463				0.00		0.00		0.53			5.43									
rang Kindred Row																													
	45A	46A	0.71	22		22	60	0.71	60	3.64	0.71		0.00		0.00		0.00	0.00	0.71	0.71	0.23	0.94	78.5	200	0.65	26.44	0.04	0.84	0.39
	46A	47A	0.58	22		22	60	1.29	120	3.58	1.39		0.00		0.00		0.00	0.00	0.58	1.29	0.43	1.82	90.5	200	0.65	26.44	0.07	0.84	0.48
To placette Allied Mews, Pipe 47A - 48A								1.29	120				0.00		0.00		0.00			1.29									
ruelle Ballinora Lane																													
	56A	57A	0.39	18		18	49	0.39	49	3.65	0.58		0.00		0.00		0.00	0.00	0.39	0.39	0.13	0.71	61.5	200	0.65	26.44	0.03	0.84	0.36
	57A	58A	0.30			17	46	0.69	95	3.60	1.11		0.00		0.00		0.00	0.00	0.30	0.69	0.23	1.34	66.0	200	0.40	20.74	0.06	0.66	0.37
	58A	59A	0.01					0.70	95	3.60	1.11		0.00		0.00		0.00	0.00	0.01	0.70	0.23	1.34	10.5	200	0.40	20.74	0.06	0.66	0.37
To chemin Culdaff Road, Pipe 59A - 63A								0.70	95				0.00		0.00		0.00			0.70									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha			
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.50				Townhouse coeff=	2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4	

Designed: R.A.	PROJECT: **195 Huntmar Drive**		
Checked: W.L.	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 87-93	File Ref: 12-624	Date: **July 2020**	Sheet No. 1 of 5

624_San3.xlsx



SANITARY SEWER CALCULATION SHEET

Ottawa

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION									COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
placette Allied Mews																													
	41A	42A	0.71	22		22	60	0.71	60	3.64	0.71		0.00		0.00		0.00	0.00	0.71	0.71	0.23	0.94	79.0	200	0.80	29.34	0.03	0.93	0.42
	42A	43A	0.57	22		22	60	1.28	120	3.58	1.39		0.00		0.00		0.00	0.00	0.57	1.28	0.42	1.81	83.0	200	0.40	20.74	0.09	0.66	0.40
	43A	44A	0.03				0	1.31	120	3.58	1.39		0.00		0.00		0.00	0.00	0.03	1.31	0.43	1.82	11.0	200	0.40	20.74	0.09	0.66	0.41
	44A	47A	0.24	7		7	19	1.55	139	3.56	1.60		0.00		0.00		0.00	0.00	0.24	1.55	0.51	2.12	61.0	200	0.40	20.74	0.10	0.66	0.42
Contribution From rang Kindred Row, Pipe 46A - 47A								1.29	120				0.00		0.00		0.00		1.29	1.29									
	47A	48A	0.30	9		9	25	3.14	284	3.47	3.19		0.00		0.00		0.00	0.00	0.30	3.14	1.04	4.23	62.0	200	0.40	20.74	0.20	0.66	0.52
	48A	59A						3.14	284	3.47	3.19		0.00		0.00		0.00	0.00	0.00	3.14	1.04	4.23	10.0	200	0.40	20.74	0.20	0.66	0.52
To chemin Culdaff Road, Pipe 59A - 63A								3.14	284				0.00		0.00		0.00			3.14									
cercle Leinster Circle																													
	49A	50A	0.22	7		7	19	0.22	19	3.71	0.23		0.00		0.00		0.00	0.00	0.22	0.22	0.07	0.30	49.5	200	0.80	29.34	0.01	0.93	0.30
	50A	51A	0.26	11		11	30	0.48	49	3.65	0.58		0.00		0.00		0.00	0.00	0.26	0.48	0.16	0.74	80.5	200	0.65	26.44	0.03	0.84	0.36
	51A	55A	0.01					0.49	49	3.65	0.58		0.00		0.00		0.00	0.00	0.01	0.49	0.16	0.74	10.5	200	0.40	20.74	0.04	0.66	0.30
To chemin Culdaff Road, Pipe 55A - 59A								0.49	49				0.00		0.00		0.00			0.49									
	60A	61A						0.00				1.67	1.67		0.00		0.00	0.81	1.67	1.67	0.55	1.36	23.5	250	0.65	47.94	0.03	0.98	0.43
	61A	62A	0.45	18		18	49	0.45	49	3.65	0.58		1.67		0.00		0.00	0.81	0.45	2.12	0.70	2.09	120.0	250	0.65	47.94	0.04	0.98	0.48
	62A	63A	0.01				0	0.46	49	3.65	0.58		1.67		0.00		0.00	0.81	0.01	2.13	0.70	2.09	9.5	250	0.65	47.94	0.04	0.98	0.48
To chemin Culdaff Road, Pipe 63A - 64A								0.46	49				1.67		0.00		0.00			2.13									
Block 232 (Condo)																													
	53A	54A	1.75				446	1.75	446	3.40	4.91		0.00		0.00		0.00	0.00	1.75	1.75	0.58	5.49	11.0	250	0.65	47.94	0.11	0.98	0.64
To chemin Culdaff Road, Pipe 54A - 55A								1.75	446				0.00		0.00		0.00			1.75									
chemin Culdaff Road																													
Block 251? → MTO lands	65A	67A	0.07				0	0.07	0			21.99	21.99		0.00		0.00	10.69	22.06	22.06	7.28	17.97	26.5	250	0.30	32.57	0.55	0.66	0.68
Contribution From Block 256, Pipe 66A - 67A								0.00	0				1.59		0.00		0.00		1.59	1.59									
Road DA	67A	70A	0.25				0	0.32	0				23.58		0.00		0.00	11.46	0.25	23.90	7.89	19.35	97.0	250	0.30	32.57	0.59	0.66	0.69
Contribution From Block 244, Pipe 68A - 70A								0.00	0				1.99		0.00		0.00		1.99	1.99									
Contribution From Block 243, Pipe 69A - 70A								0.00	0				1.60		0.00		0.00		1.60	1.60									
			0.12				0	0.44	0				27.17		0.00		0.00		0.12	27.61									
	70A	72A	0.19				0	0.63	0				27.17		0.00		0.00	13.21	0.19	27.80	9.17	22.38	76.0	250	0.30	32.57	0.69	0.66	0.71
Contribution From Block 242, Pipe 71A - 72A								0.00	0				2.70		0.00		0.00		2.70	2.70									
	72A	73A	0.16				0	0.79	0				29.87		0.00		0.00	14.52	0.16	30.66	10.12	24.64	74.0	250	0.30	32.57	0.76	0.66	0.73
To avenue Derreen Avenue, Pipe 73A - 75A								0.79	0				29.87		0.00		0.00			30.66									
chemin Culdaff Road																													
	52A	54A	0.74	15		15	41	0.74	41	3.67	0.49		0.00		0.00		0.00	0.00	0.74	0.74	0.24	0.73	102.5	200	0.65	26.44	0.03	0.84	0.36
Contribution From Block 232, Pipe 53A - 54A								1.75	446				0.00		0.00		0.00		1.75	1.75									
	54A	55A	0.09	3		3	9	2.58	496	3.38	5.43		0.00		0.00		0.00	0.00	0.09	2.58	0.85	6.29	21.0	250	0.30	32.57	0.19	0.66	0.51
Contribution From cercle Leinster Circle, Pipe 51A - 55A								0.49	49				0.00		0.00		0.00		0.49	0.49									
	55A	59A	0.15	4		4	11	3.22	556	3.36	6.05		0.00		0.00		0.00	0.00	0.15	3.22	1.06	7.12	45.0	250	0.30	32.57	0.22	0.66	0.53
Contribution From placette Allied Mews, Pipe 48A - 59A								3.14	284				0.00		0.00		0.00		3.14	3.14									
Contribution From ruelle Ballinora Lane, Pipe 58A - 59A								0.70	95				0.00		0.00		0.00		0.70	0.70									
	59A	63A	0.07				0	7.13	935	3.25	9.86		0.00		0.00		0.00	0.00	0.07	7.13	2.35	12.22	45.0	250	0.30	32.57	0.38	0.66	0.61
Contribution From cercle Leinster Circle, Pipe 62A - 63A								0.46	49				1.67		0.00		0.00		2.13	9.26									
	63A	64A	0.03				0	7.62	984	3.24	10.34		1.67		0.00		0.00	0.81	0.03	9.29	3.07	14.22	27.5	250	0.30	32.57	0.44	0.66	0.64

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330	L/s/ha	
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600	m/s	
Max Res. Peak Factor =	4.00				Manning's n = (Conc)	0.013	(Pvc)	0.013
Commercial/Inst./Park Peak Factor =	1.50				Townhouse coeff=	2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4		

Designed: R.A.	PROJECT: **195 Huntmar Drive**		
Checked: W.L.	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 87-93	File Ref: 12-624	Date: **July 2020**	Sheet No. 2 of 5

624_San3.xlsx

LRL Associates Ltd.
Sanitary Sewer Design Sheet

LRL File No.: 240720.00
Project: Verevas Ottawa Waterpark
Location: 2775 & 2785 Palladium Drive
Designed: KP
Checked:
Date: July 3, 2026
DWG. Reference:

Sanitary Design Parameters

Commercial & Institutional Flow = 28000 L/ha/day
Light Industrial Flow = 35000 L/ha/day
Heavy Industrial Flow = 55000 L/ha/day
Office Space = 75L/9.3m2/d
Commercial & Institutional Peak Factor = 1.5
Average Daily Flow = 280 L/p/day
Industrial Peak Factor = as per Appendix 4-B
Extraneous Flow = 0.33 L/s/ha
Hotel = 225 L/bed/d (MEO Table 5-3)

Pipe Design Parameters

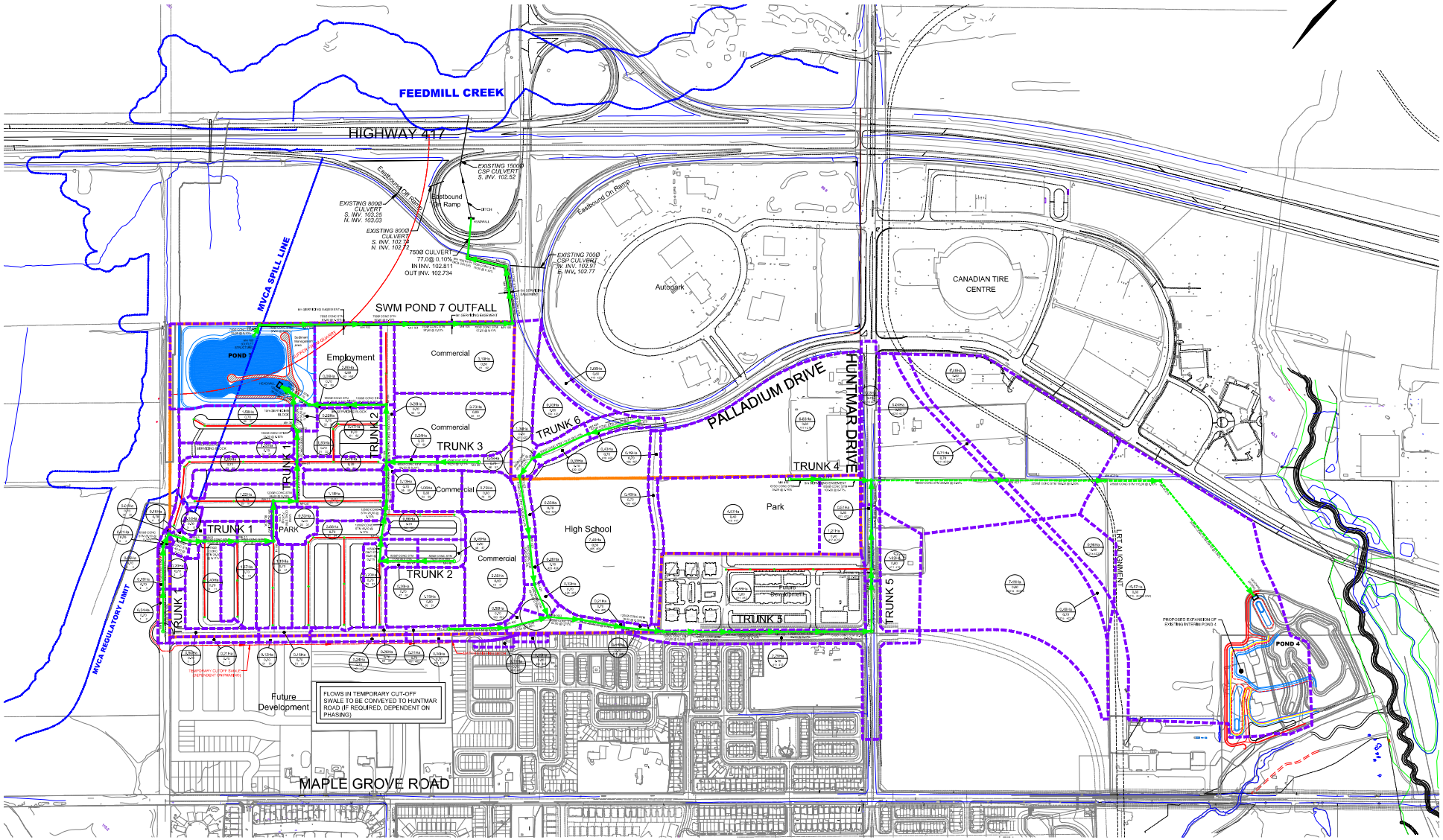
Maximum Velocity = 3.00 m/s
Minimum Velocity = 0.60 m/s
Manning's n = 0.013

LOCATION			Residential and Populations						COMMERCIAL		LIGHT-INDUSTRIAL			INSTITUTIONAL		C+I+I	INFILTRATION			TOTAL FLOW, Q	PIPE						
STREET	FROM	TO	AREA	POP.	ACCU. AREA	ACCU. POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FACT.	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW		LENGTH	DIA.	SLOPE	MATERIAL	CAP. Q(FULL)	VEL. V(FULL)	RATIO Q /QFULL
			(Ha)		(Ha)			(L/s)	(Ha)	(Ha)		(Ha)		(Ha)	(Ha)	(L/s)	(Ha)	(Ha)	(L/s)	(L/s)	(m)	(mm)	(%)		(L/s)	(m/s)	
Culdaff Road (MTO lands Block 256)	MH65A MHSA76101	MH67A MHSA76097							16.200	16.200			1.5			7.88	16.200	16.200	5.35	13.22	15.0	250	0.65%	PVC	47.94	0.98	0.28
Hotel & Entertainment Centre	**MH66A MHSA76096**	**MH67A MHSA76097**				**236**	**3.5**	**2.15**	**0.480**	**0.480**			**1.5**			**2.38**	**1.660**	**1.660**	**0.55**	5.08	**15.0**	**250**	**0.65%**	**PVC**	**47.94**	**0.98**	**0.11**
Culdaff Road Roadway																	0.250	0.250	0.08	0.08							
Culdaff Road Roadway																	0.120	0.120	0.04	0.04							
	MH67A MHSA76097	MH70A MHSA76098																		**18.42**	97.0	250	0.30%	PVC	32.57	0.66	0.57
Water Park & Support Building	**MH69A MHSA76099**	**MH70A MHSA844098**						**0.46**	**0.350**	**0.350**			**1.5**			**0.63**	**1.660**	**1.660**	**0.55**	1.64	**15.0**	**250**	**0.65%**	**PVC**	**47.94**	**0.98**	**0.03**
Culdaff Road (Block 244) parking area	**MH68A MHSA76100**	**MH70A MHSA76098**							**1.990**	**1.990**			**1.5**			**0.97**	**1.990**	**1.990**	**0.66**	1.62	**15.0**	**250**	**0.65%**	**PVC**	**47.94**	**0.98**	**0.03**
	MH70A MHSA76098	MH72A MHSA76092																		**21.69**	**97.0**	**250**	**0.30%**	**PVC**	**32.57**	**0.66**	**0.67**

	Rate	Unit/Ha	Avg Flow L/d	Avg Flow L/d	
Hotel (225L/Bed/Day)	225	236	53100		
Hotel 1st & 2nd floor	28000	0.15	4200		
Entertainment	28000	0.33	9240		
Support	28000	0.35	9800		
Water park	100000	1	100000	40000	Assume a 40% usage

APPENDIX E

Stormwater Management Design Calculations



david schaeffer engineering ltd

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LEGEND:

- STUDY LIMIT
- PROPOSED STORM TRUNK
- KWMSS STORM TRUNK
- LOCAL STORM SEWER
- STORM MANHOLE
- STORM TRIBUTARY BOUNDARY
- EXISTING DITCH
- DRAINAGE AREAS (HA) RUNOFF COEFFICIENT UPSTREAM/DOWNSTREAM MH

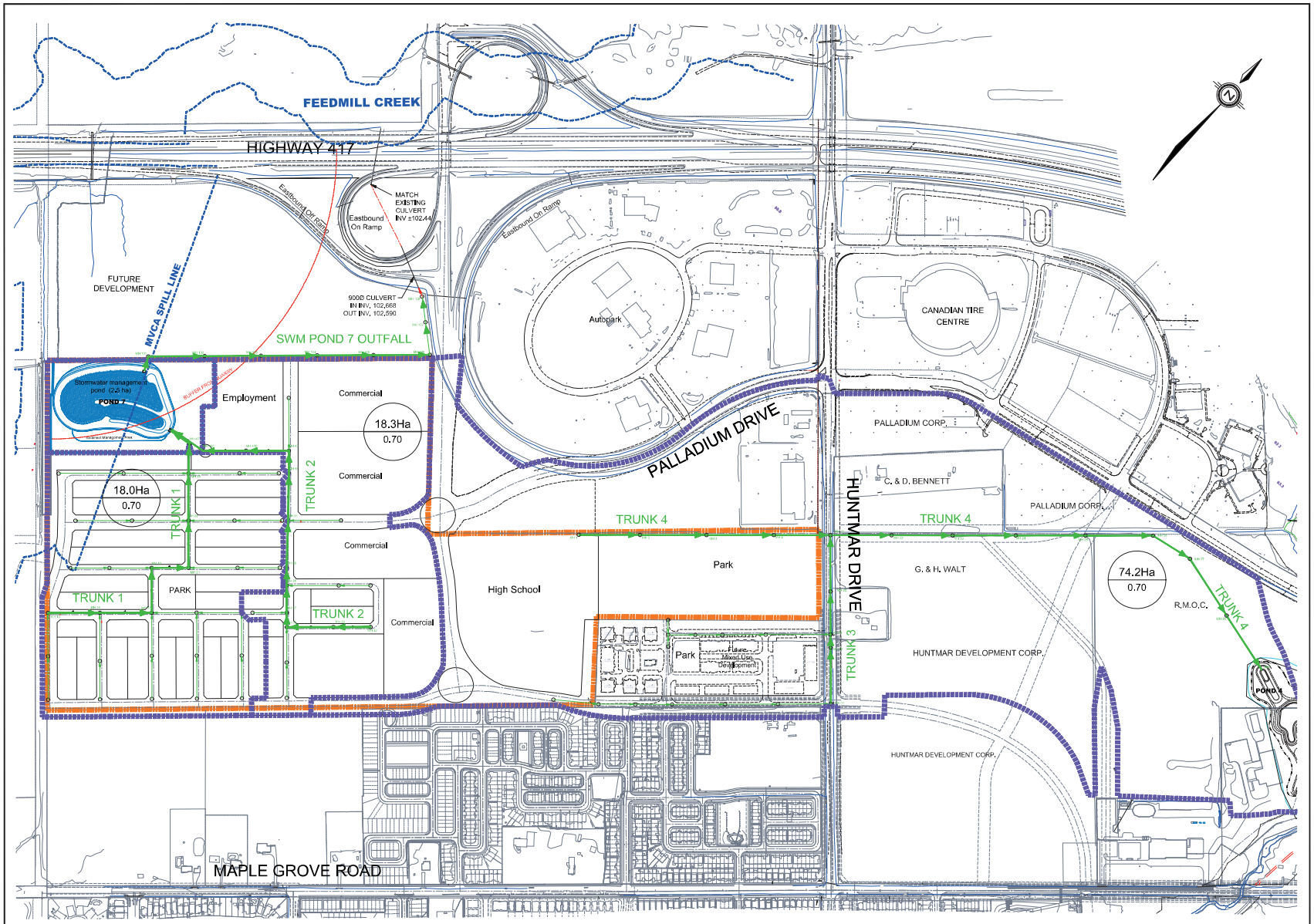
KANATA WEST - 195 HUNTMAR DRIVE

CONCEPTUAL STORM SERVICING PLAN

CITY OF OTTAWA

PROJECT No. :	12-624
SCALE	1:2500
DATE:	April 2019
DRAWING No.	2

CITY FILE No. D07-16-16-0011 CITY PLAN No. 1714



DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LEGEND:
STUDY LIMIT
EXISTING DITCH
MAJOR OVERLAND FLOW

KANATA WEST - 195 HUNTMAR DRIVE
CONCEPTUAL STORM SERVICING PLAN
CITY OF OTTAWA

PROJECT No.:	14-624
SCALE	1:2000
DATE:	MAY 2018
DRAWING No.	2

J.F. Sabourin and Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

52 Springbrook Drive
Ottawa (Stittsville), ON K2S 1B9
TEL: (613) 836-3884
FAX: (613) 836-0332
WEB: www.jfsa.com

February 6, 2019

David Schaeffer Engineering Limited
120 Iber Road, Unit 103
Ottawa, Ontario K2S 1E9

Attention: **Laura Maxwell**

Subject: **Preliminary Kanata West Pond 7 Sizing** *our file: 1476-16*

As requested by your office, we have evaluated, based on the information described below, the minimum volumes required to meet quality, erosion and quantity control requirements for proposed Kanata West Pond 7 in the City of Ottawa. Also as requested, we have summarized the work completed for this project to date.

Note that the current memo is an update of the May 22, 2018 version of this memo, revised in response to City comments received August 9, 2018. City comment C36 states that "...the Carp River PCSWMM interim condition model is now outdated as the Carp River Restoration Plan has almost been completed. Only the ultimate condition model should be used for the analysis." As such, reference to the interim conditions modelling has been removed from the updated memo to avoid confusion.

BACKGROUND INFORMATION - FLOOD LEVEL ANALYSIS

Ultimate conditions PCSWMM models of the Carp River were prepared by the City of Ottawa as per the February 24, 2017 *Carp River PCSWMM Model Documentation*. The 12-hour SCS Type II MTO design storm distribution, as provided with the model, was used to generate 2- to 100-year peak flows and water levels along the Carp River and its tributaries. The ultimate conditions model was modified for the June 13, 2017 *Kanata West Pond 4 and 7 / Impact of Proposed Changes on Carp River Model* memo by JFSA as described below:

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, Pond 4 has a drainage area of 279.234 ha at 62% imperviousness and discharges to the Carp River, and Pond 7 has a drainage area of 34.54 ha at 85% imperviousness, and discharges to Feedmill Creek. Note that the Pond 4 drainage area is slightly off from the 278.288 ha ultimate drainage area at 62% imperviousness documented in the December 2014 *Design Brief for Pond 4, Kanata West, Mattamy Homes*.

- Per information provided by DSEL, approximately 35.640 ha of drainage area in the northwest corner of the Pond 4 catchment area was modelled as redirected to the Kanata West Pond 7, for revised ultimate conditions drainage areas of 243.594 ha at 64% imperviousness to Pond 4 and 57.30 ha at 70% imperviousness to Pond 7 (including 16.5 ha of MTO lands).

- The model was also modified to reflect a 10.50 ha development area at 70% imperviousness discharging uncontrolled to Feedmill Creek, including a Highway 417 ramp. Note that the ultimate conditions PCSWMM model provided by the City has a 4.9 mm initial abstraction value for impervious areas in the 34.54 ha drainage area to Pond 7. This was assumed to be representative of required LID measures on-site, and was carried forward in PCSWMM modelling of the revised drainage area to Pond 7, but not the 10.50 ha uncontrolled area.

- A second scenario was also considered, wherein 16.50 ha of the ultimate drainage area to Pond 7 (MTO lands) was treated as currently developed at 30% imperviousness and discharging uncontrolled to Feedmill Creek. The two scenarios were referred to as Ultimate Scenario A (40.80 ha to Pond 7, 16.50 ha to Feedmill Creek) and Ultimate Scenario B (57.30 ha to Pond 7).

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, the Pond 4 stage-storage-area-discharge relationship was modelled as per the ultimate conditions design presented in the December 2014 *Design Brief for Pond 4*. For the June 2017 analysis, the interim pond stage-storage-area relationship presented in the December 2014 *Design Brief for Pond 4* was inserted into the ultimate conditions PCSWMM model, with changes to the outlet control structure to accommodate ultimate conditions runoff. Note that the revised ultimate Pond 4 design does not meet the 100-year quantity control target specified in the December 2014 *Design Brief for Pond 4*, but instead relies upon the earlier June 2006 *Kanata West Master Servicing Study*, where quantity control is required only up to the 10-year level. In order to respect hydraulic gradeline analyses completed for existing and future upstream developments, the 100-year ultimate pond level was maintained below the 94.74 m elevation simulated in the June 2006 *Kanata West Master Servicing Study* and the December 2014 *Design Brief for Pond 4*.

- In the City of Ottawa ultimate conditions Carp River PCSWMM model, the Pond 7 preliminary stage-storage-area-discharge relationship was modelled to meet unit release rates of 0.51 L/s/ha for the 15 mm 3-hour Chicago design storm and 8 L/s/ha for the 100-year 12-hour SCS Type II design storm, based on the 34.54 ha drainage area and the April 2017 *Feedmill Creek Stormwater Management Criteria Study*. These target release rates of 17.7 L/s and 276.3 L/s were not revised based on the proposed drainage area revisions; instead the volume available in Pond 7 was adjusted in the PCSWMM model for each scenario to meet the established target release rates.

These scenarios were prepared for the purpose of testing their impact on ultimate conditions 2- to 100-year water levels and flows in the Carp River PCSWMM model. Refer to the June 13, 2017 memo for further details. The summary above is provided for background information only, and is superseded by the analyses below.

BACKGROUND INFORMATION - EROSION ANALYSIS

Subsequent to and superseding the June 2017 analysis, an erosion analysis by Coldwater Consulting Limited was undertaken to understand the impact of proposed Pond 7 Scenario B on erosion in Feedmill Creek. Based on information provided by the City of Ottawa and DSEL, the ultimate conditions Scenario B model was revised to Scenario “B2" for the erosion analysis, as follows:

- The 10.50 ha development area at 70% imperviousness discharging uncontrolled to Feedmill Creek and including a Highway 417 ramp was revised to 8.95 ha at 35% imperviousness.

- The Pond 4 stage-storage curve was revised to approximately 1.6 times the interim Pond 4 stage-storage curve and the outlet controls revised to achieve 0 cm of increase in the 2- to 100-year flood levels on the Carp River.

Details and conclusions of the erosion analysis are presented in the March 13, 2018 *Feedmill Creek SWM Criteria Study - Pond 7 Increased Drainage Area - Erosion and In-Stream Works Analysis* report by Coldwater Consulting Ltd. We understand that an addendum will be prepared to describe addition in-stream erosion protection measures required under the proposed development scenario in greater detail.

The Scenario B2 PCSWMM modelling files prepared for continuous simulation of 1967-2007 Ottawa Airport hourly rainfall data in support of the erosion analysis are attached for ultimate conditions. The summary above is provided for background information only, and is superseded by the analysis below.

CURRENT ANALYSIS - PRELIMINARY SIZING OF POND 7

The current analysis supersedes the background sections above, as well as the previous May 22, 2018 version of this memo.

DSEL has provided a drainage area of 40.8 ha to Pond 7 at 71% imperviousness, per the drainage plan provided in Attachment A. Note that this drainage plan excludes the 16.5 ha MTO lands, similar to Scenario A. However, unlike Scenario A, the target release rates from Pond 7 have been pro-rated to allow for potential development of the MTO lands with separate SWM servicing. The target release rates were calculated based on the original Pond 7 drainage area of 34.54 ha from the February 24, 2017 *Carp River Ultimate Conditions PCSWMM model* by the City of Ottawa, less the 16.5 ha occupied by the MTO lands (undeveloped or separately serviced), leaving 18.04 ha. Henceforth, this scenario may be referred to as Scenario D2. Note that although drainage boundaries to Pond 7 may be refined at the detailed design stage, the target release rates from Pond 7 will be unaffected, as they are based on the original area of 34.54 ha and not the latest post-development area.

Changes made to the PCSWMM ultimate conditions model subcatchments to reflect the proposed drainage area revisions for Scenario D2 are summarized in Table A-1 of Attachment A. Note that the following changes were made to the ultimate conditions PCSWMM modelling in response to the August 9, 2018 City of Ottawa comments:

- The April 2017 *Feedmill Creek Stormwater Management Criteria Study* was updated in April 2018, and several revisions to the PCSWMM modelling of Feedmill Creek were proposed, in part to reflect field survey data gathered on November 23, 2017. The PCSWMM model revisions from the April 2018 *Feedmill Creek Stormwater Management Criteria Study* were incorporated into the ultimate conditions base model dated February 2017, as well as the ultimate conditions Scenario D2 modelling.

- The 8.95 ha area at 35% imperviousness discharging uncontrolled to Feedmill Creek and including a Highway 417 ramp has been split in the ultimate conditions Scenario D2 modelling such that 2.14 ha at 27% imperviousness (FJ107_4) outlets to node FJ020 (shared outlet with the Palladium Autopark), and the remaining 6.81 ha at 38% imperviousness (FS107_2) continues to outlet to node FJ209 (shared outlet with Pond 7). The percent imperviousness characteristics of these areas were measured using satellite images.

Minimum volume requirements for Pond 7 were estimated in PCSWMM and in a simple SWMHYMO model for the purpose of this analysis; the maximum of either modelling approach will be considered as the minimum volume required. Note that additional volume may be required to respect the limitations of real world outlet controls, to provide some degree of construction tolerance, and to allow for a reasonable range of design variation as the development proceeds through later design stages.

Table 1: Simulated Release Rates and Volumes for Kanata West Pond 7 (40.8 ha, 71% imperviousness)

Component	Unit Release Rate [1] (L/s/ha)	Target Release Rate [1] (L/s)	Required Storage (m^3)	
			SWMHYMO	PCSWMM
Permanent Pool [3]	N/A	N/A	7616	
Quality Control [3]	N/A	N/A	1632	
15 mm 3-hour Chicago	0.51	9	3540	2583
100-Year 12-Hour SCS	8	144	20995	20995

[1] Unit release rates as per the April 2018 *Feedmill Creek Stormwater Management Criteria Study* by JFSA Inc. and Coldwater Consulting Ltd.
[2] Target release rates calculated based on the original Pond 7 drainage area of 34.54 ha from the February 2017 Carp River Ultimate Conditions PCSWMM model by the City of Ottawa, less the 16.5 ha occupied by the MTO lands (undeveloped or separately serviced), leaving 18.04 ha.
[3] Quality control and permanent pool requirements based on MOE guidelines for enhanced quality control for wet ponds.

Note that the volume requirements estimated by SWMHYMO are higher than those estimated in PCSWMM due to differences in the modelling programs. Additionally, as noted above, an initial abstraction of 4.9 mm for impervious areas is included in the PCSWMM modelling of the drainage area to Pond 7, as a high-level representation of low impact development measures required per the April 2018 *Feedmill Creek Stormwater Management Criteria Study* as an erosion control measure. The standard City of Ottawa initial abstraction value of 1.57 mm for impervious areas was applied to the SWMHYMO model for the purposes of preliminary pond sizing.

The ultimate conditions 2- to 100-year 12-hour SCS Type II design storm flows and water levels at key points on Carp River and Feedmill Creek are summarized in Table B-1 of Attachment B for the ultimate conditions base model and ultimate conditions Scenario D2. As may be seen from the attached, water levels increase between the two scenarios by up to 7 cm on Feedmill Creek. Water levels do not increase on the Carp River under ultimate conditions Scenario D2. The ultimate base and Scenario D2 PCSWMM modelling files for the 2- to 100-year 12-hour SCS design storms are attached, as well as the Scenario D2 15 mm 3-hour Chicago storm PCSWMM modelling files for the preliminary pond sizing exercise. The SWMHYMO modelling files prepared for the preliminary pond sizing exercise are also attached.

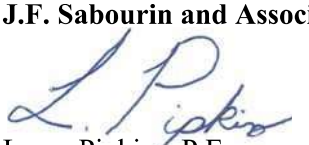
A comparison of 10- and 100-year storm Pond 4 outflow hydrographs for the ultimate base and Scenario D2 models are also included in Attachment B in response to City comments.

MINOR AND MAJOR SYSTEM DESIGN

As per the new approach formalized in the September 2016 *City of Ottawa Technical Bulletin PIEDTB-2016-01*, the subdivision is to be designed to fully contain the 100-year major system flows in road ponding areas up to 35 cm deep, with a 2-year minor system level of service on local roads, 5-year on collector roads, and 10-year on arterial roads. The calculation sheet presented in Attachment C, sourced from the May 2014 *Stormwater Management Guidelines for New Developments Draft Report* prepared for the City of Ottawa by JFSA, demonstrates on a high level that 35 cm deep road ponding areas with a high point to high point slope of 0.15% are sufficient to contain 100-year flows, less 2-year minor system capture, from local drainage areas of up to 75% imperviousness.

If the storage on a specific street segment is surpassed due to blockage or an event greater than the 100-year storm, the excess water will flow towards the next downstream street sag, and eventually to the pond. The major system will be designed such that no flooding of the properties within the subdivision would occur under the 100-year + 20% stress test.

Yours truly,
J.F. Sabourin and Associates Inc.



Laura Pipkins, P.Eng.

cc: J.F. Sabourin, M.Eng, P.Eng.
Director of Water Resources Projects

Attachment A: Conceptual Storm Servicing (DSEL, May 2018)
Revised Catchment Boundaries in the Carp River Model
Attachment B: Comparison of 2- to 100-Year Water Levels and Flows at Key Points on Carp River and Feedmill Creek
10- and 100-Year Outflow Hydrographs from Kanata West Pond 4 to the Carp River
Attachment C: 100-Year Road Ponding Volume Calculation Sheet

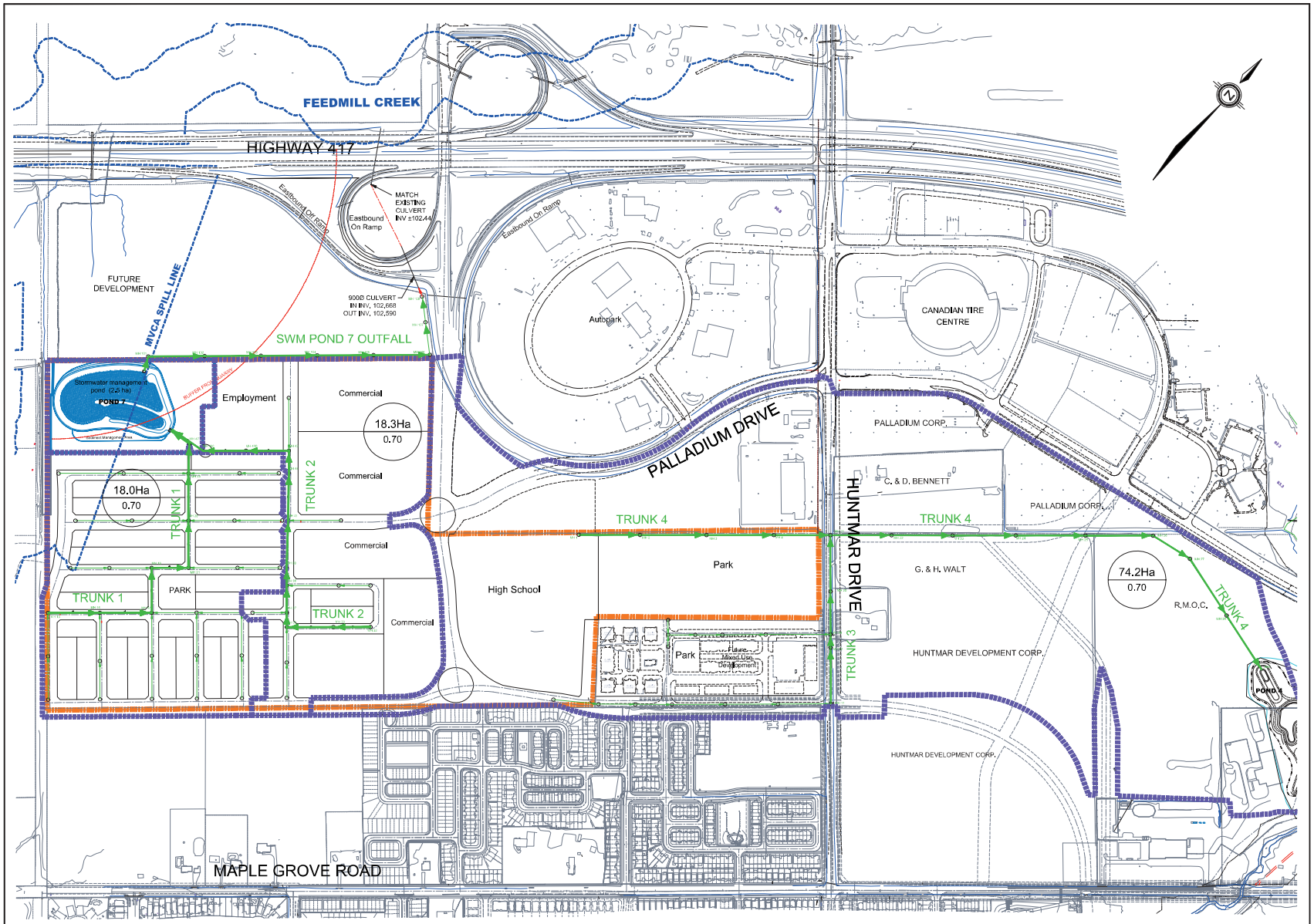
ATTACHMENT

A

Conceptual Storm Servicing Plan (DSEL, May 2018)

Revised Catchment Boundaries in the Carp River Ultimate Conditions Model

JFSA Water Resources and Environmental Consultants



DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 203
Stittsville, ON K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

LEGEND:
STUDY LIMIT
EXISTING DITCH
MAJOR OVERLAND FLOW

KANATA WEST - 195 HUNTMAR DRIVE
CONCEPTUAL STORM SERVICING PLAN
CITY OF OTTAWA

PROJECT No.:	14-624
SCALE	1:2000
DATE:	MAY 2018
DRAWING No.	2

Table A-1: Catchment Boundaries in the Carp River Ultimate Conditions Base Model Revised to Represent Ultimate Scenario D2

PCSWMM Catchment ID	February 2017 Base Model [1]			D2 - KWMSS Pond 4/7 Update [2]			Difference			Notes
	Area (ha)	Imperviousness (%)	Width (m)	Area (ha)	Imperviousness (%)	Width (m)	Area (ha)	Imperviousness (%)	Width (m)	
Base										
PS202	106.24	71.045	708.27	73.89	81.207	493.00	-32.35	10.162	-215.27	
PS230	26.10	69.428	325.00	26.35	69.428	328.07	-28.85	22.132	-1345.29	
PS241_1	18.55	57.689	480.00	18.82	57.689	486.94				
PS241_2	29.29	45.360	379.25	29.29	45.360	366.10				
PS252	17.36	40.873	291.16	17.36	40.873	284.56	0.00	0.000	-6.60	
FS020	7.28	27.000	870.00	6.84	27.000	817.25				
FS022	23.42	95.000	397.00	23.17	95.000	392.72				
FS043	8.39	15.800	200.00	9.48	15.800	226.06				
FS070	7.54	2.600	241.00	7.35	2.600	234.97				
FS081_2	6.94	54.000	192.28	7.20	54.000	199.22	0.25	0.000	6.95	
FS107	34.54	85.000	430.00	40.80	71.000	507.95	6.26	-14.000	77.95	Development to Pond 7
FS107_1				6.81	37.800	279.00	6.81	37.800	279.00	Highway 417 Ramp
FS107_3				16.50	0.000	498.00	16.50	0.000	498.00	MTO Lands Undeveloped to Feedmill Creek
FS107_4				2.14	27.400	88.00	2.14	27.400	88.00	Highway 417 Ramp

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa dated February 2017.

[2] Modified to accommodate revised Kanata West Pond 4 and 7 drainage areas.

ATTACHMENT

B

Comparison of 2- to 100- Year Water Levels and Flows at Key Points on Carp River and Feedmill Creek

10- and 100- Year Outflow Hydrographs from Kanata West Pond 4 to the Carp River

JFSA Water Resources and Environmental Consultants

Table B-1A: 2-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	3.83	93.68	3.82	93.68	-0.01	0.00
Near Fernbank Pond 2 Outfall	CJ200	5.75	93.64	5.75	93.64	0.00	0.00
Hazeldean Road	CJ199	5.64	93.61	5.64	93.61	0.00	0.00
Maple Grove Road	CJ172	5.77	93.45	5.41	93.45	-0.36	0.00
Palladium Drive (Near Pond 4 Outfall)	CJ150	23.97	93.37	22.94	93.37	-1.03	0.00
Highway 417	CJ120	11.42	93.10	11.36	93.10	-0.06	0.00
Feedmill Creek	CJ106	14.34	92.88	14.28	92.88	-0.06	0.00
Richardson Side Road	CJ050	12.93	92.57	12.83	92.57	-0.10	0.00
Huntmar Drive	CJ032	14.71	91.72	14.34	91.70	-0.37	-0.02
Downstream of Eco Woods Pond	FJ105	0.51	117.52	0.51	117.52	0.00	0.00
Upstream of Overland Drive	FJ094	0.97	113.35	0.97	113.35	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	0.64	110.51	0.64	110.51	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	0.77	110.44	0.76	110.44	-0.01	0.00
Adjacent to future Expansion Area 3	FJ085	0.77	110.43	0.76	110.43	-0.01	0.00
Downstream of future Expansion Area 3	FJ074	0.94	107.03	0.94	107.03	0.00	0.00
Existing major system spill point (Interim model)	FJ073	0.98	106.71	0.98	106.71	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	0.94	106.50	0.93	106.50	-0.01	0.00
Upstream of Highway 417*	FJ063	2.12	105.37	2.12	105.37	0.00	0.00
Downstream of Highway 417	FJ062	1.97	105.34	1.97	105.34	0.00	0.00
Upstream of Palladium Dr.	FJ038	3.41	99.63	3.45	99.64	0.04	0.01
Upstream of 417 on-ramp	FJ034	3.38	98.77	3.42	98.78	0.04	0.01
Upstream of 417 off-ramp	FJ032	3.37	98.70	3.41	98.71	0.04	0.01
Upstream of Tanger access road	FJ027	3.38	97.46	3.41	97.47	0.03	0.01
Upstream of Huntmar Drive	FJ019	4.53	96.89	4.57	96.90	0.04	0.01
Between Huntmar Drive and the Carp River	FJ007	4.48	94.46	4.52	94.47	0.04	0.01

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

Table B-1B: 5-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	5.50	93.88	5.49	93.88	-0.01	0.00
Near Fernbank Pond 2 Outfall	CJ200	8.70	93.84	8.70	93.84	0.00	0.00
Hazeldean Road	CJ199	8.50	93.82	8.50	93.82	0.00	0.00
Maple Grove Road	CJ172	9.02	93.66	8.45	93.65	-0.57	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	42.48	93.61	37.51	93.60	-4.97	-0.01
Highway 417	CJ120	17.13	93.39	16.97	93.39	-0.16	0.00
Feedmill Creek	CJ106	22.33	93.15	22.19	93.15	-0.14	0.00
Richardson Side Road	CJ050	20.20	92.85	20.11	92.84	-0.09	-0.01
Huntmar Drive	CJ032	24.31	92.05	24.02	92.04	-0.29	-0.01
Downstream of Eco Woods Pond	FJ105	0.66	117.59	0.66	117.59	0.00	0.00
Upstream of Overland Drive	FJ094	1.20	113.40	1.20	113.40	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	0.82	110.59	0.82	110.59	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.15	110.52	1.15	110.52	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	1.15	110.51	1.15	110.51	0.00	0.00
Downstream of future Expansion Area 3	FJ074	1.48	107.07	1.48	107.07	0.00	0.00
Existing major system spill point (Interim model)	FJ073	1.48	106.83	1.48	106.83	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	1.49	106.61	1.49	106.61	0.00	0.00
Upstream of Highway 417*	FJ063	2.79	105.57	2.79	105.57	0.00	0.00
Downstream of Highway 417	FJ062	2.75	105.49	2.75	105.49	0.00	0.00
Upstream of Palladium Dr.	FJ038	5.60	100.02	5.71	100.04	0.11	0.02
Upstream of 417 on-ramp	FJ034	5.45	99.27	5.61	99.29	0.16	0.02
Upstream of 417 off-ramp	FJ032	5.49	99.16	5.67	99.17	0.18	0.01
Upstream of Tanger access road	FJ027	6.08	97.78	6.30	97.79	0.22	0.01
Upstream of Huntmar Drive	FJ019	7.37	97.18	7.57	97.19	0.20	0.01
Between Huntmar Drive and the Carp River	FJ007	7.02	94.79	7.06	94.86	0.04	0.07

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

Table B-1C: 10-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	6.44	94.00	6.44	94.00	0.00	0.00
Near Fernbank Pond 2 Outfall	CJ200	10.49	93.96	10.49	93.96	0.00	0.00
Hazeldean Road	CJ199	10.21	93.95	10.22	93.95	0.01	0.00
Maple Grove Road	CJ172	11.42	93.80	10.54	93.79	-0.88	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	47.05	93.75	42.30	93.74	-4.75	-0.01
Highway 417	CJ120	21.25	93.55	20.96	93.55	-0.29	0.00
Feedmill Creek	CJ106	27.96	93.29	27.72	93.29	-0.24	0.00
Richardson Side Road	CJ050	24.98	93.03	24.74	93.03	-0.24	0.00
Huntmar Drive	CJ032	31.02	92.23	30.59	92.22	-0.43	-0.01
Downstream of Eco Woods Pond	FJ105	0.78	117.64	0.78	117.64	0.00	0.00
Upstream of Overland Drive	FJ094	1.24	113.41	1.24	113.41	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	0.91	110.65	0.91	110.65	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	1.53	110.60	1.53	110.60	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	1.53	110.58	1.53	110.58	0.00	0.00
Downstream of future Expansion Area 3	FJ074	1.97	107.10	1.97	107.10	0.00	0.00
Existing major system spill point (Interim model)	FJ073	1.97	106.95	1.97	106.95	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	2.00	106.66	2.00	106.66	0.00	0.00
Upstream of Highway 417*	FJ063	3.26	105.71	3.26	105.71	0.00	0.00
Downstream of Highway 417	FJ062	3.26	105.58	3.26	105.58	0.00	0.00
Upstream of Palladium Dr.	FJ038	7.28	100.30	7.45	100.32	0.17	0.02
Upstream of 417 on-ramp	FJ034	7.29	99.49	7.44	99.51	0.15	0.02
Upstream of 417 off-ramp	FJ032	7.31	99.29	7.45	99.30	0.14	0.01
Upstream of Tanger access road	FJ027	7.52	97.91	7.74	97.93	0.22	0.02
Upstream of Huntmar Drive	FJ019	9.10	97.37	9.25	97.39	0.15	0.02
Between Huntmar Drive and the Carp River	FJ007	8.70	94.96	8.89	94.97	0.19	0.01

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

Table B-1D: 25-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	7.34	94.14	7.35	94.14	0.01	0.00
Near Fernbank Pond 2 Outfall	CJ200	12.59	94.11	12.59	94.11	0.00	0.00
Hazeldean Road	CJ199	12.08	94.10	12.11	94.09	0.03	-0.01
Maple Grove Road	CJ172	12.31	93.96	12.34	93.95	0.03	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	38.62	93.91	36.81	93.91	-1.81	0.00
Highway 417	CJ120	25.99	93.73	25.67	93.73	-0.32	0.00
Feedmill Creek	CJ106	34.82	93.46	34.57	93.45	-0.25	-0.01
Richardson Side Road	CJ050	32.84	93.18	32.59	93.18	-0.25	0.00
Huntmar Drive	CJ032	40.79	92.47	40.41	92.46	-0.38	-0.01
Downstream of Eco Woods Pond	FJ105	1.01	117.73	1.01	117.73	0.00	0.00
Upstream of Overland Drive	FJ094	1.27	113.42	1.27	113.42	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	1.16	110.76	1.16	110.76	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	2.09	110.71	2.09	110.71	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	2.09	110.68	2.09	110.68	0.00	0.00
Downstream of future Expansion Area 3	FJ074	2.67	107.14	2.67	107.14	0.00	0.00
Existing major system spill point (Interim model)	FJ073	2.67	107.02	2.67	107.02	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	2.72	106.75	2.72	106.75	0.00	0.00
Upstream of Highway 417*	FJ063	4.20	105.92	4.20	105.92	0.00	0.00
Downstream of Highway 417	FJ062	4.21	105.74	4.21	105.74	0.00	0.00
Upstream of Palladium Dr.	FJ038	9.67	100.64	9.92	100.68	0.25	0.04
Upstream of 417 on-ramp	FJ034	9.40	99.85	9.62	99.89	0.22	0.04
Upstream of 417 off-ramp	FJ032	9.40	99.53	9.62	99.55	0.22	0.02
Upstream of Tanger access road	FJ027	9.55	98.10	9.77	98.12	0.22	0.02
Upstream of Huntmar Drive	FJ019	11.44	97.63	11.64	97.65	0.20	0.02
Between Huntmar Drive and the Carp River	FJ007	11.33	95.10	11.59	95.11	0.26	0.01

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

Table B-1E: 50-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	7.91	94.23	7.91	94.23	0.00	0.00
Near Fernbank Pond 2 Outfall	CJ200	14.09	94.21	14.07	94.20	-0.02	-0.01
Hazeldean Road	CJ199	13.34	94.20	13.35	94.19	0.01	-0.01
Maple Grove Road	CJ172	13.99	94.07	13.87	94.06	-0.12	-0.01
Palladium Drive (Near Pond 4 Outfall)	CJ150	42.08	94.02	38.46	94.01	-3.62	-0.01
Highway 417	CJ120	29.30	93.84	28.88	93.84	-0.42	0.00
Feedmill Creek	CJ106	39.47	93.55	39.16	93.55	-0.31	0.00
Richardson Side Road	CJ050	37.44	93.29	37.25	93.29	-0.19	0.00
Huntmar Drive	CJ032	47.33	92.62	46.97	92.61	-0.36	-0.01
Downstream of Eco Woods Pond	FJ105	1.20	117.79	1.20	117.79	0.00	0.00
Upstream of Overland Drive	FJ094	1.16	113.44	1.16	113.44	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	1.45	110.83	1.45	110.83	0.00	0.00
Downstream of Maple Grove open road allowance	FJ087	2.51	110.78	2.51	110.78	0.00	0.00
Adjacent to future Expansion Area 3	FJ085	2.51	110.75	2.51	110.75	0.00	0.00
Downstream of future Expansion Area 3	FJ074	3.19	107.14	3.19	107.14	0.00	0.00
Existing major system spill point (Interim model)	FJ073	3.19	107.06	3.19	107.06	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	3.26	106.82	3.26	106.82	0.00	0.00
Upstream of Highway 417*	FJ063	4.92	106.08	4.92	106.08	0.00	0.00
Downstream of Highway 417	FJ062	4.94	105.85	4.94	105.85	0.00	0.00
Upstream of Palladium Dr.	FJ038	11.07	100.84	11.34	100.91	0.27	0.07
Upstream of 417 on-ramp	FJ034	10.79	100.12	11.00	100.16	0.21	0.04
Upstream of 417 off-ramp	FJ032	10.79	99.70	10.99	99.73	0.20	0.03
Upstream of Tanger access road	FJ027	10.96	98.23	11.16	98.25	0.20	0.02
Upstream of Huntmar Drive	FJ019	12.78	97.79	13.01	97.82	0.23	0.03
Between Huntmar Drive and the Carp River	FJ007	12.92	95.16	13.16	95.16	0.24	0.00

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

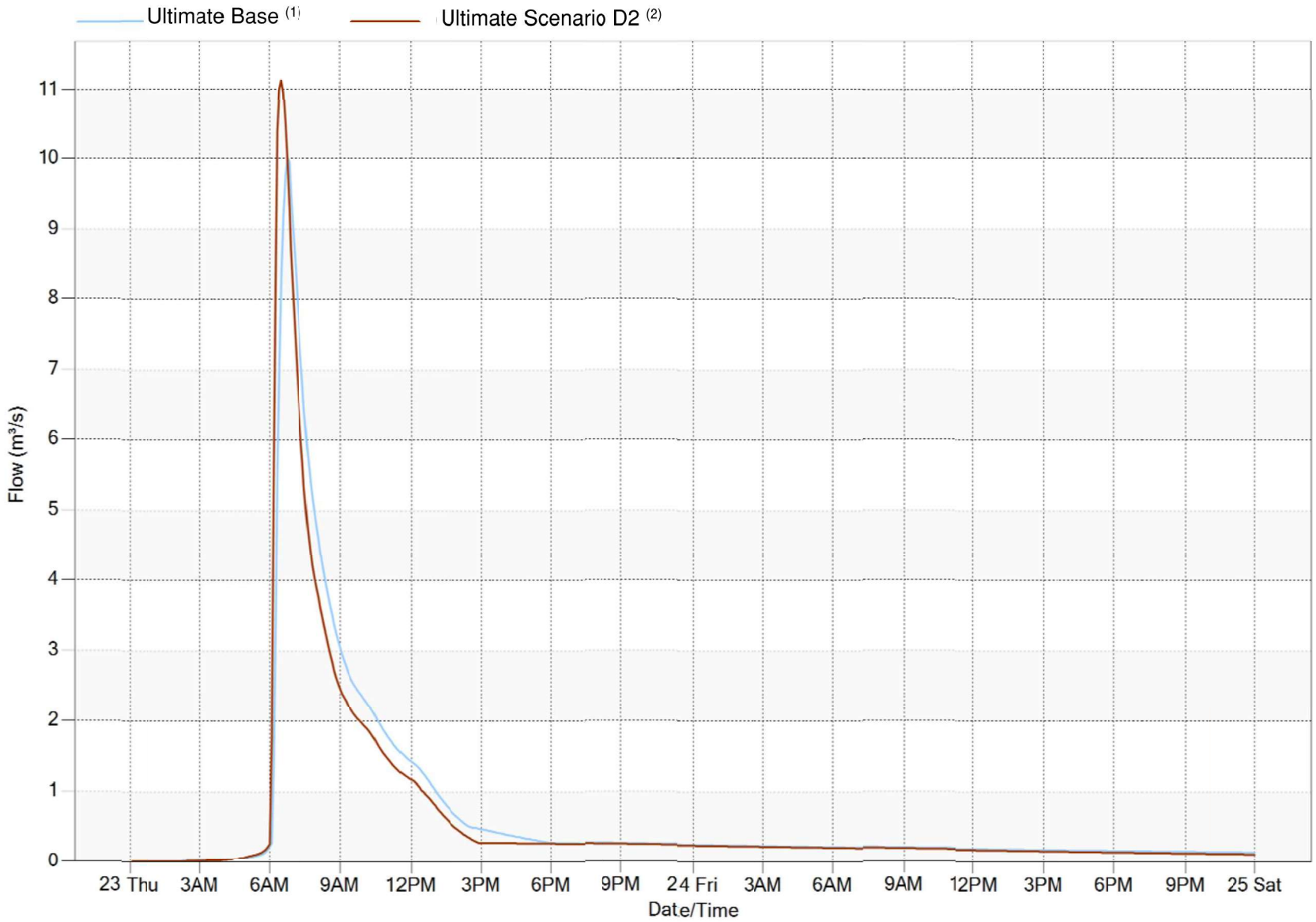
Table B-1F: 100-Year 12-Hour SCS Type II Storm Water Levels and Flows on the Carp River and Feedmill Creek Under Scenario D2

Location on Carp River (CJ) or Feedmill Creek (FJ)	PCSWMM Node	Ultimate Base [1]		D2 - KWMSS Pond 4/7 Update [2]		Difference	
		Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)	Flow (m^3/s)	Water Level (m)
Near Fernbank Pond 3 Outfall	CJ201	8.52	94.33	8.50	94.32	-0.02	-0.01
Near Fernbank Pond 2 Outfall	CJ200	14.98	94.31	14.94	94.30	-0.04	-0.01
Hazeldean Road	CJ199	13.98	94.30	14.00	94.30	0.02	0.00
Maple Grove Road	CJ172	16.24	94.18	15.95	94.18	-0.29	0.00
Palladium Drive (Near Pond 4 Outfall)	CJ150	35.73	94.14	37.07	94.13	1.34	-0.01
Highway 417	CJ120	32.41	93.98	31.95	93.97	-0.46	-0.01
Feedmill Creek	CJ106	44.38	93.69	44.03	93.68	-0.35	-0.01
Richardson Side Road	CJ050	43.51	93.46	43.23	93.45	-0.28	-0.01
Huntmar Drive	CJ032	57.07	93.10	56.75	93.10	-0.32	0.00
Downstream of Eco Woods Pond	FJ105	1.46	117.87	1.46	117.87	0.00	0.00
Upstream of Overland Drive	FJ094	1.71	113.57	1.71	113.57	0.00	0.00
Upstream of Maple Grove open road allowance	FJ088	1.70	110.89	1.71	110.89	0.01	0.00
Downstream of Maple Grove open road allowance	FJ087	2.92	110.85	2.94	110.85	0.02	0.00
Adjacent to future Expansion Area 3	FJ085	2.92	110.81	2.93	110.81	0.01	0.00
Downstream of future Expansion Area 3	FJ074	3.71	107.16	3.71	107.16	0.00	0.00
Existing major system spill point (Interim model)	FJ073	3.71	107.10	3.71	107.10	0.00	0.00
Upstream of rural crossing, adjacent to Pond 7 area	FJ071	3.79	106.86	3.79	106.86	0.00	0.00
Upstream of Highway 417*	FJ063	5.55	106.25	5.55	106.25	0.00	0.00
Downstream of Highway 417	FJ062	5.56	105.94	5.56	105.93	0.00	-0.01
Upstream of Palladium Dr.	FJ038	12.00	101.17	12.24	101.24	0.24	0.07
Upstream of 417 on-ramp	FJ034	11.84	100.34	12.07	100.39	0.23	0.05
Upstream of 417 off-ramp	FJ032	11.84	99.84	12.07	99.87	0.23	0.03
Upstream of Tanger access road	FJ027	12.00	98.32	12.23	98.35	0.23	0.03
Upstream of Huntmar Drive	FJ019	13.85	97.91	14.13	97.95	0.28	0.04
Between Huntmar Drive and the Carp River	FJ007	14.04	95.19	14.31	95.20	0.27	0.01

[1] As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

[2] Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

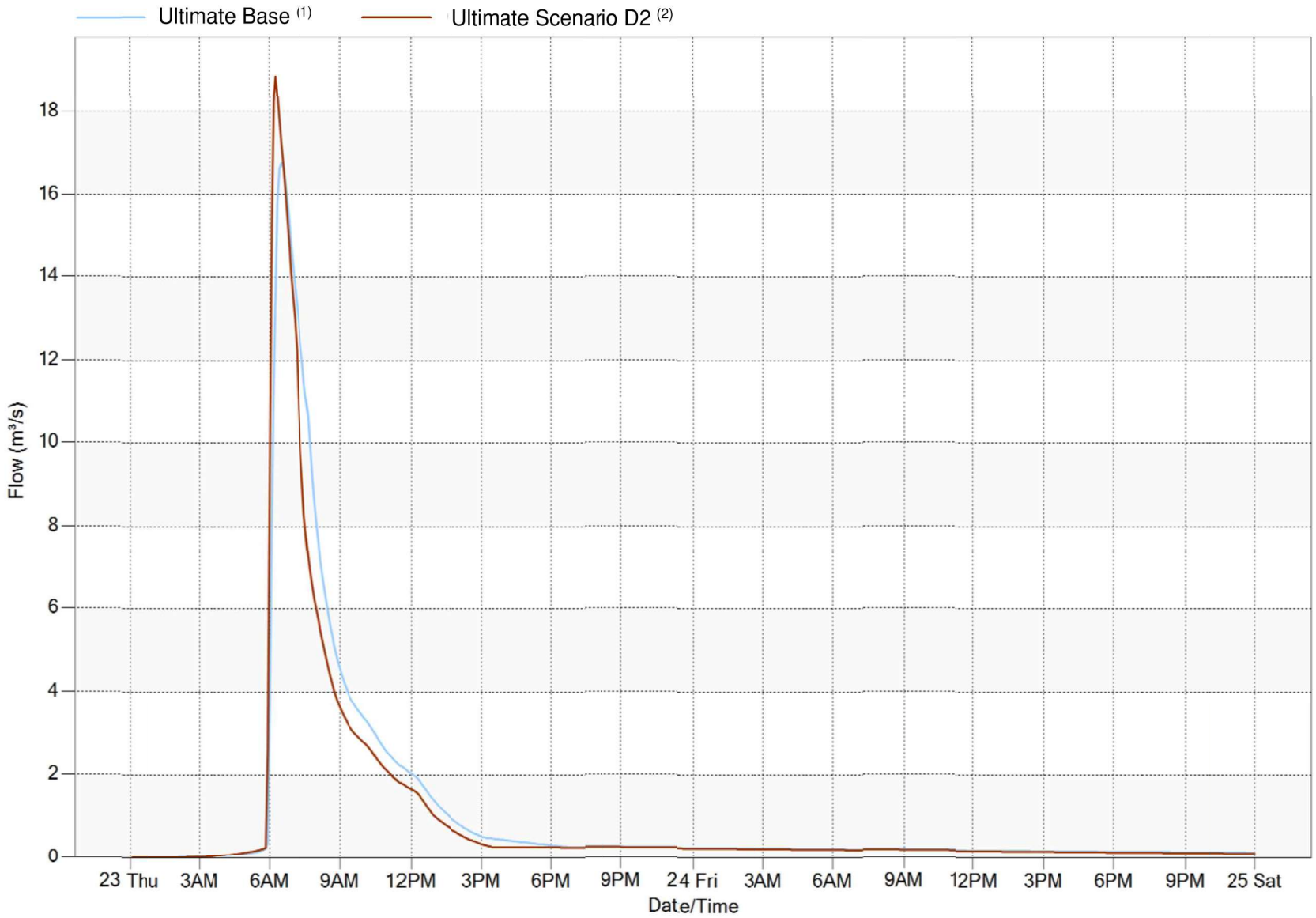
Figure B-1: 10-Year Outflow Hydrographs from Kanata West Pond 4 to the Carp River



(1) As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

(2) Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

Figure B-2: 100-Year Outflow Hydrographs from Kanata West Pond 4 to the Carp River



(1) As per ultimate conditions Carp River PCSWMM model provided by the City of Ottawa, dated February 2017, modified to reflect April 2018 "Feedmill Creek SWM Criteria Final Report".

(2) Ultimate base model modified to reflect revised Kanata West Pond 4 and Pond 7 drainage areas and designs, and surrounding areas draining uncontrolled to Feedmill Creek.

ATTACHMENT

C

100- Year Road Ponding Volume Calculation Sheet

JFSA Water Resources and Environmental Consultants

Calculation Sheet C-1: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less Minor System Capture

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Exte	2	%
Longitudinal Slope (U/S Ponding Extent to LP)	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)\ (1 - Q_5 / Q_{100})\ (LT_c)\ (60/2)$, and

Q = Flow (m^3/s) — A = Area (ha)
V = Volume (m^3) — L = Length of Unit Hydrograph
C = Runoff Coefficient — T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	19.3	18.9	18.6	18.4	18.2	18.0	17.9	17.7	17.6	17.5	17.4	17.3	17.2	17.2	17.1

Static Depth (m)	Static Volume (m^3)	Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.000	0.00	0.046	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
0.005	0.00	0.062	0.01	5.2	5.6	6.1	6.5	6.9	7.4	7.8	8.2	8.7	9.1	9.5	10.0	10.4	10.8	11.3
0.010	0.01	0.078	0.09	6.5	7.1	7.6	8.2	8.7	9.3	9.8	10.4	10.9	11.4	12.0	12.5	13.1	13.6	14.2
0.015	0.02	0.094	0.24	7.9	8.5	9.2	9.8	10.5	11.2	11.8	12.5	13.1	13.8	14.4	15.1	15.8	16.4	17.1
0.020	0.05	0.110	0.48	9.2	10.0	10.8	11.5	12.3	13.1	13.8	14.6	15.4	16.1	16.9	17.7	18.4	19.2	20.0
0.025	0.10	0.126	0.83	10.6	11.4	12.3	13.2	14.1	15.0	15.8	16.7	17.6	18.5	19.4	20.2	21.1	22.0	22.9
0.030	0.18	0.142	1.27	11.9	12.9	13.9	14.9	15.9	16.9	17.9	18.8	19.8	20.8	21.8	22.8	23.8	24.8	25.8
0.035	0.29	0.158	1.81	13.2	14.3	15.5	16.6	17.7	18.8	19.9	21.0	22.1	23.2	24.3	25.4	26.5	27.6	28.7
0.040	0.43	0.174	2.45	14.6	15.8	17.0	18.2	19.4	20.7	21.9	23.1	24.3	25.5	26.7	28.0	29.2	30.4	31.6
0.045	0.61	0.190	3.20	15.9	17.3	18.6	19.9	21.2	22.6	23.9	25.2	26.5	27.9	29.2	30.5	31.9	33.2	34.5
0.050	0.83	0.206	4.05	17.3	18.7	20.1	21.6	23.0	24.5	25.9	27.3	28.8	30.2	31.7	33.1	34.5	36.0	37.4
0.055	1.11	0.222	5.00	18.6	20.2	21.7	23.3	24.8	26.4	27.9	29.5	31.0	32.6	34.1	35.7	37.2	38.8	40.3
0.060	1.44	0.238	6.05	20.0	21.6	23.3	24.9	26.6	28.3	29.9	31.6	33.2	34.9	36.6	38.2	39.9	41.6	43.2
0.065	1.83	0.254	7.21	21.3	23.1	24.8	26.6	28.4	30.2	31.9	33.7	35.5	37.3	39.0	40.8	42.6	44.4	46.1
0.070	2.29	0.270	8.47	22.6	24.5	26.4	28.3	30.2	32.1	33.9	35.8	37.7	39.6	41.5	43.4	45.3	47.2	49.0
0.075	2.81	0.286	9.83	24.0	26.0	28.0	30.0	32.0	34.0	36.0	38.0	40.0	42.0	44.0	45.9	47.9	49.9	51.9
0.080	3.41	0.302	11.30	25.3	27.4	29.5	31.6	33.7	35.9	38.0	40.1	42.2	44.3	46.4	48.5	50.6	52.7	54.9
0.085	4.09	0.318	12.87	26.7	28.9	31.1	33.3	35.5	37.8	40.0	42.2	44.4	46.6	48.9	51.1	53.3	55.5	57.8
0.090	4.86	0.334	14.55	28.0	30.3	32.7	35.0	37.3	39.7	42.0	44.3	46.7	49.0	51.3	53.7	56.0	58.3	60.7
0.095	5.71	0.350	16.31	29.3	31.8	34.2	36.7	39.1	41.6	44.0	46.4	48.9	51.3	53.8	56.2	58.7	61.1	63.6
0.100	6.64	0.366	18.15	30.7	33.2	35.8	38.3	40.9	43.5	46.0	48.6	51.1	53.7	56.2	58.8	61.4	63.9	66.5
0.105	7.66	0.382	20.06	32.0	34.7	37.4	40.0	42.7	45.4	48.0	50.7	53.4	56.0	58.7	61.4	64.0	66.7	69.4
0.110	8.77	0.398	22.03	33.4	36.1	38.9	41.7	44.5	47.3	50.0	52.8	55.6	58.4	61.2	63.9	66.7	69.5	72.3
0.115	9.96	0.414	24.06	34.7	37.6	40.5	43.4	46.3	49.2	52.0	54.9	57.8	60.7	63.6	66.5	69.4	72.3	75.2
0.120	11.23	0.430	26.13	36.0	39.0	42.0	45.0	48.1	51.1	54.1	57.1	60.1	63.1	66.1	69.1	72.1	75.1	78.1
0.125	12.59	0.446	28.24	37.4	40.5	43.6	46.7	49.8	53.0	56.1	59.2	62.3	65.4	68.5	71.7	74.8	77.9	81.0
0.130	14.04	0.462	30.39	38.7	42.0	45.2	48.4	51.6	54.9	58.1	61.3	64.5	67.8	71.0	74.2	77.5	80.7	83.9
0.135	15.57	0.478	32.57	40.1	43.4	46.7	50.1	53.4	56.8	60.1	63.4	66.8	70.1	73.5	76.8	80.1	83.5	86.8
0.140	17.18	0.494	34.79	41.4	44.9	48.3	51.8	55.2	58.7	62.1	65.6	69.0	72.5	75.9	79.4	82.8	86.3	89.7

Calculation Sheet C-1: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less Minor System Capture

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Exte	2	%
Longitudinal Slope (U/S Ponding Extent to LP)	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)\,(1 - Q_5 / Q_{100})\,(LT_c)\,(60/2)$, and

Q = Flow (m^3/s) — A = Area (ha)
V = Volume (m^3) — L = Length of Unit Hydrograph
C = Runoff Coefficient — T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	19.3	18.9	18.6	18.4	18.2	18.0	17.9	17.7	17.6	17.5	17.4	17.3	17.2	17.2	17.1

Static Depth (m)	Static Volume (m^3)	Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)													
0.145	18.88	0.510	37.03	42.8	46.3	49.9	53.4	57.0	60.6	64.1	67.7	71.2	74.8	78.4	81.9	85.5	89.1	92.6
0.150	20.67	0.526	39.29	44.1	47.8	51.4	55.1	58.8	62.5	66.1	69.8	73.5	77.2	80.8	84.5	88.2	91.9	95.5
0.155	22.54	0.542	41.59	45.4	49.2	53.0	56.8	60.6	64.4	68.1	71.9	75.7	79.5	83.3	87.1	90.9	94.7	98.4
0.160	24.50	0.558	43.90	46.8	50.7	54.6	58.5	62.4	66.3	70.2	74.0	77.9	81.8	85.7	89.6	93.6	97.5	101.4
0.165	26.55	0.574	46.25	48.1	52.1	56.1	60.1	64.1	68.2	72.2	76.2	80.2	84.2	88.2	92.2	96.2	100.2	104.3
0.170	28.69	0.590	48.63	49.5	53.6	57.7	61.8	65.9	70.1	74.2	78.3	82.4	86.5	90.7	94.8	98.9	103.0	107.2
0.175	30.93	0.606	51.04	50.8	55.0	59.3	63.5	67.7	72.0	76.2	80.4	84.7	88.9	93.1	97.4	101.6	105.8	110.1
0.180	33.27	0.622	53.48	52.1	56.5	60.8	65.2	69.5	73.9	78.2	82.5	86.9	91.2	95.6	99.9	104.3	108.6	113.0
0.185	35.71	0.638	55.97	53.5	57.9	62.4	66.8	71.3	75.8	80.2	84.7	89.1	93.6	98.0	102.5	107.0	111.4	115.9
0.190	38.25	0.654	58.49	54.8	59.4	64.0	68.5	73.1	77.7	82.2	86.8	91.4	95.9	100.5	105.1	109.6	114.2	118.8
0.195	40.91	0.670	61.05	56.2	60.8	65.5	70.2	74.9	79.6	84.2	88.9	93.6	98.3	103.0	107.6	112.3	117.0	121.7
0.200	43.67	0.686	63.66	57.5	62.3	67.1	71.9	76.7	81.5	86.2	91.0	95.8	100.6	105.4	110.2	115.0	119.8	124.6
0.205	46.55	0.702	66.31	58.9	63.7	68.6	73.5	78.4	83.4	88.3	93.2	98.1	103.0	107.9	112.8	117.7	122.6	127.5
0.210	49.54	0.718	69.00	60.2	65.2	70.2	75.2	80.2	85.3	90.3	95.3	100.3	105.3	110.3	115.4	120.4	125.4	130.4
0.215	52.66	0.734	71.74	61.5	66.7	71.8	76.9	82.0	87.2	92.3	97.4	102.5	107.7	112.8	117.9	123.1	128.2	133.3
0.220	55.89	0.750	74.52	62.9	68.1	73.3	78.6	83.8	89.1	94.3	99.5	104.8	110.0	115.3	120.5	125.7	131.0	136.2
0.225	59.25	0.766	77.35	64.2	69.6	74.9	80.3	85.6	90.9	96.3	101.7	107.0	112.4	117.7	123.1	128.4	133.8	139.1
0.230	62.74	0.782	80.23	65.6	71.0	76.5	81.9	87.4	92.8	98.3	103.8	109.2	114.7	120.2	125.6	131.1	136.6	142.0
0.235	66.36	0.798	83.16	66.9	72.5	78.0	83.6	89.2	94.7	100.3	105.9	111.5	117.1	122.6	128.2	133.8	139.4	144.9
0.240	70.11	0.814	86.13	68.2	73.9	79.6	85.3	91.0	96.6	102.3	108.0	113.7	119.4	125.1	130.8	136.5	142.2	147.9
0.245	74.00	0.830	89.16	69.6	75.4	81.2	87.0	92.8	98.5	104.3	110.1	115.9	121.7	127.5	133.3	139.2	145.0	150.8
0.250	78.03	0.846	92.23	70.9	76.8	82.7	88.6	94.5	100.4	106.4	112.3	118.2	124.1	130.0	135.9	141.8	147.7	153.7
0.255	82.20	0.862	95.36	72.3	78.3	84.3	90.3	96.3	102.3	108.4	114.4	120.4	126.4	132.5	138.5	144.5	150.5	156.6
0.260	86.51	0.878	98.54	73.6	79.7	85.9	92.0	98.1	104.2	110.4	116.5	122.7	128.8	134.9	141.1	147.2	153.3	159.5
0.265	90.98	0.894	101.77	74.9	81.2	87.4	93.7	99.9	106.1	112.4	118.6	124.9	131.1	137.4	143.6	149.9	156.1	162.4
0.270	95.59	0.910	105.05	76.3	82.6	89.0	95.3	101.7	108.0	114.4	120.8	127.1	133.5	139.8	146.2	152.6	158.9	165.3
0.275	100.36	0.926	108.38	77.6	84.1	90.6	97.0	103.5	109.9	116.4	122.9	129.4	135.8	142.3	148.8	155.2	161.7	168.2
0.280	105.28	0.942	111.77	79.0	85.5	92.1	98.7	105.3	111.8	118.4	125.0	131.6	138.2	144.8	151.3	157.9	164.5	171.1
0.285	110.37	0.958	115.21	80.3	87.0	93.7	100.4	107.1	113.7	120.4	127.1	133.8	140.5	147.2	153.9	160.6	167.3	174.0

Calculation Sheet C-1: Road Ponding Volumes Required to Contain 100% of the 100-Year Flow, Less Minor System Capture

User Input Characteristics

IDF Parameters, Intensity = A / (B + Tc) ^ C

Parameter	2-Year	5-Year	100-Year
A	732.951	998.071	1735.688
B	6.199	6.053	6.014
C	0.810	0.814	0.820

Road Width	8.5	m
Road Cross-Slope	0.020	m/m
Right-of-Way Cross-Slope	0.035	m/m
Curb Height	0.15	m
Street Crown	0.0850	m

Lot Depth	30	m
Right Of Way Width	20	m
Difference in Elevation between High Points	0.115	m
Longitudinal Slope (U/S High Point to U/S Exte	2	%
Longitudinal Slope (U/S Ponding Extent to LP)	0.5	%
Longitudinal Slope (LP to D/S Spill Point)	0.5	%
Time of Concentration	10	minutes
Length of Unit Hydrograph	3.5	x Time of Conc.
Minor System Capture (Year or L/s/ha)	2	Year

Calculated Results

2-Year Rainfall Intensity	76.81	mm/hour
5-Year Rainfall Intensity	104.19	mm/hour
100-Year Rainfall Intensity	178.56	mm/hour

Note: Static Volume as per "*Calculation Sheet: Storage In Typical Road Ponding Area*". For Minor System Capture, enter either a 2- or 5-year return period, or a unit capture rate. Drawdown Time is the time to drain the 100-year volume after the peak of the storm, and is not dependent on drainage area. Volume calculated based on the Rational Method as runoff volume exceeding minor system capture, where Q = CIA / 360 and $V = (Q_{100} - Q_5)\,(1 - Q_5 / Q_{100})\,(LT_c)\,(60/2)$, and

Q = Flow (m^3/s) — A = Area (ha)
V = Volume (m^3) — L = Length of Unit Hydrograph
C = Runoff Coefficient — T_c = Time of Concentration (minutes)
I = Intensity (mm/hour)

Imperviousness (%)	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90
Runoff Coeff. (2-, 5-Year)	0.340	0.375	0.410	0.445	0.480	0.515	0.550	0.585	0.620	0.655	0.690	0.725	0.760	0.795	0.830
Runoff Coeff. (100-Year)	0.400	0.438	0.475	0.513	0.550	0.588	0.625	0.663	0.700	0.738	0.775	0.813	0.850	0.888	0.925
Drawdown Time (minutes)	19.3	18.9	18.6	18.4	18.2	18.0	17.9	17.7	17.6	17.5	17.4	17.3	17.2	17.2	17.1

Static Depth (m)	Static Volume (m^3)	Drainage Area (ha)	Static Volume (m^3/ha)	Static Volume Required to Contain 100% of the 100-Year Flow, Less Minor System Capture (m^3)														
0.290	115.61	0.974	118.70	81.7	88.4	95.2	102.0	108.8	115.6	122.5	129.3	136.1	142.9	149.7	156.5	163.3	170.1	176.9
0.295	121.02	0.990	122.25	83.0	89.9	96.8	103.7	110.6	117.5	124.5	131.4	138.3	145.2	152.1	159.1	166.0	172.9	179.8
0.300	126.60	1.006	125.85	84.3	91.4	98.4	105.4	112.4	119.4	126.5	133.5	140.5	147.6	154.6	161.6	168.7	175.7	182.7
0.305	132.35	1.022	129.50	85.7	92.8	99.9	107.1	114.2	121.3	128.5	135.6	142.8	149.9	157.1	164.2	171.3	178.5	185.6
0.310	138.27	1.038	133.21	87.0	94.3	101.5	108.7	116.0	123.2	130.5	137.7	145.0	152.3	159.5	166.8	174.0	181.3	188.5
0.315	144.37	1.054	136.98	88.4	95.7	103.1	110.4	117.8	125.1	132.5	139.9	147.2	154.6	162.0	169.3	176.7	184.1	191.4
0.320	150.65	1.070	140.79	89.7	97.2	104.6	112.1	119.6	127.0	134.5	142.0	149.5	157.0	164.4	171.9	179.4	186.9	194.4
0.325	157.11	1.086	144.67	91.0	98.6	106.2	113.8	121.4	128.9	136.5	144.1	151.7	159.3	166.9	174.5	182.1	189.7	197.3
0.330	163.76	1.102	148.60	92.4	100.1	107.8	115.5	123.1	130.8	138.5	146.2	153.9	161.6	169.3	177.0	184.8	192.5	200.2
0.335	170.59	1.118	152.58	93.7	101.5	109.3	117.1	124.9	132.7	140.6	148.4	156.2	164.0	171.8	179.6	187.4	195.3	203.1
0.340	177.61	1.134	156.63	95.1	103.0	110.9	118.8	126.7	134.6	142.6	150.5	158.4	166.3	174.3	182.2	190.1	198.0	206.0
0.345	184.83	1.150	160.72	96.4	104.4	112.5	120.5	128.5	136.5	144.6	152.6	160.6	168.7	176.7	184.8	192.8	200.8	208.9
0.350	192.25	1.166	164.88	97.8	105.9	114.0	122.2	130.3	138.4	146.6	154.7	162.9	171.0	179.2	187.3	195.5	203.6	211.8
0.355	199.86	1.182	169.09	99.1	107.3	115.6	123.8	132.1	140.3	148.6	156.9	165.1	173.4	181.6	189.9	198.2	206.4	214.7
0.360	207.67	1.198	173.35	100.4	108.8	117.1	125.5	133.9	142.2	150.6	159.0	167.4	175.7	184.1	192.5	200.8	209.2	217.6
0.365	215.69	1.214	177.67	101.8	110.2	118.7	127.2	135.7	144.1	152.6	161.1	169.6	178.1	186.6	195.0	203.5	212.0	220.5
0.370	223.92	1.230	182.05	103.1	111.7	120.3	128.9	137.5	146.0	154.6	163.2	171.8	180.4	189.0	197.6	206.2	214.8	223.4
0.375	232.36	1.246	186.49	104.5	113.1	121.8	130.5	139.2	147.9	156.6	165.4	174.1	182.8	191.5	200.2	208.9	217.6	226.3
0.380	241.01	1.262	190.98	105.8	114.6	123.4	132.2	141.0	149.8	158.7	167.5	176.3	185.1	193.9	202.8	211.6	220.4	229.2
0.385	249.88	1.278	195.53	107.1	116.1	125.0	133.9	142.8	151.7	160.7	169.6	178.5	187.5	196.4	205.3	214.3	223.2	232.1
0.390	258.97	1.294	200.13	108.5	117.5	126.5	135.6	144.6	153.6	162.7	171.7	180.8	189.8	198.9	207.9	216.9	226.0	235.0
0.395	268.28	1.310	204.80	109.8	119.0	128.1	137.2	146.4	155.5	164.7	173.8	183.0	192.2	201.3	210.5	219.6	228.8	237.9
0.400	277.82	1.326	209.52	111.2	120.4	129.7	138.9	148.2	157.4	166.7	176.0	185.2	194.5	203.8	213.0	222.3	231.6	240.8
0.405	287.58	1.342	214.29	112.5	121.9	131.2	140.6	150.0	159.3	168.7	178.1	187.5	196.8	206.2	215.6	225.0	234.4	243.8

J.F. Sabourin and Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

52 Springbrook Drive
Ottawa (Stittsville), ON K2S 1B9
TEL: (613) 836- 3884
FAX: (613) 836- 0332
WEB: www.jfsa.com

May 3, 2019

David Schaeffer Engineering Limited
120 Iber Road, Unit 103
Ottawa, Ontario K2S 1E9

Attention: **Laura Maxwell**

Subject: **195 Huntmar Drive / Flood Analysis of Feedmill Creek Crossings** *our file: 1476-16*

As requested by your office, we have evaluated, based on the information described below, the peak flow, water level and velocity requirements and model results at Feedmill Creek crossings during the 50-year design storm and 100-year regulatory storm under near future and modified ultimate development conditions for Feedmill Creek. Note that the proposed 195 Huntmar development site is represented under pre-development conditions in the near future conditions model.

The April 2018 *Feedmill Creek Stormwater Management Criteria Study Final Report* by J.F. Sabourin and Associates Inc. and Coldwater Consulting Ltd. evaluated erosion and flooding on Feedmill Creek under three development conditions: (1) interim conditions (2015 existing conditions); (2) near future conditions; and (3) ultimate development conditions Stormwater Management (SWM) control scenario B. Water levels and flows on Feedmill Creek were simulated using PCSWMM modelling prepared by the City of Ottawa and modified by JFSA. The proposed development at 195 Huntmar Drive in Ottawa was partly included in the ultimate conditions model, with the included development area to be serviced by proposed SWM Pond 7 discharging to Feedmill Creek, and the unmodelled development area expected to be treated separately by proposed SWM Pond 4 discharging to the Carp River. Note that approximately 16.5 ha of land belonging to the Ontario Ministry of Transportation (MTO) were also modelled as developed under ultimate conditions and serviced by proposed SWM Pond 7.

We understand that an expanded drainage area to Pond 7 from 195 Huntmar Drive of 40.8 ha at 71% imperviousness is now proposed, and have modified the ultimate conditions PCSWMM model of Feedmill Creek to reflect the updated drainage area. We also understand from the City of Ottawa that the 16.5 ha lands owned by MTO are to be treated as undeveloped and not tributary to Pond 7 under these modified ultimate conditions, with the opportunity to be developed and serviced separately in the future. The target release rates for the modified drainage area to Pond 7 were calculated based on the April 2018 *Feedmill Creek* Report SWM criteria B unit release rates, and the original ultimate conditions drainage area to Pond 7 of 34.54 ha, less the 16.5 ha occupied by the MTO lands (undeveloped or separately serviced), leaving 18.04 ha. Refinements were also made to the modelling of areas bordering the modified Pond 7 catchment area based on information provided by DSEL and the City of Ottawa.

The April 2018 *Feedmill Creek* Report evaluated the performance of four MTO culverts and two City of Ottawa crossings of Feedmill Creek during the 50-year design storm. The characteristics of these culverts as modelled in PCSWMM are summarized in Table 1 for reference, along with the characteristics of four MTO crossings of Highway 417 in the channel conveying flows to Feedmill Creek from Pond 7 and surrounding areas; (i) the existing Highway 417 crossing (ID 250) included in the April 2018 *Feedmill Creek* models; (ii /iii) the two existing culverts under the 417 East off-ramp and on-ramp, respectively, added to the model for the purposes of the current analysis; and (iv) the proposed culvert under the 417 East ramps, added to the model for the purposes of the current analysis, which conveys outflows from proposed Pond 7 and areas surrounding the culvert entrance. Figure 3a of the April 2018 *Feedmill Creek* Report is included in Attachment A and presents the locations of the culverts in question, as well as the four added culverts marked in magenta.

Table 1: PCSWMM Model Culvert Data for Key Feedmill Creek Crossings

Road/Crossing Name	Ownership	Culvert Type	Height (m)	Width (m)	Upstream Invert (m)	Edge of Travelled Lane Elevation (m)
Highway 417 (ID 220)	MTO	Concrete Box	1.35	2.4	104.27	107.3
417 East Off-Ramp	MTO	Circular CSP	0.80	N/A	103.25	105.5
417 East On-Ramp	MTO	Circular CSP	0.80	N/A	102.74	106.5
Highway 417 (ID 250)	MTO	Circular CSP	1.50	N/A	102.52	107.47
417 East Ramps (Pond 7)	MTO	Circular Concrete	0.75	N/A	102.811	107.75
Palladium Drive	MTO	Concrete Box	2.00	2.4	98.65	108.4
417 West On-Ramp	MTO	Concrete Box	2.00	2.4	97.32	104.25
417 West Off-Ramp	MTO	Concrete Box	2.00	2.4	97.08	103.9
Tanger Access Road	City of Ottawa	Concrete Box	2.15	4.2	96.4	100.5
Huntmar Drive	City of Ottawa	Elliptical CSP	1.80	3.7	95.79	100.75

Following the same approach as the April 2018 *Feedmill Creek* Report and in accordance with the *MTO Drainage Design Standards* (MTO, 2008), peak flow, water level and velocity requirements and model results at the crossings above during the 50-year 12-hour SCS Type II design storm are presented in Table 2A for the modified ultimate development conditions. Note that a 50-year 12-hour SCS Type II design storm volume of 84.7 mm was applied as calculated for this location based on the October 28, 2016 Implementation of the *Ministry Updated IDF Curves Online Application Version 3 2016-03* memorandum and associated MTO web-based rainfall IDF curves (refer to Attachment B). In accordance with the October 28, 2016 *Implementation of the Ministry's Climate Change Consideration in the Design of Highway Drainage Infrastructure 2016-04* memorandum, we understand that 2010 is the base year for current IDF values.

Table 2A: Modified Ultimate Development Conditions
50-Year Allowable and Simulated Water Levels, Flows and Velocities at Feedmill Creek Culverts

Road/Crossing Name	Maximum Allowable Water Level (m)[a]	50-Year Results for Modified Ultimate Development Conditions					
		Peak Water Level (m)	Peak Flow (m^3/s)	Freeboard (m)	Surcharge Ratio (HW/D)	Peak Velocity (m/s)	Peak Velocity x 1.5 (m/s)
Highway 417 (ID 220)	106.30	106.03	4.68	1.27	1.30	1.44	2.16
417 East Off-Ramp	104.45	104.35	0.34	1.15	1.37	1.27	1.91
417 East On-Ramp	103.94	104.28	1.08	2.22	1.93	2.27	3.41
Highway 417 (ID 250)	104.77	103.28	1.64	4.19	0.51	2.71	4.07
417 East Ramps (Pond 7)	103.94	103.47	0.42	4.28	0.88	1.16	1.74
Palladium Drive	101.65	100.82	10.95	7.58	1.08	2.36	3.54
417 West On-Ramp	100.32	100.09	10.64	4.16	1.39	2.22	3.33
417 West Off-Ramp	100.08	99.68	10.64	4.22	1.30	2.22	3.33
Tanger Access Road	99.50	98.21	10.79	2.29	0.84	1.45	2.18
Huntmar Drive	98.49	97.77	12.58	2.98	1.10	2.40	3.60

[a]Maximum allowable water level based on: Highway Drainage Design Standards - Ministry of Transportation Ontario (January, 2008). The MTO Drainage Standards call for a 50-year design flow freeway crossings with span lengths of less than 6 m.
1) Requirement for a minimum of 1.0 m freeboard between design water level and edge of pavement.
2) Requirement for upstream design flood depth (HW) as a ratio of the culvert diameter (D), limit based on HW/D <= 1.5 (for culverts up to 3.0 m diameter/rise).
3) Requirement for rip-rap protective apron sizing based on 1.5 times the velocity of the design flow.

As may be seen above, all crossings considered in the April 2018 *Feedmill Creek* Report perform in accordance with standards, as do three of the four culverts added to the model for the purposes of this analysis. Note in particular that

the proposed culvert under the Highway 417 East ramps servicing Pond 7 performs in accordance with standards. However, the 50-year water level at the 417 East on-ramp crossing under modified ultimate conditions exceeds the maximum allowable water level by 34 cm, and the culvert has a surcharge ratio of 1.93 (greater than the maximum allowable ratio of 1.5). These modified ultimate conditions violations at the existing Highway 417 East on-ramp crossing are in fact an improvement from near future conditions, where the proposed 195 Huntmar development site is represented under pre-development conditions, as discussed below.

The April 2018 *Feedmill Creek* Report used the near future conditions model as a baseline for comparison of design flood values for the ultimate development conditions; for reference, near future conditions results are presented in Table 2B. Note that the near future model has been updated to include the three added culverts in the channel conveying flows to Feedmill Creek from Pond 7 and surrounding areas, as described above. As noted above, the proposed 195 Huntmar development site is represented under pre-development conditions in the near future conditions model.

Table 2B: Near Future Development Conditions
50-Year Allowable and Simulated Water Levels, Flows and Velocities at Feedmill Creek Culverts

Road/Crossing Name	Maximum Allowable Water Level (m)[a]	50-Year Results for Near Future Development Conditions					
		Peak Water Level (m)	Peak Flow (m^3/s)	Freeboard (m)	Surcharge Ratio (HW/D)	Peak Velocity (m/s)	Peak Velocity x 1.5 (m/s)
Highway 417 (ID 220)	106.30	106.06	4.76	1.24	1.33	1.47	2.21
417 East Off-Ramp	104.45	105.35	0.75	0.15	2.62	1.49	2.24
417 East On-Ramp	103.94	105.03	1.46	1.47	2.23	2.96	4.44
Highway 417 (ID 250)	104.77	103.29	1.67	4.18	0.51	2.72	4.08
417 East Ramps (Pond 7)	103.83	N/A	N/A	N/A	N/A	N/A	N/A
Palladium Drive	101.65	100.84	11.11	7.56	1.10	2.38	3.57
417 West On-Ramp	100.32	100.12	10.79	4.13	1.40	2.25	3.38
417 West Off-Ramp	100.08	99.70	10.79	4.20	1.31	2.25	3.38
Tanger Access Road	99.50	98.23	10.94	2.27	0.85	1.46	2.19
Huntmar Drive	98.49	97.78	12.84	2.97	1.11	2.45	3.68

[a]Maximum allowable water level based on: Highway Drainage Design Standards - Ministry of Transportation Ontario (January, 2008). The MTO Drainage Standards call for a 50-year design flow freeway crossings with span lengths of less than 6 m.
1) Requirement for a minimum of 1.0 m freeboard between design water level and edge of pavement.
2) Requirement for upstream design flood depth (HW) as a ratio of the culvert diameter (D), limit based on HW/D <= 1.5 (for culverts up to 3.0 m diameter/rise).
3) Requirement for rip-rap protective apron sizing based on 1.5 times the velocity of the design flow.

As shown in Table 3, 50-year water levels at the 417 East on-ramp crossing exceeds the maximum allowable water level by 109 cm under near future conditions, and the culvert has a surcharge ratio of 2.23 (greater than the maximum allowable ratio of 1.5). Similarly, 50-year water levels at the 417 East off-ramp crossing exceeds the maximum allowable water level by 90 cm under near future conditions, and the culvert has a surcharge ratio of 2.62; furthermore, the crossing has a freeboard of 0.15 m between the 50-year water level and the edge of pavement elevation. These violations are improved or eliminated under modified ultimate conditions, as discussed above.

In accordance with the October 28, 2016 *Implementation of the Ministry's Climate Change Consideration in the Design of Highway Drainage Infrastructure 2016-04* memorandum, the proposed culvert under the Highway 417 East ramps has also been evaluated based on a 50-year 12-hour SCS Type II design storm volume of 92.4 mm at the end of a 75-year design life (2085 as measured from the base year of 2010; refer to Attachment B), as summarized in Table 2C.

Table 2C: Modified Ultimate Development Conditions (75-Year Design Life)
50-Year Allowable and Simulated Water Levels, Flows and Velocities at Highway 417 East Ramp Culvert

Road/Crossing Name	Maximum Allowable Water Level (m)[a]	50-Year Results for Modified Ultimate Development Conditions (Year 2085)					
		Peak Water Level (m)	Peak Flow (m^3/s)	Freeboard (m)	Surcharge Ratio (HW/D)	Peak Velocity (m/s)	Peak Velocity x 1.5 (m/s)
417 East Ramps (Pond 7)	103.94	103.54	0.47	4.21	0.97	1.17	1.76

[a]Maximum allowable water level based on: Highway Drainage Design Standards - Ministry of Transportation Ontario (January, 2008). The MTO Drainage Standards call for a 50-year design flow freeway crossings with span lengths of less than 6 m.
1) Requirement for a minimum of 1.0 m freeboard between design water level and edge of pavement.
2) Requirement for upstream design flood depth (HW) as a ratio of the culvert diameter (D), limit based on HW/D <= 1.5 (for culverts up to 3.0 m diameter/rise).
3) Requirement for rip-rap protective apron sizing based on 1.5 times the velocity of the design flow.

As may be seen above, the proposed culvert under the Highway 417 East ramps servicing Pond 7 performs in accordance with standards for the duration of the expected 75-year design life.

In response to MTO comments received for the previous version of this report, peak flows, water levels and velocities for the culverts are presented below in Tables 3A and 3B for the 100-year 12-hour SCS Type II regulatory design storm, under modified ultimate and near future conditions, respectively. Note that a 100-year 12-hour SCS Type II design storm volume of 93.2 mm was applied as calculated for this location based on the October 28, 2016 Implementation of the *Ministry Updated IDF Curves Online Application Version 3 2016-03* memorandum and associated MTO web-based rainfall IDF curves (refer to Attachment B).

Table 3A: Modified Ultimate Development Conditions
100-Year Simulated Water Levels, Flows and Velocities at Feedmill Creek Culverts

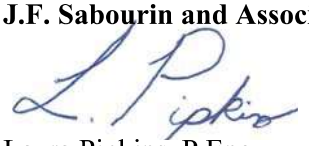
Road/Crossing Name	100-Year Results for Modified Ultimate Development Conditions					
	Peak Water Level (m)	Peak Flow (m^3/s)	Freeboard (m)	Surcharge Ratio (HW/D)	Peak Velocity (m/s)	Peak Velocity x 1.5 (m/s)
Highway 417 (ID 220)	106.18	5.39	1.12	1.41	1.66	2.49
417 East Off-Ramp	104.76	0.44	0.74	1.89	1.29	1.94
417 East On-Ramp	104.64	1.27	1.86	2.38	2.62	3.93
Highway 417 (ID 250)	103.35	1.91	4.12	0.55	2.83	4.25
417 East Ramps (Pond 7)	103.55	0.48	4.20	0.99	1.17	1.76
Palladium Drive	101.09	11.89	7.31	1.22	2.51	3.77
417 West On-Ramp	100.29	11.60	3.96	1.49	2.42	3.63
417 West Off-Ramp	99.81	11.60	4.09	1.37	2.42	3.63
Tanger Access Road	98.31	11.76	2.19	0.89	1.50	2.25
Huntmar Drive	97.90	13.71	2.85	1.17	2.61	3.92

Table 3B: Near Future Development Conditions
100-Year Simulated Water Levels, Flows and Velocities at Feedmill Creek Culverts

Road/Crossing Name	100-Year Results for Near Future Development Conditions					
	Peak Water Level (m)	Peak Flow (m^3/s)	Freeboard (m)	Surcharge Ratio (HW/D)	Peak Velocity (m/s)	Peak Velocity x 1.5 (m/s)
Highway 417 (ID 220)	106.23	5.50	1.07	1.45	1.70	2.55
417 East Off-Ramp	105.73	0.78	-0.23	3.10	1.55	2.33
417 East On-Ramp	105.33	1.59	1.17	2.60	3.20	4.80
Highway 417 (ID 250)	103.33	1.82	4.14	0.54	2.79	4.19
417 East Ramps (Pond 7)	N/A	N/A	N/A	N/A	N/A	N/A
Palladium Drive	101.21	12.07	7.19	1.28	2.53	3.80
417 West On-Ramp	100.37	11.98	3.88	1.53	2.50	3.75
417 West Off-Ramp	99.86	11.98	4.04	1.39	2.50	3.75
Tanger Access Road	98.33	12.13	2.17	0.90	1.53	2.30
Huntmar Drive	97.92	14.05	2.83	1.18	2.68	4.02

Note that the 100-year water level does not reach the edge of travelled lane elevation for any of the modelled crossings under modified ultimate conditions. Additionally, the modified ultimate conditions 100-year water levels are less than the near future conditions 100-year water levels at all crossings assessed except for Highway 417 crossing 250, where the freeboard between the 100-year water level and the edge of pavement elevation exceeds 1.0 m even during the 100-year regulatory event.

Yours truly,
J.F. Sabourin and Associates Inc.



Laura Pipkins, P.Eng.

cc: J.F. Sabourin, M.Eng, P.Eng.
Director of Water Resources Projects

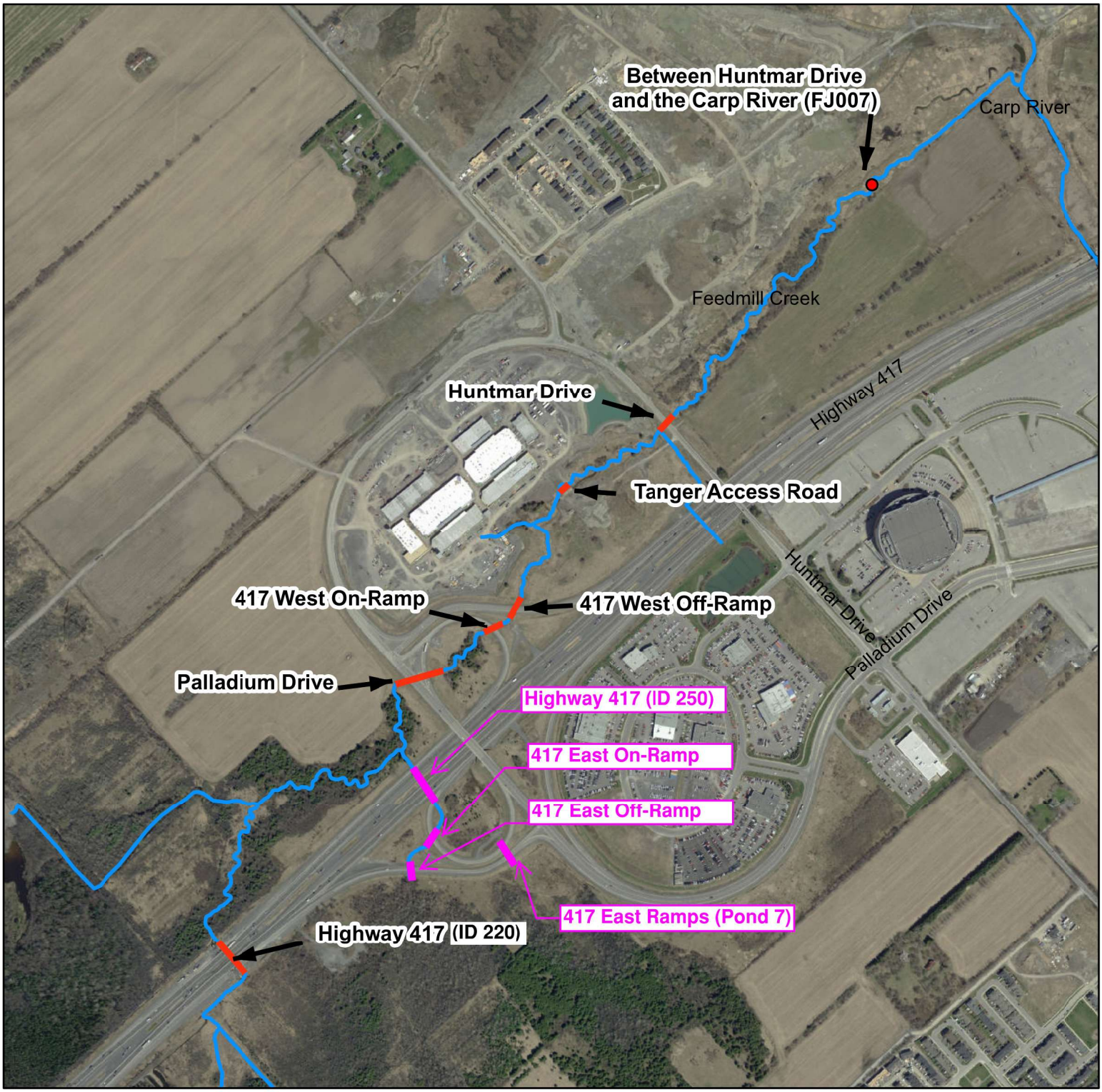
Attachment A: Feedmill Creek Culvert and Junction Location Plan
Attachment B: MTO IDF Curve Lookup Results

ATTACHMENT

A

Feedmill Creek Culvert and Junction Location Plan

JFSA Water Resources and Environmental Consultants



Legend

- Culverts
- Model Junctions
- Watercourse

NOTES:
Aerial phtotography base mapping provided by the City of Ottawa (2014)

N

J.F. Sabourin and Associates Inc.
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS
52 Springbook Drive, Ottawa, ON, K2S 1B9
(613) 836-3884
www.jfsa.com

PROJECT:
Feedmill Creek
SWM Criteria Study

TITLE:
Feedmill Creek Culvert and Junction Location Plan

CLIENT: Ottawa

SCALE:
0 50 100 200 300 400 500 Metres

PROJECT No.	1307-15
DRAWN:	JB
DATE:	APRIL 2017

FIGURE 3a

ATTACHMENT

B

MTO IDF Curve Lookup Results

JFSA Water Resources and Environmental Consultants

Active coordinate

45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Retrieved: Wed, 24 Apr 2019 20:04:34 GMT



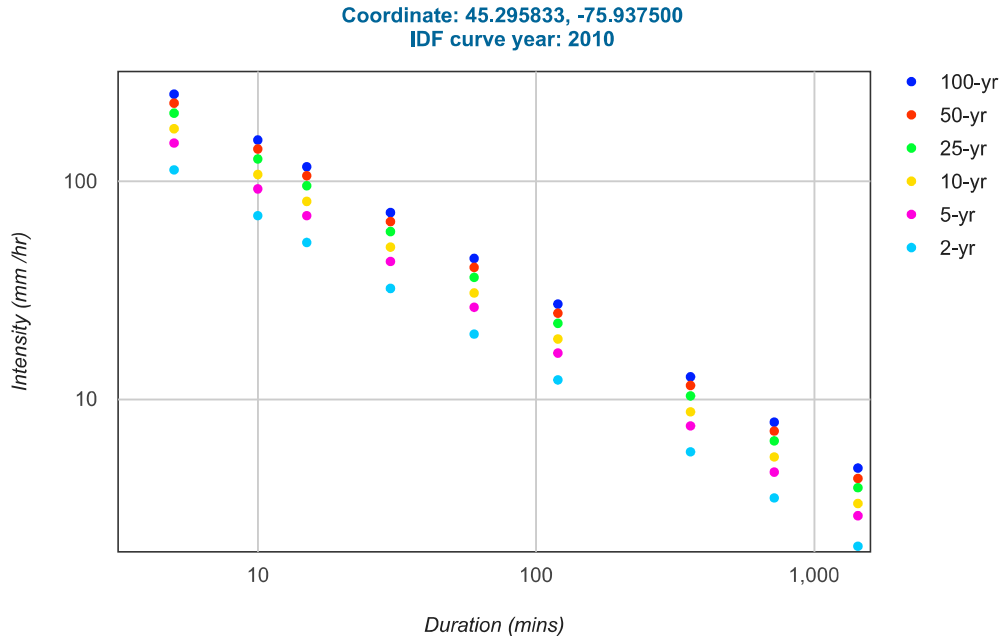
Location summary

These are the locations in the selection.

IDF Curve: 45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Retrieved: Wed, 24 Apr 2019 20:04:34 GMT

Data year: 2010
IDF curve year: 2010

Return period	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
A	19.8	26.3	30.6	36.1	40.1	44.1
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	112.5	69.3	52.2	32.1	19.8	12.2	5.7	3.5	2.1
5-yr	149.4	92.0	69.3	42.7	26.3	16.2	7.5	4.6	2.9
10-yr	173.8	107.1	80.6	49.7	30.6	18.8	8.7	5.4	3.3
25-yr	205.0	126.3	95.1	58.6	36.1	22.2	10.3	6.4	3.9
50-yr	227.8	140.3	105.7	65.1	40.1	24.7	11.5	7.1	4.3
100-yr	250.5	154.3	116.2	71.6	44.1	27.2	12.6	7.8	4.8

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	9.4	11.5	13.0	16.1	19.8	24.4	34.0	41.8	51.5
5-yr	12.4	15.3	17.3	21.3	26.3	32.4	45.1	55.6	68.5
10-yr	14.5	17.8	20.2	24.8	30.6	37.7	52.5	64.6	79.6
25-yr	17.1	21.1	23.8	29.3	36.1	44.5	61.9	76.3	94.0
50-yr	19.0	23.4	26.4	32.5	40.1	49.4	68.8	84.7	104.4
100-yr	20.9	25.7	29.1	35.8	44.1	54.3	75.6	93.2	114.8

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Active coordinate

45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Retrieved: Wed, 24 Apr 2019 20:18:28 GMT



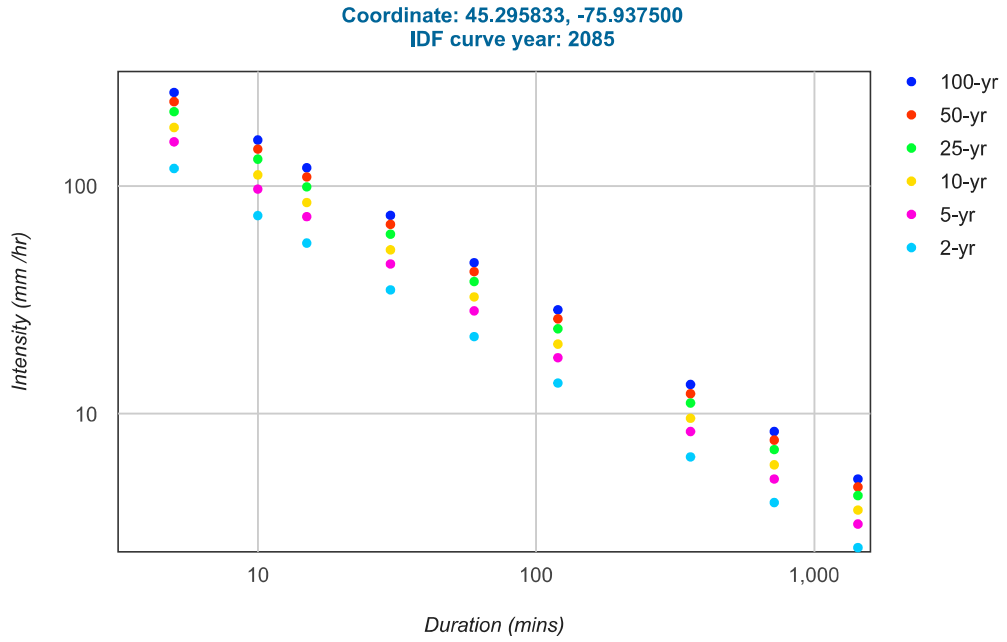
Location summary

These are the locations in the selection.

IDF Curve: 45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Results

An IDF curve was found.



Coefficient summary

IDF Curve: 45° 17' 45" N, 75° 56' 15" W (45.295833,-75.937500)

Retrieved: Wed, 24 Apr 2019 20:18:28 GMT

Data year: 2010
IDF curve year: 2085

Statistics

Rainfall intensity (mm hr^{-1})

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	119.6	74.3	56.3	35.1	21.9	13.7	6.5	4.1	2.6
5-yr	156.5	97.1	73.5	45.6	28.4	17.7	8.4	5.2	3.3
10-yr	180.9	112.1	84.8	52.6	32.7	20.3	9.6	6.0	3.8
25-yr	212.2	131.4	99.3	61.6	38.2	23.7	11.2	7.0	4.4
50-yr	234.9	145.4	109.8	68.0	42.2	26.2	12.3	7.7	4.8
100-yr	257.6	159.4	120.4	74.5	46.2	28.7	13.5	8.4	5.2

Rainfall depth (mm)

Duration	5-min	10-min	15-min	30-min	1-hr	2-hr	6-hr	12-hr	24-hr
2-yr	10.0	12.4	14.1	17.6	21.9	27.4	39.0	49.2	62.4
5-yr	13.0	16.2	18.4	22.8	28.4	35.4	50.4	62.4	79.2
10-yr	15.1	18.7	21.2	26.3	32.7	40.6	57.6	72.0	91.2
25-yr	17.7	21.9	24.8	30.8	38.2	47.4	67.2	84.0	105.6
50-yr	19.6	24.2	27.4	34.0	42.2	52.4	73.8	92.4	115.2
100-yr	21.5	26.6	30.1	37.3	46.2	57.4	81.0	100.8	124.8

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TAGGART REALTY MANAGEMENT

AMENDMENT TO: KANATA WEST BUSINESS PARK STORMWATER MANAGEMENT REPORT AND POND 6 EAST DESIGN BRIEF
333 HUNTMAR DRIVE - TANGER OUTLET CENTRES

FINAL REPORT
32862 - 5.2.3
REV 4. NOVEMBER 2015

IBI GROUP

4.4 Hydraulic Analysis

4.4.1 PCSWMM MODEL OF FEEDMILL CREEK

The City of Ottawa has provided IBI with a PCSWMM Model of Feedmill Creek (100 year, 12 hour SCS design storm) for use in confirming the water levels and flows in Feedmill creek at the SWMF outfall location. The outflow hydrographs from the XPSWMM model of the Pond 6 West and Pond 6 East SWMFs have been uploaded to the PCSWMM model to confirm water levels and flows in the creek and to generate tailwater curves to be used in the XPSWMM models. An electronic copy of the updated PCSWMM model is provided on CD within Appendix D. The results of the updated PCSWMM model with the outflow hydrographs from XPSWMM indicate water levels as follows:

Table 6 – Summary of Updated PCSWMM Model Results
100 year 12 hour SCS design storm (Model File: CarpInterim2_100ySCSFinalDraft_IBI2015-09-28-P6W-P6E.inp)

Location	PCSWMM Node ID	Max Water Level (m)
Pond 6 West Outfall	FJ038	101.35
Pond 6 East Outfall	FJ023	97.89

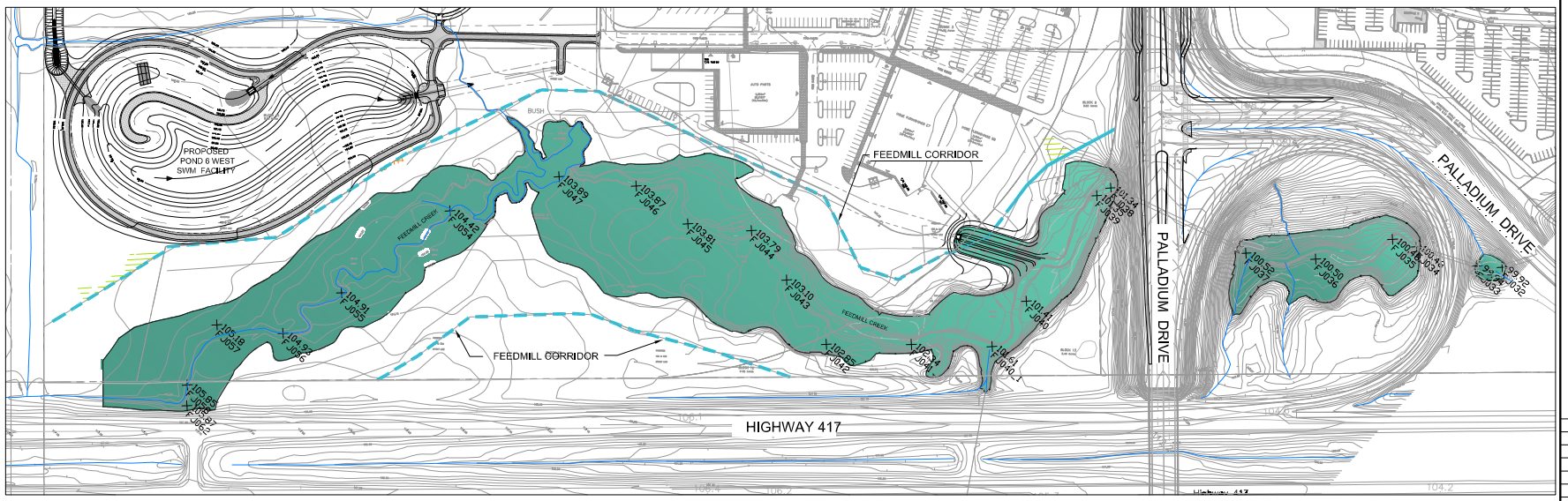
The post-development water levels have been used to confirm the function of the existing Pond 6 East SWMF as well to confirm the design and function of the proposed Pond 6 West SWMF. It should be noted that for modelling purposes for the other design storm events (ie. 100 year Chicago, Historical storms, Sensitivity Analysis), the maximum water level in Feedmill Creek during the 100 year, 12 hour SCS design storm event (as indicated within the above table) was used to generate tailwater curves based on the outflow hydrograph from XPSWMM.

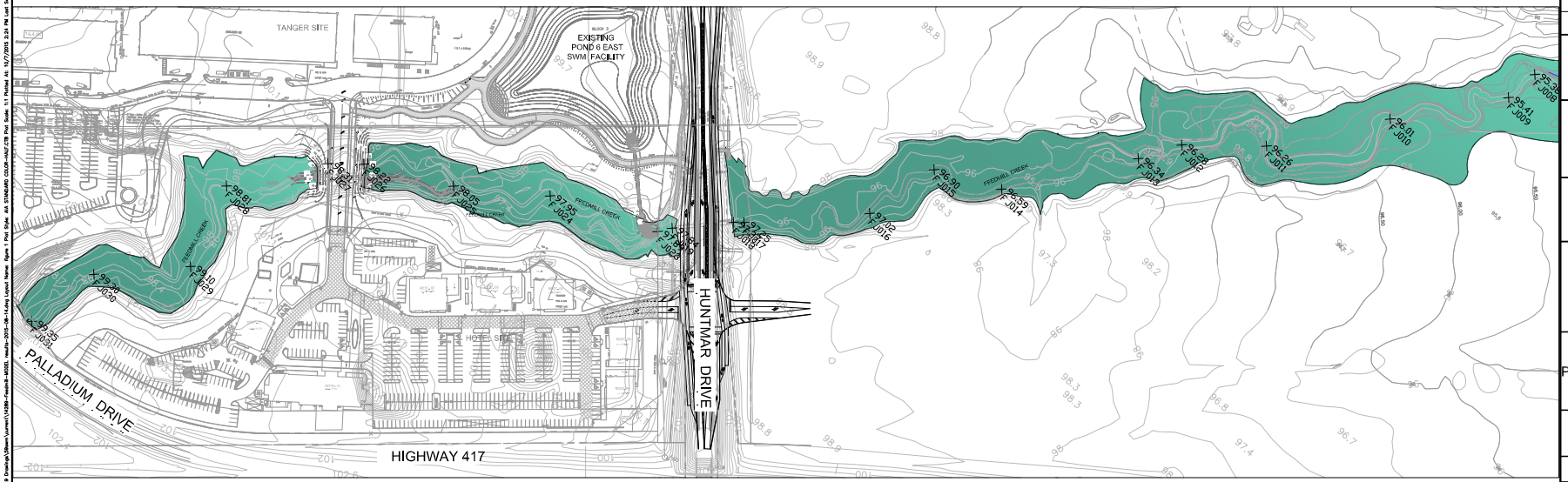
The PCSWMM model was also used to assess the post-development flows and resulting water levels within Feedmill Creek and at the existing culvert crossings adjacent to the Kanata West Business Park development area. The analysis is presented within the memo “Palladium Drive Culvert Crossings Hydrologic and Hydraulic Assessment for Kanata West Business Park Development” (IBI, September 2015). A copy of the memo is provided within Appendix G for reference.

4.4.2 XPSWMM MODEL OF POND 6 EAST

The hydraulic function of the proposed stormwater management facility was evaluated using XPSWMM hydraulic model (Engine Version 10.60). Runoff hydrographs from the SWMHYMO computer model were exported into the XPSWMM model. Parameters used for the model were based on the inflow hydrographs produced from SWMHYMO model, stage/storage characteristics of the SWM facility, outlet structure hydraulic losses, and tail water effect from the downstream water level in Feedmill Creek. A schematic and detailed output from the model can be found in Appendix C.

The 2 year, 5 year and 10 year SCS design storms were modelled using free boundary conditions. A schematic and detailed output from the XPSWMM model can be found in Appendix D. The results of the XPSWMM model including flow from the outlet structure, storage volumes and water levels are presented within the following table:





No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1			

IBI GROUP
333 Preston Street
Tower 1, Suite 400
Ottawa, Ontario
Canada K1S 5N4
Tel (613)225-1311
FAX (613)225-9868

Project Title
KANATA WEST
BUSINESS PARK

Drawing Title
FEEDMILL CREEK
PCSWMM MODEL RESULTS
INTERIM CONDITION

Scale: 1:1250	
Design: P.D.	Date: AUG. 2015
Drawn: S.V.	Checked: P.S.
Project No.: 14289	Drawing No.: FIG-1

J:\14289_Kanata West\5.0 Drawings\Drawn Vumen\14289-Feedmill-20151.mxd by: 2015-08-14 Layout Name: Figure 1 Plot Style: AS STANDARD COLOR.ctb/CTB Plot Scale: 1:1 Plotted At: 10/7/2015 2:34 PM Last Saved By: SVaks Last Modified By:

Table 1: Stage-Storage-Outflow Curve for SWM Facility 7

			Quality Control 1		Quantity Control 1		Emergency Overflow			
			Vertical Circ. Orifice		Vertical Circ. Orifice		Broad Crested Weir			
			Dia (m)	0.095	Dia (m)	0.220	L (m)	12.000		
			Area (m^2)	0.007	Area (m^2)	0.038				
			Invert (m)	103.85	Invert (m)	104.10	C_w	1.580		
			C_o	0.62	C_o	0.62	Invert (m)	105.50		
			Q @ D	0.004	Q @ D	0.035	n contr.	0		
Elevation	Active Sto.	Demarkation	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m^3)	Points	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
103.85	**0**	**PP Elev**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
103.90	894		0.050	0.002	0.000	0.000	0.000	0.000	0.002	0.089
103.941	**1639**	**QC Elev**	**0.091**	**0.004**	**0.000**	**0.000**	**0.000**	**0.000**	**0.004**	**0.164**
103.95	1806		0.100	0.004	0.000	0.000	0.000	0.000	0.004	0.181
104.00	2735		0.150	0.006	0.000	0.000	0.000	0.000	0.006	0.274
104.05	3682		0.200	0.008	0.000	0.000	0.000	0.000	0.008	0.368
104.10	**4647**	**Ext. Det.**	**0.250**	**0.009**	**0.000**	**0.000**	**0.000**	**0.000**	**0.009**	**0.465**
104.15	5629		0.300	0.010	0.050	0.008	0.000	0.000	0.018	0.563
104.20	6629		0.350	0.011	0.100	0.016	0.000	0.000	0.026	0.663
104.25	7647		0.400	0.012	0.150	0.024	0.000	0.000	0.035	0.765
104.30	8682		0.450	0.012	0.200	0.031	0.000	0.000	0.044	0.868
104.35	9728		0.500	0.013	0.250	0.039	0.000	0.000	0.052	0.973
104.40	10778		0.550	0.014	0.300	0.046	0.000	0.000	0.059	1.078
104.45	11833		0.600	0.014	0.350	0.051	0.000	0.000	0.066	1.183
104.50	12893		0.650	0.015	0.400	0.056	0.000	0.000	0.071	1.289
104.55	13956		0.700	0.016	0.450	0.061	0.000	0.000	0.077	1.396
104.60	15025		0.750	0.016	0.500	0.065	0.000	0.000	0.082	1.502
104.65	16097		0.800	0.017	0.550	0.069	0.000	0.000	0.086	1.610
104.70	17174		0.850	0.017	0.600	0.073	0.000	0.000	0.091	1.717
104.75	18255		0.900	0.018	0.650	0.077	0.000	0.000	0.095	1.826
104.80	19341		0.950	0.018	0.700	0.080	0.000	0.000	0.099	1.934
104.85	20432		1.000	0.019	0.750	0.084	0.000	0.000	0.103	2.043
104.90	21528		1.050	0.019	0.800	0.087	0.000	0.000	0.106	2.153
104.95	22630		1.100	0.020	0.850	0.090	0.000	0.000	0.110	2.263
105.00	23738		1.150	0.020	0.900	0.093	0.000	0.000	0.113	2.374
105.05	24851		1.200	0.021	0.950	0.096	0.000	0.000	0.117	2.485
105.08	25522		1.230	0.021	0.980	0.097	0.000	0.000	0.119	2.552
105.10	25970		1.250	0.021	1.000	0.098	0.000	0.000	0.120	2.597
105.15	27094		1.300	0.022	1.050	0.101	0.000	0.000	0.123	2.709
105.20	28224		1.350	0.022	1.100	0.104	0.000	0.000	0.126	2.822
105.25	29360		1.400	0.023	1.150	0.106	0.000	0.000	0.129	2.936
105.30	30501		1.450	0.023	1.200	0.109	0.000	0.000	0.132	3.050
105.35	31648		1.500	0.023	1.250	0.111	0.000	0.000	0.135	3.165

Table 1: Stage-Storage-Outflow Curve for SWM Facility 7

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			Area (m^2)	0.007	Area (m^2)	0.038				
			Invert (m)	103.85	Invert (m)	104.10	C_w	1.580		
			C_o	0.62	C_o	0.62	Invert (m)	105.50		
			Q @ D	0.004	Q @ D	0.035	n contr.	0		
Elevation	Active Sto.	Demarkation Points	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m^3)		(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
105.40	32800		1.550	0.024	1.300	0.114	0.000	0.000	0.138	3.280
105.45	33959		1.600	0.024	1.350	0.116	0.000	0.000	0.141	3.396
105.50	**35123**	**Ovf Elev**	**1.650**	**0.025**	**1.400**	**0.119**	**0.000**	**0.000**	**0.143**	**3.512**
105.55	36293		1.700	0.025	1.450	0.121	0.050	0.212	0.358	3.629
105.60	37468		1.750	0.025	1.500	0.123	0.100	0.600	0.748	3.747
105.65	38649		1.800	0.026	1.550	0.125	0.150	1.101	1.253	3.865
105.70	39836		1.850	0.026	1.600	0.127	0.200	1.696	1.849	3.984
105.75	41029		1.900	0.026	1.650	0.130	0.250	2.370	2.526	4.103
105.80	42227		1.950	0.027	1.700	0.132	0.300	3.115	3.274	4.223
105.85	43435		2.000	0.027	1.750	0.134	0.350	3.926	4.087	4.343
105.90	44655		2.050	0.028	1.800	0.136	0.400	4.797	4.960	4.465
105.95	45887		2.100	0.028	1.850	0.138	0.450	5.723	5.889	4.589
106.00	47132		2.150	0.028	1.900	0.140	0.500	6.703	6.871	4.713
106.05	48390		2.200	0.029	1.950	0.142	0.550	7.734	7.904	4.839
106.10	49660		2.250	0.029	2.000	0.144	0.600	8.812	8.984	4.966
106.15	50942		2.300	0.029	2.050	0.145	0.650	9.936	10.111	5.094
106.20	52237		2.350	0.030	2.100	0.147	0.700	11.104	11.281	5.224
106.25	53544		2.400	0.030	2.150	0.149	0.750	12.315	12.494	5.354
106.30	54864		2.450	0.030	2.200	0.151	0.800	13.567	13.748	5.486
106.35	56194		2.500	0.030	2.250	0.153	0.850	14.858	15.041	5.619
106.40	57529		2.550	0.031	2.300	0.154	0.900	16.188	16.374	5.753
106.45	58871		2.600	0.031	2.350	0.156	0.950	17.556	17.743	5.887
106.50	60219		2.650	0.031	2.400	0.158	1.000	18.960	19.149	6.022
106.55	61573		2.700	0.032	2.450	0.160	1.050	20.400	20.591	6.157
106.60	62933		2.750	0.032	2.500	0.161	1.100	21.874	22.067	6.293
106.65	64300		2.800	0.032	2.550	0.163	1.150	23.382	23.578	6.430
106.70	65673		2.850	0.033	2.600	0.165	1.200	24.924	25.121	6.567
106.75	67052		2.900	0.033	2.650	0.166	1.250	26.497	26.697	6.705
106.80	68437		2.950	0.033	2.700	0.168	1.300	28.103	28.304	6.844
106.85	69841		3.000	0.033	2.750	0.170	1.350	29.740	29.943	6.984
106.90	71279		3.050	0.034	2.800	0.171	1.400	31.407	31.612	7.128
106.95	72749		3.100	0.034	2.850	0.173	1.450	33.105	33.312	7.275
107.00	74251		3.150	0.034	2.900	0.174	1.500	34.832	35.040	7.425

Table 1: Stage-Storage-Outflow Curve for SWM Facility 7

			Quality Control 1		Quantity Control 1		Emergency Overflow			
			Vertical Circ. Orifice		Vertical Circ. Orifice		Broad Crested Weir			
			Dia (m)	0.095	Dia (m)	0.220	L (m)	12.000		
			Area (m^2)	0.007	Area (m^2)	0.038				
			Invert (m)	103.85	Invert (m)	104.10	C_w	1.580		
			C_o	0.62	C_o	0.62	Invert (m)	105.50		
			Q @ D	0.004	Q @ D	0.035	n contr.	0		
Elevation	Active Sto.	Demarkation Points	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m^3)		(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
107.05	75786		3.200	0.035	2.950	0.176	1.550	36.588	36.798	7.579
107.10	77354		3.250	0.035	3.000	0.177	1.600	38.372	38.585	7.735
107.15	78955		3.300	0.035	3.050	0.179	1.650	40.185	40.399	7.895
107.20	80588		3.350	0.035	3.100	0.181	1.700	42.025	42.241	8.059
107.25	82254		3.400	0.036	3.150	0.182	1.750	43.893	44.111	8.225
107.30	83952		3.450	0.036	3.200	0.184	1.800	45.788	46.007	8.395
107.35	85671		3.500	0.036	3.250	0.185	1.850	47.709	47.930	8.567
107.40	**87397**	**Top of Berm**	**3.550**	**0.036**	**3.300**	**0.186**	**1.900**	**49.656**	**49.879**	**8.740**

Notes : - PP Elev indicates the elevation of the permanent pool.

- QC Elev indicates the elevation of the storage volume required by MOE for quality control.
- Ext Det indicates the elevation of extended detention provided based on the 15 mm storm target for erosion control.
- Ovf Elev indicates the elevation of the overflow provided above the 100-year water level.
- Top of Berm indicates the elevation at the top of the berm.

Calculation Sheet 1: 100-Year 3-Hour Chicago Storm Hydraulic Gradeline Results

Project Name : 195 Huntmar
Project Number : 1476-16
Client: DSEL

Prepared by : LP
Date : 3/29/2019

Notes	Pipe Parameters										Flow Characteristics		HGL Computations			USF Check	
	Manhole Number		Invert Elevation		Diameter	Length	MH Cover	MH Cover	Slope	n	Qcap	Flow [1]	Surch.	HGL	HGL	USF [2]	Freeboard
	(u/s)	(d/s)	(u/s) (m)	(d/s) (m)	(mm)	(m)	Elev. (m)	Elev. (m)	(%)		(L/s)	(L/s)	(m)	(u/s) (m)	(d/s) (m)		To USF (m)
	1	2	105.741	105.593	600	82	108.750	108.630	0.18	0.013	224	224	0.215	106.556	106.437	106.95	0.394
	2	3	105.555	105.416	675	82	108.630	108.500	0.17	0.013	318	318	0.207	106.437	106.314	106.83	0.393
	3	4	105.386	105.344	675	26.5	108.500	108.470	0.16	0.013	331	331	0.253	106.314	106.230	106.70	0.386
	4	5	105.269	105.221	750	43.5	108.470	108.460	0.11	0.013	361	361	0.211	106.230	106.170	106.67	0.440
	5	8	105.191	105.160	750	28	108.460	108.420	0.11	0.013	410	410	0.229	106.170	106.140	106.66	0.490
	8	11	105.010	104.941	900	63	108.420	108.320	0.11	0.013	635	635	0.230	106.140	106.056	106.62	0.480
	11	14	104.866	104.739	975	70.5	108.320	108.220	0.18	0.013	855	855	0.215	106.056	105.864	106.52	0.464
	14	17	104.589	104.496	1200	77.5	108.220	108.110	0.12	0.013	1049	1049	0.075	105.864	105.749	106.42	0.556
	17	20	104.436	104.367	1200	46	108.110	108.040	0.15	0.013	1049	1049	0.113	105.749	105.658	106.31	0.561
	20	31	104.367	104.291	1200	76	108.040	107.930	0.10	0.013	1477	1477	0.091	105.658	105.547	106.24	0.582
	31	32	104.141	104.064	1350	59.5	107.930	107.830	0.13	0.013	2276	2276	0.056	105.547	105.406	106.13	0.583
	32	36	104.034	104.020	1350	12	107.830	107.810	0.12	0.013	2315	2315	0.022	105.406	105.349	106.03	0.624
	36	37	103.990	103.902	1350	58.5	107.810	107.810	0.15	0.013	2566	2566	0.009	105.349	105.120	106.01	0.661
	37	Pond (FSto107)	103.842	103.800	1350	30	107.810	107.810	0.14	0.013	2566	2566	-0.072	105.120	105.071	106.01	0.890
	46	47	105.629	105.488	825	70.5	108.840	108.730	0.20	0.013	508	508	0.073	106.527	106.438	107.04	0.513
	47	50	105.488	105.319	825	73.5	108.730	108.620	0.23	0.013	573	573	0.125	106.438	106.247	106.93	0.492
	50	51	105.094	104.999	1050	45	108.620	108.560	0.21	0.013	1132	1133	0.103	106.247	106.167	106.82	0.573
	51	54	104.849	104.772	1200	45.5	108.560	108.490	0.17	0.013	1634	1636	0.118	106.167	106.083	106.76	0.593
	54	55	104.622	104.582	1350	26.5	108.490	108.450	0.15	0.013	2134	2136	0.111	106.083	106.037	106.69	0.607
	55	58	104.432	104.356	1500	75.5	108.450	108.330	0.10	0.013	2156	2157	0.105	106.037	105.965	106.65	0.613
	56	57	105.713	105.544	450	80.5	108.600	108.480	0.21	0.013	113	113	0.030	106.193	106.067	106.80	0.607
	57	58	105.394	105.256	600	98.5	108.480	108.340	0.14	0.013	171	171	0.073	106.067	105.965	106.68	0.613
	58	61	104.356	104.201	1500	111	108.330	108.170	0.14	0.013	2854	2854	0.109	105.965	105.617	106.53	0.565
	61	62	104.051	103.977	1650	74	108.170	108.170	0.10	0.013	3482	3482	-0.084	105.617	105.518	106.37	0.753
	62	63	103.977	103.902	1650	74.5	108.170	108.170	0.10	0.013	3496	3497	-0.109	105.518	105.374	106.37	0.852
	63	Pond (FSto107)	103.872	103.800	1650	65.5	108.170	108.170	0.11	0.013	3857	3857	-0.148	105.374	105.071	106.37	0.996
Pond Outfall	100	101	103.744	103.719	750	25	107.700	107.700	0.10	0.013	123	117	-0.448	104.046	103.956	105.90	1.854
Pond Outfall	101	102	103.659	103.561	750	97.5	107.700	107.700	0.10	0.013	123	117	-0.453	103.956	103.858	105.90	1.944
Pond Outfall	102	103	103.561	103.463	750	97.5	107.700	108.010	0.10	0.013	123	117	-0.453	103.858	103.761	105.90	2.042
Pond Outfall	103	104	103.463	103.365	750	97.5	108.010	108.310	0.10	0.013	123	117	-0.452	103.761	103.668	106.21	2.449
Pond Outfall	104	105	103.365	103.267	750	97.5	108.310	108.410	0.10	0.013	123	117	-0.447	103.668	103.594	106.51	2.842
Pond Outfall	105	106	103.267	103.169	750	97.5	108.410	105.800	0.10	0.013	123	117	-0.423	103.594	103.411	106.61	3.016
Pond Outfall	106	107	103.109	103.052	750	57	105.800	105.540	0.10	0.013	123	117	-0.448	103.411	103.359	104.00	0.589
Pond Outfall	107	108	103.052	103.007	750	45	105.540	105.500	0.10	0.013	123	117	-0.443	103.359	103.264	103.74	0.381
Pond Outfall	108	109	102.947	102.871	750	75.5	105.500	105.500	0.10	0.013	123	117	-0.433	103.264	103.110	103.70	0.436
Pond Outfall	109	110	102.811	102.734	750	77	105.500	105.500	0.10	0.013	123	117	-0.451	103.110	103.028	103.70	0.590
Pond Outfall	110	111 (FJ209)	102.704	102.600	750	103.5	105.500	105.500	0.10	0.013	123	117	-0.426	103.028	102.830	103.70	0.672

Notes:
[1] Flow capture set equal to 2- or 5-year PCSWMM-simulated flows + 14% to account for additional flows captured during the 100-year storm.
[2] USF estimated as 1.8 m below the upstream manhole cover elevation.

Calculation Sheet 1: 100-Year 12-Hour SCS Storm Hydraulic Gradeline Results

Project Name : 195 Huntmar
Project Number : 1476-16
Client: DSEL

Prepared by : LP
Date : 3/29/2019

Notes	Pipe Parameters										Flow Characteristics		HGL Computations			USF Check	
	Manhole Number		Invert Elevation		Diameter	Length	MH Cover	MH Cover	Slope	n	Qcap	Flow [1]	Surch.	HGL	HGL	USF [2]	Freeboard
	(u/s)	(d/s)	(u/s) (m)	(d/s) (m)	(mm)	(m)	Elev. (m)	Elev. (m)	(%)		(L/s)	(L/s)	(u/s) (m)	(u/s) (m)	(d/s) (m)		To USF (m)
	1	2	105.741	105.593	600	82	108.750	108.630	0.18	0.013	261	224	0.213	106.554	106.454	106.95	0.396
	2	3	105.555	105.416	675	82	108.630	108.500	0.17	0.013	347	318	0.224	106.454	106.332	106.83	0.376
	3	4	105.386	105.344	675	26.5	108.500	108.470	0.16	0.013	336	331	0.271	106.332	106.227	106.70	0.368
	4	5	105.269	105.221	750	43.5	108.470	108.460	0.11	0.013	369	361	0.208	106.227	106.184	106.67	0.443
	5	8	105.191	105.160	750	28	108.460	108.420	0.11	0.013	369	410	0.243	106.184	106.147	106.66	0.476
	8	11	105.010	104.941	900	63	108.420	108.320	0.11	0.013	600	635	0.237	106.147	106.068	106.62	0.473
	11	14	104.866	104.739	975	70.5	108.320	108.220	0.18	0.013	951	855	0.227	106.068	105.876	106.52	0.452
	14	17	104.589	104.496	1200	77.5	108.220	108.110	0.12	0.013	1351	1049	0.087	105.876	105.762	106.42	0.544
	17	20	104.436	104.367	1200	46	108.110	108.040	0.15	0.013	1510	1049	0.126	105.762	105.670	106.31	0.548
	20	31	104.367	104.291	1200	76	108.040	107.930	0.10	0.013	1233	1477	0.103	105.670	105.560	106.24	0.570
	31	32	104.141	104.064	1350	59.5	107.930	107.830	0.13	0.013	1924	2276	0.069	105.560	105.418	106.13	0.570
	32	36	104.034	104.020	1350	12	107.830	107.810	0.12	0.013	1849	2314	0.034	105.418	105.402	106.03	0.612
	36	37	103.990	103.902	1350	58.5	107.810	107.810	0.15	0.013	2067	2567	0.062	105.402	105.402	106.01	0.608
	37	Pond (FSto107)	103.842	103.800	1350	30	107.810	107.810	0.14	0.013	1997	2565	0.210	105.402	105.402	106.01	0.608
	46	47	105.629	105.488	825	70.5	108.840	108.730	0.20	0.013	642	508	0.073	106.527	106.438	107.04	0.513
	47	50	105.488	105.319	825	73.5	108.730	108.620	0.23	0.013	688	578	0.125	106.438	106.247	106.93	0.492
	50	51	105.094	104.999	1050	45	108.620	108.560	0.21	0.013	1251	1130	0.103	106.247	106.167	106.82	0.573
	51	54	104.849	104.772	1200	45.5	108.560	108.490	0.17	0.013	1607	1632	0.118	106.167	106.083	106.76	0.593
	54	55	104.622	104.582	1350	26.5	108.490	108.450	0.15	0.013	2067	2133	0.111	106.083	106.037	106.69	0.607
	55	58	104.432	104.356	1500	75.5	108.450	108.330	0.10	0.013	2235	2156	0.105	106.037	105.965	106.65	0.613
	56	57	105.713	105.544	450	80.5	108.600	108.480	0.21	0.013	131	113	0.030	106.193	106.066	106.80	0.607
	57	58	105.394	105.256	600	98.5	108.480	108.340	0.14	0.013	230	171	0.072	106.066	105.965	106.68	0.614
	58	61	104.356	104.201	1500	111	108.330	108.170	0.14	0.013	2645	2854	0.109	105.965	105.617	106.53	0.565
	61	62	104.051	103.977	1650	74	108.170	108.170	0.10	0.013	2882	3482	-0.084	105.617	105.518	106.37	0.753
	62	63	103.977	103.902	1650	74.5	108.170	108.170	0.10	0.013	2882	3492	-0.109	105.518	105.403	106.37	0.852
	63	Pond (FSto107)	103.872	103.800	1650	65.5	108.170	108.170	0.11	0.013	3023	3857	-0.119	105.403	105.402	106.37	0.967
Pond Outfall	100	101	103.744	103.719	750	25	107.700	107.700	0.10	0.013	352	136	-0.421	104.073	103.983	105.90	1.827
Pond Outfall	101	102	103.659	103.561	750	97.5	107.700	107.700	0.10	0.013	352	136	-0.426	103.983	103.886	105.90	1.917
Pond Outfall	102	103	103.561	103.463	750	97.5	107.700	108.010	0.10	0.013	352	136	-0.425	103.886	103.789	105.90	2.014
Pond Outfall	103	104	103.463	103.365	750	97.5	108.010	108.310	0.10	0.013	352	136	-0.424	103.789	103.697	106.21	2.421
Pond Outfall	104	105	103.365	103.267	750	97.5	108.310	108.410	0.10	0.013	352	136	-0.418	103.697	103.621	106.51	2.813
Pond Outfall	105	106	103.267	103.169	750	97.5	108.410	105.800	0.10	0.013	352	136	-0.396	103.621	103.439	106.61	2.989
Pond Outfall	106	107	103.109	103.052	750	57	105.800	105.540	0.10	0.013	352	136	-0.420	103.439	103.387	104.00	0.561
Pond Outfall	107	108	103.052	103.007	750	45	105.540	105.500	0.10	0.013	352	136	-0.415	103.387	103.292	103.74	0.353
Pond Outfall	108	109	102.947	102.871	750	75.5	105.500	105.500	0.10	0.013	352	136	-0.405	103.292	103.137	103.70	0.408
Pond Outfall	109	110	102.811	102.734	750	77	105.500	105.500	0.10	0.013	352	136	-0.424	103.137	103.055	103.70	0.563
Pond Outfall	110	111 (FJ209)	102.704	102.600	750	103.5	105.500	105.500	0.10	0.013	352	136	-0.399	103.055	102.845	103.70	0.645

Notes:
[1] Flow capture set equal to 2- or 5-year PCSWMM-simulated flows + 14% to account for additional flows captured during the 100-year storm.
[2] USF estimated as 1.8 m below the upstream manhole cover elevation.

Table B-5: Stage-Storage-Outflow Curve for SWM Facility (Ultimate, Free Outfall Conditions)

			Flow Augmentation 1		Quality Control 1		Quantity Control 1		Quantity Control 2			
			Vertical Orifice		Vertical Orifice		Rectangular Weir		Rectangular Weir			
			Dia (m)	0.200	Dia (m)	0.350	L (m)	37	L (m)	30		
			Area (m^2)	0.031	Area (m^2)	0.096	top of DIS					
			Invert (m)	93.20	Invert (m)	93.40	C_w	1.800	C_w	1.670		
			C_o	0.62	C_o	0.62	Invert (m)	94.20	Invert (m)	94.60		
			Q @ D	0.027	Q @ D	0.111	n contr.	0	n contr.	0		
Elevation	Active Sto.	Demarkation	Head	Outflow	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m^3)	Points	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
93.20	**0**	**PP Elev**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
93.25	1731		0.050	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.007	0.173
93.30	3483		0.100	0.013	0.000	0.000	0.000	0.000	0.000	0.000	0.013	0.348
93.35	5249		0.150	0.018	0.000	0.000	0.000	0.000	0.000	0.000	0.018	0.525
93.40	**7032**	**FA Elev**	**0.200**	**0.023**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.023**	**0.703**
93.45	8805		0.250	0.028	0.050	0.016	0.000	0.000	0.000	0.000	0.044	0.881
93.498	**10532**	**QC Elev**	**0.298**	**0.033**	**0.098**	**0.031**	**0.000**	**0.000**	**0.000**	**0.000**	**0.064**	**1.053**
93.50	10604		0.300	0.033	0.100	0.032	0.000	0.000	0.000	0.000	0.064	1.060
93.55	12434		0.350	0.037	0.150	0.047	0.000	0.000	0.000	0.000	0.084	1.243
93.60	14281		0.400	0.040	0.200	0.063	0.000	0.000	0.000	0.000	0.103	1.428
93.65	16133		0.450	0.043	0.250	0.079	0.000	0.000	0.000	0.000	0.122	1.613
93.70	18011		0.500	0.046	0.300	0.095	0.000	0.000	0.000	0.000	0.141	1.801
93.75	19891		0.550	0.049	0.350	0.111	0.000	0.000	0.000	0.000	0.160	1.989
93.80	21795		0.600	0.052	0.400	0.125	0.000	0.000	0.000	0.000	0.177	2.179
93.85	23708		0.650	0.054	0.450	0.139	0.000	0.000	0.000	0.000	0.193	2.371
93.90	25636		0.700	0.057	0.500	0.151	0.000	0.000	0.000	0.000	0.208	2.564
93.95	27579		0.750	0.059	0.550	0.162	0.000	0.000	0.000	0.000	0.221	2.758
94.00	29536		0.800	0.061	0.600	0.172	0.000	0.000	0.000	0.000	0.234	2.954
94.05	31606		0.850	0.064	0.650	0.182	0.000	0.000	0.000	0.000	0.246	3.161
94.10	33638		0.900	0.066	0.700	0.191	0.000	0.000	0.000	0.000	0.257	3.364
94.15	35474		0.950	0.068	0.750	0.200	0.000	0.000	0.000	0.000	0.268	3.547
94.20	**37496**	**Ext. Det.**	**1.000**	**0.070**	**0.800**	**0.209**	**0.000**	**0.000**	**0.000**	**0.000**	**0.279**	**3.750**
94.25	39535		1.050	0.072	0.850	0.217	0.050	0.745	0.000	0.000	1.033	3.953
94.30	41620		1.100	0.073	0.900	0.225	0.100	2.106	0.000	0.000	2.404	4.162
94.35	43719		1.150	0.075	0.950	0.233	0.150	3.869	0.000	0.000	4.177	4.372
94.40	45857		1.200	0.077	1.000	0.240	0.200	5.957	0.000	0.000	6.274	4.586
94.45	48016		1.250	0.079	1.050	0.247	0.250	8.325	0.000	0.000	8.651	4.802
94.50	50200		1.300	0.080	1.100	0.254	0.300	10.943	0.000	0.000	11.278	5.020
94.55	52402		1.350	0.082	1.150	0.261	0.350	13.790	0.000	0.000	14.133	5.240
94.60	54631		1.400	0.084	1.200	0.268	0.400	16.849	0.000	0.000	17.200	5.463
94.65	56875		1.450	0.085	1.250	0.274	0.450	20.104	0.050	0.560	21.024	5.688
94.70	59128		1.500	0.087	1.300	0.280	0.500	23.547	0.100	1.584	25.498	5.913
94.74	61399		1.540	0.088	1.340	0.285	0.540	26.428	0.140	2.624	29.426	6.140
94.80	63758		1.600	0.090	1.400	0.292	0.600	30.953	0.200	4.481	35.816	6.376
94.85	66120		1.650	0.091	1.450	0.298	0.650	34.902	0.250	6.263	41.554	6.612
94.90	68506		1.700	0.093	1.500	0.304	0.700	39.005	0.300	8.232	47.634	6.851
94.95	70965		1.750	0.094	1.550	0.310	0.750	43.258	0.350	10.374	54.036	7.097
95.00	73267		1.800	0.096	1.600	0.315	0.800	47.655	0.400	12.674	60.741	7.327
95.05	**75819**	**Top of Berm**	**1.850**	**0.097**	**1.650**	**0.321**	**0.850**	**52.192**	**0.450**	**15.124**	**67.734**	**7.582**

Notes :
- PP Elev indicates the elevation of the permanent pool.
- FA Elev indicates the elevation of flow augmentation provided in accordance with the ***KWMSS*** (10% of active volume).
- QC Elev indicates the elevation of the storage volume required by MOE for quality control.
- Ext. Det. indicates the elevation of extended detention provided as per the ***KWMSS***.
- Top of Berm indicates the elevation at the top of the berm.
- Head losses for reverse grade pipe included in quality control outflow calculations.

Table B-6: Stage-Storage-Outflow Curve for SWM Facility (Ultimate, Restrictive Downstream Conditions)

			Flow Augmentation 1		Quality Control 1		Quantity Control 1		Quantity Control 2			
			Vertical Orifice		Vertical Orifice		Rectangular Weir		Rectangular Weir			
			Dia (m)	0.200	Dia (m)	0.350	L (m)	37	L (m)	30		
			Area (m^2)	0.031	Area (m^2)	0.096	top of DIS					
			Invert (m)	94.20	Invert (m)	94.20	C_w	1.800	C_w	1.670		
			C_o	0.62	C_o	0.62	Invert (m)	94.20	Invert (m)	94.60		
			Q @ D	0.027	Q @ D	0.111	n contr.	0	n contr.	0		
Elevation	Active Sto.	Demarkation	Head	Outflow	Head	Outflow	Head	Outflow	Head	Outflow	Outflow	Storage
(m)	(m^3)	Points	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m)	(m^3/s)	(m^3/s)	(ha·m)
93.20	**0**	**PP Elev**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**
93.25	1731		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.173
93.30	3483		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.348
93.35	5249		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.525
93.40	**7032**	**FA Elev**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.703**
93.45	8805		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.881
93.498	**10532**	**QC Elev**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**1.053**
93.50	10604		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.060
93.55	12434		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.243
93.60	14281		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.428
93.65	16133		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.613
93.70	18011		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.801
93.75	19891		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.989
93.80	21795		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.179
93.85	23708		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.371
93.90	25636		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.564
93.95	27579		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.758
94.00	29536		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.954
94.05	31606		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.161
94.10	33638		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.364
94.15	35474		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	3.547
94.20	**37496**	**Ext. Det.**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**0.000**	**3.750**
94.25	39535		0.050	0.019	0.050	0.059	0.050	0.745	0.000	0.000	0.823	3.953
94.30	41620		0.100	0.026	0.100	0.084	0.100	2.106	0.000	0.000	2.216	4.162
94.35	43719		0.150	0.032	0.150	0.102	0.150	3.869	0.000	0.000	4.003	4.372
94.40	45857		0.200	0.036	0.200	0.118	0.200	5.957	0.000	0.000	6.111	4.586
94.45	48016		0.250	0.039	0.250	0.132	0.250	8.325	0.000	0.000	8.497	4.802
94.50	50200		0.300	0.043	0.300	0.145	0.300	10.943	0.000	0.000	11.131	5.020
94.55	52402		0.350	0.046	0.350	0.156	0.350	13.790	0.000	0.000	13.992	5.240
94.60	54631		0.400	0.049	0.400	0.167	0.400	16.849	0.000	0.000	17.064	5.463
94.65	56875		0.450	0.051	0.450	0.177	0.450	20.104	0.050	0.560	20.893	5.688
94.70	59128		0.500	0.054	0.500	0.187	0.500	23.547	0.100	1.584	25.372	5.913
94.75	61399		0.550	0.056	0.550	0.196	0.550	27.166	0.150	2.911	30.328	6.140
94.80	63758		0.600	0.059	0.600	0.205	0.600	30.953	0.200	4.481	35.697	6.376
94.85	66120		0.650	0.061	0.650	0.213	0.650	34.902	0.250	6.263	41.438	6.612
94.90	68506		0.700	0.063	0.700	0.221	0.700	39.005	0.300	8.232	47.522	6.851
94.95	70965		0.750	0.065	0.750	0.229	0.750	43.258	0.350	10.374	53.926	7.097
95.00	73267		0.800	0.067	0.800	0.236	0.800	47.655	0.400	12.674	60.633	7.327
95.05	**75819**	**Top of Berm**	**0.850**	**0.069**	**0.850**	**0.244**	**0.850**	**52.192**	**0.450**	**15.124**	**67.628**	**7.582**

Notes :
- PP Elev indicates the elevation of the permanent pool.
- FA Elev indicates the elevation of flow augmentation provided in accordance with the ***KWMSS*** (10% of active volume).
- QC Elev indicates the elevation of the storage volume required by MOE for quality control.
- Ext. Det. indicates the elevation of extended detention provided as per the ***KWMSS*** .
- Top of Berm indicates the elevation at the top of the berm.
- Head losses for reverse grade pipe included in quality control outflow calculations.

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
3	4	101.527	100.526	101.64	B9L6	0.113	62.5	11.8	100.715	0.925
				102.89	B9L1		62.5	49.7	101.322	1.568
				102.59	B17L1		62.5	49.7	101.322	1.268
				101.67	B17L6		62.5	11.8	100.715	0.955
4	5	100.526	100.444	101.87	B39L6	1.344				
5	6	100.444	100.327	101.63	B39L1	1.186				
6	7	100.327	100.241	101.65	B38L1	1.323				
7	9	100.241	99.778	101.26	B37L1	1.019				
9	Plug	99.778	99.706	N/A	N/A	N/A				
10	11	101.009	100.751	101.67	B11L1	0.661				
11	4	100.751	100.526	101.67	B10	0.919				
12	13	101.137	100.961	101.74	B15	0.603				
13	14	100.961	100.776	N/A	N/A	N/A				
14	4	100.776	100.526	N/A	N/A	N/A				
15	16	101.930	101.607	102.68	B19L1	0.750				
16	3	101.607	101.527	103.17	B3L6	1.563				
17	5	100.535	100.444	N/A	N/A	N/A				
21	22	103.721	103.529	N/A	N/A	N/A				
22	23B	103.529	103.368	N/A	N/A	N/A				
23	9	99.912	99.778	101.17	B97W	1.258				
27	28	103.612	103.204	104.66	B9L3	1.048				
28	34	103.204	103.056	N/A	N/A	N/A				
29	30B	104.012	103.840	105.02	B31L4	1.008				
30	14	100.793	100.776	N/A	N/A	N/A				
31	32	103.790	103.242	105.13	B26L6	1.340				
32	33	103.242	103.231	104.95	B25L3	1.708				
33	34	103.231	103.056	104.85	B25L1	1.619				
34	36	103.056	102.900	N/A	N/A	N/A				
35	36	102.921	102.900	103.59	B8L5	0.669	87.3	85.7	102.921	0.669
				103.79	B8L1		87.3	60.4	102.915	0.875
				103.79	B6L6		87.3	54.3	102.913	0.877
				103.93	B6L1		87.3	13.8	102.903	1.027
36	38	102.900	102.246	N/A	N/A	N/A				
37	38	102.564	102.246	103.19	B1L1	0.626	85.4	83.8	102.558	0.632
				103.53	B1L4		85.4	65.7	102.491	1.039
				103.53	B2L1		85.4	58.1	102.462	1.068
				103.24	B2L5		85.4	27.1	102.347	0.893
				103.24	B3L1		85.4	20.4	102.322	0.918
38	3	102.246	101.527	103.12	B3L4	0.874				
101	102	101.418	101.265	102.09	109	0.672	29.5	4.8	101.290	0.800
				102.14	108		29.5	11.7	101.326	0.814
				102.14	107		29.5	24.6	101.393	0.747
102	103	101.265	101.159	101.83	106	0.565	26.5	17.7	101.230	0.600
				101.97	105		26.5	5.1	101.179	0.791
				101.95	112		26.5	9.6	101.197	0.753
				101.95	111		26.5	20.0	101.239	0.711
				102.03	110		26.5	26.5	101.265	0.765
103	104105	101.159	100.722	108.84	102	7.681				
105	106	100.465	100.370	101.94	93	1.475				
106	107	100.370	100.149	101.41	88	1.040				
107	108	100.149	99.667	100.84	79	0.691				
108	109C	99.667	99.465	99.91	75	0.243	46.1	11.9	99.517	0.393
				100.06	76		46.1	23.0	99.566	0.494
				100.34	77		46.1	33.9	99.614	0.726
				100.55	78		46.1	44.3	99.659	0.891
111	112	101.628	101.400	102.09	122	0.462	33.1	3.0	101.421	0.669

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				102.09	121		33.1	13.7	101.494	0.596
				102.31	120		33.1	17.5	101.521	0.789
				102.40	119		33.1	18.8	101.529	0.871
				102.52	118		33.1	19.6	101.535	0.985
				102.52	117		33.1	31.1	101.614	0.906
				102.49	116		33.1	27.3	101.588	0.902
				102.36	115		33.1	16.6	101.514	0.846
				102.24	114		33.1	12.4	101.485	0.755
				102.02	113		33.1	3.8	101.426	0.594
112	103	101.400	101.159	101.87	124	0.470	62.4	48.0	101.344	0.526
				101.97	123		62.4	60.8	101.394	0.576
				101.94	125		62.4	41.7	101.320	0.620
				101.94	126		62.4	26.0	101.259	0.681
				101.92	127		62.4	13.6	101.212	0.708
114	124C	99.460	99.407	N/A	N/A	N/A				
116	117	100.785	100.747	101.55	72	0.765				
117	118	100.747	100.289	101.10	31	0.353	66.3	7.9	100.344	0.756
				101.23	30		66.3	12.6	100.376	0.854
				101.27	29		66.3	25.8	100.467	0.803
				101.27	28		66.3	36.8	100.543	0.727
				101.30	27		66.3	53.1	100.656	0.644
				101.55	71		66.3	58.2	100.691	0.859
				101.41	70		66.3	47.2	100.615	0.795
				101.27	69		66.3	36.2	100.539	0.731
				101.17	68		66.3	30.1	100.497	0.673
				101.22	67		66.3	15.3	100.395	0.825
				101.22	66		66.3	8.9	100.350	0.870
118	123	100.289	99.563	100.62	59	0.331	68.0	2.3	99.588	1.032
				100.76	60		68.0	8.3	99.652	1.108
				100.97	61		68.0	18.8	99.764	1.206
				101.10	62		68.0	30.3	99.886	1.214
				101.15	63		68.0	45.1	100.045	1.105
				101.15	64		68.0	55.4	100.154	0.996
				101.11	65		68.0	61.5	100.220	0.890
				101.15	32		68.0	62.8	100.233	0.917
				101.18	33		68.0	50.4	100.101	1.079
				101.18	34		68.0	34.7	99.933	1.247
				101.07	35		68.0	24.1	99.820	1.250
				100.89	36		68.0	10.8	99.678	1.212
119	120	100.765	100.496	101.22	22	0.455	61.0	9.4	100.537	0.683
				101.38	23		61.0	16.4	100.568	0.812
				101.39	24		61.0	27.4	100.617	0.773
				101.39	25		61.0	38.2	100.664	0.726
				101.38	26		61.0	53.0	100.730	0.650
				101.57	8		61.0	54.5	100.736	0.834
				101.45	9		61.0	44.1	100.690	0.760
				101.34	10		61.0	33.3	100.643	0.697
				101.49	11		61.0	22.3	100.594	0.896
				101.49	12		61.0	17.7	100.574	0.916
				101.45	13		61.0	5.3	100.519	0.931
120	122	100.496	100.096	101.02	17	0.524				
122	123	100.096	99.563	N/A	N/A	N/A				
123	124C	99.563	99.407	99.95	41	0.387				
125	122	100.447	100.096	100.54	47	0.093	43.2	11.3	100.188	0.352
				100.66	46		43.2	26.7	100.313	0.347
				100.77	45		43.2	40.2	100.423	0.347

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				100.77	72		43.2	34.0	100.372	0.398
				100.73	71		43.2	27.2	100.317	0.413
				100.73	70		43.2	10.1	100.178	0.552
126	127	100.713	100.459	101.60	84	0.887				
127	128	100.459	100.380	101.57	82	1.111				
128	132	100.380	99.947	101.15	74	0.770				
129	130	100.800	100.490	101.28	93	0.480				
130	131	100.490	100.457	101.56	98	1.070				
131	132	100.457	99.947	101.38	100	0.923				
132	134C	99.947	99.533	100.53	44	0.583				
133	134C	99.790	99.533	100.22	23	0.430				
135	139	99.453	99.175	99.91	32	0.457				
137	138	99.259	99.256	99.79	Ph1-39	0.531				
138	139	99.256	99.175	99.74	Ph1-29	0.484	112.4	21.8	99.191	0.549
				99.89	Ph1-30		112.4	34.1	99.200	0.690
				100.05	Ph1-31		112.4	49.6	99.211	0.839
				100.04	Ph1-32		112.4	56.2	99.216	0.825
				100.01	Ph1-33		112.4	66.9	99.223	0.787
				99.91	Ph1-34		112.4	77.3	99.231	0.679
				99.82	Ph1-35		112.4	87.6	99.238	0.582
				99.83	Ph1-36		112.4	101.5	99.248	0.582
				99.87	Ph1-37		112.4	108.3	99.253	0.617
				99.79	Ph1-38		112.4	112.4	99.256	0.534
				99.84	Ph1-23		112.4	21.8	99.191	0.649
				99.89	Ph1-24		112.4	37.9	99.202	0.688
				100.04	Ph1-25		112.4	48.9	99.210	0.830
				100.04	Ph1-26		112.4	59.5	99.218	0.822
				99.84	Ph1-27		112.4	70.2	99.226	0.614
				99.84	Ph1-28		112.4	81.6	99.234	0.606
139	151	99.175	98.979	N/A	N/A	N/A				
140	141	99.778	98.857	99.83	Ph1-60	0.052	76.6	54.8	99.516	0.314
				99.84	Ph1-62		76.6	42.7	99.370	0.470
				99.94	Ph1-63		76.6	32.3	99.245	0.695
				99.94	Ph1-64		76.6	21.9	99.120	0.820
				99.94	Ph1-65		76.6	11.3	98.993	0.947
				99.84	Ph1-66		76.6	0.4	98.862	0.978
				100.12	Ph1-56		76.6	7.8	98.951	1.169
				100.09	Ph1-57		76.6	21.9	99.120	0.970
				99.89	Ph1-58		76.6	28.8	99.203	0.687
				99.81	Ph1-59		76.6	39.2	99.328	0.482
				99.92	Ph1-61		76.6	54.8	99.516	0.404
141	142	98.857	98.371	99.36	Ph1-50	0.503				
142	172	98.371	97.846	99.26	Ph1-48	0.889				
144	145	100.707	99.845	101.34	137	0.633				
145	146AA	99.845	99.643	101.42	131	1.575				
146	147	99.552	99.002	100.62	Ph1-22	1.068				
146	176A	99.552	99.013	N/A	N/A	N/A				
147	152	99.002	98.500	99.54	Ph1-13	0.538				
148	149	99.391	99.299	100.28	20	0.889				
149	151	99.299	98.979	99.98	14	0.681				
150	151	99.182	98.979	99.83	Ph1-9	0.648				
151	152	98.979	98.500	N/A	N/A	N/A				
152	153	98.500	97.714	99.71	Ph1-B180W	1.210				
153	174	97.714	97.011	99.29	Ph1-B181	1.576				
154	155	97.642	97.521	98.28	148	0.638				
154	157	97.642	97.539	98.36	Ph1-122	0.718				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
155	155B	97.521	97.520	98.34	Ph1-118	0.819				
156	156B	97.367	97.336	98.40	Ph1-109	1.033				
157	158	97.539	97.389	98.30	Ph1-124	0.761				
158	158B	97.389	97.351	98.42	Ph1-132	1.031				
159	173	97.283	97.094	N/A	N/A	N/A				
160	174	97.177	97.011	98.45	Ph1-B183	1.273				
167	168	99.086	99.080	100.73	Ph5-24	1.644				
168	169	99.080	99.071	N/A	N/A	N/A				
169	170	99.071	99.030	N/A	N/A	N/A				
170	171	99.030	98.250	99.63	Ph1-87	0.600				
171	171A	98.250	97.989	N/A	N/A	N/A				
172	172A	97.846	97.657	N/A	N/A	N/A				
173	174	97.094	97.011	98.95	Ph1-100	1.856				
174	174C	97.011	96.814	98.69	Ph1-168	1.679				
175	176	99.243	99.099	N/A	N/A	N/A				
176	176A	99.099	99.013	N/A	N/A	N/A				
177	178	98.841	97.300	N/A	N/A	N/A				
178	179	97.300	96.980	N/A	N/A	N/A				
179	180	96.980	96.404	N/A	N/A	N/A				
180	181	96.404	96.012	N/A	N/A	N/A				
181	T182	96.012	95.645	N/A	N/A	N/A				
201	202	99.094	99.091	N/A	N/A	N/A				
202	203	99.091	99.062	N/A	N/A	N/A				
203	204	99.062	98.721	N/A	N/A	N/A				
204	205	98.721	98.668	N/A	N/A	N/A				
205	206	98.668	98.477	N/A	N/A	N/A				
206	207	98.477	98.425	N/A	N/A	N/A				
207	208	98.425	98.217	N/A	N/A	N/A				
208	208i	98.217	96.830	N/A	N/A	N/A				
301	302	100.767	100.321	101.35	139	0.583	61.0	6.4	100.368	0.982
				101.55	140		61.0	24.9	100.503	1.047
				101.68	141		61.0	31.9	100.554	1.126
				101.78	142		61.0	47.6	100.669	1.111
				101.95	143		61.0	56.9	100.737	1.213
				101.77	134		61.0	56.1	100.731	1.039
				101.77	135		61.0	42.2	100.630	1.140
				101.77	136		61.0	36.1	100.585	1.185
				101.77	137		61.0	19.1	100.461	1.309
				101.54	138		61.0	3.5	100.347	1.193
302	303	100.321	100.208	N/A	N/A	N/A				
303	108	100.208	99.667	N/A	N/A	N/A				
401	402	100.099	100.057	N/A	N/A	N/A				
402	403	100.057	100.045	N/A	N/A	N/A				
403	405	100.045	100.019	N/A	N/A	N/A				
404	405	100.230	100.019	N/A	N/A	N/A				
405	406	100.019	99.984	N/A	N/A	N/A				
406	407	99.984	99.965	100.71	B98E	0.726				
407	23	99.965	99.912	101.13	B98W	1.165				
104105	105	100.722	100.465	101.82	94	N/A				
104105	104301	100.722	101.128	N/A	N/A	N/A				
104301	301	101.128	100.767	101.63	146	0.502	75.3	23.6	100.880	0.750
				101.80	145		75.3	17.4	100.850	0.950
				101.95	144		75.3	7.5	100.803	1.147
				101.66	147		75.3	38.6	100.952	0.708
				101.80	148		75.3	44.7	100.981	0.819
				101.80	149		75.3	61.3	101.061	0.739

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				101.92	128		75.3	60.7	101.058	0.862
				101.92	129		75.3	44.1	100.978	0.942
				101.76	130		75.3	33.7	100.929	0.831
				101.63	131		75.3	23.3	100.879	0.751
				101.63	132		75.3	17.2	100.849	0.781
				101.76	133		75.3	5.4	100.793	0.967
115117	117	100.769	100.747	101.28	1	N/A				
115119	119	100.765	100.765	101.64	7	N/A				
115119	115117	100.765	100.769	N/A	N/A	N/A				
121122	122	100.262	100.096	100.50	48	N/A				
121140	140	100.227	99.778	100.32	58	0.089	80.5	21.3	99.897	0.419
				100.52	54		80.5	62.5	100.127	0.393
				100.45	55		80.5	52.1	100.069	0.383
				100.41	56		80.5	41.8	100.011	0.395
				100.38	57		80.5	35.9	99.978	0.402
				100.31	59		80.5	19.6	99.887	0.421
				100.35	60		80.5	30.0	99.945	0.409
				100.40	61		80.5	39.9	100.001	0.396
				100.44	62		80.5	50.3	100.059	0.385
121140	121122	100.227	100.262	N/A	N/A	N/A				
136137	137	99.269	99.259	99.78	Ph1-22	0.511				
136150	150	99.182	99.182	99.75	Ph1-12	0.568				
136150	136137	99.182	99.269	99.78	Ph1-19	0.598				
109C	114	99.465	99.460	N/A	N/A	N/A				
109C	113Ci	99.465	99.377	N/A	N/A	N/A				
10B	12B	104.087	103.965	N/A	N/A	N/A				
113Ci	208	99.377	98.217	N/A	N/A	N/A				
11B	12B	104.789	103.965	105.33	B44L6	0.541				
11BE	24B	104.656	104.434	105.22	B76L7	0.564				
124C	170	99.407	99.030	99.76	49	0.353	103.3	29.8	99.139	0.621
				99.79	50		103.3	39.9	99.176	0.614
				99.85	51		103.3	50.8	99.215	0.635
				100.00	52		103.3	61.5	99.254	0.746
				100.00	53		103.3	77.2	99.312	0.688
				99.92	54		103.3	89.3	99.356	0.564
				99.92	42		103.3	98.9	99.391	0.529
				99.89	43		103.3	83.5	99.335	0.555
				99.87	44		103.3	77.6	99.313	0.557
				99.86	45		103.3	62.8	99.259	0.601
				99.81	46		103.3	52.3	99.221	0.589
				99.79	47		103.3	46.5	99.200	0.590
				99.78	48		103.3	30.5	99.141	0.639
124C	124CI	99.407	98.747	N/A	N/A	N/A				
124CI	206	98.747	98.477	N/A	N/A	N/A				
12B	17B	103.965	103.853	105.45	B42L1	1.485				
134B	203	99.163	99.062	N/A	N/A	N/A				
134C	135	99.533	99.453	99.99	26	0.457				
134C	134CI	99.533	99.508	N/A	N/A	N/A				
134CI	134B	99.508	99.163	N/A	N/A	N/A				
13B	14B	105.064	104.726	105.56	B48L1	0.496				
146AA	146	99.643	99.552	101.26	130	1.617				
146AA	146CI	99.643	99.182	N/A	N/A	N/A				
146CI	201	99.182	99.094	N/A	N/A	N/A				
14B	15B	104.726	104.521	105.48	B48L4	0.754				
14B	18B	104.726	104.852	105.64	B36L4	0.914				
152B	152	98.944	98.500	N/A	N/A	N/A				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
155B	156	97.520	97.367	98.34	Ph1-110	0.820				
156B	159	97.336	97.283	98.54	Ph1-107	1.204				
158B	159	97.351	97.283	98.44	Ph1-134	1.089				
15B	16B	104.521	104.210	N/A	N/A	N/A				
16B	17B	104.210	103.853	N/A	N/A	N/A				
171A	172	97.989	97.846	N/A	N/A	N/A				
172A	172B	97.657	97.279	99.24	Ph1-88	1.583				
172B	173	97.279	97.094	99.23	Ph1-94	1.951				
174A	178	98.595	97.300	N/A	N/A	N/A				
174C	180	96.814	96.404	N/A	N/A	N/A				
174H	174A	99.206	98.595	100.09	Ph1-36	0.884				
174I	174H	100.334	99.206	100.39	Ph1-32	0.056	107.6	9.7	99.308	1.082
				100.44	Ph1-31		107.6	20.1	99.417	1.023
				100.59	Ph1-30		107.6	28.1	99.501	1.089
				100.74	Ph1-29		107.6	40.6	99.632	1.108
				100.45	Ph1-28		107.6	47.9	99.708	0.742
				100.94	Ph1-27		107.6	58.9	99.823	1.117
				101.09	Ph1-26		107.6	70.8	99.948	1.142
				101.14	Ph1-25		107.6	88.4	100.133	1.007
				101.28	B30W		107.6	88.2	100.131	1.149
				101.28	B30E		107.6	57.1	99.805	1.475
				101.17	31		107.6	46.1	99.689	1.481
				101.14	32		107.6	35.8	99.581	1.559
				101.14	33		107.6	25.4	99.472	1.668
				101.14	34		107.6	15.0	99.363	1.777
				101.29	B35W		107.6	8.6	99.296	1.994
174J	174I	100.967	100.334	101.13	B154E	0.163	80.4	6.1	100.382	0.748
				101.85	B154W		80.4	30.2	100.572	1.278
				101.91	128		80.4	36.7	100.623	1.287
				101.91	127		80.4	52.9	100.750	1.160
				101.93	126		80.4	57.4	100.786	1.144
				101.99	125		80.4	67.8	100.868	1.122
				102.00	124		80.4	78.1	100.949	1.051
				101.96	27		80.4	70.5	100.889	1.071
				101.91	28		80.4	58.7	100.796	1.114
				101.86	B29W		80.4	51.1	100.736	1.124
				101.65	B29E		80.4	7.1	100.390	1.260
174K	174J	101.549	100.967	102.02	26	0.471				
176A	177	99.013	98.841	N/A	N/A	N/A				
17B	21	103.853	103.721	105.02	B42L5	1.167				
18B	19B	104.852	104.844	105.55	B35L3	0.698				
19B	20B	104.844	104.425	105.36	B34L1	0.516				
1B	2B	105.102	104.927	N/A	N/A	N/A				
208i	HW	96.830	96.690	N/A	N/A	N/A				
20B	21	104.425	103.721	105.02	B32L1	0.595				
23B	28	103.368	103.204	N/A	N/A	N/A				
2400B	24B	104.769	104.434	N/A	N/A	N/A				
24B	25B	104.434	104.174	105.04	B14L1	0.606	67.3	56.5	104.392	0.648
				105.04	B14L6		67.3	18.0	104.244	0.796
				105.04	B13L1		67.3	11.2	104.217	0.823
25B	26B	104.174	103.658	104.84	B12L4	0.666	63.2	1.6	103.671	1.169
				104.84	B11L1		63.2	3.7	103.688	1.152
				105.00	B12L1		63.2	29.8	103.901	1.099
				105.00	B13L6		63.2	36.2	103.954	1.046
26B	27	103.658	103.612	104.84	B11L1	1.182				
2B	3B	104.927	104.904	N/A	N/A	N/A				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
30B	31	103.840	103.790	105.20	B29L3	1.360				
39B	10B	104.775	104.087	N/A	N/A	N/A				
3B	5B	104.904	104.826	N/A	N/A	N/A				
4B	5B	105.112	104.826	105.78	B58L3	0.668				
5B	15B	104.826	104.521	105.54	B61L3	0.714				
6B	7B	104.272	104.238	105.13	B86L6	0.858	85.4	77.9	104.269	0.861
				105.15	B86L1		85.4	39.4	104.254	0.896
				105.15	B66L6		85.4	33.2	104.251	0.899
7B	8B	104.238	104.210	105.50	B87L1	1.262				
8B	9B	104.210	104.201	105.64	B64L1	1.430				
9B	10B	104.201	104.087	105.51	B62L1	1.309				
CMH	401	100.121	100.099	N/A	N/A	N/A				
CMH1	12B	104.929	103.965	N/A	N/A	N/A				
CMH2	3	101.531	101.527	N/A	N/A	N/A				
CMH3	22	104.829	103.529	N/A	N/A	N/A				
MG101	MG101a	104.282	104.630	N/A	N/A	N/A				
MG101	MG102	104.282	104.049	N/A	N/A	N/A				
MG101a	MG102	104.630	104.049	105.67	B203W	1.040	94.0	86.5	104.584	1.086
				105.78	B203E		94.0	48.5	104.349	1.431
				105.78	B204W		94.0	41.3	104.304	1.476
				105.84	B204E		94.0	17.3	104.156	1.684
				105.84	B205W		94.0	10.1	104.111	1.729
MG102	MG102a	104.049	104.168	N/A	N/A	N/A				
MG102	MG103	104.049	103.820	N/A	N/A	N/A				
MG102a	MG103	104.168	103.820	105.90	B205E	1.732	90.4	76.5	104.114	1.786
				105.90	B206W		90.4	69.3	104.087	1.813
				106.11	B206E		90.4	38.4	103.968	2.142
MG103	MG103O	103.820	99.565	N/A	N/A	N/A				
MG103a	MG104	104.544	99.513	N/A	N/A	N/A				
MG103O	MG103a	99.565	104.544	N/A	N/A	N/A				
MG103O	MG104	99.565	99.513	N/A	N/A	N/A				
MG104	MG104a	99.513	106.010	N/A	N/A	N/A				
MG104	MG105	99.513	99.468	N/A	N/A	N/A				
MG104a	MG105	106.010	104.811	106.04	B37W	0.030	63.2	32.4	105.426	0.614
				106.09	B37E		63.2	8.9	104.980	1.110
MG105	MG105a	99.468	104.999	N/A	N/A	N/A				
MG105	MG106	99.468	99.375	N/A	N/A	N/A				
MG105a	MG106	104.999	99.375	106.19	Estimate	1.191				
MG106	MG1060	99.375	99.312	N/A	N/A	N/A				
MG106	MG106a	99.375	105.277	N/A	N/A	N/A				
MG1060	MG1060a	99.312	102.556	N/A	N/A	N/A				
MG1060	MG107	99.312	99.278	N/A	N/A	N/A				
MG1060a	MG107	102.556	99.278	103.78	Estimate	1.226				
MG106a	MG1060	105.277	99.312	106.56	Estimate	1.283				
MG107	175	99.278	99.243	N/A	N/A	N/A				
MG144	MG101	104.874	104.282	N/A	N/A	N/A				
N4A01	MG101	105.460	104.282	N/A	N/A	N/A				
N4A02ii	MG144	105.100	104.874	N/A	N/A	N/A				
N4C10	N4C11	97.625	96.713	N/A	N/A	N/A				
N4C11	N4C21A	96.713	96.197	N/A	N/A	N/A				
N4C18	N4C21A	97.031	96.197	N/A	N/A	N/A				
N4C21A	N4C21B	96.197	95.613	N/A	N/A	N/A				
N4C21B	P4	95.613	94.556	N/A	N/A	N/A				
P4	P4out	94.556	93.200	N/A	N/A	N/A				
Plug	176A	99.706	99.013	N/A	N/A	N/A				
T182	T183	95.645	95.391	N/A	N/A	N/A				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
T183	T184	95.391	95.048	N/A	N/A	N/A				
T184	T185	95.048	94.763	N/A	N/A	N/A				
T185	T186	94.763	94.661	N/A	N/A	N/A				
T186	T187	94.661	94.597	N/A	N/A	N/A				
T187	P4	94.597	94.556	N/A	N/A	N/A				
W1	W4	111.315	111.309	113.76	142	2.445				
W2	W1	111.561	111.315	113.68	147	2.119				
W2	W3	111.561	112.460	113.51	149	1.949				
W3	W7	112.460	110.915	113.08	155	0.620				
W4	W5	111.309	111.178	113.40	136	2.091				
W5	W6	111.178	111.160	113.23	134	2.052				
W6	W7	111.160	110.915	112.84	129	1.680				
W7	W18	110.915	110.368	112.51	158	1.595				
W8	W9	107.774	107.759	110.51	189	2.736				
W9	W10	107.759	107.624	110.45	190	2.691				
W10	W11	107.624	107.584	110.40	200	2.776				
W11	W16	107.584	107.445	110.29	202	2.706				
W12	W8	109.572	107.774	110.55	188	0.978				
W13	W12	109.844	109.572	111.69	183	1.846				
W13	W14	109.844	109.493	110.84	177	0.996				
W14	W15	109.493	109.493	110.64	176	1.147				
W15	W16	109.493	107.445	110.35	174	0.857				
W16	W19	107.445	103.423	N/A	N/A	N/A				
W17	W18	110.508	110.368	111.51	119	1.002				
W18	W19	110.368	103.423	110.59	173	0.222	94.3	15.6	104.572	6.018
				110.74	172		94.3	25.7	105.316	5.424
				110.75	171		94.3	40.0	106.369	4.381
				111.10	170		94.3	46.5	106.848	4.252
				111.60	169		94.3	61.3	107.938	3.662
				112.07	168		94.3	66.9	108.350	3.720
				112.13	167		94.3	84.8	109.668	2.462
				112.00	109		94.3	93.3	110.294	1.706
				111.75	108		94.3	79.7	109.293	2.457
				111.47	107		94.3	73.6	108.843	2.627
				111.22	106		94.3	59.5	107.805	3.415
				111.03	105		94.3	54.6	107.444	3.586
				110.87	104		94.3	40.4	106.398	4.472
W19	W27	103.423	103.471	N/A	N/A	N/A				
W19	W19a	103.423	109.318	N/A	N/A	N/A				
W19a	W27	109.318	103.471	110.41	99	1.092				
W20	W21	109.053	109.029	110.82	64	1.767				
W21	W22	109.029	108.769	110.74	59	1.711				
W22	W23	108.769	108.713	110.73	55	1.961				
W23	W26	108.713	108.415	110.54	49	1.827				
W24	W20	110.046	109.053	110.95	66	0.904				
W25	W24	110.204	110.046	111.68	72	1.476				
W25	W26	110.204	108.415	110.99	82	0.786				
W26	W27	108.415	103.471	110.46	85	2.045				
W27	W53	103.471	103.504	N/A	N/A	N/A				
W27	W27a	103.471	109.075	N/A	N/A	N/A				
W27a	W53	109.075	103.504	110.26	48	1.185				
W28	W43	103.597	103.660	N/A	N/A	N/A				
W28	W28a	103.597	108.418	N/A	N/A	N/A				
W28a	W43	108.418	103.660	108.34	B209N	-0.078	63.5	14.0	104.709	3.631
				109.36	B209S		63.5	53.8	107.691	1.669
				109.45	B210N		63.5	57.5	107.968	1.482

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				109.19	B218S		63.5	43.8	106.942	2.248
				108.38	B218N		63.5	18.3	105.031	3.349
W29	W30	107.364	106.959	109.68	B217W	2.316				
W30	W31	106.959	106.929	108.65	B216S	1.691				
W31	W32	106.929	106.896	108.25	B219N	1.321				
W32	W33	106.896	106.885	108.16	B214N	1.264				
W33	W43	106.885	103.660	107.71	B213W	0.825				
W34	W38	106.897	106.674	108.40	20	1.503	58.0	56.4	106.891	1.509
				108.51	19		58.0	48.4	106.860	1.650
				108.52	18		58.0	37.2	106.817	1.703
				108.52	17		58.0	22.5	106.761	1.759
				108.47	16		58.0	16.5	106.737	1.733
				108.42	15		58.0	3.8	106.689	1.731
W35	W36	107.485	107.233	108.32	22	0.835	65.7	60.5	107.465	0.855
				108.34	21		65.7	62.9	107.474	0.866
				108.39	23		65.7	43.0	107.398	0.992
				108.48	24		65.7	31.1	107.352	1.128
				108.55	25		65.7	25.3	107.330	1.220
				108.55	26		65.7	9.8	107.271	1.279
				108.55	27		65.7	4.3	107.249	1.301
				108.45	32		65.7	7.0	107.260	1.190
				108.53	33		65.7	18.7	107.305	1.225
				108.54	34		65.7	36.0	107.371	1.169
				108.54	35		65.7	42.8	107.397	1.143
				108.49	36		65.7	59.8	107.462	1.028
W36	W37	107.233	107.191	108.82	29	1.587				
W37	W42	107.191	105.900	108.21	31	1.019				
W38	W39	106.674	106.610	108.32	13	1.646				
W39	W40	106.610	106.159	108.18	9	1.570				
W40	W41	106.159	106.046	108.16	4	2.001				
W41	W42	106.046	105.900	108.08	1	2.034				
W42	W43	105.900	103.660	N/A	N/A	N/A				
W43	W54	103.660	103.748	N/A	N/A	N/A				
W43	W43a	103.660	106.887	N/A	N/A	N/A				
W43a	W54	106.887	103.748	105.92	B211N	-0.967	92.8	3.4	103.863	2.057
				106.37	B211S		92.8	27.2	104.668	1.702
				106.37	B212N		92.8	34.4	104.912	1.458
				107.43	B212S		92.8	58.9	105.740	1.690
				107.85	B208S		92.8	82.9	106.552	1.298
				106.86	B208N		92.8	44.9	105.267	1.593
				106.73	B207S		92.8	37.7	105.023	1.707
				105.93	B207N		92.8	6.7	103.975	1.955
W52	W19	108.833	103.423	N/A	N/A	N/A				
W53	W28	103.504	103.597	N/A	N/A	N/A				
W53	W53a	103.504	109.197	N/A	N/A	N/A				
W53a	W28	109.197	103.597	110.16	B210S	0.963				
W54	MG103	103.748	103.820	N/A	N/A	N/A				
MH122	W19	102.778	103.423	(By IBI)	(By IBI)	(By IBI)				
MH122	MH111	102.778	102.470	(By IBI)	(By IBI)	(By IBI)				
EXT300	MH206	104.485	103.339	(By IBI)	(By IBI)	(By IBI)				
EXTA3	EX OUTLET	108.220	103.962	(By IBI)	(By IBI)	(By IBI)				
MH118	MH131A	101.899	101.844	(By IBI)	(By IBI)	(By IBI)				
MH113	MH120	102.313	101.957	(By IBI)	(By IBI)	(By IBI)				
MH111	MH113	102.470	102.313	(By IBI)	(By IBI)	(By IBI)				
MH120	MH119	101.957	101.940	(By IBI)	(By IBI)	(By IBI)				
MH119	MH118	101.940	101.899	(By IBI)	(By IBI)	(By IBI)				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
MH121	MH120	101.785	101.957	(By IBI)	(By IBI)	(By IBI)				
MH216	MH217	101.652	101.720	(By IBI)	(By IBI)	(By IBI)				
MH215	MH216	101.360	101.652	(By IBI)	(By IBI)	(By IBI)				
MH215	OVRFLW	101.360	100.971	(By IBI)	(By IBI)	(By IBI)				
OVRFLW	Node736	100.971	100.494	(By IBI)	(By IBI)	(By IBI)				
OVRFLW	Node736	100.971	100.494	(By IBI)	(By IBI)	(By IBI)				
Node736	FEEDMILL	100.494	99.990	(By IBI)	(By IBI)	(By IBI)				
MH101	BLKHD1	105.525	100.148	(By IBI)	(By IBI)	(By IBI)				
BLKHD1	MG105	100.148	99.468	(By IBI)	(By IBI)	(By IBI)				
MH102A	MH101	106.325	105.525	(By IBI)	(By IBI)	(By IBI)				
MH103	MH104	104.253	103.925	(By IBI)	(By IBI)	(By IBI)				
MH104	MH105	103.925	103.292	(By IBI)	(By IBI)	(By IBI)				
MH105	MH109	103.292	102.458	(By IBI)	(By IBI)	(By IBI)				
MH109	MH118	102.458	101.899	(By IBI)	(By IBI)	(By IBI)				
MH106	MH101	105.914	105.525	(By IBI)	(By IBI)	(By IBI)				
MH107	MH108	105.956	104.019	(By IBI)	(By IBI)	(By IBI)				
MH108	MH109	104.019	102.458	(By IBI)	(By IBI)	(By IBI)				
MH110A	MH111	103.958	102.470	(By IBI)	(By IBI)	(By IBI)				
MH112A	MH113	102.478	102.313	(By IBI)	(By IBI)	(By IBI)				
MH123	MH121	101.963	101.785	(By IBI)	(By IBI)	(By IBI)				
MH124	MH123	102.884	101.963	(By IBI)	(By IBI)	(By IBI)				
MH125	MH124	103.915	102.884	(By IBI)	(By IBI)	(By IBI)				
MH126	MH125	104.173	103.915	(By IBI)	(By IBI)	(By IBI)				
MH127A	MH126	102.276	104.173	(By IBI)	(By IBI)	(By IBI)				
MH201	MH123	102.027	101.963	(By IBI)	(By IBI)	(By IBI)				
MH129	MH130	101.868	101.853	(By IBI)	(By IBI)	(By IBI)				
MH130	MH131A	101.853	101.844	(By IBI)	(By IBI)	(By IBI)				
MH132	MH120	102.033	101.957	(By IBI)	(By IBI)	(By IBI)				
MH200	MH201	102.279	102.027	(By IBI)	(By IBI)	(By IBI)				
MH202	MH204	103.125	102.705	(By IBI)	(By IBI)	(By IBI)				
MH204	MH203A	102.705	102.225	(By IBI)	(By IBI)	(By IBI)				
MH203A	MH218	102.225	101.873	(By IBI)	(By IBI)	(By IBI)				
MH218	MH213	101.873	101.767	(By IBI)	(By IBI)	(By IBI)				
MH213	MH220	101.767	101.669	(By IBI)	(By IBI)	(By IBI)				
MH211	MH212	103.093	102.838	(By IBI)	(By IBI)	(By IBI)				
MH212	MH204	102.838	102.705	(By IBI)	(By IBI)	(By IBI)				
MH209	MH208	103.775	103.570	(By IBI)	(By IBI)	(By IBI)				
MH208	MH207	103.570	103.526	(By IBI)	(By IBI)	(By IBI)				
MH207	MH206	103.526	103.339	(By IBI)	(By IBI)	(By IBI)				
MH206	MH205	103.339	103.238	(By IBI)	(By IBI)	(By IBI)				
MH205	MH202	103.238	103.125	(By IBI)	(By IBI)	(By IBI)				
MH210	MH206	103.591	103.339	(By IBI)	(By IBI)	(By IBI)				
MH219	MH216	101.743	101.652	(By IBI)	(By IBI)	(By IBI)				
MH127B	MH202	103.229	103.125	(By IBI)	(By IBI)	(By IBI)				
MH203B	MH201	102.026	102.027	(By IBI)	(By IBI)	(By IBI)				
MH110B	MH108	104.554	104.019	(By IBI)	(By IBI)	(By IBI)				
MH112B	MH109	102.831	102.458	(By IBI)	(By IBI)	(By IBI)				
MH106A	MH107	105.958	105.956	(By IBI)	(By IBI)	(By IBI)				
MH102B	MH103	106.006	104.253	(By IBI)	(By IBI)	(By IBI)				
EX OUTLET	MH202	103.962	103.125	(By IBI)	(By IBI)	(By IBI)				
MH131	MH114	99.495	99.436	(By IBI)	(By IBI)	(By IBI)				
MH131A	MH131	101.844	99.495	(By IBI)	(By IBI)	(By IBI)				
MH114	STUB	99.436	99.406	(By IBI)	(By IBI)	(By IBI)				
STUB	MG107	99.406	99.278	(By IBI)	(By IBI)	(By IBI)				
MH217	MH121	101.720	101.785	(By IBI)	(By IBI)	(By IBI)				
MH220	MH215	101.669	101.360	(By IBI)	(By IBI)	(By IBI)				

Table E-1: Pond 4 HGL Table for the 100-Year, 3-Hour Chicago Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
MH128	MH124	103.651	102.884	(By IBI)	(By IBI)	(By IBI)				
H401	H402	105.460	104.424	106.34	Fut.Est.	0.880				
H402	H403	104.424	100.985	105.30	Fut.Est.	0.876				
H403	H404	100.985	100.873	104.56	Fut.Est.	3.575				
H404	H405	100.873	100.763	104.06	Fut.Est.	3.187				
H405	H406	100.763	100.483	103.39	Fut.Est.	2.627				
H406	H407	100.483	100.215	102.71	Fut.Est.	2.227				
H407	H408	100.215	99.972	102.06	Fut.Est.	1.845				
H408	H409	99.972	99.716	101.45	Fut.Est.	1.478				
H409	H410	99.716	99.493	101.00	Fut.Est.	1.284				
H410	H411	99.493	99.266	100.54	Fut.Est.	1.047				
H411	H412	99.266	98.852	100.13	Fut.Est.	0.864				
H412	H430	98.852	98.724	99.98	Fut.Est.	1.128				
H413	N4C10	98.290	97.625	99.62	Fut.Est.	1.330				
H416	H417	99.953	98.986	100.90	Fut.Est.	0.947				
H417	N4C10	98.986	97.625	99.97	Fut.Est.	0.984				
H419	H420	101.497	101.428	102.31	Fut.Est.	0.813				
H420	H421	101.428	101.326	103.05	Fut.Est.	1.622				
H421	H422	101.326	101.236	103.94	Fut.Est.	2.614				
H422	H423	101.236	101.145	104.28	Fut.Est.	3.044				
H423	H424	101.145	101.134	104.47	Fut.Est.	3.325				
H424	H403	101.134	100.985	104.60	Fut.Est.	3.466				
H430	H413	98.724	98.290	99.94	Fut.Est.	1.216				
N4A02	N4A02ii	105.103	105.100	N/A	N/A	N/A				

Notes:

[1] USF elevations within Phase 1 as per Stantec's grading plan.

[2] Conservative estimate of freeboard based on U/S HGL and lowest USF connected to pipe. Actual HGL / freeboard at all connecting lots interpolated where conservative estimate does not meet freeboard requirements.

[3] Future USF estimated as 1.8 m below the upstream manhole cover elevation.

100.715 Interpolated HGL elevation

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
3	4	101.589	100.549	101.64	B9L6	0.051	62.5	11.8	100.745	0.895
				102.89	B9L1		62.5	49.7	101.376	1.514
				102.59	B17L1		62.5	49.7	101.376	1.214
				101.67	B17L6		62.5	11.8	100.745	0.925
4	5	100.549	100.465	101.87	B39L6	1.321				
5	6	100.465	100.346	101.63	B39L1	1.165				
6	7	100.346	100.259	101.65	B38L1	1.304				
7	9	100.259	99.786	101.26	B37L1	1.001				
9	Plug	99.786	99.713	N/A	N/A	N/A				
10	11	101.060	100.785	101.67	B11L1	0.610				
11	4	100.785	100.549	101.67	B10	0.885				
12	13	101.185	101.001	101.74	B15	0.555				
13	14	101.001	100.808	N/A	N/A	N/A				
14	4	100.808	100.549	N/A	N/A	N/A				
15	16	101.948	101.673	102.68	B19L1	0.732				
16	3	101.673	101.589	103.17	B3L6	1.497				
17	5	100.554	100.465	N/A	N/A	N/A				
21	22	103.810	103.616	N/A	N/A	N/A				
22	23B	103.616	103.456	N/A	N/A	N/A				
23	9	99.918	99.786	101.17	B97W	1.252				
27	28	103.686	103.292	104.66	B9L3	0.974				
28	34	103.292	103.144	N/A	N/A	N/A				
29	30B	104.000	103.826	105.02	B31L4	1.020				
30	14	100.825	100.808	N/A	N/A	N/A				
31	32	103.775	103.329	105.13	B26L6	1.355				
32	33	103.329	103.316	104.95	B25L3	1.621				
33	34	103.316	103.144	104.85	B25L1	1.534				
34	36	103.144	102.992	N/A	N/A	N/A				
35	36	103.016	102.992	103.59	B8L5	0.574	87.3	85.7	103.016	0.574
				103.79	B8L1		87.3	60.4	103.009	0.781
				103.79	B6L6		87.3	54.3	103.007	0.783
				103.93	B6L1		87.3	13.8	102.996	0.934
36	38	102.992	102.343	N/A	N/A	N/A				
37	38	102.793	102.343	103.19	B1L1	0.397	85.4	83.8	102.785	0.405
				103.53	B1L4		85.4	65.7	102.689	0.841
				103.53	B2L1		85.4	58.1	102.649	0.881
				103.24	B2L5		85.4	27.1	102.486	0.754
				103.24	B3L1		85.4	20.4	102.450	0.790
38	3	102.343	101.589	103.12	B3L4	0.777				
101	102	101.438	101.286	102.09	109	0.652	29.5	4.8	101.311	0.779
				102.14	108		29.5	11.7	101.346	0.794
				102.14	107		29.5	24.6	101.413	0.727
102	103	101.286	101.181	101.83	106	0.544	26.5	17.7	101.251	0.579
				101.97	105		26.5	5.1	101.201	0.769
				101.95	112		26.5	9.6	101.219	0.731
				101.95	111		26.5	20.0	101.260	0.690
				102.03	110		26.5	26.5	101.286	0.744
103	104105	101.181	100.728	108.84	102	7.659				
105	106	100.440	100.323	101.94	93	1.500				
106	107	100.323	100.081	101.41	88	1.087				
107	108	100.081	99.594	100.84	79	0.759				
108	109C	99.594	99.446	99.91	75	0.316	46.1	11.9	99.484	0.426
				100.06	76		46.1	23.0	99.520	0.540
				100.34	77		46.1	33.9	99.555	0.785
				100.55	78		46.1	44.3	99.588	0.962
111	112	101.609	101.435	102.09	122	0.481	33.1	3.0	101.451	0.639

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				102.09	121		33.1	13.7	101.507	0.583
				102.31	120		33.1	17.5	101.527	0.783
				102.40	119		33.1	18.8	101.534	0.866
				102.52	118		33.1	19.6	101.538	0.982
				102.52	117		33.1	31.1	101.598	0.922
				102.49	116		33.1	27.3	101.579	0.911
				102.36	115		33.1	16.6	101.522	0.838
				102.24	114		33.1	12.4	101.500	0.740
				102.02	113		33.1	3.8	101.455	0.565
112	103	101.435	101.181	101.87	124	0.435	62.4	48.0	101.376	0.494
				101.97	123		62.4	60.8	101.428	0.542
				101.94	125		62.4	41.7	101.351	0.589
				101.94	126		62.4	26.0	101.287	0.653
				101.92	127		62.4	13.6	101.236	0.684
114	124C	99.443	99.397	N/A	N/A	N/A				
116	117	100.783	100.743	101.55	72	0.767				
117	118	100.743	100.272	101.10	31	0.357	66.3	7.9	100.328	0.772
				101.23	30		66.3	12.6	100.362	0.868
				101.27	29		66.3	25.8	100.455	0.815
				101.27	28		66.3	36.8	100.533	0.737
				101.30	27		66.3	53.1	100.649	0.651
				101.55	71		66.3	58.2	100.685	0.865
				101.41	70		66.3	47.2	100.607	0.803
				101.27	69		66.3	36.2	100.529	0.741
				101.17	68		66.3	30.1	100.486	0.684
				101.22	67		66.3	15.3	100.381	0.839
				101.22	66		66.3	8.9	100.335	0.885
118	123	100.272	99.552	100.62	59	0.348	68.0	2.3	99.576	1.044
				100.76	60		68.0	8.3	99.640	1.120
				100.97	61		68.0	18.8	99.751	1.219
				101.10	62		68.0	30.3	99.873	1.227
				101.15	63		68.0	45.1	100.030	1.120
				101.15	64		68.0	55.4	100.139	1.011
				101.11	65		68.0	61.5	100.203	0.907
				101.15	32		68.0	62.8	100.217	0.933
				101.18	33		68.0	50.4	100.086	1.094
				101.18	34		68.0	34.7	99.919	1.261
				101.07	35		68.0	24.1	99.807	1.263
				100.89	36		68.0	10.8	99.666	1.224
119	120	100.760	100.497	101.22	22	0.460	61.0	9.4	100.538	0.682
				101.38	23		61.0	16.4	100.568	0.812
				101.39	24		61.0	27.4	100.615	0.775
				101.39	25		61.0	38.2	100.662	0.728
				101.38	26		61.0	53.0	100.726	0.654
				101.57	8		61.0	54.5	100.732	0.838
				101.45	9		61.0	44.1	100.687	0.763
				101.34	10		61.0	33.3	100.641	0.699
				101.49	11		61.0	22.3	100.593	0.897
				101.49	12		61.0	17.7	100.573	0.917
				101.45	13		61.0	5.3	100.520	0.930
120	122	100.497	100.097	101.02	17	0.523				
122	123	100.097	99.552	N/A	N/A	N/A				
123	124C	99.552	99.397	99.95	41	0.398				
125	122	100.449	100.097	100.54	47	0.091	43.2	11.3	100.189	0.351
				100.66	46		43.2	26.7	100.315	0.345
				100.77	45		43.2	40.2	100.425	0.345

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				100.77	72		43.2	34.0	100.374	0.396
				100.73	71		43.2	27.2	100.319	0.411
				100.73	70		43.2	10.1	100.179	0.551
126	127	100.712	100.459	101.60	84	0.888				
127	128	100.459	100.381	101.57	82	1.111				
128	132	100.381	99.953	101.15	74	0.769				
129	130	100.844	100.515	101.28	93	0.436				
130	131	100.515	100.481	101.56	98	1.045				
131	132	100.481	99.953	101.38	100	0.899				
132	134C	99.953	99.564	100.53	44	0.577				
133	134C	99.790	99.564	100.22	23	0.430				
135	139	99.489	99.225	99.91	32	0.421				
137	138	99.309	99.306	99.79	Ph1-39	0.481				
138	139	99.306	99.225	99.74	Ph1-29	0.434	112.4	21.8	99.241	0.499
				99.89	Ph1-30		112.4	34.1	99.250	0.640
				100.05	Ph1-31		112.4	49.6	99.261	0.789
				100.04	Ph1-32		112.4	56.2	99.266	0.775
				100.01	Ph1-33		112.4	66.9	99.273	0.737
				99.91	Ph1-34		112.4	77.3	99.281	0.629
				99.82	Ph1-35		112.4	87.6	99.288	0.532
				99.83	Ph1-36		112.4	101.5	99.298	0.532
				99.87	Ph1-37		112.4	108.3	99.303	0.567
				99.79	Ph1-38		112.4	112.4	99.306	0.484
				99.84	Ph1-23		112.4	21.8	99.241	0.599
				99.89	Ph1-24		112.4	37.9	99.252	0.638
				100.04	Ph1-25		112.4	48.9	99.260	0.780
				100.04	Ph1-26		112.4	59.5	99.268	0.772
				99.84	Ph1-27		112.4	70.2	99.276	0.564
				99.84	Ph1-28		112.4	81.6	99.284	0.556
139	151	99.225	99.040	N/A	N/A	N/A				
140	141	99.742	98.831	99.83	Ph1-60	0.088	76.6	54.8	99.483	0.347
				99.84	Ph1-62		76.6	42.7	99.339	0.501
				99.94	Ph1-63		76.6	32.3	99.215	0.725
				99.94	Ph1-64		76.6	21.9	99.091	0.849
				99.94	Ph1-65		76.6	11.3	98.965	0.975
				99.84	Ph1-66		76.6	0.4	98.836	1.004
				100.12	Ph1-56		76.6	7.8	98.924	1.196
				100.09	Ph1-57		76.6	21.9	99.091	0.999
				99.89	Ph1-58		76.6	28.8	99.174	0.716
				99.81	Ph1-59		76.6	39.2	99.297	0.513
				99.92	Ph1-61		76.6	54.8	99.483	0.437
141	142	98.831	98.371	99.36	Ph1-50	0.529				
142	172	98.371	97.845	99.26	Ph1-48	0.889				
144	145	100.707	99.845	101.34	137	0.633				
145	146AA	99.845	99.643	101.42	131	1.575				
146	147	99.552	99.006	100.62	Ph1-22	1.068				
146	176A	99.552	98.994	N/A	N/A	N/A				
147	152	99.006	98.573	99.54	Ph1-13	0.534				
148	149	99.445	99.354	100.28	20	0.835				
149	151	99.354	99.040	99.98	14	0.626				
150	151	99.210	99.040	99.83	Ph1-9	0.620				
151	152	99.040	98.573	N/A	N/A	N/A				
152	153	98.573	97.770	99.71	Ph1-B180W	1.137				
153	174	97.770	97.121	99.29	Ph1-B181	1.520				
154	155	97.643	97.524	98.28	148	0.637				
154	157	97.643	97.540	98.36	Ph1-122	0.717				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
155	155B	97.524	97.523	98.34	Ph1-118	0.816				
156	156B	97.374	97.343	98.40	Ph1-109	1.026				
157	158	97.540	97.394	98.30	Ph1-124	0.760				
158	158B	97.394	97.357	98.42	Ph1-132	1.026				
159	173	97.289	97.195	N/A	N/A	N/A				
160	174	97.197	97.121	98.45	Ph1-B183	1.253				
167	168	99.073	99.069	100.73	Ph5-24	1.657				
168	169	99.069	99.061	N/A	N/A	N/A				
169	170	99.061	99.025	N/A	N/A	N/A				
170	171	99.025	98.246	99.63	Ph1-87	0.605				
171	171A	98.246	97.987	N/A	N/A	N/A				
172	172A	97.845	97.657	N/A	N/A	N/A				
173	174	97.195	97.121	98.95	Ph1-100	1.755				
174	174C	97.121	96.955	98.69	Ph1-168	1.569				
175	176	99.225	99.079	N/A	N/A	N/A				
176	176A	99.079	98.994	N/A	N/A	N/A				
177	178	98.823	97.299	N/A	N/A	N/A				
178	179	97.299	97.013	N/A	N/A	N/A				
179	180	97.013	96.680	N/A	N/A	N/A				
180	181	96.680	96.336	N/A	N/A	N/A				
181	T182	96.336	96.034	N/A	N/A	N/A				
201	202	99.022	98.877	N/A	N/A	N/A				
202	203	98.877	98.848	N/A	N/A	N/A				
203	204	98.848	98.553	N/A	N/A	N/A				
204	205	98.553	98.515	N/A	N/A	N/A				
205	206	98.515	98.389	N/A	N/A	N/A				
206	207	98.389	98.329	N/A	N/A	N/A				
207	208	98.329	98.183	N/A	N/A	N/A				
208	208i	98.183	96.820	N/A	N/A	N/A				
301	302	100.670	100.222	101.35	139	0.680	61.0	6.4	100.269	1.081
				101.55	140		61.0	24.9	100.405	1.145
				101.68	141		61.0	31.9	100.456	1.224
				101.78	142		61.0	47.6	100.572	1.208
				101.95	143		61.0	56.9	100.640	1.310
				101.77	134		61.0	56.1	100.634	1.136
				101.77	135		61.0	42.2	100.532	1.238
				101.77	136		61.0	36.1	100.487	1.283
				101.77	137		61.0	19.1	100.362	1.408
				101.54	138		61.0	3.5	100.248	1.292
302	303	100.222	100.118	N/A	N/A	N/A				
303	108	100.118	99.594	N/A	N/A	N/A				
401	402	100.107	100.066	N/A	N/A	N/A				
402	403	100.066	100.054	N/A	N/A	N/A				
403	405	100.054	100.028	N/A	N/A	N/A				
404	405	100.275	100.028	N/A	N/A	N/A				
405	406	100.028	99.992	N/A	N/A	N/A				
406	407	99.992	99.972	100.71	B98E	0.718				
407	23	99.972	99.918	101.13	B98W	1.158				
104105	105	100.728	100.440	101.82	94	N/A				
104105	104301	100.728	101.125	N/A	N/A	N/A				
104301	301	101.125	100.670	101.63	146	0.505	75.3	23.6	100.813	0.817
				101.80	145		75.3	17.4	100.775	1.025
				101.95	144		75.3	7.5	100.715	1.235
				101.66	147		75.3	38.6	100.903	0.757
				101.80	148		75.3	44.7	100.940	0.860
				101.80	149		75.3	61.3	101.040	0.760

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				101.92	128		75.3	60.7	101.037	0.883
				101.92	129		75.3	44.1	100.936	0.984
				101.76	130		75.3	33.7	100.874	0.886
				101.63	131		75.3	23.3	100.811	0.819
				101.63	132		75.3	17.2	100.774	0.856
				101.76	133		75.3	5.4	100.703	1.057
115117	117	100.765	100.743	101.28	1	N/A				
115119	119	100.761	100.760	101.64	7	N/A				
115119	115117	100.761	100.765	N/A	N/A	N/A				
121122	122	100.197	100.097	100.50	48	N/A				
121140	140	100.167	99.742	100.32	58	0.149	80.5	21.3	99.854	0.462
				100.52	54		80.5	62.5	100.072	0.448
				100.45	55		80.5	52.1	100.017	0.434
				100.41	56		80.5	41.8	99.963	0.444
				100.38	57		80.5	35.9	99.932	0.448
				100.31	59		80.5	19.6	99.845	0.463
				100.35	60		80.5	30.0	99.900	0.454
				100.40	61		80.5	39.9	99.953	0.444
				100.44	62		80.5	50.3	100.008	0.436
121140	121122	100.167	100.197	N/A	N/A	N/A				
136137	137	99.318	99.309	99.78	Ph1-22	0.462				
136150	150	99.211	99.210	99.75	Ph1-12	0.539				
136150	136137	99.211	99.318	99.78	Ph1-19	0.569				
109C	114	99.446	99.443	N/A	N/A	N/A				
109C	113Ci	99.446	99.338	N/A	N/A	N/A				
10B	12B	104.228	104.079	N/A	N/A	N/A				
113Ci	208	99.338	98.183	N/A	N/A	N/A				
11B	12B	104.770	104.079	105.33	B44L6	0.560				
11BE	24B	104.661	104.434	105.22	B76L7	0.559				
124C	170	99.397	99.025	99.76	49	0.363	103.3	29.8	99.132	0.628
				99.79	50		103.3	39.9	99.169	0.621
				99.85	51		103.3	50.8	99.208	0.642
				100.00	52		103.3	61.5	99.246	0.754
				100.00	53		103.3	77.2	99.303	0.697
				99.92	54		103.3	89.3	99.347	0.573
				99.92	42		103.3	98.9	99.381	0.539
				99.89	43		103.3	83.5	99.326	0.564
				99.87	44		103.3	77.6	99.304	0.566
				99.86	45		103.3	62.8	99.251	0.609
				99.81	46		103.3	52.3	99.213	0.597
				99.79	47		103.3	46.5	99.192	0.598
				99.78	48		103.3	30.5	99.135	0.645
124C	124CI	99.397	98.727	N/A	N/A	N/A				
124CI	206	98.727	98.389	N/A	N/A	N/A				
12B	17B	104.079	103.944	105.45	B42L1	1.371				
134B	203	99.140	98.848	N/A	N/A	N/A				
134C	135	99.564	99.489	99.99	26	0.426				
134C	134CI	99.564	99.539	N/A	N/A	N/A				
134CI	134B	99.539	99.140	N/A	N/A	N/A				
13B	14B	105.063	104.726	105.56	B48L1	0.497				
146AA	146	99.643	99.552	101.26	130	1.617				
146AA	146CI	99.643	99.182	N/A	N/A	N/A				
146CI	201	99.182	99.022	N/A	N/A	N/A				
14B	15B	104.726	104.523	105.48	B48L4	0.754				
14B	18B	104.726	104.858	105.64	B36L4	0.914				
152B	152	98.944	98.573	N/A	N/A	N/A				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
155B	156	97.523	97.374	98.34	Ph1-110	0.817				
156B	159	97.343	97.289	98.54	Ph1-107	1.197				
158B	159	97.357	97.289	98.44	Ph1-134	1.083				
15B	16B	104.523	104.261	N/A	N/A	N/A				
16B	17B	104.261	103.944	N/A	N/A	N/A				
171A	172	97.987	97.845	N/A	N/A	N/A				
172A	172B	97.657	97.324	99.24	Ph1-88	1.583				
172B	173	97.324	97.195	99.23	Ph1-94	1.906				
174A	178	98.553	97.299	N/A	N/A	N/A				
174C	180	96.955	96.680	N/A	N/A	N/A				
174H	174A	99.042	98.553	100.09	Ph1-36	1.048				
174I	174H	100.108	99.042	100.39	Ph1-32	0.282	107.6	9.7	99.138	1.252
				100.44	Ph1-31		107.6	20.1	99.241	1.199
				100.59	Ph1-30		107.6	28.1	99.320	1.270
				100.74	Ph1-29		107.6	40.6	99.444	1.296
				100.45	Ph1-28		107.6	47.9	99.517	0.933
				100.94	Ph1-27		107.6	58.9	99.626	1.314
				101.09	Ph1-26		107.6	70.8	99.743	1.347
				101.14	Ph1-25		107.6	88.4	99.918	1.222
				101.28	B30W		107.6	88.2	99.916	1.364
				101.28	B30E		107.6	57.1	99.608	1.672
				101.17	31		107.6	46.1	99.499	1.671
				101.14	32		107.6	35.8	99.397	1.743
				101.14	33		107.6	25.4	99.294	1.846
				101.14	34		107.6	15.0	99.191	1.949
				101.29	B35W		107.6	8.6	99.127	2.163
174J	174I	100.927	100.108	101.13	B154E	0.203	80.4	6.1	100.170	0.960
				101.85	B154W		80.4	30.2	100.416	1.434
				101.91	128		80.4	36.7	100.482	1.428
				101.91	127		80.4	52.9	100.647	1.263
				101.93	126		80.4	57.4	100.693	1.237
				101.99	125		80.4	67.8	100.799	1.191
				102.00	124		80.4	78.1	100.904	1.096
				101.96	27		80.4	70.5	100.826	1.134
				101.91	28		80.4	58.7	100.706	1.204
				101.86	B29W		80.4	51.1	100.629	1.231
				101.65	B29E		80.4	7.1	100.180	1.470
174K	174J	101.534	100.927	102.02	26	0.486				
176A	177	98.994	98.823	N/A	N/A	N/A				
17B	21	103.944	103.810	105.02	B42L5	1.076				
18B	19B	104.858	104.851	105.55	B35L3	0.692				
19B	20B	104.851	104.431	105.36	B34L1	0.509				
1B	2B	105.102	104.928	N/A	N/A	N/A				
208i	HW	96.820	96.690	N/A	N/A	N/A				
20B	21	104.431	103.810	105.02	B32L1	0.589				
23B	28	103.456	103.292	N/A	N/A	N/A				
2400B	24B	104.769	104.434	N/A	N/A	N/A				
24B	25B	104.434	104.177	105.04	B14L1	0.606	67.3	56.5	104.393	0.647
				105.04	B14L6		67.3	18.0	104.246	0.794
				105.04	B13L1		67.3	11.2	104.220	0.820
25B	26B	104.177	103.734	104.84	B12L4	0.663	63.2	1.6	103.745	1.095
				104.84	B11L1		63.2	3.7	103.760	1.080
				105.00	B12L1		63.2	29.8	103.943	1.057
				105.00	B13L6		63.2	36.2	103.988	1.012
26B	27	103.734	103.686	104.84	B11L1	1.106				
2B	3B	104.928	104.905	N/A	N/A	N/A				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
30B	31	103.826	103.775	105.20	B29L3	1.374				
39B	10B	104.775	104.228	N/A	N/A	N/A				
3B	5B	104.905	104.830	N/A	N/A	N/A				
4B	5B	105.112	104.830	105.78	B58L3	0.668				
5B	15B	104.830	104.523	105.54	B61L3	0.710				
6B	7B	104.446	104.394	105.13	B86L6	0.684	85.4	77.9	104.441	0.689
				105.15	B86L1		85.4	39.4	104.418	0.732
				105.15	B66L6		85.4	33.2	104.414	0.736
7B	8B	104.394	104.374	105.50	B87L1	1.106				
8B	9B	104.374	104.364	105.64	B64L1	1.266				
9B	10B	104.364	104.228	105.51	B62L1	1.146				
CMH	401	100.129	100.107	N/A	N/A	N/A				
CMH1	12B	104.929	104.079	N/A	N/A	N/A				
CMH2	3	101.597	101.589	N/A	N/A	N/A				
CMH3	22	104.829	103.616	N/A	N/A	N/A				
MG101	MG101a	104.282	104.595	N/A	N/A	N/A				
MG101	MG102	104.282	104.029	N/A	N/A	N/A				
MG101a	MG102	104.595	104.029	105.67	B203W	1.075	94.0	86.5	104.550	1.120
				105.78	B203E		94.0	48.5	104.321	1.459
				105.78	B204W		94.0	41.3	104.278	1.502
				105.84	B204E		94.0	17.3	104.133	1.707
				105.84	B205W		94.0	10.1	104.090	1.750
MG102	MG102a	104.029	104.097	N/A	N/A	N/A				
MG102	MG103	104.029	103.786	N/A	N/A	N/A				
MG102a	MG103	104.097	103.786	105.90	B205E	1.803	90.4	76.5	104.049	1.851
				105.90	B206W		90.4	69.3	104.024	1.876
				106.11	B206E		90.4	38.4	103.918	2.192
MG103	MG103O	103.786	99.554	N/A	N/A	N/A				
MG103a	MG104	104.544	99.502	N/A	N/A	N/A				
MG103O	MG103a	99.554	104.544	N/A	N/A	N/A				
MG103O	MG104	99.554	99.502	N/A	N/A	N/A				
MG104	MG104a	99.502	105.903	N/A	N/A	N/A				
MG104	MG105	99.502	99.455	N/A	N/A	N/A				
MG104a	MG105	105.903	104.811	106.04	B37W	0.137	63.2	32.4	105.371	0.669
				106.09	B37E		63.2	8.9	104.965	1.125
MG105	MG105a	99.455	104.985	N/A	N/A	N/A				
MG105	MG106	99.455	99.359	N/A	N/A	N/A				
MG105a	MG106	104.985	99.359	106.19	Estimate	1.205				
MG106	MG1060	99.359	99.295	N/A	N/A	N/A				
MG106	MG106a	99.359	105.265	N/A	N/A	N/A				
MG1060	MG1060a	99.295	102.549	N/A	N/A	N/A				
MG1060	MG107	99.295	99.261	N/A	N/A	N/A				
MG1060a	MG107	102.549	99.261	103.78	Estimate	1.233				
MG106a	MG1060	105.265	99.295	106.56	Estimate	1.295				
MG107	175	99.261	99.225	N/A	N/A	N/A				
MG144	MG101	104.896	104.282	N/A	N/A	N/A				
N4A01	MG101	105.487	104.282	N/A	N/A	N/A				
N4A02ii	MG144	105.125	104.896	N/A	N/A	N/A				
N4C10	N4C11	97.846	97.008	N/A	N/A	N/A				
N4C11	N4C21A	97.008	96.553	N/A	N/A	N/A				
N4C18	N4C21A	97.351	96.553	N/A	N/A	N/A				
N4C21A	N4C21B	96.553	96.000	N/A	N/A	N/A				
N4C21B	P4	96.000	94.662	N/A	N/A	N/A				
P4	P4out	94.662	93.200	N/A	N/A	N/A				
Plug	176A	99.713	98.994	N/A	N/A	N/A				
T182	T183	96.034	95.781	N/A	N/A	N/A				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
T183	T184	95.781	95.465	N/A	N/A	N/A				
T184	T185	95.465	95.101	N/A	N/A	N/A				
T185	T186	95.101	94.909	N/A	N/A	N/A				
T186	T187	94.909	94.757	N/A	N/A	N/A				
T187	P4	94.757	94.662	N/A	N/A	N/A				
W1	W4	111.331	111.327	113.76	142	2.429				
W2	W1	111.561	111.331	113.68	147	2.119				
W2	W3	111.561	112.451	113.51	149	1.949				
W3	W7	112.451	110.943	113.08	155	0.629				
W4	W5	111.327	111.199	113.40	136	2.073				
W5	W6	111.199	111.179	113.23	134	2.031				
W6	W7	111.179	110.943	112.84	129	1.661				
W7	W18	110.943	110.387	112.51	158	1.567				
W8	W9	107.778	107.762	110.51	189	2.732				
W9	W10	107.762	107.626	110.45	190	2.688				
W10	W11	107.626	107.586	110.40	200	2.774				
W11	W16	107.586	107.445	110.29	202	2.704				
W12	W8	109.576	107.778	110.55	188	0.974				
W13	W12	109.848	109.576	111.69	183	1.842				
W13	W14	109.848	109.493	110.84	177	0.992				
W14	W15	109.493	109.493	110.64	176	1.147				
W15	W16	109.493	107.445	110.35	174	0.857				
W16	W19	107.445	103.379	N/A	N/A	N/A				
W17	W18	110.475	110.387	111.51	119	1.035				
W18	W19	110.387	103.379	110.59	173	0.203	94.3	15.6	104.538	6.052
				110.74	172		94.3	25.7	105.289	5.451
				110.75	171		94.3	40.0	106.352	4.398
				111.10	170		94.3	46.5	106.835	4.265
				111.60	169		94.3	61.3	107.935	3.665
				112.07	168		94.3	66.9	108.351	3.719
				112.13	167		94.3	84.8	109.681	2.449
				112.00	109		94.3	93.3	110.313	1.687
				111.75	108		94.3	79.7	109.302	2.448
				111.47	107		94.3	73.6	108.849	2.621
				111.22	106		94.3	59.5	107.801	3.419
				111.03	105		94.3	54.6	107.437	3.593
				110.87	104		94.3	40.4	106.381	4.489
W19	W27	103.379	103.428	N/A	N/A	N/A				
W19	W19a	103.379	109.269	N/A	N/A	N/A				
W19a	W27	109.269	103.428	110.41	99	1.141				
W20	W21	109.113	109.086	110.82	64	1.707				
W21	W22	109.086	108.802	110.74	59	1.654				
W22	W23	108.802	108.739	110.73	55	1.928				
W23	W26	108.739	108.428	110.54	49	1.801				
W24	W20	110.051	109.113	110.95	66	0.899				
W25	W24	110.200	110.051	111.68	72	1.480				
W25	W26	110.200	108.428	110.99	82	0.790				
W26	W27	108.428	103.428	110.46	85	2.032				
W27	W53	103.428	103.462	N/A	N/A	N/A				
W27	W27a	103.428	109.070	N/A	N/A	N/A				
W27a	W53	109.070	103.462	110.26	48	1.190				
W28	W43	103.555	103.618	N/A	N/A	N/A				
W28	W28a	103.555	108.417	N/A	N/A	N/A				
W28a	W43	108.417	103.618	108.34	B209N	-0.077	63.5	14.0	104.676	3.664
				109.36	B209S		63.5	53.8	107.684	1.676
				109.45	B210N		63.5	57.5	107.964	1.486

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
				109.19	B218S		63.5	43.8	106.928	2.262
				108.38	B218N		63.5	18.3	105.001	3.379
W29	W30	107.364	106.981	109.68	B217W	2.316				
W30	W31	106.981	106.955	108.65	B216S	1.669				
W31	W32	106.955	106.922	108.25	B219N	1.295				
W32	W33	106.922	106.910	108.16	B214N	1.238				
W33	W43	106.910	103.618	107.71	B213W	0.800				
W34	W38	107.126	106.870	108.40	20	1.274	58.0	56.4	107.119	1.281
				108.51	19		58.0	48.4	107.084	1.426
				108.52	18		58.0	37.2	107.034	1.486
				108.52	17		58.0	22.5	106.969	1.551
				108.47	16		58.0	16.5	106.943	1.527
				108.42	15		58.0	3.8	106.887	1.533
W35	W36	107.485	107.233	108.32	22	0.835	65.7	60.5	107.465	0.855
				108.34	21		65.7	62.9	107.474	0.866
				108.39	23		65.7	43.0	107.398	0.992
				108.48	24		65.7	31.1	107.352	1.128
				108.55	25		65.7	25.3	107.330	1.220
				108.55	26		65.7	9.8	107.271	1.279
				108.55	27		65.7	4.3	107.249	1.301
				108.45	32		65.7	7.0	107.260	1.190
				108.53	33		65.7	18.7	107.305	1.225
				108.54	34		65.7	36.0	107.371	1.169
				108.54	35		65.7	42.8	107.397	1.143
				108.49	36		65.7	59.8	107.462	1.028
W36	W37	107.233	107.191	108.82	29	1.587				
W37	W42	107.191	105.942	108.21	31	1.019				
W38	W39	106.870	106.794	108.32	13	1.450				
W39	W40	106.794	106.257	108.18	9	1.386				
W40	W41	106.257	106.113	108.16	4	1.903				
W41	W42	106.113	105.942	108.08	1	1.967				
W42	W43	105.942	103.618	N/A	N/A	N/A				
W43	W54	103.618	103.710	N/A	N/A	N/A				
W43	W43a	103.618	106.851	N/A	N/A	N/A				
W43a	W54	106.851	103.710	105.92	B211N	-0.931	92.8	3.4	103.825	2.095
				106.37	B211S		92.8	27.2	104.631	1.739
				106.37	B212N		92.8	34.4	104.874	1.496
				107.43	B212S		92.8	58.9	105.704	1.726
				107.85	B208S		92.8	82.9	106.516	1.334
				106.86	B208N		92.8	44.9	105.230	1.630
				106.73	B207S		92.8	37.7	104.986	1.744
				105.93	B207N		92.8	6.7	103.937	1.993
W52	W19	108.808	103.379	N/A	N/A	N/A				
W53	W28	103.462	103.555	N/A	N/A	N/A				
W53	W53a	103.462	109.196	N/A	N/A	N/A				
W53a	W28	109.196	103.555	110.16	B210S	0.964				
W54	MG103	103.710	103.786	N/A	N/A	N/A				
MH122	W19	102.753	103.379	(By IBI)	(By IBI)	(By IBI)				
MH122	MH111	102.753	102.413	(By IBI)	(By IBI)	(By IBI)				
EXT300	MH206	104.942	103.413	(By IBI)	(By IBI)	(By IBI)				
EXTA3	EX OUTLET	108.220	104.218	(By IBI)	(By IBI)	(By IBI)				
MH118	MH131A	101.852	101.799	(By IBI)	(By IBI)	(By IBI)				
MH113	MH120	102.263	101.912	(By IBI)	(By IBI)	(By IBI)				
MH111	MH113	102.413	102.263	(By IBI)	(By IBI)	(By IBI)				
MH120	MH119	101.912	101.891	(By IBI)	(By IBI)	(By IBI)				
MH119	MH118	101.891	101.852	(By IBI)	(By IBI)	(By IBI)				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
MH121	MH120	101.746	101.912	(By IBI)	(By IBI)	(By IBI)				
MH216	MH217	101.622	101.686	(By IBI)	(By IBI)	(By IBI)				
MH215	MH216	101.346	101.622	(By IBI)	(By IBI)	(By IBI)				
MH215	OVRFLW	101.346	100.964	(By IBI)	(By IBI)	(By IBI)				
OVRFLW	Node736	100.964	100.486	(By IBI)	(By IBI)	(By IBI)				
OVRFLW	Node736	100.964	100.486	(By IBI)	(By IBI)	(By IBI)				
Node736	FEEDMILL	100.486	99.990	(By IBI)	(By IBI)	(By IBI)				
MH101	BLKHD1	105.298	99.970	(By IBI)	(By IBI)	(By IBI)				
BLKHD1	MG105	99.970	99.455	(By IBI)	(By IBI)	(By IBI)				
MH102A	MH101	106.277	105.298	(By IBI)	(By IBI)	(By IBI)				
MH103	MH104	104.116	103.809	(By IBI)	(By IBI)	(By IBI)				
MH104	MH105	103.809	103.116	(By IBI)	(By IBI)	(By IBI)				
MH105	MH109	103.116	102.130	(By IBI)	(By IBI)	(By IBI)				
MH109	MH118	102.130	101.852	(By IBI)	(By IBI)	(By IBI)				
MH106	MH101	105.835	105.298	(By IBI)	(By IBI)	(By IBI)				
MH107	MH108	105.893	103.922	(By IBI)	(By IBI)	(By IBI)				
MH108	MH109	103.922	102.130	(By IBI)	(By IBI)	(By IBI)				
MH110A	MH111	103.913	102.413	(By IBI)	(By IBI)	(By IBI)				
MH112A	MH113	102.353	102.263	(By IBI)	(By IBI)	(By IBI)				
MH123	MH121	101.872	101.746	(By IBI)	(By IBI)	(By IBI)				
MH124	MH123	102.510	101.872	(By IBI)	(By IBI)	(By IBI)				
MH125	MH124	103.829	102.510	(By IBI)	(By IBI)	(By IBI)				
MH126	MH125	104.173	103.829	(By IBI)	(By IBI)	(By IBI)				
MH127A	MH126	102.276	104.173	(By IBI)	(By IBI)	(By IBI)				
MH201	MH123	101.907	101.872	(By IBI)	(By IBI)	(By IBI)				
MH129	MH130	101.839	101.812	(By IBI)	(By IBI)	(By IBI)				
MH130	MH131A	101.812	101.799	(By IBI)	(By IBI)	(By IBI)				
MH132	MH120	102.035	101.912	(By IBI)	(By IBI)	(By IBI)				
MH200	MH201	102.145	101.907	(By IBI)	(By IBI)	(By IBI)				
MH202	MH204	103.204	102.741	(By IBI)	(By IBI)	(By IBI)				
MH204	MH203A	102.741	102.238	(By IBI)	(By IBI)	(By IBI)				
MH203A	MH218	102.238	101.872	(By IBI)	(By IBI)	(By IBI)				
MH218	MH213	101.872	101.762	(By IBI)	(By IBI)	(By IBI)				
MH213	MH220	101.762	101.663	(By IBI)	(By IBI)	(By IBI)				
MH211	MH212	102.953	102.811	(By IBI)	(By IBI)	(By IBI)				
MH212	MH204	102.811	102.741	(By IBI)	(By IBI)	(By IBI)				
MH209	MH208	103.615	103.527	(By IBI)	(By IBI)	(By IBI)				
MH208	MH207	103.527	103.505	(By IBI)	(By IBI)	(By IBI)				
MH207	MH206	103.505	103.413	(By IBI)	(By IBI)	(By IBI)				
MH206	MH205	103.413	103.315	(By IBI)	(By IBI)	(By IBI)				
MH205	MH202	103.315	103.204	(By IBI)	(By IBI)	(By IBI)				
MH210	MH206	103.510	103.413	(By IBI)	(By IBI)	(By IBI)				
MH219	MH216	101.654	101.622	(By IBI)	(By IBI)	(By IBI)				
MH127B	MH202	103.394	103.204	(By IBI)	(By IBI)	(By IBI)				
MH203B	MH201	102.000	101.907	(By IBI)	(By IBI)	(By IBI)				
MH110B	MH108	104.441	103.922	(By IBI)	(By IBI)	(By IBI)				
MH112B	MH109	102.761	102.130	(By IBI)	(By IBI)	(By IBI)				
MH106A	MH107	105.894	105.893	(By IBI)	(By IBI)	(By IBI)				
MH102B	MH103	105.898	104.116	(By IBI)	(By IBI)	(By IBI)				
EX OUTLET	MH202	104.218	103.204	(By IBI)	(By IBI)	(By IBI)				
MH131	MH114	99.483	99.423	(By IBI)	(By IBI)	(By IBI)				
MH131A	MH131	101.799	99.483	(By IBI)	(By IBI)	(By IBI)				
MH114	STUB	99.423	99.393	(By IBI)	(By IBI)	(By IBI)				
STUB	MG107	99.393	99.261	(By IBI)	(By IBI)	(By IBI)				
MH217	MH121	101.686	101.746	(By IBI)	(By IBI)	(By IBI)				
MH220	MH215	101.663	101.346	(By IBI)	(By IBI)	(By IBI)				

Table E-2: Pond 4 HGL Table for the 100-Year, 12-Hour SCS Storm (Ultimate, Restrictive Conditions)

MH		U/S	D/S	USF [1]	Lot	Freeboard [2]	Interpolated HGL			
(u/s)	(d/s)	HGL	HGL	(m)	Number	(m)	Length (m)	Dist from d/s (m)	HGL (m)	Freeboard (m)
MH128	MH124	103.215	102.510	(By IBI)	(By IBI)	(By IBI)				
H401	H402	105.450	104.412	106.34	Fut.Est.	0.890				
H402	H403	104.412	100.644	105.30	Fut.Est.	0.888				
H403	H404	100.644	100.559	104.56	Fut.Est.	3.916				
H404	H405	100.559	100.444	104.06	Fut.Est.	3.501				
H405	H406	100.444	100.193	103.39	Fut.Est.	2.946				
H406	H407	100.193	99.972	102.71	Fut.Est.	2.517				
H407	H408	99.972	99.749	102.06	Fut.Est.	2.088				
H408	H409	99.749	99.583	101.45	Fut.Est.	1.701				
H409	H410	99.583	99.416	101.00	Fut.Est.	1.417				
H410	H411	99.416	99.205	100.54	Fut.Est.	1.124				
H411	H412	99.205	98.822	100.13	Fut.Est.	0.925				
H412	H430	98.822	98.705	99.98	Fut.Est.	1.158				
H413	N4C10	98.321	97.846	99.62	Fut.Est.	1.299				
H416	H417	100.055	99.039	100.90	Fut.Est.	0.845				
H417	N4C10	99.039	97.846	99.97	Fut.Est.	0.931				
H419	H420	101.386	101.158	102.31	Fut.Est.	0.924				
H420	H421	101.158	101.033	103.05	Fut.Est.	1.892				
H421	H422	101.033	100.931	103.94	Fut.Est.	2.907				
H422	H423	100.931	100.832	104.28	Fut.Est.	3.349				
H423	H424	100.832	100.747	104.47	Fut.Est.	3.638				
H424	H403	100.747	100.644	104.60	Fut.Est.	3.853				
H430	H413	98.705	98.321	99.94	Fut.Est.	1.235				
N4A02	N4A02ii	105.129	105.125	N/A	N/A	N/A				

Notes:

[1] USF elevations within Phase 1 as per Stantec's grading plan.

[2] Conservative estimate of freeboard based on U/S HGL and lowest USF connected to pipe. Actual HGL / freeboard at all connecting lots interpolated where conservative estimate does not meet freeboard requirements.

[3] Future USF estimated as 1.8 m below the upstream manhole cover elevation.

100.745 Interpolated HGL elevation

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA											
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA.	DIA.	TYPE	SLOPE	LENGTH	INV	OBV	T/G	CAPACITY	VELOCITY	TIME OF FLOW	RATIO
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	Conc. (min)	2 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)	100 Year (mm/h)	Q (l/s)	(mm) (actual)	(mm) (nominal)		(%)	(m)	UPS	UPS	UPS	(l/s)	(m/s)	(min.)	Q/Q full
			0.13	0.59	0.21	0.79			0.00	0.00			0.00	0.00			0.00	0.00																		
	43	44	0.59	0.73	1.20	1.98			0.00	0.00			0.00	0.00			0.00	0.00	10.34	75.51	102.41	120.04	175.47	150	600	600	CONC	0.15	75.0	104.997	105.597	108.131	238	0.84	1.49	0.63
	44	45			0.00	1.98			0.00	0.00			0.00	0.00			0.00	0.00	11.83	70.42	95.42	111.81	163.39	140	600	600	CONC	0.15	71.5	104.864	105.464	108.180	238	0.84	1.42	0.59
	45	46			0.00	1.98			0.00	0.00			0.00	0.00			0.00	0.00	13.25	66.24	89.68	105.06	153.47	131	600	600	CONC	0.15	11.0	104.697	105.297	107.849	238	0.84	0.22	0.55
To Block 234, Pipe 46 - TEE47						1.98				0.00				0.00				0.00	13.47																	
Contribution From place Unity Place, Pipe 34 - 40						10.25				0.00				0.00				0.00	17.55																	
Contribution From avenue Derreen Avenue, Pipe 20 - 40						4.16				5.70				0.00				0.00	21.93																	
Contribution From avenue Derreen Avenue, Pipe 39 - 40						1.85				1.38				0.00				0.00	14.16																	
			0.09	0.59	0.15	16.41			0.00	7.08			0.00	0.00			0.00	0.00																		
			0.10	0.59	0.16	16.57			0.00	7.08			0.00	0.00			0.00	0.00																		
			0.17	0.73	0.34	16.92			0.00	7.08			0.00	0.00			0.00	0.00																		
	40	41	0.29	0.59	0.48	17.39			0.00	7.08			0.00	0.00			0.00	0.00	21.93	49.13	66.29	77.56	113.13	1324	1350	1350	CONC	0.11	63.5	104.088	105.438	108.142	1770	1.24	0.86	0.75
	41	46	0.42	0.73	0.85	18.24			0.00	7.08			0.00	0.00			0.00	0.00	22.78	47.95	64.68	75.67	110.36	1333	1350	1350	CONC	0.11	25.5	103.988	105.338	107.944	1770	1.24	0.34	0.75
To Block 234, Pipe 46 - TEE47						18.24				7.08				0.00				0.00	23.12																	
place Unity Place																																				
	33	34	0,53	0,40	0,59	0,59			0,00	0,00			0,00	0,00			0,00	0,00	10,00	76,81	104,19	122,14	178,56	45	375	375	PVC	0,30	10,5	105,183	105,558	108,299	96	0,87	0,20	0,47
Contribution From terrasse Crossway Terrace, Pipe 30 - 34						6.54				0,00				0.00				0.00	16.28																	
Contribution From terrasse Crossway Terrace, Pipe 32 - 34						1.72				0.00				0.00				0.00	13.06																	
			0.07	0.74	0.14	9.00			0.00	0.00			0.00	0.00			0.00	0.00																		
			0.19	0.59	0.31	9,31			0.00	0,00			0.00	0.00			0.00	0.00																		
			0.24	0.73	0.49	9,79			0.00	0,00			0.00	0.00			0.00	0.00																		
	34	40	0.28	0.59	0.46	10.25			0.00	0.00			0.00	0.00			0.00	0.00	16.28	58.91	79.64	93.25	136.14	604	1050	1050	CONC	0.11	80.0	104.476	105.526	108.299	906	1.05	1.27	0.67
To place Unity Place, Pipe 40 - 41						10.25				0.00				0.00				0.00	17.55																	
Block 234																																				
Contribution From place Unity Place, Pipe 41 - 46						18.24				7.08				0.00				0.00	23.12																	
Contribution From place Unity Place, Pipe 45 - 46						1.98				0.00				0.00				0.00	13.47																	
	46	47			0.00	20.23			0.00	7.08			0.00	0.00			0.00	0.00	23.12	47.49	64.06	74.94	109.30	1414	1350	1350	CONC	0.11	34.5	103.930	105.280	107.970	1770	1.24	0.46	0.80
	47	HW			0.00	20.23			0.00	7.08			0.00	0.00			0.00	0.00	23.59	46.89	63.24	73.98	107.89	1396	1350	1350	CONC	0.11	8.5	103.859	105.209	107.970	1770	1.24	0.11	0.79
To POND 7						20.23				7.08				0.00				0.00	23.70																	
Block 244																																				
	91	95	1.99	0.80	4.43	4.43			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	340	825	825	CONC	0.15	6.5	104.776	105.601	107.450	556	1.04	0.10	0.61
To Block 235, Pipe 95 - TEE96						4.43				0.00				0.00				0.00	10.10																	
Block 243																																				
	90	92	1.60	0.80	3.56	3.56			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	273	750	750	CONC	0.15	19.0	105.205	105.955	108.580	431	0.98	0.32	0.63
To chemin Culdaff Road, Pipe 92 - 93						3.56				0.00				0.00				0.00	10.32																	
Block 256 Block 251																																				
	88	89	1.59	0.80	3.54	3.54			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	272	750	750	CONC	0.15	19.0	105.358	106.108	108.640	431	0.98	0.32	0.63
To chemin Culdaff Road, Pipe 89 - 92						3.54				0.00				0.00				0.00	10.32																	
Block 242																																				
	85	86	2.70	0.80	6.00	6.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	461	900	900	CONC	0.15	19.0	105.071	105.971	108.395	701	1.10	0.29	0.66
To chemin Culdaff Road, Pipe 86 - 87						6.00				0.00				0.00				0.00	10.29																	
voie Bermondsey Way																																				
	35	36	0,17	0,74	0,35	0,35			0,00	0,00			0.00	0.00			0.00	0.00	10.00	76,81	104,19	122,14	178,56	27	300	300	PVC	0,35	76,5	105,705	106,005	108,204	57	0,81	1,58	0,47
	36	37			0.00	0.35			0.00	0.00			0.00	0.00			0.00	0.00	11.58	71.24	96.55	113.14	165.34	25	300	300	PVC	0.35	11.5	105.407	105.707	108.155	57	0.81	0.24	0.44
			0.21	0.59	0.34	0.69			0.00	0.00			0.00	0.00			0.00	0.00																		
	37	39	0.41	0.74	0.84	1.54			0.00	0.00			0.00	0.00			0.00	0.00	11.81	70.48	95.51	111.91	163.53	108	525	525	CONC	0.20	65.0	105.142	105.667	108.085	192	0.89	1.22	0.56
To avenue Derreen Avenue, Pipe 39 - 40						1.54				0.00				0.00				0.00	13.03																	
Block 241																																				
	82	83	1.06	0.80	2.36	2.36			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	181	675	675	CONC	0.15	19.5	105.489	106.164	108.350	326	0.91	0.36	0.56
To avenue Derreen Avenue, Pipe 83 - 84						2.36				0.00				0.00				0.00	10.36																	

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

LICENSED PROFESSIONAL ENGINEER
W. LIU
100167932
20-07-09
PROVINCE OF ONTARIO

Designed: W.L.	PROJECT: 195 Huntmar Drive		
Checked: P.P.	LOCATION: City of Ottawa		
Dwg. Reference: STM Drainage Plan, Dwgs 95 to 98	File Ref: 12-624		Date: July 2020
			Sheet No. SHEET 2 OF 5

624_Stm3.xlsx

LRL Associates Ltd.
Storm Watershed Summary

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Dwg Reference: C701, C702

Pre-Development Catchments

Watershed	C = 0.20	C = 0.80	C = 0.90	Total Area (ha)	Combined C
ECA-01A (uncontrolled)	3.185	0.000	0.137	3.322	0.23
Total	**3.185**	**0.000**	**0.137**	**3.322**	**0.23**

Post-Development Catchments

Watershed	C = 0.20	C = 0.8	C = 0.90	Total Area (ha)	Combined C
CA-01A (controlled)	0.000	0.000	0.027	0.027	0.90
CA-02A (controlled)	0.008	0.000	0.063	0.071	0.83
CA-03A (controlled)	0.012	0.000	0.036	0.048	0.73
CA-04A (controlled)	0.017	0.000	0.037	0.053	0.68
CA-05A (controlled)	0.052	0.000	0.081	0.133	0.63
CA-06A (controlled)	0.002	0.000	0.031	0.034	0.85
CA-07A (controlled)	0.013	0.000	0.068	0.081	0.79
CA-100A (controlled)	0.000	0.000	0.153	0.153	0.90
CA-08A (controlled)	0.000	0.000	0.058	0.058	0.90
CA-09A (controlled)	0.014	0.000	0.050	0.064	0.75
CA-101A (controlled)	0.000	0.000	0.249	0.249	0.90
CA-10A (controlled)	0.010	0.000	0.068	0.077	0.81
CA-102A (controlled)	0.000	0.000	0.409	0.409	0.90
CA-11A (controlled)	0.014	0.000	0.041	0.055	0.72
CA-12A (controlled)	0.011	0.000	0.039	0.050	0.74
CA-13A (controlled)	0.000	0.000	0.061	0.061	0.90
CA-14A (controlled)	0.005	0.000	0.145	0.150	0.88
CA-15A (controlled)	0.004	0.000	0.145	0.149	0.88
CA-16A (controlled)	0.003	0.000	0.063	0.066	0.87
CA-17A (controlled)	0.004	0.000	0.058	0.062	0.85
CA-18A (controlled)	0.120	0.000	0.130	0.249	0.56
CA-19A (controlled)	0.011	0.000	0.067	0.078	0.80
CA-20A (controlled)	0.085	0.000	0.159	0.244	0.66
CA-21A (controlled)	0.080	0.000	0.000	0.080	0.20
CA-22A (controlled)	0.062	0.000	0.000	0.062	0.20
CA-23A (controlled)	0.009	0.000	0.054	0.062	0.80
CA-24A (controlled)	0.014	0.000	0.028	0.042	0.67
CA-25A (controlled)	0.028	0.000	0.020	0.048	0.49
CA-26A (controlled)	0.028	0.000	0.020	0.048	0.50
CA-27A (controlled)	0.039	0.000	0.020	0.060	0.44
CA-28A (controlled)	0.009	0.000	0.023	0.032	0.70
CA-29A (controlled)	0.007	0.000	0.023	0.030	0.74
CA-30A (controlled)	0.009	0.000	0.024	0.033	0.70
CA-31A (controlled)	0.006	0.000	0.023	0.029	0.76
CA-32A (uncontrolled)	0.045	0.000	0.000	0.045	0.20
CA-33A (uncontrolled)	0.020	0.000	0.003	0.023	0.29
CA-34A (uncontrolled)	0.102	0.000	0.000	0.102	0.20
CA-35A (uncontrolled)	0.005	0.000	0.003	0.007	0.46
Total	**0.841**	**0.000**	**2.471**	**3.322**	**0.72**

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

EAST Stormwater Management Design Sheet

STORM - 2 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**3.322**	ha	**∑R=**	**0.23**
Uncontrolled	EWS-01	3.322	ha	R=	0.23
	Total Uncontrolled =	**3.322**	**ha**	**∑R=**	**0.23**

Allowable Release Rate = 545.00 L/s *(195 Huntmar Drive, 2yr C=0.80)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**3.315**	ha	**∑R=**	**0.72**	**0.90**
Controlled	CA-01A (controlled)	0.027	ha	R=	0.90	1.00
	CA-02A (controlled)	0.071	ha	R=	0.83	1.00
	CA-03A (controlled)	0.048	ha	R=	0.73	0.91
	CA-04A (controlled)	0.053	ha	R=	0.68	0.85
	CA-05A (controlled)	0.133	ha	R=	0.63	0.78
	CA-06A (controlled)	0.034	ha	R=	0.85	1.00
	CA-07A (controlled)	0.081	ha	R=	0.79	0.98
	CA-100A (controlled)	0.153	ha	R=	0.90	1.00
	CA-08A (controlled)	0.058	ha	R=	0.90	1.00
	CA-09A (controlled)	0.064	ha	R=	0.75	0.94
	CA-101A (controlled)	0.249	ha	R=	0.90	1.00
	CA-10A (controlled)	0.077	ha	R=	0.81	1.00
	CA-102A (controlled)	0.409	ha	R=	0.90	1.00
	CA-11A (controlled)	0.055	ha	R=	0.72	0.90
	CA-12A (controlled)	0.050	ha	R=	0.74	0.93
	CA-13A (controlled)	0.061	ha	R=	0.90	1.00
	CA-14A (controlled)	0.150	ha	R=	0.88	1.00
	CA-15A (controlled)	0.149	ha	R=	0.88	1.00
	CA-16A (controlled)	0.066	ha	R=	0.87	1.00
	CA-17A (controlled)	0.062	ha	R=	0.85	1.00
	CA-18A (controlled)	0.249	ha	R=	0.56	0.70
	CA-19A (controlled)	0.078	ha	R=	0.80	1.00
	CA-20A (controlled)	0.244	ha	R=	0.66	0.82
	CA-21A (controlled)	0.080	ha	R=	0.20	0.25
	CA-22A (controlled)	0.062	ha	R=	0.20	0.25
	CA-23A (controlled)	0.062	ha	R=	0.80	1.00
	CA-24A (controlled)	0.042	ha	R=	0.67	0.84
	CA-25A (controlled)	0.048	ha	R=	0.49	0.61
	CA-26A (controlled)	0.048	ha	R=	0.50	0.62
	CA-27A (controlled)	0.060	ha	R=	0.44	0.55
	CA-28A (controlled)	0.032	ha	R=	0.70	0.88
	CA-29A (controlled)	0.030	ha	R=	0.74	0.93
	CA-30A (controlled)	0.033	ha	R=	0.70	0.88
	CA-31A (controlled)	0.029	ha	R=	0.76	0.94
	Total Contolled =	**3.144**	**ha**	**∑R=**	**0.75**	**0.94**
Uncontrolled	CA-32A (uncontrolled)	0.045	ha	R=	0.20	0.25
	CA-33A (uncontrolled)	0.023	ha	R=	0.29	0.36
	CA-34A (uncontrolled)	0.102	ha	R=	0.20	0.25
	Total Uncontolled =	**0.170**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (2-Yr)

$I_2 = 732.951 / (Td + 6.199)^{0.810}$ **A = 732.951** **B = 0.810** **C = 6.199**

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	76.81	629.46	220.90	261.28	9.65	270.93
15	61.77	506.22	220.44	261.28	7.76	269.04
20	52.03	426.42	198.17	261.28	6.54	267.82
25	45.17	370.17	163.33	261.28	5.68	266.96
30	40.04	328.18	120.41	261.28	5.03	266.31
35	36.06	295.52	71.91	261.28	4.53	265.81
40	32.86	269.34	19.34	261.28	4.13	265.41
45	30.24	247.83	0.00	261.28	3.80	265.08
50	28.04	229.81	0.00	261.28	3.52	264.81
55	26.17	214.48	0.00	261.28	3.29	264.57
60	24.56	201.26	0.00	261.28	3.09	264.37
65	23.15	189.73	0.00	261.28	2.91	264.19
70	21.91	179.59	0.00	261.28	2.75	264.03
75	20.81	170.57	0.00	261.28	2.62	263.90
80	19.83	162.52	0.00	261.28	2.49	263.77
85	18.94	155.26	0.00	261.28	2.38	263.66
90	18.14	148.69	0.00	261.28	2.28	263.56
95	17.41	142.71	0.00	261.28	2.19	263.47
100	16.75	137.24	0.00	261.28	2.10	263.39
105	16.13	132.22	0.00	261.28	2.03	263.31
110	15.57	127.60	0.00	261.28	1.96	263.24
115	15.05	123.32	0.00	261.28	1.89	263.17
120	14.56	119.34	0.00	261.28	1.83	263.11

*Average release rate taken as 50% of max. allowable controlled release rate for an underground storage calculation

On-site stormwater detention
Storage required = 220.90 m^3

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

EAST Stormwater Management Design Sheet

STORM - 5 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**3.322**	ha	**∑R=**	**0.23**
Uncontrolled	EWS-01	3.322	ha	R=	0.23
	Total Uncontrolled =	**3.322**	**ha**	**∑R=**	**0.23**

Allowable Release Rate = 545.00 L/s *(195 Huntmar Drive, 2yr C=0.80)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**3.315**	ha	**∑R=**	**0.72**	**0.90**
Controlled	CA-01A (controlled)	0.027	ha	R=	0.90	1.00
	CA-02A (controlled)	0.071	ha	R=	0.83	1.00
	CA-03A (controlled)	0.048	ha	R=	0.73	0.91
	CA-04A (controlled)	0.053	ha	R=	0.68	0.85
	CA-05A (controlled)	0.133	ha	R=	0.63	0.78
	CA-06A (controlled)	0.034	ha	R=	0.85	1.00
	CA-07A (controlled)	0.081	ha	R=	0.79	0.98
	CA-100A (controlled)	0.153	ha	R=	0.90	1.00
	CA-08A (controlled)	0.058	ha	R=	0.90	1.00
	CA-09A (controlled)	0.064	ha	R=	0.75	0.94
	CA-101A (controlled)	0.249	ha	R=	0.90	1.00
	CA-10A (controlled)	0.077	ha	R=	0.81	1.00
	CA-102A (controlled)	0.409	ha	R=	0.90	1.00
	CA-11A (controlled)	0.055	ha	R=	0.72	0.90
	CA-12A (controlled)	0.050	ha	R=	0.74	0.93
	CA-13A (controlled)	0.061	ha	R=	0.90	1.00
	CA-14A (controlled)	0.150	ha	R=	0.88	1.00
	CA-15A (controlled)	0.149	ha	R=	0.88	1.00
	CA-16A (controlled)	0.066	ha	R=	0.87	1.00
	CA-17A (controlled)	0.062	ha	R=	0.85	1.00
	CA-18A (controlled)	0.249	ha	R=	0.56	0.70
	CA-19A (controlled)	0.078	ha	R=	0.80	1.00
	CA-20A (controlled)	0.244	ha	R=	0.66	0.82
	CA-21A (controlled)	0.080	ha	R=	0.20	0.25
	CA-22A (controlled)	0.062	ha	R=	0.20	0.25
	CA-23A (controlled)	0.062	ha	R=	0.80	1.00
	CA-24A (controlled)	0.042	ha	R=	0.67	0.84
	CA-25A (controlled)	0.048	ha	R=	0.49	0.61
	CA-26A (controlled)	0.048	ha	R=	0.50	0.62
	CA-27A (controlled)	0.060	ha	R=	0.44	0.55
	CA-28A (controlled)	0.032	ha	R=	0.70	0.88
	CA-29A (controlled)	0.030	ha	R=	0.74	0.93
	CA-30A (controlled)	0.033	ha	R=	0.70	0.88
	CA-31A (controlled)	0.029	ha	R=	0.76	0.94
	Total Contolled =	**3.144**	**ha**	**∑R=**	**0.75**	**0.94**
Uncontrolled	CA-32A (uncontrolled)	0.045	ha	R=	0.20	0.25
	CA-33A (uncontrolled)	0.023	ha	R=	0.29	0.36
	CA-34A (uncontrolled)	0.102	ha	R=	0.20	0.25
	Total Uncontolled =	**0.170**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A = 998.071** **B = 0.814** **C = 6.053**

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	104.19	853.92	198.81	522.56	13.09	535.66
15	83.56	684.79	146.01	522.56	10.50	533.06
20	70.25	575.74	63.82	522.56	8.83	531.39
25	60.90	499.07	0.00	522.56	7.65	530.21
30	53.93	441.96	0.00	522.56	6.78	529.34
35	48.52	397.63	0.00	522.56	6.10	528.66
40	44.18	362.11	0.00	522.56	5.55	528.12
45	40.63	332.97	0.00	522.56	5.11	527.67
50	37.65	308.59	0.00	522.56	4.73	527.29
55	35.12	287.85	0.00	522.56	4.41	526.98
60	32.94	269.99	0.00	522.56	4.14	526.70
65	31.04	254.42	0.00	522.56	3.90	526.46
70	29.37	240.72	0.00	522.56	3.69	526.25
75	27.89	228.56	0.00	522.56	3.50	526.07
80	26.56	217.69	0.00	522.56	3.34	525.90
85	25.37	207.91	0.00	522.56	3.19	525.75
90	24.29	199.06	0.00	522.56	3.05	525.61
95	23.31	191.00	0.00	522.56	2.93	525.49
100	22.41	183.64	0.00	522.56	2.82	525.38
105	21.58	176.88	0.00	522.56	2.71	525.27
110	20.82	170.65	0.00	522.56	2.62	525.18
115	20.12	164.89	0.00	522.56	2.53	525.09
120	19.47	159.55	0.00	522.56	2.45	525.01

On-site stormwater detention

Storage required = 198.81 m^3

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

Stormwater Management Design Sheet
Block 243/252 (2782 & 2772 Palladium Dr.)

STORM - 100 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**3.322**	ha	**∑R=**	**0.23**
Uncontrolled	EWS-01	3.322	ha	R=	0.23
	Total Uncontrolled =	**3.322**	**ha**	**∑R=**	**0.23**

Allowable Release Rate = 545.00 L/s *(195 Huntmar Drive, 2yr C=0.80)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**3.315**	ha	**∑R=**	**0.72**	**0.90**
Controlled	CA-01A (controlled)	0.027	ha	R=	0.90	1.00
	CA-02A (controlled)	0.071	ha	R=	0.83	1.00
	CA-03A (controlled)	0.048	ha	R=	0.73	0.91
	CA-04A (controlled)	0.053	ha	R=	0.68	0.85
	CA-05A (controlled)	0.133	ha	R=	0.63	0.78
	CA-06A (controlled)	0.034	ha	R=	0.85	1.00
	CA-07A (controlled)	0.081	ha	R=	0.79	0.98
	CA-100A (controlled)	0.153	ha	R=	0.90	1.00
	CA-08A (controlled)	0.058	ha	R=	0.90	1.00
	CA-09A (controlled)	0.064	ha	R=	0.75	0.94
	CA-101A (controlled)	0.249	ha	R=	0.90	1.00
	CA-10A (controlled)	0.077	ha	R=	0.81	1.00
	CA-102A (controlled)	0.409	ha	R=	0.90	1.00
	CA-11A (controlled)	0.055	ha	R=	0.72	0.90
	CA-12A (controlled)	0.050	ha	R=	0.74	0.93
	CA-13A (controlled)	0.061	ha	R=	0.90	1.00
	CA-14A (controlled)	0.150	ha	R=	0.88	1.00
	CA-15A (controlled)	0.149	ha	R=	0.88	1.00
	CA-16A (controlled)	0.066	ha	R=	0.87	1.00
	CA-17A (controlled)	0.062	ha	R=	0.85	1.00
	CA-18A (controlled)	0.249	ha	R=	0.56	0.70
	CA-19A (controlled)	0.078	ha	R=	0.80	1.00
	CA-20A (controlled)	0.244	ha	R=	0.66	0.82
	CA-21A (controlled)	0.080	ha	R=	0.20	0.25
	CA-22A (controlled)	0.062	ha	R=	0.20	0.25
	CA-23A (controlled)	0.062	ha	R=	0.80	1.00
	CA-24A (controlled)	0.042	ha	R=	0.67	0.84
	CA-25A (controlled)	0.048	ha	R=	0.49	0.61
	CA-26A (controlled)	0.048	ha	R=	0.50	0.62
	CA-27A (controlled)	0.060	ha	R=	0.44	0.55
	CA-28A (controlled)	0.032	ha	R=	0.70	0.88
	CA-29A (controlled)	0.030	ha	R=	0.74	0.93
	CA-30A (controlled)	0.033	ha	R=	0.70	0.88
	CA-31A (controlled)	0.029	ha	R=	0.76	0.94
	Total Contolled =	**3.144**	**ha**	**∑R=**	**0.75**	**0.94**
Uncontrolled	CA-32A (uncontrolled)	0.045	ha	R=	0.20	0.25
	CA-33A (uncontrolled)	0.023	ha	R=	0.29	0.36
	CA-34A (uncontrolled)	0.102	ha	R=	0.20	0.25
	Total Uncontolled =	**0.170**	**ha**	**∑R=**	**0.21**	**0.27**

Post-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$ **A = 1735.688** **B = 0.820** **C = 6.014**

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

Stormwater Management
Design Sheet
Block 243/252 (2782 & 2772 Palladium Dr.)

STORM - 100 YEAR

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	178.56	1463.38	564.49	522.56	22.44	545.00
15	142.89	1171.09	583.67	522.56	17.96	540.52
20	119.95	983.05	552.59	522.56	15.07	537.64
25	103.85	851.08	492.78	522.56	13.05	535.61
30	91.87	752.91	414.62	522.56	11.54	534.11
35	82.58	676.77	323.84	522.56	10.38	532.94
40	75.15	615.85	223.90	522.56	9.44	532.01
45	69.05	565.90	117.02	522.56	8.68	531.24
50	63.95	524.14	4.72	522.56	8.04	530.60
55	59.62	488.65	0.00	522.56	7.49	530.06
60	55.89	458.08	0.00	522.56	7.02	529.59
65	52.65	431.46	0.00	522.56	6.62	529.18
70	49.79	408.05	0.00	522.56	6.26	528.82
75	47.26	387.28	0.00	522.56	5.94	528.50
80	44.99	368.72	0.00	522.56	5.65	528.22
85	42.95	352.03	0.00	522.56	5.40	527.96
90	41.11	336.93	0.00	522.56	5.17	527.73
95	39.43	323.19	0.00	522.56	4.96	527.52
100	37.90	310.63	0.00	522.56	4.76	527.33
105	36.50	299.11	0.00	522.56	4.59	527.15
110	35.20	288.50	0.00	522.56	4.42	526.99
115	34.01	278.69	0.00	522.56	4.27	526.84
120	32.89	269.59	0.00	522.56	4.13	526.70

On-site stormwater detention

Storage required = **583.67** **m^3**

Surface storage provided = 608.29 m^3 (See Dwg C601A)

LRL Associates Ltd.
Storm Design Sheet

LRL File No.	240720
Project:	Palladium Resort Development Limited Partnership
Location:	Culdaff Rd, Kanata
Date:	June 12, 2025
Designed:	M. Longtin
Checked:	K. Paradis
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method
Q = 2.78CIA
Q = Peak flow (L/s)
A = Drainage area (ha)
C = Runoff coefficient
I = Rainfall intensity (mm/hr)

Runoff Coefficient (C)

Grass	0.20
Gravel	0.80
Asphalt / rooftop	0.90

City of Ottawa IDF curve equation
(5 year event, intensity in mm/hr)
$I_5 = 998.071 / (Td + 6.053)^{0.814}$
Min. velocity = 0.80 m/s
Manning's "n" = 0.013

LOCATION			AREA (ha)			FLOW						STORM SEWER								
WATERSHED / STREET	From MH	To MH	C = 0.20	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Controlled Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q_{FULL})	Velocity Actual (Approx.) (m/s)
CA-01A	CB01A	CBMH02A	0.000	0.000	0.027	0.068	0.068	10.00	104.19	7.09		250	PVC	0.50%	52.6	42.0	0.86	1.02	0.17	0.34
CA-02A	CBMH02A	CBMH03A	0.008	0.000	0.063	0.163	0.231	11.02	99.08	22.85		250	PVC	0.50%	20.1	42.0	0.86	0.39	0.54	0.87
CA-03A	CBMH03A	CBMH04A	0.012	0.000	0.036	0.097	0.328	11.41	97.27	31.89		300	PVC	0.40%	25.2	61.2	0.87	0.49	0.52	0.88
CA-04A	CBMH04A	CBMH06A	0.017	0.000	0.037	0.101	0.428	11.90	95.13	40.76		300	PVC	0.40%	9.0	61.2	0.87	0.17	0.67	0.88
CA-05A	CB05A	CBMH06A	0.052	0.000	0.081	0.231	0.231	10.00	104.19	24.08		250	PVC	0.50%	24.4	42.0	0.86	0.47	0.57	0.34
CA-06A	CBMH06A	CBMH07A	0.002	0.000	0.031	0.079	0.739	12.37	93.13	68.82		375	PVC	0.30%	36.7	96.0	0.87	0.70	0.72	0.81
CA-07A	CBMH07A	CBMH27A	0.013	0.000	0.068	0.177	0.916	13.08	90.33	82.75		375	PVC	0.35%	33.9	103.7	0.94	0.60	0.80	0.87
CA-100A	Roof	CBMH08A	0.000	0.000	0.153	0.383	0.383	10.00	104.19	39.86		300	PVC	1.00%	11.3	96.7	1.37	0.14	0.41	0.55
CA-08A	CBMH08A	CBMH09A	0.000	0.000	0.058	0.146	0.528	10.14	103.47	54.65		300	PVC	0.50%	11.6	68.4	0.97	0.20	0.80	0.83
CA-09A	CBMH09A	CBMH14A	0.014	0.000	0.050	0.133	0.661	10.34	102.44	67.73		375	PVC	0.30%	35.7	96.0	0.87	0.68	0.71	0.30
CA-101A	Roof	CBMH10A	0.000	0.000	0.249	0.622	0.622	10.00	104.19	64.81		300	PVC	1.00%	18.2	96.7	1.37	0.22	0.67	0.55
CA-10A	CBMH10A	CBMH11A	0.010	0.000	0.068	0.175	0.797	10.22	103.04	82.09		375	PVC	0.40%	24.3	110.9	1.00	0.40	0.74	0.86
CA-102A	Roof	CBMH11A	0.000	0.000	0.409	1.023	1.023	10.00	104.19	106.60		375	PVC	1.00%	11.3	175.3	1.59	0.12	0.61	0.63
CA-11A	CBMH11A	CBMH13A	0.014	0.000	0.041	0.110	1.930	10.74	100.42	193.78		525	PVC	0.40%	34.2	272.0	1.26	0.45	0.71	0.44
CA-12A	CBMH12A	CBMH13A	0.011	0.000	0.061	0.159	0.159	10.00	104.19	16.52		250	PVC	0.50%	18.8	42.0	0.86	0.37	0.39	0.34
CA-13A	CBMH13A	CBMH14A	0.000	0.000	0.145	0.363	2.451	12.55	92.42	226.56		525	PVC	0.40%	32.3	272.0	1.26	0.43	0.83	0.44

LRL Associates Ltd.
Storm Design Sheet

LRL File No.	240720
Project:	Palladium Resort Development Limited Partnership
Location:	Culdaff Rd, Kanata
Date:	June 12, 2025
Designed:	M. Longtin
Checked:	K. Paradis
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method	Runoff Coefficient (C)		City of Ottawa IDF curve equation
Q = 2.78CIA	Grass	0.20	(5 year event, intensity in mm/hr)
Q = Peak flow (L/s)	Gravel	0.80	$I_5 = 998.071 / (Td + 6.053)^{0.814}$
A = Drainage area (ha)	Asphalt / rooftop	0.90	Min. velocity = 0.80 m/s
C = Runoff coefficient			Manning's "n" = 0.013
I = Rainfall intensity (mm/hr)			

CA-14A	CBMH14A	CBMH15A	0.005	0.000	0.145	0.366	3.112	13.57	88.48	275.41		600	PVC	0.35%	40.0	363.3	1.28	0.52	0.76	0.51
CA-15A	CBMH15A	CBMH17A	0.004	0.000	0.145	0.366	3.478	14.09	86.62	301.30		600	PVC	0.40%	30.1	388.3	1.37	0.37	0.78	1.17
CA-16A	CBMH16A	CBMH17A	0.003	0.000	0.063	0.160	0.160	10.00	104.19	16.65		250	PVC	0.50%	50.8	42.0	0.86	0.99	0.40	0.34
CA-17A	CBMH17A	MH27A	0.004	0.000	0.058	0.146	3.784	15.08	83.31	315.26		600	PVC	0.45%	26.6	411.9	1.46	0.30	0.77	0.58
CA-18A	CBMH18A	CBMH19A	0.120	0.000	0.130	0.391	0.391	10.00	104.19	40.69		300	PVC	0.40%	32.1	61.2	0.87	0.62	0.67	0.35
CA-19A	CBMH19A	CBMH20A	0.011	0.000	0.067	0.173	0.564	10.62	101.04	56.93		375	PVC	0.40%	28.2	110.9	1.00	0.47	0.51	0.86
CA-20A	CBMH20A	CBMH21A	0.085	0.000	0.159	0.444	1.008	11.09	98.78	99.55		450	PVC	0.30%	45.0	156.2	0.98	0.76	0.64	0.84
CA-21A	CBMH21A	CBMH22A	0.080	0.000	0.000	0.044	1.052	11.85	95.34	100.30		450	PVC	0.30%	41.4	156.2	0.98	0.70	0.64	0.84
CA-22A	CBMH22A	CBMH23A	0.062	0.000	0.000	0.034	1.086	12.55	92.40	100.38		450	PVC	0.30%	44.7	156.2	0.98	0.76	0.64	0.84
CA-23A	CBMH23A	CBMH24A	0.009	0.000	0.054	0.139	1.226	13.31	89.44	109.63		450	PVC	0.30%	31.0	156.2	0.98	0.53	0.70	0.84
CA-24A	CBMH24A	CBMH25A	0.014	0.000	0.028	0.078	1.303	13.84	87.51	114.06		450	PVC	0.30%	38.9	156.2	0.98	0.66	0.73	0.84
CA-25A	CBMH25A	CBMH26A	0.028	0.000	0.020	0.066	1.369	14.50	85.21	116.68		450	PVC	0.30%	39.4	156.2	0.98	0.67	0.75	0.84
CA-26A	CBMH26A	MH27A	0.028	0.000	0.020	0.066	1.435	15.17	83.02	119.17		450	PVC	0.30%	12.0	156.2	0.98	0.20	0.76	0.84
	MH27A	OGS1	0.000	0.000	0.000	0.000	5.830	19.90	70.46	410.77		600	PVC	1.00%	3.4	614.0	2.17	0.03	0.67	1.86
	OGS2	EXIST MH	0.000	0.000	0.000	0.000	5.830	19.93	70.40	410.44		600	PVC	1.00%	3.4	614.0	2.17	0.03	0.67	1.86

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

EAST Stormwater Management Storage Volumes

Structure	T/G	HWL (100yr event)	Ponding Depth (100yr event) (m)	Storage (100yr event) (m3)
CBMH02A	108.05	108.25	0.20	11.71
CBMH03A	108.10	108.25	0.15	7.75
CBMH04A	108.10	108.25	0.15	9.59
CB05A	108.10	108.25	0.15	10.46
CBMH06A	108.10	108.25	0.15	9.19
CBMH07A	108.00	108.25	0.25	44.09
CBMH09A	108.05	108.25	0.20	22.70
CBMH13A	108.00	108.25	0.25	41.39
CBMH14A	107.95	108.25	0.30	118.59
CBMH15A	107.95	108.25	0.30	121.28
CB16A	107.95	108.25	0.30	59.49
CBMH17A	107.95	108.25	0.30	53.56
CBMH30A	108.20	108.25	Variable	25.65
CBMH31A	108.20	108.25	Variable	25.73
CBMH32A	108.20	108.25	Variable	26.64
CBMH33A	108.20	108.25	Variable	20.47

LRL Associates Ltd.
Storm Watershed Summary

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Dwg Reference: C701, C702

Pre-Development Catchments

Watershed	C = 0.20	C = 0.80	C = 0.90	Total Area (ha)	Combined C
ECA-01B (uncontrolled)	1.994	0.000	0.000	1.994	0.20
Total	**1.994**	**0.000**	**0.000**	**1.994**	**0.20**

Post-Development Catchments

Watershed	C = 0.20	C = 0.8	C = 0.90	Total Area (ha)	Combined C
CA-01B (controlled)	0.151	0.000	0.000	0.151	0.20
CA-02B (controlled)	0.000	0.000	0.039	0.039	0.90
CA-03B (controlled)	0.000	0.000	0.052	0.052	0.90
CA-04B (controlled)	0.000	0.000	0.050	0.050	0.90
CA-05B (controlled)	0.057	0.000	0.000	0.057	0.20
CA-06B (controlled)	0.004	0.000	0.066	0.070	0.86
CA-07B (controlled)	0.016	0.000	0.111	0.127	0.81
CA-08B (controlled)	0.160	0.000	0.000	0.160	0.20
CA-09B (controlled)	0.006	0.000	0.079	0.085	0.85
CA-10B (controlled)	0.016	0.000	0.113	0.129	0.81
CA-11B (controlled)	0.017	0.000	0.112	0.129	0.81
CA-12B (controlled)	0.017	0.000	0.110	0.127	0.81
CA-13B (controlled)	0.007	0.000	0.047	0.054	0.82
CA-14B (controlled)	0.007	0.000	0.045	0.051	0.81
CA-15B (controlled)	0.001	0.000	0.072	0.073	0.89
CA-16B (controlled)	0.001	0.000	0.070	0.071	0.89
CA-17B (controlled)	0.027	0.000	0.034	0.061	0.59
CA-18B (controlled)	0.024	0.000	0.036	0.060	0.62
CA-19B (controlled)	0.022	0.000	0.039	0.061	0.65
CA-20B (controlled)	0.021	0.000	0.040	0.061	0.66
CA-21B (uncontrolled)	0.168	0.000	0.000	0.168	0.20
CA-22B (uncontrolled)	0.078	0.000	0.000	0.078	0.20
CA-23B (uncontrolled)	0.080	0.000	0.001	0.081	0.21
Total	**0.878**	**0.000**	**1.116**	**1.994**	**0.59**

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 2 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**1.994**	ha	**∑R=**	**0.20**
Uncontrolled	EWS-01	1.994	ha	R=	0.20
	Total Uncontrolled =	**1.994**	**ha**	**∑R=**	**0.20**

Allowable Release Rate = 340.00 L/s *(As determined by Stantec)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**1.994**	ha	**∑R=**	**0.59**	**0.74**
Controlled	CA-01B (controlled)	0.151	ha	R=	0.20	0.25
	CA-02B (controlled)	0.039	ha	R=	0.90	1.00
	CA-03B (controlled)	0.052	ha	R=	0.90	1.00
	CA-04B (controlled)	0.050	ha	R=	0.90	1.00
	CA-05B (controlled)	0.057	ha	R=	0.20	0.25
	CA-06B (controlled)	0.070	ha	R=	0.86	1.00
	CA-07B (controlled)	0.127	ha	R=	0.81	1.00
	CA-08B (controlled)	0.160	ha	R=	0.20	0.25
	CA-09B (controlled)	0.085	ha	R=	0.85	1.00
	CA-10B (controlled)	0.129	ha	R=	0.81	1.00
	CA-11B (controlled)	0.129	ha	R=	0.81	1.00
	CA-12B (controlled)	0.127	ha	R=	0.81	1.00
	CA-13B (controlled)	0.054	ha	R=	0.82	1.00
	CA-14B (controlled)	0.051	ha	R=	0.81	1.00
	CA-15B (controlled)	0.073	ha	R=	0.89	1.00
	CA-16B (controlled)	0.071	ha	R=	0.89	1.00
	CA-17B (controlled)	0.061	ha	R=	0.59	0.74
	CA-18B (controlled)	0.060	ha	R=	0.62	0.78
	CA-19B (controlled)	0.061	ha	R=	0.65	0.81
	CA-20B (controlled)	0.061	ha	R=	0.66	0.82
	Total Contolled =	**1.666**	**ha**	**∑R=**	**0.67**	**0.84**
Uncontrolled	CA-21B (uncontrolled)	0.168	ha	R=	0.20	0.25
	CA-22B (uncontrolled)	0.078	ha	R=	0.20	0.25
	CA-23B (uncontrolled)	0.081	ha	R=	0.21	0.26
	Total Uncontolled =	**0.328**	**ha**	**∑R=**	**0.20**	**0.25**

Post-development Stormwater Management (2-Yr)

$I_2 = 732.951 / (Td + 6.199)^{0.810}$ **A = 732.951** **B = 0.810** **C = 6.199**

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	*Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	76.81	297.32	88.73	149.44	17.69	167.13
15	61.77	239.11	80.71	149.44	14.23	163.66
20	52.03	201.42	62.38	149.44	11.98	161.42
25	45.17	174.85	38.12	149.44	10.40	159.84
30	40.04	155.01	10.04	149.44	9.22	158.66
35	36.06	139.59	0.00	149.44	8.31	157.74
40	32.86	127.22	0.00	149.44	7.57	157.01
45	30.24	117.06	0.00	149.44	6.96	156.40
50	28.04	108.55	0.00	149.44	6.46	155.90
55	26.17	101.31	0.00	149.44	6.03	155.46
60	24.56	95.07	0.00	149.44	5.66	155.09
65	23.15	89.62	0.00	149.44	5.33	154.77
70	21.91	84.83	0.00	149.44	5.05	154.48
75	20.81	80.57	0.00	149.44	4.79	154.23
80	19.83	76.76	0.00	149.44	4.57	154.00
85	18.94	73.34	0.00	149.44	4.36	153.80
90	18.14	70.23	0.00	149.44	4.18	153.62
95	17.41	67.41	0.00	149.44	4.01	153.45
100	16.75	64.83	0.00	149.44	3.86	153.29
105	16.13	62.46	0.00	149.44	3.72	153.15
110	15.57	60.27	0.00	149.44	3.59	153.02
115	15.05	58.25	0.00	149.44	3.47	152.90
120	14.56	56.37	0.00	149.44	3.35	152.79

*Average release rate taken as 50% of max. allowable controlled release rate for an underground storage calculation

On-site stormwater detention

Storage required = 88.73 m^3

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

Stormwater Management Design Sheet

STORM - 5 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) = $A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**1.994**	ha	**∑R=**	**0.20**
Uncontrolled	EWS-01	1.994	ha	R=	0.20
	Total Uncontrolled =	**1.994**	**ha**	**∑R=**	**0.20**

Allowable Release Rate = 340.00 L/s *(As determined by Stantec)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**1.994**	ha	**∑R=**	**0.59**	**0.74**
Controlled	CA-01B (controlled)	0.151	ha	R=	0.20	0.25
	CA-02B (controlled)	0.039	ha	R=	0.90	1.00
	CA-03B (controlled)	0.052	ha	R=	0.90	1.00
	CA-04B (controlled)	0.050	ha	R=	0.90	1.00
	CA-05B (controlled)	0.057	ha	R=	0.20	0.25
	CA-06B (controlled)	0.070	ha	R=	0.86	1.00
	CA-07B (controlled)	0.127	ha	R=	0.81	1.00
	CA-08B (controlled)	0.160	ha	R=	0.20	0.25
	CA-09B (controlled)	0.085	ha	R=	0.85	1.00
	CA-10B (controlled)	0.129	ha	R=	0.81	1.00
	CA-11B (controlled)	0.129	ha	R=	0.81	1.00
	CA-12B (controlled)	0.127	ha	R=	0.81	1.00
	CA-13B (controlled)	0.054	ha	R=	0.82	1.00
	CA-14B (controlled)	0.051	ha	R=	0.81	1.00
	CA-15B (controlled)	0.073	ha	R=	0.89	1.00
	CA-16B (controlled)	0.071	ha	R=	0.89	1.00
	CA-17B (controlled)	0.061	ha	R=	0.59	0.74
	CA-18B (controlled)	0.060	ha	R=	0.62	0.78
	CA-19B (controlled)	0.061	ha	R=	0.65	0.81
	CA-20B (controlled)	0.061	ha	R=	0.66	0.82
	Total Contolled =	**1.666**	**ha**	**∑R=**	**0.67**	**0.84**
Uncontrolled	CA-21B (uncontrolled)	0.168	ha	R=	0.20	0.25
	CA-22B (uncontrolled)	0.078	ha	R=	0.20	0.25
	CA-23B (uncontrolled)	0.081	ha	R=	0.21	0.26
	Total Uncontolled =	**0.328**	**ha**	**∑R=**	**0.20**	**0.25**

Post-development Stormwater Management (5-Yr)

$I_5 = 998.071 / (Td + 6.053)^{0.814}$ **A = 998.071** **B = 0.814** **C = 6.053**

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	104.19	403.35	62.68	298.87	24.00	322.87
15	83.56	323.46	22.13	298.87	19.25	318.12
20	70.25	271.95	0.00	298.87	16.18	315.05
25	60.90	235.74	0.00	298.87	14.03	312.90
30	53.93	208.76	0.00	298.87	12.42	311.29
35	48.52	187.82	0.00	298.87	11.17	310.05
40	44.18	171.04	0.00	298.87	10.18	309.05
45	40.63	157.28	0.00	298.87	9.36	308.23
50	37.65	145.76	0.00	298.87	8.67	307.55
55	35.12	135.97	0.00	298.87	8.09	306.96
60	32.94	127.53	0.00	298.87	7.59	306.46
65	31.04	120.17	0.00	298.87	7.15	306.02
70	29.37	113.70	0.00	298.87	6.77	305.64
75	27.89	107.96	0.00	298.87	6.42	305.30
80	26.56	102.83	0.00	298.87	6.12	304.99
85	25.37	98.21	0.00	298.87	5.84	304.72
90	24.29	94.02	0.00	298.87	5.59	304.47
95	23.31	90.22	0.00	298.87	5.37	304.24
100	22.41	86.74	0.00	298.87	5.16	304.03
105	21.58	83.55	0.00	298.87	4.97	303.84
110	20.82	80.61	0.00	298.87	4.80	303.67
115	20.12	77.89	0.00	298.87	4.63	303.51
120	19.47	75.36	0.00	298.87	4.48	303.36

On-site stormwater detention

Storage required = 62.68 m^3

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

WEST - Stormwater Management Design Sheet

STORM - 100 YEAR

Runoff Equation

Q = 2.78CIA (L/s)
C = Runoff coefficient
I = Rainfall intensity (mm/hr) $= A / (Td + C)^B$
A = Area (ha)
T_c = Time of concentration (min)

Pre-development Catchment within Development Area

	Total Area =	**1.994**	ha	**∑R=**	**0.20**
Uncontrolled	EWS-01	1.994	ha	R=	0.20
	Total Uncontrolled =	**1.994**	**ha**	**∑R=**	**0.20**

Allowable Release Rate = 340.00 L/s *(195 Huntmar Drive, 2yr C=0.80)*

Post-development Stormwater Management

					$\sum R_{2\&5}$	$\sum R_{100}$
	Total Site Area =	**1.994**	ha	**∑R=**	**0.59**	**0.74**
Controlled	CA-01B (controlled)	0.151	ha	R=	0.20	0.25
	CA-02B (controlled)	0.039	ha	R=	0.90	1.00
	CA-03B (controlled)	0.052	ha	R=	0.90	1.00
	CA-04B (controlled)	0.050	ha	R=	0.90	1.00
	CA-05B (controlled)	0.057	ha	R=	0.20	0.25
	CA-06B (controlled)	0.070	ha	R=	0.86	1.00
	CA-07B (controlled)	0.127	ha	R=	0.81	1.00
	CA-08B (controlled)	0.160	ha	R=	0.20	0.25
	CA-09B (controlled)	0.085	ha	R=	0.85	1.00
	CA-10B (controlled)	0.129	ha	R=	0.81	1.00
	CA-11B (controlled)	0.129	ha	R=	0.81	1.00
	CA-12B (controlled)	0.127	ha	R=	0.81	1.00
	CA-13B (controlled)	0.054	ha	R=	0.82	1.00
	CA-14B (controlled)	0.051	ha	R=	0.81	1.00
	CA-15B (controlled)	0.073	ha	R=	0.89	1.00
	CA-16B (controlled)	0.071	ha	R=	0.89	1.00
	CA-17B (controlled)	0.061	ha	R=	0.59	0.74
	CA-18B (controlled)	0.060	ha	R=	0.62	0.78
	CA-19B (controlled)	0.061	ha	R=	0.65	0.81
	CA-20B (controlled)	0.061	ha	R=	0.66	0.82
	Total Contolled =	**1.666**	**ha**	**∑R=**	**0.67**	**0.84**
Uncontrolled	CA-21B (uncontrolled)	0.168	ha	R=	0.20	0.25
	CA-22B (uncontrolled)	0.078	ha	R=	0.20	0.25
	CA-23B (uncontrolled)	0.081	ha	R=	0.21	0.26
	Total Uncontolled =	**0.328**	**ha**	**∑R=**	**0.20**	**0.25**

Post-development Stormwater Management (100-Yr)

$I_{100} = 1735.688 / (Td + 6.014)^{0.820}$

A = 1735.688 **B = 0.820** **C = 6.014**

LRL File No. 240720
Project: Palladium Resort Development Limited Partnership
Location: Culdaff Rd, Kanata
Date: July 8, 2026
Designed: M. Longtin
Checked: K. Paradis
Drawing Ref.: C701, C702

WEST - Stormwater Management Design Sheet

STORM - 100 YEAR

Time (min)	Intensity (mm/hr)	Controlled Runoff (L/s)	Storage Volume (m^3)	Controlled Release Rate (L/s)	Uncontrolled Runoff (L/s)	Total Release Rate (L/s)
10	178.56	691.23	235.41	298.87	41.13	340.00
15	142.89	553.16	228.86	298.87	32.91	331.79
20	119.95	464.35	198.57	298.87	27.63	326.50
25	103.85	402.01	154.70	298.87	23.92	322.79
30	91.87	355.64	102.17	298.87	21.16	320.03
35	82.58	319.67	43.68	298.87	19.02	317.89
40	75.15	290.90	0.00	298.87	17.31	316.18
45	69.05	267.30	0.00	298.87	15.90	314.78
50	63.95	247.58	0.00	298.87	14.73	313.60
55	59.62	230.81	0.00	298.87	13.73	312.61
60	55.89	216.38	0.00	298.87	12.87	311.75
65	52.65	203.80	0.00	298.87	12.13	311.00
70	49.79	192.74	0.00	298.87	11.47	310.34
75	47.26	182.93	0.00	298.87	10.88	309.76
80	44.99	174.17	0.00	298.87	10.36	309.24
85	42.95	166.28	0.00	298.87	9.89	308.77
90	41.11	159.15	0.00	298.87	9.47	308.34
95	39.43	152.66	0.00	298.87	9.08	307.96
100	37.90	146.73	0.00	298.87	8.73	307.60
105	36.50	141.29	0.00	298.87	8.41	307.28
110	35.20	136.27	0.00	298.87	8.11	306.98
115	34.01	131.64	0.00	298.87	7.83	306.71
120	32.89	127.34	0.00	298.87	7.58	306.45

On-site stormwater detention

Storage required = **235.41** **m^3**

Surface storage provided = 847.33 m^3 (See Dwg C601)

LRL Associates Ltd.
Storm Design Sheet

LRL File No.	240720
Project:	Palladium Resort Development Limited Partnership
Location:	Culdaff Rd, Kanata
Date:	June 12, 2025
Designed:	M. Longtin
Checked:	K. Paradis
Drawing Reference:	C702, C401

Storm Design Parameters

Rational Method
Q = 2.78CIA
Q = Peak flow (L/s)
A = Drainage area (ha)
C = Runoff coefficient
I = Rainfall intensity (mm/hr)

Runoff Coefficient (C)

Grass	0.20
Gravel	0.80
Asphalt / rooftop	0.90

City of Ottawa IDF curve equation
(5 year event, intensity in mm/hr)
$I_5 = 998.071 / (Td + 6.053)^{0.814}$
Min. velocity = 0.80 m/s
Manning's "n" = 0.013

LOCATION			AREA (ha)			FLOW						STORM SEWER								
WATERSHED / STREET	From MH	To MH	C = 0.20	C = 0.80	C = 0.90	Indiv. 2.78AC	Accum. 2.78AC	Time of Conc. (min.)	Rainfall Intensity (mm/hr)	Peak Flow Q (L/s)	Controlled Flow Q (L/s)	Pipe Diameter (mm)	Type	Slope (%)	Length (m)	Capacity Full (L/s)	Velocity Full (m/s)	Time of Flow (min.)	Ratio (Q/Q_{FULL})	Velocity Actual (Approx.) (m/s)
CA-01B	Landscape CB01B	CBMH02B	0.151	0.000	0.000	0.084	0.084	10.00	104.19	8.77		250	PVC	0.50%	30.7	42.0	0.86	0.60	0.21	0.34
CA-02B	CBMH02B	CBMH03B	0.000	0.000	0.039	0.098	0.182	10.60	101.14	18.45		300	PVC	0.40%	29.5	61.2	0.87	0.57	0.30	0.88
CA-03B	CBMH03B	CBMH04B	0.000	0.000	0.052	0.129	0.312	11.17	98.41	30.66		300	PVC	0.40%	38.8	61.2	0.87	0.75	0.50	0.88
CA-04B	CBMH04B	MH17B	0.000	0.000	0.050	0.126	0.437	11.91	95.07	41.56		300	PVC	0.40%	28.8	61.2	0.87	0.55	0.68	0.88
CA-05B	Landscape CB05B	CBMH06B	0.057	0.000	0.000	0.032	0.032	10.00	104.19	3.28		250	PVC	0.50%	28.3	42.0	0.86	0.55	0.08	0.34
CA-06B	CBMH06B	CBMH07B	0.004	0.000	0.066	0.167	0.199	10.55	101.37	20.14		300	PVC	0.40%	29.7	61.2	0.87	0.57	0.33	0.80
CA-07B	CBMH07B	CBMH12B	0.016	0.000	0.111	0.287	0.485	11.12	98.61	47.85		300	PVC	0.40%	38.8	61.2	0.87	0.75	0.78	0.80
CA-08B	Landscape CB08B	CBMH09B	0.160	0.000	0.000	0.089	0.089	10.00	104.19	9.26		250	PVC	0.50%	30.7	42.0	0.86	0.60	0.22	0.34
CA-09B	CBMH09B	CBMH10B	0.006	0.000	0.079	0.201	0.289	11.12	98.61	28.54		300	PVC	0.40%	33.2	61.2	0.87	0.64	0.47	0.74
CA-10B	CBMH10B	CBMH11B	0.016	0.000	0.113	0.292	0.581	11.87	95.25	55.33		375	PVC	0.30%	38.8	96.0	0.87	0.74	0.58	0.30
CA-11B	CBMH11B	CBMH12B	0.017	0.000	0.112	0.290	0.871	12.61	92.15	80.27		375	PVC	0.35%	34.2	103.7	0.94	0.61	0.77	0.33
CA-12B	CBMH12B	CBMH16B	0.017	0.000	0.110	0.285	1.156	13.71	87.97	101.71		450	PVC	0.25%	29.5	142.6	0.90	0.55	0.71	0.31
CA-13B	CB13B	CBMH14B	0.007	0.000	0.047	0.122	0.122	10.00	104.19	12.68		250	PVC	0.50%	38.8	42.0	0.86	0.75	0.30	0.34
CA-14B	CBMH14B	CBMH15B	0.007	0.000	0.045	0.115	0.237	10.75	100.37	23.79		300	PVC	0.40%	40.8	61.2	0.87	0.79	0.39	0.74
CA-15B	CBMH15B	CBMH16B	0.001	0.000	0.072	0.180	0.417	11.54	96.70	40.31		300	PVC	0.40%	54.2	61.2	0.87	1.04	0.66	0.74
CA-16B	CBMH16B	CBMH17B	0.001	0.000	0.070	0.176	1.573	16.30	79.59	125.20		450	PVC	0.30%	20.0	156.2	0.98	0.34	0.80	0.84
	CBMH17B	OGS2	0.000	0.000	0.000	0.000	2.010	18.76	73.09	146.92		525	PVC	0.25%	4.0	215.0	0.99	0.07	0.68	0.85
	OGS2	EXIST MH	0.000	0.000	0.000	0.000	2.010	19.76	70.79	142.30		525	PVC	0.25%	4.0	215.0	0.99	0.07	0.66	0.85

LRL File No.	240720
Project:	Palladium Resort Development Limited Partnership
Location:	Culdaff Rd, Kanata
Date:	July 8, 2026
Designed:	M. Longtin
Checked:	K. Paradis
Drawing Ref.:	C701, C702

WEST Stormwater Management Storage Volumes

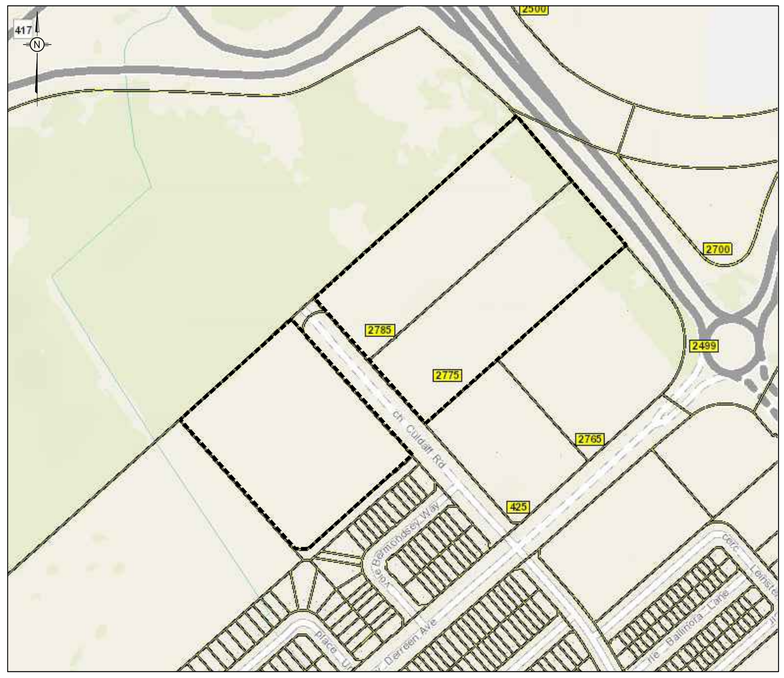
Structure	T/G	HWL (100yr event)	Ponding Depth (100yr event) (m)	Storage (100yr event) (m3)
CBMH01B	108.00	108.30	0.30	64.98
CBMH02B	108.15	108.30	0.15	7.24
CBMH03B	108.10	108.30	0.20	25.54
CBMH04B	108.05	108.30	0.25	26.78
CBMH05B	108.15	108.30	0.15	14.61
CBMH06B	108.05	108.30	0.25	9.84
CBMH07B	108.00	108.30	0.30	90.52
CBMH08B	108.00	108.30	0.30	42.52
CBMH09B	108.05	108.30	0.25	8.52
CBMH10B	108.00	108.30	0.30	82.72
CBMH11B	108.00	108.30	0.30	86.36
CBMH12B	108.00	108.30	0.30	82.86
CB13B	108.10	108.30	0.20	25.40
CBMH14B	108.10	108.30	0.20	20.86
CBMH16B	108.00	108.30	0.30	46.28
CBMH17B	108.00	108.30	0.30	44.16
CB19B	108.21	108.30	VARIABLE	40.32
CB20B	108.23	108.30	VARIABLE	37.26
CB21B	108.23	108.30	VARIABLE	46.48
CB22B	108.23	108.30	VARIABLE	44.08

APPENDIX F

Civil Engineering Drawings

PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE / UNADDRESSED PARCEL CULDAFF ROAD
OTTAWA, ON

REVISION 01



KEY PLAN (N.T.S.)

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LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

AS INSTRUMENTS OF SERVICE, ALL DRAWINGS, SPECIFICATIONS, CADD FILES OR OTHER ELECTRONIC MEDIA AND COPIED THERE OF FURNISHED BY THE ENGINEER ARE HIS PROPERTY. THEY ARE TO BE USED ONLY FOR THIS PROJECT AND ARE NOT TO BE USED ON ANY OTHER PROJECT, INCLUDING REPEATS OF THE PROJECT. CHANGES TO THE DRAWINGS MAY ONLY BE MADE BY THE ENGINEER.

UNLESS THE REVISION TITLE IS "ISSUED FOR CONSTRUCTION", THESE DRAWINGS SHALL BE CONSIDERED PRELIMINARY AND SHALL NOT BE USED AS A CONSTRUCTION DOCUMENT.

THESE DRAWINGS ILLUSTRATES THE WORK TO BE DONE. THE ENGINEER IS NOT RESPONSIBLE FOR THE MEANS, METHODS, TECHNIQUES, SEQUENCES, AND PROCEDURES USED TO DO THE WORK, OR THE SAFETY ASPECTS OF CONSTRUCTION, AND NOTHING ON THESE DRAWINGS EXPRESSED OR IMPLIED CHANGES THIS CONDITION. CONTRACTOR SHALL DETERMINE ALL CONDITIONS AT THE SITE AND SHALL BE RESPONSIBLE FOR KNOWING HOW THEY AFFECT THE WORK. SUBMITTAL OF A BID TO PERFORM THIS WORK IS ACKNOWLEDGEMENT OF THE RESPONSIBILITIES, AND THAT THEY HAVE BEEN FULLY CONSIDERED IN PLANNING OF THE WORK, AND THE BID PRICE. NO CLAIMS FOR EXTRA CHARGES DUE TO THESE CONDITIONS WILL BE FORTHCOMING.

UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES. THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

IN ADDITION, THE CLIENT AGREES, TO THE FULLEST EXTENT PERMITTED BY LAW, TO INDEMNIFY AND HOLD HARMLESS LRL FROM ANY DAMAGES, LIABILITIES OR COST, INCLUDING REASONABLE ATTORNEY'S FEES AND COST OF DEFENSE, ARISING FROM SUCH CHANGES.

IN ADDITION, THE CLIENT AGREES TO INCLUDE IN ANY CONTRACTS FOR CONSTRUCTION APPROPRIATE LANGUAGE THAT PROHIBITS THE CONTRACTOR OR ANY SUBCONTRACTORS OF ANY TIER FROM MAKING ANY CHANGES OR MODIFICATIONS TO LRL'S CONSTRUCTION DOCUMENTS WITHOUT THE PRIOR WRITTEN APPROVAL OF LRL AND THAT FURTHER REQUIRES THE CONTRACTOR TO INDEMNIFY BOTH LRL AND THE CLIENT FROM ANY LIABILITY OR COST ARISING FROM SUCH CHANGES MADE WITHOUT SUCH PROPER AUTHORIZATION.

GENERAL NOTES:

EXISTING SERVICES AND UTILITIES SHOWN ON THESE DRAWINGS ARE TAKEN FROM THE BEST AVAILABLE RECORDS, BUT MAY NOT BE COMPLETE OR TO DATE. CONTRACTOR SHALL VERIFY IN FIELD FOR LOCATION AND ELEVATION OF PIPES AND CHECK WITH THE UTILITY COMPANIES BEFORE DIGGING OR PERFORMING WORK.

CONTRACTOR IS ADVISED TO COLLECT INFORMATION ON SOIL CONDITIONS BEFORE START OF CONSTRUCTION.

THE ENGINEER WAIVES ANY AND ALL RESPONSIBILITY AND LIABILITY FOR PROBLEMS WHICH ARISE FROM FAILURE TO FOLLOW THESE PLANS, SPECIFICATIONS AND THE DESIGN INTENT THEY CONVEY, OR FOR PROBLEMS WHICH ARISE FROM OTHERS' FAILURE TO OBTAIN AND/OR FOLLOW THE ENGINEER'S GUIDANCE WITH RESPECT TO ANY ERRORS, OMISSIONS, INCONSISTENCIES AMBIGUITIES OR CONFLICTS WHICH ARE ALLEGED.

CONTRACTOR TO VERIFY ALL DIMENSIONS AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES BEFORE WORK COMMENCES. DO NOT SCALE DRAWINGS.

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K.L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE /
UNADDRESSED PARCEL, CULDAFF ROAD
OTTAWA, ON

DRAWING TITLE
TITLE PAGE

PROJECT NO.
240720

C000

GENERAL NOTES

1. ALL WORKS MATERIALS SHALL CONFIRM TO THE LAST REVISION OF THE STANDARDS AND SPECIFICATIONS FOR THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS), WHERE APPLICABLE. LOCAL UTILITY STANDARDS AND MINISTRY OF TRANSPORTATION STANDARDS WILL APPLY WHERE REQUIRED.
2. THE CONTRACTORS SHALL CONFIRM THE LOCATION OF ALL EXISTING UTILITIES WITHIN THE SITE AND ADJACENT WORK AREAS. THE CONTRACTORS SHALL BE RESPONSIBLE FOR PROTECTING ALL EXISTING UTILITIES TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR OR REPLACEMENT OF ANY SERVICES OR UTILITIES DISTURBED DURING CONSTRUCTION , TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION.
3. ALL DIMENSIONS SHALL BE CHECKED AND VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO THE START OF CONSTRUCTION, ANY DISCREPANCIES SHALL BE REPORTED IMMEDIATELY TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTORS TO CONFIRM UTILITY LOCATIONS AND NOTIFY ENGINEER OF POSSIBLE CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT CONTRACTORS EXPENSE.
4. ANY AREA BEYOND THE LIMIT OF THE SITE DISTURBED DURING CONSTRUCTION SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITY HAVING JURISDICTION AT THE CONTRACTOR'S EXPENSE. RELOCATING OF EXISTING SERVICES AND/OR UTILITIES SHALL BE AS SHOWN ON THE DRAWINGS OR DETECTED BY THE ENGINEER AT THE EXPENSE OF DEVELOPERS.
5. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE 'OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS'. THE GENERAL CONTRACTORS SHALL BE DEEMED TO BE THE 'CONTRACTOR' AS DEFINED IN THE ACT.
6. ALL THE CONSTRUCTION SIGNAGE MUST CONFIRM TO THE MINISTRY OF TRANSPORTATION OF ONTARIO MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES PER LATEST AMENDMENT.
7. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THE CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES TO PREVENT CONFLICTS.
8. ALL DIMENSIONS ARE IN METRES UNLESS SPECIFIED OTHERWISE.
9. THERE WILL BE NO SUBSTITUTION OF MATERIALS UNLESS PRIOR WRITTEN APPROVAL IS RECEIVED FROM THE ENGINEER.
10. ALL CONSTRUCTION SHALL BE CARRIED OUT IN ACCORDANCE WITH THE RECOMMENDATIONS MADE IN THE GEOTECHNICAL REPORT.
11. FOR DETAILS RELATING TO STORMWATER MANAGEMENT AND ROOF DRAINAGE REFER TO THE SITE SERVICING AND STORMWATER MANAGEMENT REPORT.
12. ALL SEWERS CONSTRUCTED WITH GRADES LESS THAN 1.0% SHALL BE INSTALLED USING LASER ALIGNMENT AND CHECKED WITH LEVEL INSTRUMENT PRIOR TO BACKFILLING.
13. THE CONTRACTOR IS RESPONSIBLE FOR OBTAINING ALL PERMITS REQUIRED AND TO BEAR THE COST OF THE SAME.
14. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ADDITIONAL BEDDING, OR ADDITIONAL STRENGTH PIPE IF THE MAXIMUM TRENCH WIDTH AS SPECIFIED BY OPSD IS EXCEEDED.
15. ALL PIPE/CULVERT SECTION SIZES REFER TO INSIDE DIMENSIONS.
16. SHOULD DEEPLY BURIED ARCHAEOLOGICAL REMAINS BE FOUND ON THE PROPERTY DURING CONSTRUCTION ACTIVITIES, THE HERITAGE OPERATIONS UNIT OF THE ONTARIO MINISTRY OF CULTURE MUST BE NOTIFIED IMMEDIATELY.
17. ALL NECESSARY CLEARING AND GRUBBING SHALL BE COMPLETED BY THE CONTRACTOR. REVIEW WITH CONTRACT ADMINISTRATOR AND THE CITY OF OTTAWA PRIOR TO ANY TREE CUTTING/REMOVAL.
18. DRAWINGS SHALL BE READ ON CONJUNCTION WITH ARCHITECTURAL SITE PLAN.
19. THE CONTRACTOR SHALL PROVIDE THE PROJECT ENGINEER ON SET OF AS CONSTRUCTED SITE SERVICING AND GRADING DRAWINGS.
20. BENCHMARKS: IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THAT THE SITE BENCHMARK(S) HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION DEPICTED ON THIS PLAN.
21. THE CONTRACTOR IS TO PERFORM TESTING AT EACH PROJECT MILESTONE AND SEND TO THE ENGINEER FOR REVIEW. THESE TESTS WILL BE REQUIRED FOR PROJECT SIGNOFF.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL

THE CONTRACTOR SHALL IMPLEMENT BEST MANAGEMENT PRACTICES, TO PROVIDE FOR PROTECTION OF THE AREA DRAINAGE SYSTEM AND THE RECEIVING WATERCOURSE, DURING CONSTRUCTION ACTIVITIES. THE CONTRACTOR ACKNOWLEDGES THAT FAILURE TO IMPLEMENT APPROPRIATE EROSION AND SEDIMENT CONTROL MEASURES MAY BE SUBJECT TO PENALTIES IMPOSED BY ANY APPLICABLE REGULATORY AGENCY.

THE CONTRACTOR ACKNOWLEDGES THAT SURFACE EROSION AND SEDIMENT RUNOFF RESULTING FROM THEIR CONSTRUCTION OPERATIONS HAS POTENTIAL TO CAUSE A DETRIMENTAL IMPACT TO ANY DOWNSTREAM WATERCOURSE OR SEWER, AND THAT ALL CONSTRUCTION OPERATIONS THAT MAY IMPACT UPON WATER QUALITY SHALL BE CARRIED OUT IN MANNER THAT STRICTLY MEETS THE REQUIREMENT OF ALL APPLICABLE LEGISLATION AND REGULATIONS.

AS SUCH, THE CONTRACTOR SHALL BE RESPONSIBLE FOR CARRYING OUT THEIR OPERATIONS, AND SUPPLYING AND INSTALLING ANY APPROPRIATE CONTROL MEASURES, SO AS TO PREVENT SEDIMENT LADEN RUNOFF ENTERING ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA.

THE CONTRACTOR ACKNOWLEDGES THAT NO ONE MEASURE IS LIKELY TO BE 100% EFFECTIVELY FOR EROSION PROTECTION AND CONTROLLING SEDIMENT RUNOFF AND DISCHARGES FROM THE SITE. THEREFORE, WHERE NECESSARY THE CONTRACTOR SHALL IMPLEMENT ADDITIONAL MEASURES ARRANGED IN SUCH MANNER AS TO MITIGATE SEDIMENT RELEASE FROM THE CONSTRUCTION OPERATIONS AND ACHIEVE SPECIFIC MAXIMUM PERMITTED CRITERIA WHERE APPLICABLE. SUGGESTED ON-SITE MEASURES MAY INCLUDE, BUT SHALL NOT BE LIMITED TO, THE FOLLOWING METHODS: SEDIMENT PONDS, FILTER BAGS, PUMP FILTERS, SETTLING TANKS, SILT FENCE, STRAW BALES, FILTER CLOTHS, CATCH BASIN FILTERS, CHECK DAMS AND/OR OTHER RECOGNIZED TECHNOLOGIES AND METHOD AVAILABLE AT THE TIME OF CONSTRUCTION. SPECIFIC MEASURES SHALL BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS OF OPSS 577 WHERE APPROPRIATE, OR IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

WHERE, IN THE OPINION OF THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, THE INSTALLED CONTROL MEASURES FAIL TO PERFORM ADEQUATELY, THE CONTRACTOR SHALL SUPPLY AND INSTALL ADDITIONAL OR ALTERNATIVE MEASURES AS DIRECTED BY THE CONTRACT ADMINISTRATOR OR REGULATORY AGENCY, AS SUCH, THE CONTRACTOR SHALL HAVE ADDITIONAL CONTROL MATERIALS ON SITE AT ALL TIME WHICH ARE EASILY ACCESSIBLE AND MAY BE IMPLEMENTED BY HIM AT THE MOMENT'S NOTICE.

PRIOR TO COMMENCING WORK, THE CONTRACTOR SHALL SUBMIT TO THE CONTRACT ADMINISTRATOR SIX COPIES OF A DETAILED EROSION AND SEDIMENT CONTROL PLAN (ESCP). THE ESCP WILL CONSIST OF WRITTEN DESCRIPTION AND DETAILED DRAWINGS INDICATING THE ON-SITE ACTIVITIES AND MEASURES TO BE USED TO CONTROL EROSION AND SEDIMENT MOVEMENT FOR EACH STEP OF THE WORK.

CONTRACTOR'S RESPONSIBILITIES

THE CONTRACTOR SHALL ENSURE THAT ALL WORKERS, INCLUDING SUB-CONTRACTOR, IN THE WORKING ARE ARE AWARE OF THE IMPORTANCE OF THE EROSION AND SEDIMENT CONTROL MEASURES AND INFORMED OF THE CONSEQUENCES OF THE FAILURE TO COMPLY WITH THE REQUIREMENTS OF ALL REGULATORY AGENCIES.

THE CONTRACTOR SHALL PERIODICALLY (WEEKLY), AND WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENT DEPOSITS AS REQUIRED AT THE SEDIMENT CONTROL DEVICES, INCLUDING THOSE DEPOSITS THAT MAY ORIGINATE FROM OUTSIDE THE CONSTRUCTION AREA. ACCUMULATED SEDIMENT SHALL BE REMOVED IN SUCH A MANNER THAT PREVENTS THE DEPOSITION OF THIS MATERIAL INTO THE WATERCOURSE AND AVOIDS DAMAGE TO EXISTING SITE FEATURES. THE SEDIMENT SHALL BE REMOVED FROM THE SITE AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH REQUIREMENTS FRO EXCESS EARTH MATERIAL, AS SPECIFIED ELSEWHERE IN THE CONTRACT.

THE CONTRACTOR IS REQUIRED TO IMPLEMENT SEDIMENT AND EROSION CONTROL MEASURES AT LEAST ONE WEEK BEFORE THE COMMENCEMENT OF ANY CONSTRUCTION ACTIVITIES. THESE MEASURES SHOULD BE THOROUGHLY INSTALLED TO EFFECTIVELY MANAGE SOIL EROSION AND SEDIMENT RUNOFF. FOLLOWING INSTALLATION, THE CONTRACTOR MUST CONDUCT INSPECTIONS OF THESE CONTROL MEASURES ON A WEEKLY BASIS TO ENSURE THEIR ONGOING EFFECTIVENESS AND FUNCTIONALITY.

IN ADDITION TO THE REGULAR WEEKLY INSPECTIONS, THE CONTRACTOR MUST ALSO CARRY OUT ADDITIONAL INSPECTIONS IN THE AFTERMATH OF ANY MAJOR RAINFALL EVENTS. THIS WILL HELP ASSESS THE PERFORMANCE OF THE EROSION CONTROL MEASURES UNDER INCREASED WATER FLOW CONDITIONS. ANY DEFICIENCIES OR DAMAGES IDENTIFIED DURING THESE INSPECTIONS MUST BE PROMPTLY REPAIRED TO MAINTAIN COMPLIANCE AND ENSURE THE INTEGRITY OF THE CONSTRUCTION SITE.

THE CONTRACTOR SHALL PERIODICALLY, AND WHEN REQUESTED BY THE CONTRACT ADMINISTRATOR, CLEAN OUT ACCUMULATED SEDIMENT DEPOSITS AS REQUIRED AT THE SEDIMENT CONTROL DEVICES, INCLUDING THOSE DEPOSITS THAT MAY ORIGINATE FROM OUTSIDE THE CONSTRUCTION AREA. ACCUMULATED SEDIMENT SHALL BE REMOVED IN SUCH A MANNER THAT PREVENTS THE DEPOSITION OF THIS MATERIAL INTO THE SEWER WATERCOURSE AND AVOIDS DAMAGE TO CONTROL MEASURES. THE SEDIMENT SHALL BE REMOVED FROM THE SITE AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH REQUIREMENTS FRO EXCESS EARTH MATERIAL, AS SPECIFIED ELSEWHERE IN THE CONTRACT.

THE CONTRACTOR SHALL IMMEDIATELY REPORT TO THE CONTRACT ADMINISTRATOR ANY ACCIDENTAL DISCHARGES OF SEDIMENT MATERIAL INTO EITHER THE WATERCOURSE OR THE STORM SEWER SYSTEM. FAILURE TO REPORT WILL BE CONSTITUTE A BRACH OF THIS SPECIFICATION AND THE CONTRACTOR MAY ALSO BE SUBJECT TO THE PENALTIES IMPOSED BY THE APPLICABLE REGULATORY AGENCY. APPROPRIATE RESPONSE MEASURES, INCLUDING ANY REPAIRS TO EXISTING CONTROL MEASURES OR THE IMPLEMENTATION OF ADDITIONAL CONTROL MEASURES, SHALL BE CARRIED OUT BY THE CONTRACTOR WITHOUT DELAY.

THE SEDIMENT CONTROL MEASURES SHALL ONLY BE REMOVED WHEN, IN THE OPINION OF THE CONTRACT ADMINISTRATOR, THE MEASURE OR MEASURES, IS NO LONGER REQUIRED. NO CONTROL MEASURE MAY BE PERMANENTLY REMOVED WITHOUT PRIOR AUTHORIZATION FROM THE CONTRACT ADMINISTRATOR. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE REMOVED IN A MANNER THAT AVOIDS THE ENTRY OF ANY EQUIPMENT, OTHER THAN HAND-HELD EQUIPMENT, INTO ANY WATERCOURSE, AND PREVENTS THE RELEASE OF ANY SEDIMENT OR DEBRIS INTO ANY SEWER OR WATERCOURSE WITHIN OR DOWNSTREAM OF THE WORKING AREA. ALL ACCUMULATED SEDIMENT SHALL BE REMOVED FROM THE WORKING AREA AT THE CONTRACTOR'S EXPENSE AND MANAGED IN COMPLIANCE WITH THE REQUIREMENTS FOR EXCESS EARTH MATERIAL

WHERE, IN THE OPINION OF EITHER THE CONTRACT ADMINISTRATOR OR A REGULATORY AGENCY, ANY OF THE TERMS SPECIFIED HEREIN HAVE NOT BEEN COMPLIED WITH OR PERFORMED IN A SUITABLE MANNER, OR TAT ALL, THE CONTRACTOR ADMINISTRATOR OR A REGULATORY AGENCY HAS THE RIGHT TO IMMEDIATELY WITHDRAW ITS PERMISSION TO CONTINUE THE WORK BUT MAY RENEW ITS PERMISSION UPON BEING SATISFIED THAT THE DEFAULTS OR DEFICIENCIES IN THE PERFORMANCE OF THIS SPECIFICATION BY THE CONTRACTOR HAVE BEEN REMEDIED.

SPILL CONTROL NOTES

1. ALL CONSTRUCTION EQUIPMENT SHALL BE RE-FUELED, MAINTAINED, AND STORED NO LESS THAN 30 METRES FROM WATERCOURSE, STEAMS, CREEKS, WOODLOTS, AND ANY ENVIRONMENTALLY SENSITIVE AREAS, OR AS OTHERWISE SPECIFIED.
2. THE CONTRACTOR MUST IMPLEMENT ALL NECESSARY MEASURES IN ORDER TO PREVENT LEAKS, DISCHARGES OR SPILLS OF POLLUTANTS, DELETERIOUS MATERIALS, OR OTHER SUCH MATERIALS OR SUBSTANCES WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT.
3. IN THE EVENT OF A LEAK, DISCHARGE OR SPILL OF POLLUTANT, DELETERIOUS MATERIAL OR OTHER SUCH MATERIAL OR SUBSTANCE WHICH WOULD OR COULD CAUSE AN ADVERSE IMPACT TO THE NATURAL ENVIRONMENT, THE CONTRACTOR SHALL:
   - 3.1. IMMEDIATELY NOTIFY APPROPRIATE FEDERAL, PROVINCIAL, AND LOCAL GOVERNMENT MINISTRIES, DEPARTMENTS, AGENCIES, AND AUTHORITIES OF THE INCIDENT IN ACCORDANCE WITH ALL CURRENT LAWS, LEGISLATION, ACTS, BY-LAWS, PERMITS, APPROVALS, ETC.
   - 3.2. TAKE IMMEDIATE MEASURES TO CONTAIN THE MATERIAL OR SUBSTANCE, AND TO TAKE SUCH MEASURES TO MITIGATE AGAINST ADVERSE IMPACTS TO THE NATURAL ENVIRONMENT.
   - 3.3. RESTORE THE AFFECTED AREA TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION.

MUD MAT NOTES

1. THE GRANULAR MATERIAL WILL REQUIRE PERIODIC REPLACEMENT AS IT BECOMES CONTAMINATED BY VEHICLE TRAFFIC.
2. SEDIMENT SHALL BE CLEANED FROM PUBLIC ROADS AT THE END OF EACH DAY.
3. SEDIMENT SHALL BE REMOVED FROM PUBLIC ROADS BY SHOVELING OR SWEEPING AND DISPOSED OR PROPERLY IN A CONTROLLED SEDIMENT DISPOSAL AREA.

SITE GRADING NOTES

1. PRIOR TO THE COMMENCEMENT OF THE SITE GRADING WORKS, ALL SILTATION CONTROL DEVICES SHALL BE INSTALLED AND OPERATIONAL PER EROSION CONTROL PLAN.
2. ALL GRANULAR AND PAVEMENT FOR ROADS/PARKING AREAS SHALL BE CONSTRUCTED IN ACCORDANCE WITH GEOTECHNICAL ENGINEER'S RECOMMENDATIONS.
3. ALL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD AND PARKING AREAS ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
4. CONCRETE CURB SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. SC1.1 PROVISION SHALL BE MADE OR CURB DEPRESSIONS AS INDICATED ON ARCHITECTURAL SITE PLAN. CONCRETE SIDEWALK SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD SC1.4. ALL CURBS, CONCRETE ISLANDS, AND SIDEWALKS SHOWN O THIS DRAWING ARE TO BR PRICED IN SITE WORKS PORTION OF THE CONTRACT.
5. PAVEMENT REINSTATEMENT FOR SERVICE AND UTILITY CUTS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. R10 AND OPSD 509.010 AND OPSS 310.
6. GRANULAR 'A' SHALL BE PLACED TO A MINIMUM THICKNESS OF 30MM AROUND ALL STRUCTURES WITHIN THE PAVEMENT AREA.
7. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'B' COMPACTED IN MAXIMUM 30MM LIFTS.
8. ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR BACKFILLING.
9. CONTRACTOR TO OBTAIN A ROAD OCCUPANCY PERMIT 48 HOURS PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL ROAD ALLOWANCE, IF REQUIRED BY THE MUNICIPALITY.
10. ALL PAVEMENT MARKING FEATURES AND SITE SIGNAGE SHALL BE PLACED PER ARCHITECTURAL SITE PLAN. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT PAINT.
11. REFER TO ARCHITECTURAL SITE PLAN FOR DIMENSIONS AND SITE DETAILS.
12. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT. ALL JOINTS MUST BE SEALED.
13. SIDEWALKS TO BE 13MM & BEVELED AT 2:1 OR 6MM WITH NO BEVEL REQUIRED BELOW THE FINISHED FLOOR SLAB ELEVATION AT ENTRANCES REQUIRED TO BE BARRIER-FREE, UNLESS OTHERWISE NOTED. ALL IN ACCORDANCE WITH OBC 3.8.1.3 & OTTAWA ACCESSIBILITY DESIGN STANDARDS.
14. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.

ROADWORK SPECIFICATIONS

15. ROADWORK TO BE COMPLETED IN ACCORDANCE WITH GEOTECHNICAL REPORT, PREPARED BY LRL ASSOCIATES. DATED JUNE 2026.
16. AL TOPSOIL AND ORGANIC MATERIAL SHALL BE STRIPPED WITHIN THE ROAD ALLOWANCE PRIOR TO THE COMMENCEMENT OF CONSTRUCTION AND STOCK PILLED ON SITE AS DIRECTED BY NATIONAL MUNICIPALITY.
17. THE SUBGRADE SHALL BE CROWNED AND SLOPED AT LEAST 2% AND PROOF ROLLED WITH HEAVY ROLLERS.
18. SUB-EXCAVATE SOFT AREAS AND FILL WITH GRANULAR 'A', TYPE II COMPACTED IN MAXIMUM 300MM LIFTS.
19. ALL GRANULAR FOR ROADS SHALL BE COMPACTED TO MINIMUM OF 100% STANDARD PROCTOR DENSITY MAXIMUM DRY DENSITY (SPMDD).
20. CONCRETE RAMP C/W TACTILE WALKING SURFACE INDICATORS COMPONENT AS PER OPSD 310.039. TACTILE WALKING SURFACE INDICATORS TO BE INSTALLED AT ALL RAMPS. MATERIAL TO BE POLYMER COMPOSITE, COLOR GREY.

SANITARY, FOUNDATION DRAIN, STORM SEWER AND WATERMAIN NOTES

GENERAL

1. LASER ALIGNMENT CONTROL TO BE UTILIZED ON ALL SEWER INSTALLATIONS.
2. CLAY SEALS TO BE INSTALLED AS PER CITY STANDARD DRAWING S8. THE SEALS SHOULD BE AT LEAST 1.5M LONG (IN THE TRENCH DIRECTION) AND SHOULD EXTEND FROM TRENCH WALL TO TRENCH WALL. THE SEALS SHOULD EXTEND FROM THE FROST LINE AND FULLY PENETRATE THE BEDDING, SUB-BEDDING, AND COVER MATERIAL. THE BARRIERS SHOULD CONSIST OF RELATIVELY DRY AND COMPATIBLE BROWN SILTY CLAY PLACED IN MAXIMUM 225MM LIFTS AND COMPACTED TO A MINIMUM OF 95% SPMDD. THE CLAY SEALS SHOULD BE PLACED AT THE SITE BOUNDARIES AND AT 60M INTERVALS IN THE SERVICE TRENCHES.
3. SERVICES TO BUILDING TO BE TERMINATED 1.0M FROM THE OUTSIDE FACE OF BUILDING UNLESS OTHERWISE NOTED.
4. ALL MAINTENANCE STRUCTURE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY. A MINIMUM OF 300MM AROUND STRUCTURES.
5. "MODULOC" OR APPROVED PRE-CAST MAINTENANCE STRUCTURE AND CATCH BASIN ADJUSTERS TO BE USED IN LIEU OF BRICKING. PARGE ADJUSTING UNITS ON THE OUTSIDE ONLY.
6. SAFETY PLATFORMS SHALL BE PER OPSD 404.02.
7. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH OPSD 1003.01, IF APPLICABLE.
8. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SEWERS, INCLUDING PICTORIAL REPORT, ONE (1) CD COPY AND TWO (2) VIDEO RECORDING IN A FORMAT ACCEPTABLE TO ENGINEER. ALL SEWER ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION. ASPHALT WEAR COURSE SHALL NOT BE PLACED UNTIL THE VIDEO INSPECTION OF SEWERS AND NECESSARY REPAIRS HAVE BEEN COMPLETED TO THE SATISFACTION OF THE ENGINEER.
9. CONTRACTOR SHALL PERFORM LEAKAGE TESTING, IN THE PRESENCE OF THE CONSULTANT, FOR SANITARY SEWERS IN ACCORDANCE WITH OPSS 407. CONTRACTOR SHALL PERFORM VIDEO INSPECTION OF ALL SEWERS. A COPY OF THE VIDEO AND INSPECTION REPORT SHALL BE SUBMITTED TO THE CONSULTANT FOR REVIEW AND APPROVAL PRIOR TO PLACEMENT OF WEAR COURSE ASPHALT.

SANITARY

10. ALL SANITARY SEWER INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). AND SPECIFICATIONS (OPSS).
11. ALL SANITARY GRAVITY SEWER SHALL BE PVC SDR 35, IPEX 'RING-TITE' (OR APPROVED EQUIVALENT) PER CSA STANDARD B182.2 OR LATEST AMENDMENT, UNLESS SPECIFIED OTHERWISE.
12. EXISTING MAINTENANCE STRUCTURES TO BE RE-BENCHED WHERE A NEW CONNECTION IS MADE.
13. SANITARY GRAVITY SEWER TRENCH AND BEDDING SHALL BE PER CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' BEDDING, UNLESS SPECIFIED OTHERWISE.
14. SANITARY MAINTENANCE STRUCTURE FRAME AND COVERS SHALL BE PER CITY OF OTTAWA STD. S24 AND S25.
15. SANITARY MAINTENANCE STRUCTURES SHALL BE BENCHED PER OPSD 701.021.
16. 100MM THICK HIGH-DENSITY GRADE 'A' POLYSTYRENE INSULATION TO BE INSTALLED IN ACCORDANCE WITH CITY STD W22 WHERE INDICATED ON DRAWING SSP-1.

STORM

17. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2, OR LATEST AMENDMENT. ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1, OR LATEST AMENDMENT. PIPE SHALL BE JOINED WITH STD. RUBBER GASKETS AS PER CSA A257.3, OR LATEST AMENDMENT.
18. ALL STORM SEWER TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. S6 AND S7 CLASS 'B' UNLESS OTHERWISE SPECIFIED. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY PROJECT GEOTECHNICAL ENGINEER.
19. ALL PVC STORM SEWERS ARE TO BE SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
20. CATCH BASIN SHALL BE IN ACCORDANCE WITH OPSD 705.010.
21. CATCH BASIN LEADS SHALL BE IN 200MM DIA. AT 1% SLOPE (MIN) UNLESS SPECIFIED OTHERWISE.
22. ALL CATCH BASINS SHALL HAVE 600MM SUMPS, UNLESS SPECIFIED OTHERWISE.
23. ALL CATCH BASIN LEAD INVERTS TO BE 1.5M BELOW FINISHED GRADE UNLESS SPECIFIED OTHERWISE.
24. THE STORM SEWER CLASSES HAVE BEEN DESIGNED BASED ON BEDDING CONDITIONS SPECIFIED ABOVE. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED , THE CONTRACTOR IS REQUIRED TO PROVIDE AND SHALL BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
25. ALL ROAD AND PARKING LOT CATCH BASINS TO BE INSTALLED WITH ORTHOGONALLY PLACED SUBDRAINS IN ACCORDANCE WITH DETAIL. PERFORATED SUBDRAIN FOR ROAD AND PARKING LOT CATCH BASIN SHALL BE INSTALLED PER CITY STD R1 UNLESS OTHERWISE NOTED.
26. PERFORATED SUBDRAIN FOR REAR YARD AND LANDSCAPING APPLICATIONS SHALL BE INSTALLED PER CITY STD S29, S30 AND S31, WHERE APPLICABLE.
27. RIP-RAP TREATMENT SEWER AND CULVERT OUTLETS PER OPSD 810.010.
28. ALL STORM SEWER/ CULVERTS TO BE INSTALLED WITH FROST TREATMENT PER OPSD 803.031 WHERE APPLICABLE.
29. ALL STORM MANHOLES WITH PIPE LESS THAN 900MM IN DIAMETER SHALL BE CONSTRUCTED WITH A 300MM SUMP AS PER SDG, CLAUSE 6.2.6.

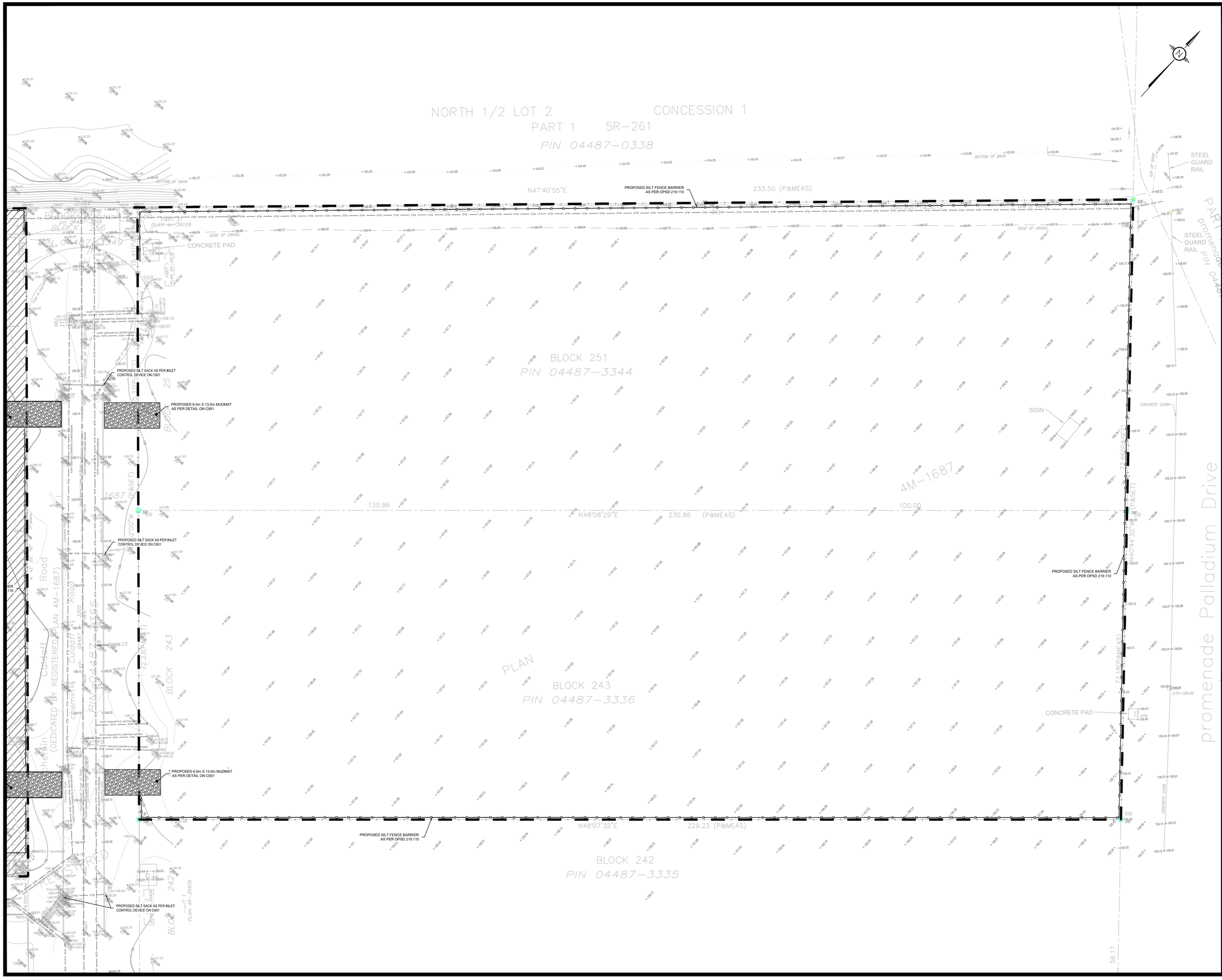
WATERMAIN

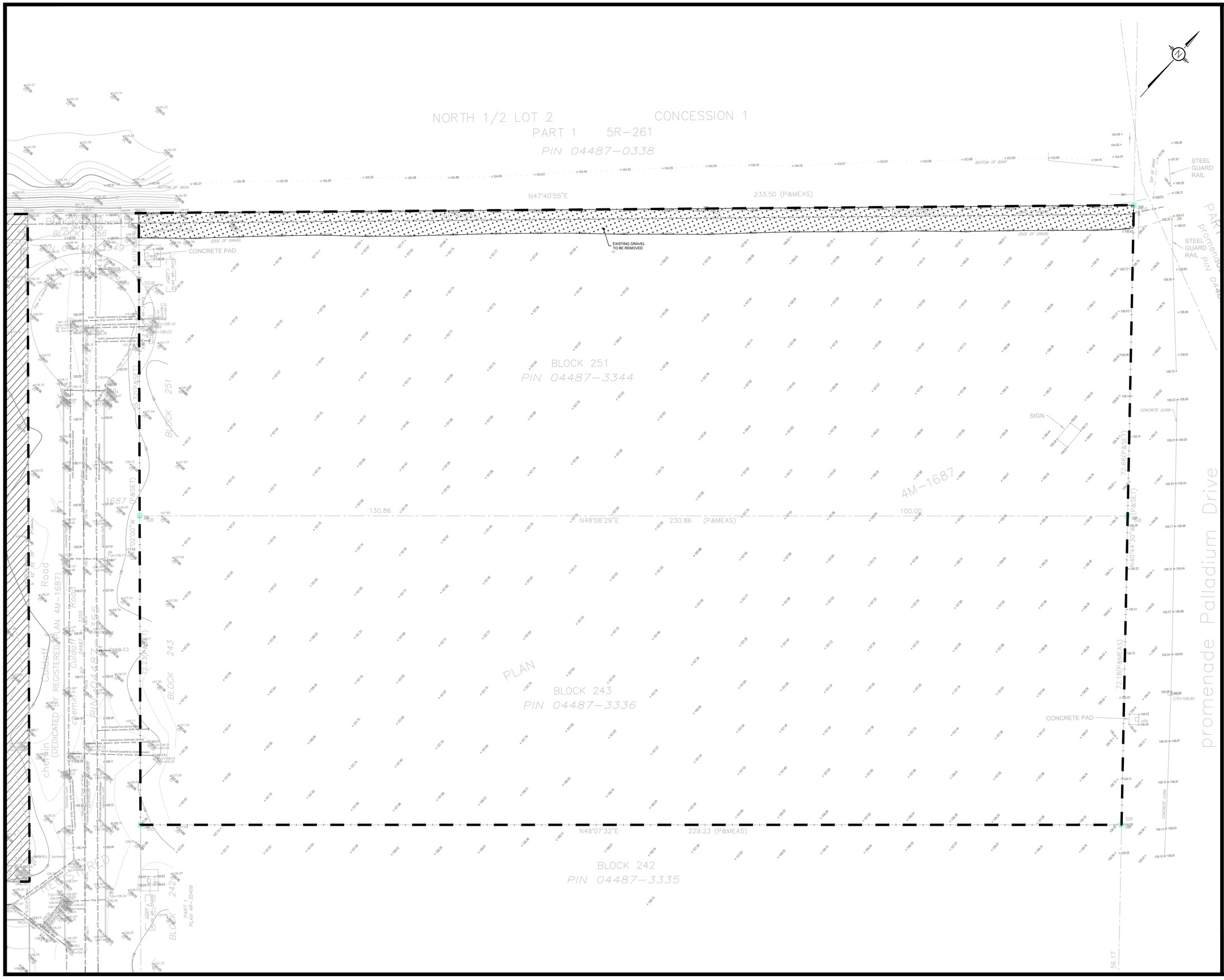
30. ALL WATERMAIN INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE CITY OF OTTAWA AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
31. ALL PVC WATERMAINS SHALL BE AWWA C-900 CLASS 150, SDR 18 OR APPROVED EQUIVALENT.
32. ALL WATER SERVICES LESS THAN OR EQUAL TO 50MM IN DIAMETER TO BE TYPE 'K' COPPER.
33. WATERMAIN TRENCH AND BEDDING SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STANDARD W17. UNLESS SPECIFIED OTHERWISE. BEDDING AND COVER MATERIAL SHALL BE SPECIFIED BY THE PROJECT GEOTECHNICAL ENGINEER.
34. ALL PVC WATERMAINS, SHALL BE INSTALLED WITH A 10 GAUGE STRANDED COPPER TWU OR RWU TRACER WIRE IN ACCORDANCE WITH CITY OF OTTAWA STD. W.36.
35. CATHODIC PROTECTION IS REQUIRED ON ALL METALLIC FITTINGS PER CITY OF OTTAWA STD.25.5 AND W25.6.
36. VALVE BOXES SHALL BE INSTALLED PER CITY OF OTTAWA STD W24.
37. WATERMAIN IN FILL AREAS TO BE INSTALLED WITH RESTRAINED JOINTS PER CITY OF OTTAWA STD.25.5 AND W25.6.
38. THRUST BLOCKING OF WATERMAINS TO BE INSTALLED PER CITY OF OTTAWA STD. W25.3 AND W25.4.
39. THE CONTRACTOR SHALL PROVIDE ALL TEMPORARY CAPS, PLUGS, BLOW-OFFS, AND NOZZLES REQUIRED FOR TESTING AND DISINFECTION OF THE WATERMAIN.
40. WATERMAIN CROSSING OVER AND BELOW SEWERS SHALL BE IN ACCORDANCE WITH THE CITY OF OTTAWA STD. W25,2 AND W25, RESPECTIVELY.
41. WATER SERVICES ARE TO BE INSULATED PER CITY STD, W23 WHERE SEPARATION BETWEEN SERVICES AND MAINTENANCE HOLES ARE LESS THAN 2.4M.
42. THE MINIMUM VERTICAL CLEARANCE BETWEEN WATERMAIN AND SEWER/UTILITY IS 0.5M PER MOE GUIDELINES. FOR CROSSING UNDER SEWERS, ADEQUATE STRUCTURAL SUPPORT FOR THE SEWER IS REQUIRED TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING. THE LENGTH OF WATER PIPE SHALL BE CENTERED AT THE POINT OF CROSSING TO ENSURE THAT THE JOINTS WILL BE EQUIDISTANT AND AS FAR AS POSSIBLE FROM THE SEWER.
43. ALL BURIED WATER INFRASTRUCTURE, INCLUDING WATERMAINS, PRIVATE FIRE PROTECTION LINES, AND SERVICE CONNECTIONS, SHALL HAVE A MINIMUM COVER OF 2.4 M. WHERE MINIMUM COVER CANNOT BE ACHIEVED, THERMAL INSULATION SHALL BE PROVIDED IN ACCORDANCE WITH STD DWG W22.
44. GENERAL WATER PLANT TO UTILITY CLEARANCE AS PER STD DWG R20.
45. FIRE HYDRANT INSTALLATION AS PER STD DWG W19, ALL BOTTOM OF HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.10M ABOVE PROPOSED FINISHED GRADE AT HYDRANT; FIRE HYDRANT LOCATION AS PER STD DWG W18.
46. BUILDING SERVICE TO BE CAPPED 1.0M OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED AND MUST BE RESTRAINED A MINIMUM OF 12M BACK FROM STUB.
47. ALL WATERMAINS SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES UNLESS OTHERWISE DIRECTED. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED.
48. ALL WATERMAINS SHALL BE BACTERIOLOGICALLY TESTED IN ACCORDANCE WITH THE CITY OF OTTAWA AND ONTARIO GUIDELINES. ALL CHLORINATED WATER TO BE DISCHARGED AND PRETREATED TO ACCEPTABLE LEVELS PRIOR TO DISCHARGE. ALL DISCHARGED WATER MUST BE CONTROLLED AND TREATED SO AS NOT TO ADVERSELY EFFECT ENVIRONMENT. IT IS RESPONSIBILITY OF THE CONTRACTOR TO ENSURE THAT ALL MUNICIPAL AND/OR PROVINCIAL REQUIREMENTS ARE FOLLOWED.
49. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A PLUG AND 50MM BLOW OFF UNLESS OTHERWISE NOTED.

PAVEMENT STRUCTURE

COURSE	MATERIAL	THICKNESS (mm) AUTOMOBILE PARKING	THICKNESS (mm) TRUCK ROUTE (HEAVY TRAFFIC)
SURFACE	HL.3 A/C (PG 58-34)	50	40
BINDER	HL.8 A/C (PG 58-34)	--	50
BASECOURSE	OPSS GRANULAR "A"	150	150
SUBBASE	OPSS GRANULAR "B" TYPE II	300	450

NOTE:
IN PREPARATION FOR PAVEMENT CONSTRUCTION AT THIS SITE, ANY SURFICIAL OR NEAR SURFACE/SUBGRADE LEVEL


NORTH 1/2 LOT 2 CONCESSION 1
PART 1 5R–261
PIN 04487–0338
N47°40'55"E
233.50 (P&MEAS)
PROPOSED SILT FENCE BARRIER AS PER OPSD 219.110
BOTTOM OF BANK
TOP OF BANK
STEEL GUARD RAIL
CONCRETE PAD
EDGE OF GRAVEL
BLOCK 251
PIN 04487–3344
PROPOSED SILT SACK AS PER INLET CONTROL DEVICE ON C901
PROPOSED 6.0m X 13.0m MUDMAT AS PER DETAIL ON C901
N48°08'29"E
230.86 (P&MEAS)
130.86
100.00
4M–1687
SIGN
CONCRETE CURB
BLOCK 243
PIN 04487–3336
BLOCK 242
PIN 04487–3335
N48°07'32"E
229.23 (P&MEAS)
72.18(P&MEAS)
N40°44'30"W
Promenade Palladium Drive
Cundiff Road
Southeast Corner of Lot 2 Concession 1 (Dedicated by Registered Plan 4M–1687)
PLAN 4M–1687
PLAN 4R–34109
PLAN 4R–35406
PLAN 4R–35455
PART 1 PLAN 4R–34109
PART 1 PLAN 4R–34111
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 250mmØ PVC SANITARY SEWER
EXIST 200mmØ PVC WATERMAIN
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 200mmØ PVC WATERMAIN
EXIST 200mmØ PVC SANITARY SEWER



USE AND INTERPRETATION OF DRAWINGS

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5m 0 10 20m

SCALE: 1:400

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K.L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE
OTTAWA, ON

DRAWING TITLE
DEMOLITION PLAN

PROJECT NO.
240720

C102A

NORTH 1/2 LOT 2 CONCESSION 1
PART 1 5R-261
PIN 04487-0338

HOTEL
7 STOREYS
F.F.E. = 108.70

FAMILY ENTERTAINMENT CENTRE
2 STOREYS
F.F.E. = 108.70

SUPPORT BUILDING
1 STOREY ABOVE GRADE, PLUS BASEMENT
F.F.E. = 108.70

INDOOR WATERPARK

SLIDE TOWER

OUTDOOR AMENITY SPACE (BY OTHERS)

CULDAFF ROAD

PROPOSED LANDSCAPING REFER TO LATEST LANDSCAPE PLAN PREPARED BY NAK DESIGN STRATEGIES

N47°40'55"E 233.50 (P&MEAS)

N48°07'32"E 229.23 (P&MEAS)

BLOCK 242
PIN 04487-3335

BENCHMARK
TOP OF SPINDLE
ELEV. = 109.04m

EXTENT OF ASPHALT RE-GRADING

ASPHALT REINSTATEMENT SHALL MATCH EXISTING GRANULAR AND ASPHALT THICKNESS WHILE MAINTAINING A MINIMUM OF:
40mm OF HL3
50mm OF HL8
150mm OF GRANULAR "A"
400mm OF GRANULAR "B"
CONTRACTOR TO COMPLETE ROAD CUT AS PER CITY OF OTTAWA DETAIL R10

PROP ENTRANCE PER CITY STANDARD SC7.4

PROP ENTRANCE PER CITY STANDARD SC7.4

PROP ENTRANCE PER CITY STANDARD SC7.4

108.68 (PER D07-12-24-0140)

108.83 (PER D07-12-24-0140)

108.97 (PER D07-12-24-0140)

109.10 (PER D07-12-24-0140)

109.10 (PER D07-12-24-0140)

SNOW STORAGE

COMMUNITY GARDEN

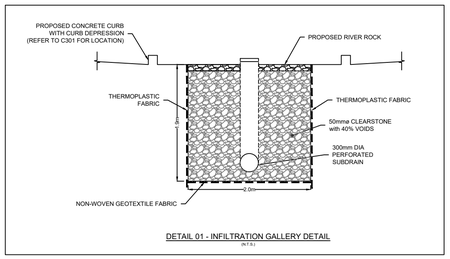
PERGOLA

MAINTENANCE SHED

STEEL GUARD RAIL

CONCRETE CURB

SIB



DETAIL 01 - INFILTRATION GALLERY DETAIL
NTS

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5m 0 10 20m
SCALE: 1:400

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01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K.L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
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2962 CARP ROAD, OTTAWA ON

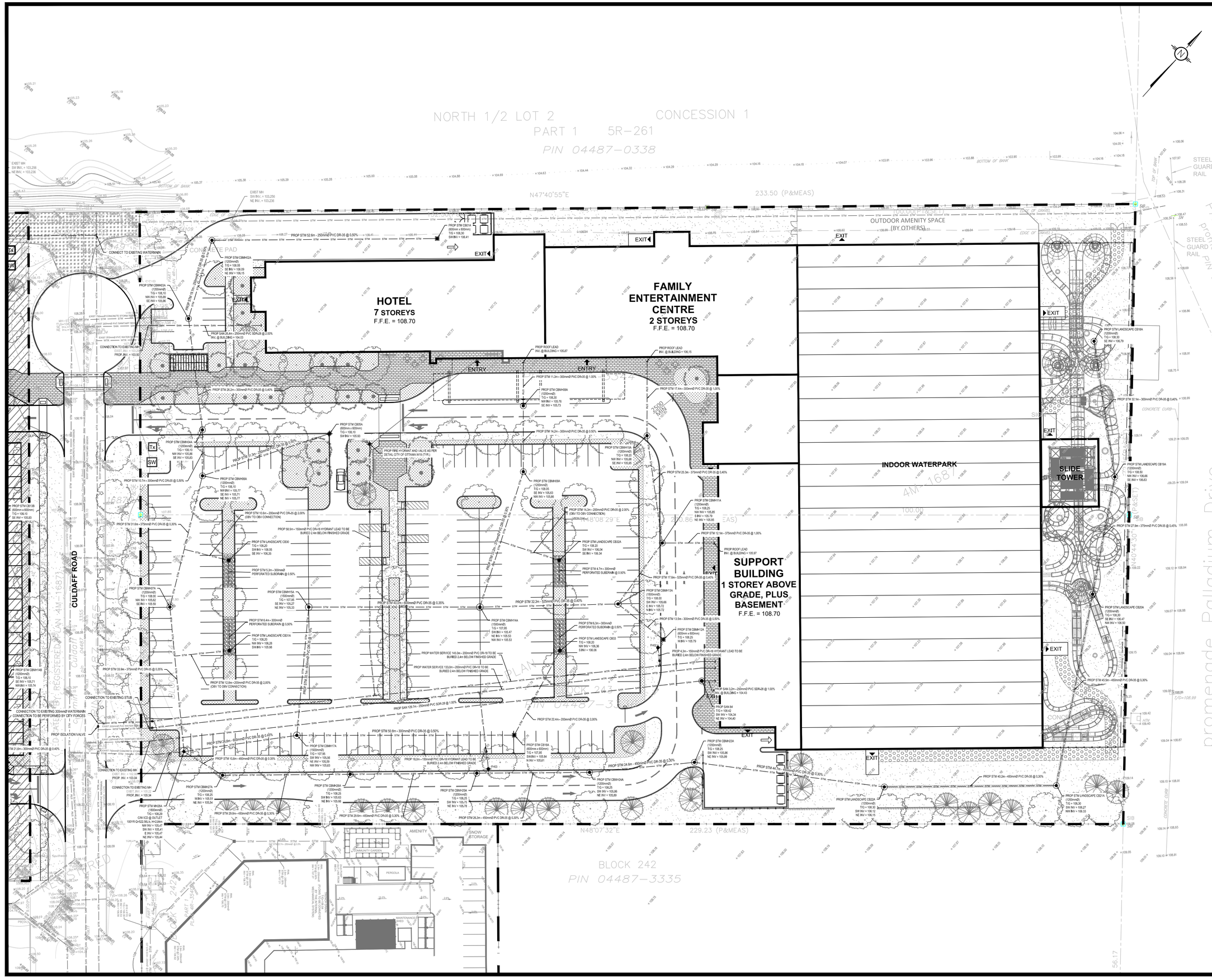
DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE
OTTAWA, ON

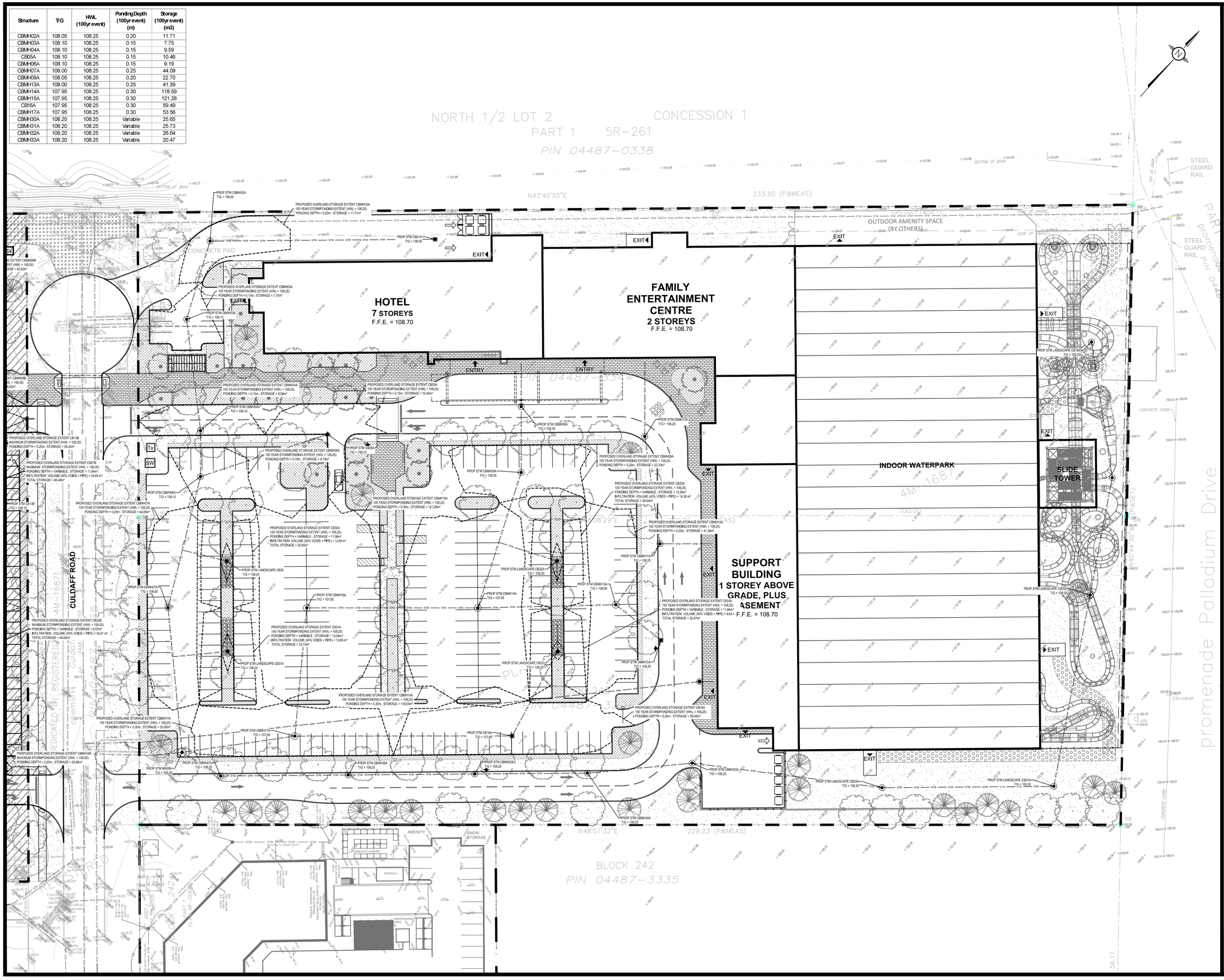
DRAWING TITLE
GRADING AND DRAINAGE PLAN

PROJECT NO.
240720

C301A


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PART 1 5R–261
PIN 04487–0338
HOTEL
7 STOREYS
F.F.E. = 108.70
FAMILY ENTERTAINMENT CENTRE
2 STOREYS
F.F.E. = 108.70
INDOOR WATERPARK
SLIDE TOWER
SUPPORT BUILDING
1 STOREY ABOVE GRADE, PLUS BASEMENT
F.F.E. = 108.70
OUTDOOR AMENITY SPACE (BY OTHERS)
CULDAFF ROAD
Promenade Palladium Drive
N47°40'55"E 233.50 (P&MEAS)
N48°07'32"E 229.23 (P&MEAS)
BLOCK 242
PIN 04487–3335
AMENITY
SNOW STORAGE
COMMUNITY GARDEN
PERGOLA
MAINTENANCE
CONCRETE PAD
STEEL GUARD RAIL
EXIT
ENTRY
CONNECT TO EXISTING WATERMAIN
CONNECTION TO EXISTING STUB
CONNECTION TO EXISTING MH
PROP ISOLATION VALVE
PROP FIRE HYDRANT AND VALVE AS PER DETAIL CITY OF OTTAWA W16 (TYP.)
PROP STM 52.6m - 250mm Ø PVC DR-35 @ 0.50%
PROP STM 26.2m - 300mm Ø PVC DR-35 @ 0.40%
PROP STM 11.3m - 300mm Ø PVC DR-35 @ 1.00%
PROP STM 17.4m - 300mm Ø PVC DR-35 @ 1.00%
PROP STM 14.2m - 300mm Ø PVC DR-35 @ 0.50%
PROP STM 25.3m - 375mm Ø PVC DR-35 @ 0.40%
PROP STM 31.6m - 375mm Ø PVC DR-35 @ 0.30%
PROP STM 10.6m - 200mm Ø PVC DR-35 @ 2.00% (OBV TO OBV CONNECTION)
PROP STM 14.3m - 200mm Ø PVC DR-35 @ 2.00% (OBV TO OBV CONNECTION)
PROP STM 12.5m - 375mm Ø PVC DR-35 @ 1.00%
PROP STM 17.6m - 525mm Ø PVC DR-35 @ 0.40%
PROP STM 13.5m - 300mm Ø PVC DR-35 @ 0.50%
PROP STM 58.5m - 150mm Ø PVC DR-18 HYDRANT LEAD TO BE BURIED 2.4m BELOW FINISHED GRADE
PROP STM 32.3m - 525mm Ø PVC DR-35 @ 0.40%
PROP STM 52.0m - 450mm Ø PVC DR-35 @ 0.35%
PROP STM 33.9m - 375mm Ø PVC DR-35 @ 0.33%
PROP STM 12.6m - 200mm Ø PVC DR-35 @ 2.00% (OBV TO OBV CONNECTION)
PROP STM 50.8m - 300mm Ø PVC DR-35 @ 0.50%
PROP STM 20.5m - 900mm Ø PVC DR-35 @ 0.45%
PROP STM 10.6m - 450mm Ø PVC DR-35 @ 0.35%
PROP STM 18.0m - 150mm Ø PVC DR-18 HYDRANT LEAD TO BE BURIED 2.4m BELOW FINISHED GRADE
PROP STM 24.5m - 450mm Ø PVC DR-35 @ 0.30%
PROP STM 29.6m - 450mm Ø PVC DR-35 @ 0.30%
PROP STM 26.3m - 450mm Ø PVC DR-35 @ 0.30%
PROP STM 45.5m - 450mm Ø PVC DR-35 @ 0.30%
PROP STM 40.2m - 450mm Ø PVC DR-35 @ 0.30%
PROP STM 32.1m - 300mm Ø PVC DR-35 @ 0.40%
PROP STM 27.9m - 375mm Ø PVC DR-35 @ 0.40%
PROP STM 22.4m - 200mm Ø PVC DR-35 @ 2.00%
PROP SAN 26.4m - 250mm Ø PVC SDR-28 @ 2.00%
PROP SAN 129.7m - 250mm Ø PVC SDR-28 @ 1.00%
PROP SAN 3.2m - 250mm Ø PVC SDR-28 @ 1.00%
PROP WATER SERVICE 145.0m - 200mm Ø PVC DR-18 TO BE BURIED 2.4m BELOW FINISHED GRADE
PROP WATER SERVICE 133.0m - 200mm Ø PVC DR-18 TO BE BURIED 2.4m BELOW FINISHED GRADE
PROP STM CB01A (600mm x 600mm) TG = 108.30 SW INV = 106.41
PROP STM CBMH02A (1200mm Ø) TG = 108.05 SE INV = WS NE INV = 106.15
PROP STM CBMH03A (1200mm Ø) TG = 108.10 NW INV = 105.99 SE INV = 105.96
PROP STM CBMH04A (1200mm Ø) TG = 108.10 NW INV = 105.86 SE INV = 105.83
PROP STM CBMH05A (1200mm Ø) TG = 108.05 SE INV = 105.63 NW INV = 105.66
PROP STM CBMH06A (1200mm Ø) TG = 108.10 NW INV = 105.77 SE INV = 105.71 NE INV = 105.77
PROP STM CBMH07A (1200mm Ø) TG = 108.25 W INV = 105.51 NE INV = 105.54
PROP STM CBMH08A (1200mm Ø) TG = 108.29 CSW-VCD @ OUT/LOT 1001W Q=522.95L/s, H=2.84m NW INV = 105.41 SW INV = 105.41 E INV = 105.47 NE INV = 105.44
PROP STM CBMH11A (1200mm Ø) TG = 108.25 NW INV = 105.65 S INV = 105.79 NE INV = 105.65
PROP STM CBMH12A (600mm x 600mm) TG = 108.25 W INV = 105.79
PROP STM CBMH13A (1500mm Ø) TG = 108.00 SW INV = 105.66 E INV = 105.72 N INV = 105.72
PROP STM CBMH14A (1500mm Ø) TG = 107.95 SW INV = 105.47 NE INV = 105.53 NW INV = 105.53
PROP STM CBMH15A (1500mm Ø) TG = 107.95 SE INV = 105.27 NE INV = 105.33
PROP STM CBMH16A (600mm x 600mm) TG = 107.95 N INV = 105.61 SW INV = 105.84
PROP STM CBMH17A (1500mm Ø) TG = 107.95 SW INV = 105.56 NE INV = 105.59 NW INV = 105.63
PROP STM CBMH18A (1200mm Ø) TG = 108.20 NW INV = 105.98 SE INV = 105.95
PROP STM CBMH19A (1200mm Ø) TG = 108.25 NW INV = 105.86 NE INV = 105.89
PROP STM CBMH20A (1200mm Ø) TG = 108.25 SW INV = 105.78 NE INV = 105.78
PROP STM CBMH23A (1200mm Ø) TG = 108.25 W INV = 105.96 NE INV = 105.99
PROP STM CB13B (600mm x 600mm) TG = 108.10 SE INV = 105.83
PROP STM LANDSCAPE CB30 TG = 108.20 SW INV = 106.05 SE INV = 106.35
PROP STM LANDSCAPE CB31A TG = 108.20 NW INV = 106.28 SW INV = 105.98
PROP STM LANDSCAPE CB32A TG = 108.20 SW INV = 106.04 SE INV = 106.34
PROP STM LANDSCAPE CB33 TG = 108.20 NW INV = 106.36 S INV = 106.06
PROP STM LANDSCAPE CB18A (1200mm Ø) TG = 108.30 SE INV = 106.79
PROP STM LANDSCAPE CB19A (1200mm Ø) TG = 108.50 NW INV = 106.66 SE INV = 106.63
PROP STM LANDSCAPE CB20A (1200mm Ø) TG = 108.30 SE INV = 106.47 NW INV = 106.50
PROP STM LANDSCAPE CB21A (1200mm Ø) TG = 108.30 SW INV = 106.27 NW INV = 106.33
PROP STM LANDSCAPE CB22A (1200mm Ø) TG = 108.30 SW INV = 106.12 NE INV = 106.15
PROP STM MH08A (1800mm Ø) TG = 108.29 100YR Q=522.95L/s, H=2.84m NW INV = 105.41 SW INV = 105.41 E INV = 105.47 NE INV = 105.44
EXIST MH SW INV. = 103.256 NE INV. = 103.236
EXIST CB SW INV. = 103.256
EXIST 1200mmØ CONCRETE STORM SEWER
EXIST 200mmØ PVC WATER MAIN
EXIST 250mmØ PVC SANITARY SEWER
EXIST 300mmØ PVC WATER MAIN
EXIST 375mmØ CONCRETE STORM SEWER
EXIST 450mmØ CONCRETE STORM SEWER
EXIST 525mmØ CONCRETE STORM SEWER
EXIST 600mmØ CONCRETE STORM SEWER
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 900mmØ CONCRETE STORM SEWER
EXIST 1200mmØ CONCRETE STORM SEWER
EXIST 1500mmØ CONCRETE STORM SEWER
EXIST 1800mmØ CONCRETE STORM SEWER
EXIST 2100mmØ CONCRETE STORM SEWER
EXIST 2400mmØ CONCRETE STORM SEWER
EXIST 3000mmØ CONCRETE STORM SEWER
EXIST 3600mmØ CONCRETE STORM SEWER
EXIST 4200mmØ CONCRETE STORM SEWER
EXIST 4800mmØ CONCRETE STORM SEWER
EXIST 5400mmØ CONCRETE STORM SEWER
EXIST 6000mmØ CONCRETE STORM SEWER
EXIST 6600mmØ CONCRETE STORM SEWER
EXIST

Structure	T/G	HWL (100yr event)	Ponding Depth (100yr event) (m)	Storage (100yr event) (m3)
CBMH02A	108.05	108.25	0.20	11.71
CBMH03A	108.10	108.25	0.15	7.75
CBMH04A	108.10	108.25	0.15	9.59
CB05A	108.10	108.25	0.15	10.46
CBMH06A	108.10	108.25	0.15	9.19
CBMH07A	108.00	108.25	0.25	44.09
CBMH09A	108.05	108.25	0.20	22.70
CBMH13A	108.00	108.25	0.25	41.39
CBMH14A	107.95	108.25	0.30	118.59
CBMH15A	107.95	108.25	0.30	121.28
CB16A	107.95	108.25	0.30	59.49
CBMH17A	107.95	108.25	0.30	53.56
CBMH30A	108.20	108.25	Variable	25.65
CBMH31A	108.20	108.25	Variable	25.73
CBMH32A	108.20	108.25	Variable	26.64
CBMH33A	108.20	108.25	Variable	20.47



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5m 0 10 20m

SCALE: 1:400

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K. L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE
OTTAWA, ON

DRAWING TITLE
STORMWATER MANAGEMENT PLAN

PROJECT NO.
240720

C601A

NORTH 1/2 LOT 2 CONCESSION 1
PART 1 5R-261
PIN 04487-0338

N47°40'55"E 233.50 (P&MEAS)
132.58 (P&MEAS) 100.00 (P1&SET)

BLOCK 256
PIN 04487-3349
PLAN 4M-34109

BLOCK 251
PIN 04487-3344

BLOCK 243
PIN 04487-3336

BLOCK 242
PIN 04487-3335

N48°08'29"E 230.86 (P&MEAS)
130.86 100.00

N48°07'32"E 229.23 (P&MEAS)

N40°44'30"W 72.68 (P&SET)
72.18 (P&MEAS)
56.17

ECA-01A
3.322 | 0.23

STEEL GUARD RAIL
CONCRETE PAD
CONCRETE CURB
SIGN
EDGE OF GRAVEL
BOTTOM OF BANK
TOP OF BANK
SIB

Cutoff Road
Chemin Cutoff Road (DEDICATED BY REGISTERED PLAN 4M-1687)
Promenade Palladium Drive

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

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5m 0 10 20m
SCALE: 1:400

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K. L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

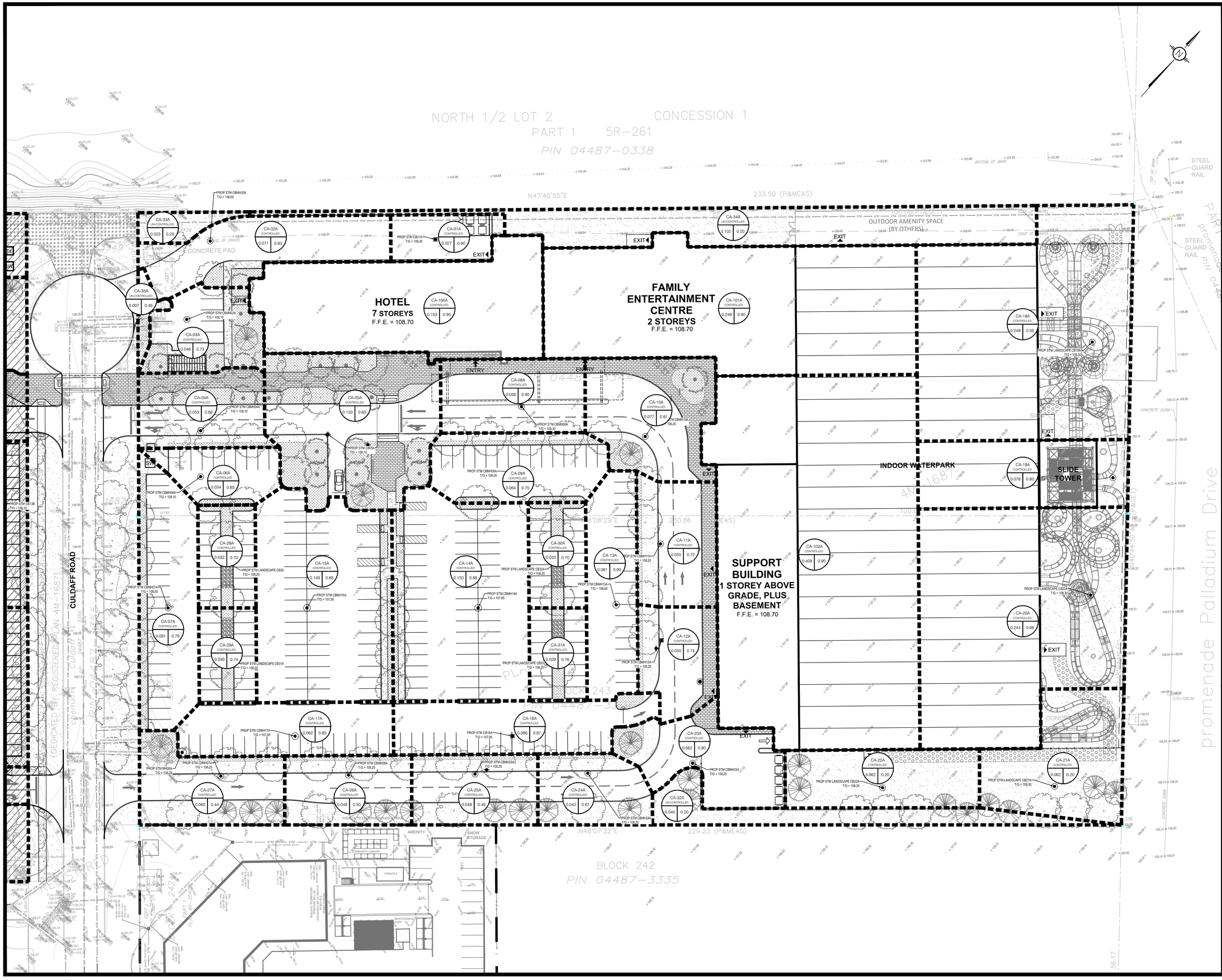
DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE
OTTAWA, ON

DRAWING TITLE
PRE-DEVELOPMENT WATERSHED PLAN

PROJECT NO.
240720

C701A



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5m 0 10 20m

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LICENSED PROFESSIONAL ENGINEER
K.L. PARADIS
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NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
5430 Canotek Road | Ottawa, ON, K1J 9G2
www.lrl.ca | (613) 842-3434

CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

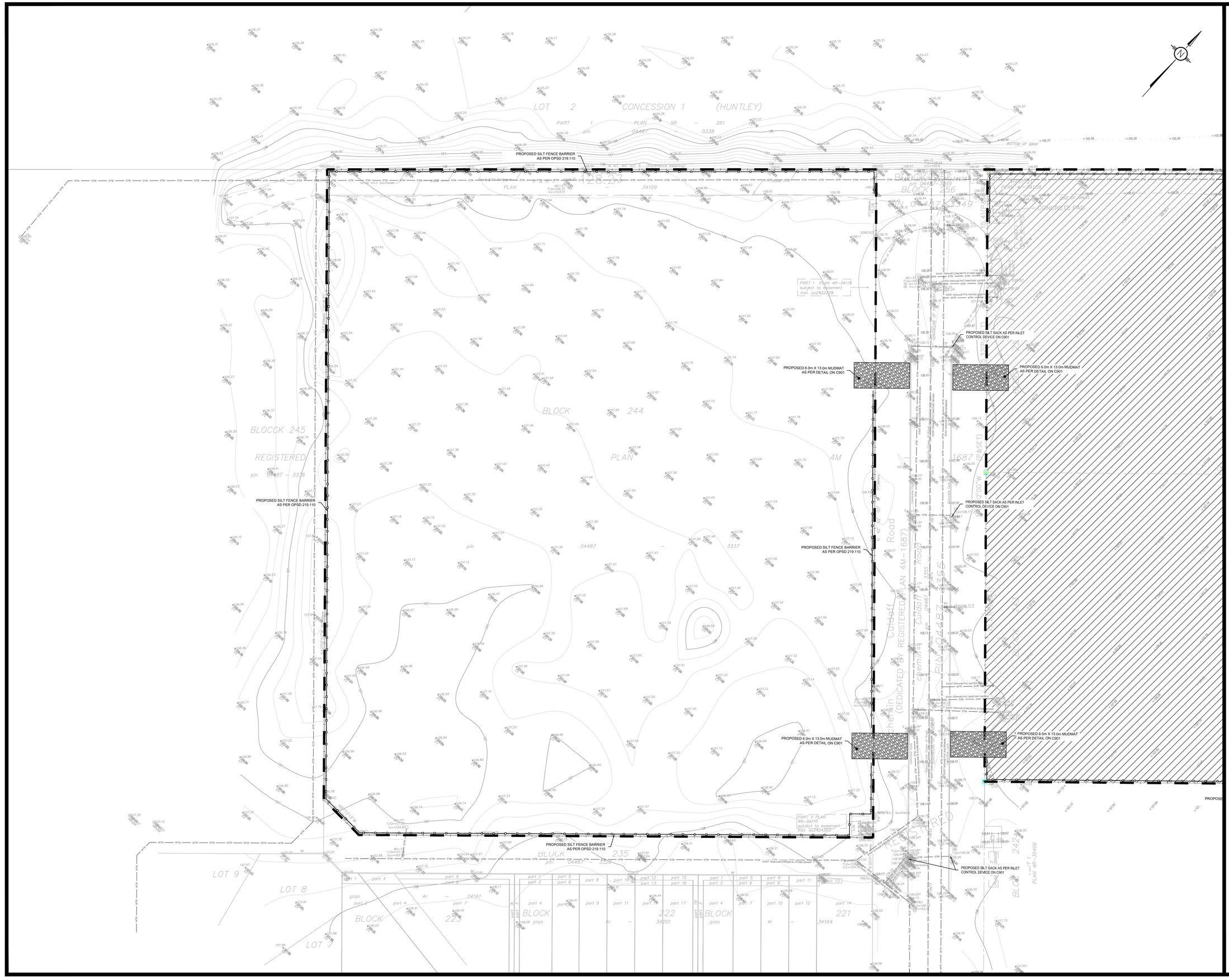
DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

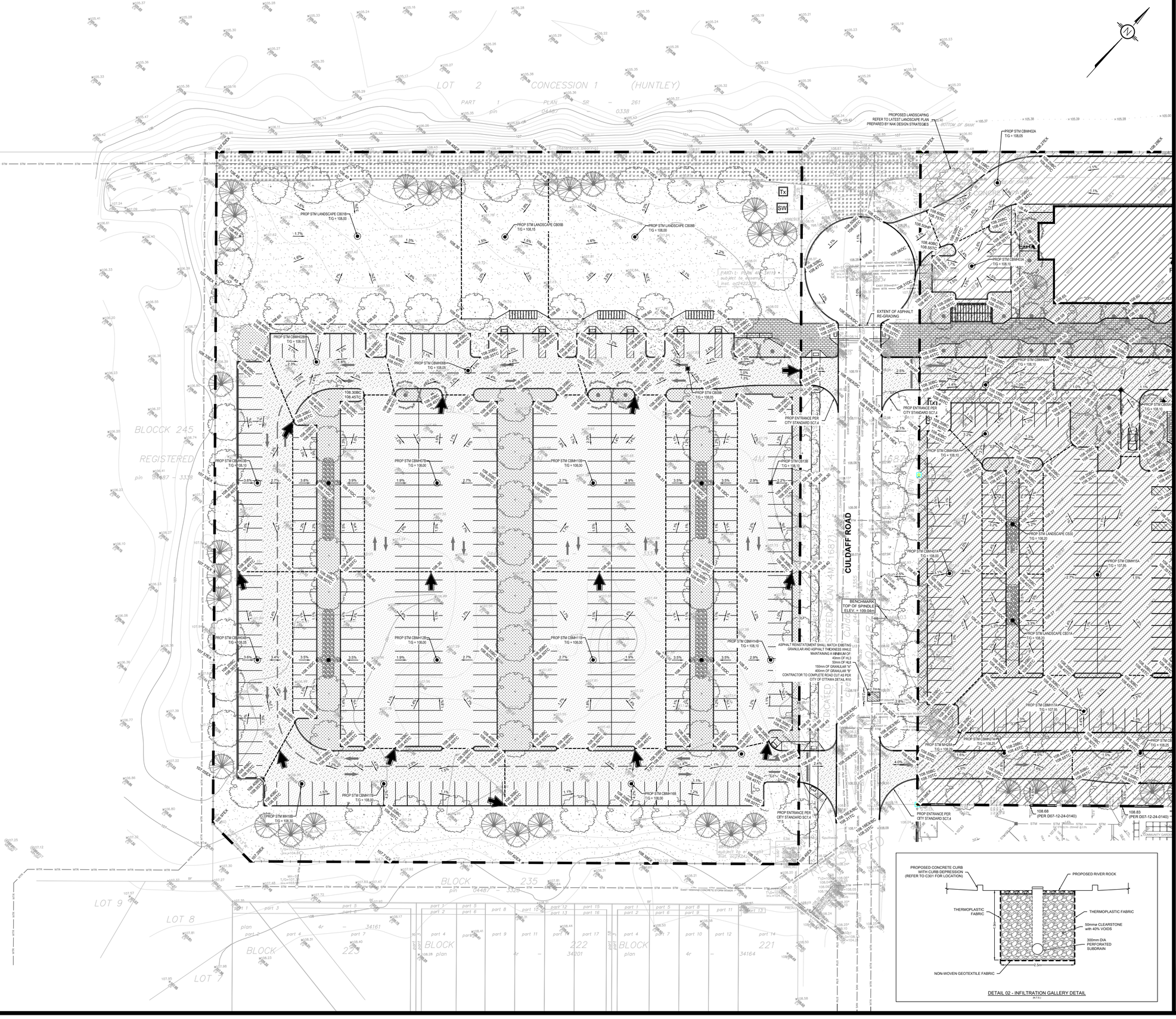
PROJECT
PALLADIUM RESORT DEVELOPMENT
2775 & 2785 PALLADIUM DRIVE
OTTAWA, ON

DRAWING TITLE
POST-DEVELOPMENT WATERSHED PLAN

PROJECT NO.
240720

C702A


PROPOSED SILT FENCE BARRIER AS PER OPSD 219.110
PROPOSED SILT FENCE BARRIER AS PER OPSD 219.110
PROPOSED SILT FENCE BARRIER AS PER OPSD 219.110
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PROPOSED 6.0m X 13.0m MUDMAT AS PER DETAIL ON C901
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PROPOSED 6.0m X 13.0m MUDMAT AS PER DETAIL ON C901
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PROPOSED SILT SACK AS PER INLET CONTROL DEVICE ON C901
PROPOSED SILT SACK AS PER INLET CONTROL DEVICE ON C901
LOT 2 CONCESSION 1 (HUNTLEY)
PART 1 PLAN 5R – 261
pin 04487 – 0338
PLAN 4M – 1687
pin 04487 – 3337
PLAN 4M – 1687
pin 04487 – 3555
PLAN 4M – 1687
pin 04487 – 3556
PLAN 4M – 1687
pin 04487 – 3557
PLAN 4M – 1687
pin 04487 – 3558
PLAN 4M – 1687
pin 04487 – 3559
PLAN 4M – 1687
pin 04487 –



USE AND INTERPRETATION OF DRAWINGS

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION ARE PART OF THE CONTRACT DOCUMENTS AND DESCRIBE USE AND INTENT OF THE DRAWING. THE CONTRACT DOCUMENTS INCLUDE NOT ONLY THE DRAWINGS, BUT ALSO THE OWNER-CONTRACTOR AGREEMENTS, CONDITIONS OF THE CONTRACT, THE SPECIFICATIONS, ADDENDA, AND MODIFICATIONS ISSUED AFTER EXECUTION OF THE CONTRACT. THESE CONTRACT DOCUMENTS ARE COMPLEMENTARY, AND WHAT IS REQUIRED BY ANY ONE SHALL BE BINDING AS IF REQUIRED BY ALL. WORK NOT COMPLETELY DELINEATED HEREON SHALL BE CONSTRUCTED OF THE SAME MATERIALS AND DETAILED SIMILARLY AS WORK SHOWN MORE COMPLETELY ELSEWHERE IN THE CONTRACT DOCUMENTS.

BY USE OF THE DRAWINGS FOR CONSTRUCTION OF THE PROJECT, THE OWNER CONFIRMS THAT HE HAS REVIEWED AND APPROVED THE DRAWINGS. THE CONTRACTOR CONFIRMS THAT HE HAS VISITED THE SITE, FAMILIARIZED HIMSELF WITH THE LOCAL CONDITIONS, VERIFIED FIELD DIMENSIONS AND CORRELATED HIS OBSERVATIONS WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS.

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UNAUTHORIZED CHANGES:

IN THE EVENT THE CLIENT, THE CLIENT'S CONTRACTORS OR SUBCONTRACTORS, OR ANYONE FOR WHOM THE CLIENT IS LEGALLY LIABLE MAKES OR PERMITS TO BE MADE ANY CHANGES TO ANY REPORTS, PLANS, SPECIFICATIONS OR OTHER CONSTRUCTION DOCUMENTS PREPARED BY LRL ASSOCIATES LTD. (LRL) WITHOUT OBTAINING LRL'S PRIOR WRITTEN CONSENT, THE CLIENT SHALL ASSUME FULL RESPONSIBILITY FOR THE RESULTS OF SUCH CHANGES. THEREFORE THE CLIENT AGREES TO WAIVE ANY CLAIM AGAINST LRL AND TO RELEASE LRL FROM ANY LIABILITY ARISING DIRECTLY OR INDIRECTLY FROM SUCH UNAUTHORIZED CHANGES.

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SCALE: 1:400

No.	REVISIONS	BY	DATE
01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
K. L. PARADIS
100045152
2026-07-06
PROVINCE OF ONTARIO

NOT AUTHENTIC UNLESS SIGNED AND DATED

LRL
ENGINEERING | INGÉNIERIE
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CLIENT
PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

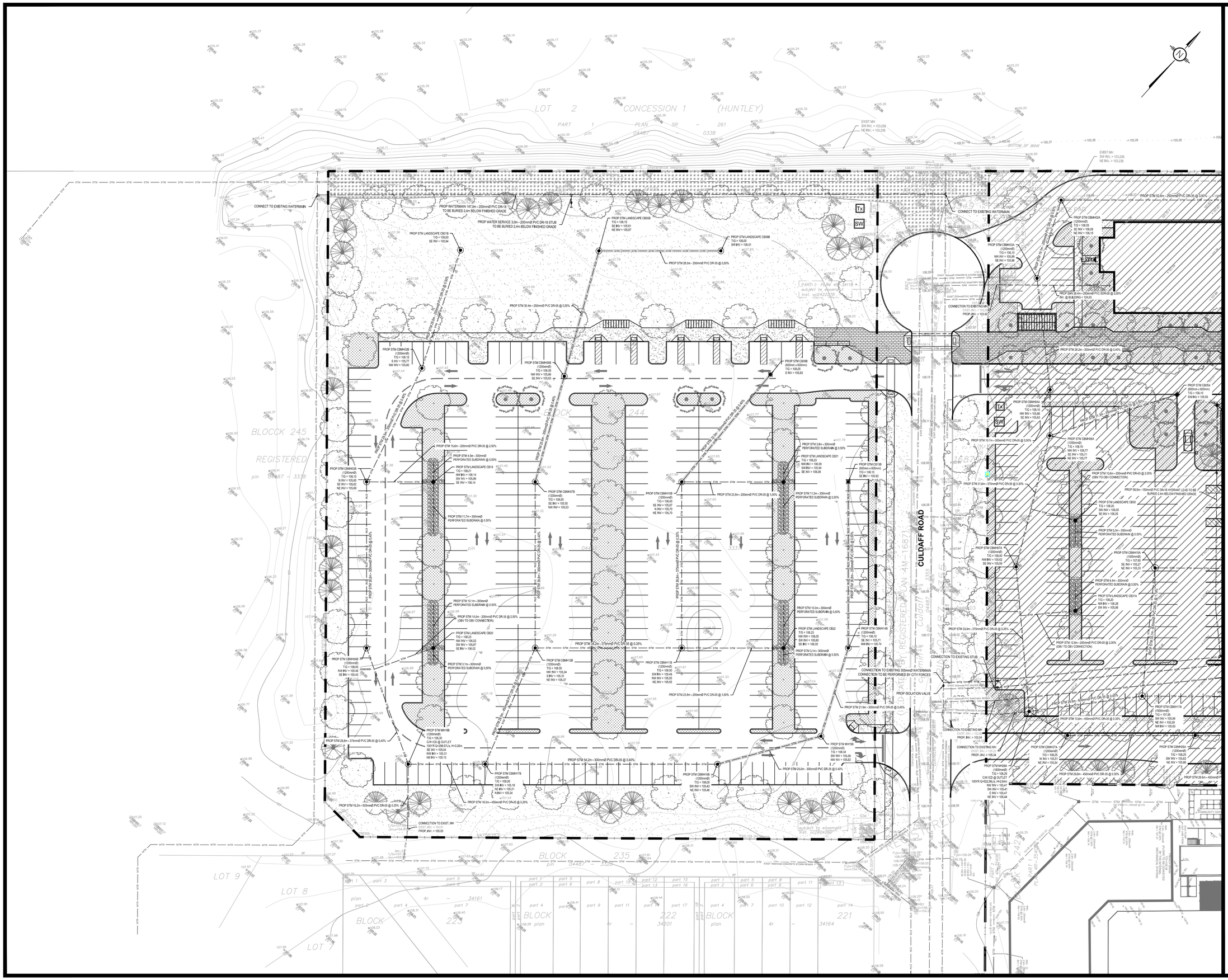
DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT
UNADDRESSED PARCEL, CULDAFF ROAD
OTTAWA, ON

DRAWING TITLE
GRADING AND DRAINAGE PLAN

PROJECT NO.
240720

C301B



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SCALE: 1:400

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01	ISSUED FOR APPROVAL	M.L.	06 JUL 2026

LICENSED PROFESSIONAL ENGINEER
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2026-07-06
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CLIENT
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2962 CARP ROAD, OTTAWA ON

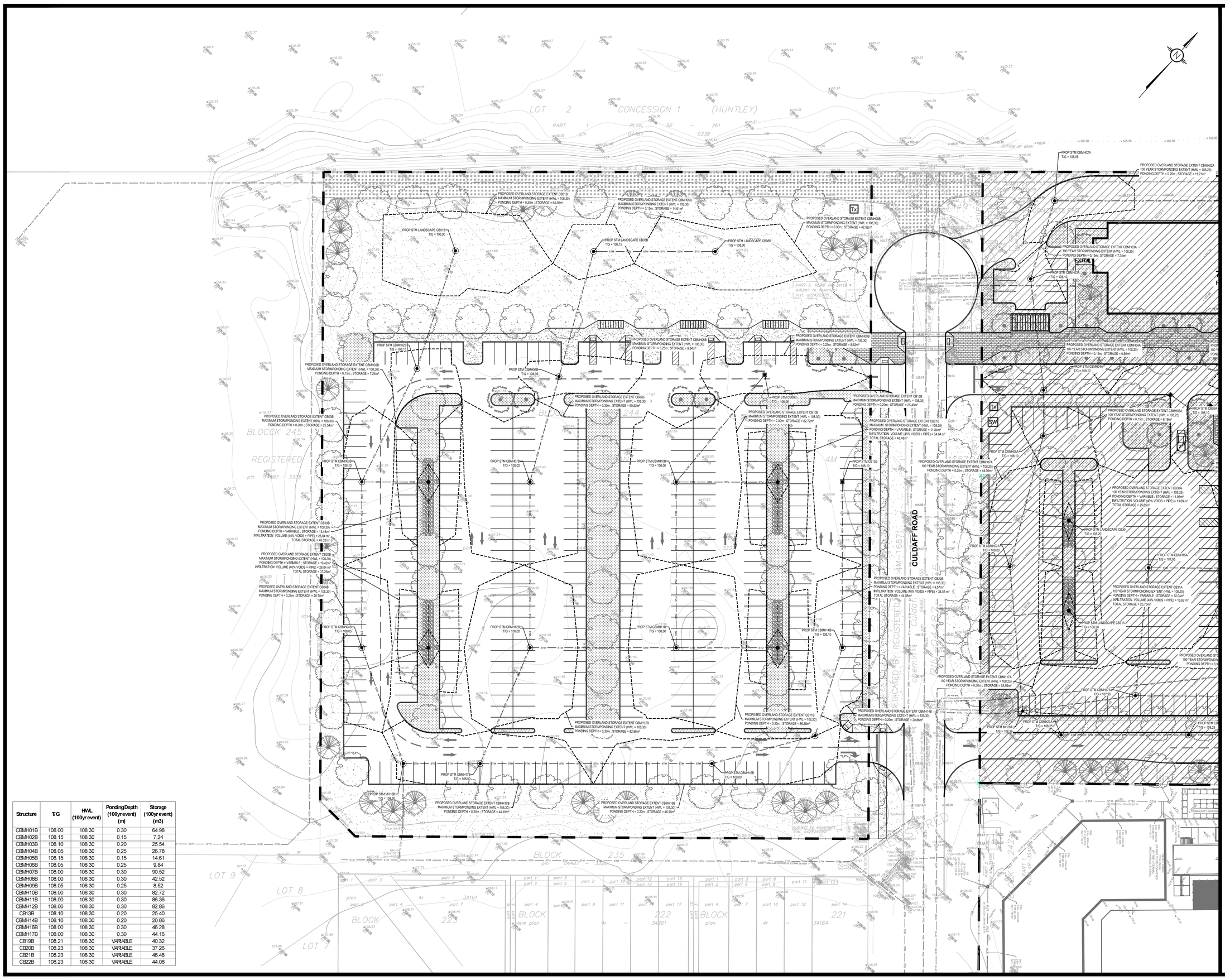
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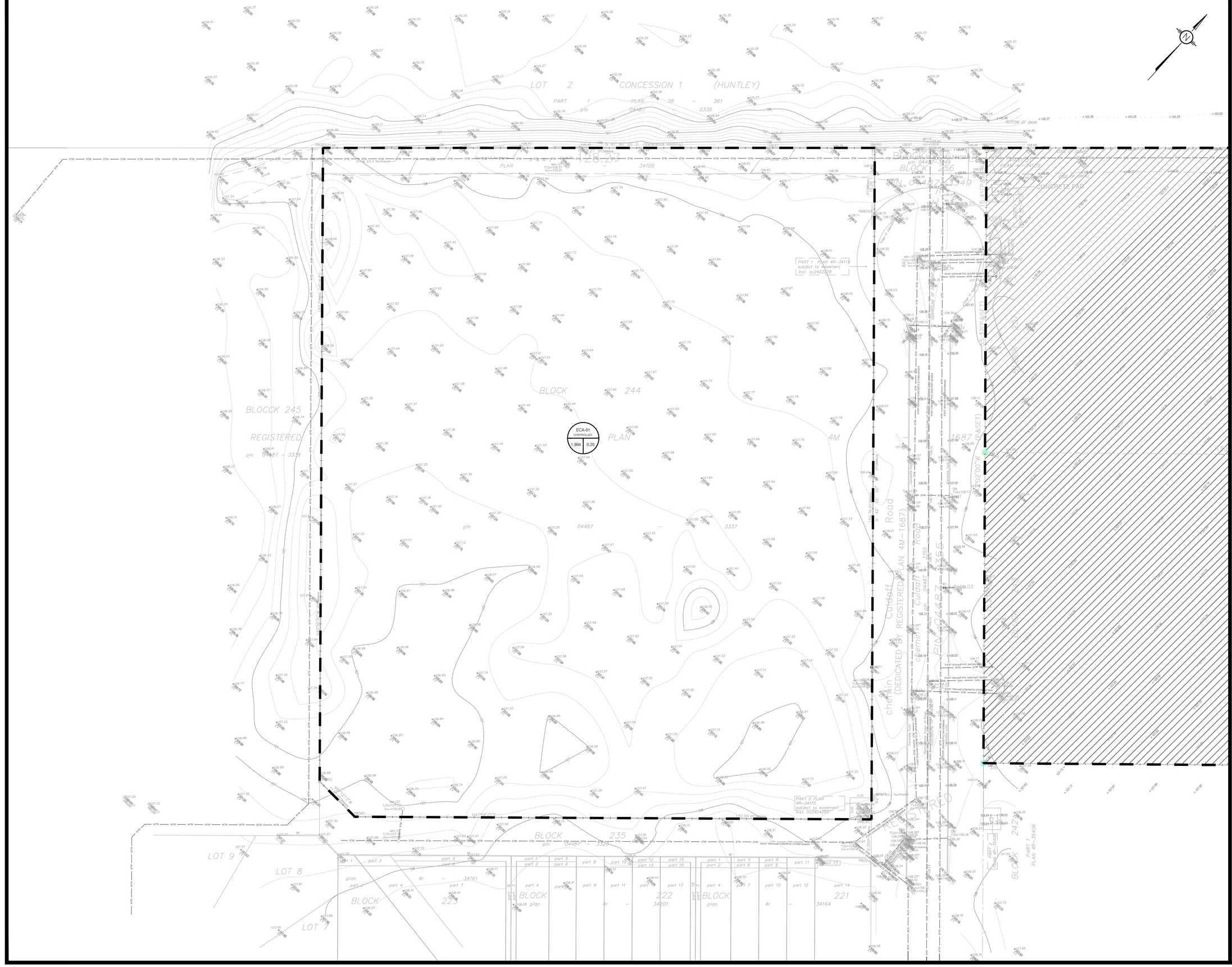
PROJECT
PALLADIUM RESORT DEVELOPMENT
UNADDRESSED PARCEL, CULDAFF ROAD
OTTAWA, ON

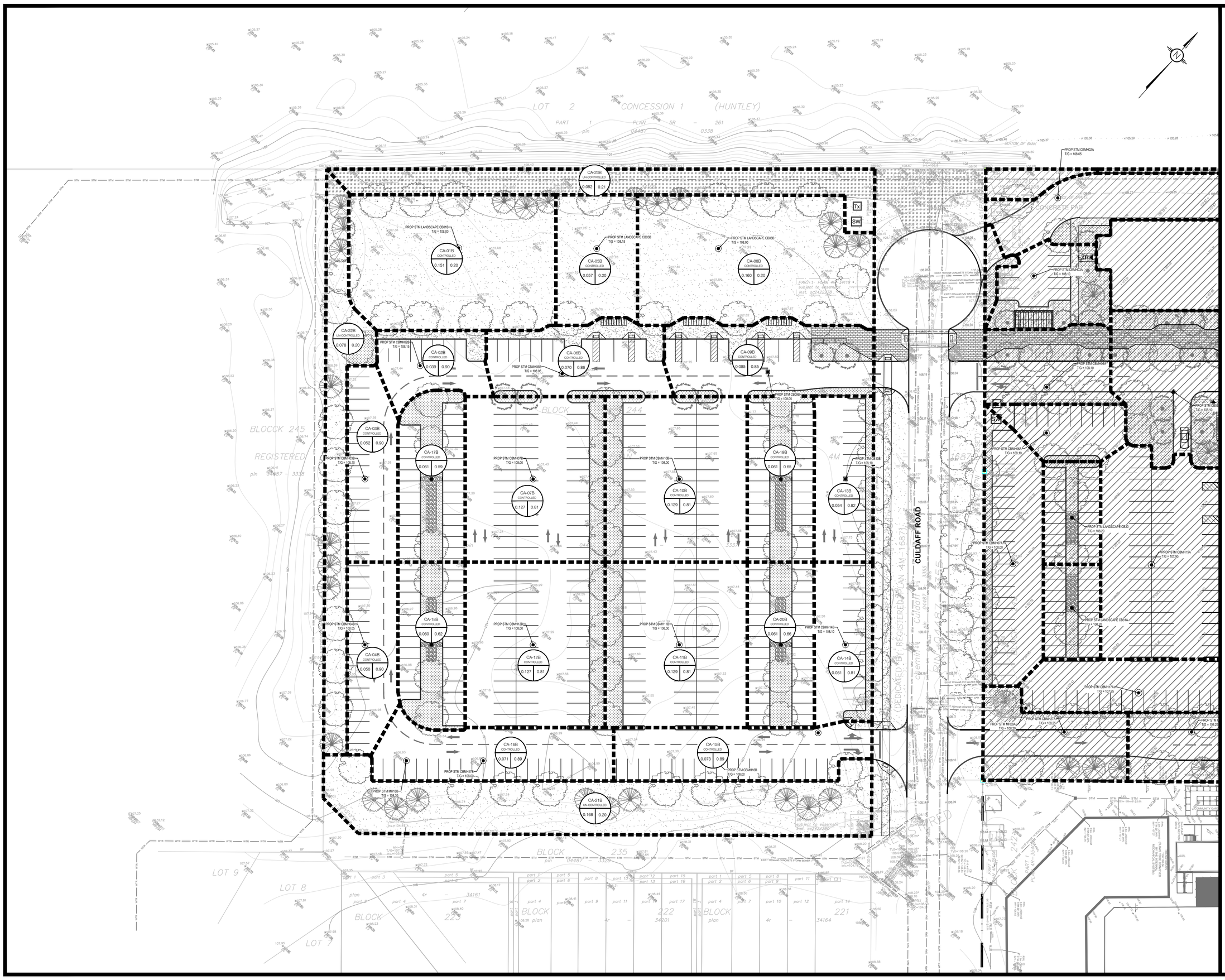
DRAWING TITLE
SERVICING PLAN

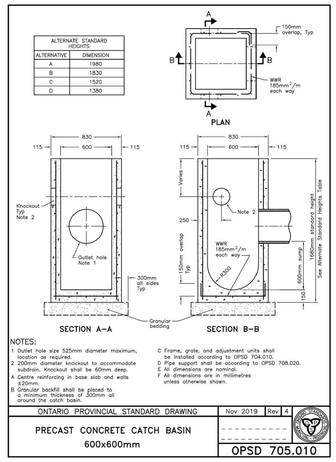
PROJECT NO.
240720

C401B


LOT 2 CONCESSION 1 (HUNTLEY)
PART 1 PLAN 5R – 261
pin 0447 0338
BLOCK 244
BLOCK 245
BLOCK 235
BLOCK 222
BLOCK 221
REGISTERED
pin 04487 – 3338
CULDAFF ROAD
PROPOSED OVERLAND STORAGE EXTENT CB01B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 64.86m³
PROP STM LANDSCAPE CB01B
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CB02B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.15m ; STORAGE = 7.24m³
PROP STM CBMH02B
T/G = 108.15
PROP STM LANDSCAPE CB05B
T/G = 108.15
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.15m ; STORAGE = 14.61m³
PROP STM LANDSCAPE CB08B
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CB08B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 42.52m³
PROP STM CBMH08B
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CB03B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.20m ; STORAGE = 25.54m³
PROP STM CBMH03B
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CB19B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = VARIABLE ; STORAGE = 13.48m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 26.84 m³
TOTAL STORAGE = 40.32m³
PROPOSED OVERLAND STORAGE EXTENT CB20B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = VARIABLE ; STORAGE = 10.42m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 26.84 m³
TOTAL STORAGE = 37.26m³
PROPOSED OVERLAND STORAGE EXTENT CB04B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.25m ; STORAGE = 26.78m³
PROP STM CBMH04B
T/G = 108.05
PROPOSED OVERLAND STORAGE EXTENT CB07B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 90.52m³
PROP STM CBMH07B
T/G = 108.00
PROP STM CBMH10B
T/G = 108.00
PROP STM CBMH12B
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CBMH12B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 82.86m³
PROP STM CBMH11B
T/G = 108.00
PROP STM CBMH17B
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CBMH17B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 44.16m³
PROPOSED OVERLAND STORAGE EXTENT CBMH16B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 46.28m³
PROP STM MH18B
T/G = 108.30
PROPOSED OVERLAND STORAGE EXTENT CBMH09B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.25m ; STORAGE = 8.52m³
PROP STM CBMH09B
T/G = 108.05
PROPOSED OVERLAND STORAGE EXTENT CB15B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 82.72m³
PROP STM CB09B
T/G = 108.05
PROPOSED OVERLAND STORAGE EXTENT CB11B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.30m ; STORAGE = 86.36m³
PROP STM CBMH14B
T/G = 108.10
PROP STM CBMH16B
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CB13B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.20m ; STORAGE = 25.40m³
PROP STM CB13B
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CB21B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = VARIABLE ; STORAGE = 11.84m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 34.64 m³
TOTAL STORAGE = 46.48m³
PROPOSED OVERLAND STORAGE EXTENT CB22B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = VARIABLE ; STORAGE = 9.57m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 34.51 m³
TOTAL STORAGE = 44.08m³
PROPOSED OVERLAND STORAGE EXTENT CBMH14B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.20m ; STORAGE = 25.86m³
PROP STM MH19A
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CBMH07A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.25m ; STORAGE = 44.09m³
PROP STM CBMH07A
T/G = 108.00
PROPOSED OVERLAND STORAGE EXTENT CBMH17A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.30m ; STORAGE = 53.56m³
PROP STM CBMH17A
T/G = 107.95
PROPOSED OVERLAND STORAGE EXTENT CBMH14B
MAXIMUM STORMPONDING EXTENT (HWL = 108.30)
PONDING DEPTH = 0.20m ; STORAGE = 25.86m³
PROP STM MH20A
T/G = 108.05
PROP STM CBMH14A
T/G = 108.25
PROPOSED OVERLAND STORAGE EXTENT CBMH02A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.20m ; STORAGE = 11.71m³
PROP STM CBMH02A
T/G = 108.05
PROPOSED OVERLAND STORAGE EXTENT CBMH03A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.15m ; STORAGE = 7.75m³
PROP STM CBMH03A
T/G = 108.15
PROPOSED OVERLAND STORAGE EXTENT CBMH04A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.15m ; STORAGE = 6.59m³
PROP STM CBMH04A
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CBMH06A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = 0.15m ; STORAGE = 9.19m³
PROP STM CBMH06A
T/G = 108.10
PROP STM CBMH04A
T/G = 108.10
PROPOSED OVERLAND STORAGE EXTENT CB30A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = VARIABLE ; STORAGE = 11.06m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 13.69 m³
TOTAL STORAGE = 25.05m³
PROP STM LANDSCAPE CB30
T/G = 108.20
PROP STM CBMH15A
T/G = 107.95
PROPOSED OVERLAND STORAGE EXTENT CB31A
100 YEAR STORMPONDING EXTENT (HWL = 108.25)
PONDING DEPTH = VARIABLE ; STORAGE = 12.04m³
INFILTRATION VOLUME (40% VOIDS + PIPE) = 13.69 m³
TOTAL STORAGE = 25.73m³
PROP STM LANDSCAPE CB31A
T/G = 108.20
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 200mmØ PVC SANITARY SEWER
EXIST 300mmØ PVC WATER MAIN
EXIST 1800mmØ CONCRETE STORM SEWER
EXIST 1650mmØ CONCRETE STORM SEWER
EXIST 1500mmØ CONCRETE STORM SEWER
EXIST 1350mmØ CONCRETE STORM SEWER
EXIST 1200mmØ CONCRETE STORM SEWER
EXIST 1050mmØ CONCRETE STORM SEWER
EXIST 900mmØ CONCRETE STORM SEWER
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 600mmØ CONCRETE STORM SEWER
EXIST 450mmØ CONCRETE STORM SEWER
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EXIST 150mmØ CONCRETE STORM SEWER
EXIST 100mmØ CONCRETE STORM SEWER
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EXIST 5mmØ CONCRETE STORM SEWER
EXIST 2mmØ CONCRETE STORM SEWER
EXIST 1mmØ CONCRETE STORM SEWER
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EXIST 0.00000000000000000318618382226490455405776079553542358669776137875310966317118774141573179670099493901720699244872747600570882486035353515625mmØ CONCRETE STORM SEWER
EXIST 0.000000000000000001593091911132452277028880397767711793348880689376554831585593870707865898350497469508603496224363738002854412430176767578125mmØ CONCRETE STORM SEWER
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EXIST 0.0000000000000000124460305557222834142881281075602483855381303857543356742624521149052023308263114805359648142528417031473002211059967041015625mmØ CONCRETE STORM SEWER
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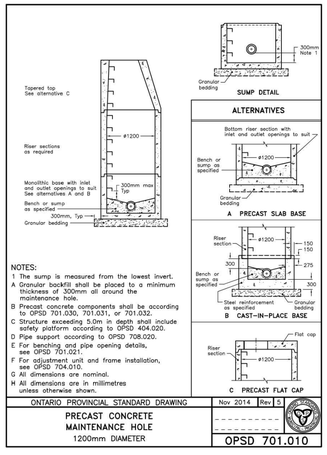

LOT 2 CONCESSION 1 (HUNTLEY)
PART 1 PLAN 5R – 261
pin 04487 – 0338
PLAN 28.27 – 34109
BLOCK 256
PLAN 4M–1687
PART 1 PLAN 4R–34406
PART 1 PLAN 4R–34118 subject to easement Inst. oc2422278
PART 5 PLAN 4R–34110 subject to easement Inst. oc2422278
BLOCK 245
REGISTERED PLAN 4M–1687
pin 04487 – 3339
BLOCK 244
BLOCK 235
pin 04487 – 3328
BLOCK 222
34201
BLOCK 223
34161
BLOCK 221
34164
LOT 9
LOT 8
LOT 7
Culdaff Road
(DEDICATED BY REGISTERED PLAN 4M–1682)
Clementine Crescent
(DEDICATED BY REGISTERED PLAN 4M–1682)
ECA-01
CONTROLLED
1.994
0.20
BOTTOM OF BANK
TOP OF BANK
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 200mmØ PVC SANITARY SEWER
EXIST 250mmØ PVC WATER SERVICE
EXIST 1800mmØ CONCRETE STORM SEWER
EXIST 300mmØ PVC WATER SERVICE
EXIST 200mmØ PVC WATER SERVICE
EXIST 150mmØ PVC WATER SERVICE
EXIST 1050mmØ CONCRETE STORM SEWER
EXIST 1200mmØ CONCRETE STORM SEWER
EXIST 1500mmØ CONCRETE STORM SEWER
EXIST 1350mmØ CONCRETE STORM SEWER
EXIST 1650mmØ CONCRETE STORM SEWER
EXIST 1800mmØ CONCRETE STORM SEWER
EXIST 2100mmØ CONCRETE STORM SEWER
EXIST 2400mmØ CONCRETE STORM SEWER
EXIST 2700mmØ CONCRETE STORM SEWER
EXIST 3000mmØ CONCRETE STORM SEWER
EXIST 3300mmØ CONCRETE STORM SEWER
EXIST 3600mmØ CONCRETE STORM SEWER
EXIST 3900mmØ CONCRETE STORM SEWER
EXIST


CA-23B UN-CONTROLLED 0.082 0.21
CA-01B CONTROLLED 0.151 0.20
CA-05B CONTROLLED 0.057 0.20
CA-08B CONTROLLED 0.160 0.20
CA-22B UN-CONTROLLED 0.078 0.20
CA-02B CONTROLLED 0.039 0.90
CA-06B CONTROLLED 0.070 0.86
CA-09B CONTROLLED 0.085 0.85
CA-03B CONTROLLED 0.052 0.90
CA-17B CONTROLLED 0.061 0.59
CA-07B CONTROLLED 0.127 0.81
CA-10B CONTROLLED 0.129 0.81
CA-19B CONTROLLED 0.061 0.66
CA-13B CONTROLLED 0.054 0.82
CA-18B CONTROLLED 0.060 0.62
CA-04B CONTROLLED 0.050 0.90
CA-12B CONTROLLED 0.127 0.81
CA-11B CONTROLLED 0.129 0.81
CA-20B CONTROLLED 0.061 0.66
CA-14B CONTROLLED 0.051 0.81
CA-16B CONTROLLED 0.071 0.89
CA-15B CONTROLLED 0.073 0.59
CA-21B UN-CONTROLLED 0.168 0.20
PROP STM LANDSCAPE CB01B TG = 108.00
PROP STM LANDSCAPE CB05B TG = 108.15
PROP STM LANDSCAPE CB08B TG = 108.00
PROP STM CBMH02A TG = 108.05
PROP STM CBMH02B TG = 108.15
PROP STM CBMH03B TG = 108.05
PROP STM CBMH04A TG = 108.10
PROP STM CBMH04B TG = 108.10
PROP STM CBMH05B TG = 108.05
PROP STM CBMH06B TG = 108.10
PROP STM CBMH07A TG = 108.05
PROP STM CBMH07B TG = 108.00
PROP STM CBMH08B TG = 108.00
PROP STM CBMH09B TG = 108.15
PROP STM CBMH10B TG = 108.00
PROP STM CBMH11B TG = 108.00
PROP STM CBMH12B TG = 108.00
PROP STM CBMH13B TG = 108.00
PROP STM CBMH14B TG = 108.10
PROP STM CBMH15A TG = 107.95
PROP STM CBMH16B TG = 108.00
PROP STM CBMH17A TG = 107.95
PROP STM CBMH18B TG = 108.10
PROP STM LANDSCAPE CB10 TG = 108.20
PROP STM LANDSCAPE CB11A TG = 108.20
PROP STM MH03A TG = 108.20
PROP STM MH18B TG = 108.10
EXIST 750mmØ CONCRETE STORM SEWER
EXIST 200mmØ PVC SANITARY SEWER
EXIST 300mmØ PVC WATER MAIN
CULDAFF ROAD
BLOCK 245
REGISTERED pin 04487 – 3338
BLOCK 244
BLOCK 235
BLOCK 222
BLOCK 221
LOT 2 CONCESSION 1 (HUNTLEY)
PART 1 PLAN 5R – 261 pin 04487 0338
PART 1, PLAN 4R-14119 subject to easement Inst. OC542278
PART 2 PLAN 4R-14119
PART 1 PLAN 4R-14119
PART 2 PLAN 4R-14119
PART 2 PLAN 4R-14119
PART 3 PLAN 4R-14119
PART 1 PLAN 4R-14119
PART 2



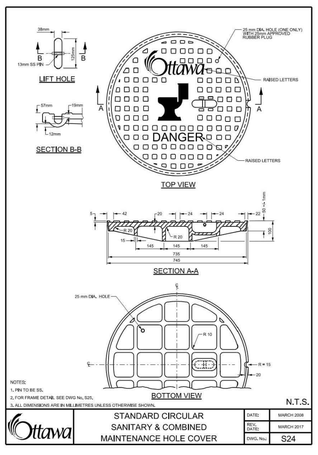
NOTES:
1 Outlet hole size 525mm diameter maximum, location as required.
2 200mm diameter knockout to accommodate subdrain. Knockout shall be 60mm deep.
A Centre reinforcing in base slab and walls ±20mm.
B Granular backfill shall be placed to a minimum thickness of 300mm all around the catch basin.
C Frame, grate, and adjustment units shall be installed according to OPSD 704.010.
D Pipe support shall be according to OPSD 708.020.
E All dimensions are nominal.
F All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2019	Rev 4
PRECAST CONCRETE CATCH BASIN 600x600mm		
		OPSD 705.010



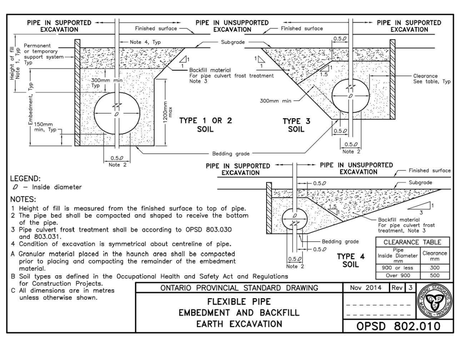
NOTES:
1 The sump is measured from the lowest invert.
A Granular backfill shall be placed to a minimum thickness of 300mm all around the maintenance hole.
B Precast concrete components shall be according to OPSD 701.030, 701.031, or 701.032.
C Structure exceeding 5.0m in depth shall include safety platform according to OPSD 404.020.
D Pipe support according to OPSD 708.020.
E For benching and pipe opening details, see OPSD 701.021.
F For adjustment unit and frame installation, see OPSD 704.010.
G All dimensions are nominal.
H All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 5
PRECAST CONCRETE MAINTENANCE HOLE 1200mm DIAMETER		
		OPSD 701.010



NOTES:
1. PIN TO BE SS.
2. FOR FRAME DETAIL, SEE DWG No. S25.

Ottawa	STANDARD CIRCULAR SANITARY & COMBINED MAINTENANCE HOLE COVER	DATE:	MARCH 2008
		REV. DATE:	MARCH 2017
		DWG. No.:	S24

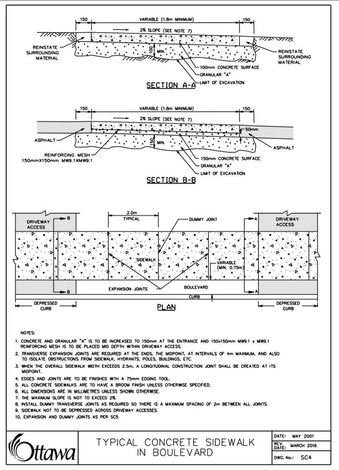


LEGEND:
D = inside diameter

NOTES:
1 Height of fill is measured from the finished surface to top of pipe.
2 The pipe bed shall be compacted and shaped to receive the bottom of the pipe.
3 Pipe culvert frost treatment shall be according to OPSD 803.030 and 803.031.
4 Condition of excavation is symmetrical about centreline of pipe.
A Granular material placed in the haunch area shall be compacted prior to placing and compacting the remainder of the embedment material.
B Soil types as defined in the Occupational Health and Safety Act and Regulations for Construction Projects.
C All dimensions are in metres unless otherwise shown.

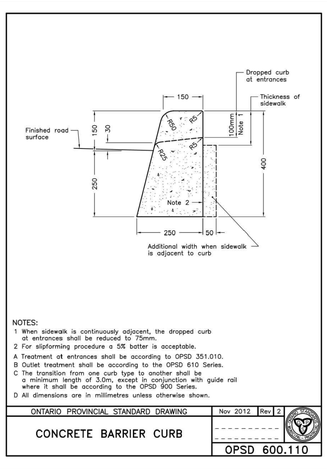
CLEARANCE TABLE	
Pipe Inside Diameter mm	Clearance mm
900 or less	300
Over 900	500

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2014	Rev 3
FLEXIBLE PIPE EMBEDMENT AND BACKFILL EARTH EXCAVATION		
		OPSD 802.010



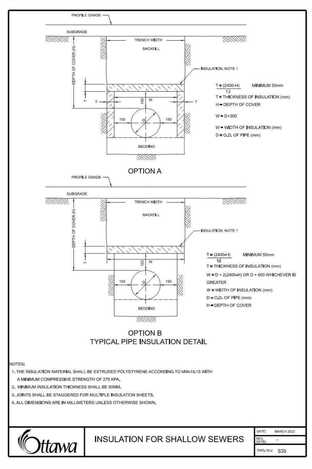
NOTES:
1. CONCRETE AND GRANULAR "A" IS TO BE INCREASED TO 150mm AT THE ENTRANCE AND 150x150mm WWR1.4 x WWR1 REINFORCING MESH IS TO BE PLACED AND DEPTH WITHIN DRIVEWAY ACCESS.
2. TRANSVERSE EXPANSION JOINTS ARE REQUIRED AT THE ENDS, THE MIDPOINT, AT INTERVALS OF 4m MAXIMUM, AND ALSO TO ISOLATE OBSTRUCTIONS FROM SIDEWALK, HYDRANTS, POLES, BUILDINGS, ETC.
3. WHEN THE OVERALL SIDEWALK WIDTH EXCEEDS 2.5m, A LONGITUDINAL CONSTRUCTION JOINT SHALL BE CREATED AT ITS MIDPOINT.
4. EDGES AND JOINTS ARE TO BE FINISHED WITH A 75mm EDGING TOOL.
5. ALL CONCRETE SIDEWALKS ARE TO HAVE A BROOM FINISH UNLESS OTHERWISE SPECIFIED.
6. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
7. THE MAXIMUM SLOPE IS NOT TO EXCEED 2%.
8. INSTALL DUMMY TRANSVERSE JOINTS AS REQUIRED SO THERE IS A MAXIMUM SPACING OF 2m BETWEEN ALL JOINTS.
9. SIDEWALK NOT TO BE DEPRESSED ACROSS DRIVEWAY ACCESSES.
10. EXPANSION AND DUMMY JOINTS AS PER SC9

Ottawa	TYPICAL CONCRETE SIDEWALK IN BOULEVARD	DATE:	MAY 2001
		REV. DATE:	MARCH 2016
		DWG. No.:	SC4



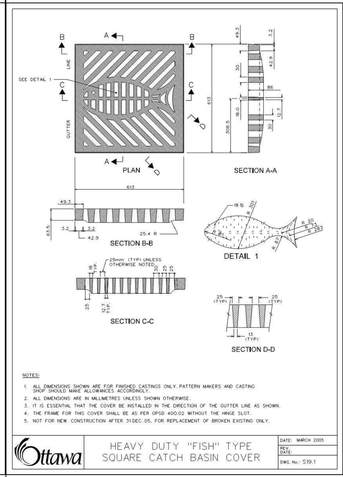
NOTES:
1 When sidewalk is continuously adjacent, the dropped curb at entrances shall be reduced to 75mm.
2 For slipforming procedure a 5% batter is acceptable.
A Treatment at entrances shall be according to OPSD 351.010.
B Outlet treatment shall be according to the OPSD 610 Series.
C The transition from one curb type to another shall be a minimum length of 3.0m, except in conjunction with guide rail where it shall be according to the OPSD 900 Series.
D All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2012	Rev 2
CONCRETE BARRIER CURB		
		OPSD 600.110



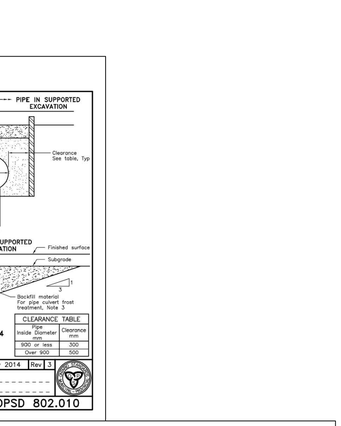
NOTES:
1. THE INSULATION MATERIAL SHALL BE EXTRUDED POLYSTYRENE ACCORDING TO MMA-15/15 WITH A MINIMUM COMPRESSIVE STRENGTH OF 275 KPA.
2. MINIMUM INSULATION THICKNESS SHALL BE 50MM.
3. JOINTS SHALL BE STAGGERED FOR MULTIPLE INSULATION SHEETS.
4. ALL DIMENSIONS ARE IN MILLIMETERS UNLESS OTHERWISE SHOWN.

Ottawa	INSULATION FOR SHALLOW SEWERS	DATE:	MARCH 2007
		REV. DATE:	
		DWG. No.:	S35



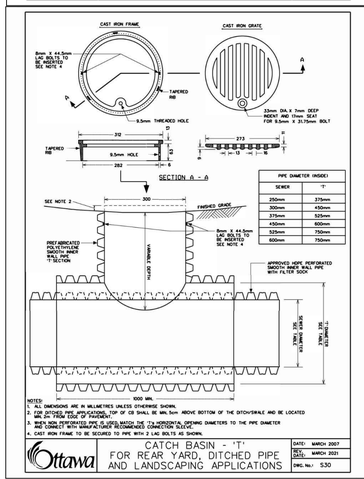
NOTES:
1. ALL DIMENSIONS SHOWN ARE FOR FINISHED CASTINGS ONLY. PATTERN MAKERS AND CASTING SHOP SHOULD MAKE ALLOWANCES ACCORDINGLY.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS SHOWN OTHERWISE.
3. IT IS ESSENTIAL THAT THE COVER BE INSTALLED IN THE DIRECTION OF THE GUTTER LINE AS SHOWN.
4. THE FRAME FOR THIS COVER SHALL BE AS PER OPSD 400.02 WITHOUT THE HINGE SLOT.
5. NOT FOR NEW CONSTRUCTION AFTER 31 DEC. 05, FOR REPLACEMENT OF BROKEN CASTINGS ONLY.

Ottawa	HEAVY DUTY "FISH" TYPE SQUARE CATCH BASIN COVER	DATE:	MARCH 2005
		REV. DATE:	
		DWG. No.:	S19.1



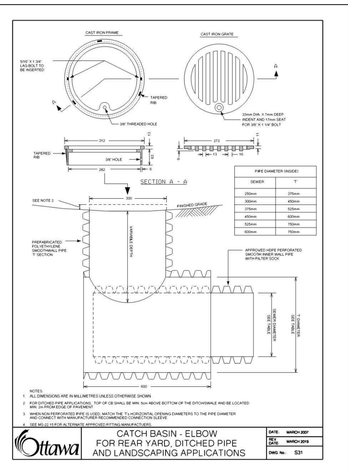
NOTES:
1. PIN TO BE SS.
2. FOR FRAME DETAIL, SEE DWG No. S25.

Ottawa	STANDARD CIRCULAR STORM MAINTENANCE HOLE COVER	DATES:	MARCH 2019
		REV. DATES:	MARCH 2017
		DWG. No.:	S24.1



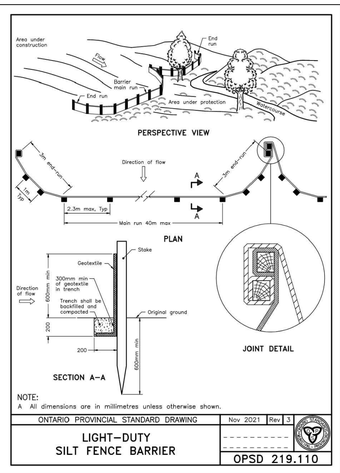
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. FOR DITCHED PIPE APPLICATIONS, TOP OF CB SHALL BE MIN. 5cm ABOVE BOTTOM OF THE DITCH/SWALE AND BE LOCATED AT THE TOP OF SLOPE.
3. WHEN NON-PERFORATED PIPE IS USED, MATCH THE 'T' HORIZONTAL DRIVING DIAMETERS TO THE PIPE DIAMETER AND CONNECT WITH MANUFACTURER RECOMMENDED CONNECTION SLEEVE.
4. CAST IRON FRAME TO BE SECURED TO PIPE WITH 2 LAG BOLTS AS SHOWN.

Ottawa	CATCH BASIN - 'T' FOR REAR YARD, DITCHED PIPE AND LANDSCAPING APPLICATIONS	DATE:	MARCH 2007
		REV. DATE:	MARCH 2021
		DWG. No.:	S30



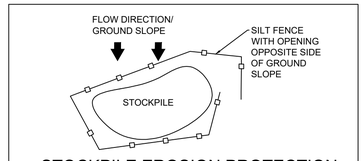
NOTES:
1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE SHOWN.
2. FOR DITCHED PIPE APPLICATIONS, TOP OF CB SHALL BE MIN. 5cm ABOVE BOTTOM OF THE DITCH/SWALE AND BE LOCATED AT THE TOP OF SLOPE.
3. WHEN NON-PERFORATED PIPE IS USED, MATCH THE 'T' HORIZONTAL DRIVING DIAMETERS TO THE PIPE DIAMETER AND CONNECT WITH MANUFACTURER RECOMMENDED CONNECTION SLEEVE.
4. SEE MG.22.1 FOR ALTERNATIVE APPROVED FITTING MANUFACTURER.

Ottawa	CATCH BASIN - ELBOW FOR REAR YARD, DITCHED PIPE AND LANDSCAPING APPLICATIONS	DATE	MARCH 2007
		REV. DATE	MARCH 2019
		DWG No.	S31

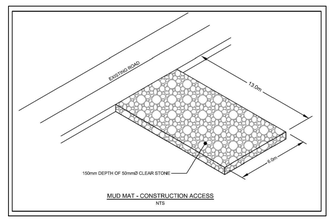


NOTE:
A All dimensions are in millimetres unless otherwise shown.

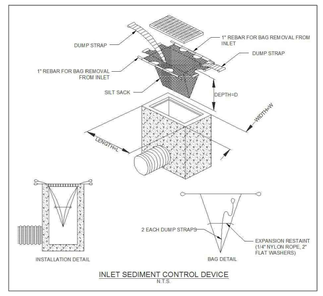
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2021	Rev 3
LIGHT–DUTY SILT FENCE BARRIER		
		OPSD 219.110



STOCKPILE EROSION PROTECTION
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LICENSED PROFESSIONAL ENGINEER
K. L. PARADIS
100045152
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PALLADIUM RESORT DEVELOPMENT LIMITED PARTNERSHIP
2962 CARP ROAD, OTTAWA ON

DESIGNED BY:	DRAWN BY:	APPROVED BY:
M.L.	M.L.	K.P.

PROJECT
PALLADIUM RESORT DEVELOPMENT

DRAWING TITLE
CONSTRUCTION DETAIL PLAN

PROJECT NO.
240720

C901

APPENDIX G

195 Huntmar Drive Design Brief (*Appendices not included*)

david schaeffer engineering ltd

120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

DESIGN BRIEF

FOR

2325483 ONTARIO LTD.
195 HUNTMAR DRIVE

CITY OF OTTAWA

PROJECT NO.: 12-624

JULY 2020
2ND SUBMISSION
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DESIGN BRIEF
FOR
195 HUNTMAR DRIVE

2325483 ONTARIO LTD.

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ACRONYMS

FSR - Functional Servicing Report (FSR)
HGL - Hydraulic Grade Line
ICD - Inlet Control Device
ICI - Institutional, Commercial, Industrial
KWMSS - Kanata West Master Servicing Study
KWPS - Kanata West Pump Station
LID – Low Impact Development
MECP – Ministry of Environment, Conservation, and Parks
MGR - Maple Grove Road
MTO – Ministry of Transportation
MVCA - Mississippi Valley Conservation Authority
ROW – Right-of-Way
SWM – Stormwater Management

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DESIGN BRIEF
FOR
195 HUNTMAR DRIVE
2325483 ONTARIO LTD.
JULY 2020

CITY OF OTTAWA
PROJECT NO.: 12-624

1.0 INTRODUCTION & BACKGROUND

David Schaeffer Engineering Limited (DSEL) has prepared this Design Brief on behalf of 2325483 Ontario Ltd. in support of development within 195 Huntmar Drive.

195 Huntmar Drive is located within the City of Ottawa urban boundary, in the Stittsville ward. As illustrated in ***Figure 1.1***, the subject property is located south of the Highway 417 interchange with Palladium Drive and west of Huntmar Drive. The 195 Huntmar property measures approximately 58 ha.



Figure 1.1: Site Location

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The approved *Functional Servicing Report* (FSR) (DSEL, May 2019) for the property demonstrated that the development of 195 Huntmar Drive was adequately supported by municipal services set out in the *Kanata West Master Servicing Study* (KWMSS) (Stantec/CLC/IBI, June 2006) and as refined during the planning, detailed design, and buildout of the various municipal infrastructure projects within the KWMSS area.

Additionally, the *Summary of Design Refinements to Projects Identified in Kanata West Master Servicing Study* (KWMSS Refinements Report) (DSEL, September 2016), demonstrated that neighbouring properties are not negatively affected by the proposed refinements to the KWMSS within the FSR.

This Design Brief is provided to demonstrate conformance with the design criteria of the City of Ottawa, the FSR, background studies including the KWMSS, and general industry practice. It provides detailed water, sanitary sewer, stormwater management and grading design information to support the development of the western portion of 195 Huntmar Drive. The report should be read in conjunction with the third revision of the Engineering Drawings (DSEL, July 9, 2020).

This Design Brief and detailed engineering submission have been prepared by **David Schaeffer Engineering Ltd**., with stormwater management analysis provided by **J.F. Sabourin and Associates Inc**., watermain analysis provided by **GeoAdvice Engineering Inc.**, and geotechnical analysis provided by **Paterson Group Inc**. Roundabout alignments and layout of the North South Arterial (Robert Grant Avenue) have been incorporated into the design based on design information provided by **Robinson Consultants.** Right-of-way cross sections and traffic calming measures have been incorporated into the design based on direction from **CHG Transportation Inc**.

1.1 Development Concept

The proposed development concept for the entirety of 195 Huntmar Drive can be seen in the Draft Plan of Subdivision and subsequent Draft 4-M plan included in ***Appendix A.*** The predicted populations associated with the development concept are described in ***Table 1.1*** below. The road network includes a combination of local, collector and arterial road segments, ranging in width from 18m to 37.5m. Redline changes have been made between the Draft Plan of Subdivision and the subsequent Draft 4-M plan, including, but not limited to, the addition of one lot near the pond block.

Robert Grant Avenue, the North-South Arterial road, bisects the site. This Design Brief includes the detailed design of the portion of 195 Huntmar Drive west of the Robert Grant Avenue plus includes detailed design information for the northern portion of Robert Grant Avenue, which coincides with the proposed limit of registration. This area may be developed in smaller construction phases, as shown in the Engineering Drawings. Detailed designs of the high school, district park, Stittsville Main Street, and the remainder of Robert Grant Avenue are expected to be completed in the future as part of separate approval processes.

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The cross section for Derreen Avenue (26m ROW) that is shown in the design drawings is generally per cross section 26B in the *Design Guidelines for Neighbourhood Collector Streets* (City of Ottawa, August 2019). The alignments and cross sections for the North-South Arterial (Robert Grant Avenue) and Stittsville Main Street that are shown in the design drawings, including roundabout intersections, are per the Robinson Consultants' design that was prepared for the purpose of the Road Modification Agreement and North South Arterial Front-Ending Agreement (see ***Appendix A)***. The local road cross section is consistent with City Standards.

Note that a temporary road with 7m pavement width and 1.5m shoulders is proposed to run from the interim southern limit of Robert Grant Avenue through Block 239 to allow for a secondary point of access to the subdivision both during construction and for public use post-construction. The design and construction of the southern segment of Robert Grant Avenue will be completed in the future as part of a separate approval process. Similarly, the design and construction of Stittsville Main Street will also be completed in the future as part of a separate approval process. The portion of Stittsville Main Street that is to be constructed as part of the current scope of work is proposed to be a temporary road with 7m pavement width to facilitate travel between Curraglass Walk, Allied Mews, and Kindred Row. For the purpose of servicing design, the engineering drawings have assumed cross sections related to future work based on input from CGH Transportation Inc., so that the underground infrastructure is built with appropriate allowances for future development.

A temporary turnaround has been provided for Derreen Avenue until either the portion of Stittsville Main Street within the study area is fully constructed, or the extension of existing Stittsville Main Street from Maple Grove Road is constructed, as considered in the KWMSS. A temporary turnaround is also provided on Culdaff Road at the limit of the commercial lands, until the lands to the north that are owned by MTO are developed, as considered in the KWMSS.

Please note that a site plan application is expected to be required to support the development of the condo/apartment Block 232. Consistent with the FSR, an allowance of 15% increased population above the predicted 143 units is provided for the purpose of servicing demand calculations, to provide flexibility at the site plan application stage in the development process. Site plan applications are also expected to be required to support the development of the commercial/employment blocks.

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Table 1.1: Development Statistics

Land Use	Total Area (ha)	Projected Residential Units	Residential Population per Unit	Population*
Singles	4.75	157	3.4	534
Towns	6.81	350	2.7	945
Back-to-Back Towns	0.72	70	2.7	189
Condo/Apartments	1.75	143 (+0.15%)	2.7	445
Commercial/Employment	11.26			
High School	7.46			
Stormwater Management (SWM) Pond	4.02			
Roads	14.45			
Parks	6.50			
Open Space/Easements	0.84			
Total	58.56 ha	720		2113

** NOTE: Population projections may differ from population estimates used in background Transportation Studies, Planning Rationale, and other studies. Population projection and residential population per unit values are based on Ministry of Environment and Parks guidelines for servicing demand calculations.*

1.2 Existing Conditions

The pre-development elevations range approximately between 101m – 108m based on available topographic mapping provided by the City of Ottawa.

The subject lands are within Carp River watershed, and are under the jurisdiction of the Mississippi Valley Conservation Authority (MVCA).

Per the FSR (DSEL, May 2019):

- Under pre-development conditions, the western part of the subject lands are believed to naturally drain to Feedmill Creek via the Northwest Swale, as identified in the *Environmental Impact Statement* (Muncaster, May 2018). The Northwest Swale outlets to a series of downstream ditches and culverts associated with the Highway 417/Palladium Drive interchange. An existing 1500mm dia. culvert brings flows under Highway 417 to Feedmill Creek, which then discharges to the Carp River.
- The remaining lands are believed to naturally drain through the East Swale – as identified in the *Environmental Impact Statement* (Muncaster, May 2018) – to the Huntmar Drive roadside ditch which is within the Carp River watershed per the *Carp River Watershed/Subwatershed Study* (Robinson Consultants, December 2004). A culvert under Huntmar Drive, just north of the site, conveys flows from the western roadside ditch to an east-west ditch that eventually drains through a

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culvert under Palladium Drive and flows directly into the Carp River (just north of Palladium Drive).

The approximate pre-development external drainage is depicted in ***Drawing 94,*** and is to be conveyed to its original receiver, the Huntmar Drive roadside ditch.

Per the FSR and Paterson Group recommendations (***Appendix G***), there are no grade raise restrictions for the area being considered as part of this Design Brief. The inferred bedrock surface ranges in elevation from 106.5m at the southern limit of the site, to 100.5m at the northern limit. See ***Appendix G*** for approximate bedrock contours, including inferred bedrock information for servicing extensions beyond the subdivision.

South of the subject lands, there are existing residential developments and planned residential/mixed use developments, including:

- a development proposal at 173 Huntmar Drive, potentially including low rise apartment buildings, townhouses blocks, and commercial buildings with retail on the ground floor and office uses above, complete with surface parking and associated private streets;
- a development proposal at 1981 Maple Grove Road, potentially including single-detached dwellings, townhomes, and back-to-back townhomes; and,
- a development proposal at 1919 Maple Grove Road, potentially including single-detached dwellings, townhomes, back-to-back townhomes, and apartments.

For the purpose of this design, servicing demand associated with land uses from the KWMSS have been carried forward for these properties, where applicable.

West of the subject lands, there is natural vegetated land that is currently zoned Rural Countryside Zone (RU) but is partially identified as a 69.5 ha Developing Community in the City's Official Plan. The area is also known as the Area 3 Developing Community. It is understood that development applications are being initiated for these lands, and as such, the detailed design of sanitary municipal services through the subject lands has been coordinated to ensure that sufficient municipal infrastructure capacity is provided. See ***Appendix D*** for details. Coordination with the landowner has resulted in sanitary servicing demand rates for a 73.25 Ha development area and 4900 residents being carried for these lands.

East of the subject lands, there is an ongoing development application for 130 Huntmar, which includes a segment of Robert Grant Avenue (the North-South Arterial), from Huntmar Drive to Maple Grove Road. This development provides for the opportunity to coordinate servicing strategies in the area, to minimize future construction disruptions in the community. Specifically, by providing an opportunity to support sanitary and watermain infrastructure, the development of the Robert Grant Avenue corridor within the 130 Huntmar site postpones the need for infrastructure to be installed within Huntmar Drive, a key transportation link in the community. Additional details are provided in

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Section 4 and ***Appendix D.*** The City of Ottawa has initiated a Municipal Class Environmental Assessment process for the future widening of Huntmar Drive between Maple Grove and Palladium Drive, so any additional infrastructure works within Huntmar Drive would be expected to be coordinated with that process.

Consistent with the FSR, development of the subject lands requires closure of the Northwest Swale and Eastern Swale that are characterized in the *Environmental Impact Statement* (Muncaster Environmental Planning, May 2018), and require closure of all other on-site watercourses identified in the *Headwaters Report* (Bowfin, May 2018). See the FSR for additional details. Written authorization from MVCA pursuant to Ontario Regulation 153/06, MVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses regulation is required to fill the features (***Section 1.4***).

Consistent with the approved FSR, creation of amphibian habitat within the Feedmill Creek Corridor is proposed to mitigate the impacts of the closures of the features that have a Conservation classification. See ***Appendix F*** for concept plan. This work is to be advanced concurrent with the subdivision works.

1.3 Limit of Development

As part of the development application for the subject lands, the limit of the Feedmill Creek corridor was defined. See the approved FSR for additional details. The 30m setback from Normal High Water Mark is proposed to act as a proxy for the development setback limit, until such time as the extents of the 1:100 year floodplain is determined via topographic survey once the 195 Huntmar development site has been raised in conformance with the *Feedmill Creek Floodplain Mapping Study* (MVCA, January 2017). All fill placement will be at least 31.5m from the centre of the low-flow channel of Feedmill Creek, in order to allow for urban development to proceed in general accordance with the Kanata West Concept Plan, the KWMSS, and Official Plan, etc. The fill is required because under current conditions, the low-lying lands within 195 Huntmar may be subject to flooding under the 1:100 year flood event.

1.4 Permits / Approvals

1.4.1 Existing Permits / Approvals

The existing approvals related to 195 Huntmar Drive are presented in ***Table 1.2*** and additional information is enclosed in ***Appendix B***.

Table 1.2: Existing Permits/Approvals

Agency	Approval Type	Approval Number	Remarks
City of Ottawa	Tree Cut Permit per City of Ottawa Urban Tree Conservation By-law No. 2009-200.	D06-01-18-0035, various dates	Permits for tree removal within the site.

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MVCA	Permit under Ontario Regulation 153/06, MVCA's Development, Interference with Wetlands and Alterations to Shorelines and Watercourses Regulation	W20/042	Placement of fill, grading within the MVCA regulatory limit (15m from spill hazard line), and associated closure of existing drainage features.
MECP	Permit to Take Water	PTTW No. 2572-BJ4SHB	Pumping of groundwater may be required during construction, given groundwater conditions and proposed land uses and on-site/off-site municipal infrastructure.
MTO	Permission to Enter	K-02552	Permits grading activities within MTO lands adjacent to 195 Huntmar.

1.4.2 Required Permits / Approvals

Development of 195 Huntmar Drive is expected to be subject to the following permits and approvals, presented in ***Table 1.3***.

Table 1.3: Required Permits/Approvals

Agency	Potential Permit/Approval Required	Potential Trigger	Remarks
MECP/City of Ottawa	Environmental Compliance Approval	Construction of new stormwater management pond (Pond 7), construction of sanitary & storm sewers.	The City of Ottawa is expected to review all stormwater collection system, stormwater management, and wastewater collection system on behalf of the MECP by transfer of review authority.
MECP/City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration.	Construction of watermains.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.
MTO	Encroachment Permit and Building & Land Use Permit	Stormwater management facility outlet sewer to be constructed on Provincial Lands & general subdivision works in proximity to Highway 417.	MTO has been consulted and reviewed the approved FSR. Additional permits are required to complete underground servicing work. Permits for transportation network modifications (surface works), to be addressed by **CGH Transportation Inc.**

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City of Ottawa	Planning Act Approvals	Servicing infrastructure, grading, utilities, etc.	The City of Ottawa is expected to review the development application including detailed engineering designs, in order to offer approval to construction underground services, grading, and utilities.

1.5 Pre-Consultation

Pre-application consultation was conducted with City of Ottawa, MVCA and MTO staff as part of the Draft Plan of Subdivision process under the *Planning Act.* Discussion included deviations from the KWMSS and the suggested 100-year release rate of 8 L/s/ha for Pond 7. City of Ottawa, MVCA and MTO staff also provided servicing comments that were addressed as part of the approved FSR. A public meeting was held on January 10, 2018 to present a revised development concept and revised servicing strategy to the public and agency stakeholders, as part of *Planning Act* approvals. Notice of approval of the Draft Plan of Subdivision was received December 17, 2019, and is subject to the conditions detailed in ***Appendix A.*** Subsequent to approval of the Draft Plan, over the course of detailed design and preparation of this Design Brief, the project team consulted with various City staff in order to achieve consensus on design matters.

Per the City of Ottawa Transfer of Review Agreement No. TOR-OTT-E-2019-01, MECP pre-consultation is not required, as the City of Ottawa assessed that the proposed works fall under Schedule A of the agreement. As such, the City of Ottawa is expected to review the proposed infrastructure on behalf of MECP as part of issuing Environmental Compliance Approval for the appropriate works.

1.6 Summary of Revisions

The first submission of this Design Brief was completed in December 2019.

City of Ottawa staff provided comments on the first submission, which can be found in ***Appendix A***. Responses and a revised set of engineering drawings were provided to the City of Ottawa in April 2020, along with supplementary design information.

City of Ottawa Staff provided feedback and supplementary comments during May to July 2020. A summary table of all project comments and the project team responses can be found in ***Appendix A***.

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2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following key studies were utilized in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012
  (Sewer Design Guidelines)

  - **Technical Bulletin ISDTB-2014-01, Revisions to Ottawa Design Guidelines - Sewer**
    City of Ottawa, February 5, 2014.
    (ISDTB-2014-01)

  - **Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

  - **Technical Bulletin ISTB-2018-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, March 21, 2018.
    (ISTB-2018-01)

  - **Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, July 8, 2019.
    (ISTB-2019-02)

- **Ottawa Design Guidelines – Water Distribution,**
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

  - **Technical Bulletin ISD-2010-2**
    City of Ottawa, December 15, 2010.
    (*ISDTB-2010-2*)

  - **Technical Bulletin ISDTB-2014-02**
    City of Ottawa, May 27, 2014.
    (*ISDTB-2014-02*)

  - **Technical Bulletin ISTB-2018-02**
    City of Ottawa, March 21, 2018
    (*ISDTB-2018-02*)

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- **Fire Underwriters Survey, 1999.**
  (FUS)

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MECP Design Guidelines)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Kanata West Master Servicing Study,**
  Stantec, CCL, IBI, June 2006.
  (KWMSS)

- **Mississippi-Rideau Source Water Protection Plan,**
  MVCA & RVCA, August 2014.

- **Summary of Design Refinements to Projects Identified in Kanata West Master Servicing Study, 195 Huntmar Drive,**
  David Schaeffer Engineering Ltd, September 2016.
  (KWMSS Refinements Report)

- **Feedmill Creek Floodplain Mapping,**
  MVCA, January 2017.

- **Feedmill Creek Flood Plain Mapping Study, Sections 6.1.1- 8.0,**
  MVCA, January 2017.

- **Building Better and Smarter Suburbs: Strategic Directions and Action Plan,**
  City of Ottawa, February 2015.

- **Feedmill Creek Stormwater Management Criteria Study**
  JFSA & Coldwater Consulting, April 2018.

- **Design Brief for Pond 4, Kanata West, Mattamy Homes**
  JFSA, December 2014.

2.2 Report Integration

Table 2.1 summarizes the studies that have been completed in support of the development application for 195 Huntmar Drive, and their relationship to this Design Brief.

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Table 2.1: Associated Reports for 195 Huntmar Drive and Relationship to Design Brief

Report	Author	Relationship to Design Brief
Planning Rationale	Fotenn, 2016 & Addendum 2018	Delineates the study area and explains the development context. Provides spatial information on land uses, development densities, and projected populations to be serviced.
Environmental Impact Statement	Muncaster Environmental Planning, 2018	Delineates the natural heritage system. Defines fish habitat within watercourses in the subject lands and adjacent to the subject lands, which influences stormwater management recommendations for the development. Considers impacts of on-site and off-site municipal infrastructure and details any additional studies required prior to construction. Assesses the existing ditches that are proposed to be closed due to proposed concept plan and site grading.
Geotechnical Investigations	Paterson Group, 2018 - 2020	Provides grade-raise recommendations, provides bedrock contours, slope recommendations and other subsurface information to inform the detailed design of municipal infrastructure and grading within the subject lands.
Community Transportation Study	Parsons/CGH, July 2016 & Addenda 2018/2019	Identifies required ROW widths and alignments.
KWMSS Refinements Report	DSEL, 2016	Addresses City staff's request for additional details about the proposed project refinements, with a focus on demonstrating that neighboring properties are not negatively affected by the proposed refinements to the KWMSS.
Headwaters Report	Bowfin Environmental Consulting Inc., 2018	Examines existing headwater features within the property, and provides management recommendations (e.g. mitigation, conservation, no management, etc.).
Functional Servicing Report	DSEL, May 2019	Provides sufficient detail to demonstrate that development of the subject lands will be adequately supported by municipal services, as set out in the KWMSS and as refined during the planning, detailed design, and buildout of the various municipal infrastructure projects within the KWMSS area.
Design Brief for Stormwater Management Pond 7 (Pond Design Brief)	JFSA, July 2020	Provides technical support for the detailed design of the proposed pond & outfall, as well as to demonstrate conformance with the overall servicing requirements of the June 2006 Kanata West Master Servicing Study, April 2018 Feedmill Creek Stormwater Management Criteria Study Final Report, SWMP Design Manual, Functional Servicing

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		Report, and generally accepted stormwater management practice.
Stormwater Management Report	JFSA, July 2020	Evaluates the major and minor system flows of the proposed development with respect to the City of Ottawa stormwater management guidelines and to check the adequacy of the proposed pipe sizes to convey the 2-year (5-year on collector and 10-year on arterial roads) and the 100-year storm flows from within the development and from external areas.
Erosion and In-Stream Work Analysis	Coldwater Consulting Inc., March 2019	Provides design recommendations for the Feedmill Creek corridor related to Pond 7 outflows, to inform the City of Ottawa's subwatershed-level project for rehabilitation works in Feedmill Creek.

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3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies adjacent to the existing City of Ottawa 3W pressure zone as shown in the excerpt from the City of Ottawa Water Distribution Mapping in ***Appendix B***.

An existing 600mm diameter trunk watermain extends on Huntmar Drive from north of Highway 417 to Cyclone Taylor Boulevard.

Existing 300mm diameter trunk watermains are located along Palladium Drive, within the Palladium Autopark, along Maple Grove Road and along the portion of Huntmar Drive north of the subject lands. One public 300mm diameter watermain stub is provided in close proximity to the subject lands along Palladium Drive and another private 300mm diameter watermain stub exists in the Palladium Autopark. A 400mm diameter watermain stub is provided on Huntmar Drive at the intersection with Maple Grove Road, and a 300mm diameter watermain is provided on Maple Grove Road east of Huntmar Drive.

The 3W pressure zone network is operational within the existing residential neighbourhood (Mattamy Fairwinds) south of the subject lands, and 200mm/150mm diameter watermain stubs are available for connection at the limit of the subject lands. The existing watermains in the area are shown in ***Drawings 6-19***.

3.2 Water Supply Servicing Design

The ultimate alignment of the trunk watermain network was analyzed as part of the FSR. All of the watermains listed in the KWMSS were considered in the analysis, except for the extension of the 600mm diameter watermain on Huntmar Drive, which was considered to be a 400mm watermain based on input from City of Ottawa & Stantec Consulting. See the FSR for additional details.

The hydraulic analysis within the FSR was completed using boundary conditions provided by the City under the 2031 planning scenario, considering all demands from future developments adjacent to the subject property in the KWMSS area. The FSR concluded that the site was serviceable, and able to meet all water supply and fire flow demands in these ultimate conditions

As part of this Design Brief, the watermain network for the subject property has been analyzed to demonstrate serviceability in the interim condition, prior to full buildout in the KWMSS area. Details are provided in the *Hydraulic Capacity and Modeling Analysis – 195 Huntmar Drive Subdivision* (GeoAdvice Report) (GeoAdvice, Dec 2019), included in ***Appendix C***. The watermain network has been sized to meet the greater of maximum hour and maximum day plus fire flow demands. ***Table 3.1*** summarizes the Water Supply Guidelines employed in the preparation of the watermain network hydraulic modelling and design (***Appendix C***).

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Table 3.1: Water Supply Design Criteria

Design Parameter	Value
Residential – Single Family	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential Average Daily Demand	280 L/d/p
Residential – Maximum Daily Demand	2.5 x Average Daily Demand
Residential – Maximum Hourly Demand	2.2 x Maximum Daily Demand
Residential – Minimum Hourly Demand	0.5 x Average Daily Demand
Commercial/Institutional/District Park Average Daily Demand	50,000 L/gross ha/day
Parkette Average Daily Demand	28,000 L/gross ha/day
Commercial/Institutional/Park Maximum Daily Demand	1.5 x Average Daily Demand
Commercial/Institutional/Park Maximum Hour Demand	1.8 x Maximum Daily Demand
Commercial/Institutional/Park Minimum Hourly Demand	0.5 x Average Daily Demand
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure must not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa

Notes:

- *Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010), Table 4.1 – Per Unit Populations and Table 4.2 – Consumption Rates for Subdivisions of 501 to 3,000 Persons.*
- *No Outdoor Water Demand considered for residential uses.*
- *Park water demands assumed based on classification and potential for community facilities, etc.*
- *MTO Lands demand rate (9,120 L/ha/d) and fire flow demand (216.67 L/s) are consistent with the rates used in the Kanata West MSS.*

A summary of water demands for the development are presented in ***Table 3.2***. Note that a small buffer (10%) was applied to the population estimates and ICI areas to account for any minor changes that may occur prior to the full buildout of the development. Consistent with the assumption in ***Section 1.2***, a 15% buffer was applied to the apartment block.

Fire flow calculations for single detached dwellings, townhouses and back-to-back townhouses are detailed in the GeoAdvice Report found in ***Appendix C***. The fire flows are calculated in accordance with the Fire Underwriters Survey's Water Supply for Public Fire Protection Guideline (1999) as amended by ISTB-2014-02 & ISTB-2018-02. Calculations for the majority of single detached dwellings and traditional townhomes reached the City of Ottawa's cap of 10,000 L/min (167 L/s) as outlined in ISDTB-2014-02. Calculations for specific locations where the back-unit separation is below 10 m, thus not meeting the requirement of the 10,000 L/min cap, are also included in the GeoAdvice Report. The calculated fire flow demand of 217 L/ has been applied to detached dwellings

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at locations not meeting the 10,000 L/min cap requirements. See ***Appendix C*** for details on FUS requirements and hydrant coverage. Fire walls are proposed within the back-to-back townhouses in order to limit the required fire flow to 233 L/s.

Table 3.2: Summary of Water Demands

Dwelling Type	Number of Units	**Population**		**Allocated Demand**	**Avg Day** (L/s)	**Max Day** 2.5 x Avg Day (L/s)	**Peak Hour** 2.2 x Max Day (L/s)	**Min Hour** 0.5 x Avg Day (L/s)
		Persons per unit	Population per dwelling type					
Single Detached	157	3.4	588	280 L/c/d	1.91	4.76	10.48	0.95
Townhomes	350	2.7	1040	280 L/c/d	3.37	8.43	18.54	1.69
Back-to-Back Townhomes	70	2.7	208	280 L/c/d	0.67	1.69	3.71	0.34
Apartments	143		445	280 L/c/d	1.44	3.61	7.93	0.72
Land Use Type	Area			**Allocated Demand**	**Avg Day** (L/s)	**Max Day** 1.5 x Avg Day (L/s)	**Peak Hour** 1.8 x Max Day (L/s)	**Min Hour** 0.5 x Avg Day (L/s)
Commercial/Employment	11.26 ha			50,000 L/ha/d	7.17	10.75	19.35	3.58
High School	7.46 ha			50,000 L/ha/d	4.75	7.12	12.82	2.37
Park	5.85 ha			50,000 L/ha/d	3.72	5.59	10.05	1.86
Parkette	0.53 ha			28,000 L/ha/d	0.19	0.28	0.51	0.09
MTO Lands	16.50 ha			9,120 L/ha/d	1.74	2.61	4.70	0.87

The fire flow demands for the apartment, commercial, employment, school and park blocks were recommended within the GeoAdvice report based on similar information from recent projects within the City of Ottawa and are consistent with the approved FSR. A fire flow demand of 217 L/s was assumed for the MTO Lands to the north of the subject property, consistent with the KWMSS.

Boundary conditions based on the 2019 model representing interim conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the proposed connections to the site. Boundary conditions for multiple scenarios were provided as the timing of the watermains included in the KWMSS is uncertain. Specifically, the timing of the extensions of the trunk watermains on Huntmar Drive and on the Stittsville Main Street major collector (from the site to Maple Grove Road) are expected to be determined in the future based on phased development demands.

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Upon analysis, it was determined that the current development limits for 195 Huntmar could be adequately serviced in the interim conditions prior to full buildout, using the following connections:

- Existing 300mm stub near the intersection of Huntmar Drive and Palladium Drive;
- Existing 200mm stub within Maestro Avenue (within Mattamy Fairwinds);
- Existing 150mm stub within Cayman Road (within Mattamy Fairwinds); and,
- Existing Maple Grove Road trunk watermain.

The boundary conditions provided by the City for use in the hydraulic analysis are summarized below in ***Table 3.3*** and the associated ***Figure 3.1***. Details of all the boundary conditions provided by the City can be found in ***Appendix C***.

Table 3.3: Interim Boundary Conditions

Condition	Connection 1 HGL (Palladium Drive and Huntmar Drive)	Connection 2 HGL (Maestro Ave)	Connection 3 HGL (Huntmar and Maple Grove Road)
	(m)	(m)	(m)
Max HGL (max. pressure)	161.2	160.8	160.8
Peak Hour (min. pressure)	155.8	155.8	156.2
Max Day + Fire (167 L/s)	151.2	149.5	155.6
Max Day + Fire (283 L/s)	141.9	137.4	153.0



Figure 3.1: Interim Boundary Conditions

The watermain network has been sized based on the interim boundary conditions to demonstrate serviceability prior to full buildout within the KWMSS area ,and consists of

watermains ranging in diameter from 150mm to 400mm. The proposed network includes watermain service for all commercial, employment, and condo blocks. The proposed network is consistent with the ultimate layout shown in the FSR, with exception of the proposed dead-end within the cul-de-sac in Unity Place, and the upsizing of the 150mm diameter to 200mm diameter within Allied Mews.

Per correspondence with GeoAdvice in ***Appendix C***, given that the timing for the future developments to the west and south of the subject property (***Section 1.2***) is unknown, the watermain within Stittsville Main Street has been upsized from the 200mm diameter considered in the GeoAdvice Report to 250mm diameter in the proposed design. This was done as a precaution, in order to not create any future bottlenecks in water supply for these future developments, given the lack of modelling information available for external lands. Per the analysis in Appendix C, the proposed network is sufficiently sized to support future development of the Area 3 Developing Community.

Similarly, additional connections to the existing development to the south on Cayman Road (Mattamy Fairwinds) and to the future MTO lands (via pond block) are shown in the design, but not included in the watermain model. Per correspondence in ***Appendix C***, the additional connections are expected to have a negligible impact on the water supply in the area and will increase redundancy in the overall network.

Consistent with the approved FSR, the proposed alignment of the trunk watermain infrastructure conforms the spirit of the KWMSS, but differs slightly due to changes in the proposed road network. Under the proposed concept plan, total demands of 23.22 L/s are to be accommodated for the subject lands – 24.96 L/s when including the additional demands from the MTO lands. This represents a slight increase from the estimated demands within the FSR. See ***Table 3.4*** below for details. The KWMSS fire flow allowance for the subject lands was 13,000 L/min, whereas now up to 17,000 L/min may need to be accommodated, consistent with the approved FSR. The increased water and fire flow demand can be adequately serviced by the proposed water main layout as indicated by water modeling results (***Section 3.2.1***).

Table 3.4: Comparison of Development Demands

Water Demand for 195 Huntmar Drive within KWMSS (L/s)	Water Demand for 195 Huntmar Drive within FSR (L/s)	Water Demand for 195 Huntmar Drive within Current Design (L/s)
5.3	20.54	23.22

3.2.1 Watermain Modelling

A hydraulic analysis has been completed for the development within the GeoAdvice Report. The analysis, including the watermain network configuration and sizing, is provided in ***Appendix C***. As part of the analysis, phasing of the subject property was considered to demonstrate serviceability from initial development to full buildout of the

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195 Huntmar development. The development is to advance in phases according to the land owners preferred timing. As such, the phases considered in the GeoAdvice Report are subject to change.

Modelling was carried out for minimum hour, peak hour and maximum day plus fire flow. Modelling results shown in ***Table 3.5*** indicate that the development can be adequately serviced for minimum hour and peak hour criteria.

Table 3.5: Summary of Available Service Pressures

Pressure Zone	Minimum Hour Demand Maximum Pressure (kPa)	Peak Hour Demand Minimum Pressure (kPa)
3W	531	459

Per the GeoAdvice Report, the pressure reducing valve recommendations from the ultimate condition analysis within the FSR are to be followed. As such, PRVs are to be included in many homes throughout the subdivision, specifically where the City standard PRV location would be below an elevation of 108m. Further details can be found in ***Appendix C*** and the FSR. PRVs are labelled in ***Drawings 6 to 19.***

Per ***Table 3.1,*** the minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire. A summary of available fire flows under full buildout of the proposed development is shown below in ***Table 3.6***. Further details can be found in ***Appendix C****.*

Table 3.6: Summary of Available Fire Flows

Land Use	Estimated Required Fire Flow (L/s)	Minimum Available Fire Flow (L/s)	No. of Nodes where residual pressure is less than 140 kPa
Singles / Townhomes / Parkette	167	186 (J-40)	0
MTO Lands / Non-Capped Single	217	236 (J-11)	0
Back-to-Back Townhomes	233	268 (J-43)	0
Commercial / High School / District Park	250	264 (J-10)	0
Apartments / Condos	283	327 (J-27)	0

The dead-end watermain on Unity Place is not included in the results summarized in ***Table 3.6****,* as it was further analyzed per the dead-end watermain protocol detailed within ISTB-2018-02. Hydrant spacing was analyzed in the area to confirm the appropriate number of hydrants to provide the required fire flow of 167 L/s. As detailed in the GeoAdvice Report enclosed in ***Appendix C***, 3 hydrants can provide sufficient fire flow to the dead-end watermain on Unity Place.

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3.2.2 Watermain Phasing

The City of Ottawa has initiated a Municipal Class Environmental Assessment for the widening of Huntmar Drive. Huntmar Drive currently acts as a main transportation link within the community, and City staff have indicated a desire to eliminate or delay any work within the corridor in order to better coordinate underground infrastructure work with future road work. As such, a separate phasing analysis for watermains has been completed under separate cover. The phasing analysis considers the first construction phase for 195 Huntmar being serviced by only the Cayman, Maestro, and Palladium Drive connections. At the time of development of future phases, connection to the proposed 400mm watermain within Robert Grant Avenue east of the site (within 130 Huntmar) will be pursued as a way to further postpone construction within the Huntmar Drive ROW, if required.

3.3 Water Servicing Conclusions

The City's 3W pressurized water supply network will be expanded to meet the water demands of the proposed development. The proposed water supply design is expected to conform to all relevant City and MECP Guidelines and Policies. Detailed analysis of the network indicates that a network of 150mm to 400mm diameter watermains satisfy these demands for the interim condition - prior to full buildout of the surrounding KWMSS area - with connections to existing watermains on Palladium Drive, Huntmar Drive, Cayman Road, and Maestro Avenue. Serviceability of the development of the ultimate condition has been demonstrated as part of the FSR.

The trunk watermain network has shifted from the alignments proposed in the KWMSS, in order to follow the proposed arterial and collector road network. The hydraulic analysis completed for the proposed watermain network concludes that all required domestic and fire flows can be met throughout the development. Pressure reducing valves are recommended throughout parts of the subdivision.

Anticipated fire flow requirements can be met throughout the development lands according to City Guidelines and ISTB-2018-02. Firewalls are required to limit fire flow demands for the back-to-back products.

Timing of infrastructure, specifically the watermain extension on Huntmar Drive, is to be further coordinated with City staff based on opportunities to connect to the proposed 400mm diameter watermain within the 130 Huntmar site. A separate phasing analysis is being undertaken to demonstrate serviceability of the first phase of construction based on connections to Palladium Drive and Fairwinds (Maestro and Cayman).

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4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject lands are within the Kanata West Pump Station (KWPS) catchment area, as originally defined in the KWMSS.

An existing sanitary trunk sewer runs along Maple Grove Road (MGR) from John Woods Street to the west side of Poole Creek, and conveys flows to a recently constructed 1200mm sanitary sewer that continues along Maple Grove Road and outlets into the KWPS.

The City of Ottawa has indicated that the KWPS is designed to serve a drainage area larger than that contemplated in the KWMSS. The drainage area for the KWPS provided by the City is shown in ***Figure 4.1.*** Per ECA No. 7443-9Y8Q8R (***Appendix D***), the design of the KWPS will accommodate 528 L/s firm capacity upon completion in 2018, and 1250 L/s in 2031 ultimate conditions.

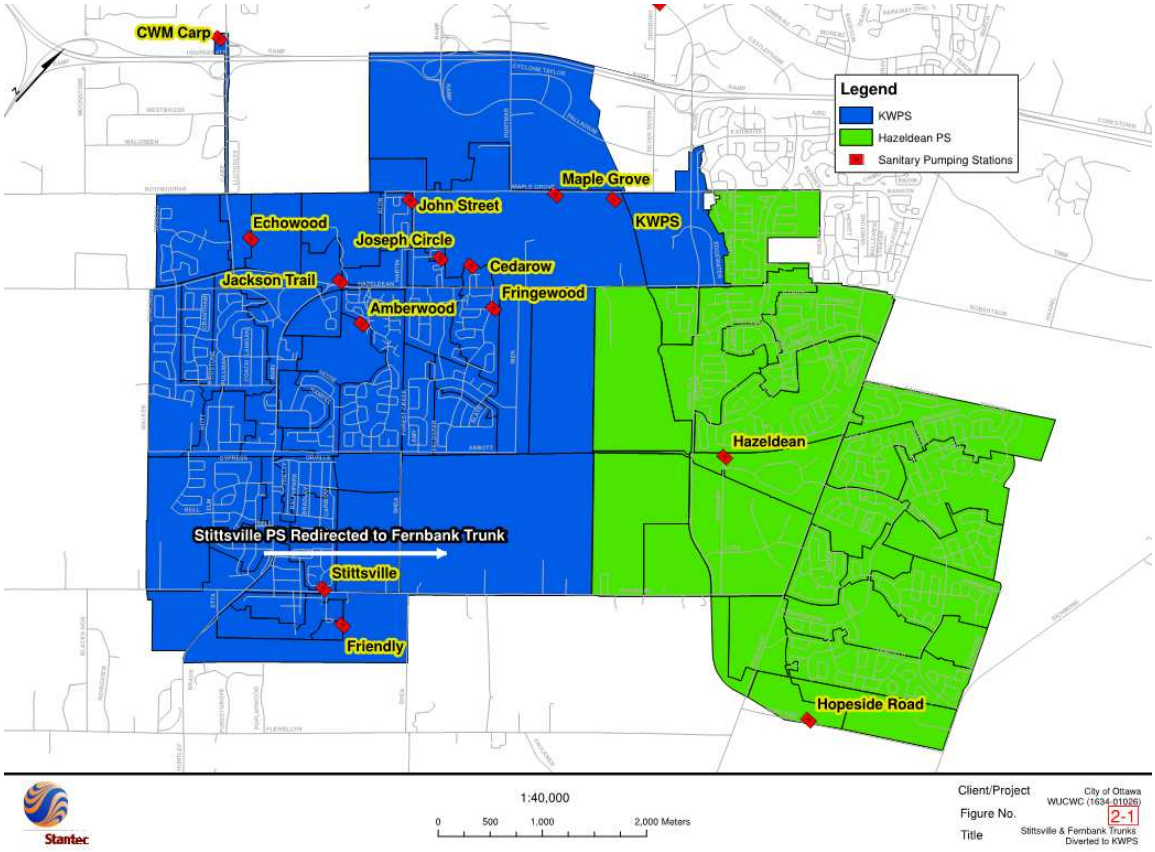


Figure 4.1: KWPS Drainage Area (Stantec, August 2012)

4.2 Wastewater Design

Consistent with the FSR, the subject lands are to be serviced by an internal gravity sanitary sewer system that is to follow the local road network & servicing blocks, and is to extend towards the MGR trunk sanitary sewer. While the FSR and first submission of this Design Brief considered the sanitary flows following existing Huntmar Drive, flows are now considered to drain to through the neighbouring development lands located at 130 Huntmar Drive in order to minimize transportation disruptions in the community.

The subject lands and external drainage area flows have been considered within the latest design of the *130 Huntmar Drive – Sanitary Trunk Sewer* (Atrel Engineering, July 6, 2020), included in ***Appendix D***. The sanitary flows are still considered to drain to the MGR trunk sanitary sewer, however the inlet location - existing MH96 - is further downstream as compared to the inlet considered in previous studies associated with 195 Huntmar. The sanitary trunk sewer alignment follows Robert Grant Avenue – the North-South Arterial – through the 130 Huntmar lands. In advance of development of 130 Huntmar, an easement is to be provided for the North-South Arterial ROW, to allow for construction and maintenance of this trunk sewer to serve the 195 Huntmar outflows.

The detailed analysis of capacity within the MGR trunk sewer within the FSR has been updated to reflect the sanitary flows from the 195 Huntmar Drive development considered in this Design Brief. The updated analysis can be found in ***Appendix D***.

- The analysis has been updated based on the latest information made available by the City of Ottawa at the time of this Design Brief.

- As part of the analysis, the KWMSS sanitary design sheet for areas tributary to MH10 (a.k.a. MH91 in as-builts) on MGR was recreated***,*** in order to be updated based on the latest sanitary design information available to DSEL and current City of Ottawa demand parameters. See the FSR and ***Appendix D*** for additional details.

- Consistent with the analysis within the FSR, all flows from the KWMSS drainage areas detailed above were directed to KWMSS MH 10, as a conservative approach to confirm capacity within the MGR sewer segment from KWMSS MH 10 (a.k.a. MH91) to MH 98A. In reality, multiple inlet locations between MH 10 (a.k.a. MH91) to MH 98A will be completed for the drainage areas considered.

- The *Reconstruction of Maple Grove Road As-Builts* (DSEL, Sept 2013) were used to determine the capacity of the sewer segments between KWMSS MH 10 (a.k.a. MH91) to MH 98A.

- Applying the wastewater parameters in ***Table 4.2***, the total peak rational method flow to KWMSS MH 10 was determined to be 542.67 L/s - see ***Appendix D***. A comparison to the total peak flows to MH 10 in the KWMSS and the FSR can be found in ***Table 4.1*** below.

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Table 4.1: Comparison of Peak Rational Method Flow to KWMSS MH 10

KWMSS (L/s)	FSR (L/s)	Current Design (L/s)
368.56	542.55	542.67

There is demonstrated capacity within the MGR sewer to accommodate the anticipated peak rational method flows. No segment of sewer between MH 10 and SAMH3 is at greater than 71% capacity (217 L/s of residual capacity). Again, note that all flows to this run of sewer have conservatively been directed to MH 10 for the purposes of this analysis. In reality, portions of the 542.67 L/s flow will enter the MGR sewer at different locations between KWMSS MH 10 and SAMH3.

It is understood that the recently constructed 1200mm dia. sanitary sewer downstream of SAMH3 has been designed for the ultimate operating conditions of the KWPS and therefore has not been considered to introduce capacity constraints for the lands tributary to the MGR sewer.

Table 4.2: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4p/unit
Residential – Townhome/ Semi	2.7p/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor, where K=0.8
Commercial / Institutional Flows	28,000 L/gross ha/day
Commercial / Institutional Peak Factor	1.5 if contribution >20%, otherwise 1.0
Light Industrial Flows	35,000 L/gross ha/day
Industrial Peaking Factor	Per Figure in Appendix 4-B, City of Ottawa Guidelines
Infiltration and Inflow Allowance	0.33 L/s/gross ha for all areas
Park Flows	9,300 L/ha/d (75 p/acre per Sewer Guidelines Appendix 4-A)
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, Technical Bulletins, and recent residential subdivision in City of Ottawa.	

The 195 Huntmar Drive development is to be serviced by the sanitary sewer network shown in ***Drawings 87-93*** and the offsite sanitary sewer within 130 Huntmar Drive shown in ***Appendix D***. The total peak flow directed to the MGR trunk sanitary sewer is anticipated to be 173.98 L/s when considering all upstream and downstream drainage areas, as demonstrated in the sanitary design sheet in ***Appendix D*** for the connection to

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the existing Maple Grove Road sanitary sewer at the intersection with Robert Grant Avenue. Proposed sewers range from 200mm to 525mm in diameter. High level sewers are provided within 195 Huntmar where the trunk sanitary sewer is greater than 5m deep.

An allowance of 73.25 Ha of future residential development (4900 population) for the Area 3 developing community has been accommodated in the proposed sanitary sewer network. The trunk sanitary sewer alignment and inlet location on Derreen Avenue have been confirmed with the Area 3 land owners. The proposed obvert elevation at the limit of the Area 3 land (Control MH 10) is 104.377m. This is below the required 105.10m elevation to cross the Feedmill Creek bed, as described by the Area 3 land owners in the correspondence in ***Appendix D***. Extensions of services have been provided for all commercial, employment, and condo blocks, as well as services for future development of the MTO lands (per the KWMSS). The MGR sewer capacity analysis demonstrates the downstream infrastructure to have sufficient capacity to accommodate the additional flows attributed to the future residential and commercial/employment developments, but details are to be confirmed by the proponent for the development of these lands.

Table 4.2 summarizes the City standards applied in the sanitary analysis detailed in ***Appendix D***. A breakdown of outflows to the 130 Huntmar sanitary sewer network is provided in ***Table 4.3.***

Table 4.3: Comparison of Peak Rational Method Flow to 130 Huntmar Drive Sanitary Sewers

MH ID	Outflow Calculated from 195 Huntmar and External Drainage Areas (L/s)	Allowance Provided in 130 Huntmar Design (L/s)
MH 217 A (Huntmar & Robert Grant)	134.66 L/s	134.75 L/s
MH 301 (Huntmar & Future Road, in vicinity of District Park)	9.25 L/s	9.38 L/s

4.3 Wastewater Servicing Conclusions

The proposed wastewater servicing strategy for the subject lands is designed to conform to all relevant City Standards and MECP Guidelines, including the design parameters for the Kanata West Pump Station.

The subject lands will be serviced by on-site sanitary sewers and off-site trunk sanitary sewers delivering collected wastewater to the Kanata West Pump Station. The proposed offsite trunk sanitary sewer alignment to service the subject lands is an extension of the trunk sanitary sewer within Robert Grant Avenue, directing flows to the existing Maple Grove Road trunk sewer.

An allowance for future Area 3 development west of 195 Huntmar has been incorporated into the sanitary servicing design, along with other external areas per the KWMSS.

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Sufficient residual capacity has been confirmed within the Maple Grove Road trunk sanitary sewer to accommodate the preferred sanitary sewer alignment and the buildout of the 195 Huntmar development.

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5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Drainage

The subject lands are within the Carp River watershed - under the jurisdiction of the Mississippi Valley Conservation Authority (MVCA) - and drain according to the pattern described in ***Section 1.1***.

The existing drainage split between Feedmill Creek and the Carp River is documented in the FSR, and is consistent with City of Ottawa base mapping and with the drainage boundaries set out in the City of Ottawa's *Feedmill Creek SWM Criteria Study* (JFSA & Coldwater Consulting, April 2018).

Per the pre-development flowrate & waterlevel calculations in the *Pond Design Brief* (JFSA, July 2020), approximately 1.9 m^3/s of stormwater runoff arrives at the existing 1500mm culvert under Highway 417 (invert of 102.52) under pre-development 100-year design storm conditions, estimated via stormwater modelling undertaken as part of the City of Ottawa's *Feedmill Creek SWM Criteria Study* (JFSA & Coldwater Consulting, April 2018).

5.2 Stormwater Management Criteria

Stormwater management requirements for the proposed development have been adopted from the KWMSS, and refined based on consultation with City of Ottawa staff as part of the approved FSR.

Per the FSR, the stormwater runoff for the site west of arterial Robert Grant Avenue is to be controlled for erosion control, quantity control, and quality control by Pond 7 before being discharged to Feedmill Creek.

For stormwater runoff destined to Feedmill Creek:

- Per the FSR, the stormwater runoff up to and including that generated in a City of Ottawa 100-year design event is to be attenuated to a 8 L/s/ha release rate for the 100-year 12-hour SCS Type II design storm event for Pond 7, to respect the flow regime of Feedmill Creek (the receiving watercourse). The release rate is to be based on the original drainage area considered in the *Feedmill Creek SWM Criteria Study* (JFSA & Coldwater Consulting, April 2018).
- An Enhanced Level of quality control (long-term average removal of 80% of total suspended solids) is expected to be required, given the aquatic habitat in Feedmill Creek.
- Furthermore, a unit release rate of 0.51 L/s/ha for the 15mm 3-hour Chicago design storm has been considered, consistent with the FSR and the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018) for erosion protection for the downstream watercourse. The release

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rate is to be based on the original drainage area considered in the *Feedmill Creek SWM Criteria Study* (JFSA & Coldwater Consulting, April 2018).

The following key City standards were considered as part of the stormwater management strategy within the subject lands, among other requirements:

- Storm sewers on local roads are designed to provide a minimum 2-year level of service per the City's latest Technical Bulletin PIEDTB-2016-01.
- Storm sewers on collector roads are designed to provide a minimum 5-year level of service per the City's latest Technical Bulletin PIEDTB-2016-01.
- Storm sewers on arterial roads are designed to provide a minimum 10-year level of service.
- For less frequent storms (i.e. larger than the minimum level of service), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges.
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s.
- For the 100-year storm and for local and collector roads, the maximum depth of water (static and/or dynamic) on streets, rearyards, public space and parking areas shall not exceed 0.35 m at the gutter. For arterial roads, no barrier curb overtopping is permitted.
- The major system is designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public ROW or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope, must remain below all building openings during the stress test event (100-year + 20%), and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope.
- Arterial roads must leave at least one lane free of water in each direction at all times up to a 100-year return period.
- For catchbasins installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30 cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope.
- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads.

5.3 Stormwater Management Design

Consistent with the FSR, Pond 7 is proposed to be constructed within the site boundary and outlet to Feedmill Creek via a proposed 750mm outlet pipe to existing infrastructure within the MTO ROW. Consistent with the approved FSR, the facility footprint is proposed

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to shift and expand from that shown in the KWMSS, to achieve orderly and cost-effective development of the subject lands.

The outlet pipe is to be located within easements in the subdivision, consistent with the FSR. The downstream outlet pipe alignment has been modified from the FSR: the outlet pipe is to be constructed within the existing MTO/Palladium Drive ROW along the shoulder, based on input from MTO staff in Nov 2019.

The outlet pipe is then to continue under the Highway 417 eastbound on-ramp and off-ramp (proposed to be installed via jack and bore technique), and connect to Feedmill Creek via a new ditch to the existing 1500 mm dia. culvert under Highway 417, consistent with the FSR. See ***Appendix E*** for ditch capacity calculations.

Pond 7 is to receive all stormwater runoff within the part of the subject lands that is west of the arterial Robert Grant Avenue and within the roundabout intersection of Palladium Drive/Robert Grant Avenue, allowing this portion of the subject property to proceed with development. Note the Pond 7 drainage area has been modified from the FSR to specifically include this intersection, per the design details put forward as part of the Road Modification Agreement process.

In the future, Pond 7 could be expanded onto the 16.5 ha MTO lands directly north of the site, to also receive flows from development of the MTO lands, to better align with the original KWMSS Pond 7 tributary area. Therefore, the pond outlet pipe has been sized to accommodate future development of the approximately 16.5 ha MTO lands directly adjacent to the site. The MTO have reviewed the proposed design and have offered their agreement in principle – see ***Appendix A.***

Consistent with the FSR, a proposed 100-year 12-hour SCS Type II design storm release rate for Pond 7 of 276.32 L/s is proposed, based on an allowance of 34.54 Ha of development controlled to 8 L/s/ha. This allowance is to be shared by the 195 Huntmar site (144 L/s for the proposed subject property drainage area) and the MTO lands (132 L/s for the 16.5 Ha drainage area). The Pond 7 erosion control rate of 0.51 L/s/ha for the 15mm 3-hour Chicago design storm has been established and shared in the same way. See the FSR and the *Pond Design Brief* (JFSA/DSEL, July 2020) for additional details.

The proposed Pond 7 drainage area represents a slight increase from the FSR. See ***Table 5.1*** for details. However, the pond has been designed to control flows to the rates that were previously approved in the FSR, as these outflow rates were approved based on their acceptable impacts on downstream infrastructure. Additional details regarding the pond release rates can be found in the *Pond Design Brief* (JFSA/DSEL, July 2020), under separate cover.

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Table 5.1: Comparison of Subject Land Drainage to Feedmill Creek and Carp River

	Existing Drainage (ha.)	KWMSS Drainage (ha.)	FSR Drainage (ha.)	Proposed Drainage (ha.)
Feedmill Creek	21.34	7.77	40.27	41.73

The portion of the subject property east of the arterial Robert Grant Avenue along with portions of Stittsville Main Street and Robert Grant Avenue are still considered to drain to Pond 4, located beside the Carp River, as per the FSR. No changes are proposed to interim Pond 4 as part of this Design Brief. Future storm sewers tributary to Pond 4 are shown in the design, as their location was considered in the design of the watermain, sanitary sewers and site grading. Their designs are to be confirmed as part of a separate design process, along with the future expansion of Pond 4.

The proposed stormwater management system can be seen in ***Drawings 95-98***. Rational method design sheets and runoff coefficient calculation for single detached homes, townhomes and back-to-back townhomes are provided in ***Appendix E,*** based on maximum permitted development. The paved area and grassed area runoff coefficients of 0.90 and 0.20 were used, respectively, to calculate average runoff coefficients that were applied to the arterial and collector roads. Consistent with the FSR, assumptions for other land uses are:

- District Park & Parkette: C=0.40;
- High School: C=0.60;
- Condo/Apartments & Commercial/Employment: C=0.80.

Per the drainage areas and runoff coefficients shown in ***Drawings 95-98***, the estimated average imperviousness for the Pond 7 drainage area is 67%. The Pond Design Brief (JFSA/DSEL, July 2020), provided under separate cover, details the proposed pond size and pond elements to meet the erosion, quality, and quantity requirements outlined in ***Section 5.2***. The proposed 100-year pond water level is 105.123m. Additional characteristics are summarized and compared to previous reporting in ***Table 5.2***.

The Pond 7 design detailed within the *Pond Design Brief* (JFSA/DSEL, July 2020) has been undertaken adhering to KWMSS and the MECP SWMP Design Manual. Information regarding storage requirements and operating characteristics, inlet and outlet structures, orifice sizing, emergency overflows and pond footprint design can be found within the Pond Design Brief and ***Drawings 81-84***. A 2m pathway is to be provided around the northern and western sides of the pond, in accordance with coordination with City staff.

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Table 5.2: Comparison of Proposed and Previous Versions of Pond 7 Design

	Pond 7 KWMSS	Pond 7 Feedmill Creek Stormwater Management Criteria Study (JFSA & Coldwater Consulting, Apr 2018)	Pond 7 Preliminary Kanata West Pond 7 Sizing (JFSA, Feb 2019)	Proposed Pond 7 (JFSA, July 2020)
Drainage Area	34.08 ha.	34.54 Ha	40.8 Ha	41.73 Ha
Average Imperviousness	70%	85%	71%	67%
Required Permanent Pool Volume	6305 m^3 (185 m^3/ha)	N/A	7616 m^3 (185 m^3/ha)	7523 m^3 (178 m^3/ha)
Permanent Pool Elevation	102.20	N/A	Approx. 103.80-103.85	103.85
Required Quality Control Volume	1363 m^3 (40m^3/ha)	N/A	1632 m^3 (40m^3/ha)	1691 m^3 (40m^3/ha)
100-year Release Rate	3654 L/s (Carp River Restoration Plan – Greenland International Consulting Engineers, Feb 2014)	276.32 L/s	144 L/s	144 L/s

As part of the approved FSR, it was confirmed that there are no unacceptable negative erosion or water level impacts caused by the introduction of Pond 7 discharge to Feedmill Creek (and the existing ditches and culverts between Pond 7 and Feedmill Creek). See the FSR and the *Pond Design Brief* (JFSA/DSEL, July 2020) for additional details.

Specifically:

- The outflows from Pond 7 were considered within the subwatershed-level erosion analysis of Feedmill Creek. The City of Ottawa has recommended a project for in-stream and bank improvements within Feedmill Creek, to mitigate against erosive impacts associated with the development of the overall subwatershed.
- The existing 1500mm dia culvert crossing Highway 417 within MTO lands was subject to a detailed analysis of water level conditions, whereby the 100-year water level is expected to be 103.35m at the inlet to the culvert under restrictive downstream flooding conditions within Feedmill Creek after development of the site. This water level is similar to existing conditions. The invert of the culvert is considered to be 102.52m. Under the 100-year water level, over a metre of freeboard is achieved to the edge of pavement. This restrictive condition has been considered in the design of the pond and outfall, as discussed in the *Pond Design Brief* (JFSA/DSEL, July 2020).

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5.3.1 Minor System

The subject lands are expected to be serviced by an internal gravity storm sewer system ranging from 300mm-1650mm diameter. The storm sewers follow the local road network and dedicated servicing blocks/easements, as shown in ***Drawings 95-98***. Consistent with the FSR, the proposed alignment of the trunk storm sewer infrastructure within the subject lands differs from the KWMSS because of the changes to the proposed road network.

Table 5.3 summarizes the standards that have been employed in the detailed design of the storm sewer network, meeting the requirements in ***Section 5.2.*** Trunk storm sewer sizing is provided in ***Appendix E & Drawings 95-98***.

The minor system has been sized using 2-year to 10-year return frequency for roads, front yards and rear yards, 2-year frequency for the parkette and 2-year capture for the apartment block and commercial/employment block. The rational method peak flows in the two Pond 7 inlet pipes are calculated as 1396 L/s and 2647 L/s. The storm sewer design uses inlet control devices (ICDs) to limit the minor system capture to the 2 to 10-year flows and to maximize the use of available road surface storage per the *Stormwater Management Report for the 195 Huntmar Subdivision to Pond 7* (SWM Report) (JFSA, July 2019). Runoff from events greater than the minor system is expected to be addressed via road sag storage, overland flow, or on-site storage (***Section 5.3.3).***

A system of rear-yard catchbasins and 250 mm dia. perforated storm pipes service the residential lots in the subdivision. The rear-yard infrastructure then connects to the street stormwater infrastructure via a solid pipe between homes or via rear yards. 600mm x 600mm concrete rear yard catchbasins are proposed for the last catchbasin, in order to capture the full 100-year approach flow so that there is no planned overland flow between houses in 100-year design storm event. Consistent with ISDTB-2012-4, the static maximum depth and the dynamic flow depth simulated in DDSWMM have been added to confirm that all City freeboard criteria are met. See ***Drawings 99 to 106*** for ponding extents under this approach.

Control manholes have been included in the apartment and commercial/employment blocks to capture runoff from the areas and direct it to Pond 7. Internal storm sewer networks are expected to be designed as part of separate site plan applications for these blocks.

5.3.1.1 Hydraulic Grade Line

A detailed hydraulic gradeline (HGL) analysis has been completed for the storm network tributary to Pond 7. Details can be found in the *Stormwater Management Report* (JFSA, July 2020), provided under separate cover. As detailed in the *SWM Report*, a 0.3 m freeboard between the 100-year HGL and all underside of footing elevations has been provided as per City of Ottawa Sewer Design Guidelines, despite expected surcharge in most parts of the Pond 7 sewer network.

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The minor system hydraulic gradeline analysis was completed for the proposed system using the XPSWMM, DDSWMM and SWMHYMO programs based on the 2, 5, 10 and 100-year 3-hour Chicago and 100-year 24-hour SCS design storms, for the July 1st 1979, August 4th 1988 and August 8th 1996 historical events and the 100-year 3-hour Chicago storm with a 20% increase. Inflows to the storm sewer were modelled in XPSWMM derived from catchments in the DDSWMM and SWMHYMO programs. Per the SWM Report, the full pipe velocities are no less than 0.80 m/s and no greater than 6.0 m/s for all proposed pipes. Digital XPSWMM, DDSWMM and SWMHYMO modelling files are included with the *Stormwater Management Report* (JFSA, July 2020), provided under separate cover.

Table 5.3: Storm Sewer Design Criteria

Design Parameter	Value
Minimum Minor System Design Return Period	1:2 year (PIEDTB-2016-01) (local) or 1:5 year (collector) or 1:10 year (arterial)
Major System Design Return Period	1:100 year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A = 732.951; B = 6.199; C = 0.810 5-year storm event: A = 998.071; B = 6.053; C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n' for pipe flow	0.013
Minimum Depth of Cover	2.0m from crown of sewer to grade (or 1.5m where USF freeboard to HGL is not a constraint, such as in slab-on-grade products)
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s (where velocities in excess of 3.0 m/s are proposed, provision shall be made to protect against displacement of sewers by sudden movement)
Clearance from 100-Year Hydraulic Grade Line to Building Opening (USF)	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extent of Major System	To be contained within the municipal right-of-way or adjacent to the right-of-way provided that the water level must not touch any part of the building envelope and must remain below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the nearest building envelope (PIEDTB-2016-01)
Stormwater Management Model	DDSWMM (release 2.1), SWMHYMO (v. 5.02) and XPSWMM (v. 10)

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Model Parameters	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Design Storms	Chicago 3-hour Design Storms, 12-hour SCS Type II Design Storms, and 24-hour SCS Type II Design Storms. Maximum intensity averaged over 10 minutes.
Historical Events	July 1st, 1979, August 4th, 1988 and August 8th, 1996
Climate Change Street Test	20% increase in the 100-year, 3-hour Chicago storm
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and Technical Bulletins	

5.3.2 Major System

The major system within the site is to direct flows to Pond 7 via the proposed overland flow network consisting of public ROWs and dedicated servicing blocks/easements. The overland flow network can be seen in ***Drawings 67-82***. Consistent with the FSR, all commercial/employment and parks blocks are expected to provide on-site storage for 100-year flows less the minor system capture.

The major system tributary to Pond 7 has been designed in accordance with City of Ottawa Sewed Design Guidelines and a detailed model of static and dynamic ponding is provided in *the SWM Report* (JFSA, July 2020).

There are select areas of Palladium Drive that will be tributary to the existing Palladium Drive roadside ditches, based on the design prepared as part of the Road Modification Agreement (RCI, June 2020, ***Appendix A***). The flows to these ditches under pre-development and post-development conditions are reported in the *Pond Design Brief* (JFSA/DSEL, July 2020), confirming that post-development flows will not exceed pre-development flows and that velocities for new grassed swales would be less than 0.5 m/s in the 25mm design storm event.

The JFSA analysis found that the proposed drainage systems are expected to safely capture and convey all storms up to and including the 100-year event in accordance with the requirements of the KWMSS and City standards. Peak major flows do not exceed the maximum allowable 35cm depth at the gutter for the simulated 100-year storm and the product of the maximum flow depths on streets and maximum flow velocity is less than 0.60 m^2/s on all roads.

5.4 Grading and Drainage

To achieve the planned stormwater drainage program, meet MVCA requirements to eliminate the 1:100 year spill hazard, and meet City of Ottawa guidelines pertaining to road and lot grading, final road grades are proposed to be between approximately 107.8m and 109.5m west of Robert Grant Avenue. The proposed grades require approximately 2m – 3m of fill above existing ground within certain areas of the residential portion of the site. The fill program extends to upwards of 5m within Palladium Drive, with the most fill

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required where it ties into the interchange with Highway 417. As discussed in ***Section 1.1***, there are no grade raise restrictions for this portion of the site, and the grading plans have been reviewed by Paterson Group (***Appendix G***). The proposed grading plans are ***Drawings 67-82***. Springline connections for certain storm sewers are proposed, in order to reduce fill requirements in some specific areas in the Pond 7 catchment, as detailed in ***Appendix H.***

Adjacent to Derreen Avenue, Lot 68, and the rear yards of the cul de sac at Unity Place, retaining walls are proposed in order to accommodate the proposed grades. The City has requested that retaining walls in the ROW be avoided, and as such, terracing within the road allowance (PIN 04487 - 0434), Block 246, and the boulevard of Derreen Avenue has been considered. Sloping is to begin no closer than 31.5m from the centerline of Feedmill Creek in accordance with MVCA requirements detailed in ***Section 1.3***. Paterson Group has reviewed the terracing and confirmed that the proposed max 1:1 slope is considered stable from a geotechnical perspective – see ***Appendix G*** for details.

A 4.4m wide berm is proposed around the stormwater management facility in order to eliminate the 1:100 year spill hazard in this area. The berm is to have top elevation of approximately 107.4m, which is above the Feedmill Creek 100-year flood elevation of 107.1m, and the toe of the berm is located 31.5m from Feedmill Creek. Paterson Group has reviewed the interaction of Feedmill Creek peak water levels with the proposed berm. The analysis concludes that the proposed berm is considered stable from a geotechnical perspective – see ***Appendix G*** for details.

The following additional grading criteria and guidelines were applied to detailed design, per ***City of Ottawa Guidelines***:

- Driveway slopes will have a maximum slope of 6%;
- Slope in grassed areas will be between 2% and 5%;
- Grades in excess of 7% will require terracing to a maximum of a 3:1 slope;
- Swales are to be 0.15m deep with 3:1 side slopes unless otherwise indicated on the drawings; and,
- Perforated pipe will be required for drainage swales if they are less than 1.5% in slope.

Existing grades in the subject lands are below the 100-year floodplain elevation as reported in the *Feedmill Creek Floodplain Mapping Study* (MVCA, January 2017). Written authorization from MVCA pursuant to Ontario Regulation 153/06, MVCA's *Development, Interference with Wetlands and Alterations to Shorelines and Watercourses* regulation has been received to fill site areas below the 100-year floodplain elevation that are within 15m of the MVCA spill hazard. See ***Appendix B*** for additional details.

In the interim condition, prior to development of adjacent lands, grassed swales are proposed so that existing drainage patterns can be maintained. See ***Appendix E*** for detailed capacity and flow velocity calculations. All ditches have been designed to convey

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the 100-year flows from the drainage area, and to maintain velocities of less than 0.5 m/s in the 25mm year design storm event, with check dams provided where required (***Drawing ESC2***).

5.5 Infiltration

Per the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018), there is a 5mm target retention volume to be met for the site, to be met through implementing Low Impact Development (LID) measures.

Paterson Group (May 2018) has suggested that infiltration rates of 3 mm/hr to 8 mm/hr ought to be applied to the design of LIDs based on infiltration testing of the native soils (***Appendix A***). These design rates are conservative, given the imported materials as part of the fill program are expected to have greater than 20 mm/hr infiltration rates.

Per the *Water Budget Report* (JFSA, July 2020) in ***Appendix A*** and the *Summary of Low Impact Development Measures* (DSEL, July 2020) in ***Appendix H***, it is expected that in the post-development condition, for the development area of 195 Huntmar that drains to Feedmill Creek, much of the 5mm retention target will be addressed through evapotranspiration and infiltration.

The proposed LID measures to satisfy the remainder of the 5mm retention target are:

- Infiltration trenches in the rear and side yards of the 195 Huntmar Drive development within 2.4m drainage easements; and,
- Site plan level measures (e.g. infiltration trenches, biofilters, etc.) carried forward for the commercial, employment and apartment blocks within the 195 Huntmar Drive development.

The infiltration trenches are to be based on the City standard rear-yard stormwater infrastructure systems detailed in City Standard S29, modified for extra width and so that the outlet pipe is perched to promote infiltration. Additional details of the proposed trenches can be found in the *Summary of Low Impact Development Measures* (DSEL, July 2020) in ***Appendix H*** and ***Drawing 2***. To accommodate the City's request for maintenance access, 2.4m wide easements are proposed along the rear and side property lines at all locations. Target storage requirements for each development block are provided in ***Appendix H.***

Because the subject lands are not identified as a Significant Groundwater Recharge area in the Mississippi-Rideau Source Protection Information Atlas (see ***Appendix F)***, an infiltration deficit in the post-development scenario for the subject lands is not considered to have a significant negative impact on the natural heritage system. A memo from Muncaster Environmental Planning in ***Appendix A*** provides additional information.

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5.6 Stormwater Servicing Conclusions

The storm sewers have been sized by the rational method and inlet control devices (ICDs) and orifices are used to restrict the capture rates to 2-, 5-, or 10-year flow corresponding to the land use and road classification. The storm sewer network is in general conformance with MECP and City of Ottawa Sewer Design Guidelines, with proposed deviations detailed in ***Section 8.0***. The HGL analysis was completed within the *SWM Report* (JFSA, July 2020), provided under separate cover, and confirmed that a 0.3 m freeboard between the 100-year HGL and all underside of footing elevations has been provided.

Pond 7 has been designed in conformance with the targets set out in the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018), the approved FSR, and the MECP SWMP Design Manual. Detailed storage requirements and operating characteristics, inlet and outlet structures, orifice sizing, emergency overflows and pond block design can be found within the *Pond Design Brief* (JFSA/DSEL, July 2020), provided under separate cover.

The major overland flows from the subject lands tributary to Pond 7 will be conveyed by public right-of-ways and servicing blocks/easements to the Pond 7. The *SWM Report* (JFSA, July 2020) confirms sizing of all overland flow servicing blocks//easements.

Rear and side yard infiltration trenches are proposed along with future site plan controls for the development blocks. This is to meet the 5mm target retention volume for the overall site, as described in the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018).

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6.0 UTILITIES

Overhead hydro lines run along the Huntmar Drive right-of-way adjacent to the site and underground infrastructure exists within the Palladium Drive right-of-way. Service extending to the site is to be provided off of the existing infrastructure on Palladium Drive.

Enbridge gas has existing infrastructure south of the subject property at the intersections of Huntmar Drive-Palladium Drive and Huntmar Drive-Maple Grove Road, and within the existing residential neighbourhoods to the south of the subject lands. Service extending to the site may require connections to multiple existing infrastructure points. Further consultation is required as part of the Composite Utility Plan to confirm the servicing plan for the subject lands.

Rogers Communications has service adjacent to the subject lands via pole-mounted utilities on Huntmar Drive and within the existing residential neighbourhoods to the south of the subject lands. Further consultation is required as part of the Composite Utility Plan to confirm the servicing plan for the subject lands.

Similarly, Bell infrastructure is provided within the existing residential neighbourhoods to the south of the subject lands, and further consultation is required as part of the Composite Utility Plan to confirm the servicing plan for the subject lands.

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7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated where vegetation has been removed during construction and the top layer of soil becomes agitated, and where increased stormwater runoff is directed to natural areas.

Prior to earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

The erosion and sediment controls will include (but are not limited to):

- Minimize the area to be cleared and grubbed.
- Plan construction at proper time to avoid flooding.
- Provide sediment traps and basins during dewatering.
- Silt fence to be installed around the perimeter of the site and to be cleaned and maintained throughout construction. Silt fence to remain in place until the working areas have been stabilized and re-vegetated. See ***Drawings ESC1 & ESC2***.
- A mud mat to be installed at the construction access(es) in order to prevent mud tracking onto adjacent roads.
- Catch basins to have inserts installed under the grate during construction to protect from silt entering the storm sewer system.
- Extent of exposed soils to be limited at any given time, and exposed areas will be re-vegetated as soon as possible.
- Bulkhead barriers to be installed over the lower half of the outletting sewers (where required) to reduce sediment loadings during construction.
- Exposed slopes to be protected with plastic or synthetic mulches or erosion control blankets.
- Stockpiles of cleared materials as well as equipment fueling and maintenance areas to be located away from swales, watercourses, and other conveyance routes.
- Seepage barriers such as silt fencing, straw bale check dams and other sediment and erosion control measures to be installed in any temporary drainage stormwater conveyance channels and around disturbed areas during construction and stockpiles of fine material.
- Filter inserts to remain on open surface structures such as manholes and catchbasins until these structures are commissioned and put into use, streets are asphalted and curbed, and the surrounding landscape is stabilized.

The Contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

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- Verification that water is not flowing under silt barriers; and,
- Clean and change inserts at catch basins.

Site inspectors will give recommendations related to the mitigation measures that are being implemented and maintained. Bulkhead barriers, filter clothes on open surface structures, silt fencing, and other ES&C measures may require removal of sediment and repairs. The City of Ottawa's Protocol for Wildlife Protection is to be followed during construction.

After build-out of the development, applicable sewers will be inspected and cleaned. All sediment and construction fencing should be removed following construction, providing there is no exposed soil or other potential sources of sedimentation.

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8.0 SUMMARY OF DEVIATIONS FROM CITY STANDARDS

The proposed detailed design is generally consistent with the background studies, approved FSR, and KWMSS, but is not necessarily in accordance with all City of Ottawa guidelines or consistent with general practice. The deviations from guidelines, previous approvals, and general practice are summarized below, with additional details provided in the previous sections.

Table 8.1: Summary of Proposed Design Deviations

Design Element	City Design Guideline	Proposed Design	Support for Deviation
Pipe Connections to MHs	Ottawa Sewer Design Guidelines Section 6.2.10	Certain storm manholes have been designed with connections that are spring line to spring line.	See ***Appendix H***. The deviation helps mitigate against additional fill beyond the already large earthworks program requiring approximately 2-3m of fill import across many portions of the site.
26m ROW Cross Section	26B Cross-Section from the Draft Neighbourhood Street Design Manual (City of Ottawa, August 2019)	Portion of Derreen Avenue is reduced to 24m ROW, to have 2m of western exterior boulevard used for 1:1 terracing.	Terracing is required in the area as part of raising the subdivision out of the Feedmill Creek floodplain. This has been approved as part of the FSR.
Rear Yard Infiltration Trenches	Ottawa Standard S29	Proposed design widens the infiltration trench to 1.2m wide, and perches the outlet pipe to provide 0.48m of storage prior to overflow, to promote infiltration. 2.4m drainage easements to be applied in these areas.	See ***Appendix H***. This deviation helps achieve the site-specific target of retention of the 5mm rainfall event. The required 2.4m drainage easements associated with these measures are consistent with City practice in the adjacent community.

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9.0 CONCLUSION AND RECOMMENDATIONS

This Design Brief has been prepared on behalf of 2325483 Ontario Ltd. to detail the servicing plan for the development of a portion of 195 Huntmar Drive in the Kanata West community within the City of Ottawa.

This Design Brief is to be read in conjunction with the third submission of the 195 Huntmar Drive detailed engineering drawing package, which consists of drawings dated July 9, 2020.

A detailed watermain analysis for the development is provided in the *Hydraulic Capacity and Modeling Analysis – 195 Huntmar Drive* (GeoAdvice, Dec 2019), which is provided in ***Appendix C***. Detailed stormwater analysis and Pond 7 design information is provided in the *Design Brief for Stormwater Management Pond 7 for the 195 Huntmar Drive Subdivision* (JFSA/DSEL, July 2020) & *Stormwater Management Report for the 195 Huntmar Drive to Pond 7* (JFSA, July 2020), which are provided under separate cover.

The key features of the detailed design of the proposed development are as follows:

- Water supply is provided through expansion of the City's existing 3W water supply network. The watermain network has been designed in accordance the Ottawa Water Distribution Guidelines, and the City`s Technical Bulletins ISDTB-2014-02, ISTB-2018-02. The GeoAdvice Report included in ***Appendix C*** demonstrates serviceability in the current conditions. Serviceability in the ultimate condition (full buildout of the KWMSS area) is demonstrated in the approved FSR. Phasing analysis, including the opportunity to connect to the proposed future 400mm diameter watermain within 130 Huntmar Drive subdivision, is to be further investigated.
- Fire protection is shown to be provided, per the requirements in the City`s Technical Bulletins ISDTB-2014-02, ISTB-2018-02.
- Wastewater service is provided through gravity sewers that have been designed in accordance with MECP & Ottawa Sewer Design Guidelines. The subject lands will be serviced by off-site trunk sanitary sewers delivering collected wastewater to the Kanata West Pump Station. The proposed offsite trunk sanitary sewer alignment to service the subject lands is an extension of the trunk sanitary sewer within Robert Grant Avenue, directing flows to the existing Maple Grove Road trunk sewer. The downstream sanitary sewers have been analyzed and found to have adequate capacity to accommodate the 195 Huntmar Drive wastewater flows. The extension of the trunk sanitary sewer has been coordinated with the applicant of the 130 Huntmar development site. Allowances for development of the MTO lands and Area 3 developing community have been provided in the design of the on-site sanitary sewer network.
- Pond 7 has been designed to service the minor and major flows from the portion of the development west of arterial Robert Grant Avenue and including the intersection of Robert Grant Avenue and Palladium Drive. Pond 7 has been

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designed to provide erosion protection, Enhanced Level quality treatment, and attenuation of storm events up to the 100-year design storm event before releasing flows to Feedmill Creek, as demonstrated in the *Pond Design Brief* (JFSA/DSEL, July 2020).

- The storm sewers have been sized by the rational method and inlet control devices (ICDs) and orifices are used to restrict the capture rates to 2-, 5-, or 10-year flow corresponding to the land use and road classification. The storm sewer network is in general conformance with MECP and City of Ottawa Sewer Design Guidelines, with proposed deviations detailed in ***Section 8.0***. The *SWM Report* (JFSA, July 2020), provided under separate cover, confirms that a 0.3 m freeboard is achieved between the 100-year HGL and all underside of footing elevations, that peak major flows do not exceed the maximum allowable 35cm depth at the gutter for the simulated 100-year storm, and that the product of the maximum flow depths on streets and maximum flow velocity is less than 0.60 m^2/s on all roads.
- The portion of the subject property east of arterial Robert Grant Avenue, along with portions of Robert Grant Avenue and Stittsville Main Street, are to ultimately be serviced by the ultimate Pond 4. This is consistent with the approved FSR. No changes are proposed to the existing interim Pond 4 as part of this Design Brief.
- To achieve the planned stormwater drainage program, eliminate a 1:100 year floodplain spill hazard identified in the *MVCA Feedmill Creek Floodplain Mapping* (MVCA, January 2017), and meet City of Ottawa guidelines pertaining to road and lot grading, final road grades in the area tributary to Pond 7 are planned to be set to between approximately 107.8m and 109.5m, which requires about 2m – 3m of fill above existing ground for parts of the residential land uses. The fill program for the commercial blocks and the Robert Grant Avenue/Palladium Drive intersection extend to about 4m – 5m, with the maximum fill associated with the tie-in to the existing Highway 417 interchange.
- Stormwater storage is proposed within rear yard and side yard infiltration trenches in order to meet the target retention volume of 5mm, as per the *Feedmill Creek Stormwater Management Criteria Study* (JFSA & Coldwater Consulting, April 2018). Additional measures will be required in the condo, employment, and commercial blocks as development proceeds.

The infrastructure identified in this Design Brief is expected to require approval from the City of Ottawa, Mississippi Valley Conservation Authority, Ontario Ministry of the Environment, Conservation and Parks, and Ministry of Transportation prior to construction.

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Prepared by,
David Schaeffer Engineering Ltd.



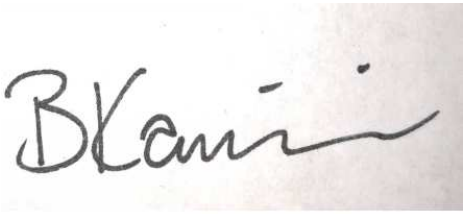
Per: Laura Maxwell, B.Sc.(Civil Eng)

Reviewed by,
David Schaeffer Engineering Ltd.



Per: Stephen Pichette, P.Eng

Prepared by,
David Schaeffer Engineering Ltd.



Per: Braden Kaminski, E.I.T.

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