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FUNCTIONAL SERVICING REPORT

FOR

CAIVAN (PERTH GC) LIMITED

PROPOSED RESIDENTIAL SUBDIVISION

TOWN OF PERTH

PROJECT NO.: 21-1278

FEBRUARY 2023

FUNCTIONAL SERVICING REPORT
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CAIVAN (PERTH GC) LIMITED

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Caivan (Perth GC) Limited to prepare a Preliminary Functional Servicing Report in support of their application for draft plan of subdivision.

The subject property is located within the West Annex lands as defined in the ***Town of Perth's Infrastructure Master Plan (IMP)***. The western property is composed of two parcels of lands known as the 'Perth Golf Course' and the 'Tayview Property' (formerly in the Tay Valley Township), as shown in the Annexed Area Plan in ***Appendix A***. The subject property is limited to the 'Perth Golf Course' only. The proposed concept plan prepared by Caivan (Perth GC) Limit is found in ***Appendix A***. The contemplated development consists of standard townhomes, single family homes, parks, stormwater management facilities, and the retention of a 9-hole golf course.

DSEL submitted a Preliminary Functional Servicing Study to the Town of Perth and Lanark County in April 2022 and received comments in August 2022. The following report was updated in response to Town and County comments.

The objective of this report is to provide sufficient detail to demonstrate that the proposed development area can be supported by municipal services.

1.1 Existing Conditions

The subject property is located within the 300-hectare lands defined as the 'Golf Course Subdivision' in the ***Town of Perth IMP*** and is located south of Tay River and north of the Grant's Creek Provincially Significant Wetland (PSW). The Tay River is located along the north and eastern property limits of the Perth Golf Course Subdivision with Grant Creek located along the southeastern boundary. The land use for the subject property has been designated by the Town of Perth for parks, open space, residential lots, and special study areas. The subject property is surrounded by an Environmental Protected Area comprising of flood plain, a natural heritage feature, and the noted PSW. The 18-hole private golf course facility is located at 141 Peter Street where sole access to this facility is via a two-lane bridge crossing Tay River from Peter Street.

The Town's Water Treatment Plant is located across the Tay River from the northeast corner of the subject property. Any discharges upstream of this area is under the Mississippi-Rideau Source Protection Plan and is enforced by the Rideau Valley Conservation Authority (RVCA).

Gemtech completed a Geotechnical Investigation for the subject lands. The site contained top soil ranging in depth from 30 to 280 mm. Peat was encountered in pockets of the site

with thicknesses ranging from 70 to 560mm. The native soils are a combination of silty sand, silty clay and glacial till. Precambrian Bedrock was encountered at numerous boreholes and was observed at surface.

The existing elevations within the subject property ranged from the normal high-water mark of the Tay River at 134.5m to elevations of 142m.

1.2 Development Layout

The proposed multi-phase development consists of park blocks, residential blocks of townhouses and single detached units, a collector road with a 24.0m right-of-way (ROW) width, and a network of local roads of 16.75m and 18.5m ROW widths. The full buildout of the development will consist of 299 townhomes, and 640 single family homes.

Site access options presented for the subject property include the use of the existing Peter Street bridge and the construction of a new bridge across the Tay River as indicated per the proposed concept plan prepared by Caivan located in ***Appendix A***.

1.3 Consultation Summary

Caivan (Perth GC) Limited and their consultant team met with Town of Perth staff on November 25, 2021 to discuss the development application. Meeting agenda is included in ***Appendix A***. Subsequently, the development team met with the Town and County staff on January 14, 2022. Meeting minutes and consultant notes are included in ***Appendix A***.

Representatives from DSEL and Stantec met with Grant Machan of the Town of Perth on February 18, 2022 to further review details related to water and wastewater servicing requirements. Email exchange and meeting notes are included in ***Appendix A***. The Town provided an update on the progression of water infrastructure improvements, key items to include in future pump station design, and expressed their preference for infrastructure crossing the Tay River to be hung from the bridge, rather than directional drilled under the river.

Caivan (Perth GC) Limited and their consultant team met with Town staff to review application comments on September 16, 2022. Meeting minutes circulated to Town and County staff on October 12, 2022 are included in ***Appendix A***.

DSEL and J.F. Sabourin and Associates (JFSA) met with RVCA staff to review the source water protection area requirements for releasing stormwater to the Tay River upstream of the drinking water intake on November 18, 2022. The RVCA provided a summary of where a stormwater management pond would be considered a threat. It was determined that the nature of the proposed land use and the area to be discharged into the Tay would not be considered a significant drinking water threat. DSEL worked with Caivan (Perth GC) Limited to optimize the development plan in an effort to balance the site's earthworks as well as to mimic existing drainage patterns.

DSEL and representatives from Caivan (Perth GC) Ltd. met with Town staff on November 25, 2022 to review DSEL lagoon analysis. DSEL presented a summary of their findings to Town staff demonstrating available capacity within the lagoon. Capacity analysis is discussed further in ***Section 4.0***. DSEL prepared and delivered detailed calculations for Town review via email on November 30, 2022. Email correspondence is included in ***Appendix A***.

1.4 Required Permits / Approvals

Once Draft Plan of Subdivision is obtained, the Town of Perth must approve detailed engineering design drawings and reports prior to construction of the municipal infrastructure identified in this report.

The following additional approvals and permits listed in ***Table 1*** are expected to be required prior to construction of the municipal infrastructure detailed herein. Other permits and approvals may be required, as detailed in other studies submitted as part of the Planning Act applications (e.g. *Tree Conservation Report, Phase 1 Environmental Site Assessment, etc*.).

Table 1: Potential Required Permits/Approvals

Agency	Permit/Approval Required	Trigger	Remarks
MECP / Town of Perth	Environmental Compliance Approval	Construction of new sanitary & storm sewers.	MECP is expected to review the stormwater collection system and wastewater collection system by direct submission once the Town approves the works.
MECP	Permit to Take Water	Construction of proposed land uses (e.g. basements for residential homes) and services.	Pumping of groundwater will be required during construction, given groundwater conditions and proposed land uses/ municipal infrastructure.
Town of Perth	MOE Form 1 – Record of Watermains Authorized as a Future Alteration	Construction of watermains.	The Town of Perth is expected to review the watermains on behalf of the MECP.
Rideau Valley Conservation Authority	Application for "Development, Interference with Wetlands and Alterations to Shorelines and Watercourse" Ont. Reg 174.06	Construction of storm outlets. Rationalization of Flood Plain	The RVCA is expected to review and approve the alterations to the shoreline and cutting and filling within the floodplain.

1.5 Municipal Class Environment Assessment (MCEA)

The Town of Perth Completed an Infrastructure Master Plan ***(IMP)*** in 2019 where servicing strategies for the subject lands were presented.

The ***IMP*** completed Phases 1 and 2 of the MCEA and selected preferred servicing solutions and indicated that "*The Master Plan enables the Town to identify the needs for a specific study area and establish broader infrastructure alternatives to consider, which may lead to better solutions. The Master Plan would then be used in support of further work for specific Schedule 'B' projects, or further work in Phases 3 and 4 for Schedule 'C' projects."*

Caivan and DSEL reviewed the ***IMP*** and coordinated additional field investigations and surveys as recommended in the ***IMP*** to refine the preferred alternatives. The following

summarizes the recommendations of the ***IMP*** along with a brief summary of the proposed modifications.

1.5.1 Amendment to IMP Water Supply Servicing

The ***IMP*** proposed two river crossings with connections to an upgraded watermain on Inverness Avenue and to the existing 300mm dia main on North Street. Methods of crossing the river were to be established at detailed design.

Figure 6-3 from the ***IMP*** is included in ***Appendix A*** along with DSEL's commentary and notes. The connection to North Street is shown through lands held in private ownership. While the map appears to indicate that a right-of-way exists at that location, a title search revealed that the lands are held in private ownership. See property index map included in ***Appendix A***. The connection to Inverness Avenue proposed in the IMP involved replacing the existing 150mm diameter main on Inverness and constructing a new 300mm diameter main between two existing homes. As shown on the markup of Figure 6-3, the connection would involve the removal of several mature tree and disruption to existing residents.

As described in ***Section 3.2***, it is proposed to have two river crossings at Peter Street and hang the proposed infrastructure from the existing and new bridges. The watermains will be maintained on separate structures and separate service trenches. One watermain will connect to the existing 300mm diameter main on North Street and the second to the existing 300mm diameter on Rogers Road.

The proposed servicing solution deviates from the IMP in alignment only. The preferred solution maintains the fundamental strategy to deliver potable water to the subject lands from the town's existing plant. The proposed solution falls within a Schedule A project as described in the Municipal Class Environment Assessment. The submission is being made under the Planning Act and no new lands are required to support the water supply servicing strategy.

> *Schedule A:*
>
> *6. Establish, extend or enlarge water distribution system and all necessary works to connect the system to an existing system, where it is required as a condition of approval on a site plan, consent, plan of subdivision or plan of condominium which will come into effect under the Planning Act prior to the construction of the extension of the collection system.*

1.5.2 Amendment to IMP Wastewater Servicing

The ***IMP*** evaluated wastewater servicing alternatives assuming that all existing sanitary sewers within the Town were in good repair and at minimum grade per MECP guidelines. Furthermore, the ***IMP*** did not review the capacity of existing receiving pump stations.

The ***IMP*** recommended two new pump stations to service the subject lands with sewage directed to Inverness Avenue and North Street. New pump stations were assumed to be $300,000 each. The IMP indicated that the detailed design engineer would be responsible to review off-site as-builts. Figure 6-5 was extracted from the ***IMP*** and included in ***Appendix A*** along with DSEL's commentary. As indicated in ***Section 1.5.1***, the proposed connection to Inverness Avenue would be disruptive to existing residents and would involve the removal

of several mature trees on private property. The alignment of the North Street connection is through privately held lands.

Caivan coordinated survey of off-site sewers and engaged Stantec Consulting to review available capacity within the existing Cockburn PS. It was discovered that several sewers sloped well below minimum grade and there is insufficient capacity from North Street to the Cockburn PS. Furthermore, several deficiencies were identified within the existing Cockburn Pump Station which is currently operating near maximum capacity. Lastly Stantec's opinion of cost for a new PS is ten times higher than assumed by the ***IMP*** ($3,000,000).

An alternative wastewater solution was developed in light of the extensive upgrades required to the downstream system and recent costing on new pump stations.

The proposed wastewater servicing solution includes a single pump station to support the development reducing capital and future operating cost. The pump station will direct wastewater from the subject lands to the existing gravity sewer south of South Street at Jessie Drive via a new forcemain along Rogers Road. Refer to ***Section 4.2*** for additional details.

The proposed wastewater solution is fundamentally consistent with the ***IMP***. Wastewater is to be collected through a series of gravity sewers to a local pump station and conveyed to existing infrastructure. No new lands are required to support the proposed solution and all works remain within existing municipal owned right-of-ways.

The proposed wastewater solution is a Municipal Class Environmental Assessment A/B project. Where:

> *Schedule A:*
>
> *10. Establish, extend, or enlarge a sewage collection system and all necessary works to connect the system to an existing sewage outlet, where it is required as a condition of approval on a site plan, consent plan of subdivision or plan of condominium which will come into effect under the Planning Act prior to the construction of the collection system.*
>
> *Schedule B:*
>
> *7. Construct new pumping station or increase pumping station capacity by adding or replacing equipment and appurtenances, where new equipment is located in a new building or structure.*

1.5.3 Amendment to IMP Stormwater Plan

The ***IMP*** recommended three stormwater management ponds that discharge all runoff to the Grants Creek Wetland with pond outlets and inlets above 100year floodplain elevation. Ponds were to discharge into a linear drainage channel prior to flowing into the wetland. The ***IMP*** stated "a Hydrologic Impact Study would have to be conducted to demonstrate that there are no negative impacts on hydrologic function of the PSW as a result of the development." Furthermore, the ***IMP*** indicated that "a water balance for the subdivision as a whole will be required prior to applying for draft plan of subdivision." The ***IMP*** did not complete a grading

plan to support the proposed stormwater servicing solution. ***Appendix A*** includes Figure 6-4 extracted from the ***IMP*** along with DSEL's commentary.

The ***IMP's*** direction to establish pond inlets and outlets above the existing 100-year floodplain level is inconsistent with the province's ***SWMP Design Manual*** and would result in starting road grades approximately 4.5m above the existing ground resulting in a significant amount of fill required to support development.

The IMP recommended a stormwater management pond located within an area identified as wetland in ***EIS Report***.

Ponds appear to be undersized for controlling post development flow.

DSEL reviewed the ability to direct all post development runoff to the Grant's Creek Wetland and maintain no negative impacts on the hydraulic function of the provincially significant wetland. It was concluded that post development drainage areas that closely match the existing topography will aid in maintaining post development water balance and hydraulic function of both the wetland and the Tay River.

DSEL prepared a master grading plan for the community and delineated stormwater drainage areas. JFSA reviewed the pre-development flow patterns and estimated pond volumes based on post-development conditions. DSEL prepared preliminary pond layouts and estimated available storage volumes. Proposed solution includes three stormwater management ponds and two OGS outlets providing quality and quantity controls. Pond outlets are set in accordance with MECP design guidelines with outlets above the 2-year level. Site grading follows existing topography where possible. Proposed outlet to Tay River upstream of Water Treatment plant intake was reviewed with the RVCA and determined not to be a significant threat under the Source Water Protection plan. See ***Section 5.2*** for additional information.

The proposed stormwater solution is a Municipal Class Environmental Assessment A project. Where:

> *Schedule A:*
>
> *17. Construction of stormwater management facilities which are required as a condition of approval on a consent, site plan, plan of subdivision or condominium which will come into effect under the Planning Act prior to the construction of the facility.*

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 Existing Studies, Guidelines, and Reports

The following documents were referenced in the preparation of this report:

- **Ottawa Sewer Design Guidelines**,
  City of Ottawa, *SDG002,* October 2012.
  (City Standards)

  - **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-2018-03, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, March 21, 2018.
    (*ISTB-2018-03*)

  - **Technical Bulletin ISTB-2019-01, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, January, 2019.
    (*ISTB-2019-01*)

  - **Technical Bulletin ISTB-2019-02, Revisions to Ottawa Design Guidelines – Sewer,**
    City of Ottawa, July 8, 2019.
    (*ISTB-2019-02*)

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)

- **Stormwater Planning and Design Manual,**
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- **Ontario Building Code Compendium**
  Ministry of Municipal Affairs and Housing Building Development Branch,

January 1, 2010, Update.
(OBC)

- **Mississippi-Rideau Source Water Protection Plan,**
  MVCA & RVCA, August 2014.

- **Erosion & Sediment Control Guidelines for Urban Construction,**
  Greater Golden Horseshoe Area Conservation Authorities, December 2006.

- **Infrastructure Master Plan for Area North of Highway 7**
  Dillon Consulting, October 2013
  (HWY 7 IMP)

- **2016 Perth Potable Water Model Update**
  Stantec, October 12, 2016
  (Ex Water Conditions)

- **Memo – Reopen EA/Master Plan Area North of HWY 7 Water Review**
  Jp2G Consultants Inc, April 5, 2019
  (Jp2G Water Memo)

- **Infrastructure Master Plan, Western Annex in the Town of Perth**
  Jp2g Consultants Inc.***,*** November 2019.
  (IMP)

- **Perth Western Annex Lands – 141 Peter Street: Potable Water Hydraulic Analysis**
  Stantec, February 2023
  (Hydraulic Analysis)

- **Caivan Perth Development – Hydrologic and Hydraulic Conditions Report,**
  JFSA, February 2023
  (SWM Report)

- **Environmental Impact Study,**
  Kilgour and Associates, February 2023
  (EIS Report)

- **Geotechnical Investigation, Proposed Residential Development, 141 Peter Street, Perth, ON**
  Gemtech, February 3, 2023
  (Geotechnical Report)

- **Hydrogeological Investigation, Proposed Residential Development, 141 Peter Street, Perth ON**
  Gemtech, February 22, 2023
  (Hydro-G Report)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The proposed subdivision is located south of the Town's watermain network located in the Town of Perth. The existing watermains in proximity to the subject property are as follows:

- 75 mm diameter watermain via the Peter Street bridge (currently carries municipal drinking water for the existing golf course)
- 300 mm diameter watermain on North Street
- 300 mm diameter watermain on Rogers Road
- 300 mm diameter watermain on Sunset Boulevard
- 150 mm diameter watermain on Inverness Avenue

Excerpt from the ***Town of Perth IMP*** is included in ***Appendix B***.

DSEL obtained the existing conditions model of the water distribution system from the Town of Perth on May 20, 2021. The existing conditions model was prepared by Stantec Consulting Ltd in 2016.

According to the ***Ex Water Conditions report***, water supply to the Town is Water supply to the Town is drawn from the Tay River where it is treated at the Water Treatment Plant (WTP) on Sunset Boulevard. There are three (3) high lift pumps at the treatment plant (2 domestic pumps each rated at 105L/s and 54.9m TDH and 1 standby fire pump rated at 158L/s and 54.9m TDH). Additionally, there are three (3) low lift pumps at the treatment plant (1 rated at 105 L/s and 2 rated at 53 L/s).

The underground reservoir at the WTP provides approximately 2800 m^3 and the clearwell provides approximately 290 m^3 of storage. Additionally, the service wells provide another 261 m^3 of storage.

The elevated water storage tank located on Harvey Street has a volume of 945 m^3 with a useable volume of 800 m^3. The 100% full water level has an approximate metric geodetic elevation of 180.5m. The storage area inside the elevated tank is approximately 8.1m in height. The corresponding 0% full water level is roughly 172m. The water levels in the storage tank are maintained manually by Town personnel by the operation of the high lift pumps at the water treatment plant.

The ***IMP*** indicated that the total storage volume available is 3,745m^3

3.2 Water Supply Alternatives

DSEL reviewed the following alternatives to deliver potable water to the contemplated development.

As indicated in ***Section 1.3***, Town staff indicated a preference to hang new infrastructure from a bridge as opposed to open cut or directional drilling below the Tay River. As such, the following alternatives assumed all river crossings would be hung from a bridge or structure. As identified in ***Section 1.5.1***, watermain alignment to North Street is shown to take place

through privately held lands. Therefore, connections to North Street were assumed to take place via Peter Street / Lustre Lane.

Option 1 – Follow the preferred solution as recommended in the ***IMP*** with connections to Inverness Avenue and North Street. The Inverness connection involves crossing the Tay River with a 115m span, traversing County lands, establishing a servicing easement on County lands and between two existing homes, and replacing an existing watermain on Inverness Avenue. The proposed connection to Inverness Avenue is constrained by two existing homes and associated landscaping and mature trees. The span was measured as the narrowest distance across the Tay River's 100-year floodplain limit near the preferred alignment as identified in the ***IMP***.

Option 2 – Provide connections to the existing 300mm diameter main on Sunset Boulevard and the 300mm diameter main on North Street. The Sunset connection involves crossing the Tay River with a 115m span, traversing and establishing easements on County lands. The span was measured as the narrowest distance across the Tay River's 100-year floodplain limit near the preferred alignment as identified in the ***IMP***.

Option 3 – Recommended – Provide connections to the existing 300mm diameter main on North Street and the 300mm diameter main on Rogers Road. The mains are to be placed in separate trenches and hung from separate bridges crossing the Tay River. One main will be placed on the existing upgraded Peter Street Bridge. The second main to be placed on the new twin bridge at Peter Street. The recommended solution minimizes disruption to existing residents, does not require new lands or easements to be established, and avoids the need to construct and maintain a third Tay River water crossing.

3.3 Water Supply Servicing Design

The proposed subdivision will be serviced by a network of 150mm, 200mm and 300mm diameter watermains and a looped connection to the existing 300mm diameter main on North Street. ***Table 2*** summarizes the Water Supply Design Criteria used in preparation of the preliminary water demand estimates.

Table 2: Water Supply Design Criteria

Design Parameter	Value
Residential Single Family	3.8 P/unit
Residential Townhouse/Back-to-Back	3.5 P/unit
Residential Average Daily Demand	450 L/d/P
Residential Maximum Daily Demand	2 x Average Daily
Residential Maximum Hourly	2.2 x Maximum Daily
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.1 m from top of watermain to finished grade
During normal operating conditions pressure must not drop below	275 kPa
During normal operating conditions pressure must not exceed	550 kPa
During fire flow operating pressure must not drop below	140 kPa

Required Fire Flow Single Family**	7,000 L/min
Required Fire Flow Townhomes**	10,000 L/min
per Corporation of the Town of Perth – Engineering Design Guidelines* * Preliminary estimate to be reviewed at detailed design*	

Town of Perth Engineering Design Guidelines stipulate that fire flow requirements are to be established in accordance with the latest version of the Fire Underwriter's Survey (FUS). Where fire flow cannot be met the municipality will consider the minimum flows outlined within the Ministry of Environment "Guidelines for the Design of Water Distribution Systems." Stantec estimated required fire flows for the contemplated development per the ***FUS*** guidelines. See ***Appendix B*** for a copy of the ***Hydraulic Analysis***.

The proposed configuration of watermains for the subject property is shown in ***Figure 3***.

The ***Hydraulic Analysis*** reviewed a preliminary water distribution system to support the contemplated development. The analysis contemplated demands for the subject lands, Tayview development, and area North of highway 7. System pressure requirements are met across the entire development during average day and peak hour demands. The system was shown to provide fire flow in excess of 10,000L/min throughout. See ***Appendix B*** for a copy of the ***Hydraulic Analysis***.

3.4 Water Tower Expansion

The ***Hydraulic Analysis*** estimated required water storage for the complete buildout the Town of Perth envisioned in the ***IMP*** including the Western Annex lands, Tayview Development, and North of HWY 7 area. The estimated total required storage was ***6,557m³*** based on Town of Perth Engineering Design Guidelines. Therefore, the estimated storage expansion required is ***2,812m³***. Sizing of the storage facility is beyond the scope of this study.

Dillon Consulting Ltd was retained by the Town of Perth in 2010 to complete an Infrastructure Master Plan ***(HWY 7 IMP)*** for the area north of Highway 7 and east of Lanark Road. The Study was performed in accordance with the planning process defined in the Municipal Class Environmental Assessment. The Study concluded that a watermain network is needed throughout the study area including an elevated water storage tank to provide fire flow capacity in addition to balancing and contingency volume. The ***HWY 7 IMP*** recommended a new elevated storage tower with a capacity of 3,404m^3 and located north of highway 7 within a planned park block.

The Town of Perth retained JP2G Consultants Inc in 2019 to provide a general review of the existing watermain network within the Town of Perth. JP2G specifically reviewed the contemplated water tower requirement and location recommended by the ***HWY 7 IMP***. The HWY 7 IMP discounted the 2,800m3 available at the water treatment plan. JP2G indicated that the volume should be made available for use as fire water storage. JP2G reviewed two alternative locations for a new water tower; north of highway 7 and south of South Road. A water tower located north of highway 7 as planned in the HWY 7 IMP was anticipated to provide 139 L/s to 142 L/s (8,340 L/min to 8,520 L/min) of fire flow to the Golf Course lands. While a tower located south of the Town would provide 158 L/s to 163 L/s (9,480 L/min to 9,780 L/min) to the Golf Course lands. The JP2G report concluded that the current water tower and water plant is able to support the Town up to 7,230 people and recommended additional analysis to confirm plant upgrades and preferred tower location. Statistics Canada completed a census in 2021 and reported a population of 6,469, see ***Appendix C***.

The Town of Perth commissioned Watson and Associates Economists Ltd in 2021 to complete a Financial Plan in accordance with Water Ontario Regulation 453/07. Watson's financial plan forecasted a $4,750,700 expenditure in 2024 for a new elevated storage tank.

DSEL estimated population growth within the Town of Perth assuming 34 building permits per year from 2022 to 2025, increasing to 65 permits per year in 2025 (per permit data and forecasts provided by the Town). The Town's population could reach 7,191p by 2028. However, the Town's 2021 Drinking Water Summary report illustrates a reduction in water use from 2018 to 2021 (see ***Appendix C***). Therefore, further investigation is recommended to support the trigger to expand the Town's storage requirements.

3.5 Water Supply Conclusion

It is proposed to make two connections to the Town's existing water distribution system at North Street and Rogers Road. It is proposed to supply potable water to the development through a series of 150mm, 200mm, and 300mm diameter water mains. Stantec analysis indicates a minimum of 10,000L/min is available throughout the development. All system pressures are met during average day, peak hour, and fire flow scenarios.

The Town of Perth commissioned an Infrastructure Master Plan for the Area North of Highway 7 (***HWY 7 IMP***, Dillon October 2013), updates to their water model (***Ex Water Conditions***, Stantec 2016), review of water tower locations (***Jp2G Water Memo***, Jp2G April 2019), and an Infrastructure Master Plan for the Western Annex Lands (***IMP***, Jp2G November 2019). The studies commissioned by the Town indicated a need to increase water storage to support future development. The ***Jp2G Water Memo*** indicated that the Town can currently support an estimated population of 7,230 people. Statistic Canada completed a census in 2021 and reported a population of 6,469. The Town's 2021 Drinking Water Summary report illustrates a reduction in water use from 2018 to 2021. Recommend that further analysis and investigation to confirm triggers for establishing a new water tower.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The existing golf course facility is serviced through a small private pump station. The Peter Street bridge currently carries wastewater for the golf course through a 100 mm diameter sewer force main connected to Peter Street at Lustre Lane. Most of the Town of Perth, including the subject property, conveys wastewater to a pump station on Cockburn Street and Big Ben Trail, referred to as the Cockburn PS. This facility pumps wastewater to a 750mm diameter trunk sewer which ultimately discharges into the Perth Lagoon. Refer to ***Figure 4*** for an illustration of the Town's existing wastewater collection system.

Caivan engaged JD Barnes / OnSite Locates to complete an as-built survey of the existing sewers along Peter Street, Lewis Street, Beckwith Street East to the existing Cockburn PS. It was found that several sewers along the route to the existing Cockburn PS were installed below minimum grade and lack capacity to convey existing peak flows. Sewers along Ottawa Street, Rogers Road, and Jessie Street were also surveyed to review the as-built slopes and sizes. Sewer surveys are included in ***Appendix C***. The minimum residual capacity along the outlet is 92.9L/s between MHs 22 and 23 east of Rogers Road. Refer to calculation sheet in ***Appendix C***.

Stantec Consulting was retained to review the available capacity of the existing Cockburn PS. Limited information was made available to conduct their review. Their analysis was based on a site review conducted on June 14, 2021. Stantec found that the existing facility is at or near capacity. Should the contemplated development be directed to the Cockburn PS is was recommended to replace the two existing 30HP pumps with two new 45HP pumps and interconnecting the two 400mm forcemains to gain additional capacity to provide relief to existing flows. Refer to the technical memorandum included in ***Appendix C*** for additional information.

The Town of Perth is serviced by a sewage lagoon originally designed in 1961 for a population of 8,500 people (Proctor & Redfern, 1961). The system is comprised of three stabilization cells and a vacant dry cell, all covering an 80acre area. The Ministry of the Environment, Environmental Compliance Approval (ECA) 1045-6VTHH8 allows an annual average daily sewage flow of 7,718 m^3/day. See ***Appendix C*** for a copy of the ECA. ***Table 3*** summarizes average annual flow, annual rain fall, and lagoon capacity as a percentage. Annual flow averages from 2011 to 2013 were extracted from the ***IMP***. Town staff provided flow rates for the years 2018 to 2022 via email on November 25, 2022, see ***Appendix A*** for correspondence. Annual rainfall data was acquired from Environment Canada at Drummond Centre, approximately 14km from the Town of Perth. Lagoon capacity was taken as a percentage of the average daily flow over 7,718m^3/d specified on the ECA.

Table 3: Annual Average Lagoon Flow

Design Parameter	2011	2012	2013	2018	2019	2020	2021	2022
Avg Daily Flow (m^3/d)	6264	5042	5981	6639	6650	5454	4959	5085
Annual Rain (mm)	806	626.8	872.4	785	860.2	825.2	802.2	828.2
Lagoon Capacity (%)	80.5	64.8	76.9	85.3	85.5	70.1	63.7	65.4

The following was extracted from ***Amendment No.16*** to the ***Official Plan of the Town of Perth.***

> *'In 2017, the Town of Perth initiated a major upgrade of its lagoon system with the construction of a "Submerged Attached Growth Reactor (SAGR) – Phase 1". This major capital investment resulted in the treatment capacity of the lagoon increasing from 6,100 persons to 8,100 persons. Phase 2 of the SAGR project, which is planned and designed but not constructed, will bring the capacity to 10,500 persons. Phase 1 was commissioned in the fourth quarter of 2018.*
>
> *The Town has completed a servicing Master Plan to facilitate development in the northerly portion of the Town and has completed Phase I of the expansion of the sewage lagoon with a design population of 8,100. Phase II of the lagoon upgrade would establish a design population of 10,500, if needed.'*

Official Plan Amendment No.16 speaks to the lagoon capacity as a function of population while the ECA provides a unitary flow rate.

Statics Canada gathered census data in 2011, 2016, and 2021 during the monitoring periods. The reported population of Perth was 5,840 in 2011, 5,930 in 2016, and 6,469 in 2021. See census profiles in ***Appendix C***. As shown in ***Table 3***, while the highest reported population is in 2021, the lagoon was at 63.7% capacity. Furthermore, in 2011 the lagoon was at 80.5% capacity with 629 fewer people.

As discussed in the ***IMP***, the Town of Perth since 2007 has undergone an intensive wet weather flow reduction program. Town staff have indicated to DSEL that sewer rehabilitation projects in the Town have eliminated stretches of combined sewers. 2018 was the second driest in the monitored period it showed the lagoon at 85.3% capacity, 2019 was wetter than 2018, yet the capacity remained consistent. 2022 saw the third highest amount of annual rainfall in the monitored period while the lagoon was at third lowest capacity.

Town staff have indicated that industrial users of water have reduced since 2011 and may also explain the reduction in flows at the lagoon facility. Lagoon capacity analysis is further reviewed in ***Section 4.3***.

4.2 Wastewater Design Alternatives

DSEL reviewed the following alternatives to support development of the Golf Course Lands.

Option 1 – Follow the recommendations in the ***IMP***. The IMP recommended two wastewater pump stations with outlet to Inverness Avenue and North Street. It is Stantec's opinion that the cost of a new pump station was underestimated by a factor of 10. The connection to Inverness Avenue requires the establishment of a servicing easement between two existing homes along with upgrades to the existing local sanitary sewer. The second connection to North Street requires extensive upgrades to gravity sewers from the site to the Cockburn PS. Furthermore, upgrades to Cockburn PS would be required to accommodate additional flow. Option 1 was considered to be cost prohibitive and distributive to existing residents and was abandoned.

Option 2 – Single pump station directing wastewater to North Street per the ***IMP***. A connection to North Street requires extensive upgrades to gravity sewers from the site to the Cockburn PS. Furthermore, upgrades to Cockburn PS would be required to accommodate additional flow. Option 2 was considered to be cost prohibitive and distributive to existing residents and was abandoned.

Option 3 – Recommended - Single pump station directing wastewater to Roger Road at Jessie Drive. A proposed forcemain route down Rogers Road avoids disruption to the core of the Town of Perth and avoids the need to upgrade the Cockburn PS. DSEL verified available capacity at the Jessie Drive sanitary sewer to support the contemplated development. The proposed design alternative is fundamentally in keeping with the ***IMP*** and minimizes capacity and future maintenance cost.

4.3 Wastewater Design

The proposed development will consist of a network of gravity sanitary mains tributary to a new wastewater pump station located within the development area. This proposed pump station will outlet to Rogers Road at Jessie Drive. Refer to ***Figure 5*** for an illustration of the conceptual sewer layout. ***Figure 6*** illustrates the off-site forcemain routing to Jessie Drive. ***Figure 14*** illustrates preliminary sewer profiles.

The contemplated pump station will operate using Float Control within the duplex pump control panel, i.e., with no Programmable Logic Controller (PLC) (no SCADA controls are included).

The pump station design will provide the Town with the ability to remotely monitor the PS alarms using a basic cellular communication system. Critical station statuses (including high wetwell level, pump failure, power failure, generator failure, and generator running) will be communicated to the Town's WIN-911 alarm notification system.

A pre-fabricated control panel kiosk set on a reinforced concrete pad will house all required services to accommodate the pumping station, including electrical distribution equipment, automatic transfer switch, and duplex pump control panel.

The standby power generator is anticipated to be fueled by natural gas and housed within a sound attenuating enclosure set on a reinforced concrete slab.

In the event of pump station failure, the facility will overflow to stormwater management facility 2 where overflow sewage can be isolated.

Table 4 summarizes the wastewater design criteria used to calculate the existing sanitary flows and populations, per the ***Town of Perth IMP*** in accordance with the ***City of Ottawa Sewer Design Guidelines***. This study employs City of Ottawa design guidelines, including the latest technical memorandums for consistency with the ***Town of Perth IMP***.

Table 4: Wastewater Design Criteria

Design Parameter	Value
Average Daily Demand	280 L/d/per day
Peak Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Infiltration and Inflow Allowance	0.33 L/s/ha
Park Flows	9300 L/ha/d
Park Peak Factor	X1
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	250 mm diameter

Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.0 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa (including revisions per ISTB Sewer-2018-01)	

DSEL reviewed the available capacity of the receiving sewer at Rogers Road and Jessie Drive. The minimum residual capacity along the outlet is 92.9L/s. Refer to calculation sheet in ***Appendix C***. The full build out of the development is estimated to produce a peak flow of ***~42L/s*** based on ***City of Ottawa Sewer Design Guidelines***.

4.4 Lagoon Capacity

As indicated in ***Section 4.1***, the Town of Perth is serviced by an existing lagoon with a rated capacity of 7,718 m^3/day per Environmental Compliance Approval (ECA) 1045-6VTHH8. See ***Appendix C*** for a copy of the ECA.

DSEL delineated the service area to the Town's lagoons based on sewershed mapping provided by the Town and land use plan extracted from the Town's official plan. The estimated total area serviced by the lagoon is 771ha, including ROWs, industrial, park, residential, and commercial areas. See figure included in ***Appendix C***. The total service area includes the subject lands, but excludes vacant unserviced areas, and the Town's Landfill site.

The Town of Perth published a 2021 drinking water summary report. The drinking water summary provided average daily treated water volumes, extracted pages are included in ***Appendix C***. Town staff confirmed that there are no other significant contributors of drinking water other than the Town's water treatment plant. Therefore, it stands to reason that the delta between the measured flows at the lagoon and the treated water is from infiltration and inflow. ***Table 5*** summarizes the estimated infiltration and inflow contributions for the years 2018 to 2021.

Table 5: Estimated Infiltration and Inflow

Design Parameter	2018	2019	2020	2021
Avg Daily Flow (m^3/d)	6,639	6,650	5,454	4,959
Annual Rain (mm)	785	860.2	825.2	802.2
Lagoon Capacity (%)	85.3	85.5	70.1	63.7
Water Plant Flow (m^3/d)	3,072	3,011	2,896	2,787
I&I	3567	3639	2558	2172
Unit I&I (L/s/ha)	0.054	0.055	0.038	0.033

Table 6 summarizes a brief statistical analysis of the rainfall between the years 2018 and 2021.

Table 6: Rainfall Summary

Design Parameter	2018	2019	2020	2021
Total Annual	785	860.2	825.2	802.2
Max daily	58.4	50	49.2	47.8
Number of rain days	119	126	128	121
Rainfall greater than 5mm	43	46	46	43
Rainfall greater than 10mm	26	26	23	24

Rainfall greater than 20mm	9	11	8	12
Rainfall greater than 30mm	5	7	5	5

As discussed in ***Section 4.1***, the Town has continued advancing projects to reduce the amount of wet weather flow into the sewage system. As seen in ***Table 5***, there is a comparable amount of rainfall between the years 2019 and 2020. ***Table 6*** shows that the type of storm events is generally consistent between the years. However, there is a measurable drop in the estimated amount of extraneous flow. The reduction in extraneous flows continues to be observed in 2021. An average annual infiltration and inflow of 0.033L/s/ha was carried in the lagoon capacity analysis.

DSEL estimated the inflows to the lagoon using City of Ottawa design flows, 2022 census data to estimate population, service areas delineated from sewershed mapping and the Town's official plan, and the average annual infiltration rate indicated above. See ***Appendix C*** for detailed analysis. Note that 34.08ha of golf course lands are included in the existing service area. As such note the reduction in area in the existing Town of Perth is added to the Caivan (Perth CG) Ltd column. DSEL used monitored data collected in support of Caivan's development in the Village of Richmond to assess future contributions. The monitored data during Q3 of 2022 concluded that the average daily flow per person is ~170L/p/d, and found that annual infiltration rates are approximately 0.025L/s/ha.

The calculated flow for the existing Town of Perth is 5,864m^3/d. The estimated flow is significantly higher than the monitored flow at the plant. It is expected that the unit flow rates used in the analysis are over-estimating actual flows. Furthermore, it is understood that high water users in the industrial area are not operational or operating at a lower capacity. It was assumed that capacity would remain earmarked for industrial areas and as such a higher than monitored rate was carried in the analysis.

Town growth was considered to take place as infill developments or within other greenfield areas. The analysis assumes that the Town will issue approximately 34 building permits per year (year average) based on permit data provided by the Town. Once the Caivan (Perth CG) Ltd., Community begins, it is expected that a total of 75 permits per year would be issued, with 15 permits to infill and 50 permits to Caivan (Perth CG) Ltd.

The analysis shows that should all existing serviced industrial lands become active and the subject lands were to fully build out by 2044, the lagoon would be at 82% capacity. The predicted capacity is less than the lagoons experienced in 2018 and 2019 due to the continued advancement of extraneous flow reductions programs. Assuming monitored rates for the existing Town contributions the lagoon would be at 72% in 2044. Therefore, the subject lands do not trigger the need for a lagoon expansion and sufficient capacity remains in the system for the full buildout of the development while maintaining residual capacity for other growth areas within the Town.

4.5 Wastewater Servicing Conclusions

The subject property will be serviced by local sanitary sewers which will be serviced by single pump station and forcemain outletting to existing trunk sewers on Rogers Road at Jessie Drive. The receiving sewers on Roger's Road at Jessie Drive have sufficient capacity to accept wastewater from the development.

The Town's lagoon has sufficient capacity to accommodate the proposed development as well as future growth.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

The existing Golf Course contains a series of ditches outletting to the Tay River. There is no specific end of pipe treatment facilities within the golf course lands. The remaining undeveloped portions of lands do not contain any existing stormwater management infrastructure.

Stormwater runoff of the subject property is directed overland to the Tay River to the north and the Grant's Creek PSW to the south. ***Table 7*** summarizes the drainage rates tributary to the Tay River and Grants Creek PSW within the subject property. See the ***SWM Report*** prepared by JFSA for additional information and modelling parameters used to estimate the predevelopment flow rates.

Table 7: Pre-Development Drainage Conditions

Event	Predevelopment Tay River 22.86ha (m^3/s)	Predevelopment Grants Creek PSW 22.01ha (m^3/s)
25mmCH3hr	0.126	0.125
2yr 3hr Chicago	0.150	0.149
5yr 3hr Chicago	0.285	0.288
10yr 3hr Chicago	0.393	0.399
25yr 3hr Chicago	0.546	0.559
50yr 3hr Chicago	0.669	0.688
100yr 3hr Chicago	0.804	0.830
2yrSCS24hr	0.444	0.463
5yrSCS24hr	0.750	0.790
10yrSCS24hr	0.986	1.044
25yrSCS24hr	1.298	1.382
50yrSCS24hr	1.545	1.653
100yrSCS24hr	1.800	1.932

The Grants Creek PSW receives drainage from approximately 9,302.5ha according to the Ministry of Natural Resources and Forestry Ontario Watershed Information Tool. The subject lands pre-development area represents 0.2% of the total tributary area. See ***Image 1*** illustrating the tributary area to the Grants Creek PSW.

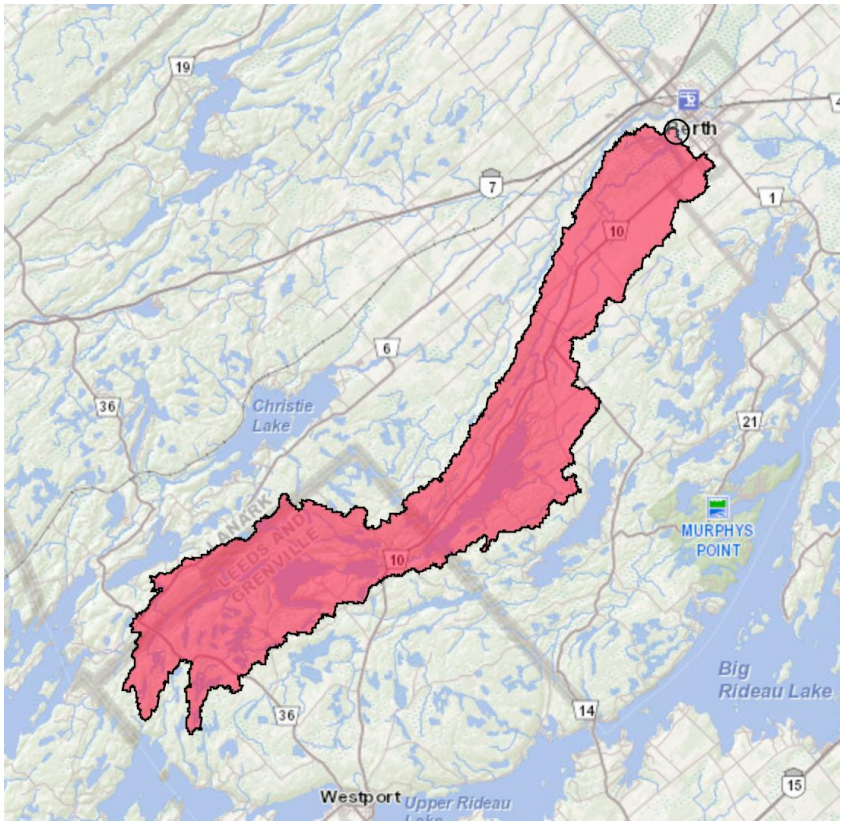


Image 1: OFAT Tributary Area of Grants Creek PSW

The ultimate receiver is the Tay River, capturing the stormwater flows immediately downstream of the study area. The total tributary area to the Tay River, immediately downstream of the development is 677.255km^2 (67,725.5ha). ***Image 2*** illustrates the tributary area to the Tay River downstream of the development. A small portion of the developed existing golf course facility drains to Grant Creek through ditch depressions with most of the facility draining to the Tay River. The subject lands contribute a total tributary area of 44.87ha at this location or 0.07%.

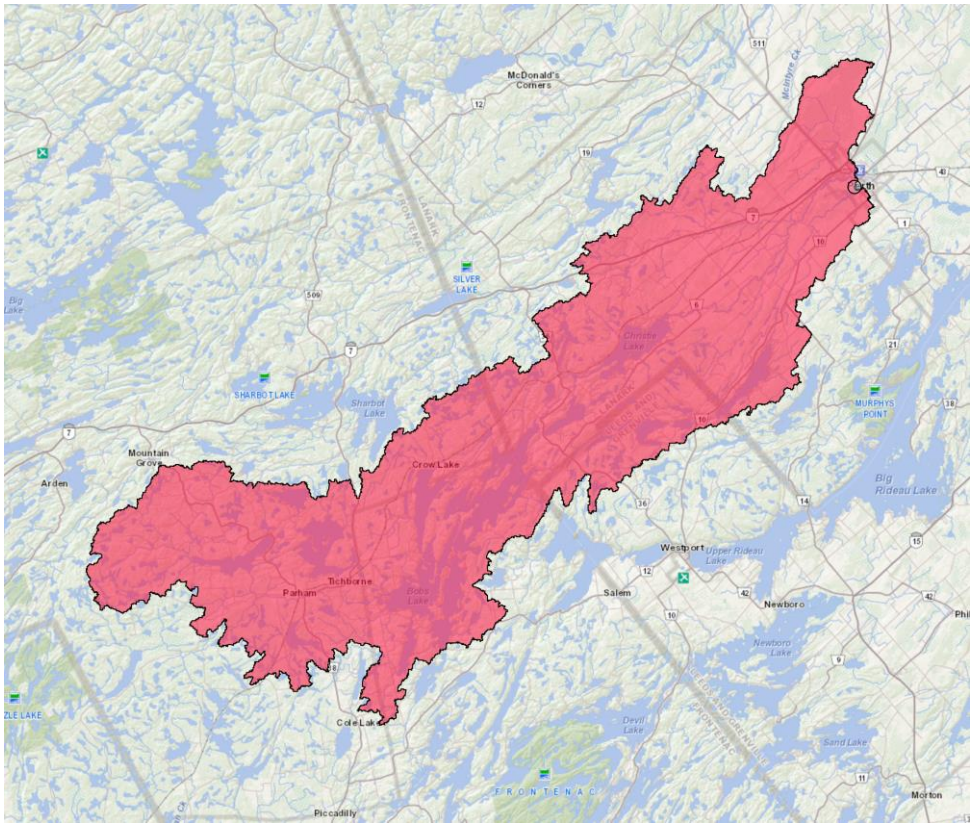


Image 2: OFAT Tributary Area to Tay River

A headwater drainage feature was identified within the western forested portion of the Golf Course lands which is the remains of a farm ditch that captures runoff from the adjacent farm property and from several on-site ditches.

5.2 Post-Development Stormwater Management Target

The Town of Perth and Rideau Valley Conservation Authority indicated that post-development flow rates cannot exceed pre-development flow rates, or demonstrate that the change in flow does not increase the risk of flooding. Therefore, the developed areas are to be assessed in both pre- and post- development conditions, and sufficient storage is provided to manage flows to the values indicated in ***Table 7***.

MECP Enhanced total suspended solids removal or better is required for runoff directed to the Tay River and Grants Creek PSW.

Stormwater management must incorporate low impact development measures to promote a treatment train approach in accordance with MECP guidelines.

The ***Town of Perth IMP*** has indicated that the drainage from the farm field must be maintained or improved, and runoff from future roadways shall not be directed to the existing drainage feature.

5.3 Stormwater Design Alternatives

Option 1 - Follow the recommendations in the ***IMP***. The IMP suggested pond operating water levels and inlets and outlets above the 100-year water level of Grants Creek Wetland. Therefore, active storage would take place 1m to 2m above the 100-year water level and road grades would be set 1.5m to 2.5m above the active storage level. Therefore, starting road grades would be up to 4.5m higher than existing ground elevations. Requiring a significant fill program with a rough estimate of ~1.5million cubic metres of fill to be imported. Furthermore, the ***EIS*** provided site constraints and defined wetland limits where the ***IMP*** ponds are located within areas identified as wetlands.

Option 2 – Recommended - Maintain the fundamental principles in the ***IMP***, with modifications to pond locations and operating water levels. The MECP design guidelines recommend establishing pond outlets above the 2-year water level of the receiving water course. DSEL reviewed the site's constraints and opportunities to assess preferred pond locations to optimize earthworks.

5.4 Proposed Minor System

The subject property is expected to be serviced by an internal gravity storm sewer system that is to generally follow the local road network and servicing easements as required. It is recommended to equipe homes with sump pumps, where appropriate, to reduce fill requirements.

DSEL reviewed strategic pond placements to optimize earthworks. As illustrated on ***Figure 7***, it is proposed to create two stormwater management ponds to discharge to the Tay River and one outletting to the Grant's Creek wetland. All ponds are contemplated as wet ponds per MECP design guidelines. Furthermore, it is recommended to service two smaller areas with a combination of low impact development measures and an end of pipe oil grit separators.

Runoff coefficients (C-values) are based on considering paved/roofed areas at C=0.90 and grassed areas at C=0.20. Summary figures of the imperviousness determinations are found in ***Drawings***. The pervious areas are highlighted, and the resultant imperviousness and runoff coefficients are summarized. As detailed design progresses, the runoff coefficient will be refined to reflect the proposed residential layouts, driveways and other details.

The ***Table 8*** below summarizes the standard that will be employed in the detailed design of the storm sewer network.

Table 8: Storm Sewer Design Criteria

Design Parameter	Value
Minimum Minor System Design Return Period	2-Year (Local Streets), 5-Year (Collector Streets), 10-Year (Arterial Streets) – PIEDTB-2016-01
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	$i = \frac{A}{(t_c + B)^C}$

5-year storm event: A = 998.071; B = 6.053; C = 0.814	
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
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)
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and Technical Bulletins	

5.5 Low Impact Development Measures

Gemtech was retained by Caivan to complete a Hydrogeological Investigation ***(Hydro-G Report)*** of the subject lands. They recommended, that in light of the high water tables and shallow bedrock across many portions of the site, modified Low Impact Development (LID) features should be considered (e.g., infiltration features with subdrains to allow for drainage during high groundwater conditions), increased soil thickness on lawns for increased storage/infiltration potential, LID features located in areas with proposed grade raises, etc.

Other examples of LIDs that can be incorporated into the development include catchbasins with infiltration trenches, rear-yard infiltration trenches, bioswales, direct roof runoff to lawns/parks, increasing thickness of topsoil (e.g., increase from the typical minimum of 15cm to 30cm to increase retention), rain gardens, permeable pavers, etc.

The Hydro-G Report noted that the potential reduction in infiltration or baseflow recharge post development will not impact the water volume contributions from groundwater currently sustaining the health or sustainability of the wetland. Noting that the water from the project Site is primarily being received by the wetland via overland processes or interflow pathways. Deeper groundwater pathways contributing to the wetland are likely limited by the clay base of the wetland and its low conductivity relative to its underlying materials.

Table 9 summarizes investigated lot level stormwater management practices. This includes methods that are applied at the individual lot level or form part of the conveyance system and can be for either storage or infiltration.

Table 9: Lot Level Treatment Systems Considered

Stormwater Management Practice	Description
Rain Barrel	Harvesting rainwater by capturing rooftop runoff by connecting roof leaders to 'barrels' for watering during periods of dry weather.
Cistern	Harvesting rainwater by capturing rooftop runoff and directing stormwater to an underground storage tank. Water is pumped for watering during dry periods.
Green Roof	Consist of a thin layer of vegetation and growing medium installed on top of a convention flat or sloped roof. Reduces the 'heat' island effect and reduces runoff volume.
Roof downspout disconnection	Roof downspouts are disconnected from the weeping tile and are directed to grass areas with options to include amended soils to promote runoff prevention.
Soakaway, infiltration trench or chamber	Rectangular or circular excavations lined with geotextile filter cloth and filled with clear stone designed to promote groundwater infiltration.
Bio-retention / Bio-filter	Consists of a filter bed consisting of a mixture of sand, soil, and organic material. Bio-retention facilities are designed to capture small storm events to retain and filter stormwater runoff. Plantings promote evapotranspiration.
Permeable pavement	An alternative to traditional impervious pavement to allow stormwater to drain through into an aggregate reservoir and infiltrate into the ground water.
Enhanced grass swale	Vegetated open channels designed to convey, treat, and attenuate stormwater runoff. Check

	dams and vegetation in the swale promote attenuation and infiltration.
Dry Swale	A dry swale incorporates an engineered soil medium and a perforated pipe under drain.
Perforated pipe system	Underground stormwater conveyance systems usually incorporated into the right-of-way drainage system (i.e. Infiltration trenches at catchbasins).
Catch Basin Shields™	A catch basin insert to promote deposition of sediment in the sump.

Residential subdivisions typically consist of urban right-of-way cross-sections and residential homes with peaked roofs.

As such the following measures were not considered:

- Cisterns – Would increase the cost of each home. Home owner would be responsible for maintaining the cisterns.
- Green Roofs – Not standard practice in residential homes. Would increase the cost of the home. Concerns for maintaining green roofs.
- Bio-retention / Bio-filter – not part of a typical right-of-way sections. Would increase right of way maintenance. Reduces space for utilities and would increase likelihood of conflicts.
- Permeable Pavement – not standard practice within municipal roads. Concerns with maintenance and pre-treatment of infiltrated water.
- Enhanced Grass Swale – Would have to take place in rear yards. It is anticipated that home owners will remove check dams.

It is recommended that the proposed subdivision will consist of the following:

- Roof Leaders to Grassed Areas with potential for incorporation of amended soils in areas where supplemental infiltration is desirable (i.e. in areas of higher rock elevations).
- Dry Swales.
- An education program to promote rain barrels.
- Perforated pipe system – placement of an exfiltration system at catch basins where subsurface conditions are suitable, i.e. depth to rock and groundwater.
- Catch Basin Shield – pre-treatment within all catch basins as is currently the practice in the Town of Perth.

5.6 Stormwater Management Facilities

Stormwater runoff will be treated and attenuated within three Wet Ponds per ***MECP Design Guidelines***. Two facilities will control and release stormwater to the Tay River, while one facility will discharge to the Grant's Creek PSW. Two areas will be treated and controlled

through the use of LIDs and an end of pipe OGS. ***Tables 10 and 11*** summarize pond storage characteristics for outlets to the Grants Creek Wetland and the Tay River.

Table 10: Stormwater Management Ponds – Grants PSW

	OGS 2 1.754ha		SWMF 2 14.566ha		Total 16.32ha	
	Outflow (m^3/s)	Storage (m^3)	Outflow (m^3/s)	Storage (m^3)	Outflow (m^3/s)	Storage (m^3)
Permanent Pool	0.0002	70	0.002	583	0.002	653
25mmCH3hr	0.012	185	0.112	1,538	0.125	1,723
2yr 3hr Chicago	0.016	212	0.133	1,762	0.149	1,974
5yr 3hr Chicago	0.031	288	0.257	2,396	0.288	2,684
10yr 3hr Chicago	0.043	339	0.356	2,812	0.399	3,151
25yr 3hr Chicago	0.060	406	0.499	3,367	0.559	3,773
50yr 3hr Chicago	0.074	454	0.614	3,769	0.688	4,223
100yr 3hr Chicago	0.089	503	0.741	4,175	0.830	4,678
2yrSCS24hr	0.044	342	0.364	2,842	0.408	3,184
5yrSCS24hr	0.072	448	0.600	3,719	0.672	4,167
10yrSCS24hr	0.099	515	0.819	4,280	0.918	4,795
25yrSCS24hr	0.149	581	1.233	4,828	1.382	5,409
50yrSCS24hr	0.178	631	1.474	5,243	1.652	5,874
100yrSCS24hr	0.207	682	1.723	6,661	1.930	6,343

Table 11: Stormwater Management Ponds – Tay River

	OGS 1 1.353ha		SWMF 1 11.26ha		SWMF 2 15.931ha		Total 28.544ha	
	Outflow (m^3/s)	Storage (m^3)	Outflow (m^3/s)	Storage (m^3)	Outflow (m^3/s)	Storage (m^3)	Outflow (m^3/s)	Storage (m^3)
Permanent Pool	0.000	54	0.001	450	0.002	637	0.003	1,141
25mmCH3hr	0.006	158	0.050	1,319	0.070	1,866	0.126	3,343
2yr 3hr Chicago	0.007	185	0.059	1,540	0.084	2,178	0.150	3,903
5yr 3hr Chicago	0.014	251	0.112	2,088	0.159	2,954	0.285	5,293
10yr 3hr Chicago	0.019	294	0.155	2,451	0.219	3,466	0.393	6,211
25yr 3hr Chicago	0.026	354	0.215	2,943	0.305	4,156	0.546	7,453
50yr 3hr Chicago	0.032	400	0.264	3,325	0.373	4,698	0.669	8,423
100yr 3hr Chicago	0.038	444	0.317	3,697	0.449	5,221	0.804	9,362
2yrSCS24hr	0.021	301	0.175	2,504	0.248	3,528	0.444	6,333
5yrSCS24hr	0.036	402	0.296	3,343	0.419	4,713	0.749	8,458
10yrSCS24hr	0.047	466	0.389	3,875	0.550	5,462	0.986	9,803
25yrSCS24hr	0.062	539	0.512	4,487	0.724	6,326	1.298	11,352
50yrSCS24hr	0.073	594	0.609	4,944	0.862	6,962	1.545	12,500
100yrSCS24hr	0.085	649	0.710	5,402	1.005	7,610	1.800	13,661

Refer to the ***SWM Report***, prepared by JFSA for additional information regarding the estimation of pond volumes.

DSEL reviewed the available storage volumes within each pond block. ***Table 12*** summarizes the available and required pond volumes.

Table 12: Pre-Development Drainage Conditions

Location	Required Volume (m^3)	Available Volume (m^3)
Pond 1	5,402	8,329
Pond 2	5,661	14,273
Pond 3	7,610	16,205

As indicated above, each pond block is sufficiently sized to accommodate the required volume.

5.7 Hydraulic Grade Line Analysis

A detailed hydraulic grade line (HGL) modelling analysis will be completed for the proposed system at the detailed design level, based on the 100-year 3-hour Chicago, 12-hour DCD, and 24-hour SCS design storms, including historical design storms and climate change stress test as required.

5.8 Major System Design

The major system flows will be conveyed through the internal road network where the 100-year event will be captured by required 100-year inlets prior to discharge to the proposed SWM Ponds where they are managed for quality/quantity control prior to release to the Tay River and Grant's Creek PSW. Major events in excess of the 100-year event will outlet to the Tay River or Grant's Creek PSW.

The major system will be designed in accordance with the amendment to the storm sewer and stormwater management elements of the ***Ottawa Sewer Design Guidelines (Technical Bulletin PIEDTB-2016-01)***.

5.9 Grading and Drainage Design

The conceptual grading design shown in ***Figure 10*** includes a saw-toothed-road design with 0.15% minimum grade from highpoint to highpoint in order to maximize available surface storage for management of flows up to the 100-year design event where possible. The proposed site grading has been developed to optimize earthworks and provide major system conveyance to the end-of-line facilities.

The ***Geotechnical Report*** indicated that the site is underlain by native deposits of weather silty clay crust, silty sand, and glacial till. Based on the borehole information there are no grade raise restrictions at the site.

DSEL completed preliminary earthworks and rock removal estimates. With consideration of top soil re-use as non-structural fill and rock bulking, the site is anticipated to generally balance. See ***Figures 11*** and ***12*** for details.

It is anticipated that rear yards abutting the Tay River and Grants Creek Wetland will drain into those features and will not be captured in the stormwater conveyance system.

5.10 Floodplain Compensation

The proposed development concept plan requires the rationalization of the existing floodplain boundary. The floodplain boundary illustrated on the attached figures was plotted by JFSA using the elevations established by the RVCA against the topography flown for the subject lands.

Figure 13 illustrates areas to be filled in shades of blue and compensation areas shown in shades of red. Note that some areas of filling are not represented in any colour, those areas have existing ground elevations are within 0.02m of the floodplain.

The area of cut was selected to avoid cutting into sensitive wetland areas.

5.11 Stormwater Servicing Conclusions

The contemplated stormwater management system will maintain predevelopment peak flows to the Tay River and Grants Creek PSW. A treatment train approach will be incorporated where Low Impact Development measures will be implemented upstream of end of pipe treatment facilities. The end of pipe treatment facilities will consist of wet ponds designed to achieve Enhanced quality control removal of suspended solids per ***MECP Design Guidelines***.

6.0 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 during construction where vegetation has been removed and the top layer of soil becomes agitated. Prior to topsoil stripping, earthworks or construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fencing will be installed around the perimeter of the active part of the site (and headwater features) and will be cleaned and maintained throughout construction. The silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catchbasins will have catchbasin inserts installed during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access to prevent mud tracking onto adjacent roads.

The following additional recommendations to the contractor will be included in contract documents:

- Limit extent of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from entering any existing ditches.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps and basins during dewatering.

The contractor will be required to complete regular inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and change inserts at catch basins.

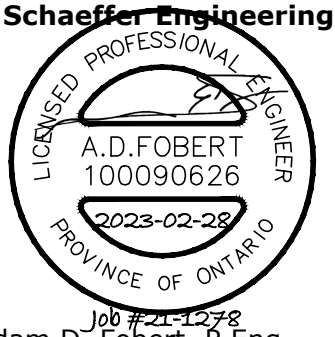
7.0 CONCLUSION AND RECOMMENDATIONS

David Schaeffer Engineering Ltd. (DSEL) has been retained by Caivan (Perth GC) Limited to prepare a Preliminary Functional Servicing Report in support of the application for draft plan of subdivision in the Town of Perth. The preceding report outlines the following:

- ***Water*** – It is proposed to make two connections to the Town's existing water distribution system at North Street and Rogers Road. It is proposed to supply potable water to the development through a series of 150mm, 200mm, and 300mm diameter water mains. A minimum of 10,000L/min is available throughout the development. All system pressures are met during average day, peak hour, and fire flow scenarios. Recommend that further analysis and investigation to confirm triggers for establishing a new water tower.
- ***Wastewater*** – The subject property will be serviced by local sanitary sewers which will be serviced by single pump station and forcemain outletting to existing trunk sewers on Rogers Road at Jessie Drive. The receiving sewers on Roger's Road at Jessie Drive have sufficient capacity to accept wastewater from the development. The Town's lagoon has sufficient capacity to accommodate the proposed development as well as future growth.
- **Stormwater** – The contemplated stormwater management system will outlet to the Tay River and the Grants Creek PSW with predevelopment peak flows maintained. Low Impact Development measures will be implemented upstream of end of pipe treatment facilities which will consist of wet ponds that are to be designed to provide quality control treatment to achieve an enhanced level of protection. A detailed Hydraulic Grade Line (HGL) modelling analysis will be completed for the proposed system at the detailed design stage.

The submitted materials demonstrate that the existing water, sanitary, and storm services can accommodate the contemplated development.

Prepared by,
David Schaeffer Engineering Ltd.

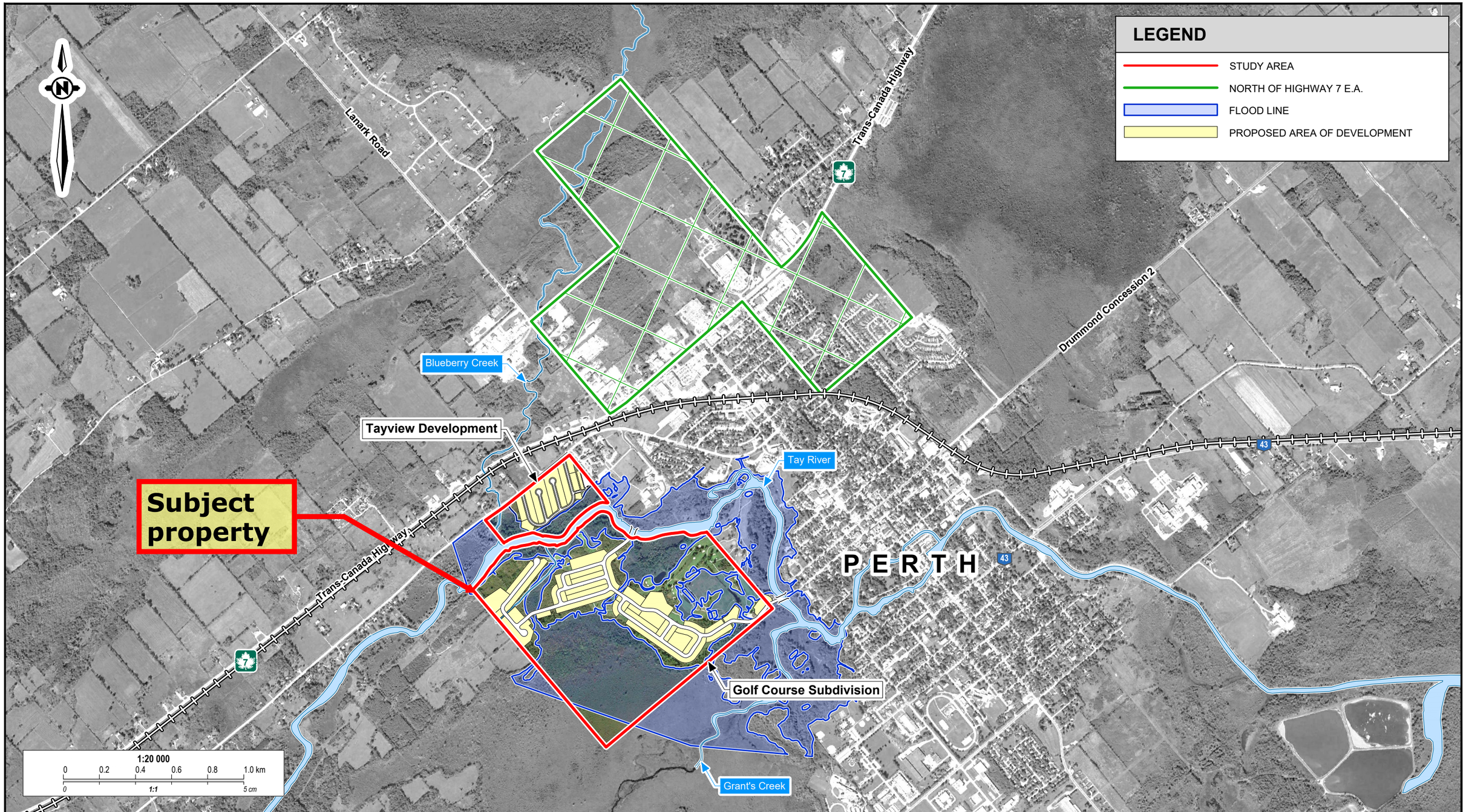


Per: Adam D. Fobert, P.Eng.

z:\projects\21-1278_caivan-perth\b_design\b3_reports\b3-2_servicing (dsel)\02_fsr_subm2\2023-02-28_1278_caivan_perth_fsr.docx

APPENDIX A

Pre-Consultation



Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

12 INTERNATIONAL DRIVE, PEMBROKE, ON
Phone: (613)735-2507, Fax:(613)735-4513

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON
Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Study Area

DESIGNED: D.N. / K.M.		PROJECT No.: 2161774A	
DRAFTED: R.W.		REVISION DATE: 2019-11-05	
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE: **1-1**	

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 1.1 - study plan.dwg | Layout: community concept plan | Print date: 11:08 AM November 27, 2019

Figure 21 Western Annex Lands Community Master Plan

TOWN OF PERTH

AGENDA

DEVELOPMENT DISCUSSION TEAM (DDT) MEETING

Held: 10:30 a.m., Thursday, November 25, 2021

Location: Virtual/Zoom

https://us06web.zoom.us/j/82631800479?pwd=NnN4K2tkRjRYM1dzK1pEelhCV2lndz09

First Meeting of the DDT Regarding the Golf Course Lands – Development

1 **Call meeting to order –** Director of Development Services

2 **Introductions –** Director of Development Services

3 **Presentation –** CAIVAN Team

4 **Planning –** Director of Development Services

5 **Engineering –** Director Environmental Services

Traffic/Roads:

Services:

6 **Building –** Chief Building Official

7 **Fire –** Fire Chief

8 **Community Services –** Director of Community Services

9 **Rideau Valley Conservation Authority –** Planner RVCA

10 **Lanark County –** County Planner

11 **Approval Strategy and Process for Offsite Infrastructure**

12 **Perth Golf Capital Projects and Upcoming DC By-Law update**

13 **Closing Comments**

Adam Fobert

From: Julie Stewart <jstewart@lanarkcounty.ca>
Sent: February 11, 2022 3:56 PM
To: 'De Santi, Nadia'; Hugo Lalonde; Marc Pichette; christopher.gordon@cghtransportation.com; john.kingsley@cghtransportation.com; Adam Fobert; Jocelyn Chandler; alex.meacoe@gemtec.ca; shaun.pelkey@gemtec.ca; Anthony Francis
Cc: tracy@zanderplan.com; gmachan@perth.ca; Trevor Choffe; Shannon Baillon; Michael Touw; Phil Mosher; Terry McCann; Sean Derouin; Kurt Greaves; Jasmin Ralph; Michelle Mahon
Subject: Perth Golf Course Lands Proposed Development - Caivan
Attachments: Minutes of Meeting January 14, 2022.pdf; Pre-consultation Subdivision Checklist Perth Golf Course January 2022.pdf; Compiled list of Other Information - Studies - Reports Perth Golf Course January 2022 .pdf

Hi Nadia, Kyle and Hugo

Please find the following attached:

- Pre-Consultation Meeting Minute Notes - January 14, 2022
- Pre-Consultation Checklist
- Compiled list of Other Information / Studies / Report Requirements (from County of Lanark, Town of Perth, RVCA)

Please feel free to forward to the members of your team whom I may have missed.

Thank you,
Julie

Julie Stewart, MCIP RPP
County Planner
99 Christie Lake Road
Perth, ON K7H 3C6
(613)267-4200 ext. 1520
jstewart@lanarkcounty.ca
www.lanarkcounty.ca

Pre-Consultation Meeting Notes - Perth Golf Course - Caivan

Virtual zoom meeting – January 14, 2022

In Attendance

Julie Stewart, Lanark County
Michelle Mahon, Lanark County
Terry McCann, Lanark County
Adam Fobert, David Schaeffer Engineering Ltd
Kyle Larmour, WSP
Christopher Gordon, CGH- Transport
John Kingsley, CGH Transport
Marc Pichette, DSEL Civil
Phil Mosher, RVCA
Sarah Macloed-Neilson, RVCA
Jocelyn Chandler, DSEL
Nadia De Santi, WSP
Grant Machan, Town of Perth
Trevor Choffe, Town of Perth
Michael Touw, Town of Perth
Brian Gass, Town of Perth
Tracy Zander, Representing Perth
Hugo Lalonde, Caivan

Hugo introduced the project, in summary:

- Potential of re-purposing existing clubhouse.
- Recognize the 9 hole golf course and the original 3 holes.
- A mix of single-family homes, townhouses and back to back townhouses are proposed.
- 650-800 units will be phased.
- Referred to current studies underway.
- Phase 1 within OP residential designation.

Julie Stewart added the County is proposing to initiate the review of population projections later in 2022, as per County Council's commitment to review in 5 years.

Tracy Zander asked if the studies and reports are for the whole site as a Master Plan ?

Hugo stated that the reports will address the site as a whole.

Town and County staff will coordinate the list of required studies/reports for submission and will provide the compiled list.

Christopher Gordon, looking for the previous traffic study.

Grant noted that he will see if he can obtain a copy and provide to CGH.

Terry McCann mentioned design work would be required where the road reaches the County property because of the existing buildings and parking lot. Setbacks to be addressed.

The road is also located within Tay Valley so coordination would have to happen with the Town, County and Tay Valley. Terry McCann is the main contact.

Hugo noted that the locations on the concept plan were derived from the Infrastructure Master Plan. They can revisit alignment as part of the traffic impact study

Shannon Baillon will forward the proposed extension of the Tay River trail system as pedestrian crossing which will have to be incorporated into the road design.

Nadia proposed bi-weekly meetings with the hope of submission in February, which Town and County staff will discuss availability

Adam Fober provided an update on the engineering work and that they are working with Stantec to update the IMP. In summary, proposing 3 stormwater management ponds, examining capacity and a water model.

Grant noted the need for a conversation around contributions required for an elevated water tower as well as the Town's plan for an expansion of the lagoon with the 5th SAGR system. Town staff can work with the civil engineers.

Nadia mentioned some discrepancies with the OP mapping.

Julie will coordinate a meeting with the Planners to discuss the Official Plan mapping and policies.

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist – Perth Golf Course

Report	Comments	Required Yes/No
Planning Rationale	Include justification Must have regard for PPS Lanark County Official Plan compatibility Local Official Plan compatibility Address OPA # 16	Yes Yes Yes Yes Yes
Hydrogeological Study, Terrain Analysis	Availability and suitability of water and waste water MOE – D-5-4 Guidelines MOE – D-5-5 Guidelines ODWSOG Checklist Summary & Sign-off Integrated Hydrologic Impact Assessment	Public Yes Yes
Environment Impact Study	SAR & Significant Habitat Wetlands Organic Soils Natural Heritage Features & Systems Significant Wetlands Significant Woodlands Significant Valleylands Significant Wildlife ANSI Fish Habitat Headwater Drainage Feature Assessment	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Servicing Options Statement	Guidelines – MOE D-5-3	Yes
Stormwater Drainage Plan	Guidelines - MOE-2003 / MNR-2001 Checklist Summary & Sign-off	Yes
Grading Plan	Sloping land within lot to direct flow of surface water away from foundations & abutting properties.	Yes

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist – Perth Golf Course

Report	Comments	Required Yes/No
Sediment and Erosion Control Hazardous Sites	Flooding, erosion hazard Slope and Soil Stability Organic Soils Karst Topography	Yes Yes Yes
Archeological Investigation	Standards & Guidelines	Yes
Tree Preservation Plan or Tree Conservation Plan	Check with local municipality	
Other	**SEE ATTACHED Compiled List of Other Information / Study / Report Requirements**	
Draft Plan	To include: Planning Act 50(17) Ont. Reg. 544/06 Lot and block configuration Compatibility with adjacent uses Road access, street layout & Pedestrian amenities Parks & Open Space amenities Easement and right-of-way requirements	Yes

Compiled list of Other Information / Study / Report Requirements for the Perth Golf Course Lands

(Refer to the Standard County of Lanark Pre-Consultation Checklist as well)
Prepared By: County of Lanark and Town of Perth and RVCA

January 2022

Master Plan for the entire development.
Master Plan should include phasing plans and details of phases.

Bridge Assessment / Capacity Study

- impacts and review of capacity for existing Peter St bridge.
- consideration of alternate bridge on North St with traffic flows off of Peter Street, migration of lights from Foster St or potentially west into Tay Valley connecting to Ernest Way.
- triggers for 2nd bridge
- access to Tay Valley lands.
- Location, design and setbacks on County lands and use of existing County driveway and parking area.
- Developer to evaluate the crossing and determine when such would be required.
- Any proposed hydraulic analysis on a potential bridge will include demonstration of no impact to upstream water levels or the creation of adverse impacts. This would include, but not be limited to, not affecting the function of the Haggart flow split as well as the WSC gauge at Perth.

Water Supply (Provision of water supply)

- triggers and requirements for new elevated water tank
- improvements to pumping capacity at WTP

Stormwater design

- confirmation of minimal ponds
- outfalls downstream of WTP Intake Protection Zone
- Demonstrate low impact development measures which prioritize a treatment train approach in accordance with the MECP Stormwater Manual
- Confirmation of enhanced water quality treatment or better

Sanitary

- upfront installation
- triggers for capacity at wastewater treatment facility (when to construct 5th cell)

Cultural Heritage Assessment for the Golf Course.

Geotechnical Study

Integrated Hydrological Impact Assessment

– to provide a water budget and runoff volume and water quality control targets

- maintain all aspects of the site's natural hydrological functions (storage, retention, infiltration, evapotranspiration, filtration, flow to wetland, etc.)
- This approach should result in a LID / Green Infrastructure approach to stormwater servicing resulting in a distributed treatment train approach.
- Legitimate constraints (shallow bedrock, contaminated areas, natural features, etc.) should be documented
- Runoff volume retention method is recommended
-

Environmental

A constraints map, using information derived from relevant reports/studies, should be one of the first things produced.

Floodplain

- All development is to be located outside the floodplain as per provincial policy. If the proposed work would question the accuracy or validity of the floodline, further discussion should occur regarding appropriate approach to be used.
-

Wetlands

Fish Habitat

EIS

Hydrological Impact Statement or hydrological investigations

Water budget

- all environmental studies should be integrated in a holistic manner

Headwater Drainage Features Assessment

Significance of woodland should be considered and evaluated

The Infrastructure Master Plan made specific mention of a tree preservation plan

Reference to the meeting minutes from the Town of Perth and the County of Lanark and the Standard County of Lanark Checklist is required.

Adam Fobert

From: Grant Machan <gmachan@perth.ca>
Sent: March 14, 2022 2:23 PM
To: Adam Fobert
Subject: Re: 1278 Caivan - Perth: Western Lands

My superintendent will be giving you call about these items. re-lit fire on topic.

Grant Machan CET
Director of Environmental Services
gmachan@perth.ca
613-267-3311 ex2233

From: Adam Fobert <AFobert@dsel.ca>
Sent: March 14, 2022 12:04
To: Grant Machan <gmachan@perth.ca>
Cc: Chochlinski, Gregory <gregory.chochlinski@stantec.com>; Mineault-Guitard, Alexandre <Alexandre.Mineault-Guitard@stantec.com>
Subject: RE: 1278 Caivan - Perth: Western Lands

Hello Grant,

Just following up on the email below and our meeting. You had mentioned during our meeting that one of your staff was working on assembling some of the background information. Has that been sent over? Perhaps it hasn't been forwarded to me on our end.

In particular Stantec are looking for:

- Which firm is the Town using for SCADA programming/development.
- Excerpt's from an existing pump station owner's manual.
- Identify town's preference for backup power generator supplier.

Also, we discussed that our report is to identify triggers for lagoon expansion. We've come across two sets of population densities in previously published works. The IMP appears to be using City of Ottawa guidelines for p/unit, while OPA 16 used 1.87p/unit for all unit types. Can you please confirm which we should be using?

Feel free to call to discuss.

Adam Fobert, P.Eng.
DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626

cell: (613) 222-9493
email: afobert@DSEL.ca

From: Adam Fobert
Sent: March 1, 2022 11:55 AM
To: 'Grant Machan' <gmachan@perth.ca>
Cc: 'Chochlinski, Gregory' <gregory.chochlinski@stantec.com>; 'Mineault-Guitard, Alexandre' <Alexandre.Mineault-Guitard@stantec.com>
Subject: RE: 1278 Caivan - Perth: Western Lands

Hello Grant,

Thank you for meeting with us on Feb 18. We prepared some meeting notes for both our files.

Let me know if you have any comments on the notes.

Note that there are a few items that Stantec are looking to obtain from you.

Adam Fobert, P.Eng.

DSEL

david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

-----Original Appointment-----
From: Grant Machan <gmachan@perth.ca>
Sent: February 18, 2022 10:44 AM
To: Adam Fobert
Subject: Accepted: 1278 Caivan - Perth: Western Lands
When: February 18, 2022 1:30 PM-2:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Zoom

Are you able to send graphics/concepts to support the discussion?

David Schaeffer Engineering Ltd.
120 Iber Road, Suite 103
Stittsville, ON K2S 1E9
613-836-0856
dsel.ca

MEETING NOTES

DATE: 2022-02-18
1:30 PM – Zoom Meeting

SUBJECT: 21-1278 Caivan - Perth

IN ATTENDANCE:	Adam Fobert (AF)	DSEL
	Gregory Chochlinski (GC)	Stantec
	Alexandre Mineault-Guitard (AMG)	Stantec
	Grant Machan (GM)	Town of Perth

Note: The following meeting notes represent the writer's interpretation of the meeting. As such, any errors or omissions must be reported to this office immediately. All comments are to be provided within 5 business days; otherwise, they are deemed acceptable by all.

ITEM	DESCRIPTION
1.	GM – Town of Perth advancing with the upgrades to Highway 7, which will include improvements to the water and sanitary. The town will be identifying a site for the Highway 7 water tower as part of that process but will not be sizing a facility. This work has been awarded to Mac Perry.
2.	Information provided regarding the Pump Station: • The facility will include a control building to house the electrical panel. • There will be no washroom in the building. • Building will tie into surrounding architecture and will be equipped with an exterior alarm light. • Facility to have both SCADA system and automatic cellular dialer. There will be no staff 24/7 monitoring SCADA. • GM to confirm which firm is used for SCADA programming/development. • GM to provide Stantec with an excerpt from the owner's manual of an existing facility that in their opinion runs well. • Preference is to have the pump selection be interchangeable with the other facilities. • Facility will be designed with a by-pass chamber to facilitate future maintenance. • Permanent Natural Gas stand-by generator will be used. • GM to confirm if they have a preferred backup generator.

	• GM – Roger Road Crossing tender was awarded last week. The town wants to investigate hanging the forcemain from the bridge. Stantec to send preliminary information for coordination of Roger's Road / Tay River Crossing. • The overflow from the pump station will be to the proposed stormwater pond.
3.	Information provided regarding the water services: • Existing conditions model was completed in 2016. • No significant changes or improvement have been made to the system since 2016. Design can start with the 2016 model as the base. • 160 Bed Retirement Home planned at Sunset Blvd. and Lanark County Admin Building to be added.

Prepared by,

David Schaeffer Engineering Ltd.
Per: Adam Fobert, P. Eng.

Adam Fobert

From: De Santi, Nadia <Nadia.De-Santi@wsp.com>
Sent: October 12, 2022 4:11 PM
To: jbowes@perth.ca; mtouw@perth.ca; gmachan@perth.ca; Julie Stewart; glen.mcdonald@rvca.ca
Cc: Susan Murphy; Hugo Lalonde; Colin Haskin; Erik Derks; Ferguson, Erin; Christopher Gordon; John Kingsley; Adam Fobert; 'Jocelyn Chandler'
Subject: Meeting Minutes - Caivan - 141 Peter St. - Draft Plan of Subdivision
Attachments: Meeting Minutes Town of Perth September 16 2022.pdf

Hello everyone,

Thank you again for meeting with us on September 16, 2022.

Please find attached the Meeting Minutes. If there are any errors or omissions, please advise by end of day, Wednesday, Oct. 19, 2022.

Thank you.

Regards,

Nadia De Santi, MCIP, RPP
Practice Lead
Urban and Community Planning

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WSP Canada Inc.
2611 Queensview Drive, Suite 300
Ottawa, Ontario, K2B 8K2

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Meeting Minutes

Meeting/Project Name	Review Comments & Resubmission Requirements Re: Application for Draft Plan of Subdivision Approval for Perth Golf Course Lands, County of Lanark File No. 09-T-22001		
Date of Meeting	September 16, 2022	**Time**	10:00 am to 12:00 pm
Location	Sunshine Room, Town of Perth Municipal Office at 80 Gore Street East and virtual via Zoom		
Minutes Prepared By	Erin Ferguson (WSP). Minutes Reviewed by Hugo Lalonde and Colin Haskin (Caivan).		

Attendees

Town of Perth: Michael Touw (Chief Administrative Officer), Joanna Bowes (Director of Development Services), Grant Machan (Director of Environmental Services)

Lanark County: Julie Stewart (County Planner)

Rideau Valley Conservation Authority: Glen McDonald (Director of Science and Planning) via Zoom

Caivan: Susan Murphy (Vice President of Land Development), Hugo Lalonde (Director of Land Development), Colin Haskin (Manager of Land Development), Erik Derks (Land Development Coordinator) via Zoom

Consulting Team: Adam Fobert (Senior Design Engineer with David Schaeffer Engineering Ltd), Christopher Gordon (Engineer with CGH Transportation), John Kingsley (EIT with CGH Transportation) via Zoom, Jocelyn Chandler (Land and Water Resource Planner with J.F. Sabourin and Associates Inc.) via Zoom, Nadia De Santi (Practice Lead with WSP), Erin Ferguson (Senior Planner with WSP) via Zoom

Agenda Items, Discussion, Actions

Topic	Discussion
1. Introductions	Nadia De Santi opened the meeting and round table introductions were made. It was noted that Colin is the main contact at Caivan for day-to-day project coordination.
2. Overview of Draft Plan of Subdivision and Project Design Brief	Hugo Lalonde gave a brief overview of the draft plan of subdivision and development master plan including the project rationale, pre-application discussions, design features, and key issues. ○ Draft Plan of Subdivision is 30 acres of residential, parks, roadways, pump station consistent with OP policies ○ There are 30 acres on Town's OP is designated as Residential, largely consistent with draft subdivision plan area but slight differences in the boundaries ○ Development is outside of environmentally sensitive wetlands and floodplain ○ At this point the plan is to retain a 9 hole golf course and renovate the clubhouse, potentially expanding commercial uses

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2611 Queensview Drive , Ottawa, ON, Canada K2B 8K2
T: +1 613 829-2800
wsp.com

	○ High quality parks as shown on the plan and connected through trail network, and there will also be connection to the Tay River Trail. Park in Phase 1 is seen as a gateway feature. Caivan would build the parks ○ Proposed blocks and lots are reflective of Caivan's approach in Ottawa with a 21 m lot depth and 3 m front yard setback ○ Street cross-sections are 24 m, 18.5 m and 16.75 m following the policy direction of Town's OP ○ Peter St bridge will service Phase 1 with later phases triggering a second crossing that will likely tie into the County property as identified in the IMP
Working Strategy Going Forward	○ Caivan's approach has been to complete pre-consultation and extensive due diligence to inform the development of this site. Town of Perth has provided commitments during these discussions. Caivan is acting on the Town's planning and engineering work done through the past OPA and IMP to present a plan that provides residential growth and sustains the historic downtown and the local businesses. This was presented to and received buy-in from Council. ○ Caivan acknowledged that is a difficult site to develop due to existing environmental constraints, and considerable offsite and external work to be done but that Caivan is committed to working together with the Town to move forward. Caivan is excited to be in Perth. ○ Agreement from those in attendance that this is a cooperative exercise. Today is about gaining clarity, need to set up some smaller working sessions related to different components of the plan going forward, but the group needs to reconvene prior to next submission as an integrated planned approach is required
Floodplain Mapping Clarification	○ Glen asked about the Tay River floodplain mapping. ○ Jocelyn explained that LIDAR data was collected and it was run through RVCA's model to generate the new floodplain boundary ○ Glen stated some pinch points with floodplain line and roads were identified on the draft plan of subdivision – the dotted line. Jocelyn advised that these will be addressed through a volumetric cut and fill approach and it is anticipated that this will be minor. ○ Julie asked if the floodplain line was surveyed. Jocelyn replied it was not, but ground survey work will be done as part of the application for cut and fill. LIDAR is very accurate so the difference between that and ground survey will be minimal **JFSA (Jocelyn) to resend map showing minor floodplain boundary changes to the RVCA, County, and Town by Sept. 30, 2022**
3. Questions on Review Comments	
Servicing	○ Adam requested clarification on one of the Town's circulation comments on the downtown intensification infrastructure work. Town indicated that there is no update on the infrastructure master plan. Michael advised that this work hasn't begun but it is still in the works under the current 2022-2026 Strategic Plan, which was recently approved by Council. Grant confirmed that it is the Town's intention to do a full IMP for the Town owned, infill, and brownfield sites.

	○ Adam gave an overview of servicing plans and reported that the work done to date indicates there is sufficient capacity available and is consistent with the past discussions with the Town regarding the servicing of the Western Annex Lands. Currently, DSEL is working with Caivan on identifying a metric to indicate when expansion would be triggered, and they are looking at historical population and permit data. Asked which metric the Town wants to see (eg. population, units, flow). ○ Town indicated that they do not have a specified metric. Grant uses a volumetric metric. Town wants to see phases for servicing requirements to look at the capacity of the Town lands overall and want to see this information ahead of time for infrastructure planning purposes but indicated that an onsite system is an option that wouldn't affect the Town's infrastructure planning/timeline. ○ Relating to the suggestion that an on-site sanitary treatment system should be explored, Adam noted that based on his exploration of these systems in other projects, the operational costs are quite high and the approval logistics are challenging as it triggers a Schedule C project, discharging upstream likely not great for residents. He suggested that additional offsite improvements would likely be more financially viable for the Town rather than an onsite system. ○ Grant clarified that the on-site system was simply a brainstorming idea and does not reflect what is recommended in the IMP, nor is it the desired strategy from the Town's perspective for the Western Annex Lands. Grant further acknowledged that Caivan requires allocation commitments from the Town for Phase 1 and beyond before proceeding with the development. ○ Hugo indicated that DSEL has been tasked to do the technical work on phasing and lagoon capacity. Caivan anticipates starting construction in 2025/26 with the first building permits and then occupancy. Hugo stated that Caivan and the Town can work out an appropriate allocation that works for the Town and gives Caivan the security to move forward. Caivan and the Town of Perth could look at a flow monitoring program as part of the allocation strategy. ○ Grant commented on how to maximize the 5th cell. Council didn't approve the 5th cell. ○ Hugo stated that with DSEL, they will look at an appropriate allocation for Phase 1 with the Town so that some development can occur and keep capacity for others too. There are tools that can be explored through the draft subdivision conditions. ○ Adam Fobert expressed concern with connection to Inverness in IMP as it would run between two homes and significantly impact these properties. Alternate solution is preferred and would potentially benefit seniors home and wouldn't affect water pressure. Town not opposed to the proposed alternate solution and acknowledged the limitations of the connection shown in IMP. ○ Grant Machan shared that planned redesign and improvements for Highway 7 will be oversized. ○ DSEL confirmed that no additional fire flow is needed for Phase 1. Town asked to confirm trigger point for tank and contingency plan. ○ Town noted that looping will be required to resolve bottleneck between Phase 1 and 2. WM looping strategy will need to be defined and reflected on the Draft Plan.
Transportation	○ Chris Gordon reported that transportation planning has followed the IMP and noted that traffic volume is not a constraint for Phase 1. The Peter Street Bridge has adequate capacity to handle the anticipated traffic volume for initial development

	phases but later phases will trigger the need for an additional crossing. Monitoring, including changes in travel patterns, following occupancy will give a better indication of the appropriate timing for the second bridge. ○ Chris advised that HP Engineering has been retained and has confirmed that the bridge structure can support construction and emergency vehicle traffic. The Memo also outlines potential Bridge enhancements for 10 to 20 years. HP's Memo will be included in the resubmission. Additionally, Caivan is exploring options to address active transportation/pedestrian connections and will bring this forward in the next submission. **Caivan/WSP to provide Town with bridge structural capacity information and will present options for providing pedestrian connection to the development at the Peter Street crossing.** ○ Joanna expressed that they have major concerns with the single bridge particularly related to emergency response access. There are also concerns about the timeframe or trigger for second bridge should the next phases of development not proceed. The Town is firm that a second bridge crossing is needed to support this development and stated that there are Official Plan policies related to this requirement and that more detail on the second access needs to be provided upfront with this application to ensure the health and safety of future residents. Joanna also confirmed that Peter Street is a truck route. ○ In relation to the proposed location of the second crossing, the Town noted that the road is used by the County but it is a private road and that although it appears in IMP, other jurisdictions may not have reviewed the proposed crossing. The adjacent Townships didn't participate in the Town's IMP even though the second crossing is proposed to run through multiple municipalities. **Julie said that she can reach out to the Township contacts and County.** ○ Hugo acknowledged that they are aware it isn't a public ROW and more coordinated work will need to be done to determine how this will work. Caivan followed guidance of the IMP re: second bridge location. ○ Town confirmed that the second crossing is not included in their 4-year infrastructure plans ○ Julie stated that the second access needs to be thought out more clearly. ○ Sue asked if the Town has plans to do the EA for the second bridge crossing. ○ Grant confirmed that the Town is not currently planning for an EA for the second bridge.
Parks and Open Space	○ Town indicated that they need to do more work to determine the parks and open space needs for the community. ○ Grant would like to see the stormwater ponds designed to be incorporated in parks and openspace network, no fences. Caivan confirmed that this is part of their plans to integrate the ponds into the parks and trails network. ○ It was confirmed that the Town does not have a Parks and Open Space Master Plan.

	○ Grant also would like to see where the onsite parking would be located for the parks and open space. **Town to involve Community Services in review/working sessions on parks and open space needs. Caivan and Town to work cooperatively with cost effective designs to minimize maintenance and to not overload Town resources.** **Caivan to include Blocks for pathways on the draft plan of subdivision for the resubmission.**
Update on EIS and Integrated Hydrological Assessment	○ It was acknowledged that the environmental studies were not complete given the time of year when Caivan submitted. Once the field monitoring program is finished and the data is analyzed, the studies will be completed and provided as part of the next submissions. ○ Jocelyn acknowledged that more work needs to be done on EIS and they are waiting until ground and surface water monitoring is done to complete EIS. ○ Integrated Hydrological Assessment will help Caivan determine if LIDs are appropriate or not in terms of ensuring water balance model will sustain wetlands **Caivan/WSP to submit completed EIS and Integrated Hydrological Assessment with next submission**
Heritage Impact Assessment Update	○ Town has not yet initiated the peer review
Application Status	○ County deemed the application complete but Joanna said more information was required to properly review the application.
Boundary Adjustment Interpretation	○ Nadia presented the rationale that the draft plan of subdivision is largely consistent with the Residential designation boundary in the OP, that the OP boundaries do not appear to reflect specific features and that the adjustment results in no net gain of residential lands therefore our planning opinion is that this can be done without OPA as per policy statement ○ Julie and Joanna indicated that they don't share this opinion and OPA is required. The Residential designation boundary is tied to previous OPAs, it is not considered to be a minor boundary adjustment. Stated that other lands designated as a Special Study Area not Future Development and that there are other components in OP that guide development of these lands. ○ Nadia sought direction on policies that would prevent development from moving forward. Joanna referred to servicing allocation and land use policies. Joanna indicated that she hasn't done a boundary adjustment before and that an OPA has to be done. Hugo indicated that Caivan is not opposed to doing an OPA. Nadia also said that the more detailed studies will be provided in the next submission and this will also help with the PPS policies and other comments that were provided by the Town. Hugo suggested having a separate meeting on the OPA and this was agreed upon as the best way to move forward before filing an OPA application. ○ Joanna confirmed that a zoning by-law amendment should be done in advance not as a condition of subdivision approval as there is no indication of density, unit mix, or affordable housing. Town requested further information on proposed uses and density to be able to understand the development and determine if it is appropriate. Joanna also

	indicated that affordable housing will need to be discussed. Caivan are exploring the affordable housing comments. Caivan indicated that there will be a variety of housing to meet different needs, and there will be a range of small to large lot singles. ○ Joanna stated that she didn't think Perth will be accepting of Ottawa housing types. Sue indicated that Caivan has developed a farmhouse style single design that can be shared with the Town. Sue offered a tour of the Ottawa Caivan sites for Town staff. Joanna would like to see the sites in person. Sue also indicated that Caivan can present their architectural package to the Town to show the different housing styles, materials, etc.
Street Cross-sections	○ Town acknowledges that the proposed road cross-sections are consistent with OP and that they do not have additional street specifications, but they have concerns with the functionality of the proposed 16.75 m and 18.5 m ROW in relation to parking and snow clearing ○ Town noted that as shown in the cross-sections in the Urban Design Brief, with a 3 m front setback a car will not fit in the driveway and will be parked within the ROW, across the sidewalk or trying to park in the space between the sidewalk and curb. Hugo confirmed that it is not Caivan's intention to have easements in the public r-o-w, and that the cross-sections don't reflect this properly. ○ Joanna commented that the 16.75 m is in the OP and the Town can't challenge Caivan on this. However, the Town will be looking to change this r-o-w in the new OP review. ○ Grant advised that this is pickup truck land. Hugo said that there would be housing options with double car garages and double driveway widths. ○ Caivan indicated that they can provide a parking plan to demonstrate how parking with driveway widths and on-street parking can work. ○ **Caivan to provide street cross-sections for reduced width ROWs approved for Ottawa showing that parking, snow clearing, and emergency vehicle manoeuvring can work for Town's review.** ○ Town suggested alternating on-street parking locations for traffic calming. ○ Joanna mentioned that there is no public transit. People are commuting out too. ○ Grant advised that the Town would like to see alternate parking on driveways and streets.
Additional Studies	○ Cavian is seeking clarification on the additional studies requested by the Town. Town indicated that study requirements can be discussed further and that some of the previously listed studies might not be required. **Caivan to draft an expanded table of contents for the revised FSR for the Town's review to see if it addresses the Town's requirements.** ○ Nadia mentioned that the Neighbourhood-Servicing Use Study and the Public Services Capacity Study are not applicable since the OP policies for these studies refer to institutional type of development which isn't being proposed by Caivan. Grant wasn't aware of these studies. **Joanna will confirm whether these are needed by Oct. 5, 2022.**
Closing Remarks	○ Grant to follow-up with Adam re servicing

	○ Hugo requested clarity on process requirements for draft subdivision approval, registration and servicing but Town indicated that these are being developed and are not yet in place. **Julie advised that the County's process will be shared.** ○ Chris reiterated that they have relied on the IMP which indicated that a North Street crossing was not considered due to perceived traffic impacts but asked if Town would consider exploration of this option. Town confirmed that they are open to Caivan exploring this option but that it would likely require lights and could have a domino effect. ○ John asked where the R-O-Ws are as it isn't clear from the County maps. Julie advised that the County lands are in Tay Valley Township. The County's Administrative Office share lands with Tay Valley and with the Township of Drummond. **Julie can provide Chris and John with the County's Public Works Department contact.** ○ Nadia asked who should be the primary point of contact as we move forward. Joanna confirmed that she should be the contact for the smaller working group meetings, including discussions on the OPA where the County would be invited to. Julie should be the point of contact to coordinate the larger group meetings with the Town and the RVCA.

Adam Fobert

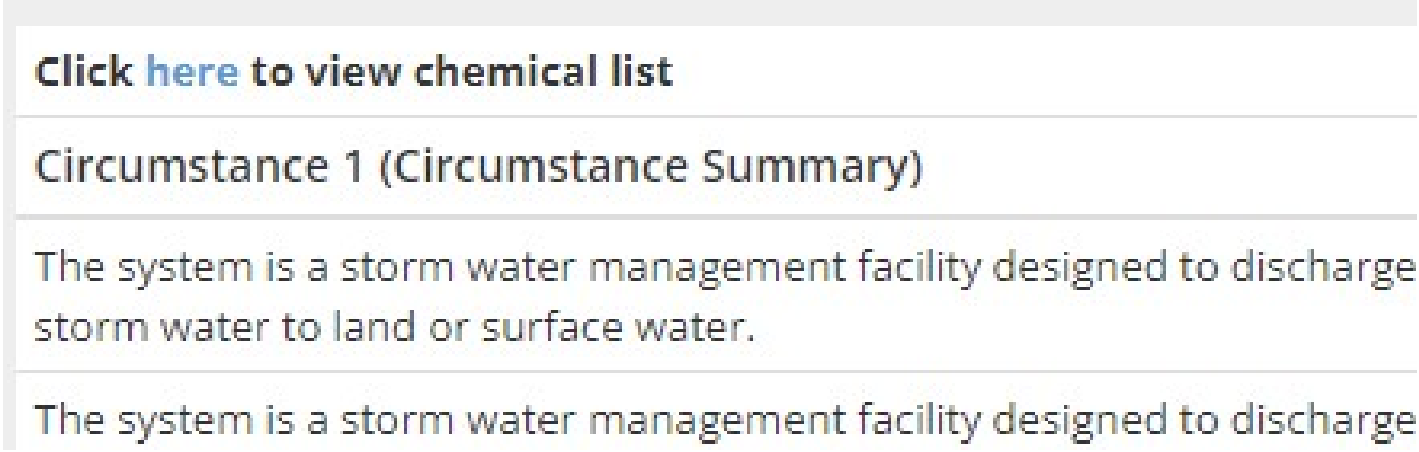
From: Marika Livingston <marika.livingston@mrsourcewater.ca>
Sent: November 18, 2022 10:04 AM
To: Jocelyn Chandler; Brian Stratton; Adam Fobert
Subject: RE: SWP Perth

Hi there,

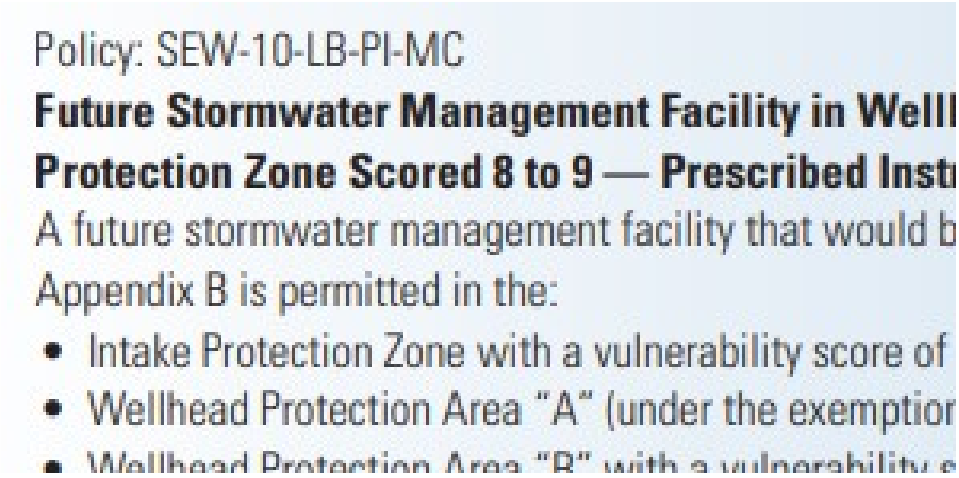
Great to meet you both this morning.

I know I committed to only touching base if something changes, but here is just a quick summary email.

The circumstances for a stormwater pond or outlet to be a significant drinking water threat are:



The policy that applies if the threat (SWM) meets the circumstances is:



However, I don't think the development meets the circumstances since I don't believe the development is over 100 hectares, in which case the Ministry shouldn't put any Source Water components in the ECA.

Thanks,

Marika

From: Jocelyn Chandler <jchandler@jfsa.com>
Sent: Friday, November 18, 2022 9:27 AM
To: Marika Livingston <marika.livingston@mrsourcewater.ca>; Brian Stratton <brian.stratton@mrsourcewater.ca>; Adam Fobert <AFobert@dsel.ca>
Subject: RE: SWP Perth

Hi Marika, I just sent you and invite for 930. We can chat and see if we can get what we need without Brian and then follow up later. J

Jocelyn Chandler, M.Pl., RPP, MCIP (she/her)
Land and Water Resource Planner / Project Manager
Cell.: 613-371-5242 | Email: jchandler@jfsa.com

From: Marika Livingston <marika.livingston@mrsourcewater.ca>
Sent: November 18, 2022 9:23 AM
To: Jocelyn Chandler <jchandler@jfsa.com>; Brian Stratton <brian.stratton@mrsourcewater.ca>; Adam Fobert <AFobert@dsel.ca>
Subject: RE: SWP Perth

Hello Jocelyn,

Can you please update me on this meeting. I have just returned from Holidays. Also, please be advised that Brian is away today.

Thanks,
Marika

-----Original Appointment-----
From: Jocelyn Chandler <jchandler@jfsa.com>
Sent: Friday, November 18, 2022 9:22 AM
To: Brian Stratton; Adam Fobert; Marika Livingston
Subject: SWP Perth
When: Friday, November 18, 2022 9:30 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Microsoft Teams meeting

Join on your computer, mobile app or room device

Click here to join the meeting

Meeting ID: 235 715 214 65
Passcode: tJFBnL

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**** Caution : External Email /// Attention : Courriel externe ****

Adam Fobert

From: Adam Fobert
Sent: November 30, 2022 2:13 PM
To: 'Grant Machan'
Cc: Hugo Lalonde; 'Colin Haskin'
Subject: RE: rough format- actual flow numbers
Attachments: san-2022-11-30_1278_projections.xlsx

Hello Grant,

Thank you for the additional flow data below.

I downloaded and reviewed the rain fall data from Environment Canada. Nearest station to Perth is Drummond, which is 14km away from the town Centre. Interestingly enough, 2018 experienced less rain than in 2021, however more wastewater flow was observed. I've highlighted 2022 since we have an incomplete rainfall data set.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Avg Daily Flow (m3/d)	6264	5042	5981					6639	6650	5454
Annual Rain (mm)	806	626.8	872.4					785	860.2	825.2
Lagoon Capacity	80.5	64.8	76.9					85.3	85.5	70.1

While 2019 was significantly wetter than 2018, there was only a small increase in lagoon flow.

We reviewed the rainfall data sets for the years between 2018 and 2021 to better understand the flow monitoring results.

Rainfall Analysis

	2018	2019	2020	2021
Total Annual	785	860.2	825.2	802.2
Max daily	58.4	50	49.2	47.8
Number of rain days	119	126	128	121
Rainfall greater than 5mm	43	46	46	43
Rainfall greater than 10mm	26	26	23	24
Rainfall greater than 20mm	9	11	8	12
Rainfall greater than 30mm	5	7	5	5

2019 had the highest annual rainfall, most number of rainy days, and more significant rain events than 2018, 2020, and 2021. Rain events between 2019 and 2020 are comparable, while the lagoon saw a 1,196m3/d drop in daily average flow. This could be attributed to change in water use at the outset of COVID.

Has the Town continued its efforts to reduce wastewater inflows to the lagoons between 2018 and 2021?

Do you have data for 2014 to 2017?

I've attached our projection analysis as well as the rain analysis I've described above. Let me know if you would like to discuss.

Adam Fobert, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

direct: (613) 845-2105
cell: (613) 222-9493
email: afobert@DSEL.ca

***** NOTE UPDATED PHONE NUMBER *****

From: Grant Machan <gmachan@perth.ca>
Sent: November 25, 2022 11:41 AM
To: Adam Fobert <AFobert@dsel.ca>
Subject: rough format- actual flow numbers

Year	2018	2019	2020
Avg Daily Flow (m3)	6639	6650	5454
% Capacity	86%	86%	71%

Grant Machan CET
Director of Environmental Services
gmachan@perth.ca
613-267-3311 ex2233

Blueberry Creek

Lands controlled by the County

Tayview Development

Sunset Boulevard

Wilson Street W

Remove/replace existing main and re-connect existing homes

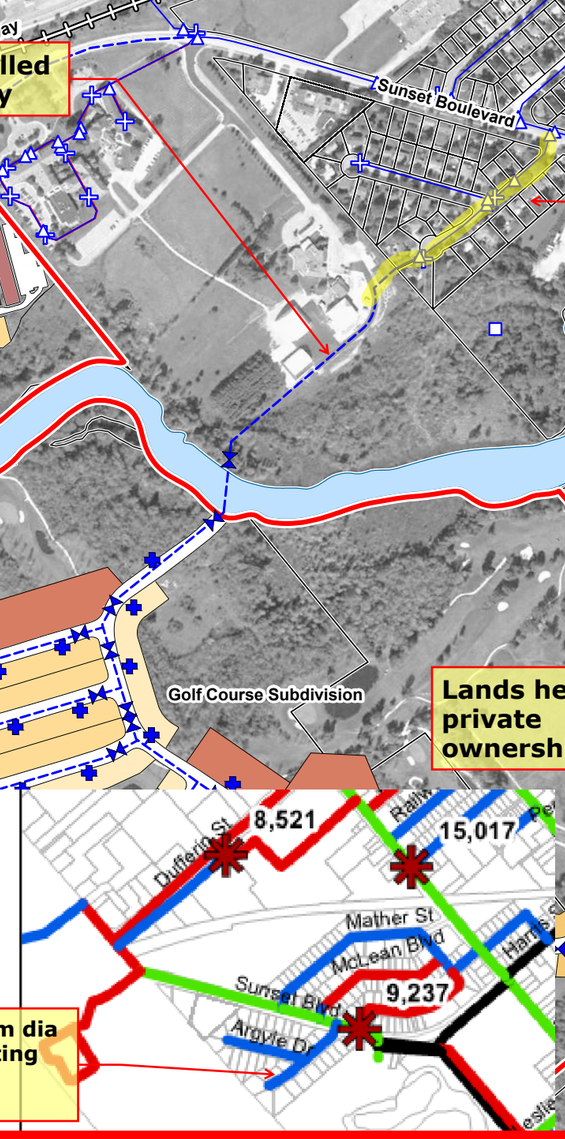
Tay River

North Street

Peter Street

Golf Course Subdivision

Lands held in private ownership

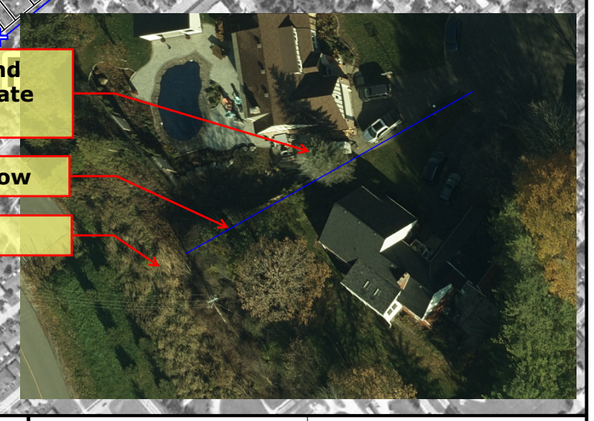


existing 150mm dia main. No existing connection to County lands.

Loss of trees and impacts to private landscaping

Loss of hedge row

Loss of trees



Grant's Creek

LEGEND

- STUDY AREA
- EXISTING WATERMAIN
- EXISTING WATER REDUCER
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- PROPOSED WATERMAIN
- PROPOSED WATER VALVE
- PROPOSED WATER HYDRANT
- AREA OF PROPOSED DEVELOPMENT
- WATERBODY

1:7 500
0 50 100 200 300 m
0 1:1 5 cm

Extract from 2016 Water Model Update

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

12 INTERNATIONAL DRIVE, PEMBROKE, ON
Phone: (613)735-2507, Fax:(613)735-4513

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON
Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Water Distribution Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	6-3

ServiceOntario

PRINTED ON 11 OCT, 2022 AT 10:47:53
FOR CHRISTOPHERF

SCALE

0 30 meters

PROPERTY INDEX MAP

LANARK(No. 27)

LEGEND

FREEHOLD PROPERTY	
LEASEHOLD PROPERTY	
LIMITED INTEREST PROPERTY	
CONDOMINIUM PROPERTY	
RETIRED PIN (MAP UPDATE PENDING)	
PROPERTY NUMBER	*0449*
BLOCK NUMBER	**08050**
GEOGRAPHIC FABRIC	
EASEMENT	

THIS IS NOT A PLAN OF SURVEY

NOTES

REVIEW THE TITLE RECORDS FOR COMPLETE PROPERTY INFORMATION AS THIS MAP MAY NOT REFLECT RECENT REGISTRATIONS

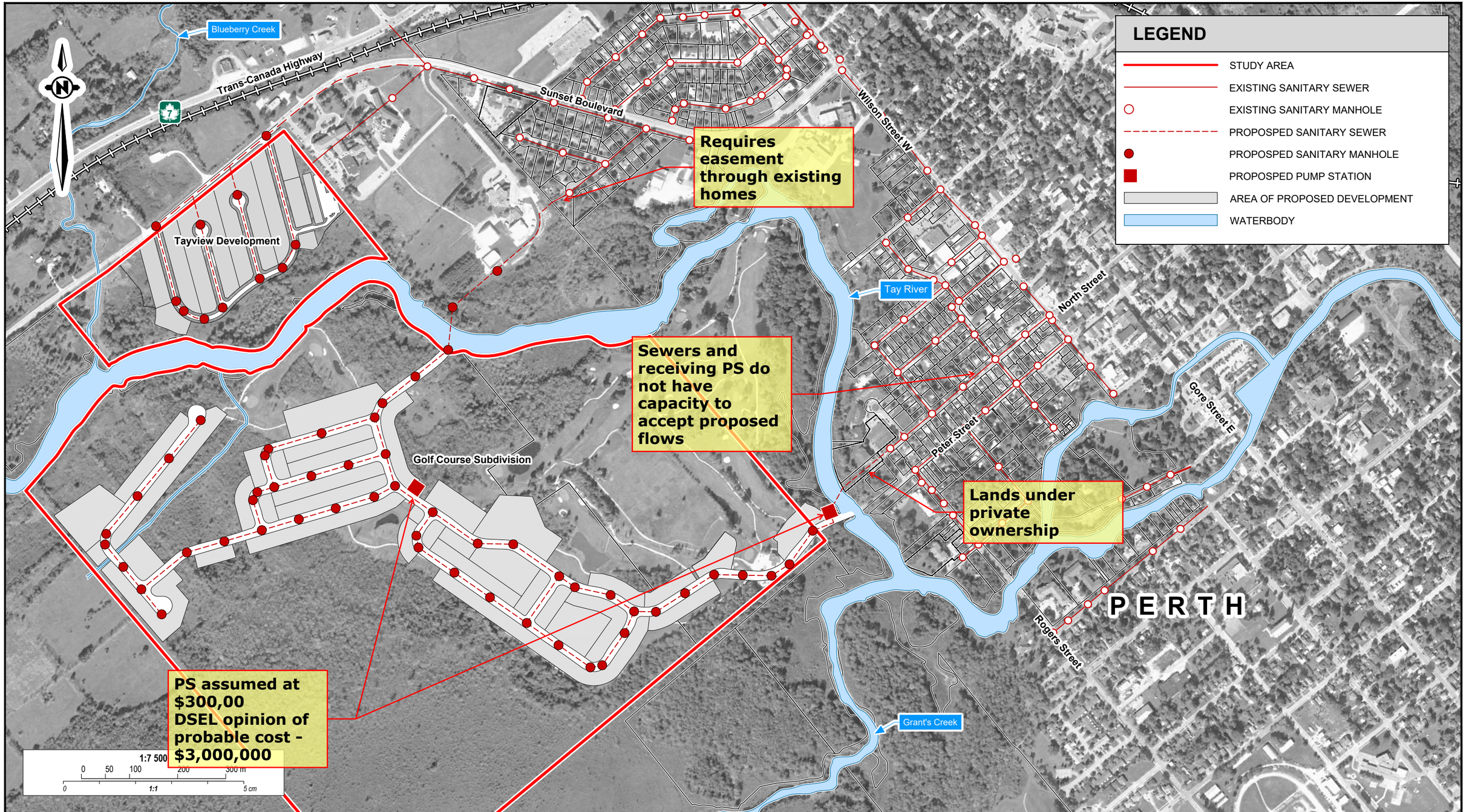
THIS MAP WAS COMPILED FROM PLANS AND DOCUMENTS RECORDED IN THE LAND REGISTRATION SYSTEM AND HAS BEEN PREPARED FOR PROPERTY INDEXING PURPOSES ONLY

FOR DIMENSIONS OF PROPERTIES BOUNDARIES SEE RECORDED PLANS AND DOCUMENTS

ONLY MAJOR EASEMENTS ARE SHOWN

REFERENCE PLANS UNDERLYING MORE RECENT REFERENCE PLANS ARE NOT ILLUSTRATED

Ontario



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Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Sanitary Sewer Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	**6-5**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.5 - preferred sanitary.dwg | Layout: 11x17 DWG to PDF | Print date: 12:49 PM November 27, 2019

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Infrastructure Master Plan Western Annexed Area

Town of Perth

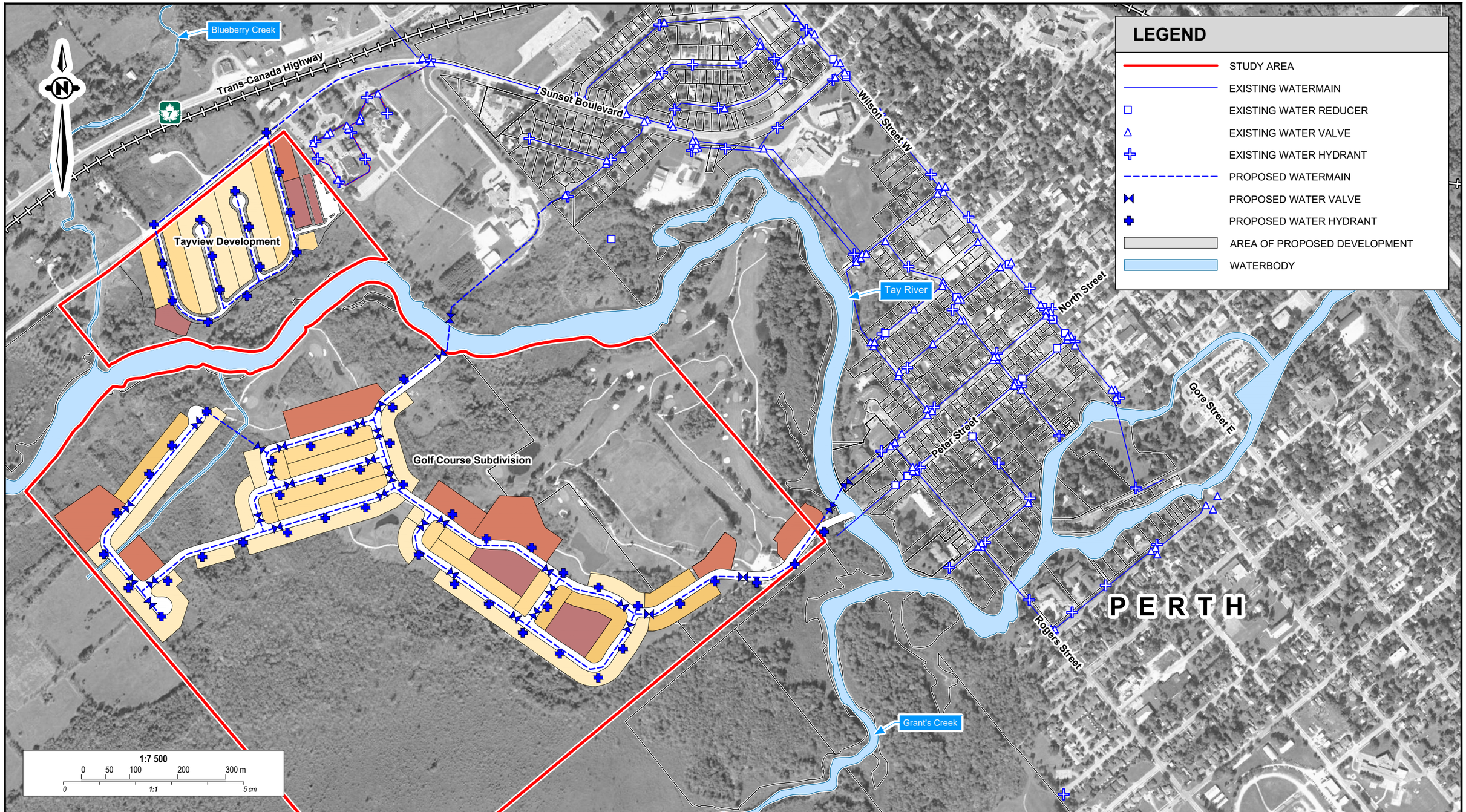
Preferred Option: Storm Sewer Network

DESIGNED: D.N. / K.M.		PROJECT No.: 2161774A
DRAFTED: R.W.		REVISION DATE: 2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:
SCALE: As shown		FIGURE: **6-4**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.4 - preferred storm.dwg | Layout: 11x17 DWG to PDF | Print date: 12:48 PM November 27, 2019

APPENDIX B

Water Supply



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Phone: (613)828-7800, Fax: (613)828-2600

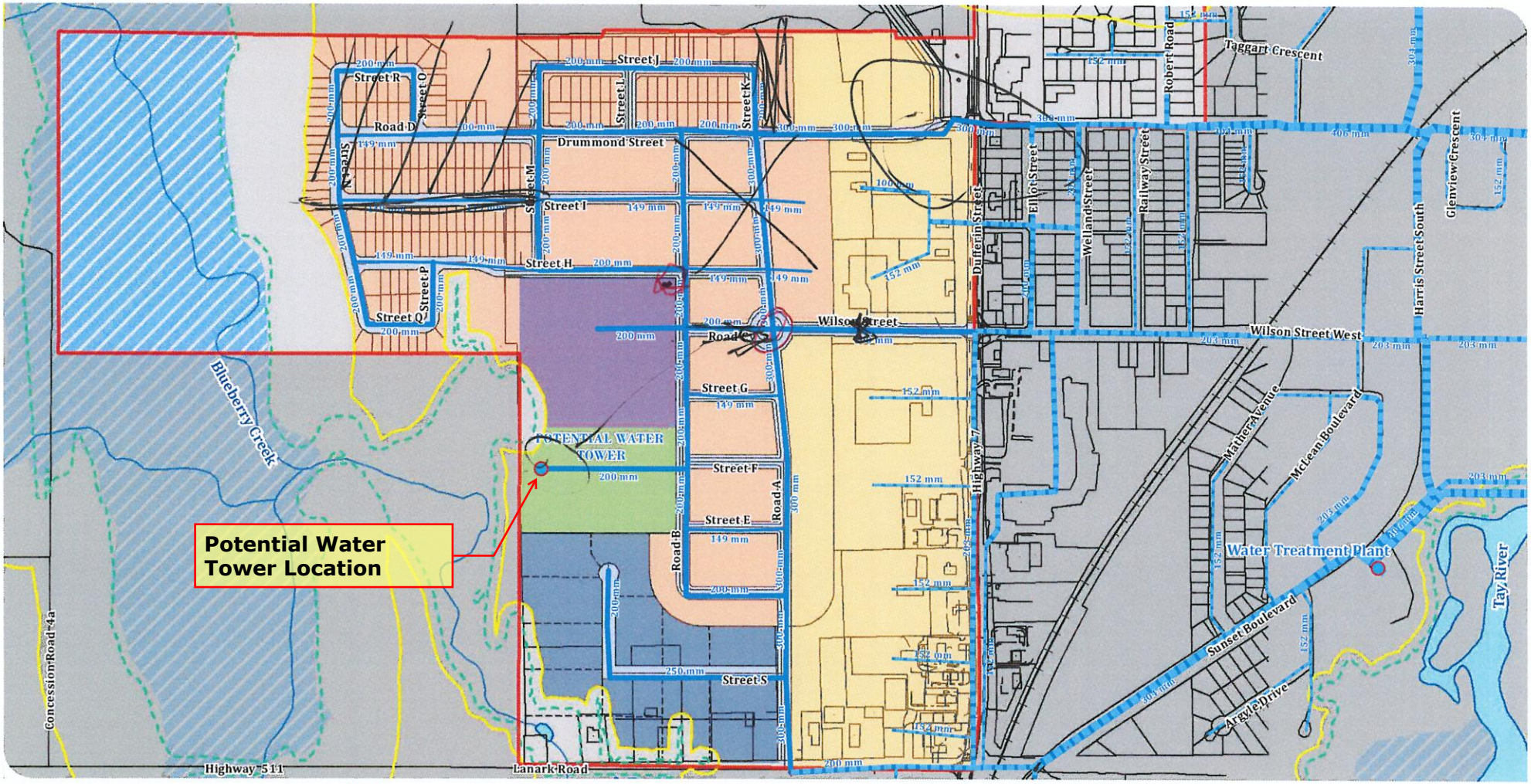
Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Water Distribution Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	**6-3**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.3 - preferred water.dwg | Layout: 11x17 DWG to PDF | Print date: 12:48 PM November 27, 2019



Town of Perth
Infrastructure Master Plan

Proposed Water Servicing

FIGURE 16

Study Area Boundary
RVCA Regulation Limit
Floodplain
Wetland
Park
Business Park
Institutional
Retail
Residential
Roads
Waterbodies
Watercourses
Proposed Water Network
Water Features
Existing Water Network
Railway

MAP DRAWING INFORMATION:
DATA PROVIDED FROM DILLON FIELD SURVEY

MAP CREATED BY: KR / YLF
MAP CHECKED BY: AH / MM
MAP PROJECTION: NAD83, Zone 18

0 45 90 180 270 360 450 Meters

1:5,500

PROJECT: 10-3930 STATUS: FINAL DATE: MAY 2013

Perth Western Annex Lands - 141 Peter Street: Potable Water Hydraulic Analysis

Final Report

February 22, 2023

Prepared for:

Caivan (Perth GC) Limited

Prepared by:

Stantec Consulting Ltd.

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	AM	20230208	KA	20230208	JS	20230208
1	Final	AM	20230222	KA	20230222	JS	20230222

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Prepared by _____
(signature)
Alexandre Mineault-Guitard, M.A.Sc., ing., P.Eng.

Reviewed by _____
(signature)
Jasmin Sidhu, P.Eng.

Approved by _____
(signature)
Kevin Alemany, M.A.Sc., P.Eng.

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1.0 INTRODUCTION

To support Caivan (Perth GC) Limited (Caivan) with their draft plan submission for the Western Annex Lands development (Western Annex), Stantec Consulting Ltd (Stantec) was requested to provide engineering services to complete a water distribution system analysis for this proposed subdivision. The purpose of the analysis is to confirm associated watermain sizing and redundancy needs.

For this assignment, Stantec's scope of work included the following tasks:

1. Review and update of the existing water distribution model;
2. Review of past studies, including the Western Annex Lands IMP (Jp2g, 2019), and the Area North of Highway 7 IMP (Dillon, 2013);
3. Analysis of Caivan's concept plan to develop water supply demands and Fire Underwriters Survey (FUS) Fire flow requirements;
4. Set up and run model simulations for average day (AVDY), peak hour (PKHR), and maximum day (MXDY) plus fire flow demands;
5. Assess the Town of Perth's (the Town) distribution system needs and upgrades to service Caivan's development and meet design criteria within the development lands;
6. Prepare a preliminary cost estimate (Class D) related to the upgrades to service Caivan's development; and,
7. Documenting the approach used, findings and recommendations from the analysis.

1.1 STUDY AREA

The study area is located along the western banks of the Tay River in the Town of Perth (Ontario). The proposed development location is on the Perth Golf Course property. Based on the updated site plan provided by Caivan (dated January 2023), the property is approximately 148 ha, where about 44 ha is proposed urban development. The proposed development is composed of townhouse units and single house units. For this analysis, the new development is considered as a single phase (ultimate build-out conditions).

Ultimately, these development lands are proposed to be serviced by a dual connection to the existing distribution network across the Tay River, along Peter Street. The proposed development location is shown in **Figure 1-1**. Note that further discussion related to the dual connection is provided in **Section 2.4.1**.

Figure No.
1-1

Title
Proposed Development Location

Client/Project

Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location

Perth, Ontario

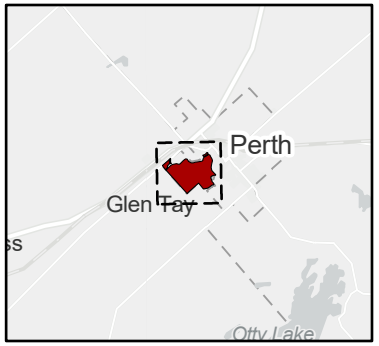
N

0 150 300
Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Proposed Road Layout



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

1.2 EXISTING HYDRAULIC MODEL

As part of a previous study in 2016, Stantec developed a hydraulic model of the Town's water distribution system. Based on communications with the Town's staff, no major upgrades to the distribution system have been made since the development of the hydraulic model. Thus, the 2016 model is assumed to be representative of the current state of the Town's water distribution system and water demands and was used as the basis for the serviceability analysis for the proposed Western Annex development.

It is noted that other new developments are also being planned in Perth and will be connected to the Town's distribution system. Further details of those developments are discussed in **Section 2.2.2**.

2.0 HYDRAULIC ASSESSMENT

For this analysis, the Town's recently adopted Engineering Design Guidelines (herein referred to as the "Town's Design Guidelines") and the Ontario Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems (2019) were used to establish water demands and design criteria. As per the Town's Design Guidelines, the potable water servicing shall meet the requirements of the Fire Underwriters Survey (FUS). However, in areas where such flow cannot be achieved, the Town will consider the minimum fire flows as per the MECP Design Guidelines. It is to note that the City of Ottawa Water Design Guidelines (herein referred to as "Ottawa's Design Guidelines") are also considered for specific applications (ex.: hydrant coverage and reliability analysis).

2.1 SERVICEABILITY

2.1.1 System Pressures

As per the Town's Design Guidelines, the static pressure at any point in the distribution system shall not exceed 550 kPa (80 psi) and no less than 275 kPa (40 psi) at ground elevation (i.e., at street level). The maximum pressure at any point in the water distribution system should not exceed 552 kPa (80 psi). For areas where pressures greater than 552 kPa (80 psi) are anticipated, pressure reducing measures are required. Under emergency fire conditions, a residual pressure of 140 kPa (20 psi) must be maintained in the distribution system while the appropriate fire flow is provided. **Figure 2-1** shows the elevations throughout the study area, based on the site's proposed grading. As shown, the elevations range from 135.38 m to 138.13 m.

2.1.2 Fire Flows

The MECP Design Guidelines require a fire flow assessment to be completed to demonstrate that local watermains can provide the objective fire flows. The detailed FUS Guidelines (long method) can be used to calculate the objective fire flows, based on site plan information. The proposed layouts for both unit types (single house and townhouse) were provided to Stantec (see **Appendix A**) and were used to estimate the fire flow requirements.

Layout and unit information yielded a governing required fire flow (RFF) of 7,000 L/min (117 L/s) for single house units, and a RFF of 10,000 L/min (167 L/s) for townhouse units, based on the assumptions listed below. Detailed FUS calculations are provided in **Appendix A**. It is to note that those calculations are to be revisited at the detailed design stage, based on the characteristics of the proposed buildings.

- Two storeys building, with the basement more than 50% below grade;
- Typical construction (e.g., wood frame, limited combustible building contents); and
- Buildings are not sprinklered.

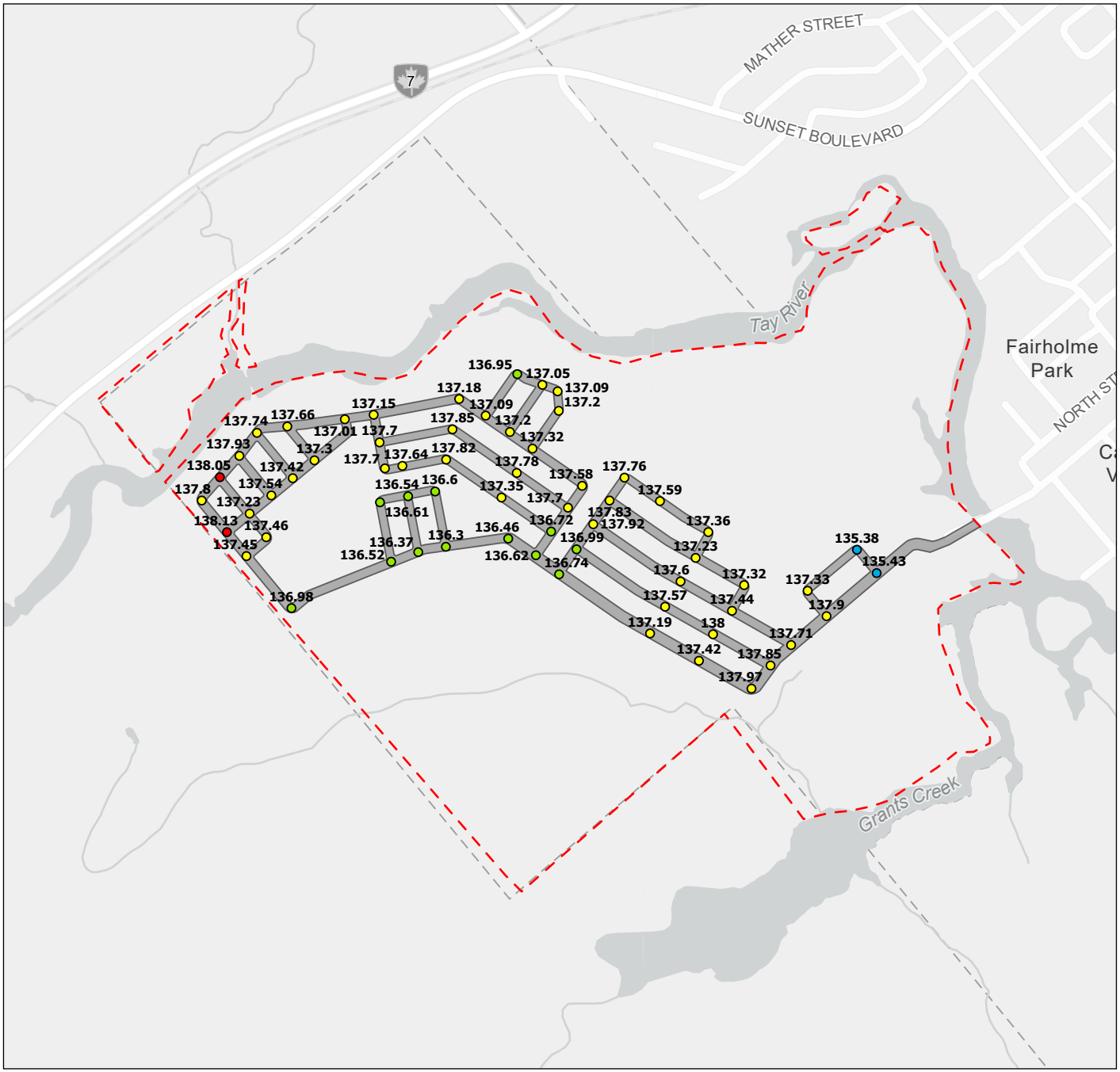


Figure No.
2-1

Title
Study Area Elevation

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Proposed Road Layout

Node Elevation (m)

- 135 - 136
- 136 - 137
- 137 - 138
- 138 - 139

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

On the other hand, the FUS Guidelines (simple method, 2020 Version) suggest a fire flow of 8,000 L/min (133 L/s) for one- or two-family dwellings up to 450 m^2 with less than 3 m of exposure distance; and 8,000 L/min (133 L/s) for row housing with exposure distances between 3 and 10 m.

For this analysis, the required fire flow defined using the FUS Guidelines "long method" will be used, as the "simple method" yields more of an average suggested value. Indeed, the "simple method" does not consider factors such as actual total effective area, combustibility of building contents, or separation distances on all four sides of the structure. Therefore, the RFF for the row housing units defined using the "long method" (10,000 L/min or 167 L/s) will be analyzed as part of the local watermain sizing.

2.2 GROWTH AND POPULATION

2.2.1 Western Annex Development

The residential population for the Western Annex Development was estimated based on projected household sizes as per population densities (or persons per unit, PPU) specified in the Town's Design Guidelines.

The proposed development consists of single house and townhouse units. Based on the proposed site layout, 640 single house units, and 299 townhouse units are considered for this analysis. **Table 2-1** shows the estimated number of units in these development lands and the projected population based on the distribution of residential unit types. The total estimated population is 3,479 persons.

Table 2-1: Estimated Unit Counts and Populations (Western Annex)

Unit Type	Unit Count	PPU	Population
Singles	640	3.8	2,432
Townhouses	299	3.5	1,047
Total	**939**		**3,479**

2.2.2 Other Developments

Other developments, as shown in **Figure 2-2**, are being considered within the Town's limits, and those will be connected to the existing water distribution network. As such, the estimations of residential population are needed to account for the projected increase in water demands.

First, the Tayview Developments (Tayview), described in the Jp2g 2019 IMP study, is located just north of the study site. As part of that development, a new retirement home (total of 160 beds, 1.3 PPU) is being planned close to the Lanark County Administration Building. Additionally, 57 single houses (3.8 PPU), 16 townhouses (3.5 PPU), 60 condos (2.0 PPU), and a commercial centre are also considered. As such, a population of 601 (excluding the commercial centre) is expected under the ultimate build-out conditions.

Secondly, the area north of Highway 7 (North HWY 7), studied in Dillon's 2013 IMP study, was also included in this serviceability analysis. Based on the mixed-density residential planning projections, 1,340 residents are expected in this area. Furthermore, provision for a new school, with 700 students and 35 staff members, was also accounted for. As such, the projected population for this area consists of 2,075 (1,340 residential, and 735 institutional). Additionally, 35 ha of commercial properties are planned for the area.

2.3 DEMAND PROJECTIONS

The criteria outlined in the Town's Design Guidelines and the MECP Design Guidelines for Drinking Water Systems (specifically Table 3-3) were followed to establish water demands for the new developments. Subsequently, the average day (AVDY) consumption rates were applied to align with revised water rates identified by the Town's Design Guidelines. As such, a residential consumption rate of 450 L/cap/d was used, as well as consumption rates of 28,000 L/ha/d and 70 L/cap/d for commercial and institutional areas, respectively.

For residential consumption, a maximum day (MXDY) peaking factor of 2 was then applied to the AVDY demand to provide a MXDY demand. A peak hour (PKHR) peaking factor of 2.2 was then applied to the MXDY demand to provide a PKHR demand. For commercial and institutional water demands, MXDY demands were calculated by multiplying the AVDY demands by a peaking factor of 1.5, while PKHR demands were calculated by multiplying MXDY demands by a peaking factor of 1.8. Estimated AVDY, MXDY and PKHR demand projections are summarized in **Table 2-2**.

Table 2-2: Estimated Demand Projections – Proposed Developments

Development	AVDY (L/S)	MXDY (L/s)	PKHR (L/s)
Western Annex	18.12	36.23	79.72
Tayview	3.17	6.32	13.88
North HWY 7	18.91	31.85	69.71
Total	**40.20**	**74.41**	**163.31**

For this analysis, the total population from all developments (Western Annex, Tayview and North of HWY 7) will be considered as the "ultimate build-out conditions". The demands presented in **Table 2-2** were added to the hydraulic model, in addition to the existing water demands in the distribution models. Those demands were developed by Stantec (2016) based on water meter records, and data from the Water treatment Plant (WTP). The total water demands for the existing system are listed below. It is to note that under PKHR conditions, the total demand (269.5 L/s) exceeds the capacity of the two (2) domestic high lift pumps at the WTP (each rated at 105 L/s).

- AVDY: 35.4 L/s;
- MXDY: 70.8 L/s; and
- PKHR: 106.2 L/s.

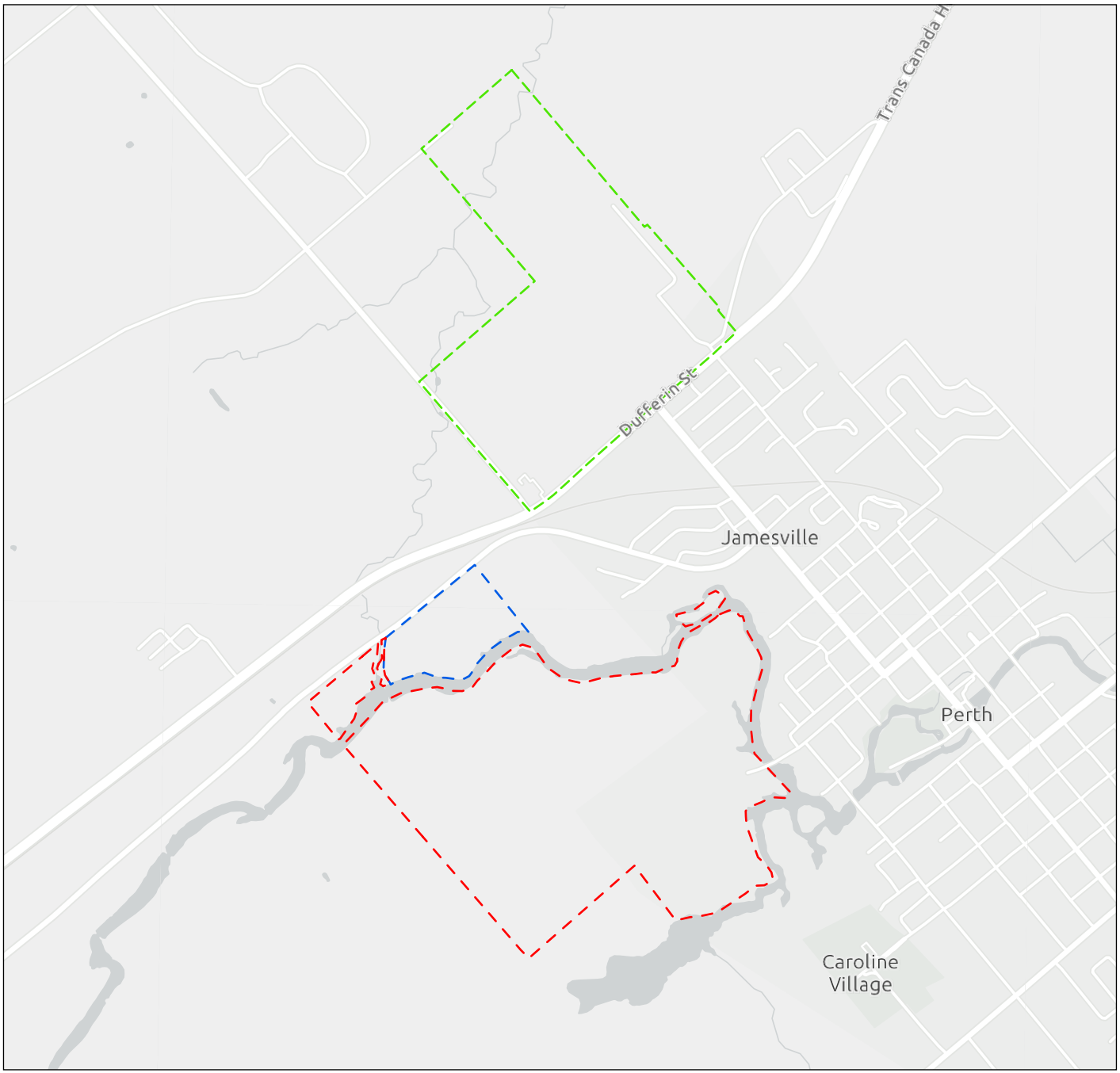


Figure No.
2-2

Title
Other Developments within the Town's Limit

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N

0 250 500
Meters

(At original document size of 8.5x11)
1:24,000

Legend

- Western Annex Development
- Tayview Development
- North of HWY 7 Development

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

2.4 MODEL DEVELOPMENT

The existing water model (Innovyze's H2OMap Water) was imported into Innovyze's InfoWater Pro (Suite 3.5, Update #3). Then new development demands were incorporated in the model.

The model was developed to reflect the most current site plan, including the proposed watermain layout (based on proposed road alignment) and water demands. Watermains added to the model were assigned Hazen-Williams coefficients ("C-Factors") in accordance with the Town's Design Guidelines. These factors are listed in **Table 2-3**.

Table 2-3: Hazen-Williams Coefficients by Watermain Size

Watermain Diameter (mm)	Coefficient
150	100
200 - 250	110
300 and over	120

Analysis of the distribution network was completed by adjusting the controls at the WTP pumping station to fill and draw the existing elevated tank between levels of 60% and 100 % full.

A new elevated storage tank was recommended to support new developments within the Town, as discussed in both the Dillon and Jp2g IMP studies. At this time, the characteristics of the future elevated tank are unknown, and the design of the elevated tank is not part of this study. For this analysis, an elevated tank was sized based on MECP Design Guidelines, as per the Town's population expected under the ultimate build-out conditions. This includes all envisioned developments, namely Western Annex, Tayview and North HWY 7. The new elevated tank will be considered only under the ultimate build-out conditions. **Table 2-4** shows the population expected under the ultimate build-out conditions, including the existing Town's population of 6,360 (Jp2g, 2019).

Table 2-4: Estimated Population at Under Ultimate Build-Out Conditions

Item	Population
Existing population	6,360
Western Annex	3,479
Tayview	601
North HWY 7	2,075
Total	**12,515**

MECP Design Guidelines specifies that treated water storage should be composed of Fire Storage (A), Equalization Storage (B), and Emergency Storage (C). Each storage component is defined as follows:

- Fire Storage (A) is defined based on population;
- Equalization Storage (B) corresponds to 25% of the MXDY demand; and
- Emergency Storage (C) corresponds to 25% of the sum of A and B components.

Under the existing conditions, a population of 6,360 (Jp2g, 2019) yields a fire flow of 162 L/s, as per the MECP Design Guidelines. It is noted that the existing pumping reserve capacity of the WTP accounts for 19.72 L/s (1,669 m^3/d), which could be reduced from the Fire Storage (A) requirement. Furthermore, the existing MXDY demand is 6,117 m^3/d (or 70.8 L/s as listed in **Section 2.3**). **Table 2-4** shows the total storage requirement as per the MECP under existing conditions. As shown, the storage requirement exceeds the existing elevated storage of 945 m^3. Note that the capacity of the high lift pumps at the WTP exceeds the existing MXDY demand, which addresses the storage deficiency.

Table 2-5: Water Storage Requirement (Existing Conditions)

	Description	Value	Unit
A	Fire Storage (Fire + Duration)[1]	1,533	m^3
B	Equalization Storage (25% of MXDY)	1,529	m^3
C	Emergency Storage (25% of A+B)	766	m^3
Total Water Storage	**A+B+C**	**3,828**	**m^3**

[1] Reduced based on pumping reserve capacity.

For a future population of 12,515, the MECP Design Guidelines yield a recommended fire flow of 215 L/s. Furthermore, the expected MXDY demand under ultimate build-out conditions is 12,546 m^3/d or 145.2 L/s (i.e., 70.8 L/s for existing demands, plus 74.4 L/s for the proposed developments). **Table 2-6** shows the total water storage requirement for the ultimate build-out conditions, as per the population presented in **Table 2-4**. The required elevated storage volume at ultimate built-out conditions exceeds the existing elevated storage of 945 m^3.

Table 2-6: Water Storage Requirement (Ultimate Built-Out Conditions)

	Description	Value	Unit
A	Fire Storage (Fire + Duration)[1]	2,109	m^3
B	Equalization Storage (25% of MXDY)	3,136	m^3
C	Emergency Storage (25% of A+B)	1,311	m^3
Total Water Storage	**A+B+C**	**6,557**	**m^3**

[1] Reduced based on pumping reserve capacity.

Considering the configuration of the existing distribution network (i.e., a single elevated tank, as well as a single feed leaving the WTP), it is recommended to provide additional storage to improve the network's resiliency, as per both the Dillon and Jp2g IMP studies. As such, 5,612 m^3 of additional storage was considered as part of this analysis, and the new elevated tank was assumed to be positioned within the North HWY 7 development. Note that the high-water level (HWL) of the new elevated tank is the same as the existing tank (i.e., 180.52 m), as per the 2013 Dillon Study.

2.4.1 Proposed Watermain Sizing & Layout

Based on the design requirements for pressure and fire protection, preliminary modelling indicates the need for a mix of 150 and 200 mm diameter watermains, as well as a 300 mm diameter feedermain, as shown in **Figure 2-3**. This layout was identified to provide sufficient flow to achieve the objective fire flow of 10,000 L/min, as well as domestic water demands.

As introduced, a dual connection is planned to the existing distribution network. There are two (2) options for the proposed connection: 1) connection to the existing 300 mm watermain at the corner of North Street and Lustre Lane via a new watermain; or 2) connection to the existing 75 mm watermain along Peter Street, on the west bank of the Tay River. Option 2 would require the replacement of the existing 75 mm (167 m) and 150 mm (45 m) watermains along Peter Street, up to the 300 mm watermain at the corner of Peter Street and Rogers Road. This is needed such that the objective fire flows are achieved within the proposed development. Both options are presented in **Figure 2-3**.

It is recommended to have two independent connections to the Town's network, to provide better resiliency. As reference, updated Section 4.3.1 of the Ottawa Water Distribution Systems Design Guidelines (ISTB-2021-03) states that "Industrial, commercial, institutional service areas with a basic day demand greater than 50 m^3/d and *residential areas serving 50 or more dwellings shall be connected with a minimum of two watermains*, separated by an isolation valve, to avoid the creation of a vulnerable service area." As a connection is planned at only one location (i.e., across the Tay River along Peter Street), the proposed development could be considered a vulnerable service area under the Ottawa's Design Guidelines, depending on the characteristics of the connections.

As such, two individual connections should be implemented, so that if one of the connections is interrupted (e.g., watermain break), the other can still service the proposed development. This would require the installation of a line valve along each connection point, so that the feed from the existing system can be isolated when needed. In that sense, it is recommended that connections to the Town's network are implemented at both options listed above, for better resiliency. However, note that for this hydraulic analysis, both connections to the Town's network were assumed as Option 1.

Furthermore, it is necessary that the watermains are separated from each other (i.e., installed in separate trenches). If a watermain break occurs along one of the feedermain, and that both pipes are installed one next to the other, the second pipe could be affected (either by being "washed out" or being hit by crews during repairs).

Similarly, there is a risk factor to consider regarding the crossings of the Tay River. It is not recommended that both feedermains cross the Tay River along the Peter Street bridge. If the bridge fails (e.g., major flooding) and that both lines are running along the bridge, it will interrupt the water servicing to the proposed development. As such, some considerations (e.g., trenchless crossing below the river) are to be taken regarding the crossings to mitigate the risks.

As such, it is recommended to have two independent connections to the existing network, as described above. This would avoid the creation of a vulnerable service area, increase resiliency against a major failure and minimize the risks for customers, as discussed in **Section 3.3**.

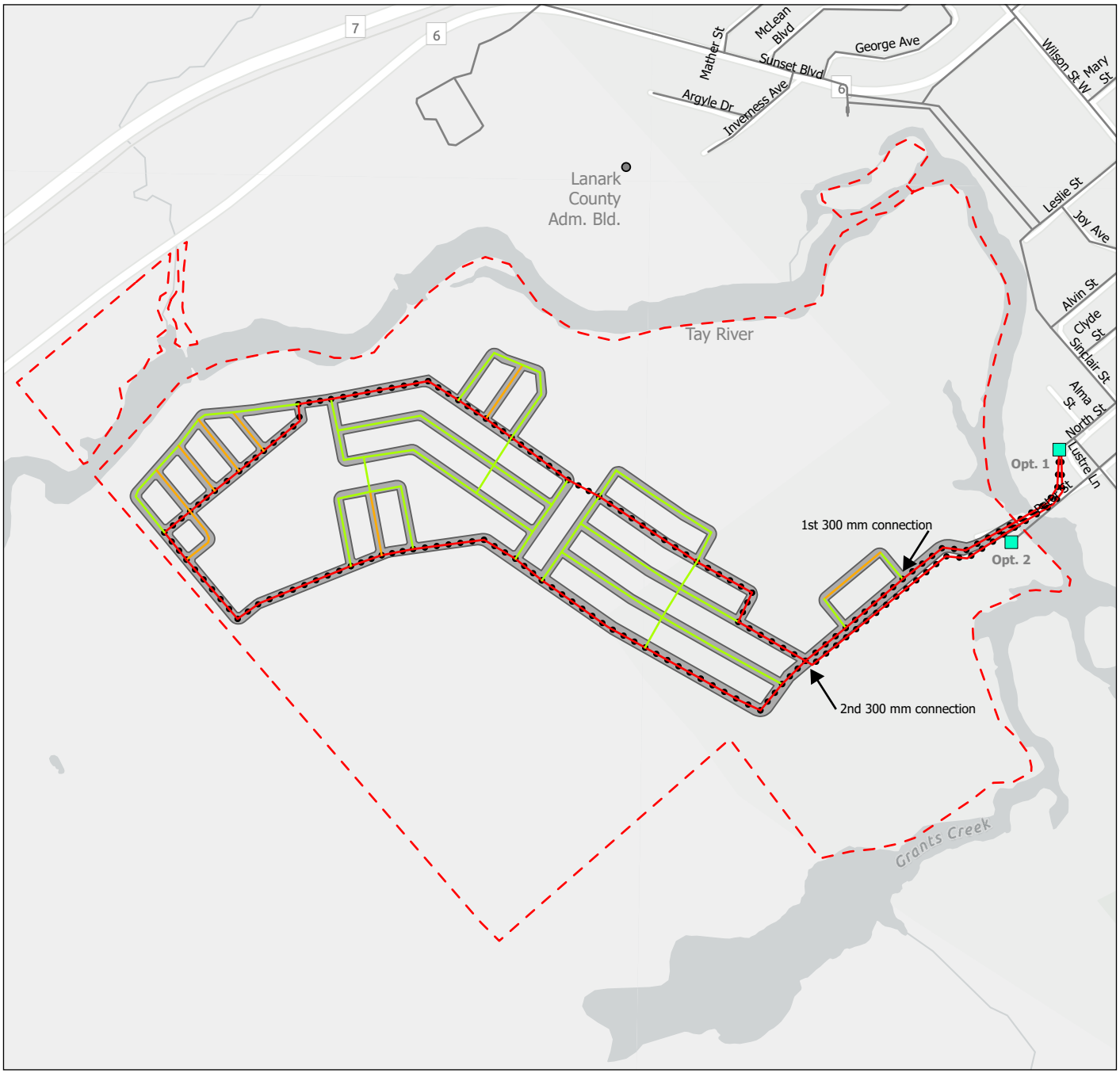


Figure No.
2-3

Title
Proposed Watermain Sizing & Layout

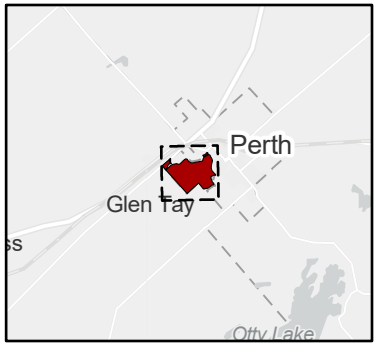
Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N
0 150 300 Meters
(At original document size of 8.5x11)
1:11,000

Legend
- Property Boundary
- Existing Distribution Network
- Connection Options

Proposed Watermain Layout
- 150 mm
- 200 mm
- 300 mm
- Feedermain



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N
2. Although a 300 mm diameter feedermain meets the serviceability criteria, Stantec recommends considering a 400 mm diameter feedermain, as noted in the report, and shown on Figure 3-2.

Stantec

3.0 PRELIMINARY HYDRAULIC MODELLING RESULTS

Preliminary hydraulic modelling was completed to assess the network's performance under different demand scenarios. The following subsections present the preliminary modelling results under AVDY, PKHR, and MXDY+FF demands for the proposed development. Note that for this analysis, a new elevated tank, sized based on MECP Design Guidelines, was assumed under ultimate build-out conditions.

All junction IDs are shown in **Appendix B**, with detailed modelling results for all scenarios provided in **Appendix C**.

3.1 AVERAGE DAY & PEAK HOUR DEMANDS

Under AVDY demands, maximum modelled pressures are between 55 and 64 psi, which falls within the desired pressure range of 40 to 80 psi based on the Town's Design Guidelines. As such, pressures are within the desired pressure range of 40 to 80 psi, and no pressure reducing measures are required within the proposed development.

For PKHR conditions, modelling results show that minimum pressures range between 48 psi and 58 psi. Note that under PKHR conditions, all three high lift pumps at the WTP are assumed to be in operations at the WTP, as PKHR demands exceed the rated capacity of the two (2) domestic pumps (refer to **Section 2.3**). The domestic pumps should be upsized before all developments are fully constructed.

3.2 MAXIMUM DAY PLUS FIRE FLOW

In this demand scenario, available fire flows across the proposed development must meet or exceed the RFF of 10,000 L/min (167 L/s) as described in **Section 2.1.2**.

Under MXDY+FF demands, assuming that the elevated tank is a 60% full and all high lift pumps running at the treatment plant, modelling shows that the RFF is exceeded across all nodes with a residual pressure of 20 psi. The minimum available fire flow within the new development is estimated at 10,600 L/min (177 L/s) at node J87.

3.3 RELIABILITY

It is good practice to assess the serviceability of the system under failure scenarios. As per the Ottawa's Design Guidelines, the system must be able to provide average day demand plus fire flow (AVDY + FF) while meeting serviceability requirements during a major failure (i.e., watermain break).

As such, four (4) reliability scenarios (shown in **Figure 3-1**) were reviewed to confirm sufficient pressure and flow can be achieved during a major failure. These break scenarios are described below. Note that

the reliability scenarios assume that both feedermains connecting to the Town's existing network are independent from each other, as described in **Section 2.4.1**.

1. Break Scenario 1: Break in the one of the 300 mm feedermain connecting to the existing network;
2. Break Scenario 2: Break in the southern 300 mm feedermain connection to the western portion of the study area;
3. Break Scenario 3: Break in the northern 300 mm feedermain connection to the western portion of the study area.
4. Break Scenario 4: Break along the 300 mm feedermain in the western portion of the study area.

Model results (see **Appendix C**) show that a few junctions do not meet the RFF of 10,000 L/min (167 L/s), as discussed below:

- Under Break Scenario 1, the RFF is not met at node J87 (8,800 L/min) and node J121 (9,900 L/min).
- Under Break Scenarios 2 to 4, the RFF is met at all locations, except at node J87 (varying from 9,000 to 9,700 L/min).

Although modelling results suggest that portions of the local network may be vulnerable under a major break scenario, sufficient fire flow coverage could be provided if hydrant spacing is planned as per Ottawa's ISDTB-2018-02. Planning for hydrant spacing such that two (2) Class AA hydrants (rated at 5,700 L/min each) are placed within 75 m of all buildings would yield a cumulative available fire flow that would exceed the 10,000 L/min RFF, under all break scenarios. It is thus recommended to plan hydrant spacing as per Ottawa's ISDTB-2018-02, rather than the Town's Design Guidelines maximum hydrant spacing of 90 m for high density residential areas, to avoid oversizing local watermains.

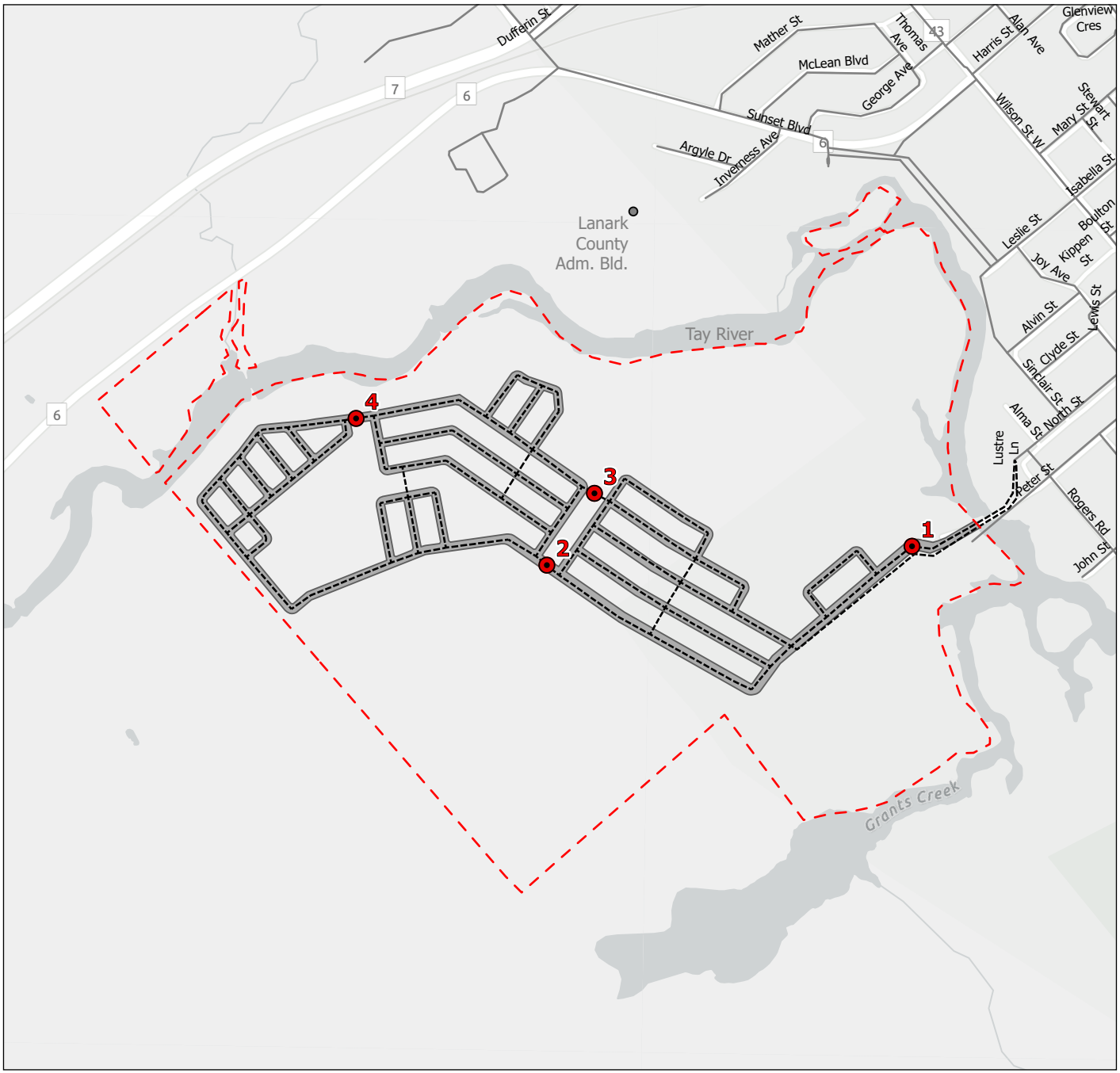


Figure No.
3-1

Title
Reliability Analysis - Watermain Break Locations

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

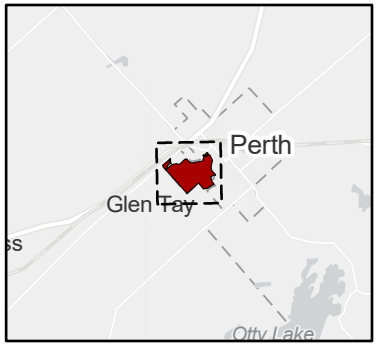
N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Existing Distribution Network
- Proposed Distribution Network
- Break Location / Scenario



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

4.0 PRELIMINARY COST ESTIMATE

A preliminary cost estimate was completed regarding the necessary upgrades to the existing network to service the Western Annex development. As previously discussed, a new elevated tank is required to support new developments within the Town. Furthermore, the domestic high lift pumps at the WTP will have to be upsized before all planned developments within Perth are constructed. As discussed in **Section 2.3**, the PKHR demand (269.5 L/s) exceeds the rated capacity of the two (2) domestic pumps (each rated at 105 L/s). The design of the elevated tank, as well as upgrades at the WTP pumping station are not part of Stantec's mandate related to the serviceability of the Western Annex development. As such, these were not included in the cost estimate analysis. The required upgrades are linked to the proposed connections to the Town's existing water distribution network. As discussed in **Section 2.4**, there are two (2) options at the proposed connection, as presented below.

- Option 1: connection to the 300 mm watermain at the corner of North Street and Lustre Lane.
- Option 2: connection to 75 mm watermain along Peter Street, on the west bank of the Tay River.

Option 1 would be completed via new watermains, whereas Option 2 would require upgrades to the existing water distribution network (watermain replacement/upsizing), in addition to new watermains.

The preliminary cost estimate for the supply and installation of new watermain was based on a unit cost of $900 / linear m for 300 mm watermains. The unit costs include supply, labour, administration, and contractor's profits, but excludes applicable taxes.

However, the items listed below were not considered as part of the cost estimate analysis. As such, the cost estimates, presented in **Table 4-1**, will have to be re-evaluated as part the detailed design phase. Note that the cost analysis considered only the water infrastructure outside of the Western Annex development boundary.

- Removal and reinstatement of watermain, paving and street infrastructure;
- Removal or supply of fire hydrants, valve boxes, and water service connections;
- Supply and installation of a temporary water supply;
- Temporary traffic maintenance and road signs; and
- Cost associated with water infrastructure crossing the Tay River and/or rock breaking and removal.

Table 4-1: Preliminary Cost Estimates[1]

Option	Description	Quantity	Unit	Unit Price ($)	Cost ($)
1	Supply and installation of new dual 300 mm watermains	352	m	900	325,800
2	Supply and installation of new dual 300 mm watermains	366	m	900	329,400

[1] Preliminary cost estimate based on the assumption listed in **Section 4.0**, without applicable taxes.

5.0 CONCLUSION AND RECOMMENDATIONS

A preliminary water distribution system hydraulic analysis was completed for the Western Annex development. The purpose of this analysis was to confirm associated watermain sizing and redundancy needs for the proposed development.

Based on the hydraulic analysis, the following conclusions and recommendations were made:

- Based on the current site plan layout, the estimated AVDY, MXDY and PKHR demands for the proposed development are 18.12 L/s, 36.23 L/s, and 79.72 L/s, respectively.
- Under the ultimate build-out conditions, the estimated AVDY, MXDY and PKHR demands for all envisioned developments in Perth (Western Annex, Tayview, and North of HWY 7) are 40.20 L/s, 74.41 L/s, and 163.31 L/s, respectively. This results in AVDY, MXDY and PKHR demands for the whole Town of 75.6 L/s, 145.2 L/s, and 269.5 L/s, respectively.
- Note that PKHR demands exceed the rated capacity of the two (2) existing domestic pumps at the WTP (refer to **Section 2.3**). As such, the domestic pumps should be upsized before all developments are fully constructed. Furthermore, additional storage is needed to support new developments within the Town. However, the design of the elevated tank, and any upgrades at the WTP pumping station are not part of Stantec's mandate.
- Governing required fire flows (RFF) of 7,000 L/min (117 L/s) for single house units, and a RFF of 10,000 L/min (167 L/s) for townhouse units were identified based on the assumptions listed in **Section 2.1.2**. The RRF calculations should be reviewed or updated as needed as part of subsequent design stages, based on available building information.
- Preliminary modelling indicates the need for a 300 mm feedermain to adequately service the proposed development. Local watermains are proposed to be 150 and 200 mm watermains. As noted in **Section 2.4.1**, it is recommended that both feedermains connecting to the existing network are fully independent from each other, even if they both cross the Tay River along Perter Street. This would avoid the creation of a vulnerable service area, increase resiliency against a major failure and minimize the risks for customers.
- With the proposed watermain layout, system pressure requirements are met under AVDY and PKHR demands. Furthermore, the RFF (10,000 L/min or 167 L/s) is exceeded across all nodes under MXDY+FF demands.
- To assess reliability and resiliency against major failures, a number of reliability scenarios were completed under AVDY+FF demand conditions to confirm sufficient pressure and flow can be achieved during a major failure. Under all break scenarios, some locations do not meet the RRF. However, sufficient fire flow coverage could be provided if hydrant spacing is planned as per Ottawa's ISDTB-2018-02. As such, it is recommended to plan for hydrant spacing such that all buildings are located within 75 m of two (2) class AA fire hydrants (as per ISTB-2018-02, Appendix I). This will provide sufficient fire protection and avoid oversizing local watermains.

- A preliminary cost estimate was completed for the necessary upgrades to the existing network to service the Western Annex development. Note that upgrades at the WTP and any new storage were not included in the cost estimate analysis. The cost for the supply and installation of new dual 300 mm diameter watermains is estimated at $325,800 for Option 1 (connection to the existing 300 mm diameter watermain at North Street and Lustre Lane), and $329,400 for Option 2 (connection to 75 mm watermain along Peter Street, on the west bank of the Tay River). Preliminary cost estimates are based on the assumption listed in **Section 4.0**, and only consider water infrastructure outside of the Western Annex development boundary.

6.0 REFERENCES

City of Ottawa. (2010). *Ottawa Design Guidelines - Water Distribution*. Ottawa.

City of Ottawa. (2018). *Technical Bulletin ISTB-2018-02*. Ottawa.

City of Ottawa. (2021). *Technical Bulletin ISTB-2021-03*. Ottawa.

Corporation of the Town of Perth (2022). *Engineering Design Guidelines*. Perth.

Dillon Consulting Ltd. (2013). *Infrastructure Master Plan for Area North of Highway 7*. October 2013. Ontario.

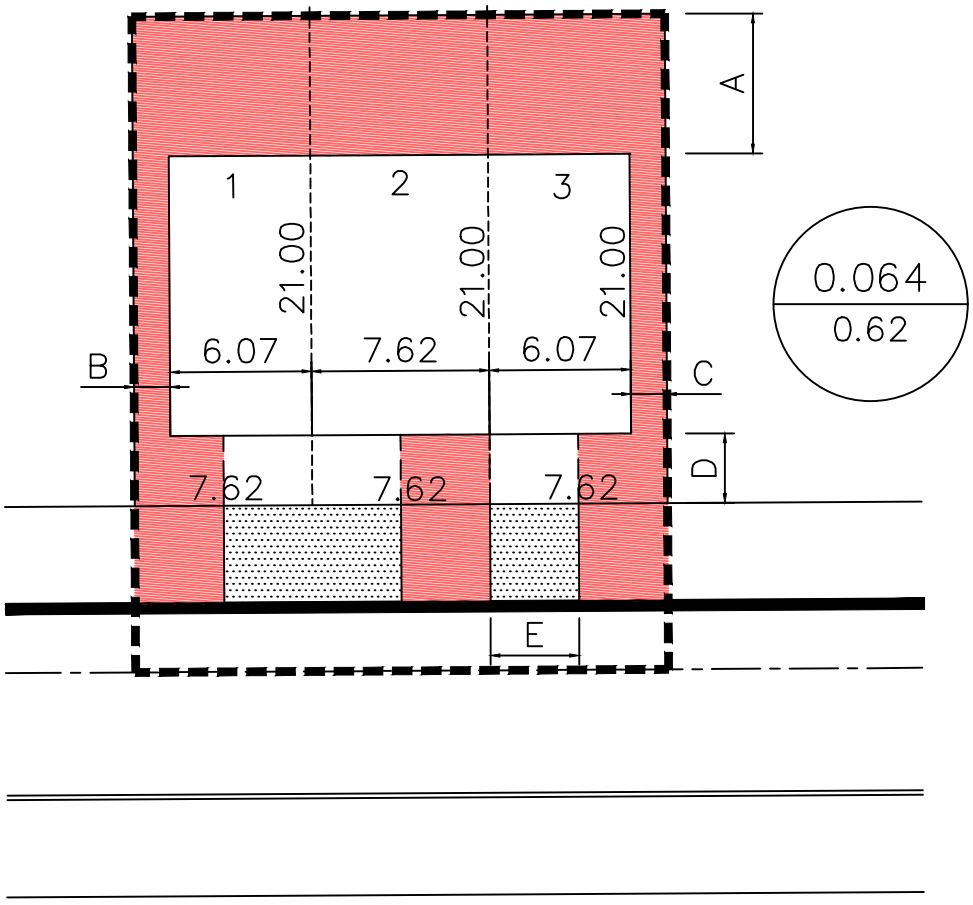
Fire Underwriters Survey (2020). *Water Supply For Public Fire Protection – A Guide to Recommended Practice In Canada*. 2020 Version.

Jp2g Consultants Inc. (2019). *Infrastructure Master Plan – Western Annex in the Town of Perth*. November 2019. Ontario.

Ministry of the Environment, Conservation and Parks. (2008). *Design Guidelines for Drinking Water Systems*. Ontario.

Stantec Consulting Ltd. (2016). *2016 Perth Potable Water Model Update*. October 12, 2016. Ottawa.

Appendix A FUS FIRE FLOW CALCULATIONS



DIMENSIONS:
A = 6.00 m
B = 1.55 m
C = 1.55 m
D = 3.00 m
E = 3.80 m
ENVELOPE LENGTH: 12.00 m
LOT: 22.86x21.00 m

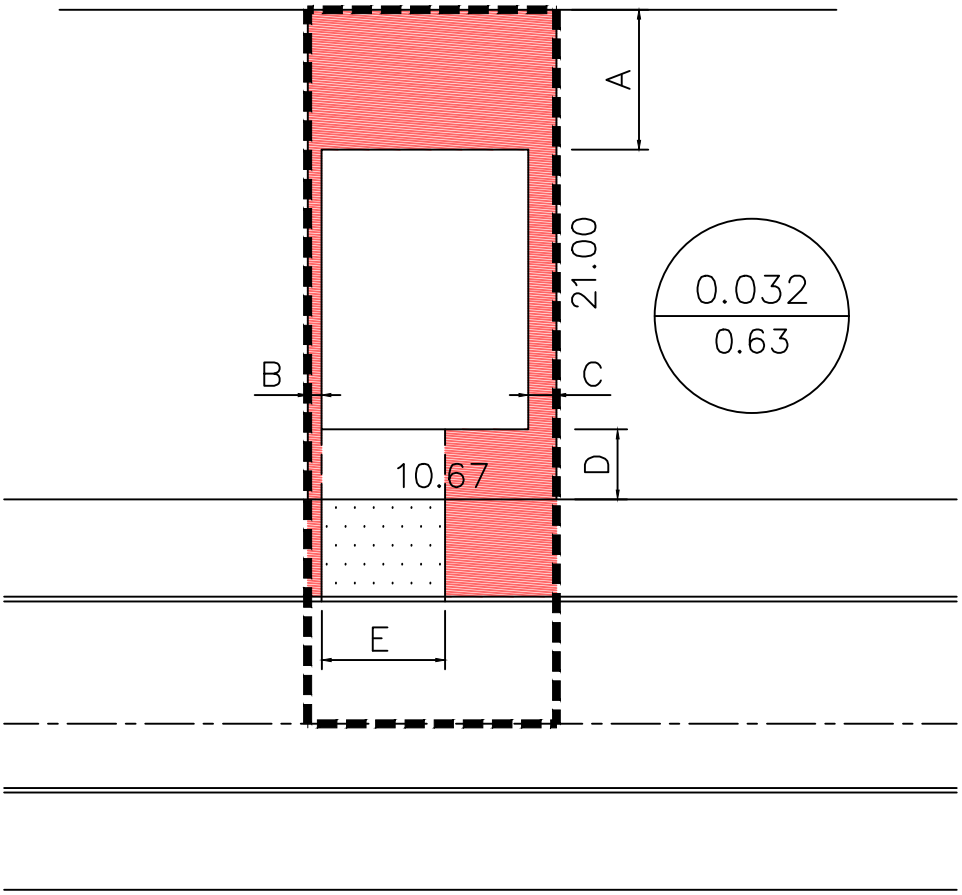
NOTE:
TOTAL AREA: 643.00 m2
TOTAL IMP AREA: 386.36 m2
IMP %: 60%
RC: 0.62

16.75 m ROW TH RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
7.62 LOT DIMENSION

120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

SCALE:	NTS	PROJECT No.:	19-1092
DATE:	FEB 2022	FIGURE:	



DIMENSIONS:
A = 6.00 m
B = 0.60 m
C = 1.20 m
D = 3.00 m
E = 5.30 m
ENVELOPE: 8.87x12.00 m
LOT: 10.67x21.00 m

NOTE:
TOTAL AREA: 326.82 m2
TOTAL IMP AREA: 202.64 m2
IMP %: 62%
RC: 0.63

16.75 m ROW SINGLE UNIT RC FIGURE

LEGENDS

PERVIOUS HATCH

TOTAL AREA 0.035 / 0.65 RC VALUE

STM TRIB LINE

10.67 LOT DIMENSION

DSEL
120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

SCALE:	NTS	PROJECT No.:	19-1092
DATE:	FEB 2022	FIGURE:	

Stantec

FUS Fire Flow Calculation - Long Method

Calculations based on: "*Water Supply for Public Fire Protection*" by Fire Underwriters' Survey, 2020

Stantec Project #: 163401476
Project Name: Perth Western Annex Lands
Date: January 30, 2023
Data inputted by: Alexandre Mineault-Guitard, ing., P.Eng
Data reviewed by: Kevin Alemany, M.A.Sc., P.Eng.

Fire Flow Calculation #: 1
Building Type/Description/Name: Residential

Notes: *Townhouse unit*

Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Type V - Wood Frame	1.5	Type V - Wood Frame	1.5	m	
			Type IV-A - Mass Timber	0.8				
			Type IV-B - Mass Timber	0.9				
			Type IV-C - Mass Timber	1				
			Type IV-D - Mass Timber	1.5				
			Type III - Ordinary construction	1				
			Type II - Non-combustible construction	0.8				
			Type I - Fire resistive construction	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	**Floor Space Area**						
		Type of Housing	Single Family	0	Townhouse - indicate # of units	1	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, Apt etc.)	0				
2.2	# of Storeys	Number of Floors/Storeys in the Unit (do not include basement if 50% below grade):			2	2	Storeys	
3	Enter Ground Floor Area of One Unit	Average Floor Area (A) based on total floor area of all floors for one unit (non-fire resistive construction):			237	237	Area in Square Metres (m^2)	
					Square Metres (m2)			
3.1	Obtain Total Effective Building Area	Total Effective Building Area (# of Storeys x # of Units (if single family or townhouse) x Average Floor Area):			474	474		
4	Obtain Required Fire Flow without Reductions	Required Fire Flow (without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1,000 L/min						**7,000**
5	Apply Factors Affecting Burning	**Reductions/Increases Due to Factors Affecting Burning**						
5.1	Choose Combustibility of Building Contents	Occupancy Content Hazard Reduction or Surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	**5,950**
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler Reduction	Adequate Sprinkler conforms to NFPA13	-0.3	None	0	N/A	**0**
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is not standard or N/A	0	N/A	**0**
			Water supply is not standard or N/A	0				
		Sprinkler Supervision Credit	Sprinkler system is fully supervised	-0.1	Sprinkler not fully supervised or N/A	0	N/A	**0**
			Sprinkler not fully supervised or N/A	0				
5.3	Choose Presence of Sprinklers for Exposures within 30m	Sprinkler Conforms to NFPA13	Adequate sprinkler for exposures conforms to NFPA13		None for exposures	0	N/A	**0**
			None for exposures					
		Water Supply	Water supply is standard for sprinkler and fire dept. hose line of exposures		Water supply is not standard or N/A for exposures		N/A	
			Water supply is not standard or N/A for exposures					
		Sprinkler Supervision	Sprinkler system of exposures is fully supervised		Sprinkler not fully supervised or N/A for exposures		N/A	
			Sprinkler not fully supervised or N/A for exposures					
5.4	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	10.1 to 20.0m	0.15	0.65	m	**3,868**
			East Side	3.1 to 10.0m	0.2			
			South Side	20.1 to 30.1m	0.1			
			West Side	3.1 to 10.0m	0.2			
6	Obtain Required Fire Flow, Duration & Volume							
							Total Required Fire Flow, rounded to nearest 1,000 L/min, with max/min limits applied:	**10,000**
							Total Required Fire Flow (above) in L/s:	**167**
							Required Duration of Fire Flow (hrs)	**2.00**
							Required Volume of Fire Flow (m^3)	**1,200**

FUS Fire Flow Calculation - Long Method

Calculations based on: "*Water Supply for Public Fire Protection*" by Fire Underwriters' Survey, 2020

Stantec Project #: 163401476
Project Name: Perth Western Annex Lands
Date: January 30, 2023
Data inputted by: Alexandre Mineault-Guitard, ing., P.Eng
Data reviewed by: Kevin Alemany, M.A.Sc., P.Eng.

Fire Flow Calculation #: 2
Building Type/Description/Name: Residential

Notes: *Single house unit*

Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Type V - Wood Frame	1.5	Type V - Wood Frame	1.5	m	
			Type IV-A - Mass Timber	0.8				
			Type IV-B - Mass Timber	0.9				
			Type IV-C - Mass Timber	1				
			Type IV-D - Mass Timber	1.5				
			Type III - Ordinary construction	1				
			Type II - Non-combustible construction	0.8				
			Type I - Fire resistive construction	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	**Floor Space Area**						
		Type of Housing	Single Family	1	Single Family	1	Units	
			Townhouse - indicate # of units	0				
			Other (Comm, Ind, Apt etc.)	0				
2.2	# of Storeys	Number of Floors/Storeys in the Unit (do not include basement if 50% below grade):			2	2	Storeys	
3	Enter Ground Floor Area of One Unit	Average Floor Area (A) based on total floor area of all floors for one unit (non-fire resistive construction):			106	106	Area in Square Metres (m^2)	
					Square Metres (m2)			
3.1	Obtain Total Effective Building Area	Total Effective Building Area (# of Storeys x # of Units (if single family or townhouse) x Average Floor Area):			213	213		
4	Obtain Required Fire Flow without Reductions	Required Fire Flow (without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1,000 L/min						5,000
5	Apply Factors Affecting Burning	**Reductions/Increases Due to Factors Affecting Burning**						
5.1	Choose Combustibility of Building Contents	Occupancy Content Hazard Reduction or Surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	4,250
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler Reduction	Adequate Sprinkler conforms to NFPA13	-0.3	None	0	N/A	0
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is not standard or N/A	0	N/A	0
			Water supply is not standard or N/A	0				
		Sprinkler Supervision Credit	Sprinkler system is fully supervised	-0.1	Sprinkler not fully supervised or N/A	0	N/A	0
			Sprinkler not fully supervised or N/A	0				
5.3	Choose Presence of Sprinklers for Exposures within 30m	Sprinkler Conforms to NFPA13	Adequate sprinkler for exposures conforms to NFPA13		None for exposures	0	N/A	0
			None for exposures					
		Water Supply	Water supply is standard for sprinkler and fire dept. hose line of exposures		Water supply is not standard or N/A for exposures		N/A	
			Water supply is not standard or N/A for exposures					
		Sprinkler Supervision	Sprinkler system of exposures is fully supervised		Sprinkler not fully supervised or N/A for exposures		N/A	
			Sprinkler not fully supervised or N/A for exposures					
5.4	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	10.1 to 20.0m	0.15	0.7	m	2,975
			East Side	3.1 to 10.0m	0.2			
			South Side	20.1 to 30.1m	0.1			
			West Side	0 to 3.0m	0.25			
6	Obtain Required Fire Flow, Duration & Volume	*Total Required Fire Flow, rounded to nearest 1,000 L/min, with max/min limits applied:*						7,000
		Total Required Fire Flow (above) in L/s:						117
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						840

Appendix B JUNCTION IDS

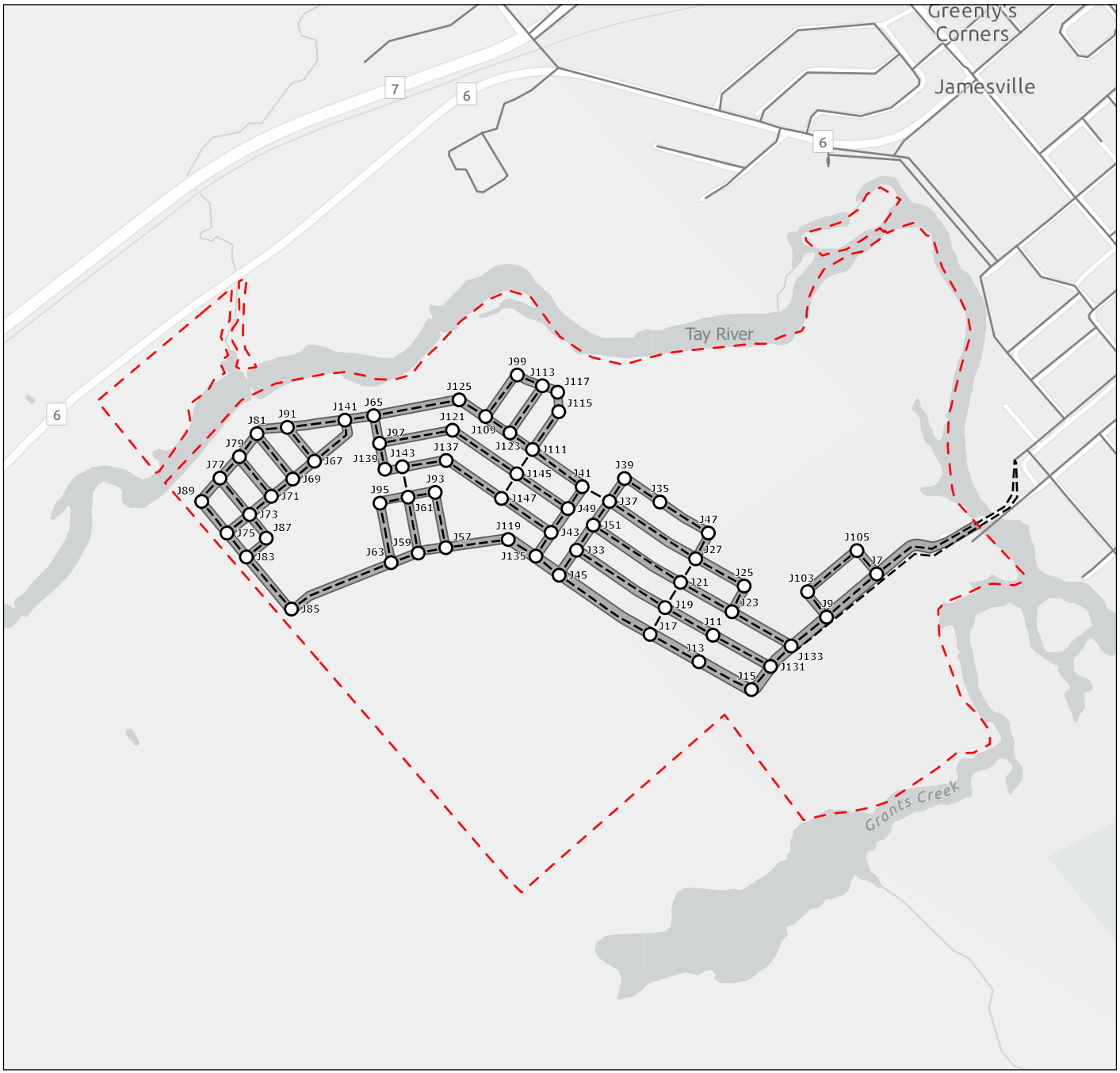


Figure No.
B-1

Title
Junction IDs

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

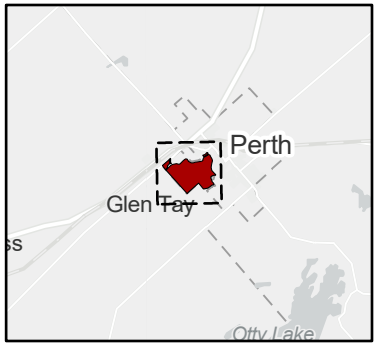
N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Model Node
- Proposed Distribution Network
- Existing Distribution Network



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

Appendix C MODEL RESULTS

AVDY Conditions

Junction ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J7	0.29	135.4	179.0	62
J9	0.29	137.9	179.0	58
J11	0.29	138.0	178.9	58
J13	0.29	137.4	178.9	59
J15	0.29	138.0	178.9	58
J17	0.29	137.2	178.9	59
J19	0.29	137.6	178.9	59
J21	0.29	137.6	178.9	59
J23	0.29	137.4	178.9	59
J25	0.29	137.3	178.9	59
J27	0.29	137.2	178.9	59
J33	0.29	137.0	178.9	59
J35	0.29	137.6	178.9	59
J37	0.29	137.8	178.9	58
J39	0.29	137.8	178.9	58
J41	0.29	137.6	178.9	59
J43	0.29	136.7	178.9	60
J45	0.29	136.7	178.9	60
J47	0.29	137.4	178.9	59
J49	0.29	137.7	178.9	58
J51	0.29	137.9	178.9	58
J57	0.29	136.3	178.9	60
J59	0.29	136.4	178.9	60
J61	0.29	136.5	178.9	60
J63	0.29	136.5	178.9	60
J65	0.29	137.2	178.9	59
J67	0.29	137.3	178.9	59
J69	0.29	137.4	178.9	59
J71	0.29	137.5	178.9	59
J73	0.29	137.2	178.9	59
J75	0.29	138.1	178.9	58
J77	0.29	138.1	178.9	58
J79	0.29	137.9	178.9	58
J81	0.29	137.7	178.9	58
J83	0.29	137.5	178.9	59
J85	0.29	137.0	178.9	59
J87	0.29	137.5	178.9	59
J89	0.29	137.8	178.9	58
J91	0.29	137.7	178.9	59
J93	0.29	136.6	178.9	60
J95	0.29	136.6	178.9	60
J97	0.29	137.7	178.9	58
J99	0.29	137.0	178.9	60
J103	0.29	137.3	179.0	59
J105	0.29	135.4	179.0	62
J109	0.29	137.1	178.9	59
J111	0.29	137.3	178.9	59
J113	0.29	137.1	178.9	59
J115	0.29	137.2	178.9	59
J117	0.29	137.1	178.9	59
J119	0.29	136.5	178.9	60
J121	0.29	137.9	178.9	58
J123	0.29	137.2	178.9	59
J125	0.29	137.2	178.9	59
J131	0.29	137.9	178.9	58
J133	0.29	137.7	178.9	59
J135	0.29	136.6	178.9	60
J137	0.29	137.8	178.9	58
J139	0.29	137.7	178.9	58
J141	0.29	137.0	178.9	59
J143	0.29	137.6	178.9	59
J145	0.29	137.8	178.9	58
J147	0.29	137.4	178.9	59

PKHR Conditions

Junction ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J7	1.27	135.4	178.3	61
J9	1.27	137.9	178.2	57
J11	1.27	138.0	178.0	57
J13	1.27	137.4	178.0	58
J15	1.27	138.0	178.0	57
J17	1.27	137.2	177.9	58
J19	1.27	137.6	177.9	57
J21	1.27	137.6	177.9	57
J23	1.27	137.4	177.9	57
J25	1.27	137.3	177.9	58
J27	1.27	137.2	177.9	58
J33	1.27	137.0	177.8	58
J35	1.27	137.6	177.8	57
J37	1.27	137.8	177.8	57
J39	1.27	137.8	177.8	57
J41	1.27	137.6	177.8	57
J43	1.27	136.7	177.8	58
J45	1.27	136.7	177.8	58
J47	1.27	137.4	177.9	57
J49	1.27	137.7	177.8	57
J51	1.27	137.9	177.8	57
J57	1.27	136.3	177.7	59
J59	1.27	136.4	177.7	59
J61	1.27	136.5	177.7	58
J63	1.27	136.5	177.7	58
J65	1.27	137.2	177.7	58
J67	1.27	137.3	177.7	57
J69	1.27	137.4	177.7	57
J71	1.27	137.5	177.7	57
J73	1.27	137.2	177.7	57
J75	1.27	138.1	177.7	56
J77	1.27	138.1	177.7	56
J79	1.27	137.9	177.7	56
J81	1.27	137.7	177.7	57
J83	1.27	137.5	177.7	57
J85	1.27	137.0	177.7	58
J87	1.27	137.5	177.7	57
J89	1.27	137.8	177.7	57
J91	1.27	137.7	177.7	57
J93	1.27	136.6	177.7	58
J95	1.27	136.6	177.7	58
J97	1.27	137.7	177.7	57
J99	1.27	137.0	177.7	58
J103	1.27	137.3	178.2	58
J105	1.27	135.4	178.3	61
J109	1.27	137.1	177.7	58
J111	1.27	137.3	177.7	57
J113	1.27	137.1	177.7	58
J115	1.27	137.2	177.7	57
J117	1.27	137.1	177.7	58
J119	1.27	136.5	177.8	59
J121	1.27	137.9	177.7	57
J123	1.27	137.2	177.7	57
J125	1.27	137.2	177.7	57
J131	1.27	137.9	178.1	57
J133	1.27	137.7	178.1	57
J135	1.27	136.6	177.8	58
J137	1.27	137.8	177.7	57
J139	1.27	137.7	177.7	57
J141	1.27	137.0	177.7	58
J143	1.27	137.6	177.7	57
J145	1.27	137.8	177.7	57
J147	1.27	137.4	177.7	57

M**XDY + FF Conditions**

Junction ID	Demand (L/s)	Static Pressure (psi)	Static Head (m)	Hydrant Available Flow at 20 psi (L/s)
J7	0.58	66	182.2	382
J9	0.58	63	182.2	355
J11	0.58	63	182.2	247
J13	0.58	63	182.2	313
J15	0.58	63	182.2	320
J17	0.58	64	182.1	313
J19	0.58	63	182.1	302
J21	0.58	63	182.1	313
J23	0.58	63	182.2	323
J25	0.58	64	182.1	315
J27	0.58	64	182.1	312
J33	0.58	64	182.1	284
J35	0.58	63	182.1	227
J37	0.58	63	182.1	300
J39	0.58	63	182.1	246
J41	0.58	63	182.1	295
J43	0.58	64	182.1	277
J45	0.58	64	182.1	305
J47	0.58	64	182.1	248
J49	0.58	63	182.1	272
J51	0.58	63	182.1	280
J57	0.58	65	182.1	284
J59	0.58	65	182.1	280
J61	0.58	65	182.1	261
J63	0.58	65	182.1	276
J65	0.58	64	182.1	273
J67	0.58	64	182.1	262
J69	0.58	63	182.1	260
J71	0.58	63	182.1	258
J73	0.58	64	182.1	259
J75	0.58	62	182.1	254
J77	0.58	63	182.1	224
J79	0.58	63	182.1	227
J81	0.58	63	182.1	228
J83	0.58	63	182.1	258
J85	0.58	64	182.1	262
J87	0.58	63	182.1	177
J89	0.58	63	182.1	221
J91	0.58	63	182.1	231
J93	0.58	65	182.1	240
J95	0.58	65	182.1	238
J97	0.58	63	182.1	254
J99	0.58	64	182.1	230
J103	0.58	64	182.2	253
J105	0.58	66	182.2	266
J109	0.58	64	182.1	279
J111	0.58	64	182.1	286
J113	0.58	64	182.1	234
J115	0.58	64	182.1	230
J117	0.58	64	182.1	229
J119	0.58	65	182.1	292
J121	0.58	63	182.1	213
J123	0.58	64	182.1	281
J125	0.58	64	182.1	275
J131	0.58	63	182.2	333
J133	0.58	63	182.2	352
J135	0.58	65	182.1	300
J137	0.58	63	182.1	224
J139	0.58	63	182.1	245
J141	0.58	64	182.1	269
J143	0.58	63	182.1	253
J145	0.58	63	182.1	271
J147	0.58	64	182.1	259

Reliability Analysis (AVDY + FF Conditions)

	Hydrant Available Flow at 20 psi (L/s)			
Junction ID	Break Scenario 1	Break Scenario 2	Break Scenario 3	Break Scenario 4
J7	273	380	380	380
J9	235	353	353	353
J11	182	244	244	244
J13	209	309	308	312
J15	210	317	317	319
J17	209	307	305	312
J19	205	300	300	301
J21	208	311	312	313
J23	212	320	321	323
J25	209	310	311	314
J27	209	304	306	311
J33	199	282	281	283
J35	173	220	221	224
J37	204	283	285	299
J39	182	237	238	244
J41	202	267	215	293
J43	197	230	232	276
J45	208	286	283	304
J47	184	241	242	246
J49	193	237	217	270
J51	196	278	278	279
J57	201	227	245	273
J59	199	227	241	265
J61	191	219	225	256
J63	197	226	237	257
J65	195	234	223	254
J67	190	224	219	180
J69	189	222	218	183
J71	188	220	217	185
J73	189	221	219	190
J75	185	216	215	189
J77	172	197	195	172
J79	173	199	196	172
J81	174	200	197	170
J83	188	219	219	197
J85	191	220	224	216
J87	147	162	161	151
J89	170	194	192	172
J91	175	202	198	169
J93	181	204	212	234
J95	180	202	209	230
J97	186	219	212	249
J99	176	208	191	225
J103	198	249	249	249
J105	215	262	262	262
J109	197	243	220	271
J111	200	251	220	282
J113	178	211	193	229
J115	176	209	190	226
J117	175	208	190	225
J119	204	223	257	287
J121	166	190	183	209
J123	198	246	220	276
J125	196	239	220	265
J131	214	332	331	332
J133	220	352	352	352
J135	206	222	267	298
J137	172	196	193	222
J139	182	211	208	243
J141	193	230	222	176
J143	186	216	215	252
J145	193	235	218	269
J147	189	223	215	257

APPENDIX C

Wastewater Collection

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1045-6VTHH8
Notice No. 1
Issue Date: November 15, 2012

The Corporation of the Town of Perth
80 Gore Street East
Perth, Ontario
K7H 1H9

Site Location: Perth Sewage Treatment Lagoons
390 Wild Life Road
Township of Drummond-North Elmsley, County of Lanark, Ontario

You are hereby notified that I have amended Approval No. 1045-6VTHH8 issued on March 26, 2007 for a three cell waste stabilization lagoon system having a rated capacity of 7,718 cubic metres per day, located in the east half of Lots 23,24, and 25, Concession X (Township of Elmsley North), in the Town of Perth , as follows:

temporary installation of two (2) Submerged Attached Growth Reactor (SAGR) cell systems, one (1) SAGR cell with dimensions of 9.0 metres wide by 15.0 metres long by 2.0 meters water depth and the other SAGR cell with dimensions of 9.0 metres wide by 10.5 metres long by 2.0 meters water depth, each system has a design flow capacity of 100 cubic metres per day, receiving lagoon effluent from existing transfer structure between lagoon Cells #2 and #3 and discharging back to lagoon Cells #3, including all controls, electrical equipment, instrumentation, aeration system, influent chambers and splitting tank, effluent chambers, piping, pumps, flow meter, valves and appurtenances essential for the proper operation of the SAGR cell systems;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Sewage Works dated October 22, 2012 and submitted by Grant Machan, Director of Environmental Services, The Corporation of the Town of Perth;

2. a design brief dated October 12, 2012 and a water quality monitoring program dated October 25, 2012, prepared by Nelson Environmental Inc.;

3. all other supporting information and documentation provided by R.V. Anderson Associates Limited.

For the purpose of this environmental compliance approval, the following definitions apply:

" *Approval"* means this entire document and any schedules attached to it, and the application;

" *Director"* means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA;*

"District Manager" means the District Manager of Ottawa District Office;

" *EPA"* means the Environmental Protection Act , R.S.O. 1990, c.E.19, as amended;

" *Ministry"* means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;

"Owner" means the The Corporation of the Town of Perth and includes its successors and assignees;

"OWRA" means the Ontario Water Resources Act , R.S.O. 1990, c. O.40, as amended;

" *Works"* means the sewage works described in the *Owner* 's application, and this *Approval.*

You are hereby notified that this environmental compliance approval is issued to you subject to the special terms and conditions outlined below:

SPECIAL TERMS AND CONDITIONS

1. EXPIRY OF APPROVAL

This temporary *Approval* shall expire and become null and void **two (2) years** after the issuance date of this temporary *Approval.*

2. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works,* carry out the following monitoring program:

(1) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 1 - Influent and Effluent Monitoring	
Sampling Locations	A: influent at splitter structure B: SAGR Cell #1 effluent C: SAGR Cell #2 effluent
Sample Type	**Grab**
Frequency	**Weekly** (except Chlorophyll-a)
Parameters	*CBOD5,* Total Suspended Solids, Total Kjeldahl Nitrogen, Total Ammonia Nitrogen, Nitrates and Nitrites, Total Phosphorus, Alkalinity, *E. Coli,* Total Coliform, Chlorophyll-a (**monthly**), Temperature (on field), Dissolved Oxygen (on field), and pH (on field)

(2) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more

recently published editions; and

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions.

(3) The *Owner* shall install and maintain a continuous flow measuring device, to measure the flowrate of the influent to the *Works* with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at weekly frequency.

3. REPORTING

(1) The *Owner* shall prepare, and submit to the *District Manager* and Technical Support Unit of Kingston Regional Office of the *Ministry,* a monitoring result report, within **thirty (30) days** following a **one (1) year** pilot study. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data collected pursuant to Condition 2, and a comparison to the effluent objectives outlined in the design brief dated October 12, 2012 prepared by Nelson Environmental Inc., including an overview of the success and adequacy of the *Works;*

(b) a description of any operating problems encountered and corrective actions taken; and

(c) If necessary, the *Owner* may want to obtain a written permission from the *District Manager* for extending the pilot study duration within the time frame set in Condition 1.

The reason for the imposition of the special condition is as follows:

1. Condition 1 is included to ensure that the *Works* are constructed in a timely manner

2. Condition 2 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works,* on a continual basis.

3. Condition 3 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Certificate,* so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

This Notice shall constitute part of the approval issued under Approval No. 1045-6VTHH8 dated March 26, 2007.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the

environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 15th day of November, 2012

Mansoor Mahmood, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

NH/
c: District Manager, MOE Ottawa District Office
Grant Machan, The Corporation of the Town of Perth

Statistics Canada Statistique Canada

Census Profile, 2021 Census of Population

Data table

Characteristic	Perth, Town (T) Ontario [Census subdivision]
	Counts
	Total
Population and dwellings	
Population, 2021 [1]	6,469
Population, 2016 [1]	5,930
Population percentage change, 2016 to 2021	9.1
Total private dwellings [2]	3,395
Private dwellings occupied by usual residents [3]	3,271
Population density per square kilometre	529.8
Land area in square kilometres	12.21

Source: Statistics Canada, 2021 Census of Population.

How to cite: Statistics Canada. 2022. (table). *Census Profile*. 2021 Census. Statistics Canada Catalogue no. (number) 98-316-X2021001. Ottawa. Released February 9, 2022. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed April 13, 2022).

Note(s):

Footnote 1

2021 and 2016 population

Statistics Canada is committed to protect the privacy of all Canadians and the confidentiality of the data they provide to us. As part of this commitment, some population counts of geographic areas are adjusted in order to ensure confidentiality.

The adjustment to counts of the total population for any dissemination block is controlled to ensure that the population counts for dissemination areas will always be within 5 of the actual values. The adjustment has no impact on the population counts of census divisions and large census subdivisions.

Footnote 2

Total private dwellings

Private dwelling refers to a separate set of living quarters with a private entrance either from outside the building or from a common hall, lobby, vestibule or stairway inside the building. The entrance to the dwelling must be one that can be used without passing through the living quarters of some other person or group of persons.

Footnote 3

Private dwellings occupied by usual residents

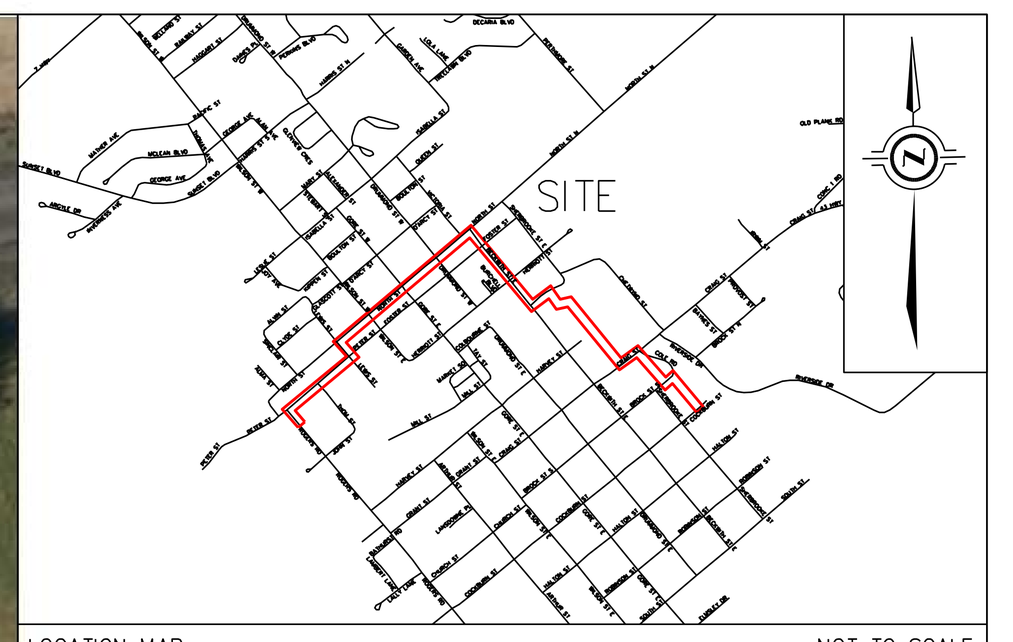
A private dwelling occupied by usual residents refers to a private dwelling in which a person or a group of persons is permanently residing. Also included are private dwellings whose usual residents are temporarily absent on May 11, 2021.

Date modified:
2022-01-30

SEWER INVERT DATA TABLE

MH/CB	DIRECTION	DIAMETER	INVERT	INVERT ELEVATION	TOP OF LID/GRATE ELEVATION	NOTES
SAN MH#1 (ROG_201)	NW NE SE	200 N/A 200	1.33 N/A 1.30	134.55 N/A 134.58	135.88	NE LAT OFFSET BY ±0.30
SAN MH#2 (ROG_200)	NW NE SW	200 200 200	1.65 1.63 ±1.65	134.33 134.35 134.33	135.98	
SAN MH#3 (PET_100)	NE SE SE S SW W W	300 200 200 150 ±300 ±150 ±150	2.78 2.71 2.65 2.69 2.76 1.90 2.52	134.16 134.23 134.29 134.25 134.18 135.04 134.42	136.94	
SAN MH#4 (PET_102)	NE SW	300 300	2.82 2.81	133.83 133.84	136.65	
SAN MH#5 (PET_104)	NW NE SE SW	150 300 250 300	2.53 3.22 3.15 3.21	134.29 133.60 133.67 133.61	136.82	
SAN MH#6 (PET_106)	NE SW	300 300	3.16 3.15	133.34 133.35	136.50	
SAN MH#7 (LEW_202)	NW NE SE SW	300 200 300 300	2.98 2.85 2.98 2.97	133.07 133.20 133.07 133.08	136.05	
SAN MH#8 (LEW_200)	NW NE SE S SW	200 300 300 100 300	3.26 3.32 3.25 2.29 3.31	133.05 132.99 133.06 134.02 133.00	136.31	
SAN MH#9 (NOR_106)	NE E SW	300 200 300	3.81 2.42 3.71	132.87 134.26 132.97	136.68	
SAN MH#10 (WIL_200)	NW' NW NE SE' SE SW	±225 225 375 ±200 300 300	4.45 3.42 4.54 ±2.80 2.60 4.42	132.73 133.76 132.64 ±134.38 134.58 132.76	136.68	NW' LAT- DROP; SE' LAT- STAIRS BLOCKING
SAN MH#11 (NOR_200)	NE SW	±600(*375) ±600(*375)	4.17 4.13	132.59 132.63	136.76	NE AND SE LAT- POSSIBLY WIDE OPENING
SAN MH#12 (NOR_201)	NE SW	375 375	3.37 3.36	132.48 132.49	135.85	
SAN MH#13 (GOR_202)	N NE SE SW	300 600 375 375	3.55 3.62 3.54 3.37	132.29 132.22 132.30 132.47	135.84	
SAN MH#14 (DRU_202)	NW NE SE SW	600 600 200 600	3.61 3.61 2.73 3.60	132.02 132.02 132.90 132.03	135.63	
SAN MH#15 (NOR_208)	NW NW SE SE SW	250 525 525 250 600	1.95 2.61 2.66 2.04 2.65	132.30 131.64 131.59 132.21 131.60	134.25	
SAN MH#16 (BEC_202)	NW SE SW	525 525 200	2.45 2.46 2.25	131.50 131.49 131.70	133.95	
SAN MH#17 (BEC_204)	SE	200	2.00	131.44	133.44	
SAN MH#18 (BEC_210)	NW SE	525 525	1.42 1.45	131.21 131.18	132.63	
SAN MH#19 (BEC_208)	NW SE	200 200	1.45 1.56	131.19 131.08	132.64	
SAN MH#20 (BEC_218)	NW SE	*525* 525	1.49 1.51	131.07 131.05	132.56	NW LAT- RECESSED
SAN MH#21 (BEC_220)	NW SE	200 200	1.50 1.52	131.07 131.05	132.57	
SAN MH#22 (RIV_202)	NW NW NE S SW	*525* 200 *300* N/A 300	±1.82 1.92 N/A N/A ±2.43	±130.96 130.86 N/A N/A ±130.35	132.78	NW, NE AND S LAT- RECESSED;
SAN MH#23 (N/A)	N SE SE'	±500 375 ±450	2.10 1.98 ±2.03	130.77 130.89 ±130.84	132.87	N LAT- CAPPED; SE' LAT- RECESSED
SAN MH#24 (RIV_204)	NE SE SE SW W	500 *400* *300* 300 ±100	2.33 N/A N/A ±2.37 1.80	130.23 N/A N/A ±130.19 130.76	132.56	SE LAT'S- SIPHON; SW LAT- RECESSED
SAN MH#25 (LIVE_200)	NW NW E SW	*400 *300 600 300	N/A N/A 3.27 3.04	N/A N/A 129.51 129.74	132.78	NW LAT'S- SIPHON AND RECESSED
SAN MH#26 (LIVE_202)	SE W	600 600	3.60 3.55	129.27 129.32	132.87	
SAN MH#27 (LIVE_206)	NW E SE	600 150 600	3.39 2.11 3.41	129.22 130.50 129.20	132.61	
SAN MH#28 (CRA_206)	NW NE	600 600	4.61 4.63	128.99 128.97	133.60	
SAN MH#29 (CRA_208)	SE SW	600 600	5.11 5.10	128.95 128.96	134.06	
SAN MH#30 (BRO_208)	NW SE	600 600	3.85 3.94	128.94 128.85	132.79	
SAN MH#31 (BRO_208)	NW NE S	600 600 100	3.77 3.79 1.67	128.83 128.81 130.93	132.60	
SAN MH#32 (BRO_210)	NE E SE SW	375 100 600 600	3.56 1.61 3.76 3.74	128.93 130.88 128.73 128.75	132.49	
SAN MH#33 (LASE_200)	NW SE	600 600	3.75 3.76	128.72 128.71	132.47	
SAN MH#34 (LASE_202)	NW NE SE SE'	600 600 600 600	4.00 4.05 2.29 4.03	128.56 128.51 130.27 128.53	132.56	SE' LAT- DROP
SAN MH#35 (COC_206)	NE *SW* SW	*600* *300* 375	N/A N/A 1.84	N/A N/A 131.02	132.86	
SAN MH#36 (RIV_200)	NW NW NE	375 300 300	2.11 2.16 ±2.43	130.78 130.73 ±130.46	132.89	

**INFORMATION OBTAINED FROM RECORDS PROVIDED BY CLIENT; NOT FIELD VERIFIED BY ONSITE LOCATES INC.*



LOCATION MAP   NOT TO SCALE

SUBSURFACE UTILITY PLAN OF

SANITARY SEWER INVESTIGATION ON VARIOUS STREETS TOWN OF PERTH

ONSITE LOCATES INC.

SCALE 1 : 1000

10 0 10 20 30 metres

METRIC

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

COORDINATE SYSTEM

UTM ZONE 18, NAD83 (CSRS) (2010.0).

NOTE:

BUILDINGS ARE DEPICTED FOR VISUAL AID ONLY. ANY ASSUMPTIONS MADE ABOUT BUILDINGS OR LOCATIONS OF FEATURES IN RELATION TO THE BUILDINGS OR BUILDING TIES ARE MADE AT THE RISK OF THE INDIVIDUAL OR PARTIES TO WHOM THIS DOCUMENT HAS BEEN PROVIDED.

BENCHMARK

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE TOWN OF PERTH BENCH MARK No 01019806708 HAVING A PUBLISHED ELEVATION OF 134.480 METRES.

LEGEND

— SAN — DENOTES UNDERGROUND SANITARY SEWER
SAN MH DENOTES SANITARY MANHOLE
BM DENOTES BENCHMARK

SEWER INVERT NOTE:

SEWER INVERT DEPTHS ARE MANUALLY MEASURED FROM THE LID/GRATE OF THE GIVEN FEATURE.

ANNOTATIONS DISPLAYED AS *ITALICIZED* WITH AN ASTERISK* HAVE BEEN INTERPOLATED FROM RECORDS AND WERE NOT FIELD VERIFIED BY ONSITE LOCATES LTD.

INVERT DEPTH MEASUREMENTS ARE FROM THE ASSUMED BOTTOM OF THE FACILITY STRUCTURE.

DEPTHS ARE NOT SUITABLE FOR EXCAVATION PURPOSES. SEWER NETWORK CONNECTIONS WERE COMPILED WHERE FIELD EVIDENCE COINCIDED WITH AS-BUILT RECORDS

WHERE NO DEPTH INFORMATION COULD BE OBTAINED, UTILITIES ARE ASSUMED TO BE AT STANDARD INSTALLATION DEPTH FOR THE SPECIFIC TYPE OF UTILITY.

THE MOST RELIABLE WAY TO PRECISELY DETERMINE THE HORIZONTAL AND VERTICAL LOCATION OF AN UNDERGROUND UTILITY IS THROUGH PHYSICAL EXPOSURE USING SAFE DIGGING TECHNIQUES (COMMONLY PERFORMED WITH HYDRO VACUUM EXCAVATION)

INVERT DEPTH MEASUREMENTS HEREON ARE PROVIDED IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

UNDERGROUND UTILITY NOTES

THE UTILITY DATA DEPICTED ON THIS DRAWING WERE ACQUIRED IN ACCORDANCE WITH ASCE STANDARD 38-02. THE INFORMATION IS SHOWN BY ATTRIBUTED QUALITY LEVELS WHICH ARE DEFINED AS FOLLOWS:

DATA QUALITY LEVEL

HIGHEST QUALITY
QUALITY LEVEL A
QUALITY LEVEL B
QUALITY LEVEL C
QUALITY LEVEL D
LOWEST QUALITY

QUALITY LEVEL "A" - INFORMATION OBTAINED BY ACTUAL PHYSICAL EXPOSURE OF TARGETED UTILITIES AND SUBSEQUENT MEASUREMENT OF THE EXPOSED PRECISE HORIZONTAL AND VERTICAL POSITION.

QUALITY LEVEL "B" - INFORMATION OBTAINED USING GEOPHYSICAL LOCATE TECHNIQUES TO IDENTIFY THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF THE DESIGNATED UTILITIES.

QUALITY LEVEL "C" - INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO THE QUALITY "D" INFORMATION OBTAINED.

QUALITY LEVEL "D" - INFORMATION DERIVED FROM UTILITY RECORDS OR VERBAL RECOLLECTIONS

ALL SERVICES ARE QUALITY "D" UNLESS NOTED OTHERWISE.
LEVEL "D" RECORD INFORMATION SHOWN ON THIS PLAN HAVE BEEN PLOTTED APPROXIMATELY AS PER THE RECORDS FOUND AND COULD NOT BE FIELD VERIFIED WITHIN THE SCOPE OF THIS PROJECT. IF FURTHER VERIFICATION IS REQUIRED, IT IS SUGGESTED THAT LEVEL "A" METHODOLOGIES BE EMPLOYED.

LOST SIGNAL- DENOTES/INDICATES A POINT WHERE QL-B METHODS COULD NO LONGER ASCERTAIN THE HORIZONTAL POSITION OF A FACILITY.

QUALITY LEVEL "D" INFORMATION COMPILED FROM RECORDS PROVIDED BY CLIENT FILE NO. SANITARY NETWORK_SHEET_4 OF 8- SURVEY AND SANITARY NETWORK_SHEET_5 OF 8-SURVEY

CAUTION: CALL BEFORE YOU DIG

THIS PLAN IS INTENDED FOR DESIGN PURPOSES ONLY. OTHER BURIED UTILITIES MAY EXIST WHICH ARE NOT SHOWN DUE TO INSUFFICIENT INFORMATION OR IMPROPER INSTALLATION. CONTACT ALL POTENTIAL OWNERS OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION OR BREAKING GROUND.
IT IS THE RESPONSIBILITY OF THE CONTRACTOR/BUILDER TO ENSURE THE APPROPRIATE LEGAL REQUIREMENTS ARE MET.

SUBSURFACE UTILITY FIELD WORK WAS COMPLETED ON THE 14TH DAY OF JUNE, 2021

ORTHOIMAGERY PROVIDED BY FIRST BASE SOLUTIONS INC.

ONSITE LOCATES INC.
UTILITY LOCATE SERVICES
A wholly owned subsidiary of J.D. Barnes Ltd.
140 RENFREW DRIVE, SUITE 100, MARKHAM, ON L3R 6B3
T: 1-800-805-6155 www.onsitelocates.ca

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
VC	ZK	21-46-31298
FILE: S:\ONSITE\21-46-31298\Drawing\21-46-31298.dgn		DATED: 2021-06-14
		PLOTTED: 6/15/2021

LOCATION MAP NOT TO SCALE

SEWER INVERT PLAN OF
ROGERS ROAD & SOUTH STREET
TOWN OF PERTH
COUNTY OF LANARK

SCALE 1 : 1000
20 0 10 20 40 60 metres

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

COORDINATE SYSTEM
UTM ZONE 18, NAD83 (CSRS) (2010.0).

BENCHMARK
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE COUNTY OF LANARK BENCH MARK/S No 010198067OB HAVING A PUBLISHED ELEVATION OF 134.480 METRES.

SEWER INVERT NOTE:
SEWER INVERT DEPTHS ARE MANUALLY MEASURED FROM THE LID/GRATE OF THE GIVEN FEATURE.

ANNOTIONS DISPLAYED AS //AS/S/S2D WITH AN ASTERISK* HAVE BEEN INTERPOLATED FROM RECORDS AND WERE NOT FIELD VERIFIED BY ONSITE LOCATES LTD.

INVERT DEPTH MEASUREMENTS ARE FROM THE ASSUMED BOTTOM OF THE FACILITY STRUCTURE.

DEPTHS ARE NOT SUITABLE FOR EXCAVATION PURPOSES. SEWER NETWORK CONNECTIONS WERE COMPILED WHERE FIELD EVIDENCE COINCIDED WITH AS-BUILT RECORDS.

WHERE NO DEPTH INFORMATION COULD BE OBTAINED, UTILITIES ARE ASSUMED TO BE AT STANDARD INSTALLATION DEPTH FOR THE SPECIFIC TYPE OF UTILITY.

THE MOST RELIABLE WAY TO PRECISELY DETERMINE THE HORIZONTAL AND VERTICAL LOCATION OF AN UNDERGROUND UTILITY IS THROUGH PHYSICAL EXPOSURE USING NON-DESTRUCTIVE TECHNIQUES (COMMONLY PERFORMED WITH HYDRO VACUUM EXCAVATION).

INVERT DEPTH MEASUREMENTS HEREON ARE PROVIDED IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND
SAN — DENOTES UNDERGROUND SANITARY SEWER
SAN MH DENOTES SANITARY MANHOLE

UNDERGROUND UTILITY NOTES
THE UTILITY DATA DEPICTED ON THIS DRAWING WERE ACQUIRED IN ACCORDANCE WITH ASCE STANDARD 38-02. THE INFORMATION IS SHOWN BY ATTRIBUTED QUALITY LEVELS WHICH ARE DEFINED AS FOLLOWS:

DATA QUALITY LEVEL

HIGHEST QUALITY — LOWEST QUALITY
QUALITY LEVEL A
QUALITY LEVEL B
QUALITY LEVEL C
QUALITY LEVEL D

QUALITY LEVEL "A" = INFORMATION OBTAINED BY ACTUAL PHYSICAL EXPOSURE OF TARGETED UTILITIES AND SUBSEQUENT MEASUREMENT OF THE EXPOSED PRECISE HORIZONTAL AND VERTICAL POSITION.

QUALITY LEVEL "B" = INFORMATION OBTAINED USING GEOPHYSICAL LOCATE TECHNIQUES TO IDENTIFY THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF THE DESIGNATED UTILITIES.

QUALITY LEVEL "C" = INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO THE QUALITY "D" INFORMATION OBTAINED.

QUALITY LEVEL "D" = INFORMATION DERIVED FROM UTILITY RECORDS OR VERBAL RECOLLECTIONS

ALL SERVICES ARE QUALITY "D" UNLESS NOTED OTHERWISE.
LEVEL "D" RECORD INFORMATION SHOWN ON THIS PLAN HAVE BEEN PLOTTED APPROXIMATELY AS PER THE RECORDS FOUND AND COULD NOT BE FIELD VERIFIED WHEN THE SCOPE OF THIS PROJECT. IF FURTHER VERIFICATION IS REQUIRED, IT IS SUGGESTED THAT LEVEL "A" METHODOLOGIES BE EMPLOYED.

LOST SIGNAL: DENOTES/INDICATES A POINT WHERE QL-B METHODS COULD NO LONGER ASCERTAIN THE HORIZONTAL POSITION OF A FACILITY.

QUALITY LEVEL "D" INFORMATION COMPILED FROM RECORDS PROVIDED BY TOWN OF PERTH SANITARY SEWER NETWORK MAPPING SHEET No. 7/8.

CAUTION: CALL BEFORE YOU DIG
THIS PLAN IS INTENDED FOR DESIGN PURPOSES ONLY. OTHER BURIED UTILITIES MAY EXIST WHICH ARE NOT SHOWN DUE TO INSUFFICIENT INFORMATION OR IMPROPER INSTALLATION. CONTACT ALL POTENTIAL OWNERS OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION OR EXCAVATING.
IT IS THE RESPONSIBILITY OF THE CONTRACTOR/BUILDER TO ENSURE THE APPROPRIATE LEGAL REQUIREMENTS ARE MET.

SUBSURFACE UTILITY FIELD WORK WAS COMPLETED ON THE 10TH DAY OF DECEMBER, 2021

ONSITE LOCATES INC.
UTILITY LOCATING SERVICES
A wholly owned subsidiary of J.D. Barnes Ltd.
140 RENFREW DRIVE, SUITE 100, MARKHAM, ON L3R 6B3
T: 1-800-863-6155
www.onsitelocates.ca

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
KB	KSM	21-46-3129B-01

FILE: S:\ONSITE\21-46-3129B\01\Cs Client\21-46-3129B-01-SEWER.dwg PLOTTED: 12/16/2021

Stantec

Memo

To:	Adam Fobert	From:	Gregory Chochlinski, Ben Morrison
	DSEL		Stantec, Ottawa
File:	Cockburn PS in Perth – Capacity Review	Date:	June 17, 2021

Reference: Cockburn PS in Perth – Capacity Review Memo

Introduction

Stantec was retained by DSEL to perform a review of the existing Cockburn sanitary pumping station (PS) that presently services the Town of Perth. Cockburn PS is the larger of two sanitary pumping stations in the Town of Perth.

The proposed new development by Caivan will discharge into the gravity sanitary system that conveys sewage to the Cockburn PS. This increased flowrate would need to be handled by Cockburn PS. The purpose of this Memo is to review the present condition, and capacity of the Cockburn pumping station and provide a high-level discussion on potential upgrades, if required.

Site Investigation

Stantec visited the Cockburn PS on June 14, 2021 and met with the Town's operator. The basic elements of the PS are as follows:

1. The PS has three pumps, two pumps are in the dry well and one pump is submersible. The wet well/dry well were originally constructed around 1982, and the wet well was expanded later to allow the installation of the third pump (submersible).

2. The two original old pumps in the dry well are 30 HP with reported flowrate capacity of about 90 L/s. The new submersible pump #3 is 45 HP (less than 2 years old) and the available documentation indicates a duty point of 140 L/s at 16.8 m head.

3. The concrete wet well, as originally constructed, is rectangular, with dimensions of 4.9 x 3.0 m. The additional wet well was constructed beside the original one and is about 1.2 m wide. An opening was provided in the common wall to interconnect the two wells. The wells are about 6.6 m deep and the top of wells is at a ground level.

4. A trash screen is installed in front of the sewer inlet. The operators have to enter a confined space to clean the screen manually. This is not a desirable arrangement.

5. The 45 HP submersible pump discharges to the dedicated 400 mm forcemain. The two 30 HP pumps discharge to another 400 mm FM. Both FMs discharge to the sewage lagoon about 1.0 km away.

6. There is a gravity overflow from the wet well directly to the river.

7. There are no flowmeters on the forcemains. The incoming and pumped flowrates could be calculated based on the sewage levels rate of drop (or increase) over time.

8. A standby 125 kW Diesel Generator is installed on site. It has an Automatic Transfer Switch and is capable of supplying power to all pumps and other equipment. The Generator is about 16 years old.

Reference: Cockburn PS in Perth – Capacity Review Memo

9. The electrical and control equipment is housed in a Control Building that was installed years after the initial construction.

10. Pumps have soft starts, housed in the Control Building.

11. Alarms are communicated to the operator's cell phones. The alarms include power failure, Generator On, and high-level alarms.

12. At the time of inspection (early afternoon, June 14, 2021) the sewage level in the wet well was going up by 0.6 m in about 3 minutes, triggering the pumping cycle. It took about 2 min of pumping by Pump 1 or 2 and about 1 min of pumping by pump #3 to lower the sewage level by 0.6 m. This indicates that the incoming flow was around 50 L/s and pumping rate was about 130 L/s (for Pumps 1 and 2) and about 210 L/s for pump #3. These are approximate numbers and should be verified by more precise and longer-term measurements.

The facility operator provided the following comments:

1. Generally the PS operates well. Only one time (spring 2019) all three pumps had to operate at once to keep up with an incoming flow. Since then, a larger submersible pump was added (45HP). The diesel generator operates well.

2. Some concrete deficiencies and rusty access hatches were noticed and should be considered for replacement.

3. The two forcemains operate well.

4. There is no bypass chamber that would allow bypassing the wet well if needed for repairs or new construction. Pumper trucks are used to handle the flow in situations like this.

5. The sanitary system in the Town is in reality a combined system as there are numerous storm connections to the sanitary pipes.

6. The existing sewage treatment lagoon where forcemains discharge to was recently expanded and there should be no capacity problem.

Discussion

The Certificate of Approval was not available at the time of the site visit to confirm the firm rated capacity of the pumping station and other information. We requested the information from the Town and we will review as soon as the information becomes available.

1. Pump #3 is much larger than pumps #1 and #2. The firm capacity of the pumping station is calculated based on the largest pump being out of service. In this case, the flowrate generated by Pumps #1 and #2 pumping at the same time through a common forcemain would be the "firm capacity" of the station. Two smaller pumps pumping at the same time through a common forcemain would have a flowrate similar to one larger pump pumping through an independent forcemain (the same diameter). Therefore, the replacement of two old pumps #1 and #2 with two new identical 45 HP pumps would essentially

double the firm capacity of the pumping station. The two forcemains should be interconnected near the PS to allow using two pumps with two FMs at the same time to maximize the flowrate.

2. The wet well currently fills up too quickly because the active storage band is very narrow (0.60 m approx.), causing the pumps to start too often (every 3 minutes). Expansion of the wet well could be considered to provide more storage and to extend the time between pumping cycles to at least 5 minutes (preferably 10 minutes).

3. With the present configuration of the suction at the two existing dry well pumps, the stop command for the lead pump is at 127.40 m (the wet well bottom is at elev. 125.95), as per the available drawings. If these two pumps were replaced with submersible pumps, the suction configuration would change and the stop command could be lowered by 0.50 – 0.60m. This would provide 80% to 100% more active storage in the wet well and require less frequent pump cycles. This may be just enough to resolve the issue of too frequent pump starts.

4. The arrangement for cleaning the existing trash screens requires confined space entry by the operator, which is very inconvenient and unsafe. A new arrangement would be recommended (removable trash basket with opening right above to allow removal by working on the surface).

5. An isolation valve on the incoming sewer (inside the wet well) should be installed to eliminate the need for inflatable balloons to be used each time the wet well must be isolated.

6. A permanent Bypass Chamber should be considered to allow any works inside the wet well to be done without an extensive mobilization of pumper trucks.

7. Electrical review would be needed to confirm if the existing 125 kW generator would be sufficient to support three 45 HP pumps and other essential equipment. The same applies to the evaluation of the Hydro power service. If insufficient, an upgrade/replacement would be required to accommodate larger pumps.

8. Replacement of the existing Control Building with a larger, sturdier one, should be considered. There is sufficient area on the site to accommodate this.

9. Improving the alarm communication system could be considered. However, the existing cell phone alarm system appears to be satisfactory.

Conclusion

The proposed new development by Caivan is expected to generate about 31.5 L/s of additional flow (at peak). The existing Cockburn PS is performing well, however it is operating close to it's maximum was operating capacity. When the largest pump is out of service the pumping station may not be able to handle the peak flow during rainy days or the spring conditions and could overflow. The additional 31.5 L/s coming from the new development would make the situation worse.

The pumping station could significantly increase its capacity by:

1. Replacing the existing 30 HP dry well pumps with two new 45 HP submersible pumps, the same as the existing Pump #3.

Reference: **Cockburn PS in Perth – Capacity Review Memo**

2. Interconnecting the two 400 mm forcemain to allow pumping through both of the forcemains at the same time under all pumping configurations.

Additional improvements could be done as discussed in the Discussion section of this Memo.

Please contact us if you have any questions or comments.

Sincerely,

Stantec Consulting Ltd.

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Senior Associate, Water

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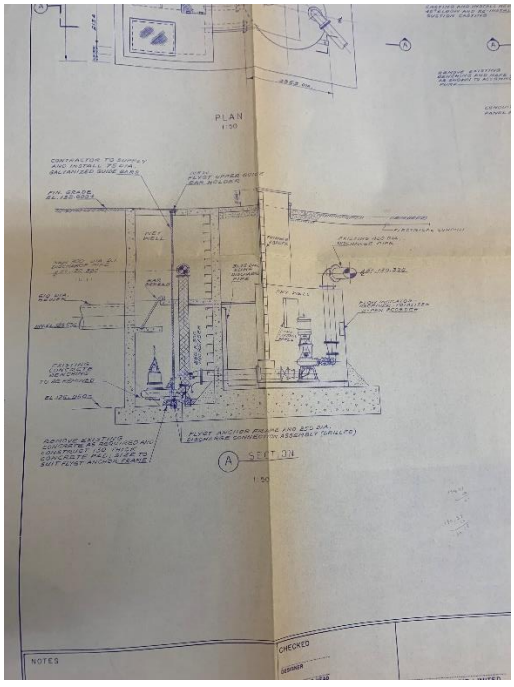
Attachement:

1. Pictures

Reference: **Cockburn PS in Perth – Capacity Review Memo**

Pictures

Reference: **Cockburn PS in Perth – Capacity Review Memo**



SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Caivan**
LOCATION: **Existing Town of Perth**
FILE REF: **19-1092A7**
DATE: **15-Jun-21**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.33	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013	
Ex. Population Per Hectare*	69	Pop/Ha	Peak Fact. Indust. per MOE graph				

*Based on an average from Areas 2, 12 and 10.

Location				Residential Area and Population					Commercial		Institutional		Industrial		Infiltration				Pipe Data										
Area ID	Up	Down	Area	Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Upstream Invert	Downstream Invert	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
Rogers Road	21	22			0.00	0	3.80	0.00		0.00	2.14	2.14	56.34	56.34	46.3	58.480	58.480	19.298	65.64	525	136.59	136.37	91.1	0.24	0.216	0.131	0.98	211.4	0.31	145.7
Rogers Road	22	23			0.00	0	3.80	0.00		0.00		2.14		56.34	46.3	0.000	58.480	19.298	65.64	525	136.35	136.21	103.0	0.14	0.216	0.131	0.73	158.5	0.41	92.9
Rogers Road	23	24			0.00	0	3.80	0.00		0.00		2.14		56.34	46.3	0.000	58.480	19.298	65.64	525	136.20	136.02	99.1	0.18	0.216	0.131	0.85	183.3	0.36	117.6
Rogers Road	24	25			0.00	0	3.80	0.00		0.00		2.14	9.80	66.14	54.3	9.800	68.280	22.532	76.81	525	135.98	135.63	91.5	0.38	0.216	0.131	1.23	266.0	0.29	189.2
Rogers Road	25	26			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.52	135.39	79.8	0.16	0.283	0.150	0.88	247.9	0.31	171.1
Rogers Road	26	27			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.37	135.24	72.4	0.18	0.283	0.150	0.92	260.2	0.30	183.4
Rogers Road	27	28			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.23	135.13	83.0	0.12	0.283	0.150	0.75	213.1	0.36	136.3
Rogers Road	28	29			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.10	134.93	72.9	0.23	0.283	0.150	1.05	296.4	0.26	219.6
Rogers Road	29	30			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.92	134.63	124.0	0.23	0.283	0.150	1.05	297.0	0.26	220.2
Rogers Road	30	31			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.59	134.03	145.9	0.38	0.283	0.150	1.35	380.4	0.20	303.6
Rogers Road	31	32			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.02	133.81	117.0	0.18	0.283	0.150	0.92	260.2	0.30	183.3

Perth Water Treatment Plant

	2021	2020	2019	2018	2017	2016	2015
JAN.	2491	2762	2972	2982	2,381	2,502	2,872
FEB.	2670	2750	3036	2890	2,454	2,571	3,290
MARCH	2630	2704	3047	2961	2,491	2,455	3,298
APRIL	2409	2555	3038	2983	2,586	2,471	3,157
MAY	3030	2938	3049	3363	2,495	2,931	3,392
JUNE	3154	3347	3062	3268	2,836	2,996	3,002
JULY	2993	3635	3469	3602	2,796	2,954	3,048
AUG.	3498	3223	3228	3269	2,837	3,024	3,015
SEPT.	2890	2981	2902	2947	2,886	2,694	2,979
OCT.	2774	2805	2912	2982	2,830	2,603	2,998
NOV.	2486	2513	2707	2840	2,568	2,372	2,852
DEC.	2417	2534	2711	2776	2,681	2,300	2,784
MAXIMUM	**3,498**	**3,635**	**3,469**	**3,602**	**2,886**	**3,024**	**3,392**
MINIMUM	**2,409**	**2,513**	**2,707**	**2,776**	**2,381**	**2,300**	**2,784**
AVERAGE	**2,787**	**2,896**	**3,011**	**3,072**	**2,654**	**2,656**	**3,057**

4.2 Appendix Table 2 – Historical Average Daily Treated Water Flow (m^3)

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 41.100 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **13.56 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	640	2176
Semi-detached and duplex	2.7	299	808
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop **2984**

Average Domestic Flow **9.67 L/s**

Peaking Factor **2.96**

Peak Domestic Flow **28.58 L/s**

Total Estimated Average Dry Weather Flow Rate	**9.67 L/s**
Total Estimated Peak Dry Weather Flow Rate	**28.58 L/s**
Total Estimated Peak Wet Weather Flow Rate	**42.14 L/s**

Residential	200	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.033	L/s/ha

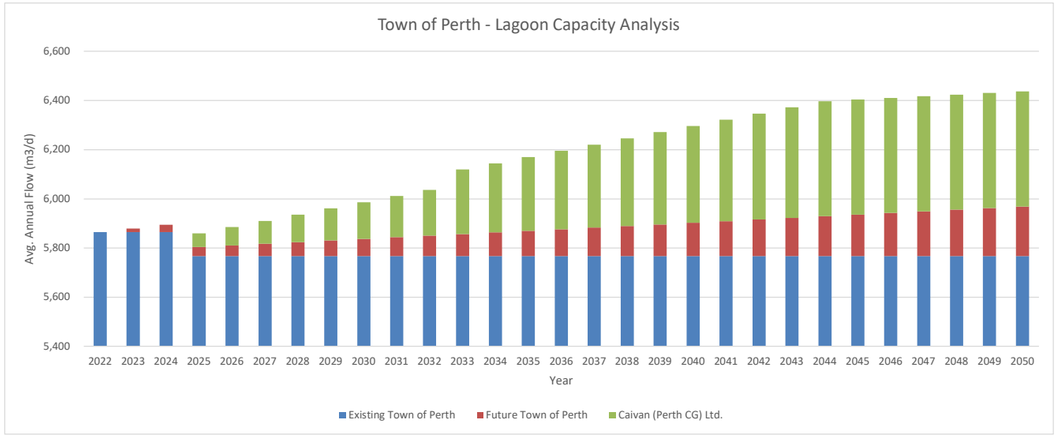
Unit Occ	2.20	p/unit
Residential	200	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.054	L/s/ha
New units to 2024	34	
New units beyond 2024	15	

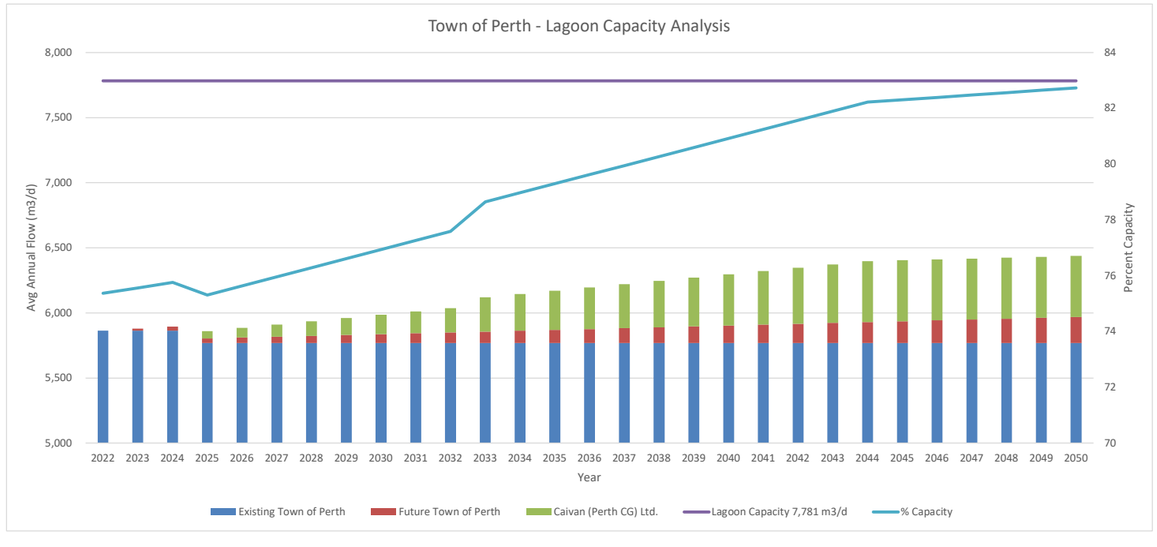
Unit Occ	2.20	p/unit
Residential	170	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.025	L/s/ha

	Existing Town of Perth									Future Town of Perth									Caivan (Perth CG) Ltd.									Total					Lagoon Capacity 7,781 m^3/d	
Year	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Units	Pop	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Qcap	% Capacity
	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)			(m^3/d)	(m^3/d)	(m^3/d)	(m^3/d)	
2022	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864							-	-	-							-	-	-	3,270	6,469	1,564	4,300	5,864	7,781	75
2023	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864		34	75				-	15	15							-	-	-	3,304	6,544	1,564	4,315	5,879	7,781	76
2024	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864		68	150				-	30	30							-	-	-	3,338	6,619	1,564	4,330	5,894	7,781	76
2025	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		83	183				-	37	37	17.118	50	110				37	19	56	3,403	6,762	1,504	4,355	5,860	7,781	75
2026	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		98	216				-	43	43	17.118	100	220				37	37	74	3,468	6,905	1,504	4,381	5,885	7,781	76
2027	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		113	249				-	50	50	17.118	150	330				37	56	93	3,533	7,048	1,504	4,406	5,910	7,781	76
2028	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		128	282				-	56	56	17.118	200	440				37	75	112	3,598	7,191	1,504	4,431	5,935	7,781	76
2029	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		143	315				-	63	63	17.118	250	550				37	94	130	3,663	7,334	1,504	4,457	5,961	7,781	77
2030	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		158	348				-	70	70	17.118	300	660				37	112	149	3,728	7,477	1,504	4,482	5,986	7,781	77
2031	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		173	381				-	76	76	17.118	350	770				37	131	168	3,793	7,620	1,504	4,507	6,011	7,781	77
2032	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		188	414				-	83	83	17.118	400	880				37	150	187	3,858	7,763	1,504	4,532	6,037	7,781	78
2033	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		203	447				-	89	89	43.648	450	990				94	168	263	3,923	7,906	1,561	4,558	6,119	7,781	79
2034	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		218	480				-	96	96	43.648	500	1100				94	187	281	3,988	8,049	1,561	4,583	6,145	7,781	79
2035	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		233	513				-	103	103	43.648	550	1210				94	206	300	4,053	8,192	1,561	4,608	6,170	7,781	79
2036	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		248	546				-	109	109	43.648	600	1320				94	224	319	4,118	8,335	1,561	4,634	6,195	7,781	80
2037	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		263	579				-	116	116	43.648	650	1430				94	243	337	4,183	8,478	1,561	4,659	6,220	7,781	80
2038	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		278	612				-	122	122	43.648	700	1540				94	262	356	4,248	8,621	1,561	4,684	6,246	7,781	80
2039	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		293	645				-	129	129	43.648	750	1650				94	281	375	4,313	8,764	1,561	4,710	6,271	7,781	81
2040	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		308	678				-	136	136	43.648	800	1760				94	299	393	4,378	8,907	1,561	4,735	6,296	7,781	81
2041	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		323	711				-	142	142	43.648	850	1870				94	318	412	4,443	9,050	1,561	4,760	6,322	7,781	81
2042	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		338	744				-	149	149	43.648	900	1980				94	337	431	4,508	9,193	1,561	4,785	6,347	7,781	82
2043	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		353	777				-	155	155	43.648	950	2090				94	355	450	4,573	9,336	1,561	4,811	6,372	7,781	82
2044	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		368	810				-	162	162	43.648	1000	2200				94	374	468	4,638	9,479	1,561	4,836	6,398	7,781	82
2045	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		383	843				-	169	169	43.648	1000	2200				94	374	468	4,653	9,512	1,561	4,843	6,404	7,781	82
2046	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		398	876				-	175	175	43.648	1000	2200				94	374	468	4,668	9,545	1,561	4,849	6,411	7,781	82
2047	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		413	909				-	182	182	43.648	1000	2200				94	374	468	4,683	9,578	1,561	4,856	6,417	7,781	82
2048	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		428	942				-	188	188	43.648	1000	2200				94	374	468	4,698	9,611	1,561	4,862	6,424	7,781	83
2049	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		443	975				-	195	195	43.648	1000	2200				94	374	468	4,713	9,644	1,561	4,869	6,431	7,781	83
2050	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		458	1008				-	202	202	43.648	1000	2200				94	374	468	4,728	9,677	1,561	4,876	6,437	7,781	83

Notes:

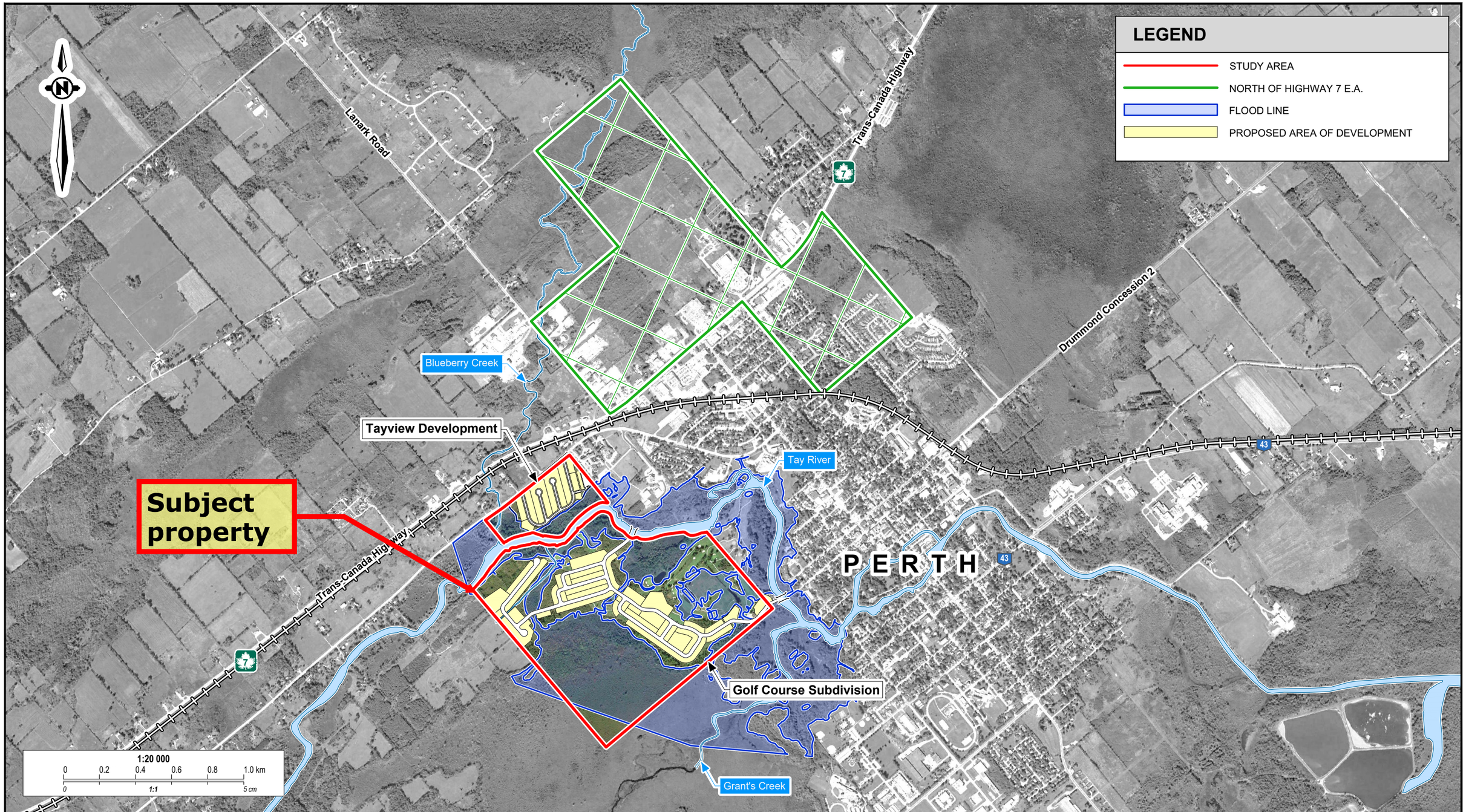
1. Lagoon Capacity per ECA 7,781m^3/d
2. 2022 population and number of units from 2021 census collected by StatsCAN (https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Perth&DGUIDlist=2021A00053509021&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0)
3. 2021 StatsCAN census indicates average unit occupany at 1.9p/unit.
4. Caivan Community annual dry weather I&I per City of Ottawa technical buletin 2018-01.
5. Existing I&I estimated from water use and monitored lagoon flows in 2021.





APPENDIX A

Pre-Consultation



Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

12 INTERNATIONAL DRIVE, PEMBROKE, ON
Phone: (613)735-2507, Fax:(613)735-4513

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON
Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Study Area

DESIGNED: D.N. / K.M.		PROJECT No.: 2161774A	
DRAFTED: R.W.		REVISION DATE: 2019-11-05	
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE: **1-1**	

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 1.1 - study plan.dwg | Layout: community concept plan | Print date: 11:08 AM November 27, 2019

CAIVAN

LEGEND:

- 24' STANDARD TOWNHOUSE
- DETACHED HOME
- 23m ROW
- 18.5m ROW
- 16.75m ROW
- PATHWAY
- 100 YEAR FLOOD PLAIN
- 30m WETLAND SETBACK

LOT COUNT

UNIT TYPE	# UNITS	%
RLTH	0	0
B2B	0	0
24' STND TH	299	32
35' SINGLE	116	12
37' SINGLE	65	7
42' SINGLE	231	25
50' SINGLE	228	24
TOTAL	939	100

REV #	DESCRIPTION	DATE
03		
02		
01		

PROJECT NAME:

PERTH GOLF

DRAWING NAME:

SECOND SUBMISSION DRAFT

DATE: 13/01/2023

DRAWING NO: SK-23

DRAWN BY: CH/ED

OTL305

NET DEVELOPABLE AREA	102.2	ac
5% NET DEV AREA	5.11	ac
PARKLAND PROVIDED	5.16	ac
DIFF.	0.05	ac

C:\Users\ErikDerks\Caivan\Land Development - Project Files\Ottawa\OTL305 - Perth Golf\0400 - Planning and design\0415 - Drawings - Plans\Current (CAIVAN)\230116_ED_Perth GC_SK-23-Grading_Friendly3.dwg, 2023-01-18 2:24:51 PM

TOWN OF PERTH

AGENDA

DEVELOPMENT DISCUSSION TEAM (DDT) MEETING

Held: 10:30 a.m., Thursday, November 25, 2021

Location: Virtual/Zoom

https://us06web.zoom.us/j/82631800479?pwd=NnN4K2tkRjRYM1dzK1pEelhCV2lndz09

First Meeting of the DDT Regarding the Golf Course Lands – Development

1 **Call meeting to order –** Director of Development Services

2 **Introductions –** Director of Development Services

3 **Presentation –** CAIVAN Team

4 **Planning –** Director of Development Services

5 **Engineering –** Director Environmental Services

Traffic/Roads:

Services:

6 **Building –** Chief Building Official

7 **Fire –** Fire Chief

8 **Community Services –** Director of Community Services

9 **Rideau Valley Conservation Authority –** Planner RVCA

10 **Lanark County –** County Planner

11 **Approval Strategy and Process for Offsite Infrastructure**

12 **Perth Golf Capital Projects and Upcoming DC By-Law update**

13 **Closing Comments**

Adam Fobert

From: Julie Stewart <jstewart@lanarkcounty.ca>
Sent: February 11, 2022 3:56 PM
To: 'De Santi, Nadia'; Hugo Lalonde; Marc Pichette; christopher.gordon@cghtransportation.com; john.kingsley@cghtransportation.com; Adam Fobert; Jocelyn Chandler; alex.meacoe@gemtec.ca; shaun.pelkey@gemtec.ca; Anthony Francis
Cc: tracy@zanderplan.com; gmachan@perth.ca; Trevor Choffe; Shannon Baillon; Michael Touw; Phil Mosher; Terry McCann; Sean Derouin; Kurt Greaves; Jasmin Ralph; Michelle Mahon
Subject: Perth Golf Course Lands Proposed Development - Caivan
Attachments: Minutes of Meeting January 14, 2022.pdf; Pre-consultation Subdivision Checklist Perth Golf Course January 2022.pdf; Compiled list of Other Information - Studies - Reports Perth Golf Course January 2022 .pdf

Hi Nadia, Kyle and Hugo

Please find the following attached:

- Pre-Consultation Meeting Minute Notes - January 14, 2022
- Pre-Consultation Checklist
- Compiled list of Other Information / Studies / Report Requirements (from County of Lanark, Town of Perth, RVCA)

Please feel free to forward to the members of your team whom I may have missed.

Thank you,
Julie

Julie Stewart, MCIP RPP
County Planner
99 Christie Lake Road
Perth, ON K7H 3C6
(613)267-4200 ext. 1520
jstewart@lanarkcounty.ca
www.lanarkcounty.ca

Pre-Consultation Meeting Notes - Perth Golf Course - Caivan

Virtual zoom meeting – January 14, 2022

In Attendance

Julie Stewart, Lanark County
Michelle Mahon, Lanark County
Terry McCann, Lanark County
Adam Fobert, David Schaeffer Engineering Ltd
Kyle Larmour, WSP
Christopher Gordon, CGH- Transport
John Kingsley, CGH Transport
Marc Pichette, DSEL Civil
Phil Mosher, RVCA
Sarah Macloed-Neilson, RVCA
Jocelyn Chandler, DSEL
Nadia De Santi, WSP
Grant Machan, Town of Perth
Trevor Choffe, Town of Perth
Michael Touw, Town of Perth
Brian Gass, Town of Perth
Tracy Zander, Representing Perth
Hugo Lalonde, Caivan

Hugo introduced the project, in summary:

- Potential of re-purposing existing clubhouse.
- Recognize the 9 hole golf course and the original 3 holes.
- A mix of single-family homes, townhouses and back to back townhouses are proposed.
- 650-800 units will be phased.
- Referred to current studies underway.
- Phase 1 within OP residential designation.

Julie Stewart added the County is proposing to initiate the review of population projections later in 2022, as per County Council's commitment to review in 5 years.

Tracy Zander asked if the studies and reports are for the whole site as a Master Plan ?

Hugo stated that the reports will address the site as a whole.

Town and County staff will coordinate the list of required studies/reports for submission and will provide the compiled list.

Christopher Gordon, looking for the previous traffic study.

Grant noted that he will see if he can obtain a copy and provide to CGH.

Terry McCann mentioned design work would be required where the road reaches the County property because of the existing buildings and parking lot. Setbacks to be addressed.

The road is also located within Tay Valley so coordination would have to happen with the Town, County and Tay Valley. Terry McCann is the main contact.

Hugo noted that the locations on the concept plan were derived from the Infrastructure Master Plan. They can revisit alignment as part of the traffic impact study

Shannon Baillon will forward the proposed extension of the Tay River trail system as pedestrian crossing which will have to be incorporated into the road design.

Nadia proposed bi-weekly meetings with the hope of submission in February, which Town and County staff will discuss availability

Adam Fober provided an update on the engineering work and that they are working with Stantec to update the IMP. In summary, proposing 3 stormwater management ponds, examining capacity and a water model.

Grant noted the need for a conversation around contributions required for an elevated water tower as well as the Town's plan for an expansion of the lagoon with the 5th SAGR system. Town staff can work with the civil engineers.

Nadia mentioned some discrepancies with the OP mapping.

Julie will coordinate a meeting with the Planners to discuss the Official Plan mapping and policies.

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist – Perth Golf Course

Report	Comments	Required Yes/No
Planning Rationale	Include justification Must have regard for PPS Lanark County Official Plan compatibility Local Official Plan compatibility Address OPA # 16	Yes Yes Yes Yes Yes
Hydrogeological Study, Terrain Analysis	Availability and suitability of water and waste water MOE – D-5-4 Guidelines MOE – D-5-5 Guidelines ODWSOG Checklist Summary & Sign-off Integrated Hydrologic Impact Assessment	Public Yes Yes
Environment Impact Study	SAR & Significant Habitat Wetlands Organic Soils Natural Heritage Features & Systems Significant Wetlands Significant Woodlands Significant Valleylands Significant Wildlife ANSI Fish Habitat Headwater Drainage Feature Assessment	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes
Servicing Options Statement	Guidelines – MOE D-5-3	Yes
Stormwater Drainage Plan	Guidelines - MOE-2003 / MNR-2001 Checklist Summary & Sign-off	Yes
Grading Plan	Sloping land within lot to direct flow of surface water away from foundations & abutting properties.	Yes

LANARK COUNTY

PLANS OF SUBDIVISION

PRE-CONSULTATION – checklist – Perth Golf Course

Report	Comments	Required Yes/No
Sediment and Erosion Control Hazardous Sites	Flooding, erosion hazard Slope and Soil Stability Organic Soils Karst Topography	Yes Yes Yes
Archeological Investigation	Standards & Guidelines	Yes
Tree Preservation Plan or Tree Conservation Plan	Check with local municipality	
Other	**SEE ATTACHED Compiled List of Other Information / Study / Report Requirements**	
Draft Plan	To include: Planning Act 50(17) Ont. Reg. 544/06 Lot and block configuration Compatibility with adjacent uses Road access, street layout & Pedestrian amenities Parks & Open Space amenities Easement and right-of-way requirements	Yes

Compiled list of Other Information / Study / Report Requirements for the Perth Golf Course Lands

(Refer to the Standard County of Lanark Pre-Consultation Checklist as well)
Prepared By: County of Lanark and Town of Perth and RVCA

January 2022

Master Plan for the entire development.
Master Plan should include phasing plans and details of phases.

Bridge Assessment / Capacity Study

- impacts and review of capacity for existing Peter St bridge.
- consideration of alternate bridge on North St with traffic flows off of Peter Street, migration of lights from Foster St or potentially west into Tay Valley connecting to Ernest Way.
- triggers for 2nd bridge
- access to Tay Valley lands.
- Location, design and setbacks on County lands and use of existing County driveway and parking area.
- Developer to evaluate the crossing and determine when such would be required.
- Any proposed hydraulic analysis on a potential bridge will include demonstration of no impact to upstream water levels or the creation of adverse impacts. This would include, but not be limited to, not affecting the function of the Haggart flow split as well as the WSC gauge at Perth.

Water Supply (Provision of water supply)

- triggers and requirements for new elevated water tank
- improvements to pumping capacity at WTP

Stormwater design

- confirmation of minimal ponds
- outfalls downstream of WTP Intake Protection Zone
- Demonstrate low impact development measures which prioritize a treatment train approach in accordance with the MECP Stormwater Manual
- Confirmation of enhanced water quality treatment or better

Sanitary

- upfront installation
- triggers for capacity at wastewater treatment facility (when to construct 5th cell)

Cultural Heritage Assessment for the Golf Course.

Geotechnical Study

Integrated Hydrological Impact Assessment

– to provide a water budget and runoff volume and water quality control targets

- maintain all aspects of the site's natural hydrological functions (storage, retention, infiltration, evapotranspiration, filtration, flow to wetland, etc.)
- This approach should result in a LID / Green Infrastructure approach to stormwater servicing resulting in a distributed treatment train approach.
- Legitimate constraints (shallow bedrock, contaminated areas, natural features, etc.) should be documented
- Runoff volume retention method is recommended
-

Environmental

A constraints map, using information derived from relevant reports/studies, should be one of the first things produced.

Floodplain

- All development is to be located outside the floodplain as per provincial policy. If the proposed work would question the accuracy or validity of the floodline, further discussion should occur regarding appropriate approach to be used.
-

Wetlands

Fish Habitat

EIS

Hydrological Impact Statement or hydrological investigations

Water budget

- all environmental studies should be integrated in a holistic manner

Headwater Drainage Features Assessment

Significance of woodland should be considered and evaluated

The Infrastructure Master Plan made specific mention of a tree preservation plan

Reference to the meeting minutes from the Town of Perth and the County of Lanark and the Standard County of Lanark Checklist is required.

Adam Fobert

From: Grant Machan <gmachan@perth.ca>
Sent: March 14, 2022 2:23 PM
To: Adam Fobert
Subject: Re: 1278 Caivan - Perth: Western Lands

My superintendent will be giving you call about these items. re-lit fire on topic.

Grant Machan CET
Director of Environmental Services
gmachan@perth.ca
613-267-3311 ex2233

From: Adam Fobert <AFobert@dsel.ca>
Sent: March 14, 2022 12:04
To: Grant Machan <gmachan@perth.ca>
Cc: Chochlinski, Gregory <gregory.chochlinski@stantec.com>; Mineault-Guitard, Alexandre <Alexandre.Mineault-Guitard@stantec.com>
Subject: RE: 1278 Caivan - Perth: Western Lands

Hello Grant,

Just following up on the email below and our meeting. You had mentioned during our meeting that one of your staff was working on assembling some of the background information. Has that been sent over? Perhaps it hasn't been forwarded to me on our end.

In particular Stantec are looking for:

- Which firm is the Town using for SCADA programming/development.
- Excerpt's from an existing pump station owner's manual.
- Identify town's preference for backup power generator supplier.

Also, we discussed that our report is to identify triggers for lagoon expansion. We've come across two sets of population densities in previously published works. The IMP appears to be using City of Ottawa guidelines for p/unit, while OPA 16 used 1.87p/unit for all unit types. Can you please confirm which we should be using?

Feel free to call to discuss.

Adam Fobert, P.Eng.
DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626

cell: (613) 222-9493
email: afobert@DSEL.ca

From: Adam Fobert
Sent: March 1, 2022 11:55 AM
To: 'Grant Machan' <gmachan@perth.ca>
Cc: 'Chochlinski, Gregory' <gregory.chochlinski@stantec.com>; 'Mineault-Guitard, Alexandre' <Alexandre.Mineault-Guitard@stantec.com>
Subject: RE: 1278 Caivan - Perth: Western Lands

Hello Grant,

Thank you for meeting with us on Feb 18. We prepared some meeting notes for both our files.

Let me know if you have any comments on the notes.

Note that there are a few items that Stantec are looking to obtain from you.

Adam Fobert, P.Eng.

DSEL

david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

-----Original Appointment-----
From: Grant Machan <gmachan@perth.ca>
Sent: February 18, 2022 10:44 AM
To: Adam Fobert
Subject: Accepted: 1278 Caivan - Perth: Western Lands
When: February 18, 2022 1:30 PM-2:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Zoom

Are you able to send graphics/concepts to support the discussion?

David Schaeffer Engineering Ltd.
120 Iber Road, Suite 103
Stittsville, ON K2S 1E9
613-836-0856
dsel.ca

MEETING NOTES

DATE: 2022-02-18
1:30 PM – Zoom Meeting

SUBJECT: 21-1278 Caivan - Perth

IN ATTENDANCE:	Adam Fobert (AF)	DSEL
	Gregory Chochlinski (GC)	Stantec
	Alexandre Mineault-Guitard (AMG)	Stantec
	Grant Machan (GM)	Town of Perth

Note: The following meeting notes represent the writer's interpretation of the meeting. As such, any errors or omissions must be reported to this office immediately. All comments are to be provided within 5 business days; otherwise, they are deemed acceptable by all.

ITEM	DESCRIPTION
1.	GM – Town of Perth advancing with the upgrades to Highway 7, which will include improvements to the water and sanitary. The town will be identifying a site for the Highway 7 water tower as part of that process but will not be sizing a facility. This work has been awarded to Mac Perry.
2.	Information provided regarding the Pump Station: • The facility will include a control building to house the electrical panel. • There will be no washroom in the building. • Building will tie into surrounding architecture and will be equipped with an exterior alarm light. • Facility to have both SCADA system and automatic cellular dialer. There will be no staff 24/7 monitoring SCADA. • GM to confirm which firm is used for SCADA programming/development. • GM to provide Stantec with an excerpt from the owner's manual of an existing facility that in their opinion runs well. • Preference is to have the pump selection be interchangeable with the other facilities. • Facility will be designed with a by-pass chamber to facilitate future maintenance. • Permanent Natural Gas stand-by generator will be used. • GM to confirm if they have a preferred backup generator.

	• GM – Roger Road Crossing tender was awarded last week. The town wants to investigate hanging the forcemain from the bridge. Stantec to send preliminary information for coordination of Roger's Road / Tay River Crossing. • The overflow from the pump station will be to the proposed stormwater pond.
3.	Information provided regarding the water services: • Existing conditions model was completed in 2016. • No significant changes or improvement have been made to the system since 2016. Design can start with the 2016 model as the base. • 160 Bed Retirement Home planned at Sunset Blvd. and Lanark County Admin Building to be added.

Prepared by,

David Schaeffer Engineering Ltd.
Per: Adam Fobert, P. Eng.

Adam Fobert

From: De Santi, Nadia <Nadia.De-Santi@wsp.com>
Sent: October 12, 2022 4:11 PM
To: jbowes@perth.ca; mtouw@perth.ca; gmachan@perth.ca; Julie Stewart; glen.mcdonald@rvca.ca
Cc: Susan Murphy; Hugo Lalonde; Colin Haskin; Erik Derks; Ferguson, Erin; Christopher Gordon; John Kingsley; Adam Fobert; 'Jocelyn Chandler'
Subject: Meeting Minutes - Caivan - 141 Peter St. - Draft Plan of Subdivision
Attachments: Meeting Minutes Town of Perth September 16 2022.pdf

Hello everyone,

Thank you again for meeting with us on September 16, 2022.

Please find attached the Meeting Minutes. If there are any errors or omissions, please advise by end of day, Wednesday, Oct. 19, 2022.

Thank you.

Regards,

Nadia De Santi, MCIP, RPP
Practice Lead
Urban and Community Planning

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M +1 (613) 816-0664
WSP Canada Inc.
2611 Queensview Drive, Suite 300
Ottawa, Ontario, K2B 8K2

-LAEmHhHzdJzBITWfa4Hgs7pbKI

Meeting Minutes

Meeting/Project Name	Review Comments & Resubmission Requirements Re: Application for Draft Plan of Subdivision Approval for Perth Golf Course Lands, County of Lanark File No. 09-T-22001		
Date of Meeting	September 16, 2022	**Time**	10:00 am to 12:00 pm
Location	Sunshine Room, Town of Perth Municipal Office at 80 Gore Street East and virtual via Zoom		
Minutes Prepared By	Erin Ferguson (WSP). Minutes Reviewed by Hugo Lalonde and Colin Haskin (Caivan).		

Attendees

Town of Perth: Michael Touw (Chief Administrative Officer), Joanna Bowes (Director of Development Services), Grant Machan (Director of Environmental Services)

Lanark County: Julie Stewart (County Planner)

Rideau Valley Conservation Authority: Glen McDonald (Director of Science and Planning) via Zoom

Caivan: Susan Murphy (Vice President of Land Development), Hugo Lalonde (Director of Land Development), Colin Haskin (Manager of Land Development), Erik Derks (Land Development Coordinator) via Zoom

Consulting Team: Adam Fobert (Senior Design Engineer with David Schaeffer Engineering Ltd), Christopher Gordon (Engineer with CGH Transportation), John Kingsley (EIT with CGH Transportation) via Zoom, Jocelyn Chandler (Land and Water Resource Planner with J.F. Sabourin and Associates Inc.) via Zoom, Nadia De Santi (Practice Lead with WSP), Erin Ferguson (Senior Planner with WSP) via Zoom

Agenda Items, Discussion, Actions

Topic	Discussion
1. Introductions	Nadia De Santi opened the meeting and round table introductions were made. It was noted that Colin is the main contact at Caivan for day-to-day project coordination.
2. Overview of Draft Plan of Subdivision and Project Design Brief	Hugo Lalonde gave a brief overview of the draft plan of subdivision and development master plan including the project rationale, pre-application discussions, design features, and key issues. ○ Draft Plan of Subdivision is 30 acres of residential, parks, roadways, pump station consistent with OP policies ○ There are 30 acres on Town's OP is designated as Residential, largely consistent with draft subdivision plan area but slight differences in the boundaries ○ Development is outside of environmentally sensitive wetlands and floodplain ○ At this point the plan is to retain a 9 hole golf course and renovate the clubhouse, potentially expanding commercial uses

Suite 300
2611 Queensview Drive , Ottawa, ON, Canada K2B 8K2
T: +1 613 829-2800
wsp.com

	○ High quality parks as shown on the plan and connected through trail network, and there will also be connection to the Tay River Trail. Park in Phase 1 is seen as a gateway feature. Caivan would build the parks ○ Proposed blocks and lots are reflective of Caivan's approach in Ottawa with a 21 m lot depth and 3 m front yard setback ○ Street cross-sections are 24 m, 18.5 m and 16.75 m following the policy direction of Town's OP ○ Peter St bridge will service Phase 1 with later phases triggering a second crossing that will likely tie into the County property as identified in the IMP
Working Strategy Going Forward	○ Caivan's approach has been to complete pre-consultation and extensive due diligence to inform the development of this site. Town of Perth has provided commitments during these discussions. Caivan is acting on the Town's planning and engineering work done through the past OPA and IMP to present a plan that provides residential growth and sustains the historic downtown and the local businesses. This was presented to and received buy-in from Council. ○ Caivan acknowledged that is a difficult site to develop due to existing environmental constraints, and considerable offsite and external work to be done but that Caivan is committed to working together with the Town to move forward. Caivan is excited to be in Perth. ○ Agreement from those in attendance that this is a cooperative exercise. Today is about gaining clarity, need to set up some smaller working sessions related to different components of the plan going forward, but the group needs to reconvene prior to next submission as an integrated planned approach is required
Floodplain Mapping Clarification	○ Glen asked about the Tay River floodplain mapping. ○ Jocelyn explained that LIDAR data was collected and it was run through RVCA's model to generate the new floodplain boundary ○ Glen stated some pinch points with floodplain line and roads were identified on the draft plan of subdivision – the dotted line. Jocelyn advised that these will be addressed through a volumetric cut and fill approach and it is anticipated that this will be minor. ○ Julie asked if the floodplain line was surveyed. Jocelyn replied it was not, but ground survey work will be done as part of the application for cut and fill. LIDAR is very accurate so the difference between that and ground survey will be minimal **JFSA (Jocelyn) to resend map showing minor floodplain boundary changes to the RVCA, County, and Town by Sept. 30, 2022**
3. Questions on Review Comments	
Servicing	○ Adam requested clarification on one of the Town's circulation comments on the downtown intensification infrastructure work. Town indicated that there is no update on the infrastructure master plan. Michael advised that this work hasn't begun but it is still in the works under the current 2022-2026 Strategic Plan, which was recently approved by Council. Grant confirmed that it is the Town's intention to do a full IMP for the Town owned, infill, and brownfield sites.

	○ Adam gave an overview of servicing plans and reported that the work done to date indicates there is sufficient capacity available and is consistent with the past discussions with the Town regarding the servicing of the Western Annex Lands. Currently, DSEL is working with Caivan on identifying a metric to indicate when expansion would be triggered, and they are looking at historical population and permit data. Asked which metric the Town wants to see (eg. population, units, flow). ○ Town indicated that they do not have a specified metric. Grant uses a volumetric metric. Town wants to see phases for servicing requirements to look at the capacity of the Town lands overall and want to see this information ahead of time for infrastructure planning purposes but indicated that an onsite system is an option that wouldn't affect the Town's infrastructure planning/timeline. ○ Relating to the suggestion that an on-site sanitary treatment system should be explored, Adam noted that based on his exploration of these systems in other projects, the operational costs are quite high and the approval logistics are challenging as it triggers a Schedule C project, discharging upstream likely not great for residents. He suggested that additional offsite improvements would likely be more financially viable for the Town rather than an onsite system. ○ Grant clarified that the on-site system was simply a brainstorming idea and does not reflect what is recommended in the IMP, nor is it the desired strategy from the Town's perspective for the Western Annex Lands. Grant further acknowledged that Caivan requires allocation commitments from the Town for Phase 1 and beyond before proceeding with the development. ○ Hugo indicated that DSEL has been tasked to do the technical work on phasing and lagoon capacity. Caivan anticipates starting construction in 2025/26 with the first building permits and then occupancy. Hugo stated that Caivan and the Town can work out an appropriate allocation that works for the Town and gives Caivan the security to move forward. Caivan and the Town of Perth could look at a flow monitoring program as part of the allocation strategy. ○ Grant commented on how to maximize the 5th cell. Council didn't approve the 5th cell. ○ Hugo stated that with DSEL, they will look at an appropriate allocation for Phase 1 with the Town so that some development can occur and keep capacity for others too. There are tools that can be explored through the draft subdivision conditions. ○ Adam Fobert expressed concern with connection to Inverness in IMP as it would run between two homes and significantly impact these properties. Alternate solution is preferred and would potentially benefit seniors home and wouldn't affect water pressure. Town not opposed to the proposed alternate solution and acknowledged the limitations of the connection shown in IMP. ○ Grant Machan shared that planned redesign and improvements for Highway 7 will be oversized. ○ DSEL confirmed that no additional fire flow is needed for Phase 1. Town asked to confirm trigger point for tank and contingency plan. ○ Town noted that looping will be required to resolve bottleneck between Phase 1 and 2. WM looping strategy will need to be defined and reflected on the Draft Plan.
Transportation	○ Chris Gordon reported that transportation planning has followed the IMP and noted that traffic volume is not a constraint for Phase 1. The Peter Street Bridge has adequate capacity to handle the anticipated traffic volume for initial development

	phases but later phases will trigger the need for an additional crossing. Monitoring, including changes in travel patterns, following occupancy will give a better indication of the appropriate timing for the second bridge. ○ Chris advised that HP Engineering has been retained and has confirmed that the bridge structure can support construction and emergency vehicle traffic. The Memo also outlines potential Bridge enhancements for 10 to 20 years. HP's Memo will be included in the resubmission. Additionally, Caivan is exploring options to address active transportation/pedestrian connections and will bring this forward in the next submission. **Caivan/WSP to provide Town with bridge structural capacity information and will present options for providing pedestrian connection to the development at the Peter Street crossing.** ○ Joanna expressed that they have major concerns with the single bridge particularly related to emergency response access. There are also concerns about the timeframe or trigger for second bridge should the next phases of development not proceed. The Town is firm that a second bridge crossing is needed to support this development and stated that there are Official Plan policies related to this requirement and that more detail on the second access needs to be provided upfront with this application to ensure the health and safety of future residents. Joanna also confirmed that Peter Street is a truck route. ○ In relation to the proposed location of the second crossing, the Town noted that the road is used by the County but it is a private road and that although it appears in IMP, other jurisdictions may not have reviewed the proposed crossing. The adjacent Townships didn't participate in the Town's IMP even though the second crossing is proposed to run through multiple municipalities. **Julie said that she can reach out to the Township contacts and County.** ○ Hugo acknowledged that they are aware it isn't a public ROW and more coordinated work will need to be done to determine how this will work. Caivan followed guidance of the IMP re: second bridge location. ○ Town confirmed that the second crossing is not included in their 4-year infrastructure plans ○ Julie stated that the second access needs to be thought out more clearly. ○ Sue asked if the Town has plans to do the EA for the second bridge crossing. ○ Grant confirmed that the Town is not currently planning for an EA for the second bridge.
Parks and Open Space	○ Town indicated that they need to do more work to determine the parks and open space needs for the community. ○ Grant would like to see the stormwater ponds designed to be incorporated in parks and openspace network, no fences. Caivan confirmed that this is part of their plans to integrate the ponds into the parks and trails network. ○ It was confirmed that the Town does not have a Parks and Open Space Master Plan.

	○ Grant also would like to see where the onsite parking would be located for the parks and open space. **Town to involve Community Services in review/working sessions on parks and open space needs. Caivan and Town to work cooperatively with cost effective designs to minimize maintenance and to not overload Town resources.** **Caivan to include Blocks for pathways on the draft plan of subdivision for the resubmission.**
Update on EIS and Integrated Hydrological Assessment	○ It was acknowledged that the environmental studies were not complete given the time of year when Caivan submitted. Once the field monitoring program is finished and the data is analyzed, the studies will be completed and provided as part of the next submissions. ○ Jocelyn acknowledged that more work needs to be done on EIS and they are waiting until ground and surface water monitoring is done to complete EIS. ○ Integrated Hydrological Assessment will help Caivan determine if LIDs are appropriate or not in terms of ensuring water balance model will sustain wetlands **Caivan/WSP to submit completed EIS and Integrated Hydrological Assessment with next submission**
Heritage Impact Assessment Update	○ Town has not yet initiated the peer review
Application Status	○ County deemed the application complete but Joanna said more information was required to properly review the application.
Boundary Adjustment Interpretation	○ Nadia presented the rationale that the draft plan of subdivision is largely consistent with the Residential designation boundary in the OP, that the OP boundaries do not appear to reflect specific features and that the adjustment results in no net gain of residential lands therefore our planning opinion is that this can be done without OPA as per policy statement ○ Julie and Joanna indicated that they don't share this opinion and OPA is required. The Residential designation boundary is tied to previous OPAs, it is not considered to be a minor boundary adjustment. Stated that other lands designated as a Special Study Area not Future Development and that there are other components in OP that guide development of these lands. ○ Nadia sought direction on policies that would prevent development from moving forward. Joanna referred to servicing allocation and land use policies. Joanna indicated that she hasn't done a boundary adjustment before and that an OPA has to be done. Hugo indicated that Caivan is not opposed to doing an OPA. Nadia also said that the more detailed studies will be provided in the next submission and this will also help with the PPS policies and other comments that were provided by the Town. Hugo suggested having a separate meeting on the OPA and this was agreed upon as the best way to move forward before filing an OPA application. ○ Joanna confirmed that a zoning by-law amendment should be done in advance not as a condition of subdivision approval as there is no indication of density, unit mix, or affordable housing. Town requested further information on proposed uses and density to be able to understand the development and determine if it is appropriate. Joanna also

	indicated that affordable housing will need to be discussed. Caivan are exploring the affordable housing comments. Caivan indicated that there will be a variety of housing to meet different needs, and there will be a range of small to large lot singles. ○ Joanna stated that she didn't think Perth will be accepting of Ottawa housing types. Sue indicated that Caivan has developed a farmhouse style single design that can be shared with the Town. Sue offered a tour of the Ottawa Caivan sites for Town staff. Joanna would like to see the sites in person. Sue also indicated that Caivan can present their architectural package to the Town to show the different housing styles, materials, etc.
Street Cross-sections	○ Town acknowledges that the proposed road cross-sections are consistent with OP and that they do not have additional street specifications, but they have concerns with the functionality of the proposed 16.75 m and 18.5 m ROW in relation to parking and snow clearing ○ Town noted that as shown in the cross-sections in the Urban Design Brief, with a 3 m front setback a car will not fit in the driveway and will be parked within the ROW, across the sidewalk or trying to park in the space between the sidewalk and curb. Hugo confirmed that it is not Caivan's intention to have easements in the public r-o-w, and that the cross-sections don't reflect this properly. ○ Joanna commented that the 16.75 m is in the OP and the Town can't challenge Caivan on this. However, the Town will be looking to change this r-o-w in the new OP review. ○ Grant advised that this is pickup truck land. Hugo said that there would be housing options with double car garages and double driveway widths. ○ Caivan indicated that they can provide a parking plan to demonstrate how parking with driveway widths and on-street parking can work. ○ **Caivan to provide street cross-sections for reduced width ROWs approved for Ottawa showing that parking, snow clearing, and emergency vehicle manoeuvring can work for Town's review.** ○ Town suggested alternating on-street parking locations for traffic calming. ○ Joanna mentioned that there is no public transit. People are commuting out too. ○ Grant advised that the Town would like to see alternate parking on driveways and streets.
Additional Studies	○ Cavian is seeking clarification on the additional studies requested by the Town. Town indicated that study requirements can be discussed further and that some of the previously listed studies might not be required. **Caivan to draft an expanded table of contents for the revised FSR for the Town's review to see if it addresses the Town's requirements.** ○ Nadia mentioned that the Neighbourhood-Servicing Use Study and the Public Services Capacity Study are not applicable since the OP policies for these studies refer to institutional type of development which isn't being proposed by Caivan. Grant wasn't aware of these studies. **Joanna will confirm whether these are needed by Oct. 5, 2022.**
Closing Remarks	○ Grant to follow-up with Adam re servicing

	○ Hugo requested clarity on process requirements for draft subdivision approval, registration and servicing but Town indicated that these are being developed and are not yet in place. **Julie advised that the County's process will be shared.** ○ Chris reiterated that they have relied on the IMP which indicated that a North Street crossing was not considered due to perceived traffic impacts but asked if Town would consider exploration of this option. Town confirmed that they are open to Caivan exploring this option but that it would likely require lights and could have a domino effect. ○ John asked where the R-O-Ws are as it isn't clear from the County maps. Julie advised that the County lands are in Tay Valley Township. The County's Administrative Office share lands with Tay Valley and with the Township of Drummond. **Julie can provide Chris and John with the County's Public Works Department contact.** ○ Nadia asked who should be the primary point of contact as we move forward. Joanna confirmed that she should be the contact for the smaller working group meetings, including discussions on the OPA where the County would be invited to. Julie should be the point of contact to coordinate the larger group meetings with the Town and the RVCA.

Adam Fobert

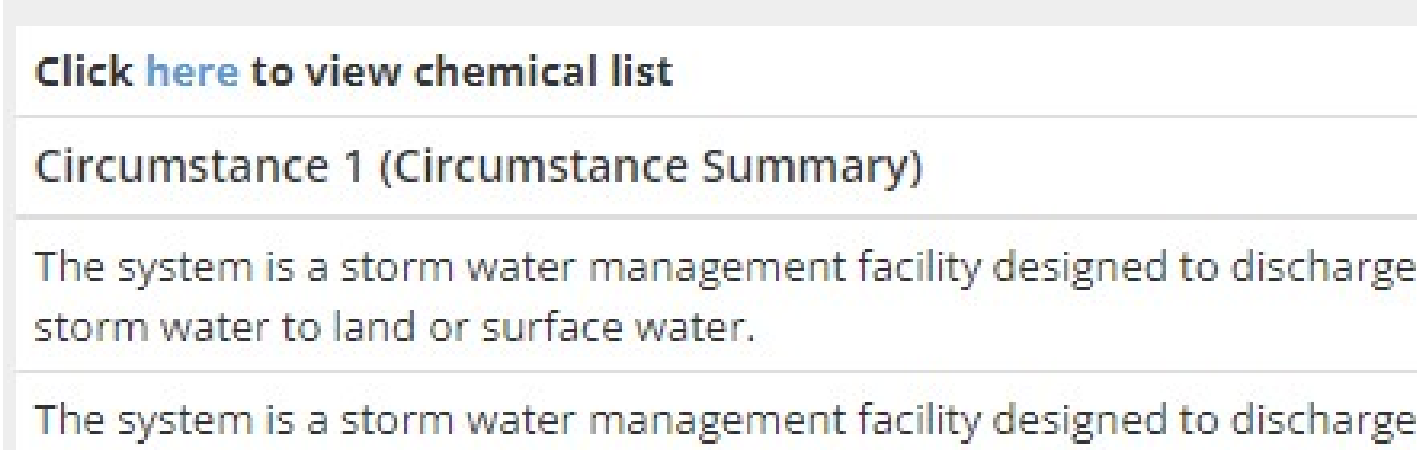
From: Marika Livingston <marika.livingston@mrsourcewater.ca>
Sent: November 18, 2022 10:04 AM
To: Jocelyn Chandler; Brian Stratton; Adam Fobert
Subject: RE: SWP Perth

Hi there,

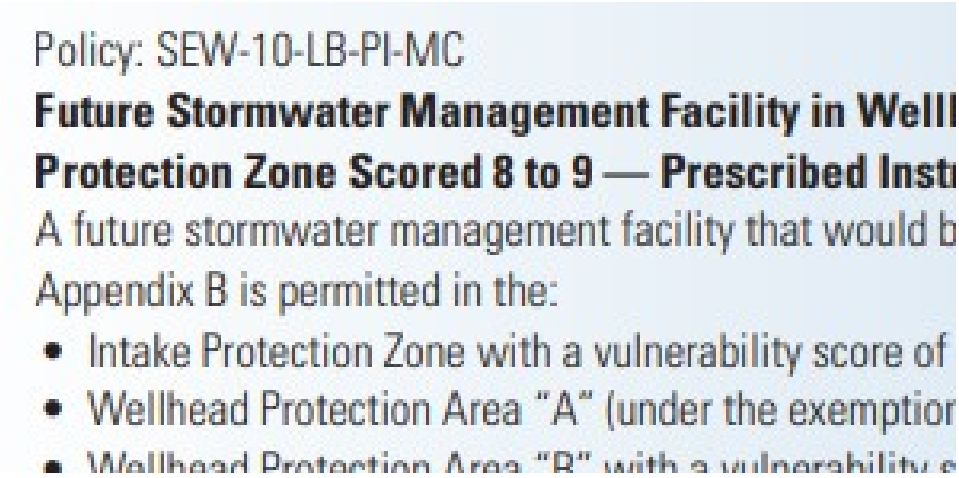
Great to meet you both this morning.

I know I committed to only touching base if something changes, but here is just a quick summary email.

The circumstances for a stormwater pond or outlet to be a significant drinking water threat are:



The policy that applies if the threat (SWM) meets the circumstances is:



However, I don't think the development meets the circumstances since I don't believe the development is over 100 hectares, in which case the Ministry shouldn't put any Source Water components in the ECA.

Thanks,

Marika

From: Jocelyn Chandler <jchandler@jfsa.com>
Sent: Friday, November 18, 2022 9:27 AM
To: Marika Livingston <marika.livingston@mrsourcewater.ca>; Brian Stratton <brian.stratton@mrsourcewater.ca>; Adam Fobert <AFobert@dsel.ca>
Subject: RE: SWP Perth

Hi Marika, I just sent you and invite for 930. We can chat and see if we can get what we need without Brian and then follow up later. J

Jocelyn Chandler, M.Pl., RPP, MCIP (she/her)
Land and Water Resource Planner / Project Manager
Cell.: 613-371-5242 | Email: jchandler@jfsa.com

From: Marika Livingston <marika.livingston@mrsourcewater.ca>
Sent: November 18, 2022 9:23 AM
To: Jocelyn Chandler <jchandler@jfsa.com>; Brian Stratton <brian.stratton@mrsourcewater.ca>; Adam Fobert <AFobert@dsel.ca>
Subject: RE: SWP Perth

Hello Jocelyn,

Can you please update me on this meeting. I have just returned from Holidays. Also, please be advised that Brian is away today.

Thanks,
Marika

-----Original Appointment-----
From: Jocelyn Chandler <jchandler@jfsa.com>
Sent: Friday, November 18, 2022 9:22 AM
To: Brian Stratton; Adam Fobert; Marika Livingston
Subject: SWP Perth
When: Friday, November 18, 2022 9:30 AM-10:00 AM (UTC-05:00) Eastern Time (US & Canada).
Where: Microsoft Teams Meeting

Microsoft Teams meeting

Join on your computer, mobile app or room device

Click here to join the meeting

Meeting ID: 235 715 214 65
Passcode: tJFBnL

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**** Caution : External Email /// Attention : Courriel externe ****

Adam Fobert

From: Adam Fobert
Sent: November 30, 2022 2:13 PM
To: 'Grant Machan'
Cc: Hugo Lalonde; 'Colin Haskin'
Subject: RE: rough format- actual flow numbers
Attachments: san-2022-11-30_1278_projections.xlsx

Hello Grant,

Thank you for the additional flow data below.

I downloaded and reviewed the rain fall data from Environment Canada. Nearest station to Perth is Drummond, which is 14km away from the town Centre. Interestingly enough, 2018 experienced less rain than in 2021, however more wastewater flow was observed. I've highlighted 2022 since we have an incomplete rainfall data set.

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Avg Daily Flow (m3/d)	6264	5042	5981					6639	6650	5454
Annual Rain (mm)	806	626.8	872.4					785	860.2	825.2
Lagoon Capacity	80.5	64.8	76.9					85.3	85.5	70.1

While 2019 was significantly wetter than 2018, there was only a small increase in lagoon flow.

We reviewed the rainfall data sets for the years between 2018 and 2021 to better understand the flow monitoring results.

Rainfall Analysis

	2018	2019	2020	2021
Total Annual	785	860.2	825.2	802.2
Max daily	58.4	50	49.2	47.8
Number of rain days	119	126	128	121
Rainfall greater than 5mm	43	46	46	43
Rainfall greater than 10mm	26	26	23	24
Rainfall greater than 20mm	9	11	8	12
Rainfall greater than 30mm	5	7	5	5

2019 had the highest annual rainfall, most number of rainy days, and more significant rain events than 2018, 2020, and 2021. Rain events between 2019 and 2020 are comparable, while the lagoon saw a 1,196m3/d drop in daily average flow. This could be attributed to change in water use at the outset of COVID.

Has the Town continued its efforts to reduce wastewater inflows to the lagoons between 2018 and 2021?

Do you have data for 2014 to 2017?

I've attached our projection analysis as well as the rain analysis I've described above. Let me know if you would like to discuss.

Adam Fobert, P.Eng.

DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

direct: (613) 845-2105
cell: (613) 222-9493
email: afobert@DSEL.ca

***** NOTE UPDATED PHONE NUMBER *****

From: Grant Machan <gmachan@perth.ca>
Sent: November 25, 2022 11:41 AM
To: Adam Fobert <AFobert@dsel.ca>
Subject: rough format- actual flow numbers

Year	2018	2019	2020
Avg Daily Flow (m3)	6639	6650	5454
% Capacity	86%	86%	71%

Grant Machan CET
Director of Environmental Services
gmachan@perth.ca
613-267-3311 ex2233

Blueberry Creek

Lands controlled by the County

Tayview Development

Sunset Boulevard

Wilson Street W

Remove/replace existing main and re-connect existing homes

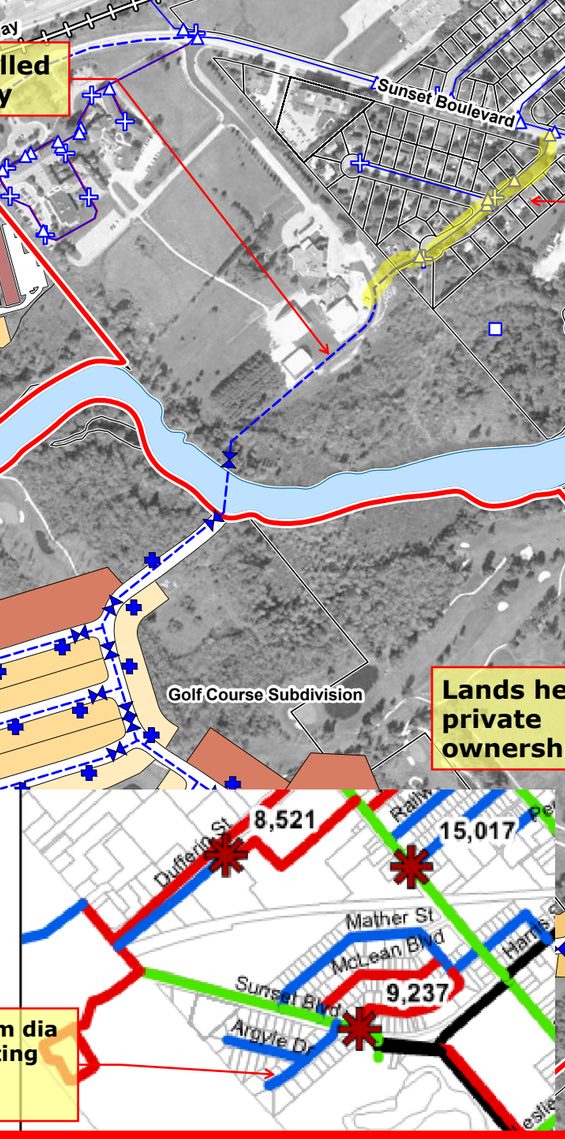
Tay River

North Street

Peter Street

Golf Course Subdivision

Lands held in private ownership

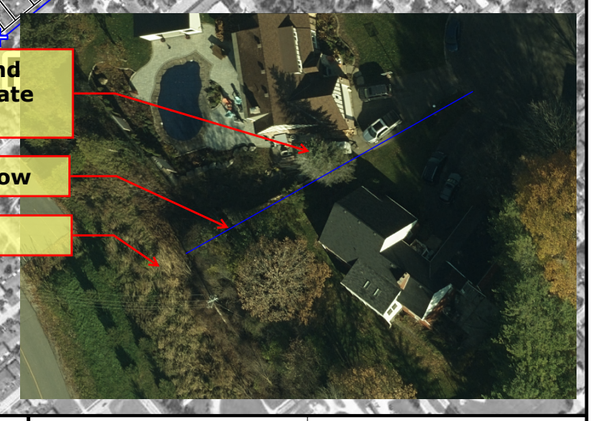


existing 150mm dia main. No existing connection to County lands.

Loss of trees and impacts to private landscaping

Loss of hedge row

Loss of trees



Grant's Creek

LEGEND

- STUDY AREA
- EXISTING WATERMAIN
- EXISTING WATER REDUCER
- EXISTING WATER VALVE
- EXISTING WATER HYDRANT
- PROPOSED WATERMAIN
- PROPOSED WATER VALVE
- PROPOSED WATER HYDRANT
- AREA OF PROPOSED DEVELOPMENT
- WATERBODY

1:7 500
0 50 100 200 300 m
0 1:1 5 cm

Extract from 2016 Water Model Update

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

12 INTERNATIONAL DRIVE, PEMBROKE, ON
Phone: (613)735-2507, Fax:(613)735-4513

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON
Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Water Distribution Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	6-3

ServiceOntario

PRINTED ON 11 OCT, 2022 AT 10:47:53
FOR CHRISTOPHERF

SCALE

0 30 meters

PROPERTY INDEX MAP

LANARK(No. 27)

LEGEND

FREEHOLD PROPERTY	
LEASEHOLD PROPERTY	
LIMITED INTEREST PROPERTY	
CONDOMINIUM PROPERTY	
RETIRED PIN (MAP UPDATE PENDING)	
PROPERTY NUMBER	*0449*
BLOCK NUMBER	**08050**
GEOGRAPHIC FABRIC	
EASEMENT	

THIS IS NOT A PLAN OF SURVEY

NOTES

REVIEW THE TITLE RECORDS FOR COMPLETE PROPERTY INFORMATION AS THIS MAP MAY NOT REFLECT RECENT REGISTRATIONS

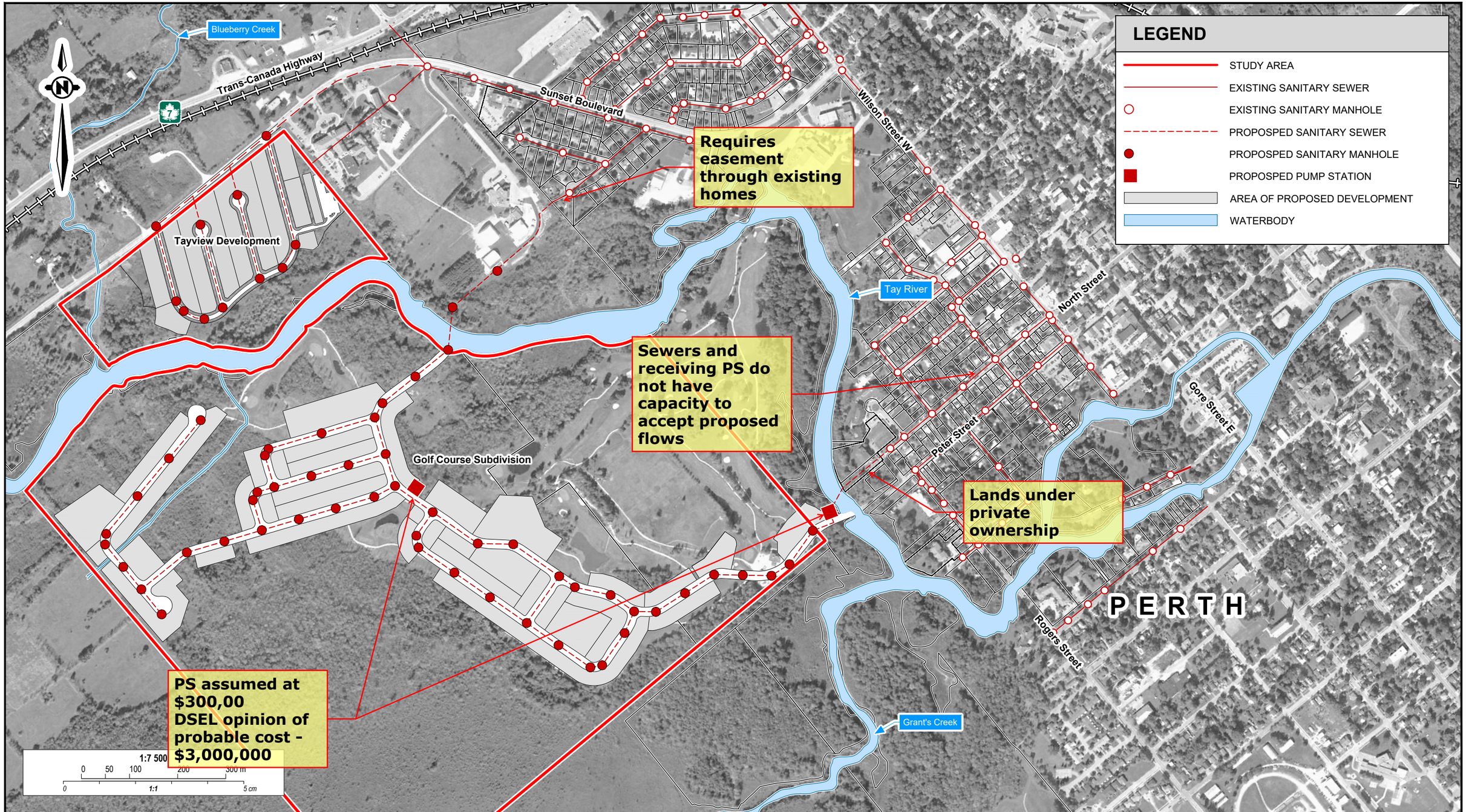
THIS MAP WAS COMPILED FROM PLANS AND DOCUMENTS RECORDED IN THE LAND REGISTRATION SYSTEM AND HAS BEEN PREPARED FOR PROPERTY INDEXING PURPOSES ONLY

FOR DIMENSIONS OF PROPERTIES BOUNDARIES SEE RECORDED PLANS AND DOCUMENTS

ONLY MAJOR EASEMENTS ARE SHOWN

REFERENCE PLANS UNDERLYING MORE RECENT REFERENCE PLANS ARE NOT ILLUSTRATED

Ontario



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Phone: (613)828-7800, Fax: (613)828-2600

Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Sanitary Sewer Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	**6-5**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.5 - preferred sanitary.dwg | Layout: 11x17 DWG to PDF | Print date: 12:49 PM November 27, 2019

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Infrastructure Master Plan Western Annexed Area

Town of Perth

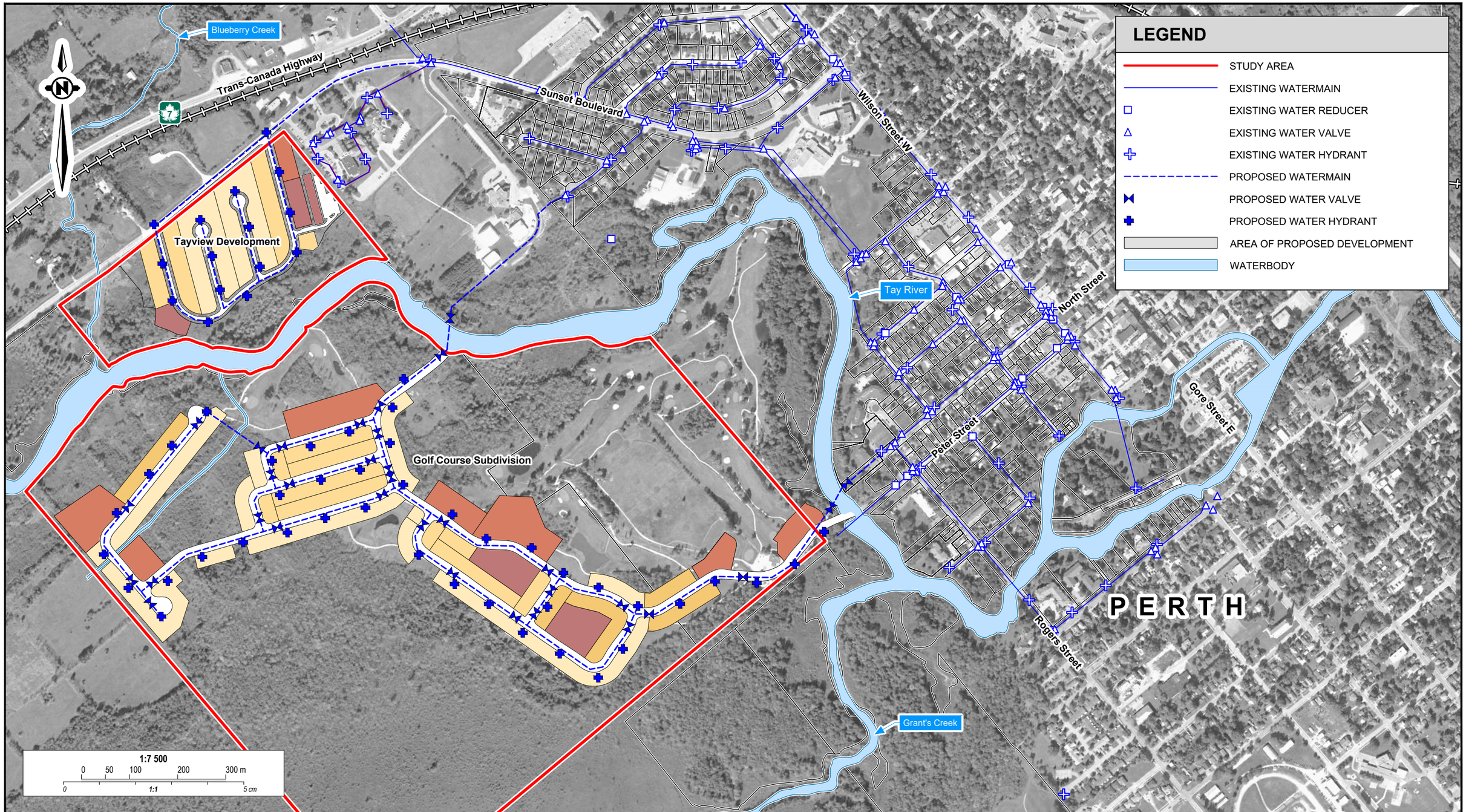
Preferred Option: Storm Sewer Network

DESIGNED: D.N. / K.M.		PROJECT No.: 2161774A
DRAFTED: R.W.		REVISION DATE: 2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:
SCALE: As shown		FIGURE: **6-4**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.4 - preferred storm.dwg | Layout: 11x17 DWG to PDF | Print date: 12:48 PM November 27, 2019

APPENDIX B

Water Supply



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Phone: (613)828-7800, Fax: (613)828-2600

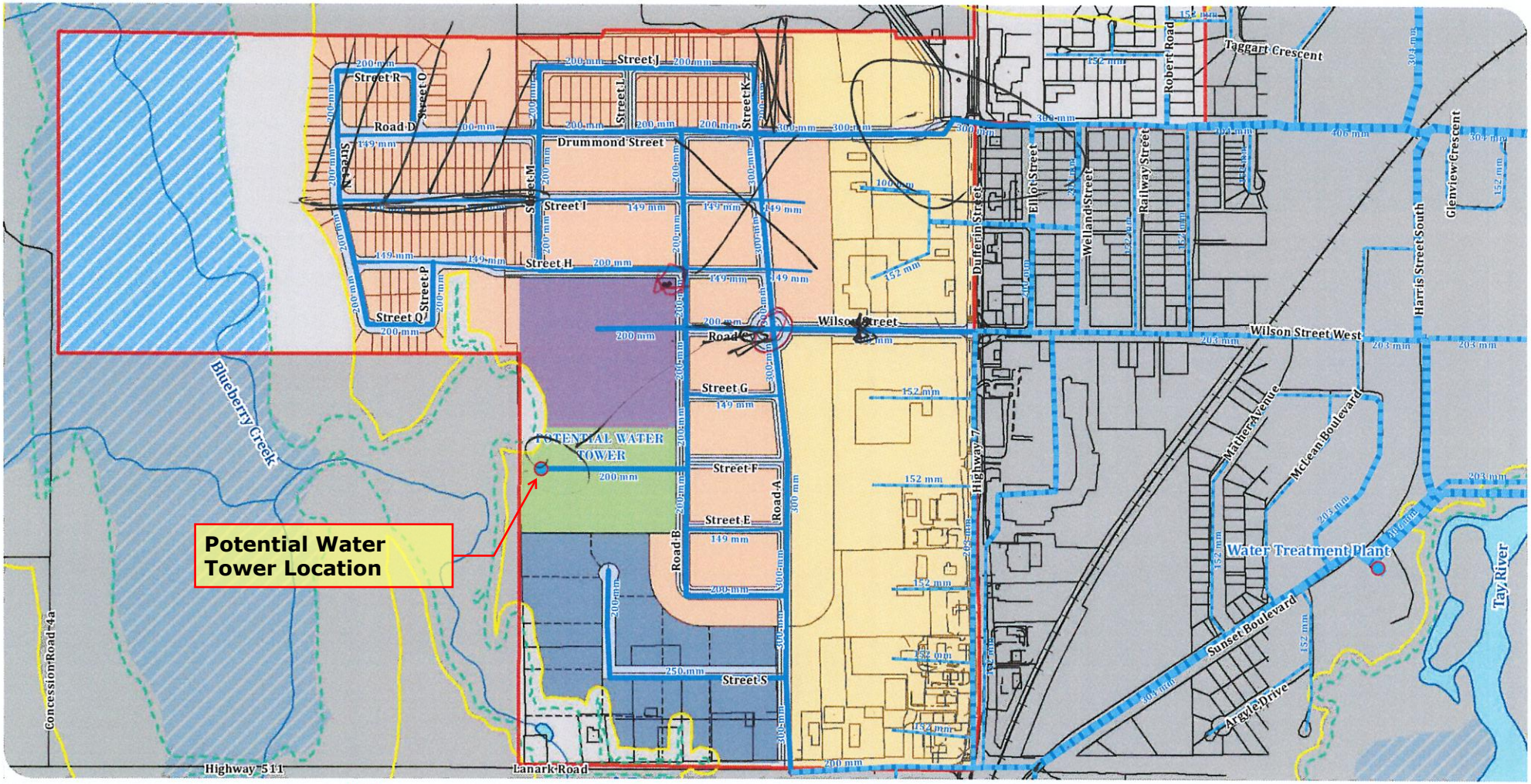
Infrastructure Master Plan Western Annexed Area

Town of Perth

Preferred Option: Water Distribution Network

DESIGNED: D.N. / K.M.		PROJECT No.:	2161774A
DRAFTED: R.W.		REVISION DATE:	2019-11-05
CHECKED: D.N.	APPROVED: K.M.	REVISION No.:	
SCALE: As shown		FIGURE:	**6-3**

Folder: \\JP2GOTTNAS\MAIN DATA\DOCS\1 - CIVIL\ACTIVE\2161774A - PERTH MASTER PLAN CLASS EA\07 DRAWINGS\ONGOING\INFRASTRUCTURE MASTER PLAN | Drawing: 6.3 - preferred water.dwg | Layout: 11x17 DWG to PDF | Print date: 12:48 PM November 27, 2019



Town of Perth
Infrastructure Master Plan

Proposed Water Servicing

FIGURE 16

Study Area Boundary
RVCA Regulation Limit
Floodplain
Wetland
Park
Business Park
Institutional
Retail
Residential
Roads
Waterbodies
Watercourses
Proposed Water Network
Water Features
Existing Water Network
Railway

MAP DRAWING INFORMATION:
DATA PROVIDED FROM DILLON FIELD SURVEY

MAP CREATED BY: KR / YLF
MAP CHECKED BY: AH / MM
MAP PROJECTION: NAD83, Zone 18

0 45 90 180 270 360 450 Meters

1:5,500

PROJECT: 10-3930 STATUS: FINAL DATE: MAY 2013

Perth Western Annex Lands - 141 Peter Street: Potable Water Hydraulic Analysis

Final Report

February 22, 2023

Prepared for:

Caivan (Perth GC) Limited

Prepared by:

Stantec Consulting Ltd.

Revision	Description	Author		Quality Check		Independent Review	
0	Draft	AM	20230208	KA	20230208	JS	20230208
1	Final	AM	20230222	KA	20230222	JS	20230222

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Prepared by _____
(signature)
Alexandre Mineault-Guitard, M.A.Sc., ing., P.Eng.

Reviewed by _____
(signature)
Jasmin Sidhu, P.Eng.

Approved by _____
(signature)
Kevin Alemany, M.A.Sc., P.Eng.

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1.0 INTRODUCTION

To support Caivan (Perth GC) Limited (Caivan) with their draft plan submission for the Western Annex Lands development (Western Annex), Stantec Consulting Ltd (Stantec) was requested to provide engineering services to complete a water distribution system analysis for this proposed subdivision. The purpose of the analysis is to confirm associated watermain sizing and redundancy needs.

For this assignment, Stantec's scope of work included the following tasks:

1. Review and update of the existing water distribution model;
2. Review of past studies, including the Western Annex Lands IMP (Jp2g, 2019), and the Area North of Highway 7 IMP (Dillon, 2013);
3. Analysis of Caivan's concept plan to develop water supply demands and Fire Underwriters Survey (FUS) Fire flow requirements;
4. Set up and run model simulations for average day (AVDY), peak hour (PKHR), and maximum day (MXDY) plus fire flow demands;
5. Assess the Town of Perth's (the Town) distribution system needs and upgrades to service Caivan's development and meet design criteria within the development lands;
6. Prepare a preliminary cost estimate (Class D) related to the upgrades to service Caivan's development; and,
7. Documenting the approach used, findings and recommendations from the analysis.

1.1 STUDY AREA

The study area is located along the western banks of the Tay River in the Town of Perth (Ontario). The proposed development location is on the Perth Golf Course property. Based on the updated site plan provided by Caivan (dated January 2023), the property is approximately 148 ha, where about 44 ha is proposed urban development. The proposed development is composed of townhouse units and single house units. For this analysis, the new development is considered as a single phase (ultimate build-out conditions).

Ultimately, these development lands are proposed to be serviced by a dual connection to the existing distribution network across the Tay River, along Peter Street. The proposed development location is shown in **Figure 1-1**. Note that further discussion related to the dual connection is provided in **Section 2.4.1**.

Figure No.
1-1

Title
Proposed Development Location

Client/Project

Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location

Perth, Ontario

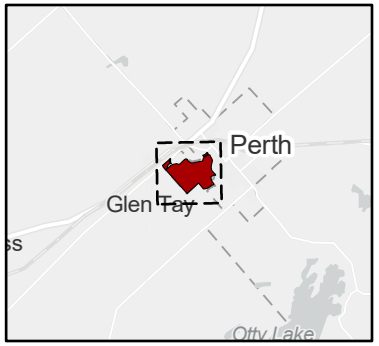
N

0 150 300
Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Proposed Road Layout



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

1.2 EXISTING HYDRAULIC MODEL

As part of a previous study in 2016, Stantec developed a hydraulic model of the Town's water distribution system. Based on communications with the Town's staff, no major upgrades to the distribution system have been made since the development of the hydraulic model. Thus, the 2016 model is assumed to be representative of the current state of the Town's water distribution system and water demands and was used as the basis for the serviceability analysis for the proposed Western Annex development.

It is noted that other new developments are also being planned in Perth and will be connected to the Town's distribution system. Further details of those developments are discussed in **Section 2.2.2**.

2.0 HYDRAULIC ASSESSMENT

For this analysis, the Town's recently adopted Engineering Design Guidelines (herein referred to as the "Town's Design Guidelines") and the Ontario Ministry of Environment, Conservation and Parks (MECP) Design Guidelines for Drinking Water Systems (2019) were used to establish water demands and design criteria. As per the Town's Design Guidelines, the potable water servicing shall meet the requirements of the Fire Underwriters Survey (FUS). However, in areas where such flow cannot be achieved, the Town will consider the minimum fire flows as per the MECP Design Guidelines. It is to note that the City of Ottawa Water Design Guidelines (herein referred to as "Ottawa's Design Guidelines") are also considered for specific applications (ex.: hydrant coverage and reliability analysis).

2.1 SERVICEABILITY

2.1.1 System Pressures

As per the Town's Design Guidelines, the static pressure at any point in the distribution system shall not exceed 550 kPa (80 psi) and no less than 275 kPa (40 psi) at ground elevation (i.e., at street level). The maximum pressure at any point in the water distribution system should not exceed 552 kPa (80 psi). For areas where pressures greater than 552 kPa (80 psi) are anticipated, pressure reducing measures are required. Under emergency fire conditions, a residual pressure of 140 kPa (20 psi) must be maintained in the distribution system while the appropriate fire flow is provided. **Figure 2-1** shows the elevations throughout the study area, based on the site's proposed grading. As shown, the elevations range from 135.38 m to 138.13 m.

2.1.2 Fire Flows

The MECP Design Guidelines require a fire flow assessment to be completed to demonstrate that local watermains can provide the objective fire flows. The detailed FUS Guidelines (long method) can be used to calculate the objective fire flows, based on site plan information. The proposed layouts for both unit types (single house and townhouse) were provided to Stantec (see **Appendix A**) and were used to estimate the fire flow requirements.

Layout and unit information yielded a governing required fire flow (RFF) of 7,000 L/min (117 L/s) for single house units, and a RFF of 10,000 L/min (167 L/s) for townhouse units, based on the assumptions listed below. Detailed FUS calculations are provided in **Appendix A**. It is to note that those calculations are to be revisited at the detailed design stage, based on the characteristics of the proposed buildings.

- Two storeys building, with the basement more than 50% below grade;
- Typical construction (e.g., wood frame, limited combustible building contents); and
- Buildings are not sprinklered.

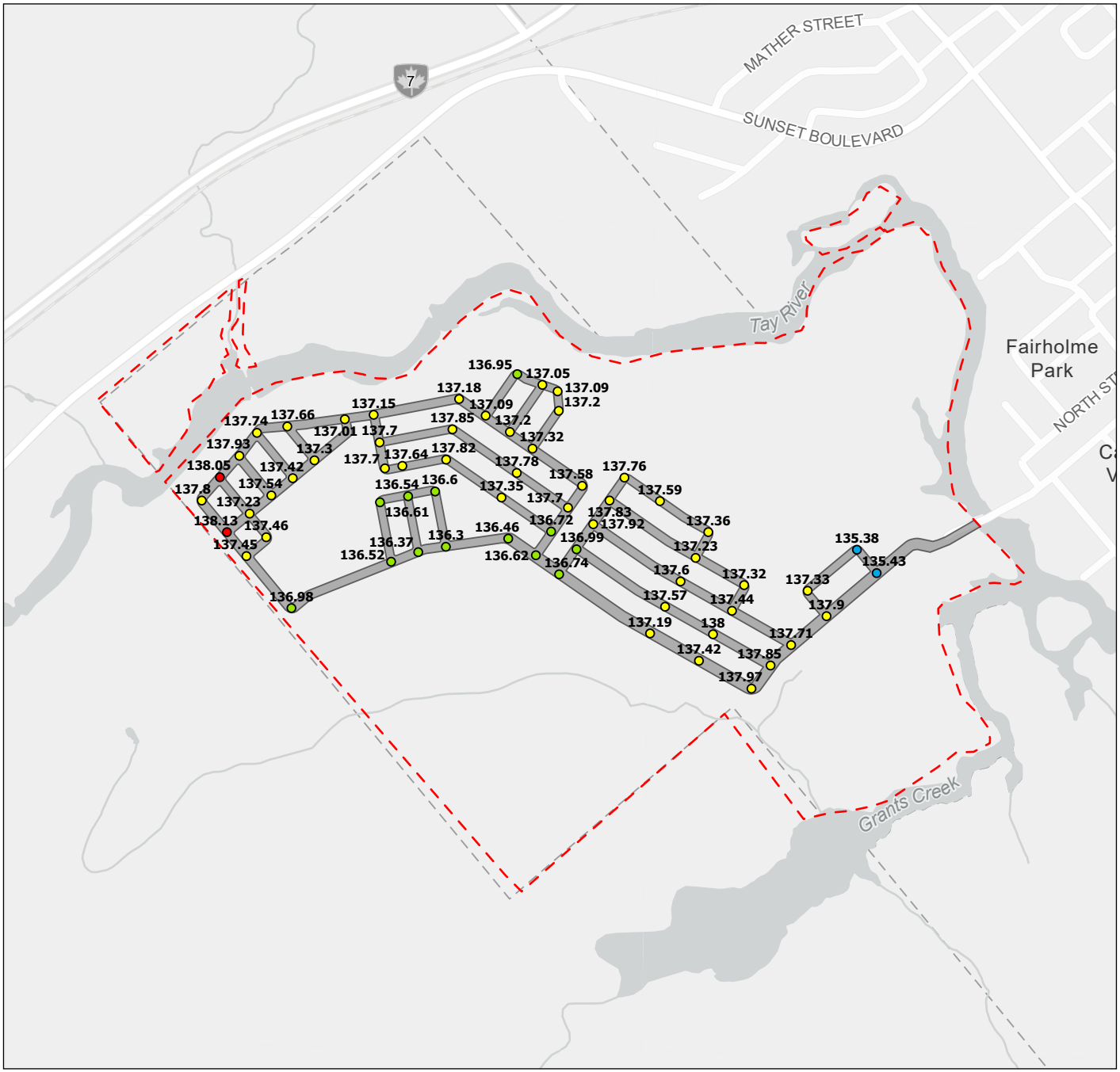


Figure No.
2-1

Title
Study Area Elevation

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Proposed Road Layout

Node Elevation (m)

- 135 - 136
- 136 - 137
- 137 - 138
- 138 - 139

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

On the other hand, the FUS Guidelines (simple method, 2020 Version) suggest a fire flow of 8,000 L/min (133 L/s) for one- or two-family dwellings up to 450 m^2 with less than 3 m of exposure distance; and 8,000 L/min (133 L/s) for row housing with exposure distances between 3 and 10 m.

For this analysis, the required fire flow defined using the FUS Guidelines "long method" will be used, as the "simple method" yields more of an average suggested value. Indeed, the "simple method" does not consider factors such as actual total effective area, combustibility of building contents, or separation distances on all four sides of the structure. Therefore, the RFF for the row housing units defined using the "long method" (10,000 L/min or 167 L/s) will be analyzed as part of the local watermain sizing.

2.2 GROWTH AND POPULATION

2.2.1 Western Annex Development

The residential population for the Western Annex Development was estimated based on projected household sizes as per population densities (or persons per unit, PPU) specified in the Town's Design Guidelines.

The proposed development consists of single house and townhouse units. Based on the proposed site layout, 640 single house units, and 299 townhouse units are considered for this analysis. **Table 2-1** shows the estimated number of units in these development lands and the projected population based on the distribution of residential unit types. The total estimated population is 3,479 persons.

Table 2-1: Estimated Unit Counts and Populations (Western Annex)

Unit Type	Unit Count	PPU	Population
Singles	640	3.8	2,432
Townhouses	299	3.5	1,047
Total	**939**		**3,479**

2.2.2 Other Developments

Other developments, as shown in **Figure 2-2**, are being considered within the Town's limits, and those will be connected to the existing water distribution network. As such, the estimations of residential population are needed to account for the projected increase in water demands.

First, the Tayview Developments (Tayview), described in the Jp2g 2019 IMP study, is located just north of the study site. As part of that development, a new retirement home (total of 160 beds, 1.3 PPU) is being planned close to the Lanark County Administration Building. Additionally, 57 single houses (3.8 PPU), 16 townhouses (3.5 PPU), 60 condos (2.0 PPU), and a commercial centre are also considered. As such, a population of 601 (excluding the commercial centre) is expected under the ultimate build-out conditions.

Secondly, the area north of Highway 7 (North HWY 7), studied in Dillon's 2013 IMP study, was also included in this serviceability analysis. Based on the mixed-density residential planning projections, 1,340 residents are expected in this area. Furthermore, provision for a new school, with 700 students and 35 staff members, was also accounted for. As such, the projected population for this area consists of 2,075 (1,340 residential, and 735 institutional). Additionally, 35 ha of commercial properties are planned for the area.

2.3 DEMAND PROJECTIONS

The criteria outlined in the Town's Design Guidelines and the MECP Design Guidelines for Drinking Water Systems (specifically Table 3-3) were followed to establish water demands for the new developments. Subsequently, the average day (AVDY) consumption rates were applied to align with revised water rates identified by the Town's Design Guidelines. As such, a residential consumption rate of 450 L/cap/d was used, as well as consumption rates of 28,000 L/ha/d and 70 L/cap/d for commercial and institutional areas, respectively.

For residential consumption, a maximum day (MXDY) peaking factor of 2 was then applied to the AVDY demand to provide a MXDY demand. A peak hour (PKHR) peaking factor of 2.2 was then applied to the MXDY demand to provide a PKHR demand. For commercial and institutional water demands, MXDY demands were calculated by multiplying the AVDY demands by a peaking factor of 1.5, while PKHR demands were calculated by multiplying MXDY demands by a peaking factor of 1.8. Estimated AVDY, MXDY and PKHR demand projections are summarized in **Table 2-2**.

Table 2-2: Estimated Demand Projections – Proposed Developments

Development	AVDY (L/S)	MXDY (L/s)	PKHR (L/s)
Western Annex	18.12	36.23	79.72
Tayview	3.17	6.32	13.88
North HWY 7	18.91	31.85	69.71
Total	**40.20**	**74.41**	**163.31**

For this analysis, the total population from all developments (Western Annex, Tayview and North of HWY 7) will be considered as the "ultimate build-out conditions". The demands presented in **Table 2-2** were added to the hydraulic model, in addition to the existing water demands in the distribution models. Those demands were developed by Stantec (2016) based on water meter records, and data from the Water treatment Plant (WTP). The total water demands for the existing system are listed below. It is to note that under PKHR conditions, the total demand (269.5 L/s) exceeds the capacity of the two (2) domestic high lift pumps at the WTP (each rated at 105 L/s).

- AVDY: 35.4 L/s;
- MXDY: 70.8 L/s; and
- PKHR: 106.2 L/s.

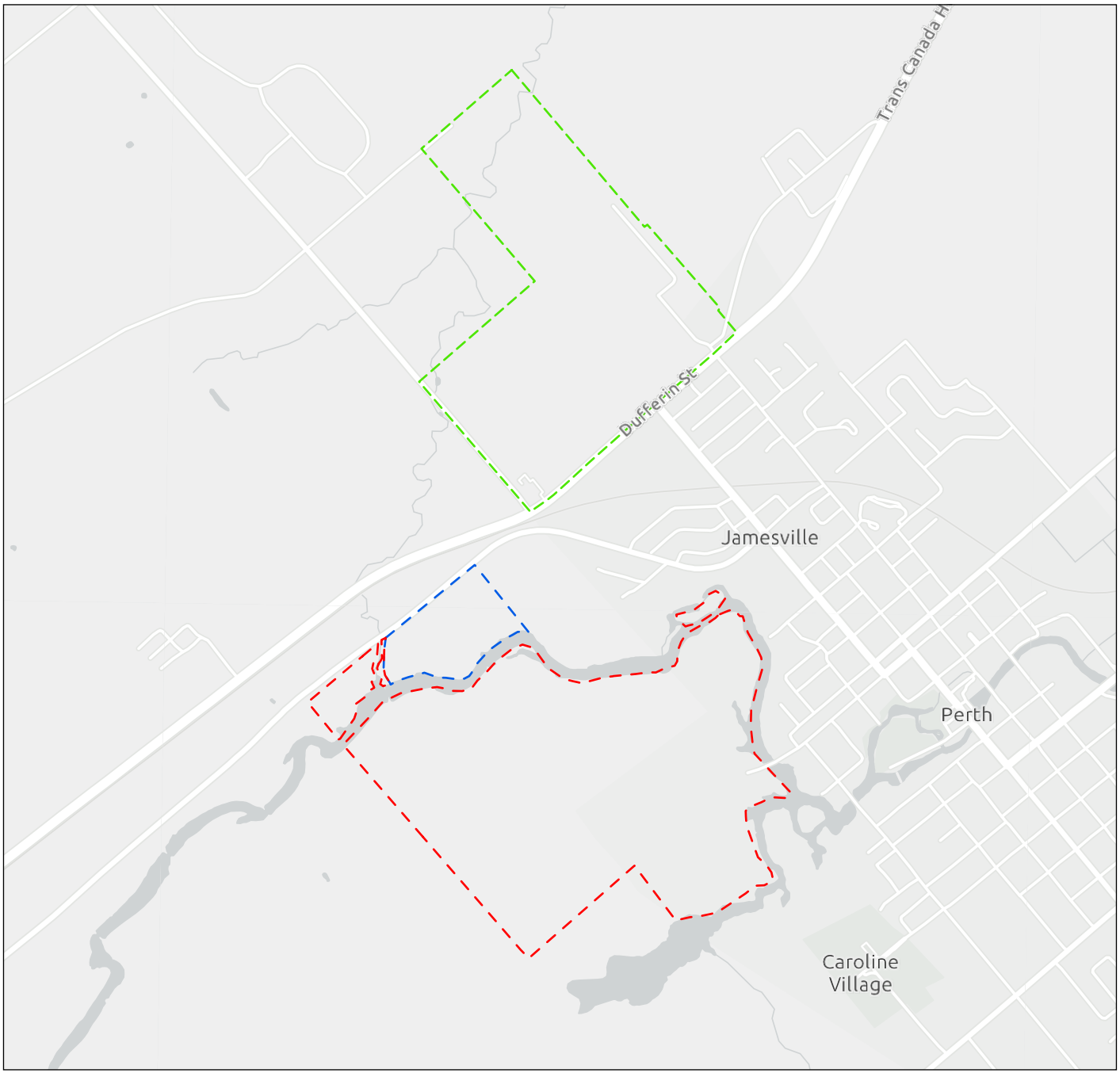


Figure No.
2-2

Title
Other Developments within the Town's Limit

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N

0 250 500
Meters

(At original document size of 8.5x11)
1:24,000

Legend

- Western Annex Development
- Tayview Development
- North of HWY 7 Development

Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

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2.4 MODEL DEVELOPMENT

The existing water model (Innovyze's H2OMap Water) was imported into Innovyze's InfoWater Pro (Suite 3.5, Update #3). Then new development demands were incorporated in the model.

The model was developed to reflect the most current site plan, including the proposed watermain layout (based on proposed road alignment) and water demands. Watermains added to the model were assigned Hazen-Williams coefficients ("C-Factors") in accordance with the Town's Design Guidelines. These factors are listed in **Table 2-3**.

Table 2-3: Hazen-Williams Coefficients by Watermain Size

Watermain Diameter (mm)	Coefficient
150	100
200 - 250	110
300 and over	120

Analysis of the distribution network was completed by adjusting the controls at the WTP pumping station to fill and draw the existing elevated tank between levels of 60% and 100 % full.

A new elevated storage tank was recommended to support new developments within the Town, as discussed in both the Dillon and Jp2g IMP studies. At this time, the characteristics of the future elevated tank are unknown, and the design of the elevated tank is not part of this study. For this analysis, an elevated tank was sized based on MECP Design Guidelines, as per the Town's population expected under the ultimate build-out conditions. This includes all envisioned developments, namely Western Annex, Tayview and North HWY 7. The new elevated tank will be considered only under the ultimate build-out conditions. **Table 2-4** shows the population expected under the ultimate build-out conditions, including the existing Town's population of 6,360 (Jp2g, 2019).

Table 2-4: Estimated Population at Under Ultimate Build-Out Conditions

Item	Population
Existing population	6,360
Western Annex	3,479
Tayview	601
North HWY 7	2,075
Total	**12,515**

MECP Design Guidelines specifies that treated water storage should be composed of Fire Storage (A), Equalization Storage (B), and Emergency Storage (C). Each storage component is defined as follows:

- Fire Storage (A) is defined based on population;
- Equalization Storage (B) corresponds to 25% of the MXDY demand; and
- Emergency Storage (C) corresponds to 25% of the sum of A and B components.

Under the existing conditions, a population of 6,360 (Jp2g, 2019) yields a fire flow of 162 L/s, as per the MECP Design Guidelines. It is noted that the existing pumping reserve capacity of the WTP accounts for 19.72 L/s (1,669 m^3/d), which could be reduced from the Fire Storage (A) requirement. Furthermore, the existing MXDY demand is 6,117 m^3/d (or 70.8 L/s as listed in **Section 2.3**). **Table 2-4** shows the total storage requirement as per the MECP under existing conditions. As shown, the storage requirement exceeds the existing elevated storage of 945 m^3. Note that the capacity of the high lift pumps at the WTP exceeds the existing MXDY demand, which addresses the storage deficiency.

Table 2-5: Water Storage Requirement (Existing Conditions)

	Description	Value	Unit
A	Fire Storage (Fire + Duration)[1]	1,533	m^3
B	Equalization Storage (25% of MXDY)	1,529	m^3
C	Emergency Storage (25% of A+B)	766	m^3
Total Water Storage	**A+B+C**	**3,828**	**m^3**

[1] Reduced based on pumping reserve capacity.

For a future population of 12,515, the MECP Design Guidelines yield a recommended fire flow of 215 L/s. Furthermore, the expected MXDY demand under ultimate build-out conditions is 12,546 m^3/d or 145.2 L/s (i.e., 70.8 L/s for existing demands, plus 74.4 L/s for the proposed developments). **Table 2-6** shows the total water storage requirement for the ultimate build-out conditions, as per the population presented in **Table 2-4**. The required elevated storage volume at ultimate built-out conditions exceeds the existing elevated storage of 945 m^3.

Table 2-6: Water Storage Requirement (Ultimate Built-Out Conditions)

	Description	Value	Unit
A	Fire Storage (Fire + Duration)[1]	2,109	m^3
B	Equalization Storage (25% of MXDY)	3,136	m^3
C	Emergency Storage (25% of A+B)	1,311	m^3
Total Water Storage	**A+B+C**	**6,557**	**m^3**

[1] Reduced based on pumping reserve capacity.

Considering the configuration of the existing distribution network (i.e., a single elevated tank, as well as a single feed leaving the WTP), it is recommended to provide additional storage to improve the network's resiliency, as per both the Dillon and Jp2g IMP studies. As such, 5,612 m^3 of additional storage was considered as part of this analysis, and the new elevated tank was assumed to be positioned within the North HWY 7 development. Note that the high-water level (HWL) of the new elevated tank is the same as the existing tank (i.e., 180.52 m), as per the 2013 Dillon Study.

2.4.1 Proposed Watermain Sizing & Layout

Based on the design requirements for pressure and fire protection, preliminary modelling indicates the need for a mix of 150 and 200 mm diameter watermains, as well as a 300 mm diameter feedermain, as shown in **Figure 2-3**. This layout was identified to provide sufficient flow to achieve the objective fire flow of 10,000 L/min, as well as domestic water demands.

As introduced, a dual connection is planned to the existing distribution network. There are two (2) options for the proposed connection: 1) connection to the existing 300 mm watermain at the corner of North Street and Lustre Lane via a new watermain; or 2) connection to the existing 75 mm watermain along Peter Street, on the west bank of the Tay River. Option 2 would require the replacement of the existing 75 mm (167 m) and 150 mm (45 m) watermains along Peter Street, up to the 300 mm watermain at the corner of Peter Street and Rogers Road. This is needed such that the objective fire flows are achieved within the proposed development. Both options are presented in **Figure 2-3**.

It is recommended to have two independent connections to the Town's network, to provide better resiliency. As reference, updated Section 4.3.1 of the Ottawa Water Distribution Systems Design Guidelines (ISTB-2021-03) states that "Industrial, commercial, institutional service areas with a basic day demand greater than 50 m^3/d and *residential areas serving 50 or more dwellings shall be connected with a minimum of two watermains*, separated by an isolation valve, to avoid the creation of a vulnerable service area." As a connection is planned at only one location (i.e., across the Tay River along Peter Street), the proposed development could be considered a vulnerable service area under the Ottawa's Design Guidelines, depending on the characteristics of the connections.

As such, two individual connections should be implemented, so that if one of the connections is interrupted (e.g., watermain break), the other can still service the proposed development. This would require the installation of a line valve along each connection point, so that the feed from the existing system can be isolated when needed. In that sense, it is recommended that connections to the Town's network are implemented at both options listed above, for better resiliency. However, note that for this hydraulic analysis, both connections to the Town's network were assumed as Option 1.

Furthermore, it is necessary that the watermains are separated from each other (i.e., installed in separate trenches). If a watermain break occurs along one of the feedermain, and that both pipes are installed one next to the other, the second pipe could be affected (either by being "washed out" or being hit by crews during repairs).

Similarly, there is a risk factor to consider regarding the crossings of the Tay River. It is not recommended that both feedermains cross the Tay River along the Peter Street bridge. If the bridge fails (e.g., major flooding) and that both lines are running along the bridge, it will interrupt the water servicing to the proposed development. As such, some considerations (e.g., trenchless crossing below the river) are to be taken regarding the crossings to mitigate the risks.

As such, it is recommended to have two independent connections to the existing network, as described above. This would avoid the creation of a vulnerable service area, increase resiliency against a major failure and minimize the risks for customers, as discussed in **Section 3.3**.

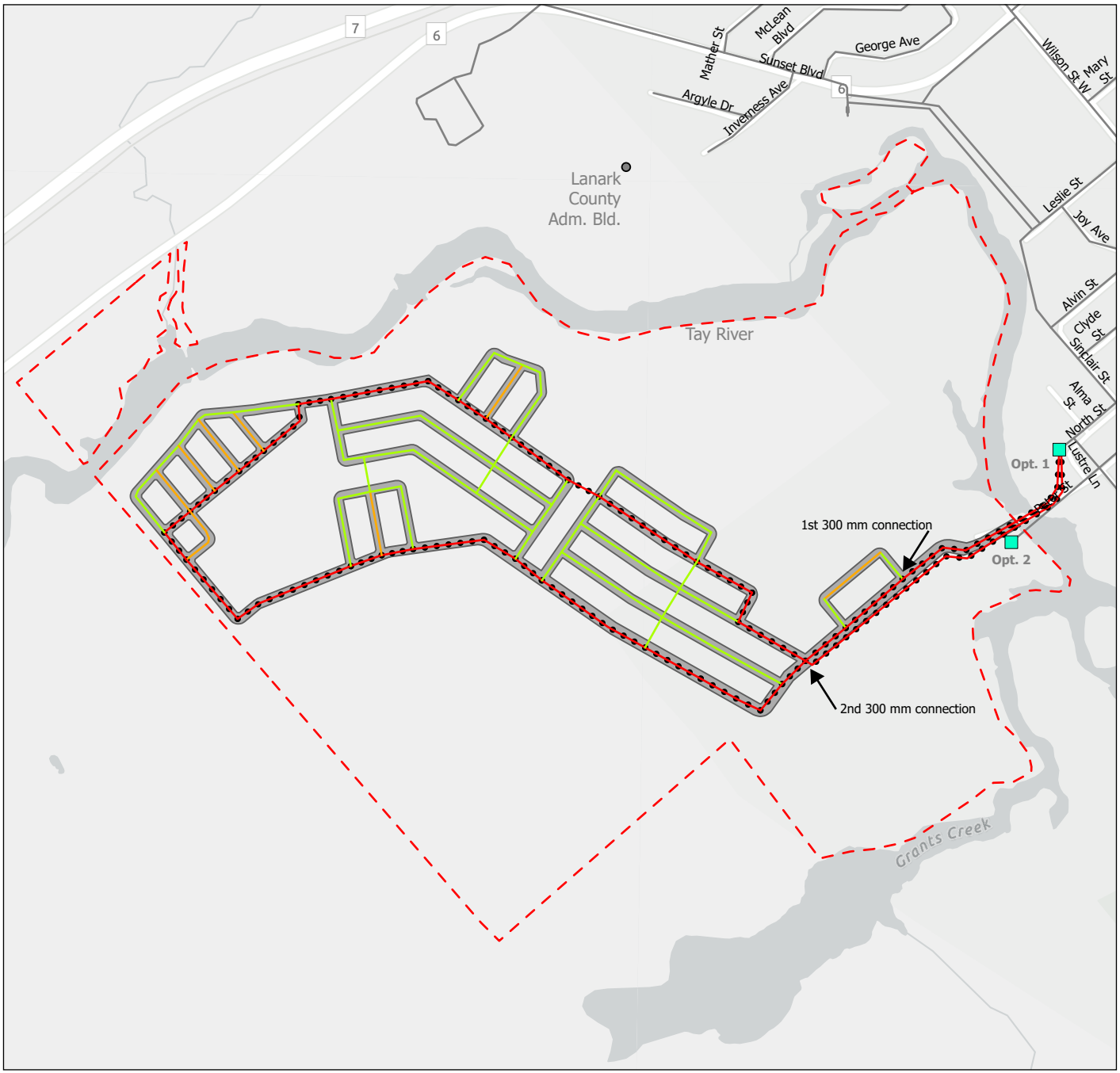


Figure No.
2-3

Title
Proposed Watermain Sizing & Layout

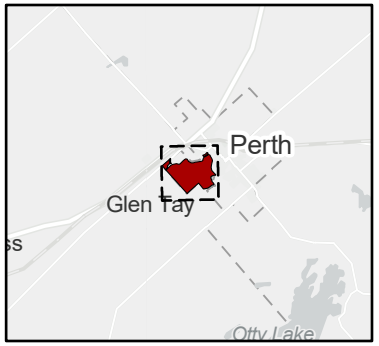
Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

N
0 150 300 Meters
(At original document size of 8.5x11)
1:11,000

Legend
- Property Boundary
- Existing Distribution Network
- Connection Options

Proposed Watermain Layout
- 150 mm
- 200 mm
- 300 mm
- Feedermain



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N
2. Although a 300 mm diameter feedermain meets the serviceability criteria, Stantec recommends considering a 400 mm diameter feedermain, as noted in the report, and shown on Figure 3-2.

Stantec

3.0 PRELIMINARY HYDRAULIC MODELLING RESULTS

Preliminary hydraulic modelling was completed to assess the network's performance under different demand scenarios. The following subsections present the preliminary modelling results under AVDY, PKHR, and MXDY+FF demands for the proposed development. Note that for this analysis, a new elevated tank, sized based on MECP Design Guidelines, was assumed under ultimate build-out conditions.

All junction IDs are shown in **Appendix B**, with detailed modelling results for all scenarios provided in **Appendix C**.

3.1 AVERAGE DAY & PEAK HOUR DEMANDS

Under AVDY demands, maximum modelled pressures are between 55 and 64 psi, which falls within the desired pressure range of 40 to 80 psi based on the Town's Design Guidelines. As such, pressures are within the desired pressure range of 40 to 80 psi, and no pressure reducing measures are required within the proposed development.

For PKHR conditions, modelling results show that minimum pressures range between 48 psi and 58 psi. Note that under PKHR conditions, all three high lift pumps at the WTP are assumed to be in operations at the WTP, as PKHR demands exceed the rated capacity of the two (2) domestic pumps (refer to **Section 2.3**). The domestic pumps should be upsized before all developments are fully constructed.

3.2 MAXIMUM DAY PLUS FIRE FLOW

In this demand scenario, available fire flows across the proposed development must meet or exceed the RFF of 10,000 L/min (167 L/s) as described in **Section 2.1.2**.

Under MXDY+FF demands, assuming that the elevated tank is a 60% full and all high lift pumps running at the treatment plant, modelling shows that the RFF is exceeded across all nodes with a residual pressure of 20 psi. The minimum available fire flow within the new development is estimated at 10,600 L/min (177 L/s) at node J87.

3.3 RELIABILITY

It is good practice to assess the serviceability of the system under failure scenarios. As per the Ottawa's Design Guidelines, the system must be able to provide average day demand plus fire flow (AVDY + FF) while meeting serviceability requirements during a major failure (i.e., watermain break).

As such, four (4) reliability scenarios (shown in **Figure 3-1**) were reviewed to confirm sufficient pressure and flow can be achieved during a major failure. These break scenarios are described below. Note that

the reliability scenarios assume that both feedermains connecting to the Town's existing network are independent from each other, as described in **Section 2.4.1**.

1. Break Scenario 1: Break in the one of the 300 mm feedermain connecting to the existing network;
2. Break Scenario 2: Break in the southern 300 mm feedermain connection to the western portion of the study area;
3. Break Scenario 3: Break in the northern 300 mm feedermain connection to the western portion of the study area.
4. Break Scenario 4: Break along the 300 mm feedermain in the western portion of the study area.

Model results (see **Appendix C**) show that a few junctions do not meet the RFF of 10,000 L/min (167 L/s), as discussed below:

- Under Break Scenario 1, the RFF is not met at node J87 (8,800 L/min) and node J121 (9,900 L/min).
- Under Break Scenarios 2 to 4, the RFF is met at all locations, except at node J87 (varying from 9,000 to 9,700 L/min).

Although modelling results suggest that portions of the local network may be vulnerable under a major break scenario, sufficient fire flow coverage could be provided if hydrant spacing is planned as per Ottawa's ISDTB-2018-02. Planning for hydrant spacing such that two (2) Class AA hydrants (rated at 5,700 L/min each) are placed within 75 m of all buildings would yield a cumulative available fire flow that would exceed the 10,000 L/min RFF, under all break scenarios. It is thus recommended to plan hydrant spacing as per Ottawa's ISDTB-2018-02, rather than the Town's Design Guidelines maximum hydrant spacing of 90 m for high density residential areas, to avoid oversizing local watermains.

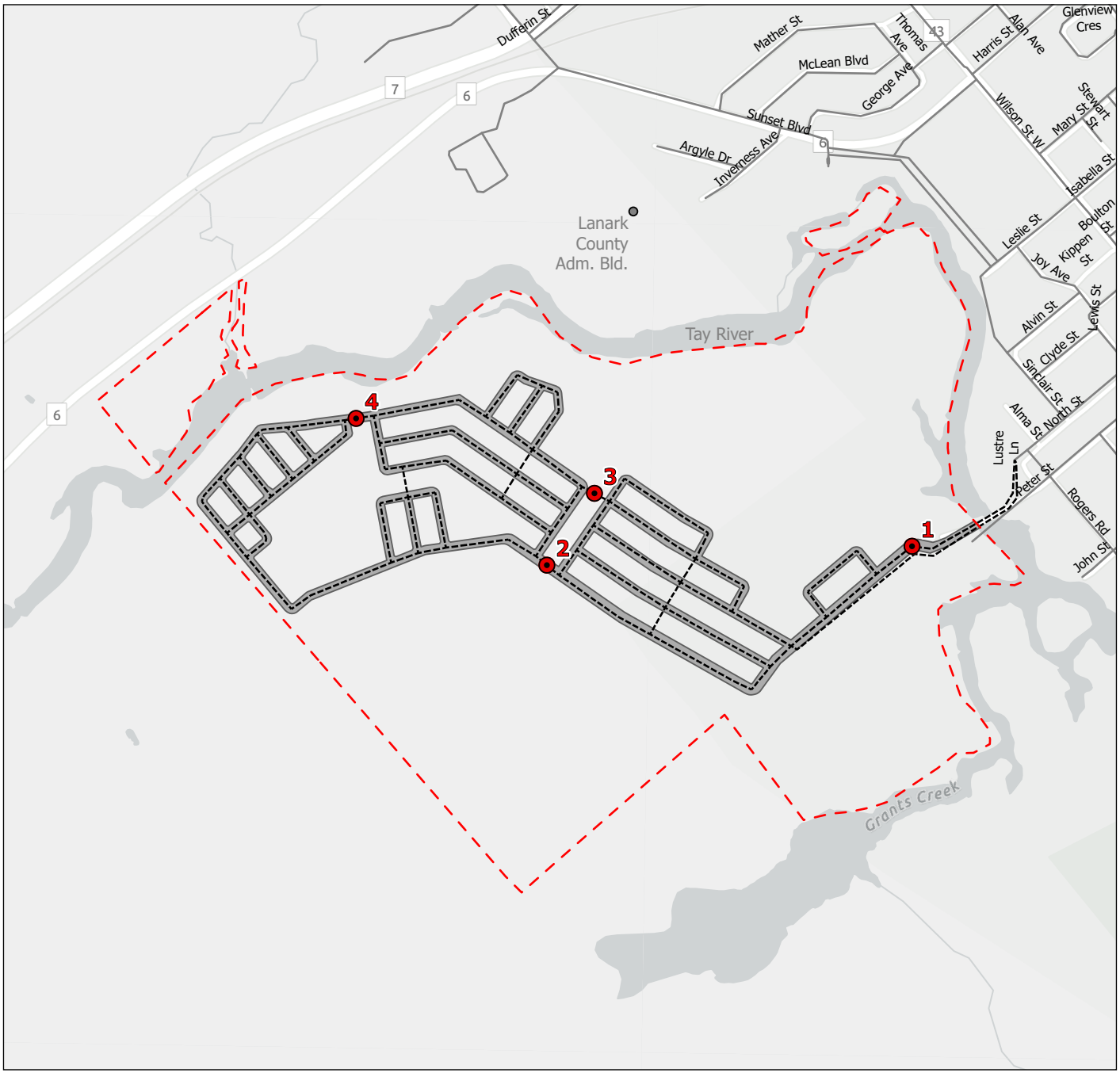


Figure No.
3-1

Title
Reliability Analysis - Watermain Break Locations

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

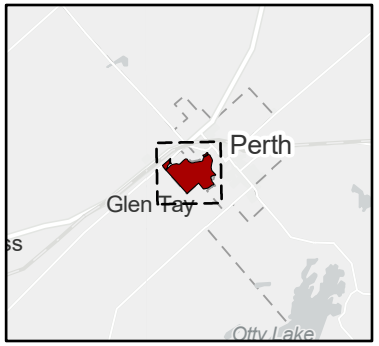
N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Existing Distribution Network
- Proposed Distribution Network
- Break Location / Scenario



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

4.0 PRELIMINARY COST ESTIMATE

A preliminary cost estimate was completed regarding the necessary upgrades to the existing network to service the Western Annex development. As previously discussed, a new elevated tank is required to support new developments within the Town. Furthermore, the domestic high lift pumps at the WTP will have to be upsized before all planned developments within Perth are constructed. As discussed in **Section 2.3**, the PKHR demand (269.5 L/s) exceeds the rated capacity of the two (2) domestic pumps (each rated at 105 L/s). The design of the elevated tank, as well as upgrades at the WTP pumping station are not part of Stantec's mandate related to the serviceability of the Western Annex development. As such, these were not included in the cost estimate analysis. The required upgrades are linked to the proposed connections to the Town's existing water distribution network. As discussed in **Section 2.4**, there are two (2) options at the proposed connection, as presented below.

- Option 1: connection to the 300 mm watermain at the corner of North Street and Lustre Lane.
- Option 2: connection to 75 mm watermain along Peter Street, on the west bank of the Tay River.

Option 1 would be completed via new watermains, whereas Option 2 would require upgrades to the existing water distribution network (watermain replacement/upsizing), in addition to new watermains.

The preliminary cost estimate for the supply and installation of new watermain was based on a unit cost of $900 / linear m for 300 mm watermains. The unit costs include supply, labour, administration, and contractor's profits, but excludes applicable taxes.

However, the items listed below were not considered as part of the cost estimate analysis. As such, the cost estimates, presented in **Table 4-1**, will have to be re-evaluated as part the detailed design phase. Note that the cost analysis considered only the water infrastructure outside of the Western Annex development boundary.

- Removal and reinstatement of watermain, paving and street infrastructure;
- Removal or supply of fire hydrants, valve boxes, and water service connections;
- Supply and installation of a temporary water supply;
- Temporary traffic maintenance and road signs; and
- Cost associated with water infrastructure crossing the Tay River and/or rock breaking and removal.

Table 4-1: Preliminary Cost Estimates[1]

Option	Description	Quantity	Unit	Unit Price ($)	Cost ($)
1	Supply and installation of new dual 300 mm watermains	352	m	900	325,800
2	Supply and installation of new dual 300 mm watermains	366	m	900	329,400

[1] Preliminary cost estimate based on the assumption listed in **Section 4.0**, without applicable taxes.

5.0 CONCLUSION AND RECOMMENDATIONS

A preliminary water distribution system hydraulic analysis was completed for the Western Annex development. The purpose of this analysis was to confirm associated watermain sizing and redundancy needs for the proposed development.

Based on the hydraulic analysis, the following conclusions and recommendations were made:

- Based on the current site plan layout, the estimated AVDY, MXDY and PKHR demands for the proposed development are 18.12 L/s, 36.23 L/s, and 79.72 L/s, respectively.
- Under the ultimate build-out conditions, the estimated AVDY, MXDY and PKHR demands for all envisioned developments in Perth (Western Annex, Tayview, and North of HWY 7) are 40.20 L/s, 74.41 L/s, and 163.31 L/s, respectively. This results in AVDY, MXDY and PKHR demands for the whole Town of 75.6 L/s, 145.2 L/s, and 269.5 L/s, respectively.
- Note that PKHR demands exceed the rated capacity of the two (2) existing domestic pumps at the WTP (refer to **Section 2.3**). As such, the domestic pumps should be upsized before all developments are fully constructed. Furthermore, additional storage is needed to support new developments within the Town. However, the design of the elevated tank, and any upgrades at the WTP pumping station are not part of Stantec's mandate.
- Governing required fire flows (RFF) of 7,000 L/min (117 L/s) for single house units, and a RFF of 10,000 L/min (167 L/s) for townhouse units were identified based on the assumptions listed in **Section 2.1.2**. The RRF calculations should be reviewed or updated as needed as part of subsequent design stages, based on available building information.
- Preliminary modelling indicates the need for a 300 mm feedermain to adequately service the proposed development. Local watermains are proposed to be 150 and 200 mm watermains. As noted in **Section 2.4.1**, it is recommended that both feedermains connecting to the existing network are fully independent from each other, even if they both cross the Tay River along Perter Street. This would avoid the creation of a vulnerable service area, increase resiliency against a major failure and minimize the risks for customers.
- With the proposed watermain layout, system pressure requirements are met under AVDY and PKHR demands. Furthermore, the RFF (10,000 L/min or 167 L/s) is exceeded across all nodes under MXDY+FF demands.
- To assess reliability and resiliency against major failures, a number of reliability scenarios were completed under AVDY+FF demand conditions to confirm sufficient pressure and flow can be achieved during a major failure. Under all break scenarios, some locations do not meet the RRF. However, sufficient fire flow coverage could be provided if hydrant spacing is planned as per Ottawa's ISDTB-2018-02. As such, it is recommended to plan for hydrant spacing such that all buildings are located within 75 m of two (2) class AA fire hydrants (as per ISTB-2018-02, Appendix I). This will provide sufficient fire protection and avoid oversizing local watermains.

- A preliminary cost estimate was completed for the necessary upgrades to the existing network to service the Western Annex development. Note that upgrades at the WTP and any new storage were not included in the cost estimate analysis. The cost for the supply and installation of new dual 300 mm diameter watermains is estimated at $325,800 for Option 1 (connection to the existing 300 mm diameter watermain at North Street and Lustre Lane), and $329,400 for Option 2 (connection to 75 mm watermain along Peter Street, on the west bank of the Tay River). Preliminary cost estimates are based on the assumption listed in **Section 4.0**, and only consider water infrastructure outside of the Western Annex development boundary.

6.0 REFERENCES

City of Ottawa. (2010). *Ottawa Design Guidelines - Water Distribution*. Ottawa.

City of Ottawa. (2018). *Technical Bulletin ISTB-2018-02*. Ottawa.

City of Ottawa. (2021). *Technical Bulletin ISTB-2021-03*. Ottawa.

Corporation of the Town of Perth (2022). *Engineering Design Guidelines*. Perth.

Dillon Consulting Ltd. (2013). *Infrastructure Master Plan for Area North of Highway 7*. October 2013. Ontario.

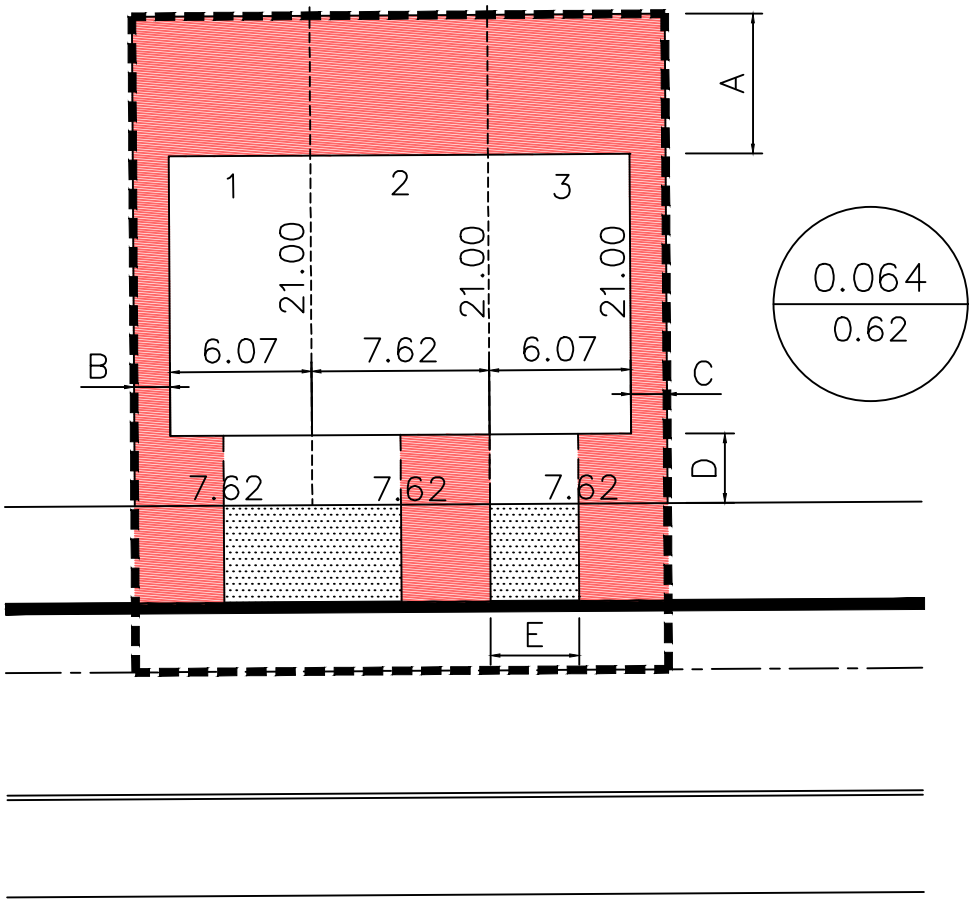
Fire Underwriters Survey (2020). *Water Supply For Public Fire Protection – A Guide to Recommended Practice In Canada*. 2020 Version.

Jp2g Consultants Inc. (2019). *Infrastructure Master Plan – Western Annex in the Town of Perth*. November 2019. Ontario.

Ministry of the Environment, Conservation and Parks. (2008). *Design Guidelines for Drinking Water Systems*. Ontario.

Stantec Consulting Ltd. (2016). *2016 Perth Potable Water Model Update*. October 12, 2016. Ottawa.

Appendix A FUS FIRE FLOW CALCULATIONS



DIMENSIONS:
A = 6.00 m
B = 1.55 m
C = 1.55 m
D = 3.00 m
E = 3.80 m
ENVELOPE LENGTH: 12.00 m
LOT: 22.86x21.00 m

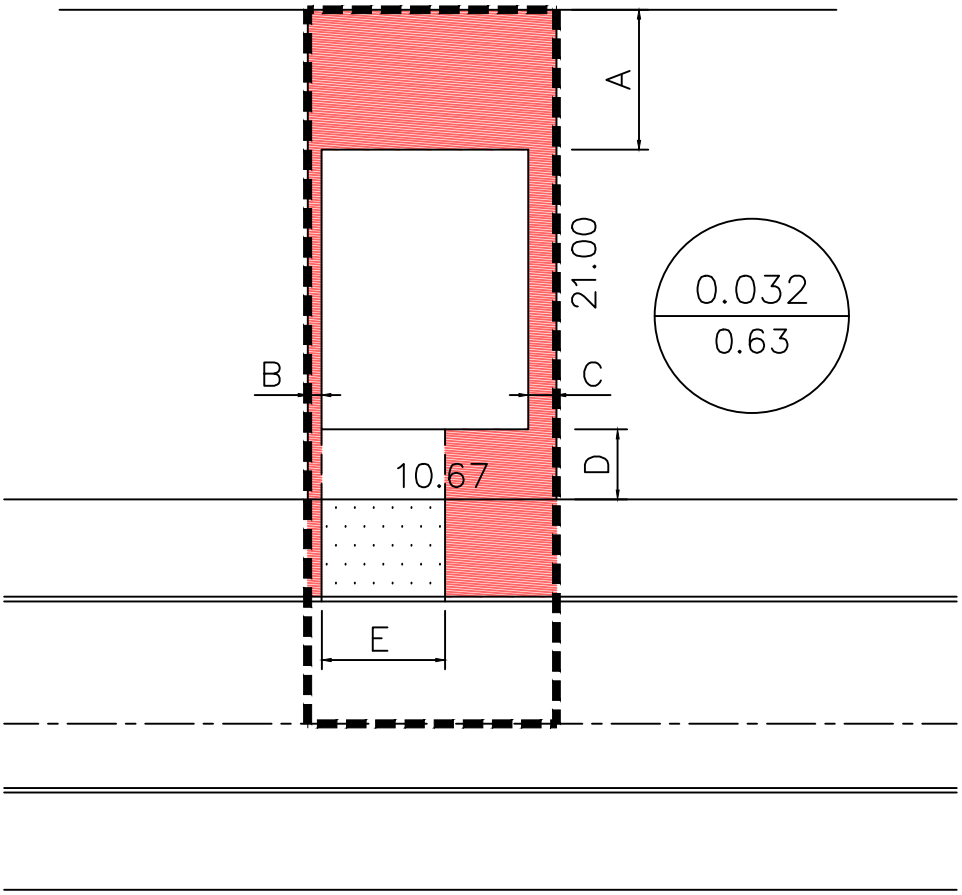
NOTE:
TOTAL AREA: 643.00 m2
TOTAL IMP AREA: 386.36 m2
IMP %: 60%
RC: 0.62

16.75 m ROW TH RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
7.62 LOT DIMENSION

120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

SCALE:	NTS	PROJECT No.:	19-1092
DATE:	FEB 2022	FIGURE:	



DIMENSIONS:
A = 6.00 m
B = 0.60 m
C = 1.20 m
D = 3.00 m
E = 5.30 m
ENVELOPE: 8.87x12.00 m
LOT: 10.67x21.00 m

NOTE:
TOTAL AREA: 326.82 m2
TOTAL IMP AREA: 202.64 m2
IMP %: 62%
RC: 0.63

16.75 m ROW SINGLE UNIT RC FIGURE

LEGENDS

PERVIOUS HATCH

TOTAL AREA 0.035 / 0.65 RC VALUE

STM TRIB LINE

10.67 LOT DIMENSION

DSEL
120 Iber Road, Unit 203
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

SCALE:	NTS	PROJECT No.:	19-1092
DATE:	FEB 2022	FIGURE:	

Stantec

FUS Fire Flow Calculation - Long Method

Calculations based on: "*Water Supply for Public Fire Protection*" by Fire Underwriters' Survey, 2020

Stantec Project #: 163401476
Project Name: Perth Western Annex Lands
Date: January 30, 2023
Data inputted by: Alexandre Mineault-Guitard, ing., P.Eng
Data reviewed by: Kevin Alemany, M.A.Sc., P.Eng.

Fire Flow Calculation #: 1
Building Type/Description/Name: Residential

Notes: *Townhouse unit*

Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Type V - Wood Frame	1.5	Type V - Wood Frame	1.5	m	
			Type IV-A - Mass Timber	0.8				
			Type IV-B - Mass Timber	0.9				
			Type IV-C - Mass Timber	1				
			Type IV-D - Mass Timber	1.5				
			Type III - Ordinary construction	1				
			Type II - Non-combustible construction	0.8				
			Type I - Fire resistive construction	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	**Floor Space Area**						
		Type of Housing	Single Family	0	Townhouse - indicate # of units	1	Units	
			Townhouse - indicate # of units	1				
			Other (Comm, Ind, Apt etc.)	0				
2.2	# of Storeys	Number of Floors/Storeys in the Unit (do not include basement if 50% below grade):			2	2	Storeys	
3	Enter Ground Floor Area of One Unit	Average Floor Area (A) based on total floor area of all floors for one unit (non-fire resistive construction):			237	237	Area in Square Metres (m^2)	
					Square Metres (m2)			
3.1	Obtain Total Effective Building Area	Total Effective Building Area (# of Storeys x # of Units (if single family or townhouse) x Average Floor Area):			474	474		
4	Obtain Required Fire Flow without Reductions	Required Fire Flow (without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1,000 L/min						**7,000**
5	Apply Factors Affecting Burning	**Reductions/Increases Due to Factors Affecting Burning**						
5.1	Choose Combustibility of Building Contents	Occupancy Content Hazard Reduction or Surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	**5,950**
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler Reduction	Adequate Sprinkler conforms to NFPA13	-0.3	None	0	N/A	**0**
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is not standard or N/A	0	N/A	**0**
			Water supply is not standard or N/A	0				
		Sprinkler Supervision Credit	Sprinkler system is fully supervised	-0.1	Sprinkler not fully supervised or N/A	0	N/A	**0**
			Sprinkler not fully supervised or N/A	0				
5.3	Choose Presence of Sprinklers for Exposures within 30m	Sprinkler Conforms to NFPA13	Adequate sprinkler for exposures conforms to NFPA13		None for exposures	0	N/A	**0**
			None for exposures					
		Water Supply	Water supply is standard for sprinkler and fire dept. hose line of exposures		Water supply is not standard or N/A for exposures		N/A	
			Water supply is not standard or N/A for exposures					
		Sprinkler Supervision	Sprinkler system of exposures is fully supervised		Sprinkler not fully supervised or N/A for exposures		N/A	
			Sprinkler not fully supervised or N/A for exposures					
5.4	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	10.1 to 20.0m	0.15	0.65	m	**3,868**
			East Side	3.1 to 10.0m	0.2			
			South Side	20.1 to 30.1m	0.1			
			West Side	3.1 to 10.0m	0.2			
6	Obtain Required Fire Flow, Duration & Volume							
							Total Required Fire Flow, rounded to nearest 1,000 L/min, with max/min limits applied:	**10,000**
							Total Required Fire Flow (above) in L/s:	**167**
							Required Duration of Fire Flow (hrs)	**2.00**
							Required Volume of Fire Flow (m^3)	**1,200**

FUS Fire Flow Calculation - Long Method

Calculations based on: "*Water Supply for Public Fire Protection*" by Fire Underwriters' Survey, 2020

Stantec Project #: 163401476
Project Name: Perth Western Annex Lands
Date: January 30, 2023
Data inputted by: Alexandre Mineault-Guitard, ing., P.Eng
Data reviewed by: Kevin Alemany, M.A.Sc., P.Eng.

Fire Flow Calculation #: 2
Building Type/Description/Name: Residential

Notes: *Single house unit*

Fire Underwriters Survey Determination of Required Fire Flow - Long Method

Step	Task	Term	Options	Multiplier Associated with Option	Choose:	Value Used	Unit	Total Fire Flow (L/min)
1	Choose Frame Used for Construction of Unit	**Framing Material**						
		Coefficient related to type of construction (C)	Type V - Wood Frame	1.5	Type V - Wood Frame	1.5	m	
			Type IV-A - Mass Timber	0.8				
			Type IV-B - Mass Timber	0.9				
			Type IV-C - Mass Timber	1				
			Type IV-D - Mass Timber	1.5				
			Type III - Ordinary construction	1				
			Type II - Non-combustible construction	0.8				
			Type I - Fire resistive construction	0.6				
2	Choose Type of Housing (if TH, Enter Number of Units Per TH Block)	**Floor Space Area**						
		Type of Housing	Single Family	1	Single Family	1	Units	
			Townhouse - indicate # of units	0				
			Other (Comm, Ind, Apt etc.)	0				
2.2	# of Storeys	Number of Floors/Storeys in the Unit (do not include basement if 50% below grade):			2	2	Storeys	
3	Enter Ground Floor Area of One Unit	Average Floor Area (A) based on total floor area of all floors for one unit (non-fire resistive construction):			106	106	Area in Square Metres (m^2)	
					Square Metres (m2)			
3.1	Obtain Total Effective Building Area	Total Effective Building Area (# of Storeys x # of Units (if single family or townhouse) x Average Floor Area):			213	213		
4	Obtain Required Fire Flow without Reductions	Required Fire Flow (without reductions or increases per FUS) (F = 220 * C * √A) Round to nearest 1,000 L/min						5,000
5	Apply Factors Affecting Burning	**Reductions/Increases Due to Factors Affecting Burning**						
5.1	Choose Combustibility of Building Contents	Occupancy Content Hazard Reduction or Surcharge	Non-combustible	-0.25	Limited combustible	-0.15	N/A	4,250
			Limited combustible	-0.15				
			Combustible	0				
			Free burning	0.15				
			Rapid burning	0.25				
5.2	Choose Reduction Due to Presence of Sprinklers	Sprinkler Reduction	Adequate Sprinkler conforms to NFPA13	-0.3	None	0	N/A	0
			None	0				
		Water Supply Credit	Water supply is standard for sprinkler and fire dept. hose line	-0.1	Water supply is not standard or N/A	0	N/A	0
			Water supply is not standard or N/A	0				
		Sprinkler Supervision Credit	Sprinkler system is fully supervised	-0.1	Sprinkler not fully supervised or N/A	0	N/A	0
			Sprinkler not fully supervised or N/A	0				
5.3	Choose Presence of Sprinklers for Exposures within 30m	Sprinkler Conforms to NFPA13	Adequate sprinkler for exposures conforms to NFPA13		None for exposures	0	N/A	0
			None for exposures					
		Water Supply	Water supply is standard for sprinkler and fire dept. hose line of exposures		Water supply is not standard or N/A for exposures		N/A	
			Water supply is not standard or N/A for exposures					
		Sprinkler Supervision	Sprinkler system of exposures is fully supervised		Sprinkler not fully supervised or N/A for exposures		N/A	
			Sprinkler not fully supervised or N/A for exposures					
5.4	Choose Separation Distance Between Units	Exposure Distance Between Units	North Side	10.1 to 20.0m	0.15	0.7	m	2,975
			East Side	3.1 to 10.0m	0.2			
			South Side	20.1 to 30.1m	0.1			
			West Side	0 to 3.0m	0.25			
6	Obtain Required Fire Flow, Duration & Volume	*Total Required Fire Flow, rounded to nearest 1,000 L/min, with max/min limits applied:*						7,000
		Total Required Fire Flow (above) in L/s:						117
		Required Duration of Fire Flow (hrs)						2.00
		Required Volume of Fire Flow (m^3)						840

Appendix B JUNCTION IDS

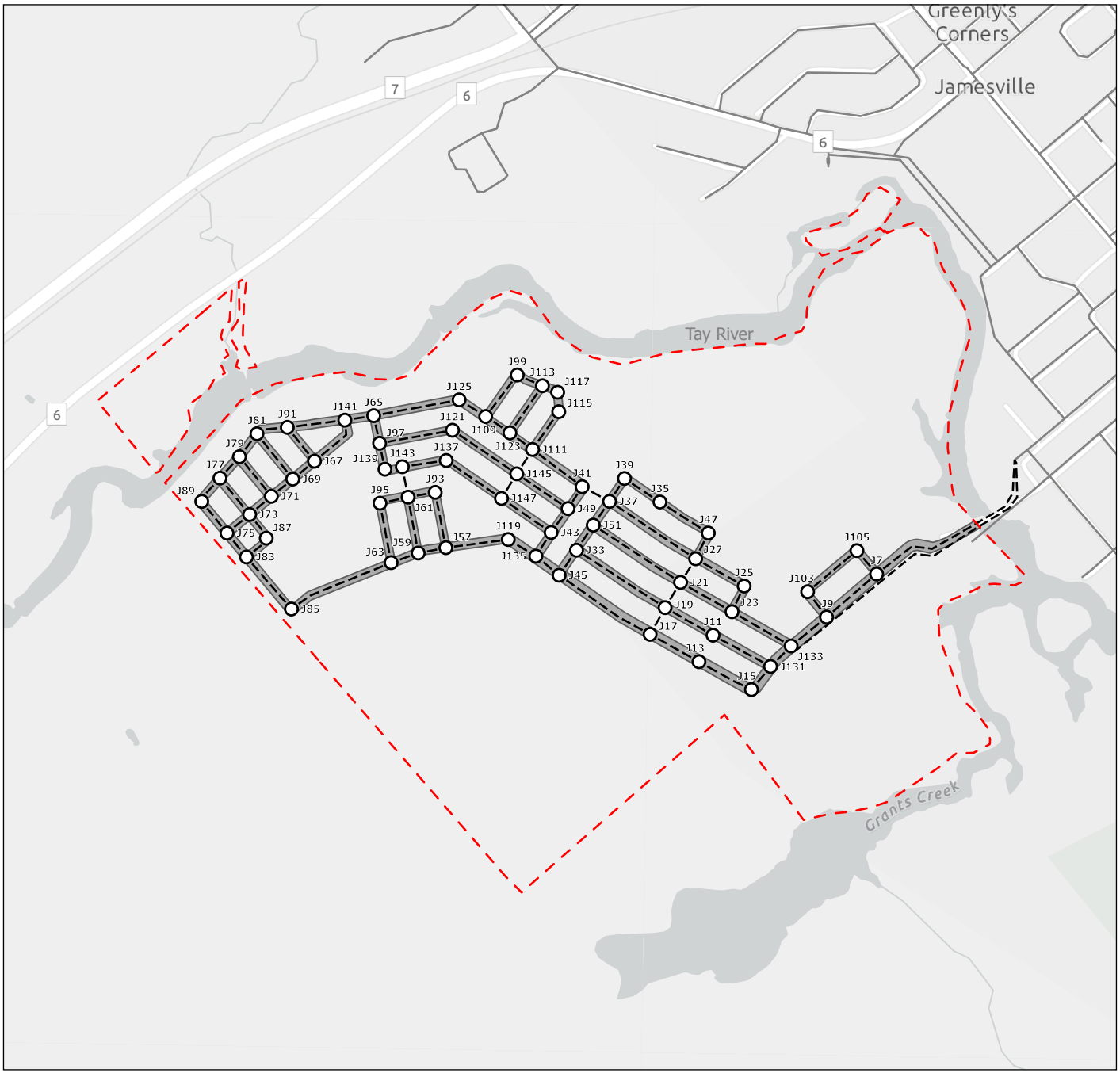


Figure No.
B-1

Title
Junction IDs

Client/Project
Caivan (Perth GC) Limited
Perth Western Annex Lands : Potable Water Hydraulic Analysis

Project Location
Perth, Ontario

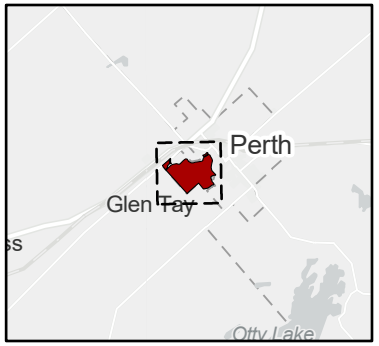
N

0 150 300 Meters

(At original document size of 8.5x11)
1:12,500

Legend

- Property Boundary
- Model Node
- Proposed Distribution Network
- Existing Distribution Network



Notes
1. Coordinate System: NAD 1983 UTM Zone 18N

Stantec

Appendix C MODEL RESULTS

AVDY Conditions

Junction ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J7	0.29	135.4	179.0	62
J9	0.29	137.9	179.0	58
J11	0.29	138.0	178.9	58
J13	0.29	137.4	178.9	59
J15	0.29	138.0	178.9	58
J17	0.29	137.2	178.9	59
J19	0.29	137.6	178.9	59
J21	0.29	137.6	178.9	59
J23	0.29	137.4	178.9	59
J25	0.29	137.3	178.9	59
J27	0.29	137.2	178.9	59
J33	0.29	137.0	178.9	59
J35	0.29	137.6	178.9	59
J37	0.29	137.8	178.9	58
J39	0.29	137.8	178.9	58
J41	0.29	137.6	178.9	59
J43	0.29	136.7	178.9	60
J45	0.29	136.7	178.9	60
J47	0.29	137.4	178.9	59
J49	0.29	137.7	178.9	58
J51	0.29	137.9	178.9	58
J57	0.29	136.3	178.9	60
J59	0.29	136.4	178.9	60
J61	0.29	136.5	178.9	60
J63	0.29	136.5	178.9	60
J65	0.29	137.2	178.9	59
J67	0.29	137.3	178.9	59
J69	0.29	137.4	178.9	59
J71	0.29	137.5	178.9	59
J73	0.29	137.2	178.9	59
J75	0.29	138.1	178.9	58
J77	0.29	138.1	178.9	58
J79	0.29	137.9	178.9	58
J81	0.29	137.7	178.9	58
J83	0.29	137.5	178.9	59
J85	0.29	137.0	178.9	59
J87	0.29	137.5	178.9	59
J89	0.29	137.8	178.9	58
J91	0.29	137.7	178.9	59
J93	0.29	136.6	178.9	60
J95	0.29	136.6	178.9	60
J97	0.29	137.7	178.9	58
J99	0.29	137.0	178.9	60
J103	0.29	137.3	179.0	59
J105	0.29	135.4	179.0	62
J109	0.29	137.1	178.9	59
J111	0.29	137.3	178.9	59
J113	0.29	137.1	178.9	59
J115	0.29	137.2	178.9	59
J117	0.29	137.1	178.9	59
J119	0.29	136.5	178.9	60
J121	0.29	137.9	178.9	58
J123	0.29	137.2	178.9	59
J125	0.29	137.2	178.9	59
J131	0.29	137.9	178.9	58
J133	0.29	137.7	178.9	59
J135	0.29	136.6	178.9	60
J137	0.29	137.8	178.9	58
J139	0.29	137.7	178.9	58
J141	0.29	137.0	178.9	59
J143	0.29	137.6	178.9	59
J145	0.29	137.8	178.9	58
J147	0.29	137.4	178.9	59

PKHR Conditions

Junction ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J7	1.27	135.4	178.3	61
J9	1.27	137.9	178.2	57
J11	1.27	138.0	178.0	57
J13	1.27	137.4	178.0	58
J15	1.27	138.0	178.0	57
J17	1.27	137.2	177.9	58
J19	1.27	137.6	177.9	57
J21	1.27	137.6	177.9	57
J23	1.27	137.4	177.9	57
J25	1.27	137.3	177.9	58
J27	1.27	137.2	177.9	58
J33	1.27	137.0	177.8	58
J35	1.27	137.6	177.8	57
J37	1.27	137.8	177.8	57
J39	1.27	137.8	177.8	57
J41	1.27	137.6	177.8	57
J43	1.27	136.7	177.8	58
J45	1.27	136.7	177.8	58
J47	1.27	137.4	177.9	57
J49	1.27	137.7	177.8	57
J51	1.27	137.9	177.8	57
J57	1.27	136.3	177.7	59
J59	1.27	136.4	177.7	59
J61	1.27	136.5	177.7	58
J63	1.27	136.5	177.7	58
J65	1.27	137.2	177.7	58
J67	1.27	137.3	177.7	57
J69	1.27	137.4	177.7	57
J71	1.27	137.5	177.7	57
J73	1.27	137.2	177.7	57
J75	1.27	138.1	177.7	56
J77	1.27	138.1	177.7	56
J79	1.27	137.9	177.7	56
J81	1.27	137.7	177.7	57
J83	1.27	137.5	177.7	57
J85	1.27	137.0	177.7	58
J87	1.27	137.5	177.7	57
J89	1.27	137.8	177.7	57
J91	1.27	137.7	177.7	57
J93	1.27	136.6	177.7	58
J95	1.27	136.6	177.7	58
J97	1.27	137.7	177.7	57
J99	1.27	137.0	177.7	58
J103	1.27	137.3	178.2	58
J105	1.27	135.4	178.3	61
J109	1.27	137.1	177.7	58
J111	1.27	137.3	177.7	57
J113	1.27	137.1	177.7	58
J115	1.27	137.2	177.7	57
J117	1.27	137.1	177.7	58
J119	1.27	136.5	177.8	59
J121	1.27	137.9	177.7	57
J123	1.27	137.2	177.7	57
J125	1.27	137.2	177.7	57
J131	1.27	137.9	178.1	57
J133	1.27	137.7	178.1	57
J135	1.27	136.6	177.8	58
J137	1.27	137.8	177.7	57
J139	1.27	137.7	177.7	57
J141	1.27	137.0	177.7	58
J143	1.27	137.6	177.7	57
J145	1.27	137.8	177.7	57
J147	1.27	137.4	177.7	57

M**XDY + FF Conditions**

Junction ID	Demand (L/s)	Static Pressure (psi)	Static Head (m)	Hydrant Available Flow at 20 psi (L/s)
J7	0.58	66	182.2	382
J9	0.58	63	182.2	355
J11	0.58	63	182.2	247
J13	0.58	63	182.2	313
J15	0.58	63	182.2	320
J17	0.58	64	182.1	313
J19	0.58	63	182.1	302
J21	0.58	63	182.1	313
J23	0.58	63	182.2	323
J25	0.58	64	182.1	315
J27	0.58	64	182.1	312
J33	0.58	64	182.1	284
J35	0.58	63	182.1	227
J37	0.58	63	182.1	300
J39	0.58	63	182.1	246
J41	0.58	63	182.1	295
J43	0.58	64	182.1	277
J45	0.58	64	182.1	305
J47	0.58	64	182.1	248
J49	0.58	63	182.1	272
J51	0.58	63	182.1	280
J57	0.58	65	182.1	284
J59	0.58	65	182.1	280
J61	0.58	65	182.1	261
J63	0.58	65	182.1	276
J65	0.58	64	182.1	273
J67	0.58	64	182.1	262
J69	0.58	63	182.1	260
J71	0.58	63	182.1	258
J73	0.58	64	182.1	259
J75	0.58	62	182.1	254
J77	0.58	63	182.1	224
J79	0.58	63	182.1	227
J81	0.58	63	182.1	228
J83	0.58	63	182.1	258
J85	0.58	64	182.1	262
J87	0.58	63	182.1	177
J89	0.58	63	182.1	221
J91	0.58	63	182.1	231
J93	0.58	65	182.1	240
J95	0.58	65	182.1	238
J97	0.58	63	182.1	254
J99	0.58	64	182.1	230
J103	0.58	64	182.2	253
J105	0.58	66	182.2	266
J109	0.58	64	182.1	279
J111	0.58	64	182.1	286
J113	0.58	64	182.1	234
J115	0.58	64	182.1	230
J117	0.58	64	182.1	229
J119	0.58	65	182.1	292
J121	0.58	63	182.1	213
J123	0.58	64	182.1	281
J125	0.58	64	182.1	275
J131	0.58	63	182.2	333
J133	0.58	63	182.2	352
J135	0.58	65	182.1	300
J137	0.58	63	182.1	224
J139	0.58	63	182.1	245
J141	0.58	64	182.1	269
J143	0.58	63	182.1	253
J145	0.58	63	182.1	271
J147	0.58	64	182.1	259

Reliability Analysis (AVDY + FF Conditions)

	Hydrant Available Flow at 20 psi (L/s)			
Junction ID	Break Scenario 1	Break Scenario 2	Break Scenario 3	Break Scenario 4
J7	273	380	380	380
J9	235	353	353	353
J11	182	244	244	244
J13	209	309	308	312
J15	210	317	317	319
J17	209	307	305	312
J19	205	300	300	301
J21	208	311	312	313
J23	212	320	321	323
J25	209	310	311	314
J27	209	304	306	311
J33	199	282	281	283
J35	173	220	221	224
J37	204	283	285	299
J39	182	237	238	244
J41	202	267	215	293
J43	197	230	232	276
J45	208	286	283	304
J47	184	241	242	246
J49	193	237	217	270
J51	196	278	278	279
J57	201	227	245	273
J59	199	227	241	265
J61	191	219	225	256
J63	197	226	237	257
J65	195	234	223	254
J67	190	224	219	180
J69	189	222	218	183
J71	188	220	217	185
J73	189	221	219	190
J75	185	216	215	189
J77	172	197	195	172
J79	173	199	196	172
J81	174	200	197	170
J83	188	219	219	197
J85	191	220	224	216
J87	147	162	161	151
J89	170	194	192	172
J91	175	202	198	169
J93	181	204	212	234
J95	180	202	209	230
J97	186	219	212	249
J99	176	208	191	225
J103	198	249	249	249
J105	215	262	262	262
J109	197	243	220	271
J111	200	251	220	282
J113	178	211	193	229
J115	176	209	190	226
J117	175	208	190	225
J119	204	223	257	287
J121	166	190	183	209
J123	198	246	220	276
J125	196	239	220	265
J131	214	332	331	332
J133	220	352	352	352
J135	206	222	267	298
J137	172	196	193	222
J139	182	211	208	243
J141	193	230	222	176
J143	186	216	215	252
J145	193	235	218	269
J147	189	223	215	257

APPENDIX C

Wastewater Collection

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL
NUMBER 1045-6VTHH8
Notice No. 1
Issue Date: November 15, 2012

The Corporation of the Town of Perth
80 Gore Street East
Perth, Ontario
K7H 1H9

Site Location: Perth Sewage Treatment Lagoons
390 Wild Life Road
Township of Drummond-North Elmsley, County of Lanark, Ontario

You are hereby notified that I have amended Approval No. 1045-6VTHH8 issued on March 26, 2007 for a three cell waste stabilization lagoon system having a rated capacity of 7,718 cubic metres per day, located in the east half of Lots 23,24, and 25, Concession X (Township of Elmsley North), in the Town of Perth , as follows:

temporary installation of two (2) Submerged Attached Growth Reactor (SAGR) cell systems, one (1) SAGR cell with dimensions of 9.0 metres wide by 15.0 metres long by 2.0 meters water depth and the other SAGR cell with dimensions of 9.0 metres wide by 10.5 metres long by 2.0 meters water depth, each system has a design flow capacity of 100 cubic metres per day, receiving lagoon effluent from existing transfer structure between lagoon Cells #2 and #3 and discharging back to lagoon Cells #3, including all controls, electrical equipment, instrumentation, aeration system, influent chambers and splitting tank, effluent chambers, piping, pumps, flow meter, valves and appurtenances essential for the proper operation of the SAGR cell systems;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Sewage Works dated October 22, 2012 and submitted by Grant Machan, Director of Environmental Services, The Corporation of the Town of Perth;

2. a design brief dated October 12, 2012 and a water quality monitoring program dated October 25, 2012, prepared by Nelson Environmental Inc.;

3. all other supporting information and documentation provided by R.V. Anderson Associates Limited.

For the purpose of this environmental compliance approval, the following definitions apply:

" *Approval"* means this entire document and any schedules attached to it, and the application;

" *Director"* means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA;*

"District Manager" means the District Manager of Ottawa District Office;

" *EPA"* means the Environmental Protection Act , R.S.O. 1990, c.E.19, as amended;

" *Ministry"* means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf;

"Owner" means the The Corporation of the Town of Perth and includes its successors and assignees;

"OWRA" means the Ontario Water Resources Act , R.S.O. 1990, c. O.40, as amended;

" *Works"* means the sewage works described in the *Owner* 's application, and this *Approval.*

You are hereby notified that this environmental compliance approval is issued to you subject to the special terms and conditions outlined below:

SPECIAL TERMS AND CONDITIONS

1. EXPIRY OF APPROVAL

This temporary *Approval* shall expire and become null and void **two (2) years** after the issuance date of this temporary *Approval.*

2. MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works,* carry out the following monitoring program:

(1) Samples shall be collected at the following sampling points, at the frequency specified, by means of the specified sample type and analyzed for each parameter listed and all results recorded:

Table 1 - Influent and Effluent Monitoring	
Sampling Locations	A: influent at splitter structure B: SAGR Cell #1 effluent C: SAGR Cell #2 effluent
Sample Type	**Grab**
Frequency	**Weekly** (except Chlorophyll-a)
Parameters	*CBOD5,* Total Suspended Solids, Total Kjeldahl Nitrogen, Total Ammonia Nitrogen, Nitrates and Nitrites, Total Phosphorus, Alkalinity, *E. Coli,* Total Coliform, Chlorophyll-a (**monthly**), Temperature (on field), Dissolved Oxygen (on field), and pH (on field)

(2) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:

(a) the Ministry's Procedure F-10-1, “Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;

(b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more

recently published editions; and

(c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions.

(3) The *Owner* shall install and maintain a continuous flow measuring device, to measure the flowrate of the influent to the *Works* with an accuracy to within plus or minus 15 per cent (+/- 15%) of the actual flowrate for the entire design range of the flow measuring device, and record the flowrate at weekly frequency.

3. REPORTING

(1) The *Owner* shall prepare, and submit to the *District Manager* and Technical Support Unit of Kingston Regional Office of the *Ministry,* a monitoring result report, within **thirty (30) days** following a **one (1) year** pilot study. The reports shall contain, but shall not be limited to, the following information:

(a) a summary and interpretation of all monitoring data collected pursuant to Condition 2, and a comparison to the effluent objectives outlined in the design brief dated October 12, 2012 prepared by Nelson Environmental Inc., including an overview of the success and adequacy of the *Works;*

(b) a description of any operating problems encountered and corrective actions taken; and

(c) If necessary, the *Owner* may want to obtain a written permission from the *District Manager* for extending the pilot study duration within the time frame set in Condition 1.

The reason for the imposition of the special condition is as follows:

1. Condition 1 is included to ensure that the *Works* are constructed in a timely manner

2. Condition 2 is included to enable the *Owner* to evaluate and demonstrate the performance of the *Works,* on a continual basis.

3. Condition 3 is included to provide a performance record for future references, to ensure that the Ministry is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Certificate,* so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

This Notice shall constitute part of the approval issued under Approval No. 1045-6VTHH8 dated March 26, 2007.

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the

environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Director appointed for the purposes of Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal 's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 15th day of November, 2012

Mansoor Mahmood, P.Eng.
Director
appointed for the purposes of Part II.1 of the *Environmental Protection Act*

NH/
c: District Manager, MOE Ottawa District Office
Grant Machan, The Corporation of the Town of Perth

Statistics Canada Statistique Canada

Census Profile, 2021 Census of Population

Data table

Characteristic	Perth, Town (T) Ontario [Census subdivision]
	Counts
	Total
Population and dwellings	
Population, 2021 [1]	6,469
Population, 2016 [1]	5,930
Population percentage change, 2016 to 2021	9.1
Total private dwellings [2]	3,395
Private dwellings occupied by usual residents [3]	3,271
Population density per square kilometre	529.8
Land area in square kilometres	12.21

Source: Statistics Canada, 2021 Census of Population.

How to cite: Statistics Canada. 2022. (table). *Census Profile*. 2021 Census. Statistics Canada Catalogue no. (number) 98-316-X2021001. Ottawa. Released February 9, 2022. https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/index.cfm?Lang=E (accessed April 13, 2022).

Note(s):

Footnote 1

2021 and 2016 population

Statistics Canada is committed to protect the privacy of all Canadians and the confidentiality of the data they provide to us. As part of this commitment, some population counts of geographic areas are adjusted in order to ensure confidentiality.

The adjustment to counts of the total population for any dissemination block is controlled to ensure that the population counts for dissemination areas will always be within 5 of the actual values. The adjustment has no impact on the population counts of census divisions and large census subdivisions.

Footnote 2

Total private dwellings

Private dwelling refers to a separate set of living quarters with a private entrance either from outside the building or from a common hall, lobby, vestibule or stairway inside the building. The entrance to the dwelling must be one that can be used without passing through the living quarters of some other person or group of persons.

Footnote 3

Private dwellings occupied by usual residents

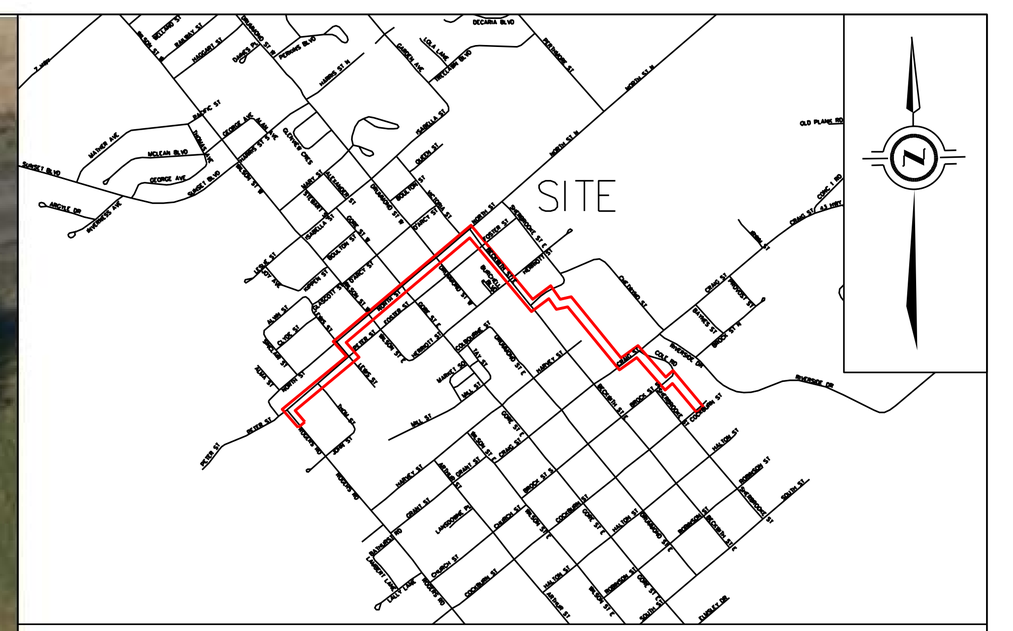
A private dwelling occupied by usual residents refers to a private dwelling in which a person or a group of persons is permanently residing. Also included are private dwellings whose usual residents are temporarily absent on May 11, 2021.

Date modified:
2022-01-30

SEWER INVERT DATA TABLE

MH/CB	DIRECTION	DIAMETER	INVERT	INVERT ELEVATION	TOP OF LID/GRATE ELEVATION	NOTES
SAN MH#1 (ROG_201)	NW NE SE	200 N/A 200	1.33 N/A 1.30	134.55 N/A 134.58	135.88	NE LAT OFFSET BY ±0.30
SAN MH#2 (ROG_200)	NW NE SW	200 200 200	1.65 1.63 ±1.65	134.33 134.35 134.33	135.98	
SAN MH#3 (PET_100)	NE SE SE S SW W W	300 200 200 150 ±300 ±150 ±150	2.78 2.71 2.65 2.69 2.76 1.90 2.52	134.16 134.23 134.29 134.25 134.18 135.04 134.42	136.94	
SAN MH#4 (PET_102)	NE SW	300 300	2.82 2.81	133.83 133.84	136.65	
SAN MH#5 (PET_104)	NW NE SE SW	150 300 250 300	2.53 3.22 3.15 3.21	134.29 133.60 133.67 133.61	136.82	
SAN MH#6 (PET_106)	NE SW	300 300	3.16 3.15	133.34 133.35	136.50	
SAN MH#7 (LEW_202)	NW NE SE SW	300 200 300 300	2.98 2.85 2.98 2.97	133.07 133.20 133.07 133.08	136.05	
SAN MH#8 (LEW_200)	NW NE SE S SW	200 300 300 100 300	3.26 3.32 3.25 2.29 3.31	133.05 132.99 133.06 134.02 133.00	136.31	
SAN MH#9 (NOR_106)	NE E SW	300 200 300	3.81 2.42 3.71	132.87 134.26 132.97	136.68	
SAN MH#10 (WIL_200)	NW' NW NE SE' SE SW	±225 225 375 ±200 300 300	4.45 3.42 4.54 ±2.80 2.60 4.42	132.73 133.76 132.64 ±134.38 134.58 132.76	136.68	NW' LAT- DROP; SE' LAT- STAIRS BLOCKING
SAN MH#11 (NOR_200)	NE SW	±600(*375) ±600(*375)	4.17 4.13	132.59 132.63	136.76	NE AND SE LAT- POSSIBLY WIDE OPENING
SAN MH#12 (NOR_201)	NE SW	375 375	3.37 3.36	132.48 132.49	135.85	
SAN MH#13 (GOR_202)	N NE SE SW	300 600 375 375	3.55 3.62 3.54 3.37	132.29 132.22 132.30 132.47	135.84	
SAN MH#14 (DRU_202)	NW NE SE SW	600 600 200 600	3.61 3.61 2.73 3.60	132.02 132.02 132.90 132.03	135.63	
SAN MH#15 (NOR_208)	NW NW SE SE SW	250 525 525 250 600	1.95 2.61 2.66 2.04 2.65	132.30 131.64 131.59 132.21 131.60	134.25	
SAN MH#16 (BEC_202)	NW SE SW	525 525 200	2.45 2.46 2.25	131.50 131.49 131.70	133.95	
SAN MH#17 (BEC_204)	SE	200	2.00	131.44	133.44	
SAN MH#18 (BEC_210)	NW SE	525 525	1.42 1.45	131.21 131.18	132.63	
SAN MH#19 (BEC_208)	NW SE	200 200	1.45 1.56	131.19 131.08	132.64	
SAN MH#20 (BEC_218)	NW SE	*525 525	1.49 1.51	131.07 131.05	132.56	NW LAT- RECESSED
SAN MH#21 (BEC_220)	NW SE	200 200	1.50 1.52	131.07 131.05	132.57	
SAN MH#22 (RIV_202)	NW NW NE S SW	*525 200 *300 N/A 300	±1.82 1.92 N/A N/A ±2.43	±130.96 130.86 N/A N/A ±130.35	132.78	NW, NE AND S LAT- RECESSED;
SAN MH#23 (N/A)	N SE SE'	±500 375 ±450	2.10 1.98 ±2.03	130.77 130.89 ±130.84	132.87	N LAT- CAPPED; SE' LAT- RECESSED
SAN MH#24 (RIV_204)	NE SE SE SW W	500 *400 *300 300 ±100	2.33 N/A N/A ±2.37 1.80	130.23 N/A N/A ±130.19 130.76	132.56	SE LAT'S- SIPHON; SW LAT- RECESSED
SAN MH#25 (LIVE_200)	NW NW E SW	*400 *300 600 300	N/A N/A 3.27 3.04	N/A N/A 129.51 129.74	132.78	NW LAT'S- SIPHON AND RECESSED
SAN MH#26 (LIVE_202)	SE W	600 600	3.60 3.55	129.27 129.32	132.87	
SAN MH#27 (LIVE_206)	NW E SE	600 150 600	3.39 2.11 3.41	129.22 130.50 129.20	132.61	
SAN MH#28 (CRA_206)	NW NE	600 600	4.61 4.63	128.99 128.97	133.60	
SAN MH#29 (CRA_208)	SE SW	600 600	5.11 5.10	128.95 128.96	134.06	
SAN MH#30 (BRO_208)	NW SE	600 600	3.85 3.94	128.94 128.85	132.79	
SAN MH#31 (BRO_208)	NW NE S	600 600 100	3.77 3.79 1.67	128.83 128.81 130.93	132.60	
SAN MH#32 (BRO_210)	NE E SE SW	375 100 600 600	3.56 1.61 3.76 3.74	128.93 130.88 128.73 128.75	132.49	
SAN MH#33 (LASE_200)	NW SE	600 600	3.75 3.76	128.72 128.71	132.47	
SAN MH#34 (LASE_202)	NW NE SE SE'	600 600 600 600	4.00 4.05 2.29 4.03	128.56 128.51 130.27 128.53	132.56	SE' LAT- DROP
SAN MH#35 (COC_206)	NE *SW SW	*600 *300 375	N/A N/A 1.84	N/A N/A 131.02	132.86	
SAN MH#36 (RIV_200)	NW NW NE	375 300 300	2.11 2.16 ±2.43	130.78 130.73 ±130.46	132.89	

*INFORMATION OBTAINED FROM RECORDS PROVIDED BY CLIENT; NOT FIELD VERIFIED BY ONSITE LOCATES INC.



LOCATION MAP NOT TO SCALE

SUBSURFACE UTILITY PLAN OF

SANITARY SEWER INVESTIGATION ON VARIOUS STREETS TOWN OF PERTH

ONSITE LOCATES INC.

SCALE 1 : 1000

10 0 10 20 30 metres

METRIC

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

COORDINATE SYSTEM

UTM ZONE 18, NAD83 (CSRS) (2010.0).

NOTE:

BUILDINGS ARE DEPICTED FOR VISUAL AID ONLY. ANY ASSUMPTIONS MADE ABOUT BUILDINGS OR LOCATIONS OF FEATURES IN RELATION TO THE BUILDINGS OR BUILDING TIES ARE MADE AT THE RISK OF THE INDIVIDUAL OR PARTIES TO WHOM THIS DOCUMENT HAS BEEN PROVIDED.

BENCHMARK

ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE TOWN OF PERTH BENCH MARK No 01019806708 HAVING A PUBLISHED ELEVATION OF 134.480 METRES.

LEGEND

— SAN — DENOTES UNDERGROUND SANITARY SEWER
○ SAN MH DENOTES SANITARY MANHOLE
BM DENOTES BENCHMARK

SEWER INVERT NOTE:

SEWER INVERT DEPTHS ARE MANUALLY MEASURED FROM THE LID/GRATE OF THE GIVEN FEATURE.

ANNOTATIONS DISPLAYED AS *ITALICIZED* WITH AN ASTERISK* HAVE BEEN INTERPOLATED FROM RECORDS AND WERE NOT FIELD VERIFIED BY ONSITE LOCATES LTD.

INVERT DEPTH MEASUREMENTS ARE FROM THE ASSUMED BOTTOM OF THE FACILITY STRUCTURE.

DEPTHS ARE NOT SUITABLE FOR EXCAVATION PURPOSES. SEWER NETWORK CONNECTIONS WERE COMPILED WHERE FIELD EVIDENCE COINCIDED WITH AS-BUILT RECORDS

WHERE NO DEPTH INFORMATION COULD BE OBTAINED, UTILITIES ARE ASSUMED TO BE AT STANDARD INSTALLATION DEPTH FOR THE SPECIFIC TYPE OF UTILITY.

THE MOST RELIABLE WAY TO PRECISELY DETERMINE THE HORIZONTAL AND VERTICAL LOCATION OF AN UNDERGROUND UTILITY IS THROUGH PHYSICAL EXPOSURE USING SAFE DIGGING TECHNIQUES (COMMONLY PERFORMED WITH HYDRO VACUUM EXCAVATION)

INVERT DEPTH MEASUREMENTS HEREON ARE PROVIDED IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

UNDERGROUND UTILITY NOTES

THE UTILITY DATA DEPICTED ON THIS DRAWING WERE ACQUIRED IN ACCORDANCE WITH ASCE STANDARD 38-02. THE INFORMATION IS SHOWN BY ATTRIBUTED QUALITY LEVELS WHICH ARE DEFINED AS FOLLOWS:

DATA QUALITY LEVEL

HIGHEST QUALITY

QUALITY LEVEL A
QUALITY LEVEL B
QUALITY LEVEL C
QUALITY LEVEL D

LOWEST QUALITY

QUALITY LEVEL "A" - INFORMATION OBTAINED BY ACTUAL PHYSICAL EXPOSURE OF TARGETED UTILITIES AND SUBSEQUENT MEASUREMENT OF THE EXPOSED PRECISE HORIZONTAL AND VERTICAL POSITION.

QUALITY LEVEL "B" - INFORMATION OBTAINED USING GEOPHYSICAL LOCATE TECHNIQUES TO IDENTIFY THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF THE DESIGNATED UTILITIES.

QUALITY LEVEL "C" - INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO THE QUALITY "D" INFORMATION OBTAINED.

QUALITY LEVEL "D" - INFORMATION DERIVED FROM UTILITY RECORDS OR VERBAL RECOLLECTIONS

ALL SERVICES ARE QUALITY "D" UNLESS NOTED OTHERWISE.
LEVEL "D" RECORD INFORMATION SHOWN ON THIS PLAN HAVE BEEN PLOTTED APPROXIMATELY AS PER THE RECORDS FOUND AND COULD NOT BE FIELD VERIFIED WITHIN THE SCOPE OF THIS PROJECT. IF FURTHER VERIFICATION IS REQUIRED, IT IS SUGGESTED THAT LEVEL "A" METHODOLOGIES BE EMPLOYED.

LOST SIGNAL- DENOTES/INDICATES A POINT WHERE QL-B METHODS COULD NO LONGER ASCERTAIN THE HORIZONTAL POSITION OF A FACILITY.

QUALITY LEVEL "D" INFORMATION COMPILED FROM RECORDS PROVIDED BY CLIENT FILE NO. SANITARY NETWORK_SHEET_4 OF 8- SURVEY AND SANITARY NETWORK_SHEET_5 OF 8-SURVEY

CAUTION: CALL BEFORE YOU DIG

THIS PLAN IS INTENDED FOR DESIGN PURPOSES ONLY. OTHER BURIED UTILITIES MAY EXIST WHICH ARE NOT SHOWN DUE TO INSUFFICIENT INFORMATION OR IMPROPER INSTALLATION. CONTACT ALL POTENTIAL OWNERS OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION OR BREAKING GROUND.
IT IS THE RESPONSIBILITY OF THE CONTRACTOR/BUILDER TO ENSURE THE APPROPRIATE LEGAL REQUIREMENTS ARE MET.

SUBSURFACE UTILITY FIELD WORK WAS COMPLETED ON THE 14TH DAY OF JUNE, 2021

ORTHOIMAGERY PROVIDED BY FIRST BASE SOLUTIONS INC.

ONSITE LOCATES INC.
UTILITY LOCATE SERVICES
A wholly owned subsidiary of J.D. Barnes Ltd.
140 RENFREW DRIVE, SUITE 100, MARKHAM, ON L3R 6B3
T: 1-800-805-6155 www.onsitelocates.ca

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
VC	ZK	21-46-31298
FILE: S:\ONSITE\21-46-31298\Drawing\21-46-31298.dgn		DATED: 2021-06-14
		PLOTTED: 6/15/2021

LOCATION MAP NOT TO SCALE

SEWER INVERT PLAN OF
ROGERS ROAD & SOUTH STREET
TOWN OF PERTH
COUNTY OF LANARK

SCALE 1 : 1000
20 0 10 20 40 60 metres

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

COORDINATE SYSTEM
UTM ZONE 18, NAD83 (CSRS) (2010.0).

BENCHMARK
ELEVATIONS SHOWN ON THIS PLAN ARE RELATED TO GEODETIC DATUM AND ARE DERIVED FROM THE COUNTY OF LANARK BENCH MARK/S No 010198067OB HAVING A PUBLISHED ELEVATION OF 134.480 METRES.

SEWER INVERT NOTE:
SEWER INVERT DEPTHS ARE MANUALLY MEASURED FROM THE LID/GRATE OF THE GIVEN FEATURE.

ANNOTIONS DISPLAYED AS //AS/S/S2D WITH AN ASTERISK* HAVE BEEN INTERPOLATED FROM RECORDS AND WERE NOT FIELD VERIFIED BY ONSITE LOCATES LTD.

INVERT DEPTH MEASUREMENTS ARE FROM THE ASSUMED BOTTOM OF THE FACILITY STRUCTURE.

DEPTHS ARE NOT SUITABLE FOR EXCAVATION PURPOSES. SEWER NETWORK CONNECTIONS WERE COMPILED WHERE FIELD EVIDENCE COINCIDED WITH AS-BUILT RECORDS.

WHERE NO DEPTH INFORMATION COULD BE OBTAINED, UTILITIES ARE ASSUMED TO BE AT STANDARD INSTALLATION DEPTH FOR THE SPECIFIC TYPE OF UTILITY.

THE MOST RELIABLE WAY TO PRECISELY DETERMINE THE HORIZONTAL AND VERTICAL LOCATION OF AN UNDERGROUND UTILITY IS THROUGH PHYSICAL EXPOSURE USING NON-DESTRUCTIVE TECHNIQUES (COMMONLY PERFORMED WITH HYDRO VACUUM EXCAVATION).

INVERT DEPTH MEASUREMENTS HEREON ARE PROVIDED IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

LEGEND
SAN — DENOTES UNDERGROUND SANITARY SEWER
SAN MH DENOTES SANITARY MANHOLE

UNDERGROUND UTILITY NOTES
THE UTILITY DATA DEPICTED ON THIS DRAWING WERE ACQUIRED IN ACCORDANCE WITH ASCE STANDARD 38-02. THE INFORMATION IS SHOWN BY ATTRIBUTED QUALITY LEVELS WHICH ARE DEFINED AS FOLLOWS:

DATA QUALITY LEVEL

HIGHEST QUALITY — LOWEST QUALITY
QUALITY LEVEL A
QUALITY LEVEL B
QUALITY LEVEL C
QUALITY LEVEL D

QUALITY LEVEL "A" = INFORMATION OBTAINED BY ACTUAL PHYSICAL EXPOSURE OF TARGETED UTILITIES AND SUBSEQUENT MEASUREMENT OF THE EXPOSED PRECISE HORIZONTAL AND VERTICAL POSITION.

QUALITY LEVEL "B" = INFORMATION OBTAINED USING GEOPHYSICAL LOCATE TECHNIQUES TO IDENTIFY THE EXISTENCE AND APPROXIMATE HORIZONTAL POSITION OF THE DESIGNATED UTILITIES.

QUALITY LEVEL "C" = INFORMATION OBTAINED BY SURVEYING AND PLOTTING VISIBLE UTILITY FEATURES AND BY USING PROFESSIONAL JUDGMENT IN CORRELATING THIS INFORMATION TO THE QUALITY "D" INFORMATION OBTAINED.

QUALITY LEVEL "D" = INFORMATION DERIVED FROM UTILITY RECORDS OR VERBAL RECOLLECTIONS

ALL SERVICES ARE QUALITY "D" UNLESS NOTED OTHERWISE.
LEVEL "D" RECORD INFORMATION SHOWN ON THIS PLAN HAVE BEEN PLOTTED APPROXIMATELY AS PER THE RECORDS FOUND AND COULD NOT BE FIELD VERIFIED WHEN THE SCOPE OF THIS PROJECT. IF FURTHER VERIFICATION IS REQUIRED, IT IS SUGGESTED THAT LEVEL "A" METHODOLOGIES BE EMPLOYED.

LOST SIGNAL: DENOTES/INDICATES A POINT WHERE QL-B METHODS COULD NO LONGER ASCERTAIN THE HORIZONTAL POSITION OF A FACILITY.

QUALITY LEVEL "D" INFORMATION COMPILED FROM RECORDS PROVIDED BY TOWN OF PERTH SANITARY SEWER NETWORK MAPPING SHEET No. 7/8.

CAUTION: CALL BEFORE YOU DIG
THIS PLAN IS INTENDED FOR DESIGN PURPOSES ONLY. OTHER BURIED UTILITIES MAY EXIST WHICH ARE NOT SHOWN DUE TO INSUFFICIENT INFORMATION OR IMPROPER INSTALLATION. CONTACT ALL POTENTIAL OWNERS OF UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION OR EXCAVATING.
IT IS THE RESPONSIBILITY OF THE CONTRACTOR/BUILDER TO ENSURE THE APPROPRIATE LEGAL REQUIREMENTS ARE MET.

SUBSURFACE UTILITY FIELD WORK WAS COMPLETED ON THE 10TH DAY OF DECEMBER, 2021

ONSITE LOCATES INC.
UTILITY LOCATING SERVICES
A wholly owned subsidiary of J.D. Barnes Ltd.
140 RENFREW DRIVE, SUITE 100, MARKHAM, ON L3R 6B3
T: 1-800-863-6155
www.onsitelocates.ca

DRAWN BY:	CHECKED BY:	REFERENCE NO.:
KB	KSM	21-46-3129B-01

FILE: S:\ONSITE\21-46-3129B\01\Cs Client\21-46-3129B-01-SEWER.dwg PLOTTED: 12/16/2021

Stantec

Memo

To:	Adam Fobert	From:	Gregory Chochlinski, Ben Morrison
	DSEL		Stantec, Ottawa
File:	Cockburn PS in Perth – Capacity Review	Date:	June 17, 2021

Reference: Cockburn PS in Perth – Capacity Review Memo

Introduction

Stantec was retained by DSEL to perform a review of the existing Cockburn sanitary pumping station (PS) that presently services the Town of Perth. Cockburn PS is the larger of two sanitary pumping stations in the Town of Perth.

The proposed new development by Caivan will discharge into the gravity sanitary system that conveys sewage to the Cockburn PS. This increased flowrate would need to be handled by Cockburn PS. The purpose of this Memo is to review the present condition, and capacity of the Cockburn pumping station and provide a high-level discussion on potential upgrades, if required.

Site Investigation

Stantec visited the Cockburn PS on June 14, 2021 and met with the Town's operator. The basic elements of the PS are as follows:

1. The PS has three pumps, two pumps are in the dry well and one pump is submersible. The wet well/dry well were originally constructed around 1982, and the wet well was expanded later to allow the installation of the third pump (submersible).

2. The two original old pumps in the dry well are 30 HP with reported flowrate capacity of about 90 L/s. The new submersible pump #3 is 45 HP (less than 2 years old) and the available documentation indicates a duty point of 140 L/s at 16.8 m head.

3. The concrete wet well, as originally constructed, is rectangular, with dimensions of 4.9 x 3.0 m. The additional wet well was constructed beside the original one and is about 1.2 m wide. An opening was provided in the common wall to interconnect the two wells. The wells are about 6.6 m deep and the top of wells is at a ground level.

4. A trash screen is installed in front of the sewer inlet. The operators have to enter a confined space to clean the screen manually. This is not a desirable arrangement.

5. The 45 HP submersible pump discharges to the dedicated 400 mm forcemain. The two 30 HP pumps discharge to another 400 mm FM. Both FMs discharge to the sewage lagoon about 1.0 km away.

6. There is a gravity overflow from the wet well directly to the river.

7. There are no flowmeters on the forcemains. The incoming and pumped flowrates could be calculated based on the sewage levels rate of drop (or increase) over time.

8. A standby 125 kW Diesel Generator is installed on site. It has an Automatic Transfer Switch and is capable of supplying power to all pumps and other equipment. The Generator is about 16 years old.

Reference: Cockburn PS in Perth – Capacity Review Memo

9. The electrical and control equipment is housed in a Control Building that was installed years after the initial construction.

10. Pumps have soft starts, housed in the Control Building.

11. Alarms are communicated to the operator's cell phones. The alarms include power failure, Generator On, and high-level alarms.

12. At the time of inspection (early afternoon, June 14, 2021) the sewage level in the wet well was going up by 0.6 m in about 3 minutes, triggering the pumping cycle. It took about 2 min of pumping by Pump 1 or 2 and about 1 min of pumping by pump #3 to lower the sewage level by 0.6 m. This indicates that the incoming flow was around 50 L/s and pumping rate was about 130 L/s (for Pumps 1 and 2) and about 210 L/s for pump #3. These are approximate numbers and should be verified by more precise and longer-term measurements.

The facility operator provided the following comments:

1. Generally the PS operates well. Only one time (spring 2019) all three pumps had to operate at once to keep up with an incoming flow. Since then, a larger submersible pump was added (45HP). The diesel generator operates well.

2. Some concrete deficiencies and rusty access hatches were noticed and should be considered for replacement.

3. The two forcemains operate well.

4. There is no bypass chamber that would allow bypassing the wet well if needed for repairs or new construction. Pumper trucks are used to handle the flow in situations like this.

5. The sanitary system in the Town is in reality a combined system as there are numerous storm connections to the sanitary pipes.

6. The existing sewage treatment lagoon where forcemains discharge to was recently expanded and there should be no capacity problem.

Discussion

The Certificate of Approval was not available at the time of the site visit to confirm the firm rated capacity of the pumping station and other information. We requested the information from the Town and we will review as soon as the information becomes available.

1. Pump #3 is much larger than pumps #1 and #2. The firm capacity of the pumping station is calculated based on the largest pump being out of service. In this case, the flowrate generated by Pumps #1 and #2 pumping at the same time through a common forcemain would be the "firm capacity" of the station. Two smaller pumps pumping at the same time through a common forcemain would have a flowrate similar to one larger pump pumping through an independent forcemain (the same diameter). Therefore, the replacement of two old pumps #1 and #2 with two new identical 45 HP pumps would essentially

double the firm capacity of the pumping station. The two forcemains should be interconnected near the PS to allow using two pumps with two FMs at the same time to maximize the flowrate.

2. The wet well currently fills up too quickly because the active storage band is very narrow (0.60 m approx.), causing the pumps to start too often (every 3 minutes). Expansion of the wet well could be considered to provide more storage and to extend the time between pumping cycles to at least 5 minutes (preferably 10 minutes).

3. With the present configuration of the suction at the two existing dry well pumps, the stop command for the lead pump is at 127.40 m (the wet well bottom is at elev. 125.95), as per the available drawings. If these two pumps were replaced with submersible pumps, the suction configuration would change and the stop command could be lowered by 0.50 – 0.60m. This would provide 80% to 100% more active storage in the wet well and require less frequent pump cycles. This may be just enough to resolve the issue of too frequent pump starts.

4. The arrangement for cleaning the existing trash screens requires confined space entry by the operator, which is very inconvenient and unsafe. A new arrangement would be recommended (removable trash basket with opening right above to allow removal by working on the surface).

5. An isolation valve on the incoming sewer (inside the wet well) should be installed to eliminate the need for inflatable balloons to be used each time the wet well must be isolated.

6. A permanent Bypass Chamber should be considered to allow any works inside the wet well to be done without an extensive mobilization of pumper trucks.

7. Electrical review would be needed to confirm if the existing 125 kW generator would be sufficient to support three 45 HP pumps and other essential equipment. The same applies to the evaluation of the Hydro power service. If insufficient, an upgrade/replacement would be required to accommodate larger pumps.

8. Replacement of the existing Control Building with a larger, sturdier one, should be considered. There is sufficient area on the site to accommodate this.

9. Improving the alarm communication system could be considered. However, the existing cell phone alarm system appears to be satisfactory.

Conclusion

The proposed new development by Caivan is expected to generate about 31.5 L/s of additional flow (at peak). The existing Cockburn PS is performing well, however it is operating close to it's maximum was operating capacity. When the largest pump is out of service the pumping station may not be able to handle the peak flow during rainy days or the spring conditions and could overflow. The additional 31.5 L/s coming from the new development would make the situation worse.

The pumping station could significantly increase its capacity by:

1. Replacing the existing 30 HP dry well pumps with two new 45 HP submersible pumps, the same as the existing Pump #3.

Reference: **Cockburn PS in Perth – Capacity Review Memo**

2. Interconnecting the two 400 mm forcemain to allow pumping through both of the forcemains at the same time under all pumping configurations.

Additional improvements could be done as discussed in the Discussion section of this Memo.

Please contact us if you have any questions or comments.

Sincerely,

Stantec Consulting Ltd.

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Senior Associate, Water

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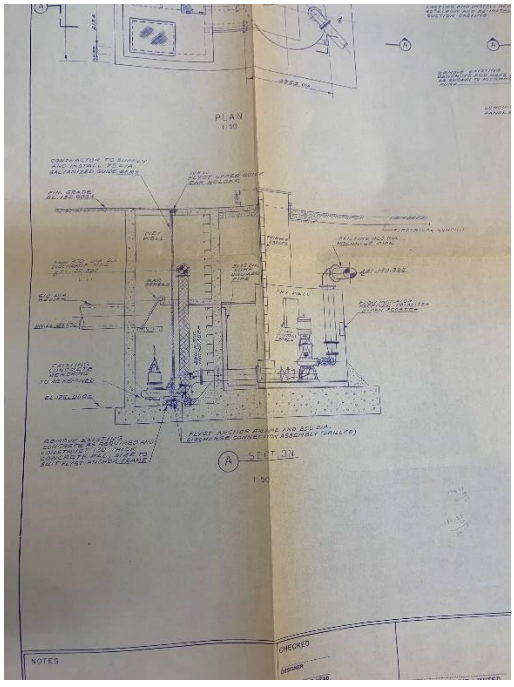
Attachement:

1. Pictures

Reference: **Cockburn PS in Perth – Capacity Review Memo**

Pictures

Reference: **Cockburn PS in Perth – Capacity Review Memo**



SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Caivan**
LOCATION: **Existing Town of Perth**
FILE REF: **19-1092A7**
DATE: **15-Jun-21**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.33	L/s/ha
Avg. Daily Flow Comm.	28,000	L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	28,000	L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust.	35,000	L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013	
Ex. Population Per Hectare*	69	Pop/Ha	Peak Fact. Indust. per MOE graph				

*Based on an average from Areas 2, 12 and 10.

Location				Residential Area and Population					Commercial		Institutional		Industrial		Infiltration				Pipe Data										
Area ID	Up	Down	Area	Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I}	Total Area	Accu. Area	Infiltration Flow	Total Flow	DIA	Upstream Invert	Downstream Invert	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
Rogers Road	21	22			0.00	0	3.80	0.00		0.00	2.14	2.14	56.34	56.34	46.3	58.480	58.480	19.298	65.64	525	136.59	136.37	91.1	0.24	0.216	0.131	0.98	211.4	0.31	145.7
Rogers Road	22	23			0.00	0	3.80	0.00		0.00		2.14		56.34	46.3	0.000	58.480	19.298	65.64	525	136.35	136.21	103.0	0.14	0.216	0.131	0.73	158.5	0.41	92.9
Rogers Road	23	24			0.00	0	3.80	0.00		0.00		2.14		56.34	46.3	0.000	58.480	19.298	65.64	525	136.20	136.02	99.1	0.18	0.216	0.131	0.85	183.3	0.36	117.6
Rogers Road	24	25			0.00	0	3.80	0.00		0.00		2.14	9.80	66.14	54.3	9.800	68.280	22.532	76.81	525	135.98	135.63	91.5	0.38	0.216	0.131	1.23	266.0	0.29	189.2
Rogers Road	25	26			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.52	135.39	79.8	0.16	0.283	0.150	0.88	247.9	0.31	171.1
Rogers Road	26	27			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.37	135.24	72.4	0.18	0.283	0.150	0.92	260.2	0.30	183.4
Rogers Road	27	28			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.23	135.13	83.0	0.12	0.283	0.150	0.75	213.1	0.36	136.3
Rogers Road	28	29			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	135.10	134.93	72.9	0.23	0.283	0.150	1.05	296.4	0.26	219.6
Rogers Road	29	30			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.92	134.63	124.0	0.23	0.283	0.150	1.05	297.0	0.26	220.2
Rogers Road	30	31			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.59	134.03	145.9	0.38	0.283	0.150	1.35	380.4	0.20	303.6
Rogers Road	31	32			0.00	0	3.80	0.00		0.00		2.14		66.14	54.3	0.000	68.280	22.532	76.81	600	134.02	133.81	117.0	0.18	0.283	0.150	0.92	260.2	0.30	183.3

Perth Water Treatment Plant

	2021	2020	2019	2018	2017	2016	2015
JAN.	2491	2762	2972	2982	2,381	2,502	2,872
FEB.	2670	2750	3036	2890	2,454	2,571	3,290
MARCH	2630	2704	3047	2961	2,491	2,455	3,298
APRIL	2409	2555	3038	2983	2,586	2,471	3,157
MAY	3030	2938	3049	3363	2,495	2,931	3,392
JUNE	3154	3347	3062	3268	2,836	2,996	3,002
JULY	2993	3635	3469	3602	2,796	2,954	3,048
AUG.	3498	3223	3228	3269	2,837	3,024	3,015
SEPT.	2890	2981	2902	2947	2,886	2,694	2,979
OCT.	2774	2805	2912	2982	2,830	2,603	2,998
NOV.	2486	2513	2707	2840	2,568	2,372	2,852
DEC.	2417	2534	2711	2776	2,681	2,300	2,784
MAXIMUM	**3,498**	**3,635**	**3,469**	**3,602**	**2,886**	**3,024**	**3,392**
MINIMUM	**2,409**	**2,513**	**2,707**	**2,776**	**2,381**	**2,300**	**2,784**
AVERAGE	**2,787**	**2,896**	**3,011**	**3,072**	**2,654**	**2,656**	**3,057**

4.2 Appendix Table 2 – Historical Average Daily Treated Water Flow (m^3)

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 41.100 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **13.56 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4	640	2176
Semi-detached and duplex	2.7	299	808
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop **2984**

Average Domestic Flow **9.67 L/s**

Peaking Factor **2.96**

Peak Domestic Flow **28.58 L/s**

Total Estimated Average Dry Weather Flow Rate	**9.67 L/s**
Total Estimated Peak Dry Weather Flow Rate	**28.58 L/s**
Total Estimated Peak Wet Weather Flow Rate	**42.14 L/s**

Residential	200	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.033	L/s/ha

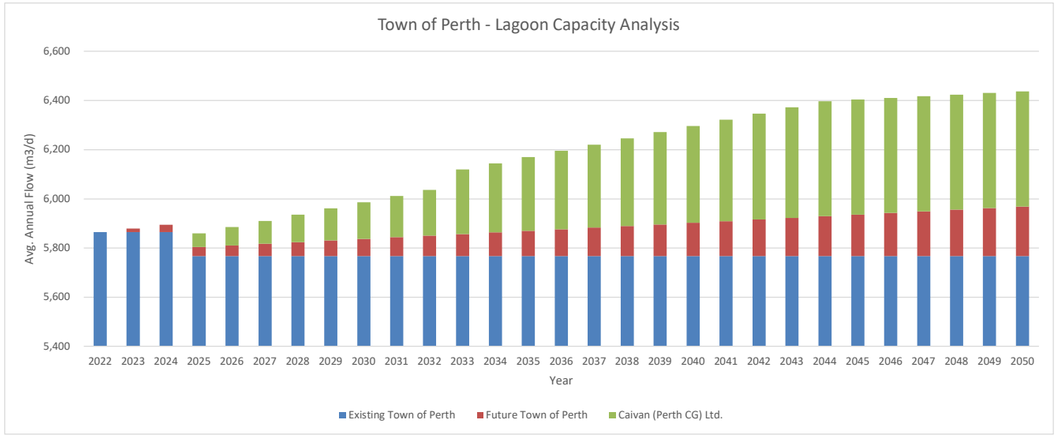
Unit Occ	2.20	p/unit
Residential	200	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.054	L/s/ha
New units to 2024	34	
New units beyond 2024	15	

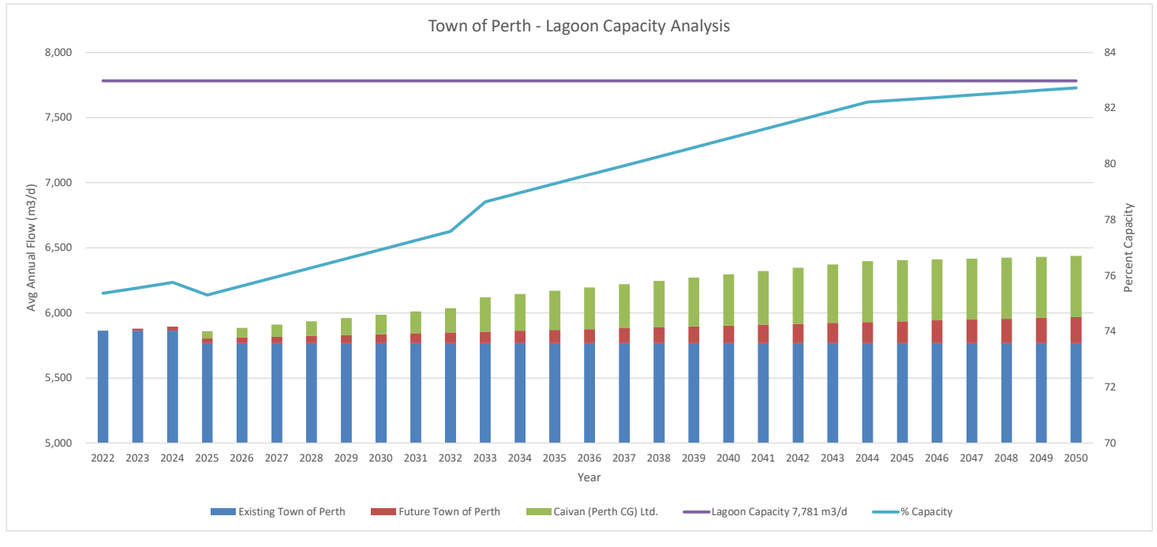
Unit Occ	2.20	p/unit
Residential	170	L/p/d
Commercial	17,000	L/d/ha
Institutional	17,000	L/d/ha
Industrial	10,000	L/d/ha
I&I	0.025	L/s/ha

	Existing Town of Perth									Future Town of Perth									Caivan (Perth CG) Ltd.									Total					Lagoon Capacity 7,781 m^3/d	
Year	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Area	Units	Pop	Commercial	Institutional	Industrial	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Units	Pop	$Q_{I\&I}$	Q_{dry}	Q_{wet}	Qcap	% Capacity
	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)	(ha)		(-)	(ha)	(ha)	(ha)	(m^3/d)	(m^3/d)	(m^3/d)			(m^3/d)	(m^3/d)	(m^3/d)	(m^3/d)	
2022	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864							-	-	-							-	-	-	3,270	6,469	1,564	4,300	5,864	7,781	75
2023	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864		34	75				-	15	15							-	-	-	3,304	6,544	1,564	4,315	5,879	7,781	76
2024	548.67	3,270	6469	111.44		111.18	1,564	4,300	5,864		68	150				-	30	30							-	-	-	3,338	6,619	1,564	4,330	5,894	7,781	76
2025	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		83	183				-	37	37	17.118	50	110				37	19	56	3,403	6,762	1,504	4,355	5,860	7,781	75
2026	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		98	216				-	43	43	17.118	100	220				37	37	74	3,468	6,905	1,504	4,381	5,885	7,781	76
2027	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		113	249				-	50	50	17.118	150	330				37	56	93	3,533	7,048	1,504	4,406	5,910	7,781	76
2028	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		128	282				-	56	56	17.118	200	440				37	75	112	3,598	7,191	1,504	4,431	5,935	7,781	76
2029	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		143	315				-	63	63	17.118	250	550				37	94	130	3,663	7,334	1,504	4,457	5,961	7,781	77
2030	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		158	348				-	70	70	17.118	300	660				37	112	149	3,728	7,477	1,504	4,482	5,986	7,781	77
2031	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		173	381				-	76	76	17.118	350	770				37	131	168	3,793	7,620	1,504	4,507	6,011	7,781	77
2032	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		188	414				-	83	83	17.118	400	880				37	150	187	3,858	7,763	1,504	4,532	6,037	7,781	78
2033	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		203	447				-	89	89	43.648	450	990				94	168	263	3,923	7,906	1,561	4,558	6,119	7,781	79
2034	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		218	480				-	96	96	43.648	500	1100				94	187	281	3,988	8,049	1,561	4,583	6,145	7,781	79
2035	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		233	513				-	103	103	43.648	550	1210				94	206	300	4,053	8,192	1,561	4,608	6,170	7,781	79
2036	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		248	546				-	109	109	43.648	600	1320				94	224	319	4,118	8,335	1,561	4,634	6,195	7,781	80
2037	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		263	579				-	116	116	43.648	650	1430				94	243	337	4,183	8,478	1,561	4,659	6,220	7,781	80
2038	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		278	612				-	122	122	43.648	700	1540				94	262	356	4,248	8,621	1,561	4,684	6,246	7,781	80
2039	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		293	645				-	129	129	43.648	750	1650				94	281	375	4,313	8,764	1,561	4,710	6,271	7,781	81
2040	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		308	678				-	136	136	43.648	800	1760				94	299	393	4,378	8,907	1,561	4,735	6,296	7,781	81
2041	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		323	711				-	142	142	43.648	850	1870				94	318	412	4,443	9,050	1,561	4,760	6,322	7,781	81
2042	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		338	744				-	149	149	43.648	900	1980				94	337	431	4,508	9,193	1,561	4,785	6,347	7,781	82
2043	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		353	777				-	155	155	43.648	950	2090				94	355	450	4,573	9,336	1,561	4,811	6,372	7,781	82
2044	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		368	810				-	162	162	43.648	1000	2200				94	374	468	4,638	9,479	1,561	4,836	6,398	7,781	82
2045	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		383	843				-	169	169	43.648	1000	2200				94	374	468	4,653	9,512	1,561	4,843	6,404	7,781	82
2046	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		398	876				-	175	175	43.648	1000	2200				94	374	468	4,668	9,545	1,561	4,849	6,411	7,781	82
2047	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		413	909				-	182	182	43.648	1000	2200				94	374	468	4,683	9,578	1,561	4,856	6,417	7,781	82
2048	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		428	942				-	188	188	43.648	1000	2200				94	374	468	4,698	9,611	1,561	4,862	6,424	7,781	83
2049	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		443	975				-	195	195	43.648	1000	2200				94	374	468	4,713	9,644	1,561	4,869	6,431	7,781	83
2050	514.58	3,270	6469	111.44		111.18	1,467	4,300	5,767		458	1008				-	202	202	43.648	1000	2200				94	374	468	4,728	9,677	1,561	4,876	6,437	7,781	83

Notes:

1. Lagoon Capacity per ECA 7,781m^3/d
2. 2022 population and number of units from 2021 census collected by StatsCAN (https://www12.statcan.gc.ca/census-recensement/2021/dp-pd/prof/details/page.cfm?Lang=E&SearchText=Perth&DGUIDlist=2021A00053509021&GENDERlist=1,2,3&STATISTIClist=1&HEADERlist=0)
3. 2021 StatsCAN census indicates average unit occupany at 1.9p/unit.
4. Caivan Community annual dry weather I&I per City of Ottawa technical buletin 2018-01.
5. Existing I&I estimated from water use and monitored lagoon flows in 2021.





SANITARY SEWER CALCULATION SHEET

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	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)
CENTRELINE17 CENTRELINE1001																											
Contribution From CENTRELINE1008, Pipe 120A - 122A						0.27	20				0.00		0.00		0.00		0.27	0.27									
Contribution From CENTRELINE1008, Pipe 121A - 122A						0.28	21				0.00		0.00		0.00		0.28	0.55									
	122A	123A	0.62		46	1.17	87	3.6	1.02		0.00		0.00		0.00	0.00	0.62	1.17	0.33	1.35	111.5	200	0.35	19.40	0.07	0.62	0.35
	123A	124A				1.17	87	3.6	1.02		0.00		0.00		0.00	0.00	0.00	1.17	0.33	1.35	8.5	200	0.35	19.40	0.07	0.62	0.35
To CENTRELINE16, Pipe 124A - 125A						1.17	87				0.00		0.00		0.00			1.17									
CENTRELINE1008																											
	105A	106A	0.68		51	0.68	51	3.7	0.60		0.00		0.00		0.00	0.00	0.68	0.68	0.19	0.80	112.5	200	0.65	26.44	0.03	0.84	0.37
To CENTRELINE16, Pipe 106A - 126A						0.68	51				0.00		0.00		0.00			0.68									
	120A	122A	0.27		20	0.27	20	3.7	0.24		0.00		0.00		0.00	0.00	0.27	0.27	0.08	0.32	51.0	200	0.65	26.44	0.01	0.84	0.28
To CENTRELINE17 CENTRELINE1001, Pipe 122A - 123A						0.27	20				0.00		0.00		0.00			0.27									
	121A	122A	0.28		21	0.28	21	3.7	0.25		0.00		0.00		0.00	0.00	0.28	0.28	0.08	0.33	50.5	200	0.65	26.44	0.01	0.84	0.28
To CENTRELINE17 CENTRELINE1001, Pipe 122A - 123A						0.28	21				0.00		0.00		0.00			0.28									
	117A	118A	0.69		52	0.69	52	3.6	0.61		0.00		0.00		0.00	0.00	0.69	0.69	0.20	0.81	113.5	200	0.65	26.44	0.03	0.84	0.38
	118A	119A				0.69	52	3.6	0.61		0.00		0.00		0.00	0.00	0.00	0.69	0.20	0.81	8.5	200	0.35	19.40	0.04	0.62	0.30
To CENTRELINE16, Pipe 119A - 124A						0.69	52				0.00		0.00		0.00			0.69									
CENTRELINE07																											
	48A	49A	0.21		16	0.21	16	3.7	0.19		0.00		0.00		0.00	0.00	0.21	0.21	0.06	0.25	49.5	200	0.65	26.44	0.01	0.84	0.26
Contribution From CENTRELINE06, Pipe 47A - 49A						1.25	119				0.00		0.00		0.00		1.25	1.46									
	49A	50A	0.22		17	1.68	152	3.6	1.75		0.00		0.00		0.00	0.00	0.22	1.68	0.48	2.23	51.0	200	0.35	19.40	0.11	0.62	0.41
	50A	51A	0.09		7	1.77	159	3.5	1.83		0.00		0.00		0.00	0.00	0.09	1.77	0.51	2.33	11.0	200	0.35	19.40	0.12	0.62	0.41
	51A	52A	0.78		58	2.55	217	3.5	2.47		0.00		0.00		0.00	0.00	0.78	2.55	0.73	3.20	122.5	200	0.35	19.40	0.16	0.62	0.45
	52A	53A	0.49		37	3.04	254	3.5	2.87		0.00		0.00		0.00	0.00	0.49	3.04	0.87	3.74	86.5	200	0.35	19.40	0.19	0.62	0.47
	53A	54A	0.56		42	3.60	296	3.5	3.32		0.00		0.00		0.00	0.00	0.56	3.60	1.03	4.35	93.0	200	0.35	19.40	0.22	0.62	0.50
	54A	55A	0.49		37	4.09	333	3.4	3.72		0.00		0.00		0.00	0.00	0.49	4.09	1.17	4.89	89.5	200	0.35	19.40	0.25	0.62	0.51
To CENTRELINE1006, Pipe 55A - 102A						4.09	333				0.00		0.00		0.00			4.09									
CENTRELINE06																											
	42A	43A	0.64		61	0.64	61	3.6	0.72		0.00		0.00		0.00	0.00	0.64	0.64	0.18	0.90	105.0	200	0.65	26.44	0.03	0.84	0.39
	43A	44A	0.61		58	1.25	119	3.6	1.38		0.00		0.00		0.00	0.00	0.61	1.25	0.36	1.74	116.5	200	0.35	19.40	0.09	0.62	0.38
To CENTRELINE1006, Pipe 44A - 55A						1.25	119				0.00		0.00		0.00			1.25									
	45A	46A	0.35		33	0.35	33	3.7	0.39		0.00		0.00		0.00	0.00	0.35	0.35	0.10	0.49	61.0	200	0.65	26.44	0.02	0.84	0.32
	46A	47A	0.07		7	0.42	40	3.7	0.48		0.00		0.00		0.00	0.00	0.07	0.42	0.12	0.60	10.0	200	0.35	19.40	0.03	0.62	0.28
	47A	49A	0.83		79	1.25	119	3.6	1.38		0.00		0.00		0.00	0.00	0.83	1.25	0.36	1.74	149.5	200	0.35	19.40	0.09	0.62	0.38
To CENTRELINE07, Pipe 49A - 50A						1.25	119				0.00		0.00		0.00			1.25									
CENTRELINE09																											
	33A	34A	0.63		47	0.63	47	3.7	0.56		0.00		0.00		0.00	0.00	0.63	0.63	0.18	0.74	100.0	200	0.65	26.44	0.03	0.84	0.36
	34A	35A				0.63	47	3.7	0.56		0.00		0.00		0.00	0.00	0.00	0.63	0.18	0.74	10.5	200	0.35	19.40	0.04	0.62	0.29
To CENTRELINE08, Pipe 35A - 36A						0.63	47				0.00		0.00		0.00			0.63									

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 =	0.286	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 =	1.00				Townhouse coeff=	2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4		

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No 1 of 6

SANITARY SEWER CALCULATION SHEET

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	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)
CENTRELINE08																											
	29A	30A	0.59		44	0.59	44	3.7	0.52		0.00		0.00		0.00	0.00	0.59	0.59	0.17	0.69	93.0	200	0.65	26.44	0.03	0.84	0.36
	30A	31A	0.09		7	0.68	51	3.7	0.60		0.00		0.00		0.00	0.00	0.09	0.68	0.19	0.80	11.0	200	0.35	19.40	0.04	0.62	0.30
	31A	32A	0.07		6	0.75	57	3.6	0.67		0.00		0.00		0.00	0.00	0.07	0.75	0.21	0.89	17.0	200	0.35	19.40	0.05	0.62	0.31
	32A	35A	0.11		9	0.86	66	3.6	0.78		0.00		0.00		0.00	0.00	0.11	0.86	0.25	1.02	32.5	200	0.35	19.40	0.05	0.62	0.33
Contribution From CENTRELINE09, Pipe 34A - 35A						0.63	47				0.00		0.00		0.00		0.63	1.49									
	35A	36A	0.15		12	1.64	125	3.6	1.45		0.00		0.00		0.00	0.00	0.15	1.64	0.47	1.92	31.5	200	0.35	19.40	0.10	0.62	0.39
	36A	37A	0.07		6	1.71	131	3.6	1.51		0.00		0.00		0.00	0.00	0.07	1.71	0.49	2.00	8.0	200	0.35	19.40	0.10	0.62	0.40
	37A	38A	0.19		14	1.90	145	3.6	1.67		0.00		0.00		0.00	0.00	0.19	1.90	0.54	2.21	37.0	200	0.35	19.40	0.11	0.62	0.41
	38A	39A	0.56		42	2.46	187	3.5	2.14		0.00		0.00		0.00	0.00	0.56	2.46	0.70	2.84	99.5	200	0.35	19.40	0.15	0.62	0.44
To CENTRELINE1006, Pipe 39A - 40A						2.46	187				0.00		0.00		0.00			2.46									
CENTRELINE12																											
	18A	19A	0.42		40	0.42	40	3.7	0.48		0.00		0.00		0.00	0.00	0.42	0.42	0.12	0.60	80.5	200	0.65	26.44	0.02	0.84	0.34
To CENTRELINE11, Pipe 19A - 20A						0.42	40				0.00		0.00		0.00			0.42									
CENTRELINE13																											
	16A	17A	0.60		57	0.60	57	3.6	0.67		0.00		0.00		0.00	0.00	0.60	0.60	0.17	0.84	109.5	200	0.65	26.44	0.03	0.84	0.38
To CENTRELINE11, Pipe 17A - 19A						0.60	57				0.00		0.00		0.00			0.60									
CENTRELINE14																											
	14A	15A	0.55		52	0.55	52	3.6	0.61		0.00		0.00		0.00	0.00	0.55	0.55	0.16	0.77	98.0	200	0.65	26.44	0.03	0.84	0.37
To CENTRELINE11, Pipe 15A - 17A						0.55	52				0.00		0.00		0.00			0.55									
CENTRELINE15																											
	11A	13A	0.48		36	0.48	36	3.7	0.43		0.00		0.00		0.00	0.00	0.48	0.48	0.14	0.57	86.5	200	0.65	26.44	0.02	0.84	0.34
To CENTRELINE11, Pipe 13A - 15A						0.48	36				0.00		0.00		0.00			0.48									
	12A	13A	0.15		12	0.15	12	3.7	0.14		0.00		0.00		0.00	0.00	0.15	0.15	0.04	0.19	29.0	200	1.40	38.81	0.00	1.24	0.32
To CENTRELINE11, Pipe 13A - 15A						0.15	12				0.00		0.00		0.00			0.15									
	107A	108A	0.14		11	0.14	11	3.7	0.13		0.00		0.00		0.00	0.00	0.14	0.14	0.04	0.17	22.5	200	1.40	38.81	0.00	1.24	0.30
	108A	109A	0.06		0	0.20	11	3.7	0.13		0.00		0.00		0.00	0.00	0.06	0.20	0.06	0.19	11.0	200	0.35	19.40	0.01	0.62	0.19
	109A	111A	0.17		13	0.37	24	3.7	0.29		0.00		0.00		0.00	0.00	0.17	0.37	0.11	0.39	51.5	200	0.35	19.40	0.02	0.62	0.24
To CENTRELINE16, Pipe 111A - 112A						0.37	24				0.00		0.00		0.00			0.37									
CENTRELINE11																											
Contribution From CENTRELINE16, Pipe 2A - 10A						0.79	60				0.00		0.00		0.00		0.79	0.79									
Contribution From CENTRELINE16, Pipe 9A - 10A						0.21	16				0.00		0.00		0.00		0.21	1.00									
	10A	13A	0.09		0	1.09	76	3.6	0.89		0.00		0.00		0.00	0.00	0.09	1.09	0.31	1.20	59.5	250	0.25	29.73	0.04	0.61	0.29
Contribution From CENTRELINE15, Pipe 11A - 13A						0.48	36				0.00		0.00		0.00		0.48	1.57									
Contribution From CENTRELINE15, Pipe 12A - 13A						0.15	12				0.00		0.00		0.00		0.15	1.72									
	13A	15A	0.15		12	1.87	136	3.6	1.57		0.00		0.00		0.00	0.00	0.15	1.87	0.53	2.11	59.5	250	0.25	29.73	0.07	0.61	0.35
Contribution From CENTRELINE14, Pipe 14A - 15A						0.55	52				0.00		0.00		0.00		0.55	2.42									
	15A	17A	0.24		18	2.66	206	3.5	2.35		0.00		0.00		0.00	0.00	0.24	2.66	0.76	3.11	59.5	250	0.25	29.73	0.10	0.61	0.39
Contribution From CENTRELINE13, Pipe 16A - 17A						0.60	57				0.00		0.00		0.00		0.60	3.26									
	17A	19A	0.23		18	3.49	281	3.5	3.16		0.00		0.00		0.00	0.00	0.23	3.49	1.00	4.16	59.0	250	0.25	29.73	0.14	0.61	0.42

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 =	0.286	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 =	1.00				Townhouse coeff=	2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4		

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No. 2 of 6

SANITARY SEWER CALCULATION SHEET

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	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)
Contribution From CENTRELINE12, Pipe 18A - 19A						0.42	40				0.00		0.00		0.00		0.42	3.91									
	19A	20A	0.31		23	4.22	344	3.4	3.84		0.00		0.00		0.00	0.00	0.31	4.22	1.21	5.04	85.5	250	0.25	29.73	0.17	0.61	0.45
	20A	21A	0.12		9	4.34	353	3.4	3.93		0.00		0.00		0.00	0.00	0.12	4.34	1.24	5.17	7.5	250	0.25	29.73	0.17	0.61	0.45
	21A	22A	0.06		5	4.40	358	3.4	3.99		0.00		0.00		0.00	0.00	0.06	4.40	1.26	5.24	25.0	250	0.25	29.73	0.18	0.61	0.45
To CENTRELINE1006, Pipe 22A - 23A						4.40	358				0.00		0.00		0.00			4.40									
CENTRELINE1006																											
Contribution From CENTRELINE11, Pipe 21A - 22A						4.40	358				0.00		0.00		0.00		4.40	4.40									
Contribution From CENTRELINE16, Pipe 8A - 22A						1.25	95				0.00		0.00		0.20		1.45	5.85									
	22A	23A	0.15		12	5.80	465	3.4	5.11		0.00		0.00		0.20	0.02	0.15	6.00	1.72	6.85	60.5	250	0.25	29.73	0.23	0.61	0.49
	23A	24A	0.65		49	6.45	514	3.4	5.62		0.00		0.00		0.20	0.02	0.65	6.65	1.90	7.54	123.5	250	0.25	29.73	0.25	0.61	0.50
	24A	25A	0.20		15	6.65	529	3.4	5.78		0.00		0.00		0.20	0.02	0.20	6.85	1.96	7.76	50.5	250	0.25	29.73	0.26	0.61	0.51
	25A	26A	0.02		0	6.67	529	3.4	5.78		0.00		0.00		0.20	0.02	0.02	6.87	1.96	7.76	11.0	250	0.25	29.73	0.26	0.61	0.51
	26A	27A	0.24		18	6.91	547	3.4	5.96		0.00		0.00		0.20	0.02	0.24	7.11	2.03	8.02	62.0	250	0.25	29.73	0.27	0.61	0.51
	27A	28A	0.20		15	7.11	562	3.4	6.12		0.00		0.00		0.20	0.02	0.20	7.31	2.09	8.23	59.0	250	0.25	29.73	0.28	0.61	0.51
	28A	39A	0.24		18	7.35	580	3.4	6.30		0.00		0.00		0.20	0.02	0.24	7.55	2.16	8.48	59.0	250	0.25	29.73	0.29	0.61	0.52
Contribution From CENTRELINE08, Pipe 38A - 39A						2.46	187				0.00		0.00		0.00		2.46	10.01									
	39A	40A	0.72		54	10.53	821	3.3	8.73		0.00		0.00		0.20	0.02	0.72	10.73	3.07	11.82	125.5	300	0.20	43.25	0.27	0.61	0.52
	40A	41A	0.17		13	10.70	834	3.3	8.86		0.00		0.00		0.20	0.02	0.17	10.90	3.12	12.00	11.0	300	0.20	43.25	0.28	0.61	0.52
	41A	44A	0.19		18	10.89	852	3.3	9.04		0.00		0.00		0.20	0.02	0.19	11.09	3.17	12.24	52.0	300	0.20	43.25	0.28	0.61	0.52
Contribution From CENTRELINE06, Pipe 43A - 44A						1.25	119				0.00		0.00		0.00		1.25	12.34									
	44A	55A	0.24		23	12.38	994	3.2	10.44		0.00		0.00		0.20	0.02	0.24	12.58	3.60	14.06	59.0	300	0.20	43.25	0.33	0.61	0.55
Contribution From CENTRELINE07, Pipe 54A - 55A						4.09	333				0.00		0.00		0.00		4.09	16.67									
	55A	102A	0.20		19	16.67	1346	3.2	13.83		0.00		0.00		0.20	0.02	0.20	16.87	4.82	18.68	62.0	300	0.20	43.25	0.43	0.61	0.59
To CENTRELINE16, Pipe 102A - 103A						16.67	1346				0.00		0.00		0.20			16.87									
CENTRELINE04																											
	95A	96A	0.57		54	0.57	54	3.6	0.64		0.00		0.00		0.00	0.00	0.57	0.57	0.16	0.80	83.0	200	0.65	26.44	0.03	0.84	0.37
	96A	97A	0.68		64	1.25	118	3.6	1.37		0.00		0.00		0.00	0.00	0.68	1.25	0.36	1.73	113.5	250	0.25	29.73	0.06	0.61	0.33
	97A	98A	0.63		60	1.88	178	3.5	2.04		0.00		0.00		0.00	0.00	0.63	1.88	0.54	2.58	104.0	250	0.25	29.73	0.09	0.61	0.37
	98A	99A	0.48		46	2.36	224	3.5	2.54		0.00		0.00		0.00	0.00	0.48	2.36	0.67	3.22	79.5	250	0.25	29.73	0.11	0.61	0.39
	99A	100A	0.41		39	2.77	263	3.5	2.97		0.00		0.00		0.00	0.00	0.41	2.77	0.79	3.76	76.0	250	0.25	29.73	0.13	0.61	0.41
To CENTRELINE05, Pipe 100A - 101A						2.77	263				0.00		0.00		0.00			2.77									
CENTRELINE05																											
	81A	82A	0.24		23	0.24	23	3.7	0.28		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.34	54.0	200	0.65	26.44	0.01	0.84	0.29
To CENTRELINE03, Pipe 82A - 83A						0.24	23				0.00		0.00		0.00			0.24									
	94A	100A	0.24		23	0.24	23	3.7	0.28		0.00		0.00		0.00	0.00	0.24	0.24	0.07	0.34	60.5	200	2.35	50.28	0.01	1.60	0.44
Contribution From CENTRELINE04, Pipe 99A - 100A						2.77	263				0.00		0.00		0.00		2.77	3.01									
	100A	101A	0.20		19	3.21	305	3.5	3.42		0.00		0.00		0.00	0.00	0.20	3.21	0.92	4.34	62.5	300	0.20	43.25	0.10	0.61	0.39
To CENTRELINE16, Pipe 101A - 102A						3.21	305				0.00		0.00		0.00			3.21									
	74A	75A	0.17		13	0.17	13	3.7	0.16		0.00		0.00		0.00	0.00	0.17	0.17	0.05	0.21	38.0	200	0.65	26.44	0.01	0.84	0.24
	75A	76A	0.12		9	0.29	22	3.7	0.26		0.00		0.00		0.00	0.00	0.12	0.29	0.08	0.35	11.0	200	0.35	19.40	0.02	0.62	0.23
	76A	77A	0.42		32	0.71	54	3.6	0.64		0.00		0.00		0.00	0.00	0.42	0.71	0.20	0.84	73.0	200	0.35	19.40	0.04	0.62	0.31
	77A	78A	0.38		29	1.09	83	3.6	0.97		0.00		0.00		0.00	0.00	0.38	1.09	0.31	1.28	67.5	200	0.35	19.40	0.07	0.62	0.34
	78A	79A	0.31		23	1.40	106	3.6	1.23		0.00		0.00		0.00	0.00	0.31	1.40	0.40	1.63	55.5	200	0.35	19.40	0.08	0.62	0.37

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 =	0.286	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 =	1.00				Townhouse coeff=	2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4	

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No. 3 of 6

SANITARY SEWER CALCULATION SHEET

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	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)
	79A	80A	0.16		12	1.56	118	3.6	1.37		0.00		0.00		0.00	0.00	0.16	1.56	0.45	1.81	11.0	200	0.35	19.40	0.09	0.62	0.39
	80A	85A	0.16		12	1.72	130	3.6	1.50		0.00		0.00		0.00	0.00	0.16	1.72	0.49	2.00	52.0	200	0.35	19.40	0.10	0.62	0.40
To CENTRELINE03, Pipe 85A - 86A						1.72	130				0.00		0.00		0.00			1.72									
CENTRELINE03																											
Contribution From CENTRELINE05, Pipe 81A - 82A						0.24	23				0.00		0.00		0.00		0.24	0.24									
	82A	83A	0.40		30	0.64	53	3.6	0.63		0.00		0.00		0.00	0.00	0.40	0.64	0.18	0.81	73.5	200	0.35	19.40	0.04	0.62	0.30
	83A	84A	0.47		35	1.11	88	3.6	1.03		0.00		0.00		0.00	0.00	0.47	1.11	0.32	1.35	77.0	200	0.35	19.40	0.07	0.62	0.35
	84A	85A	0.37		28	1.48	116	3.6	1.35		0.00		0.00		0.00	0.00	0.37	1.48	0.42	1.77	66.0	200	0.35	19.40	0.09	0.62	0.38
Contribution From CENTRELINE05, Pipe 80A - 85A						1.72	130				0.00		0.00		0.00		1.72	3.20									
	85A	86A	0.59		44	3.79	290	3.5	3.26		0.00		0.00		0.00	0.00	0.59	3.79	1.08	4.34	109.5	250	0.25	29.73	0.15	0.61	0.43
	86A	87A	0.13		10	3.92	300	3.5	3.37		0.00		0.00		0.00	0.00	0.13	3.92	1.12	4.49	13.0	250	0.25	29.73	0.15	0.61	0.43
	87A	90A	0.21		16	4.13	316	3.5	3.54		0.00		0.00		0.00	0.00	0.21	4.13	1.18	4.72	53.0	250	0.25	29.73	0.16	0.61	0.44
To CENTRELINE02, Pipe 90A - 89A						4.13	316				0.00		0.00		0.00			4.13									
CENTRELINE02																											
	129A	93A	0.39		29	0.39	29	3.7	0.35		0.00		0.00		0.00	0.00	0.39	0.39	0.11	0.46	62.5	200	0.65	26.44	0.02	0.84	0.32
	93A	92A	0.49		37	0.88	66	3.6	0.78		0.00		0.00		0.00	0.00	0.49	0.88	0.25	1.03	79.5	200	0.35	19.40	0.05	0.62	0.33
	92A	91A	0.55		41	1.43	107	3.6	1.24		0.00		0.00		0.00	0.00	0.55	1.43	0.41	1.65	91.0	200	0.35	19.40	0.09	0.62	0.37
	91A	90A	0.56		42	1.99	149	3.6	1.72		0.00		0.00		0.00	0.00	0.56	1.99	0.57	2.29	98.0	200	0.35	19.40	0.12	0.62	0.41
Contribution From CENTRELINE03, Pipe 87A - 90A						4.13	316				0.00		0.00		0.00		4.13	6.12									
	90A	89A	0.29		22	6.41	487	3.4	5.34		0.00		0.00		0.00	0.00	0.29	6.41	1.83	7.17	69.0	250	0.25	29.73	0.24	0.61	0.50
	89A	65A	0.25		19	6.66	506	3.4	5.54		0.00		0.00		0.00	0.00	0.25	6.66	1.90	7.44	76.5	250	0.25	29.73	0.25	0.61	0.50
To CENTRELINE16, Pipe 65A - 66A						6.66	506				0.00		0.00		0.00			6.66									
CENTRELINE01																											
	56A	57A	0.34		26	0.34	26	3.7	0.31		0.00		0.00		0.00	0.00	0.34	0.34	0.10	0.41	57.0	200	3.10	57.75	0.01	1.84	0.50
	57A	58A	0.13		10	0.47	36	3.7	0.43		0.00		0.00		0.00	0.00	0.13	0.47	0.13	0.56	11.0	200	2.50	51.86	0.01	1.65	0.53
	58A	60A	0.20		15	0.67	51	3.7	0.60		0.00		0.00		0.00	0.00	0.20	0.67	0.19	0.79	59.0	250	0.25	29.73	0.03	0.61	0.26
To CENTRELINE16, Pipe 60A - 64A						0.67	51				0.00		0.00		0.00			0.67									
	61A	62A	0.44		33	0.44	33	3.7	0.39		0.00		0.00		0.00	0.00	0.44	0.44	0.13	0.52	60.5	200	0.65	26.44	0.02	0.84	0.33
	62A	63A	0.09		7	0.53	40	3.7	0.48		0.00		0.00		0.00	0.00	0.09	0.53	0.15	0.63	11.0	200	0.35	19.40	0.03	0.62	0.28
	63A	64A	0.22		17	0.75	57	3.6	0.67		0.00		0.00		0.00	0.00	0.22	0.75	0.21	0.89	60.0	200	0.35	19.40	0.05	0.62	0.31
To CENTRELINE16, Pipe 64A - 65A						0.75	57				0.00		0.00		0.00			0.75									
CENTRELINE16																											
	9A	10A	0.21		16	0.21	16	3.7	0.19		0.00		0.00		0.00	0.00	0.21	0.21	0.06	0.25	28.0	200	2.75	54.39	0.00	1.73	0.42
To CENTRELINE11, Pipe 10A - 13A						0.21	16				0.00		0.00		0.00			0.21									
	128A	3A	0.25		19	0.25	19	3.7	0.23		0.00		0.00		0.00	0.00	0.25	0.25	0.07	0.30	50.0	200	0.65	26.44	0.01	0.84	0.27
	3A	2A	0.08		6	0.33	25	3.7	0.30		0.00		0.00		0.00	0.00	0.08	0.33	0.09	0.39	9.5	200	0.35	19.40	0.02	0.62	0.24
	2A	10A	0.46		35	0.79	60	3.6	0.71		0.00		0.00		0.00	0.00	0.46	0.79	0.23	0.93	81.5	200	0.35	19.40	0.05	0.62	0.31
To CENTRELINE11, Pipe 10A - 13A						0.79	60				0.00		0.00		0.00			0.79									
	4A	5A	0.23		18	0.23	18	3.7	0.22		0.00		0.00		0.00	0.00	0.23	0.23	0.07	0.28	55.5	200	0.65	26.44	0.01	0.84	0.27
	5A	6A	0.24		18	0.47	36	3.7	0.43		0.00		0.00		0.00	0.00	0.24	0.47	0.13	0.56	60.5	200	0.35	19.40	0.03	0.62	0.27
	6A	7A	0.10		8	0.57	44	3.7	0.52		0.00		0.00		0.00	0.00	0.10	0.57	0.16	0.68	18.0	200	0.35	19.40	0.04	0.62	0.29

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha
Average Daily Flow =	280	l/p/day		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha
Max Res. Peak Factor =	4.00			
Commercial/Inst./Park Peak Factor =	1.00			
Institutional =	0.32	l/s/Ha		

Industrial Peak Factor = as per MOE Graph

Extraneous Flow =	0.286	L/s/ha		
Minimum Velocity =	0.600	m/s		
Manning's n =	(Conc) 0.013	(Pvc) 0.013		
Townhouse coeff=	2.7			
Single house coeff=	3.4			

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No. 4 of 6

SANITARY SEWER CALCULATION SHEET

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	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)
	7A	8A	0.36		27	0.93	71	3.6	0.83		0.00		0.00		0.00	0.00	0.36	0.93	0.27	1.10	87.0	200	0.35	19.40	0.06	0.62	0.33
	8A	22A	0.32		24	1.25	95	3.6	1.11		0.00		0.00	0.20	0.20	0.02	0.52	1.45	0.41	1.54	85.5	200	0.35	19.40	0.08	0.62	0.37
To CENTRELINE1006, Pipe 22A - 23A						1.25	95				0.00		0.00		0.20			1.45									
	110A	111A	0.17		13	0.17	13	3.7	0.16		0.00		0.00		0.00	0.00	0.17	0.17	0.05	0.21	31.5	200	0.65	26.44	0.01	0.84	0.24
Contribution From CENTRELINE15, Pipe 109A - 111A						0.37	24				0.00		0.00		0.00		0.37	0.54									
	111A	112A	0.36		27	0.90	64	3.6	0.75		0.00		0.00		0.00	0.00	0.36	0.90	0.26	1.01	69.5	200	0.35	19.40	0.05	0.62	0.33
	112A	113A	0.39		29	1.29	93	3.6	1.09		0.00		0.00		0.00	0.00	0.39	1.29	0.37	1.45	69.5	200	0.35	19.40	0.07	0.62	0.36
	113A	114A	0.13		10	1.42	103	3.6	1.20		0.00		0.00		0.00	0.00	0.13	1.42	0.41	1.61	10.5	200	0.35	19.40	0.08	0.62	0.37
	114A	115A	0.23		18	1.65	121	3.6	1.40		0.00		0.00		0.00	0.00	0.23	1.65	0.47	1.87	41.0	200	0.35	19.40	0.10	0.62	0.39
	115A	116A	0.09		0	1.74	121	3.6	1.40		0.00		0.00		0.00	0.00	0.09	1.74	0.50	1.90	51.5	200	1.85	44.61	0.04	1.42	0.70
	116A	119A	0.58		43	2.32	164	3.5	1.88		0.00		0.00		0.00	0.00	0.58	2.32	0.66	2.55	134.0	200	0.35	19.40	0.13	0.62	0.42
Contribution From CENTRELINE1008, Pipe 118A - 119A						0.69	52				0.00		0.00		0.00		0.69	3.01									
	119A	124A	0.15		12	3.16	228	3.5	2.59		0.00		0.00		0.00	0.00	0.15	3.16	0.90	3.49	60.0	200	0.35	19.40	0.18	0.62	0.47
Contribution From CENTRELINE17 CENTRELINE1001, Pipe 123A - 124A						1.17	87				0.00		0.00		0.00		1.17	4.33									
	124A	125A	0.02		0	4.35	315	3.5	3.53		0.00		0.00		0.00	0.00	0.02	4.35	1.24	4.77	13.5	200	0.35	19.40	0.25	0.62	0.51
	125A	126A	0.04		0	4.39	315	3.5	3.53		0.00		0.00		0.00	0.00	0.04	4.39	1.26	4.78	26.5	200	0.35	19.40	0.25	0.62	0.51
To CENTRELINE1008, Pipe 126A - 127A						4.39	315				0.00		0.00		0.00			4.39									
	59A	60A	0.18		0	0.18	0				0.00		0.00		0.00	0.00	0.18	0.18	0.05	0.05	82.0	200	0.65	26.44	0.00	0.84	0.15
Contribution From CENTRELINE01, Pipe 58A - 60A						0.67	51				0.00		0.00		0.00		0.67	0.85									
	60A	64A	0.60		45	1.45	96	3.6	1.12		0.00		0.00		0.00	0.00	0.60	1.45	0.41	1.53	139.0	250	0.25	29.73	0.05	0.61	0.31
Contribution From CENTRELINE01, Pipe 63A - 64A						0.75	57				0.00		0.00		0.00		0.75	2.20									
	64A	65A	0.20		0	2.40	153	3.6	1.76		0.00		0.00	1.11	1.11	0.12	1.31	3.51	1.00	2.88	93.0	250	0.25	29.73	0.10	0.61	0.38
Contribution From CENTRELINE02, Pipe 89A - 65A						6.66	506				0.00		0.00		0.00		6.66	10.17									
	65A	66A	0.09		0	9.15	659	3.3	7.11		0.00		0.00		1.11	0.12	0.09	10.26	2.93	10.16	44.0	250	0.25	29.73	0.34	0.61	0.55
	66A	67A	0.04		0	9.19	659	3.3	7.11		0.00		0.00		1.11	0.12	0.04	10.30	2.95	10.17	19.0	250	0.25	29.73	0.34	0.61	0.55
	67A	68A	0.11		0	9.30	659	3.3	7.11		0.00		0.00		1.11	0.12	0.11	10.41	2.98	10.20	53.5	250	0.25	29.73	0.34	0.61	0.55
	68A	69A	0.05		0	9.35	659	3.3	7.11		0.00		0.00		1.11	0.12	0.05	10.46	2.99	10.22	15.0	250	0.25	29.73	0.34	0.61	0.55
	69A	70A	0.54		40	9.89	699	3.3	7.51		0.00		0.00		1.11	0.12	0.54	11.00	3.15	10.78	84.5	300	0.20	43.25	0.25	0.61	0.51
	70A	71A	0.73		55	10.62	754	3.3	8.07		0.00		0.00		1.11	0.12	0.73	11.73	3.35	11.54	115.5	300	0.20	43.25	0.27	0.61	0.52
	71A	72A	0.69		52	11.31	806	3.3	8.59		0.00		0.00		1.11	0.12	0.69	12.42	3.55	12.26	105.0	300	0.20	43.25	0.28	0.61	0.52
	72A	73A	0.49		37	11.80	843	3.3	8.95		0.00		0.00		1.11	0.12	0.49	12.91	3.69	12.77	81.0	300	0.20	43.25	0.30	0.61	0.53
	73A	101A	0.51		38	12.31	881	3.3	9.33		0.00		0.00		1.11	0.12	0.51	13.42	3.84	13.29	78.0	300	0.20	43.25	0.31	0.61	0.54
Contribution From CENTRELINE05, Pipe 100A - 101A						3.21	305				0.00		0.00		0.00		3.21	16.63									
	101A	102A	0.26		20	15.78	1206	3.2	12.49		0.00		0.00		1.11	0.12	0.26	16.89	4.83	17.44	60.5	300	0.20	43.25	0.40	0.61	0.58
Contribution From CENTRELINE1006, Pipe 55A - 102A						16.67	1346				0.00		0.00		0.20		16.87	33.76									
	102A	103A	0.34		26	32.79	2578	3.0	25.05		0.00		0.00		1.31	0.14	0.34	34.10	9.75	34.94	60.5	300	0.20	43.25	0.81	0.61	0.68
	103A	104A	0.09		7	32.88	2585	3.0	25.11		0.00		0.00		1.31	0.14	0.09	34.19	9.78	35.03	13.0	300	0.20	43.25	0.81	0.61	0.68
	104A	106A	0.31		23	33.19	2608	3.0	25.31		0.00		0.00	0.92	2.23	0.24	1.23	35.42	10.13	35.68	126.5	375	0.15	67.91	0.53	0.61	0.62
Contribution From CENTRELINE1008, Pipe 105A - 106A						0.68	51				0.00		0.00		0.00		0.68	36.10									
	106A	126A	0.02		0	33.89	2659	3.0	25.76		0.00		0.00		2.23	0.24	0.02	36.12	10.33	36.33	17.5	375	0.15	67.91	0.53	0.61	0.62
To CENTRELINE1008, Pipe 126A - 127A						33.89	2659				0.00		0.00		2.23			36.12									
CENTRELINE1008																											
Contribution From CENTRELINE16, Pipe 106A - 126A						33.89	2659				0.00		0.00		2.23		36.12	36.12									
Contribution From CENTRELINE16, Pipe 125A - 126A						4.39	315				0.00		0.00		0.00		4.39	40.51									
	126A	127A	0.06		0	38.34	2974	3.0	28.49		0.00		0.00		2.23	0.24	0.06	40.57	11.60	40.34	11.0	375	0.15	67.91	0.59	0.61	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 =	0.286	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 =	1.00				Townhouse coeff=	2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4	

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No. 5 of 6

SANITARY SEWER CALCULATION SHEET

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	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)

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 =		0.286	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 =	1.00				Townhouse coeff=		2.7		
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4		

Designed: M.S.	PROJECT: **1278 Caivan-Perth**		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref:	Date: **02 Feb 2023**	Sheet No 6 of 6

APPENDIX D

Stormwater Management

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)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
CENTRELINE01																																
	151	13	0.21	0.66	0.39	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	30	300	300	PVC	0.35	56.5	57.2089	0.8093	1.1635	0.517
	13	12	0.13	0.66	0.24	0.62			0.00	0.00			0.00	0.00			0.00	0.00	11.16	72.61	98.42	115.35	168.58	45	300	300	PVC	0.35	13.5	57.2089	0.8093	0.2780	0.792
	12	11	0.39	0.66	0.72	1.34			0.00	0.00			0.00	0.00			0.00	0.00	11.44	71.68	97.15	113.85	166.37	96	450	450	CONC	0.25	65.0	142.5531	0.8963	1.2086	0.673
	11	2	0.37	0.66	0.68	2.02			0.00	0.00			0.00	0.00			0.00	0.00	12.65	67.93	92.01	107.79	157.49	137	450	450	CONC	2.80	61.5	477.0738	2.9997	0.3417	0.287
	2	3	0.13	0.66	0.24	2.26			0.00	0.00			0.00	0.00			0.00	0.00	12.99	66.95	90.66	106.21	155.16	151	450	450	CONC	2.05	13.5	408.2099	2.5667	0.0877	0.370
	3	5	0.20	0.66	0.37	2.62			0.00	0.00			0.00	0.00			0.00	0.00	13.08	66.71	90.32	105.81	154.58	175	675	675	CONC	0.15	63.5	325.5584	0.9098	1.1633	0.538
To CENTRELINE16, Pipe 5 - 6						2.62				0.00				0.00				0.00	14.24														
CENTRELINE1002																																
Contribution From CENTRELINE16, Pipe 8 - 9						2.62				0.92				0.00				0.00	18.62														
	9	10			0.00	2.62			0.00	0.92			0.00	0.00			0.00	0.00	18.62	54.36	73.43	85.95	125.43	210	750	750	CONC	0.11	17.5	369.2322	0.8358	0.3490	0.569
	10	HW1			0.00	2.62			0.00	0.92			0.00	0.00			0.00	0.00	18.97	53.75	72.60	84.97	123.99	208	750	750	CONC	0.11	28.5	369.2322	0.8358	0.5683	0.562
CENTRELINE02																																
	154	30	0.39	0.66	0.72	0.72			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	55	375	375	PVC	0.30	58.0	96.0323	0.8695	1.1118	0.572
	30	24	0.48	0.66	0.88	1.60			0.00	0.00			0.00	0.00			0.00	0.00	11.11	72.78	98.67	115.63	169.00	116	750	750	CONC	0.11	83.0	369.2322	0.8358	1.6552	0.315
	24	25	0.55	0.66	1.01	2.61			0.00	0.00			0.00	0.00			0.00	0.00	12.77	67.60	91.54	107.25	156.68	176	750	750	CONC	0.11	87.5	369.2322	0.8358	1.7449	0.477
	25	26	0.58	0.66	1.06	3.67			0.00	0.00			0.00	0.00			0.00	0.00	14.51	62.94	85.17	99.75	145.68	231	750	750	CONC	0.11	101.0	369.2322	0.8358	2.0141	0.626
To CENTRELINE03, Pipe 26 - 27						3.67				0.00				0.00				0.00	16.53														
Contribution From CENTRELINE16, Pipe 15 - 22						1.23				0.92				0.00				0.00	13.09														
Contribution From CENTRELINE16, Pipe 21 - 22						1.05				1.49				0.00				0.00	14.45														
	22	23	0.26	0.66	0.48	2.76			0.00	2.40			0.00	0.00			0.00	0.00	14.45	63.09	85.37	99.99	146.03	379	825	825	CONC	0.11	81.0	476.0801	0.8906	1.5158	0.796
	23	26	0.26	0.66	0.48	3.23			0.00	2.40			0.00	0.00			0.00	0.00	15.97	59.58	80.56	94.33	137.72	386	825	825	CONC	0.11	66.0	476.0801	0.8906	1.2351	0.811
To CENTRELINE03, Pipe 26 - 27						3.23				2.40				0.00				0.00	17.20														
CENTRELINE03																																
Contribution From CENTRELINE05, Pipe 32 - 33						0.64				0.00				0.00				0.00	11.78														
	33	34	0.40	0.66	0.73	1.38			0.00	0.00			0.00	0.00			0.00	0.00	11.78	70.58	95.64	112.07	163.77	97	750	750	CONC	0.11	76.5	369.2322	0.8358	1.5255	0.263
	34	35	0.46	0.66	0.84	2.22			0.00	0.00			0.00	0.00			0.00	0.00	13.31	66.08	89.46	104.79	153.08	147	750	750	CONC	0.11	76.5	369.2322	0.8358	1.5255	0.397
	35	43	0.39	0.66	0.72	2.94			0.00	0.00			0.00	0.00			0.00	0.00	14.83	62.17	84.10	98.49	143.84	182	750	750	CONC	0.11	69.0	369.2322	0.8358	1.3760	0.494
Contribution From CENTRELINE05, Pipe 42 - 43						3.16				0.00				0.00				0.00	16.22														
	43	44	0.12	0.66	0.22	6.31			0.00	0.00			0.00	0.00			0.00	0.00	16.22	59.03	79.82	93.45	136.44	373	825	825	CONC	0.11	32.5	476.0801	0.8906	0.6082	0.783
To CENTRELINE1003, Pipe 44 - 45						6.31				0.00				0.00				0.00	16.83														
Contribution From CENTRELINE02, Pipe 23 - 26						3.23				2.40				0.00				0.00	17.20														
Contribution From CENTRELINE02, Pipe 25 - 26						3.67				0.00				0.00				0.00	16.53														
	26	27	0.18	0.66	0.33	7.23			0.00	2.40			0.00	0.00			0.00	0.00	17.20	57.02	77.06	90.21	131.68	598	975	975	CONC	0.11	51.5	743.2733	0.9955	0.8622	0.804
	27	28	0.15	0.66	0.28	7.51			0.00	2.40			0.00	0.00			0.00	0.00	18.06	55.37	74.81	87.57	127.80	596	975	975	CONC	0.11	15.0	743.2733	0.9955	0.2511	0.801
	28	44	0.44	0.66	0.81	8.32			0.00	2.40			0.00	0.00			0.00	0.00	18.32	54.91	74.18	86.83	126.72	635	1050	1050	CONC	0.11	75.0	905.6791	1.0459	1.1951	0.701
To CENTRELINE1003, Pipe 44 - 45						8.32				2.40				0.00				0.00	19.51														
CENTRELINE1003																																
Contribution From CENTRELINE03, Pipe 28 - 44						8.32				2.40				0.00				0.00	19.51														
Contribution From CENTRELINE03, Pipe 43 - 44						6.31				0.00				0.00				0.00	16.83														
	44	45	0.03	0.66	0.06	14.68			0.00	2.40			0.00	0.00			0.00	0.00	19.51	52.83	71.34	83.49	121.83	947	1200	1200	CONC	0.15	29.0	1509.9717	1.3351	0.3620	0.627
	45	HW2			0.00	14.68			0.00	2.40			0.00	0.00			0.00	0.00	19.87	52.24	70.53	82.54	120.43	937	1200	1200	CONC	0.15	15.0	1509.9717	1.3351	0.1873	0.620
CENTRELINE17 CENTRELINE1001																																
Contribution From CENTRELINE07, Pipe 66 - 70						1.56				0.00				0.00				0.00	12.66														
Contribution From CENTRELINE07, Pipe 69 - 70						0.70				0.00				0.00				0.00	11.22														
	70	73	0.04	0.66	0.07	2.33			0.00	0.00			0.00	0.00			0.00	0.00	12.66	67.90	91.96	107.74	157.41	158	600	600	CONC	0.15	53.5	237.8056	0.8411	1.0602	0.665
To CENTRELINE17 CENTRELINE1001, Pipe 73 - 74						2.33				0.00				0.00				0.00	13.72														

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

Designed: M.S.	PROJECT: 1278 Caivan-Perth		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference:	File Ref:	Date: 02 Feb 2023	Sheet No. SHEET 1 OF 6

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)															FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
CENTRELINE17 CENTRELINE1001																																
Contribution From CENTRELINE17 CENTRELINE1001, Pipe						2.33				0.00				0.00				0.00	13.72													
Contribution From CENTRELINE1008, Pipe 71 - 73						0.46				0.00				0.00				0.00	11.14													
Contribution From CENTRELINE1008, Pipe 72 - 73						0.53				0.00				0.00				0.00	10.96													
	73	74			0.00	3.32			0.00	0.00			0.00	0.00			0.00	0.00	13.72	64.96	87.93	102.99	150.44	216	675	675	CONC	0.15	118.5	325.5584	0.9098	2.1709	0.663
	74	79	0.63	0.66	1.16	4.48			0.00	0.00			0.00	0.00			0.00	0.00	15.89	59.74	80.78	94.59	138.10	267	675	675	CONC	0.15	8.5	325.5584	0.9098	0.1557	0.821
To CENTRELINE16, Pipe 79 - 80						4.48				0.00				0.00				0.00	16.05													
CENTRELINE1008																																
	71	73	0.25	0.66	0.46	0.46			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	35	450	450	CONC	0.20	55.0	127.5033	0.8017	1.1434	0.276
To CENTRELINE17 CENTRELINE1001, Pipe 73 - 74						0.46				0.00				0.00				0.00	11.14													
	72	73	0.29	0.66	0.53	0.53			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	41	375	375	PVC	0.30	50.0	96.0323	0.8695	0.9584	0.426
To CENTRELINE17 CENTRELINE1001, Pipe 73 - 74						0.53				0.00				0.00				0.00	10.96													
	81	82	0.68	0.66	1.25	1.25			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	96	450	450	CONC	0.20	117.0	127.5033	0.8017	2.4324	0.752
To CENTRELINE16, Pipe 82 - 83						1.25				0.00				0.00				0.00	12.43													
	76	77	0.67	0.66	1.23	1.23			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	94	450	450	CONC	0.20	119.5	127.5033	0.8017	2.4843	0.741
	77	78			0.00	1.23			0.00	0.00			0.00	0.00			0.00	0.00	12.48	68.42	92.68	108.58	158.64	84	450	450	CONC	0.20	8.5	127.5033	0.8017	0.1767	0.660
To CENTRELINE16, Pipe 78 - 79						1.23				0.00				0.00				0.00	12.66													
CENTRELINE04																																
	19	20	0.57	0.66	1.05	1.05			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	80	450	450	CONC	0.20	100.0	127.5033	0.8017	2.0789	0.630
To CENTRELINE16, Pipe 20 - 21						1.05				0.00				0.00				0.00	12.08													
	46	47	0.69	0.66	1.27	1.27			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	97	375	375	PVC	0.50	108.5	123.9771	1.1225	1.6110	0.784
	47	48	0.63	0.66	1.16	2.42			0.00	0.00			0.00	0.00			0.00	0.00	11.61	71.13	96.39	112.95	165.06	172	600	600	CONC	0.15	104.5	237.8056	0.8411	2.0708	0.724
	48	49	0.48	0.66	0.88	3.30			0.00	0.00			0.00	0.00			0.00	0.00	13.68	65.06	88.07	103.16	150.69	215	600	600	CONC	0.20	79.0	274.5943	0.9712	1.3557	0.783
	49	51	0.42	0.66	0.77	4.07			0.00	0.00			0.00	0.00			0.00	0.00	15.04	61.68	83.44	97.71	142.69	251	750	750	CONC	0.11	79.0	369.2322	0.8358	1.5754	0.680
To CENTRELINE05, Pipe 51 - 56						4.07				0.00				0.00				0.00	16.61													
CENTRELINE05																																
	31	32	0.12	0.66	0.22	0.22			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	17	300	300	PVC	0.35	26.0	57.2089	0.8093	0.5354	0.296
	32	33	0.23	0.66	0.42	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.54	74.81	101.45	118.91	173.81	48	300	300	PVC	0.35	60.5	57.2089	0.8093	1.2459	0.840
To CENTRELINE03, Pipe 33 - 34						0.64				0.00				0.00				0.00	11.78													
	50	51	0.11	0.66	0.20	0.20			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	16	300	300	PVC	3.00	24.5	167.4906	2.3695	0.1723	0.093
Contribution From CENTRELINE04, Pipe 49 - 51						4.07				0.00				0.00				0.00	16.61													
	51	56	0.23	0.66	0.42	4.70			0.00	0.00			0.00	0.00			0.00	0.00	16.61	58.21	78.68	92.12	134.49	273	825	825	CONC	0.11	68.5	476.0801	0.8906	1.2819	0.574
To CENTRELINE16, Pipe 56 - 62						4.70				0.00				0.00				0.00	17.89													
	36	37	0.18	0.66	0.33	0.33			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	25	300	300	PVC	0.35	37.0	57.2089	0.8093	0.7619	0.443
	37	38	0.08	0.66	0.15	0.48			0.00	0.00			0.00	0.00			0.00	0.00	10.76	74.00	100.33	117.60	171.88	35	375	375	PVC	0.30	13.5	96.0323	0.8695	0.2588	0.368
	38	39	0.42	0.66	0.77	1.25			0.00	0.00			0.00	0.00			0.00	0.00	11.02	73.10	99.09	116.14	169.74	91	600	600	CONC	0.15	71.0	237.8056	0.8411	1.4069	0.384
	39	40	0.41	0.66	0.75	2.00			0.00	0.00			0.00	0.00			0.00	0.00	12.43	68.59	92.91	108.85	159.04	137	600	600	CONC	0.15	70.5	237.8056	0.8411	1.3970	0.577
	40	41	0.33	0.66	0.61	2.61			0.00	0.00			0.00	0.00			0.00	0.00	13.82	64.69	87.56	102.56	149.80	169	600	600	CONC	0.15	57.0	237.8056	0.8411	1.1295	0.709
	41	42	0.13	0.66	0.24	2.84			0.00	0.00			0.00	0.00			0.00	0.00	14.95	61.88	83.71	98.03	143.15	176	600	600	CONC	0.15	13.5	237.8056	0.8411	0.2675	0.740
	42	43	0.17	0.66	0.31	3.16			0.00	0.00			0.00	0.00			0.00	0.00	15.22	61.25	82.85	97.02	141.67	193	750	750	CONC	0.11	50.0	369.2322	0.8358	0.9971	0.524
To CENTRELINE03, Pipe 43 - 44						3.16				0.00				0.00				0.00	16.22													
CENTRELINE1004																																
Contribution From CENTRELINE16, Pipe 64 - 83						9.22				5.71				0.00				0.00	21.45													
Contribution From CENTRELINE16, Pipe 82 - 83						8.62				0.00				0.00				0.00	17.26													
	83	84			0.00	17.85			0.00	5.71			0.00	0.00			0.00	0.00	21.45	49.82	67.23	78.66	114.74	1273	1200	1200	CONC	0.15	13.5	1509.9717	1.3351	0.1685	0.843
	84	HW3			0.00	17.85			0.00	5.71			0.00	0.00			0.00	0.00	21.61	49.57	66.90	78.27	114.17	1266	1200	1200	CONC	0.15	7.5	1509.9717	1.3351	0.0936	0.839

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

Designed: M.S.
Checked: W.L.
Dwg. Reference:

PROJECT: 1278 Caivan-Perth
LOCATION: **Town of Perth**
File Ref:
Date: 02 Feb 2023
Sheet No. SHEET 2 OF 6

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)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
CENTRELINE09																																
	99	100	0.63	0.66	1.16	1.16			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	89	450	450	CONC	0.20	98.5	127.5033	0.8017	2.0478	0.696
	100	101			0.00	1.16			0.00	0.00			0.00	0.00			0.00	0.00	12.05	69.75	94.49	110.72	161.78	81	450	450	CONC	0.20	13.0	127.5033	0.8017	0.2703	0.632
To CENTRELINE08, Pipe 101 - 102						1.16				0.00				0.00				0.00	12.32														
CENTRELINE08																																
	153	91	0.30	0.66	0.55	0.55			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	42	600	600	CONC	0.15	53.5	237.8056	0.8411	1.0602	0.178
To CENTRELINE1006, Pipe 91 - 92						0.55				0.00				0.00				0.00	11.06														
	95	96	0.23	0.66	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	300	300	PVC	0.35	38.0	57.2089	0.8093	0.7825	0.567
	96	97	0.20	0.66	0.37	0.79			0.00	0.00			0.00	0.00			0.00	0.00	10.78	73.93	100.23	117.48	171.71	58	375	375	PVC	0.30	39.0	96.0323	0.8695	0.7476	0.607
	97	98	0.10	0.66	0.18	0.97			0.00	0.00			0.00	0.00			0.00	0.00	11.53	71.39	96.75	113.38	165.69	69	375	375	PVC	0.30	9.5	96.0323	0.8695	0.1821	0.723
	98	101	0.13	0.66	0.24	1.21			0.00	0.00			0.00	0.00			0.00	0.00	11.71	70.80	95.94	112.43	164.29	86	450	450	CONC	0.20	35.5	127.5033	0.8017	0.7380	0.672
Contribution From CENTRELINE09, Pipe 100 - 101						1.16				0.00				0.00				0.00	12.32														
	101	102	0.10	0.66	0.18	2.55			0.00	0.00			0.00	0.00			0.00	0.00	12.45	68.52	92.82	108.75	158.88	175	525	525	CONC	0.25	29.5	215.0311	0.9933	0.4950	0.813
	102	103	0.07	0.66	0.13	2.68			0.00	0.00			0.00	0.00			0.00	0.00	12.95	67.08	90.84	106.42	155.47	180	525	525	CONC	0.25	17.5	215.0311	0.9933	0.2936	0.836
	103	104	0.12	0.66	0.22	2.90			0.00	0.00			0.00	0.00			0.00	0.00	13.24	66.26	89.72	105.10	153.53	192	600	600	CONC	0.15	13.5	237.8056	0.8411	0.2675	0.808
	104	105	0.07	0.66	0.13	3.03			0.00	0.00			0.00	0.00			0.00	0.00	13.51	65.53	88.72	103.92	151.80	198	750	750	CONC	0.11	13.5	369.2322	0.8358	0.2692	0.537
To CENTRELINE1005, Pipe 105 - 106						3.03				0.00				0.00				0.00	13.78														
Contribution From CENTRELINE1006, Pipe 92 - 94						5.89				0.00				0.00				0.00	20.73														
Contribution From CENTRELINE1006, Pipe 93 - 94						0.40				0.00				0.00				0.00	11.04														
	94	105	0.49	0.66	0.90	7.19			0.00	0.00			0.00	0.00			0.00	0.00	20.73	50.89	68.69	80.38	117.26	366	825	825	CONC	0.11	90.0	476.0801	0.8906	1.6843	0.769
To CENTRELINE1005, Pipe 105 - 106						7.19				0.00				0.00				0.00	22.41														
CENTRELINE1005																																
Contribution From CENTRELINE08, Pipe 104 - 105						3.03				0.00				0.00				0.00	13.78														
Contribution From CENTRELINE08, Pipe 94 - 105						7.19				0.00				0.00				0.00	22.41														
	105	106			0.00	10.22			0.00	0.00			0.00	0.00			0.00	0.00	22.41	48.45	65.36	76.47	111.53	495	900	900	CONC	0.11	30.0	600.4123	0.9438	0.5298	0.825
	106	HW4			0.00	10.22			0.00	0.00			0.00	0.00			0.00	0.00	22.94	47.73	64.39	75.32	109.86	488	900	900	CONC	0.11	10.5	600.4123	0.9438	0.1854	0.812
CENTRELINE06																																
	85	86	0.61	0.66	1.12	1.12			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	86	450	450	CONC	0.20	101.5	127.5033	0.8017	2.1101	0.674
	86	88	0.64	0.66	1.17	2.29			0.00	0.00			0.00	0.00			0.00	0.00	12.11	69.55	94.23	110.41	161.32	160	600	600	CONC	0.15	121.5	237.8056	0.8411	2.4077	0.671
To CENTRELINE1006, Pipe 88 - 89						2.29				0.00				0.00				0.00	14.52														
	129	130	0.35	0.66	0.64	0.64			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	49	300	300	PVC	0.40	59.5	61.1589	0.8652	1.1461	0.806
	130	131	0.08	0.66	0.15	0.79			0.00	0.00			0.00	0.00			0.00	0.00	11.15	72.67	98.51	115.44	168.72	57	300	300	PVC	0.50	11.5	68.3778	0.9673	0.1981	0.838
	131	132	0.44	0.66	0.81	1.60			0.00	0.00			0.00	0.00			0.00	0.00	11.34	72.00	97.59	114.37	167.14	115	450	450	CONC	0.25	76.5	142.5531	0.8963	1.4225	0.806
	132	134	0.39	0.66	0.72	2.31			0.00	0.00			0.00	0.00			0.00	0.00	12.77	67.60	91.54	107.25	156.68	156	525	525	CONC	0.20	76.5	192.3297	0.8885	1.4351	0.813
To CENTRELINE07, Pipe 134 - 135						2.31				0.00				0.00				0.00	14.20														
CENTRELINE07																																
	65	66	0.31	0.66	0.57	0.57			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	44	300	300	PVC	0.35	43.0	57.2089	0.8093	0.8855	0.764
	66	70	0.54	0.66	0.99	1.56			0.00	0.00			0.00	0.00			0.00	0.00	10.89	73.56	99.74	116.89	170.85	115	450	450	CONC	0.25	95.5	142.5531	0.8963	1.7758	0.805
To CENTRELINE17 CENTRELINE1001, Pipe 70 - 73						1.56				0.00				0.00				0.00	12.66														
	57	58	0.23	0.66	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	300	300	PVC	0.50	33.0	68.3778	0.9673	0.5686	0.474
	58	59	0.56	0.66	1.03	1.45			0.00	0.00			0.00	0.00			0.00	0.00	10.57	74.69	101.28	118.71	173.52	108	375	375	PVC	0.55	92.5	130.0283	1.1773	1.3095	0.833
	59	61	0.50	0.66	0.92	2.37			0.00	0.00			0.00	0.00			0.00	0.00	11.88	70.28	95.22	111.57	163.04	166	525	525	CONC	0.25	92.5	215.0311	0.9933	1.5520	0.774
To CENTRELINE1006, Pipe 61 - 62						2.37				0.00				0.00				0.00	13.43														
	67	68	0.10	0.66	0.18	0.18			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	14	300	300	PVC	0.35	20.0	57.2089	0.8093	0.4119	0.246
	68	69	0.13	0.66	0.24	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.41	75.26	102.07	119.64	174.88	32	300	300	PVC	0.35	13.5	57.2089	0.8093	0.2780	0.555
	69	70	0.15	0.66	0.28	0.70			0.00	0.00			0.00	0.00			0.00	0.00	10.69	74.25	100.68	118.01	172.49	52	300	300	PVC	0.40	27.5	61.1589	0.8652	0.5297	0.847
To CENTRELINE17 CENTRELINE1001, Pipe 70 - 73						0.70				0.00				0.00				0.00	11.22														
	133	134	0.11	0.66	0.20	0.20			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	16	600	600	CONC	0.15	25.0	237.8056	0.8411	0.4954	0.065

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

Designed: M.S.
Checked: W.L.
Dwg. Reference:

PROJECT: 1278 Caivan-Perth
LOCATION: **Town of Perth**
File Ref:
Date: 02 Feb 2023
Sheet No. SHEET 3 OF 6

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)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
Contribution From CENTRELINE06, Pipe 132 - 134						2.31				0.00				0.00				0.00	14.20														
	134	135	0.20	0.66	0.37	2.88			0.00	0.00			0.00	0.00			0.00	0.00	14.20	63.72	86.23	100.99	147.50	184	750	750	CONC	0.11	59.5	369.2322	0.8358	1.1865	0.497
To CENTRELINE1006, Pipe 135 - 138						2.88				0.00				0.00				0.00	15.39														
CENTRELINE12																																	
	124	125	0.45	0.66	0.83	0.83			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	63	450	450	CONC	0.20	81.5	127.5033	0.8017	1.6943	0.497
To CENTRELINE11, Pipe 125 - 126						0.83				0.00				0.00				0.00	11.69														
CENTRELINE13																																	
	122	123	0.60	0.66	1.10	1.10			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	85	450	450	CONC	0.20	109.5	127.5033	0.8017	2.2764	0.663
To CENTRELINE11, Pipe 123 - 125						1.10				0.00				0.00				0.00	12.28														
CENTRELINE14																																	
	120	121	0.56	0.66	1.03	1.03			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	79	450	450	CONC	0.20	98.0	127.5033	0.8017	2.0374	0.619
To CENTRELINE11, Pipe 121 - 123						1.03				0.00				0.00				0.00	12.04														
CENTRELINE11																																	
Contribution From CENTRELINE16, Pipe 108 - 116						1.50				0.00				0.00				0.00	13.04														
Contribution From CENTRELINE16, Pipe 115 - 116						0.28				0.00				0.00				0.00	10.17														
	116	119	0.10	0.66	0.18	1.96			0.00	0.00			0.00	0.00			0.00	0.00	13.04	66.83	90.49	106.01	154.87	131	750	750	CONC	0.11	66.0	369.2322	0.8358	1.3162	0.355
Contribution From CENTRELINE15, Pipe 117 - 119						0.90				0.00				0.00				0.00	11.82														
Contribution From CENTRELINE15, Pipe 118 - 119						0.26				0.00				0.00				0.00	10.39														
	119	121	0.15	0.66	0.28	3.39			0.00	0.00			0.00	0.00			0.00	0.00	14.35	63.34	85.71	100.39	146.62	215	750	750	CONC	0.11	53.5	369.2322	0.8358	1.0669	0.582
Contribution From CENTRELINE14, Pipe 120 - 121						1.03				0.00				0.00				0.00	12.04														
	121	123	0.22	0.66	0.40	4.83			0.00	0.00			0.00	0.00			0.00	0.00	15.42	60.80	82.23	96.29	140.60	293	750	750	CONC	0.11	59.5	369.2322	0.8358	1.1865	0.795
Contribution From CENTRELINE13, Pipe 122 - 123						1.10				0.00				0.00				0.00	12.28														
	123	125	0.22	0.66	0.40	6.33			0.00	0.00			0.00	0.00			0.00	0.00	16.60	58.22	78.71	92.15	134.53	369	825	825	CONC	0.11	58.5	476.0801	0.8906	1.0948	0.774
Contribution From CENTRELINE12, Pipe 124 - 125						0.83				0.00				0.00				0.00	11.69														
	125	126	0.34	0.66	0.62	7.78			0.00	0.00			0.00	0.00			0.00	0.00	17.70	56.05	75.74	88.66	129.41	436	900	900	CONC	0.11	89.0	600.4123	0.9438	1.5717	0.726
	126	127	0.09	0.66	0.17	7.94			0.00	0.00			0.00	0.00			0.00	0.00	19.27	53.23	71.89	84.14	122.78	423	900	900	CONC	0.11	9.0	600.4123	0.9438	0.1589	0.704
	127	128	0.08	0.66	0.15	8.09			0.00	0.00			0.00	0.00			0.00	0.00	19.43	52.97	71.53	83.71	122.15	429	900	900	CONC	0.11	29.0	600.4123	0.9438	0.5121	0.714
To CENTRELINE1006, Pipe 128 - 135						8.09				0.00				0.00				0.00	19.94														
CENTRELINE1006																																	
	93	94	0.22	0.66	0.40	0.40			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	31	300	300	PVC	0.35	50.5	57.2089	0.8093	1.0399	0.542
To CENTRELINE08, Pipe 94 - 105						0.40				0.00				0.00				0.00	11.04														
	136	137	0.04	0.66	0.07	0.07			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	6	300	300	PVC	1.30	12.5	110.2558	1.5598	0.1336	0.051
	137	138	0.19	0.66	0.35	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.13	76.30	103.49	121.32	177.35	32	300	300	PVC	0.35	51.0	57.2089	0.8093	1.0502	0.563
To CENTRELINE1006, Pipe 138 - 139						0.42				0.00				0.00				0.00	11.18														
	60	61	0.13	0.66	0.24	0.24			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	18	300	300	PVC	3.05	30.0	168.8806	2.3892	0.2093	0.108
Contribution From CENTRELINE07, Pipe 59 - 61						2.37				0.00				0.00				0.00	13.43														
	61	62	0.20	0.66	0.37	2.97			0.00	0.00			0.00	0.00			0.00	0.00	13.43	65.74	89.00	104.25	152.29	195	750	750	CONC	0.11	62.0	369.2322	0.8358	1.2364	0.529
To CENTRELINE16, Pipe 62 - 63						2.97				0.00				0.00				0.00	14.67														
	87	88	0.11	0.66	0.20	0.20			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	16	300	300	PVC	0.35	25.0	57.2089	0.8093	0.5148	0.271
Contribution From CENTRELINE06, Pipe 86 - 88						2.29				0.00				0.00				0.00	14.52														
	88	89	0.20	0.66	0.37	2.86			0.00	0.00			0.00	0.00			0.00	0.00	14.52	62.93	85.15	99.72	145.64	180	750	750	CONC	0.11	50.0	369.2322	0.8358	0.9971	0.488
	89	90	0.15	0.66	0.28	3.14			0.00	0.00			0.00	0.00			0.00	0.00	15.51	60.58	81.93	95.94	140.09	190	750	750	CONC	0.11	13.5	369.2322	0.8358	0.2692	0.515
	90	91	0.72	0.66	1.32	4.46			0.00	0.00			0.00	0.00			0.00	0.00	15.78	59.98	81.11	94.97	138.67	267	750	750	CONC	0.11	124.0	369.2322	0.8358	2.4728	0.724
Contribution From CENTRELINE08, Pipe 153 - 91						0.55				0.00				0.00				0.00	11.06														
	91	92	0.25	0.66	0.46	5.47			0.00	0.00			0.00	0.00			0.00	0.00	18.26	55.02	74.32	87.00	126.97	301	750	750	CONC	0.11	65.0	369.2322	0.8358	1.2962	0.815
	92	94	0.23	0.66	0.42	5.89			0.00	0.00			0.00	0.00			0.00	0.00	19.55	52.76	71.25	83.38	121.67	311	750	750	CONC	0.11	59.0	369.2322	0.8358	1.1766	0.842
To CENTRELINE08, Pipe 94 - 105						5.89				0.00				0.00				0.00	20.73														

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

Designed: M.S.	PROJECT: 1278 Caivan-Perth		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference:	File Ref:	Date: 02 Feb 2023	Sheet No. SHEET 4 OF 6

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)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
Contribution From CENTRELINE16, Pipe 114 - 128						2.41				0.00				0.00				0.00	15.76														
Contribution From CENTRELINE11, Pipe 127 - 128						8.09				0.00				0.00				0.00	19.94														
	128	135	0.14	0.66	0.26	10.76			0.00	0.00			0.00	0.00			0.00	0.00	19.94	52.12	70.38	82.36	120.17	561	975	975	CONC	0.11	54.5	743.2733	0.9955	0.9124	0.755
Contribution From CENTRELINE07, Pipe 134 - 135						2.88				0.00				0.00				0.00	15.39														
	135	138	0.65	0.66	1.19	14.83			0.00	0.00			0.00	0.00			0.00	0.00	20.85	50.70	68.43	80.07	116.81	752	1050	1050	CONC	0.11	126.5	905.6791	1.0459	2.0157	0.830
To CENTRELINE1006, Pipe 138 - 139						14.83				0.00				0.00				0.00	22.87														
CENTRELINE1006																																	
Contribution From CENTRELINE1006, Pipe 135 - 138						14.83				0.00				0.00				0.00	22.87														
Contribution From CENTRELINE1006, Pipe 137 - 138						0.42				0.00				0.00				0.00	11.18														
	138	139			0.00	15.26			0.00	0.00			0.00	0.00			0.00	0.00	22.87	47.83	64.52	75.48	110.08	730	1050	1050	CONC	0.11	11.0	905.6791	1.0459	0.1753	0.806
	139	HW5			0.00	15.26			0.00	0.00			0.00	0.00			0.00	0.00	23.05	47.60	64.20	75.11	109.54	726	1050	1050	CONC	0.11	10.0	905.6791	1.0459	0.1593	0.802
CENTRELINE15																																	
	117	119	0.49	0.66	0.90	0.90			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	69	450	450	CONC	0.20	87.5	127.5033	0.8017	1.8191	0.542
To CENTRELINE11, Pipe 119 - 121						0.90				0.00				0.00				0.00	11.82														
	118	119	0.14	0.66	0.26	0.26			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	20	300	300	PVC	0.55	24.0	71.7152	1.0146	0.3943	0.275
To CENTRELINE11, Pipe 119 - 121						0.26				0.00				0.00				0.00	10.39														
	140	141	0.15	0.66	0.28	0.28			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	21	300	300	PVC	0.35	21.5	57.2089	0.8093	0.4427	0.369
	141	142	0.06	0.66	0.11	0.39			0.00	0.00			0.00	0.00			0.00	0.00	10.44	75.15	101.91	119.45	174.61	29	375	375	PVC	0.30	13.5	96.0323	0.8695	0.2588	0.302
	142	144	0.18	0.66	0.33	0.72			0.00	0.00			0.00	0.00			0.00	0.00	10.70	74.21	100.63	117.94	172.39	53	450	450	CONC	0.20	56.0	127.5033	0.8017	1.1642	0.416
To CENTRELINE16, Pipe 144 - 145						0.72				0.00				0.00				0.00	11.87														
CENTRELINE16																																	
	115	116	0.15	0.66	0.28	0.28			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	21	300	300	PVC	2.65	23.0	157.4174	2.2270	0.1721	0.134
To CENTRELINE11, Pipe 116 - 119						0.28				0.00				0.00				0.00	10.17														
	148	149	0.18	0.66	0.33	0.33			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	25	300	300	PVC	0.35	18.0	57.2089	0.8093	0.3707	0.443
To CENTRELINE1007, Pipe 149 - 150						0.33				0.00				0.00				0.00	10.37														
	14	15			0.00	0.00	0.31	0.66	0.57	0.57			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	59	750	750	CONC	0.11	69.5	369.2322	0.8358	1.3859	0.161
					0.00	0.00	0.19	0.66	0.35	0.92			0.00	0.00			0.00	0.00														
	15	22	1.11	0.40	1.23	1.23			0.00	0.92			0.00	0.00			0.00	0.00	11.39	71.86	97.40	114.14	166.81	178	750	750	CONC	0.11	85.5	369.2322	0.8358	1.7050	0.482
To CENTRELINE02, Pipe 22 - 23						1.23				0.92				0.00				0.00	13.09														
	152	109	0.23	0.66	0.42	0.42			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	32	450	450	CONC	0.20	52.5	127.5033	0.8017	1.0914	0.254
	109	108	0.11	0.66	0.20	0.62			0.00	0.00			0.00	0.00			0.00	0.00	11.09	72.85	98.76	115.74	169.16	45	450	450	CONC	0.20	12.0	127.5033	0.8017	0.2495	0.356
	108	116	0.48	0.66	0.88	1.50			0.00	0.00			0.00	0.00			0.00	0.00	11.34	72.01	97.61	114.38	167.16	108	600	600	CONC	0.15	85.5	237.8056	0.8411	1.6943	0.456
To CENTRELINE11, Pipe 116 - 119						1.50				0.00				0.00				0.00	13.04														
	110	111	0.20	0.66	0.37	0.37			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	28	300	300	PVC	0.35	54.5	57.2089	0.8093	1.1223	0.493
	111	112	0.22	0.66	0.40	0.77			0.00	0.00			0.00	0.00			0.00	0.00	11.12	72.75	98.62	115.57	168.91	56	375	375	PVC	0.30	60.0	96.0323	0.8695	1.1501	0.584
	112	113	0.11	0.66	0.20	0.97			0.00	0.00			0.00	0.00			0.00	0.00	12.27	69.06	93.55	109.61	160.15	67	375	375	PVC	0.30	22.0	96.0323	0.8695	0.4217	0.699
	113	114	0.32	0.66	0.59	1.56			0.00	0.00			0.00	0.00			0.00	0.00	12.69	67.81	91.83	107.59	157.18	106	375	375	PVC	0.50	84.5	123.9771	1.1225	1.2546	0.853
			0.19	0.40	0.21	1.77			0.00	0.00			0.00	0.00			0.00	0.00														
	114	128	0.35	0.66	0.64	2.41			0.00	0.00			0.00	0.00			0.00	0.00	13.95	64.37	87.11	102.04	149.04	155	600	600	CONC	0.15	91.5	237.8056	0.8411	1.8132	0.653
To CENTRELINE1006, Pipe 128 - 135						2.41				0.00				0.00				0.00	15.76														
	16	17			0.00	0.00	0.52	0.66	0.95	0.95			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	99	450	450	CONC	0.20	80.5	127.5033	0.8017	1.6735	0.780
	17	18			0.00	0.00	0.04	0.66	0.07	1.03			0.00	0.00			0.00	0.00	11.67	70.93	96.11	112.63	164.58	99	450	450	CONC	0.20	17.5	127.5033	0.8017	0.3638	0.775
	18	20			0.00	0.00	0.12	0.66	0.22	1.25			0.00	0.00			0.00	0.00	12.04	69.78	94.54	110.77	161.86	118	600	600	CONC	0.15	58.0	237.8056	0.8411	1.1493	0.496
Contribution From CENTRELINE04, Pipe 19 - 20						1.05				0.00				0.00				0.00	12.08														
	20	21			0.00	1.05	0.03	0.66	0.06	1.30			0.00	0.00			0.00	0.00	13.19	66.41	89.91	105.33	153.87	187	600	600	CONC	0.15	15.5	237.8056	0.8411	0.3072	0.785
	21	22			0.00	1.05	0.10	0.66	0.18	1.49			0.00	0.00			0.00	0.00	13.49	65.57	88.76	103.97	151.88	200	750	750	CONC	0.11	48.0	369.2322	0.8358	0.9572	0.543
To CENTRELINE02, Pipe 22 - 23						1.05				1.49				0.00				0.00	14.45														

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

Designed: M.S.
Checked: W.L.
Dwg. Reference:

PROJECT: 1278 Caivan-Perth
LOCATION: **Town of Perth**
File Ref:
Date: 02 Feb 2023
Sheet No. SHEET 5 OF 6

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

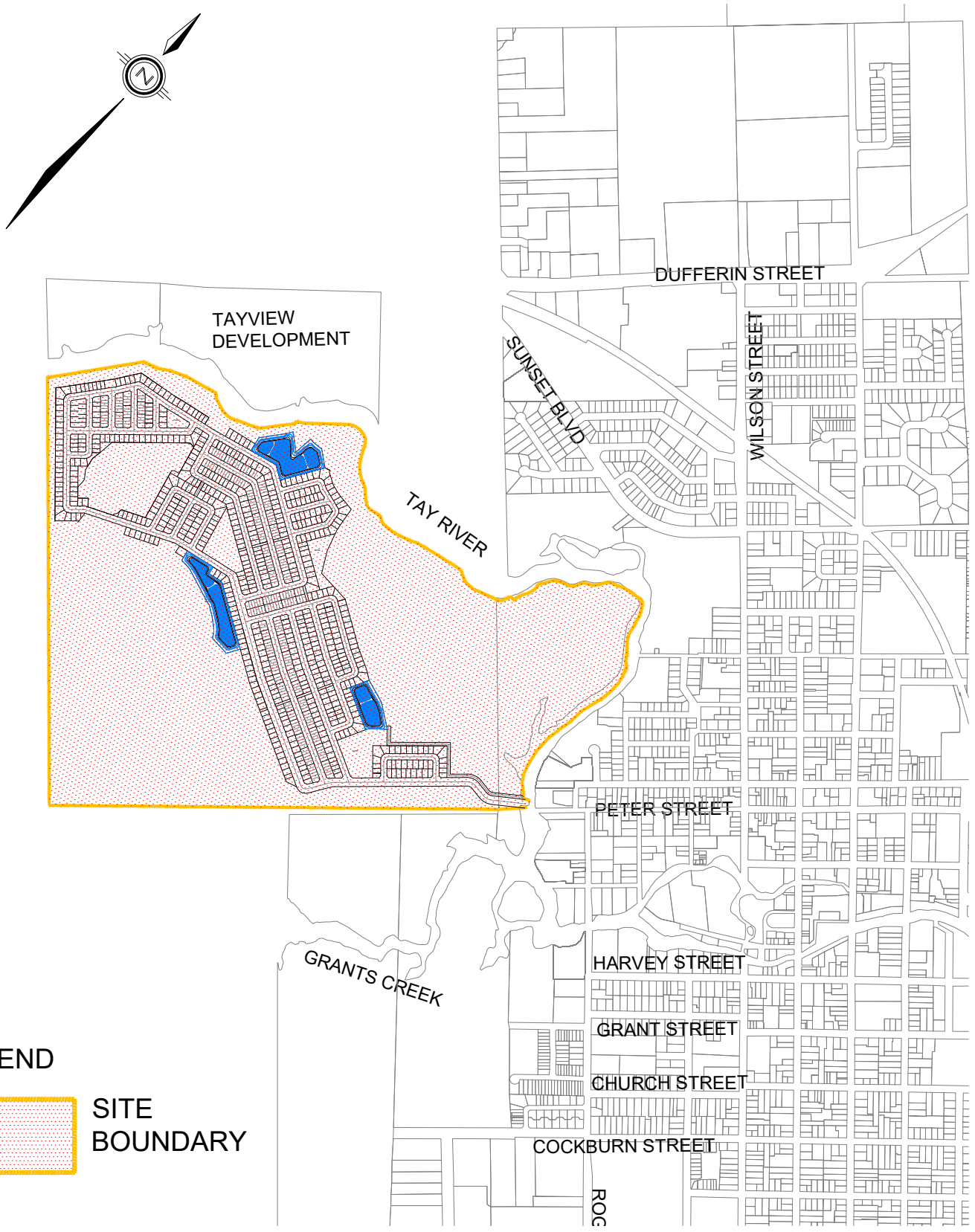
	LOCATION		AREA (Ha)																FLOW						SEWER DATA							
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
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	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
	143	144	0.19	0.66	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	450	450	CONC	0.20	32.5	127.5033	0.8017	0.6757	0.210
Contribution From CENTRELINE15, Pipe 142 - 144						0.72				0.00				0.00				0.00	11.87														
	144	145	0.35	0.66	0.64	1.71			0.00	0.00			0.00	0.00			0.00	0.00	11.87	70.31	95.27	111.64	163.13	120	600	600	CONC	0.15	68.5	237.8056	0.8411	1.3574	0.505
	145	146	0.41	0.66	0.75	2.46			0.00	0.00			0.00	0.00			0.00	0.00	13.22	66.31	89.77	105.17	153.63	163	600	600	CONC	0.15	68.5	237.8056	0.8411	1.3574	0.686
	146	147	0.13	0.66	0.24	2.70			0.00	0.00			0.00	0.00			0.00	0.00	14.58	62.78	84.94	99.48	145.28	169	600	600	CONC	0.15	13.0	237.8056	0.8411	0.2576	0.712
	147	149	0.11	0.66	0.20	2.90			0.00	0.00			0.00	0.00			0.00	0.00	14.84	62.15	84.08	98.47	143.80	180	600	600	CONC	0.15	23.5	237.8056	0.8411	0.4657	0.758
To CENTRELINE1007, Pipe 149 - 150						2.90				0.00				0.00				0.00	15.30														
	52	53			0.00	0.00	0.75	0.66	1.38	1.38			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	143	525	525	CONC	0.20	110.5	192.3297	0.8885	2.0729	0.745
	53	54			0.00	0.00	0.69	0.66	1.27	2.64			0.00	0.00			0.00	0.00	12.07	69.67	94.39	110.59	161.60	249	600	600	CONC	0.25	105.5	307.0058	1.0858	1.6194	0.812
	54	55			0.00	0.00	0.52	0.66	0.95	3.60			0.00	0.00			0.00	0.00	13.69	65.04	88.03	103.12	150.62	317	750	750	CONC	0.11	81.0	369.2322	0.8358	1.6153	0.857
	55	56			0.00	0.00	0.49	0.66	0.90	4.50			0.00	0.00			0.00	0.00	15.31	61.05	82.58	96.70	141.20	371	825	825	CONC	0.11	81.0	476.0801	0.8906	1.5158	0.780
Contribution From CENTRELINE05, Pipe 51 - 56						4.70				0.00				0.00				0.00	17.89														
	56	62			0.00	4.70	0.22	0.66	0.40	4.90			0.00	0.00			0.00	0.00	17.89	55.68	75.24	88.07	128.54	630	975	975	CONC	0.11	54.5	743.2733	0.9955	0.9124	0.848
Contribution From CENTRELINE1006, Pipe 61 - 62						2.97				0.00				0.00				0.00	14.67														
	62	63			0.00	7.67	0.36	0.66	0.66	5.56			0.00	0.00			0.00	0.00	18.81	54.03	72.98	85.42	124.66	820	1050	1050	CONC	0.15	62.0	1057.6053	1.2214	0.8460	0.775
	63	64			0.00	7.67	0.08	0.66	0.15	5.71			0.00	0.00			0.00	0.00	19.65	52.60	71.02	83.12	121.28	809	1200	1200	CONC	0.11	14.0	1293.0625	1.1433	0.2041	0.625
			0.29	0.66	0.53	8.20			0.00	5.71			0.00	0.00			0.00	0.00															
	64	83	0.92	0.40	1.02	9.22			0.00	5.71			0.00	0.00			0.00	0.00	19.86	52.26	70.57	82.58	120.49	885	1200	1200	CONC	0.11	109.0	1293.0625	1.1433	1.5889	0.684
To CENTRELINE1004, Pipe 83 - 84						9.22				5.71				0.00				0.00	21.45														
	75	78	0.57	0.66	1.05	1.05			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	80	450	450	CONC	0.20	92.0	127.5033	0.8017	1.9126	0.630
Contribution From CENTRELINE1008, Pipe 77 - 78						1.23				0.00				0.00				0.00	12.66														
	78	79	0.17	0.66	0.31	2.59			0.00	0.00			0.00	0.00			0.00	0.00	12.66	67.90	91.96	107.74	157.41	176	600	600	CONC	0.15	60.0	237.8056	0.8411	1.1890	0.739
Contribution From CENTRELINE17 CENTRELINE1001, Pipe						4.48				0.00				0.00				0.00	16.05														
	79	80	0.02	0.66	0.04	7.10			0.00	0.00			0.00	0.00			0.00	0.00	16.05	59.40	80.32	94.04	137.30	422	750	750	CONC	0.20	16.5	497.8726	1.1270	0.2440	0.847
	80	82	0.13	0.66	0.24	7.34			0.00	0.00			0.00	0.00			0.00	0.00	16.29	58.88	79.60	93.20	136.07	432	825	825	CONC	0.15	47.0	555.9418	1.0400	0.7532	0.777
Contribution From CENTRELINE1008, Pipe 81 - 82						1.25				0.00				0.00				0.00	12.43														
	82	83	0.02	0.66	0.04	8.62			0.00	0.00			0.00	0.00			0.00	0.00	17.05	57.33	77.48	90.71	132.42	494	900	900	CONC	0.11	12.0	600.4123	0.9438	0.2119	0.823
To CENTRELINE1004, Pipe 83 - 84						8.62				0.00				0.00				0.00	17.26														
	4	5			0.00	0.00	0.29	0.66	0.53	0.53			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	55	300	300	PVC	4.00	65.5	193.4015	2.7361	0.3990	0.287
Contribution From CENTRELINE01, Pipe 3 - 5						2.62				0.00				0.00				0.00	14.24														
	5	6			0.00	2.62	0.21	0.66	0.39	0.92			0.00	0.00			0.00	0.00	14.24	63.61	86.09	100.83	147.26	246	750	750	CONC	0.11	92.5	369.2322	0.8358	1.8446	0.666
	6	7			0.00	2.62			0.00	0.92			0.00	0.00			0.00	0.00	16.09	59.31	80.20	93.91	137.10	229	750	750	CONC	0.11	49.0	369.2322	0.8358	0.9771	0.621
	7	8			0.00	2.62			0.00	0.92			0.00	0.00			0.00	0.00	17.06	57.29	77.43	90.65	132.32	221	750	750	CONC	0.11	24.0	369.2322	0.8358	0.4786	0.599
	8	9			0.00	2.62			0.00	0.92			0.00	0.00			0.00	0.00	17.54	56.35	76.15	89.14	130.12	218	750	750	CONC	0.11	54.0	369.2322	0.8358	1.0769	0.590
To CENTRELINE1002, Pipe 9 - 10						2.62				0.92				0.00				0.00	18.62														
CENTRELINE1007																																	
Contribution From CENTRELINE16, Pipe 147 - 149						2.90				0.00				0.00				0.00	15.30														
Contribution From CENTRELINE16, Pipe 148 - 149						0.33				0.00				0.00				0.00	10.37														
	149	150			0.00	3.23			0.00	0.00			0.00	0.00			0.00	0.00	15.30	61.06	82.59	96.71	141.22	197	600	600	CONC	0.15	16.5	237.8056	0.8411	0.3270	0.829
	150	HW6			0.00	3.23			0.00	0.00			0.00	0.00			0.00	0.00	15.63	60.32	81.57	95.52	139.47	195	600	600	CONC	0.15	26.0	237.8056	0.8411	0.5152	0.819

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

Designed: M.S.	PROJECT: 1278 Caivan-Perth		
Checked: W.L.	LOCATION: **Town of Perth**		
Dwg. Reference:	File Ref:	Date: 02 Feb 2023	Sheet No. SHEET 6 OF 6

DRAWINGS / FIGURES



PERTH
TOWN OF PERTH

SITE LOCATION

DSEL
120 Iber Road, Unit 203
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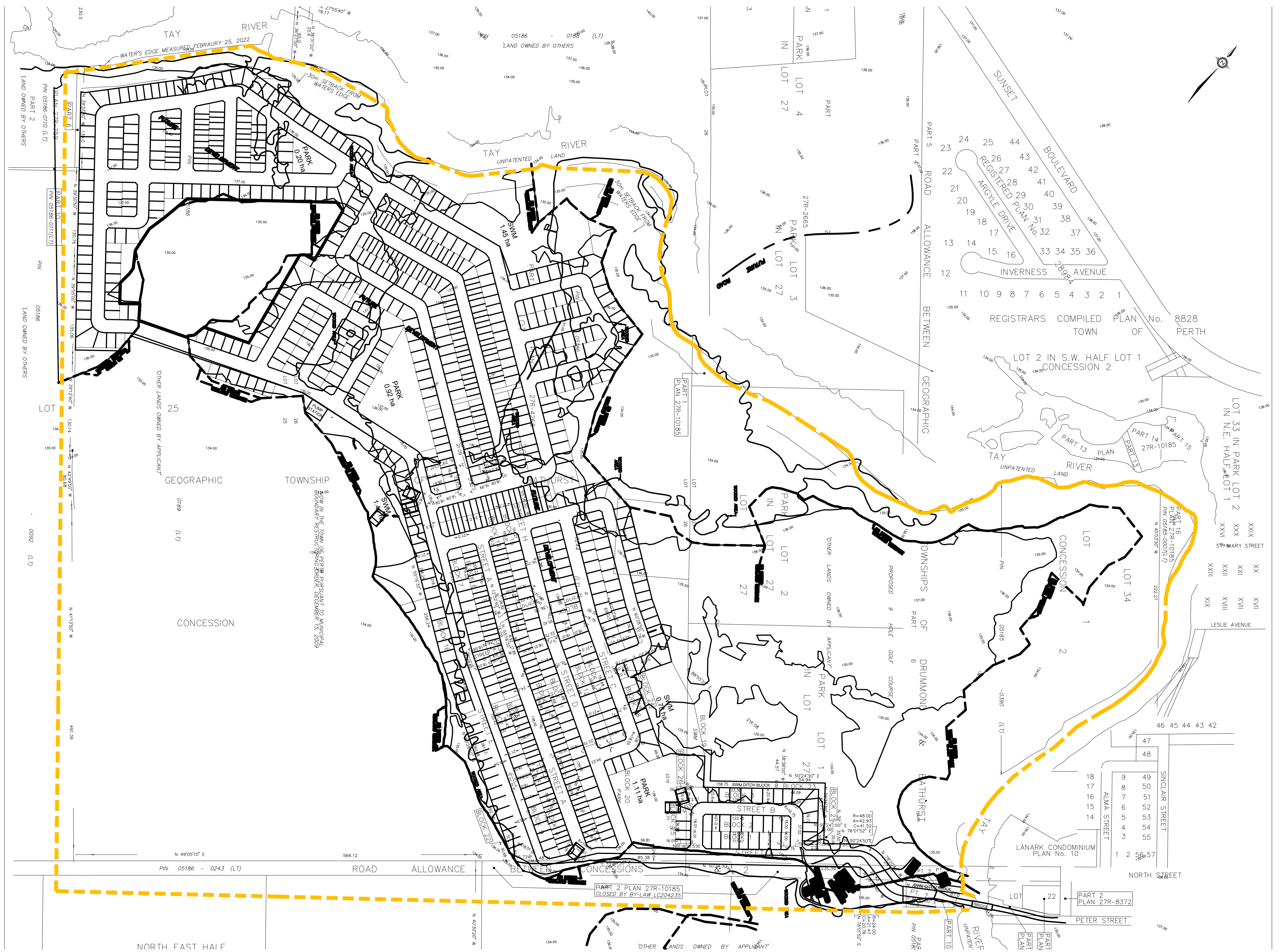
SCALE:	1:15000	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	1



LEGEND

SITE BOUNDARY

DSEL
david schaeffer engineering ltd

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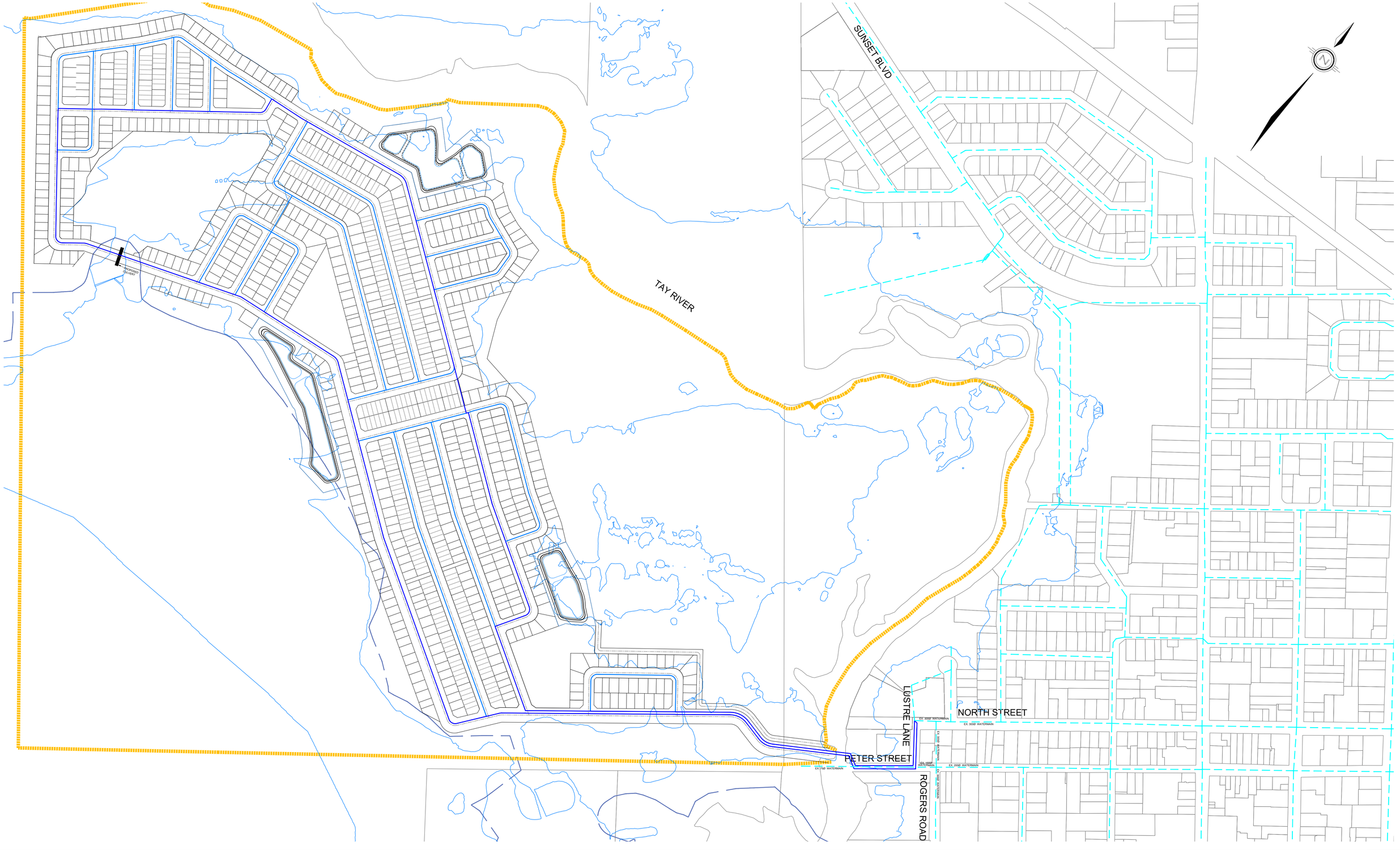
TOWN OF PERTH

SUBDIVISION PLAN

SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	2



LEGEND

- SITE BOUNDARY
- 300mm FEEDERMAIN
- EXISTING WATERMAIN
- LOCAL WATERMAIN

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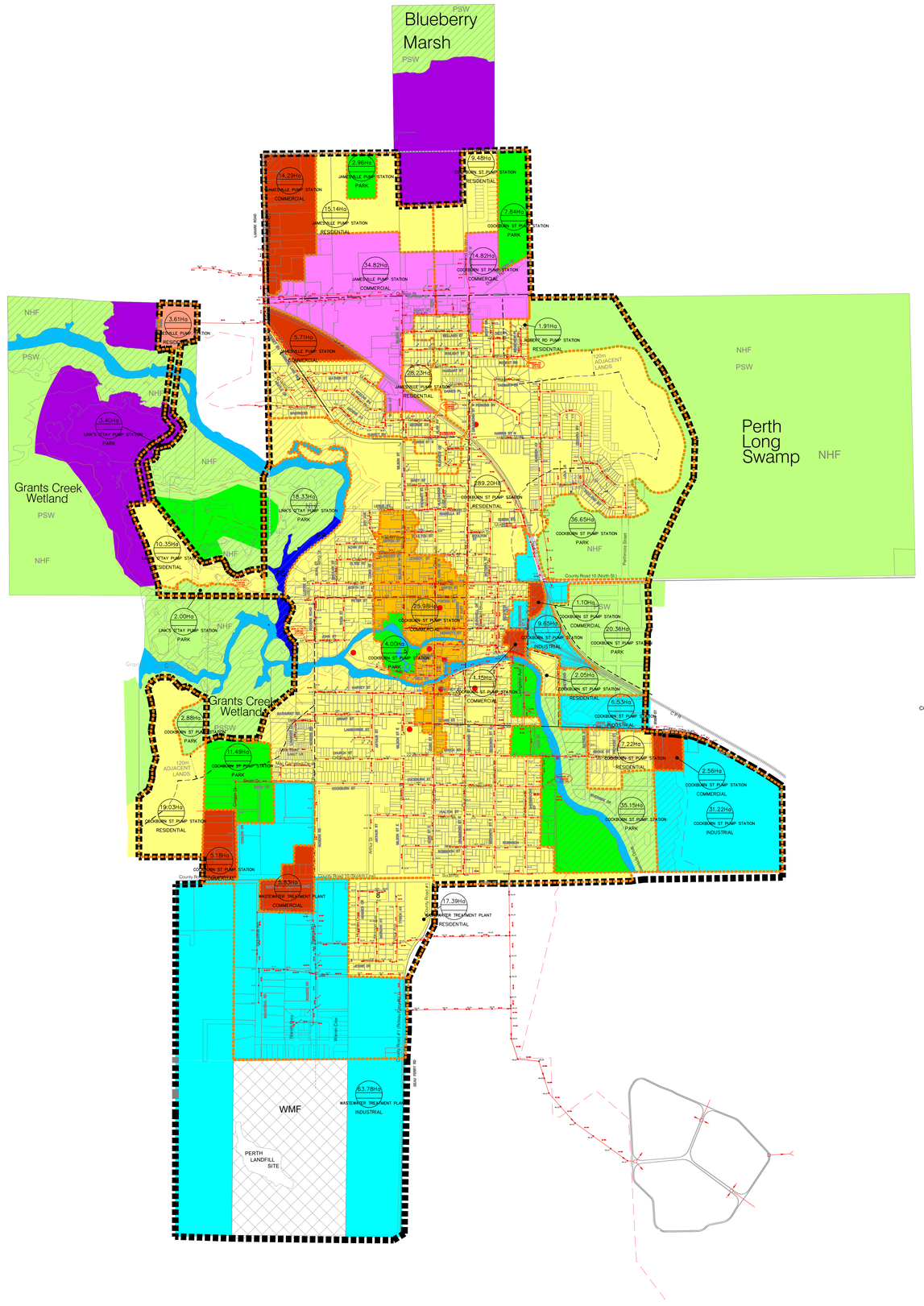
CONCEPTUAL WATERMAIN

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	3



LAND USE DESIGNATION

(FROM TOWN OF PERTH OFFICIAL PLAN)

- PERTH URBAN SETTLEMENT BOUNDARY
- RESIDENTIAL AREA
- CENTRAL AREA DISTRICT
- BUSINESS PARK
- HIGHWAY COMMERCIAL DISTRICT
- INDUSTRIAL AREA
- NEW RESIDENTIAL AREA
- SPECIAL STUDY AREA
- PARKS AND OPEN SPACE
- NHF FC / PSW PSSW — ENVIRONMENTAL PROTECTION AREA DESIGNATION CONSISTS OF FLOOD PLAIN CONSTRAINT (FC), NATURAL HERITAGE FEATURES (NHF), PROVINCIALLY SIGNIFICANT WETLANDS (PSW) AND PROVINCIALLY SIGNIFICANT SHIELD WETLANDS (PSSW)
- **OTHER PARKS**
- **WASTE MANAGEMENT FACILITY**
- **1:100 YEAR REGULATORY FLOOD LEVEL**
- **FLOOD PLAIN**
- **FILL AND CONSTRUCTION LINE**

LEGEND

(SEWER NETWORK FROM TOWN OF PERTH INFRASTRUCTURE MAPS)

- SANITARY TRUNK SEWER
- SANITARY MANHOLE
- SANITARY TRIBUTARY AREA
- 5.00Ha — AREA IN HECTARES
- COCKBURN ST PUMP STATION / RESIDENTIAL — DOWNSTREAM PUMP STATION AREA TYPE

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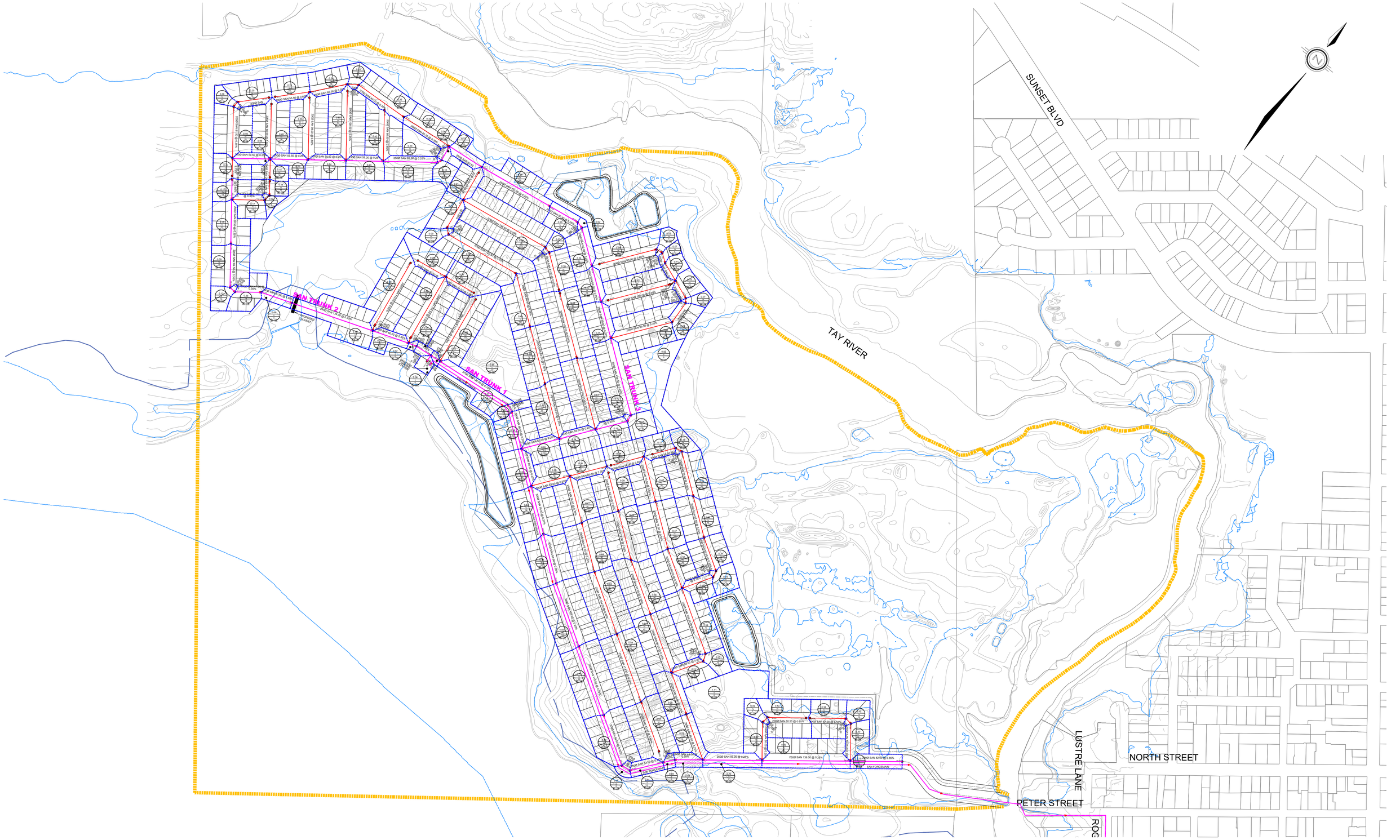
TOWN OF PERTH

PERTH-WIDE SANITARY TRIBUTARY AREA FIGURE

PROJECT No. :	21-1278
SCALE:	1:8000
DATE:	FEBRUARY 2023
DRAWING No.	4



LEGEND

- SITE BOUNDARY
- AREA IN HECTARES / POPULATION PER HECTARE / POPULATION (0.45 / 104 / 55 / Residential)
- SANITARY TRUNK SEWER
- SANITARY LOCAL SEWER
- SANITARY FORCEMAIN
- SANITARY MANHOLE
- SANITARY TRIBUTARY AREA

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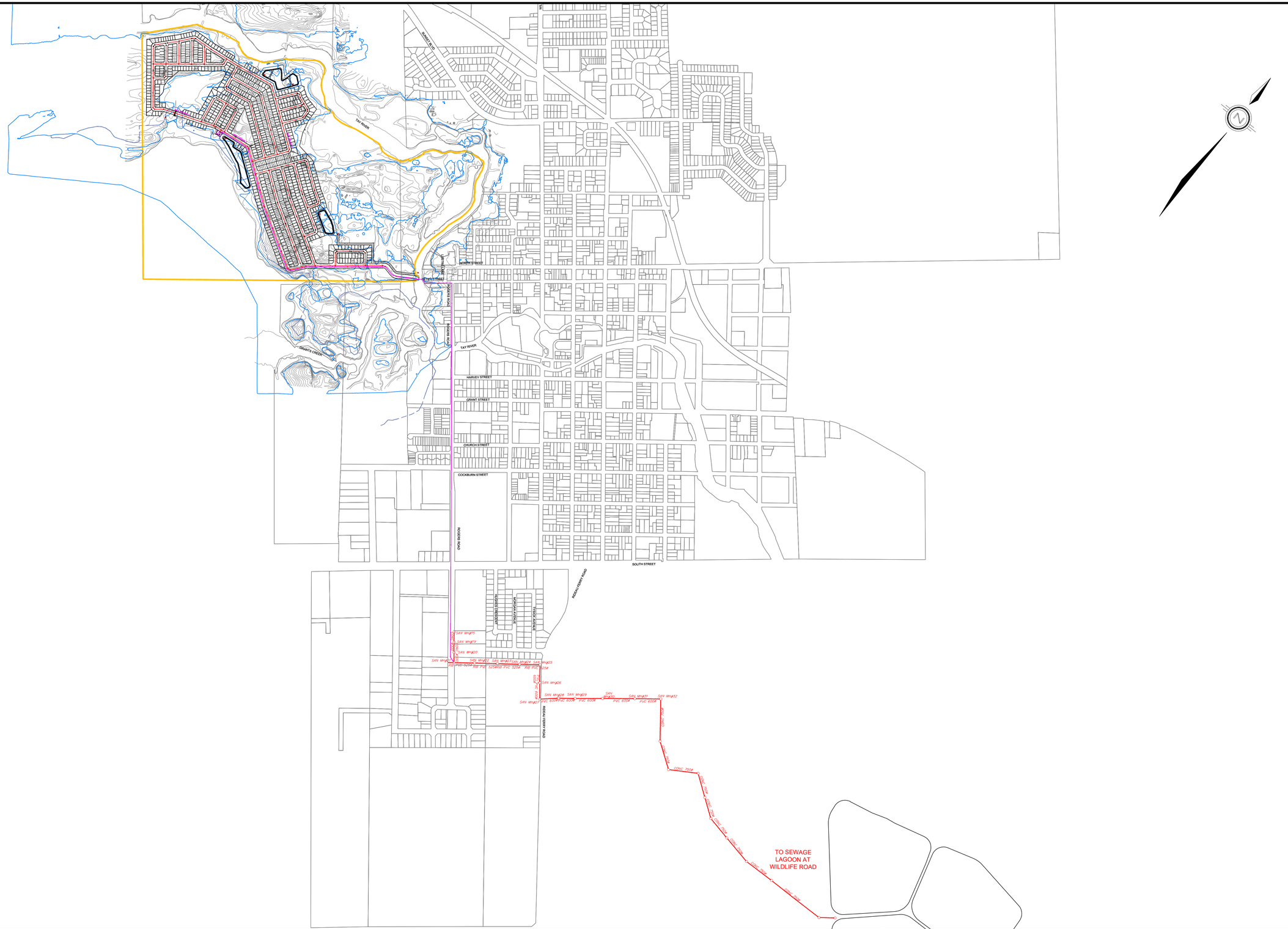
PERTH

TOWN OF PERTH

ON-SITE SANITARY SERVICING PLAN

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	5



LEGEND

- SITE BOUNDARY
- SANITARY TRUNK SEWER
- SANITARY LOCAL SEWER
- SANITARY FORCEMAIN
- SANITARY MANHOLE

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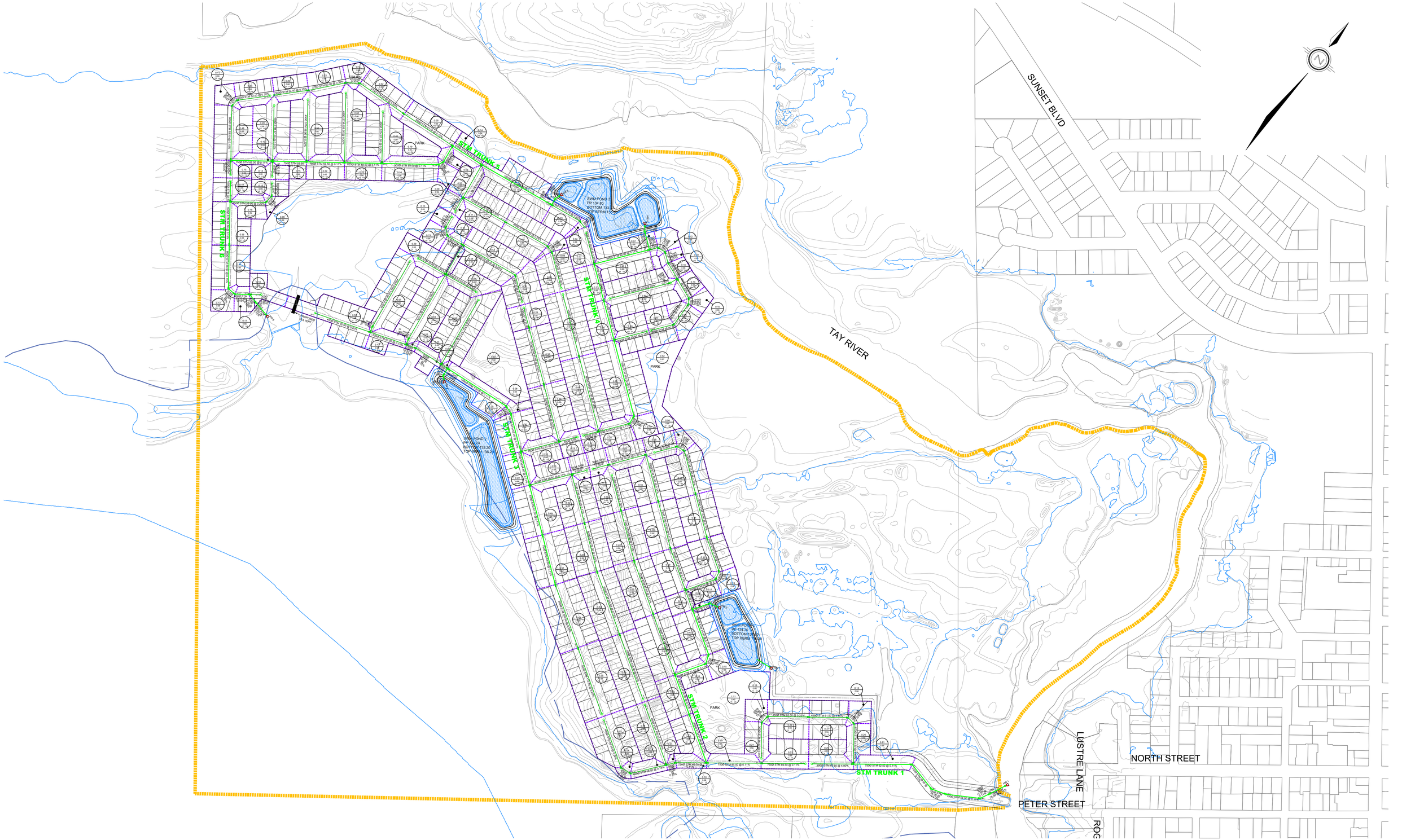
PERTH

TOWN OF PERTH

OFF-SITE SANITARY SERVICING PLAN

SCALE:	1:8000	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	6



LEGEND

- SITE BOUNDARY
- 0.50 / 0.65 / H2 '55 — AREA IN HECTARES / RUNOFF COEFFICIENT
- STORM TRUNK SEWER
- STORM LOCAL SEWER
- STORM TRUNK TRIBUTARY AREA
- STORM MAHOLE

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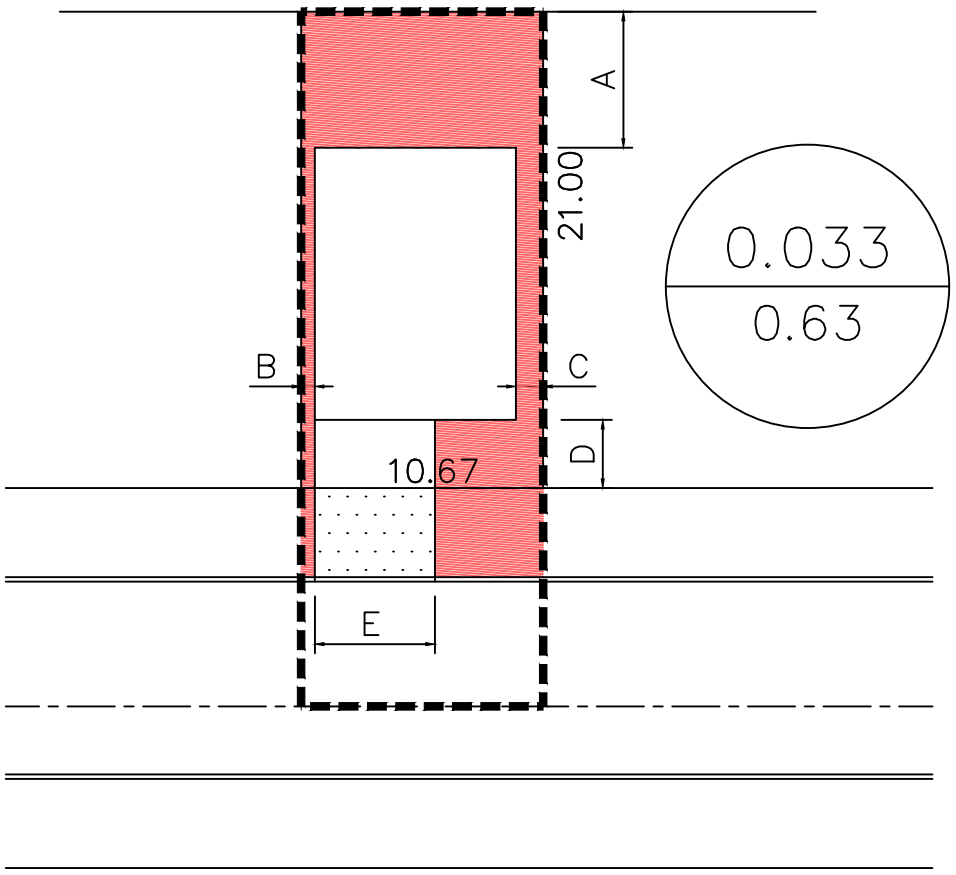
TOWN OF PERTH

STORM SERVICING PLAN

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	7



DIMENSIONS:
A = 6.00 m
B = 0.60 m
C = 1.20 m
D = 3.00 m
E = 5.30 m
ENVELOPE: 8.87x12.00 m
LOT: 10.67x21.00 m

NOTE:
TOTAL AREA: 326.82 m2
TOTAL IMP AREA: 204.00 m2
IMP %: 62%
RC: 0.63

16.75 m ROW SINGLE UNIT RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.033 / 0.63 RC VALUE
STM TRIB LINE
10.67 LOT DIMENSION

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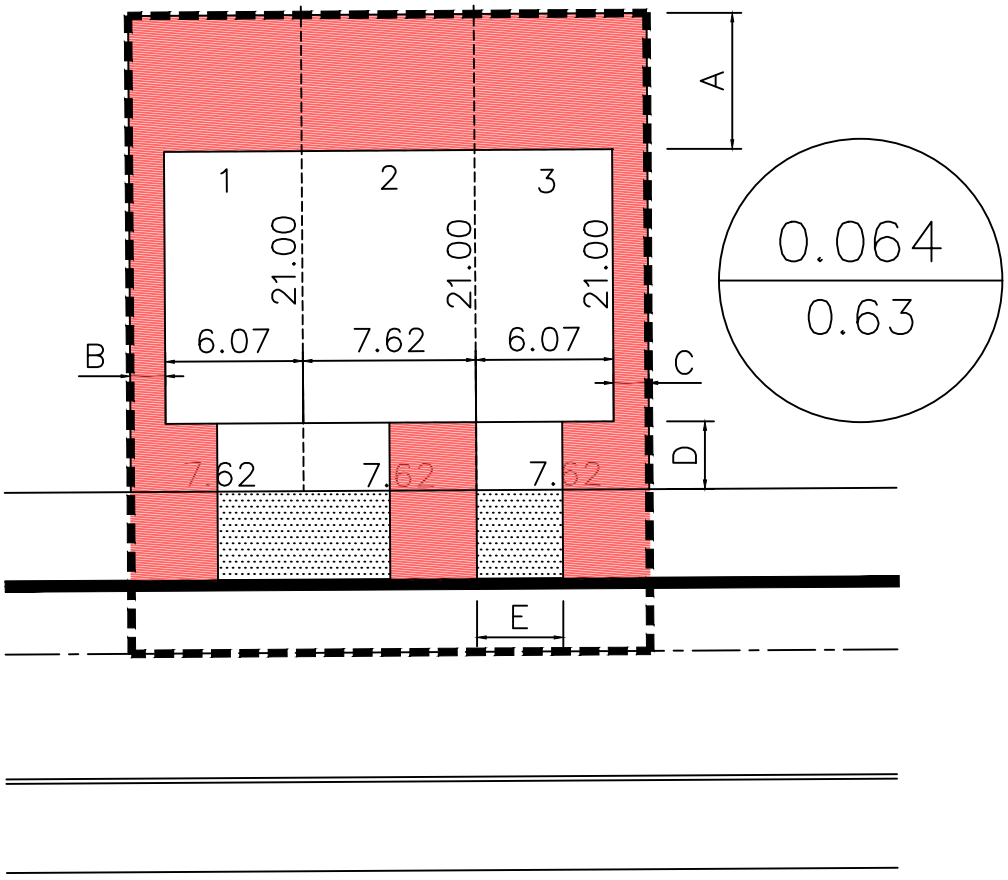
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8A



DIMENSIONS:
A = 6.00 m
B = 1.55 m
C = 1.55 m
D = 3.00 m
E = 3.80 m
ENVELOPE LENGTH: 12.00 m
LOT: 22.86x21.00 m

NOTE:
TOTAL AREA: 643.00 m2
TOTAL IMP AREA: 389.23 m2
IMP %: 61%
RC: 0.63

16.75 m ROW TH RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.065 / 0.62 RC VALUE
STM TRIB LINE
7.62 LOT DIMENSION

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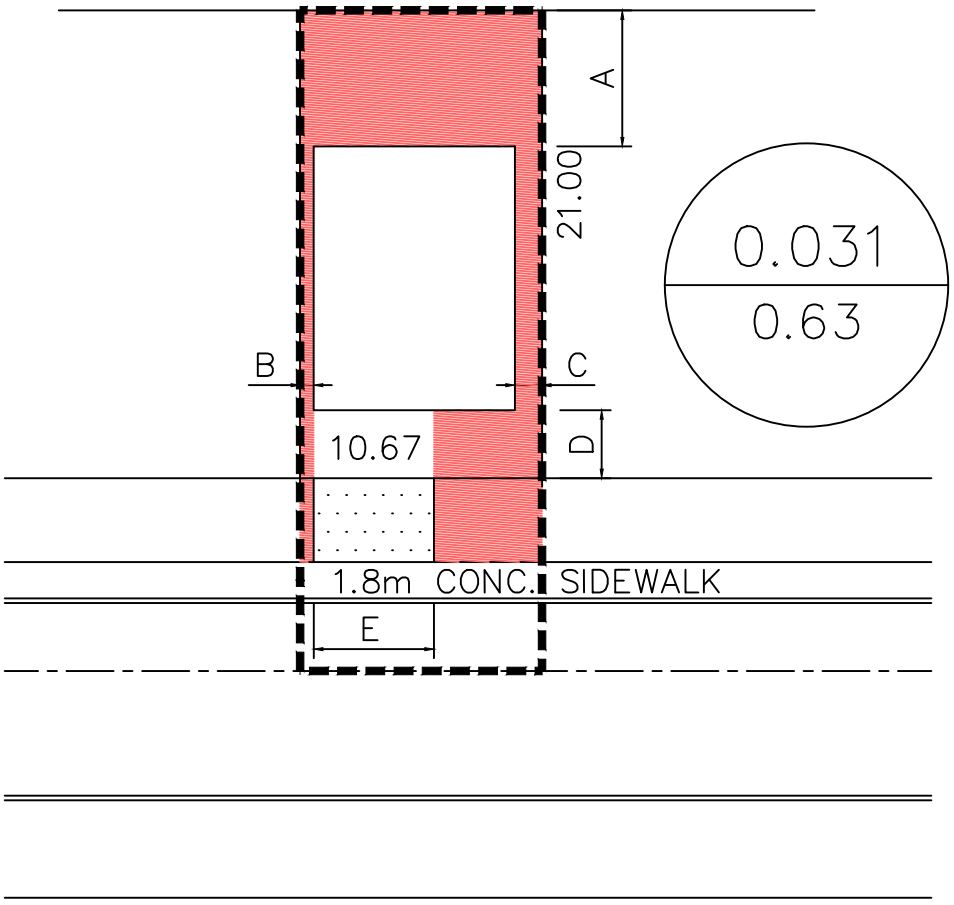
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8B



DIMENSIONS:
A = 6.00 m
B = 0.60 m
C = 1.20 m
D = 3.00 m
E = 5.30 m
ENVELOPE: 8.87x12.00 m
LOT: 10.67x21.00

NOTE:
TOTAL AREA: 310.82 m2
TOTAL IMP AREA: 189.91 m2
IMP %: 61%
RC: 0.63

18.50 m ROW SINGLE UNIT RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
10.67 LOT DIMENSION

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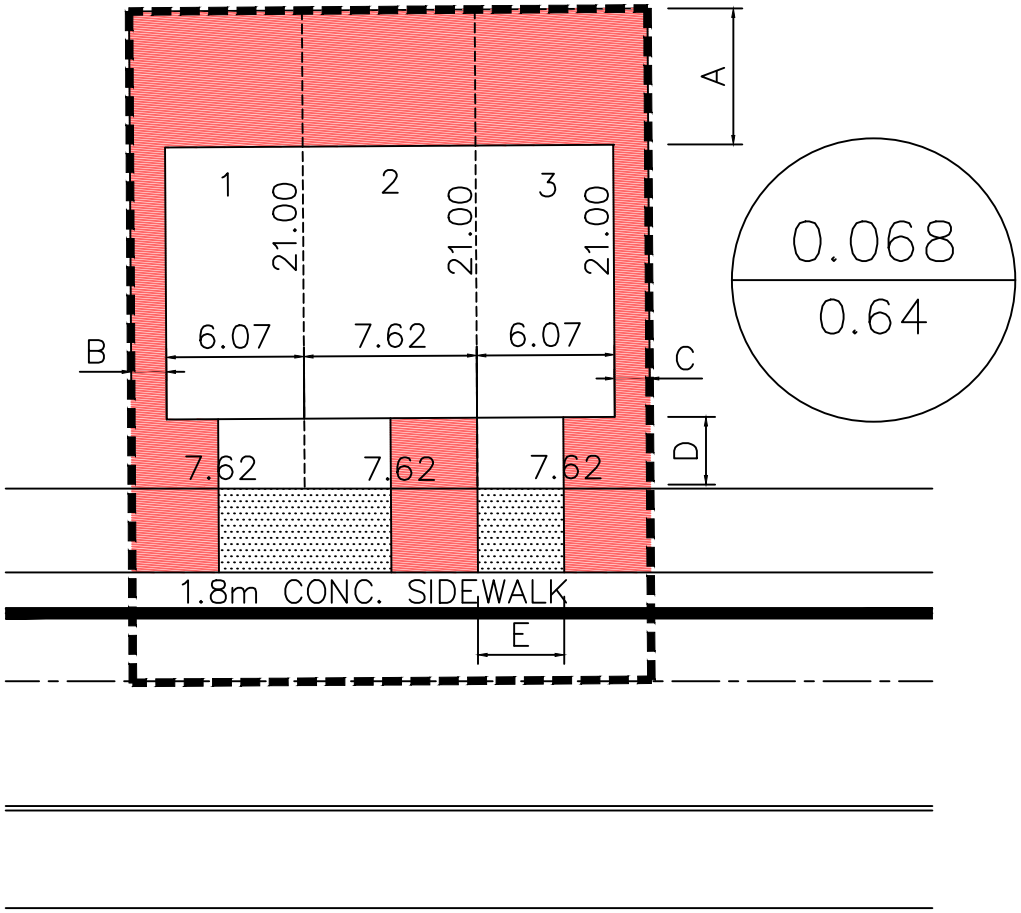
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8C



DIMENSIONS:
A = 6.00 m
B = 1.55 m
C = 1.55 m
D = 3.00 m
E = 3.80 m
ENVELOPE LENGTH: 12.00 m
LOT: 22.86x21.00 m

NOTE:
TOTAL AREA: 676.66 m2
TOTAL IMP AREA: 424.29 m2
IMP %: 63%
RC: 0.64

18.5 m ROW TH RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
7.62 LOT DIMENSION

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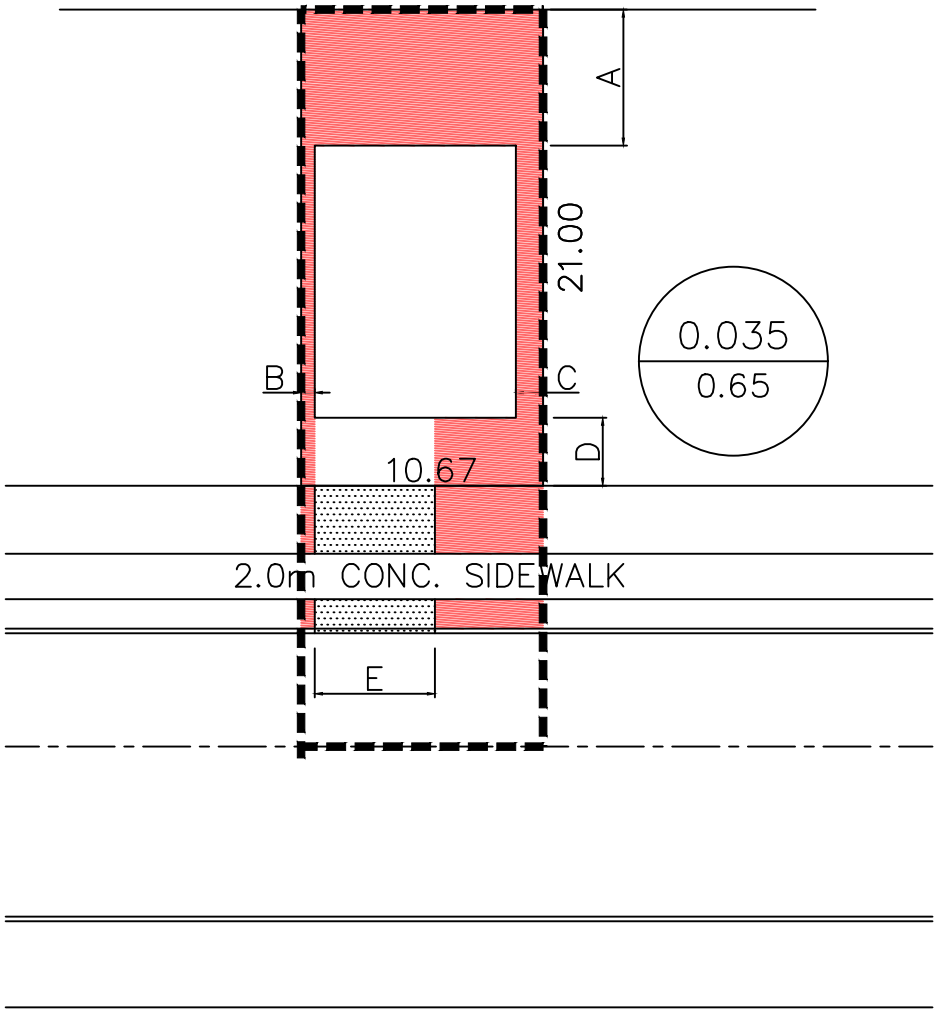
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8D



DIMENSIONS:
A = 6.00 m
B = 0.60 m
C = 1.20 m
D = 3.00 m
E = 5.30 m
ENVELOPE: 8.87x12.00 m
LOT: 10.67x21.00 m

NOTE:
TOTAL AREA: 346.78 m2
TOTAL IMP AREA: 221.96 m2
IMP %: 64%
RC: 0.65

23.0 m ROW SINGLE UNIT RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
10.67 LOT DIMENSION

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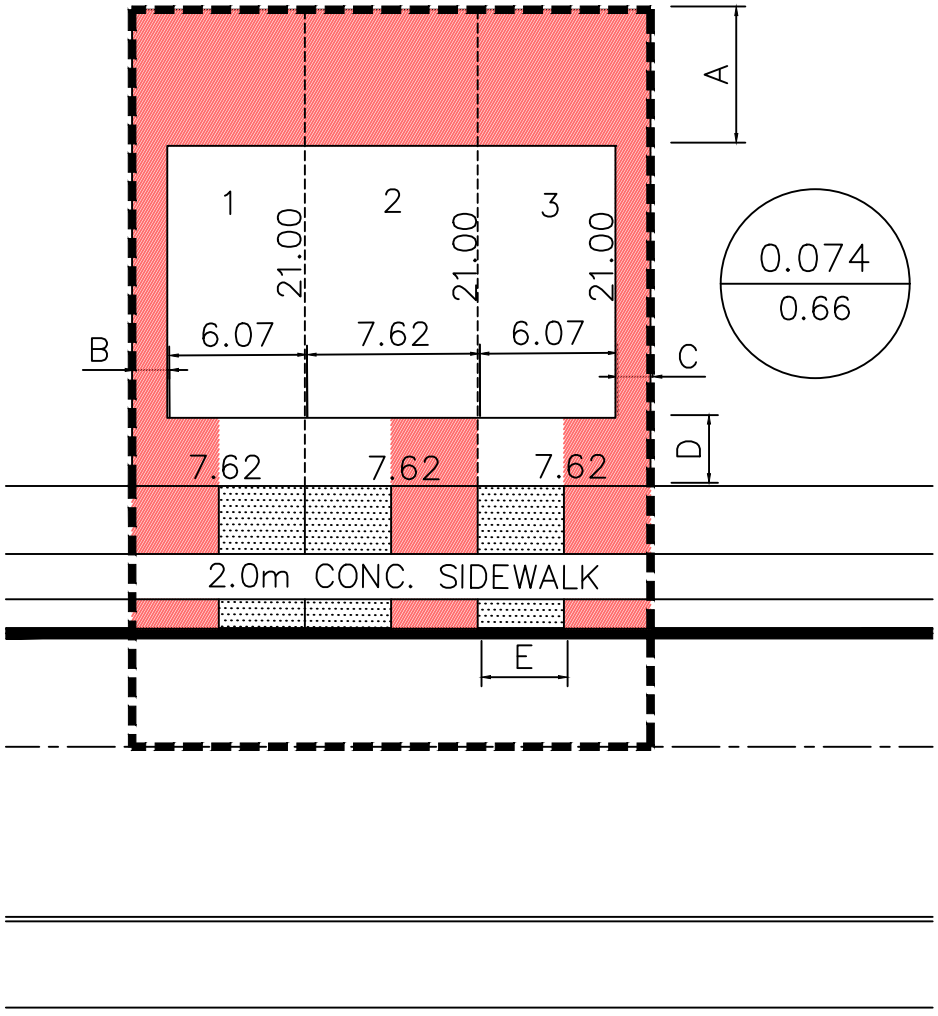
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8E



DIMENSIONS:
A = 6.00 m
B = 1.55 m
C = 1.55 m
D = 3.00 m
E = 3.80 m
ENVELOPE LENGTH: 12.00 m
LOT: 22.86x21.00 m

NOTE:
TOTAL AREA: 742.93 m2
TOTAL IMP AREA: 484.92 m2
IMP %: 65%
RC: 0.66

23.0 m ROW TH RC FIGURE

LEGENDS
PERVIOUS HATCH
TOTAL AREA 0.035 / 0.65 RC VALUE
STM TRIB LINE
7.62 LOT DIMENSION

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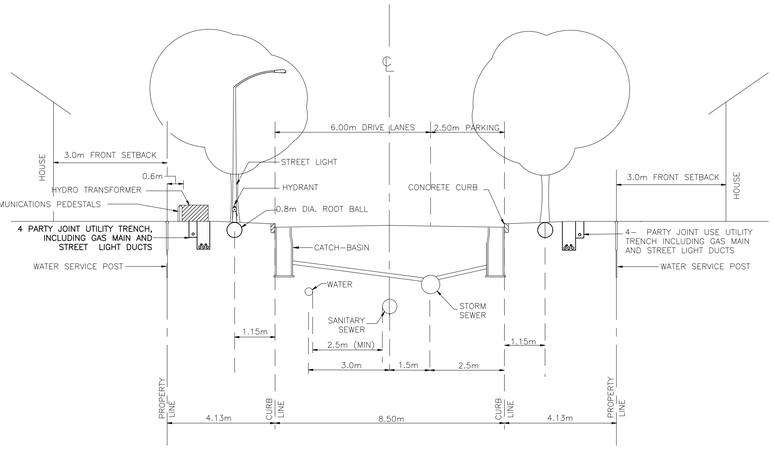
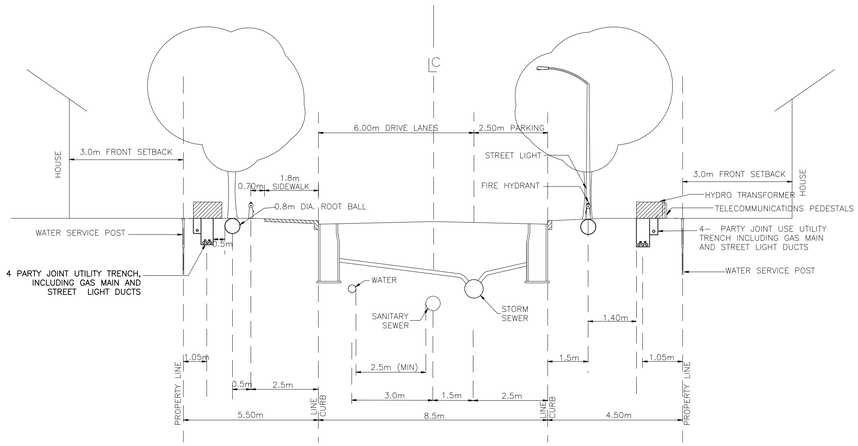
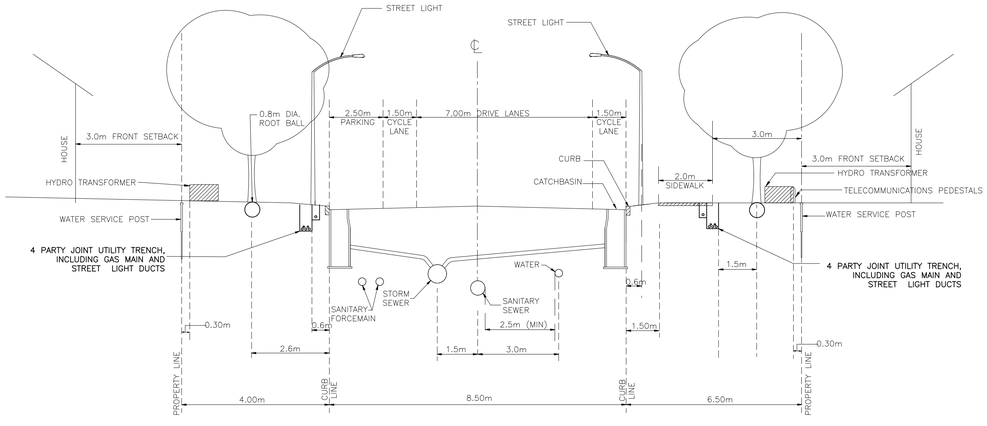
SCALE:	NTS	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	8F



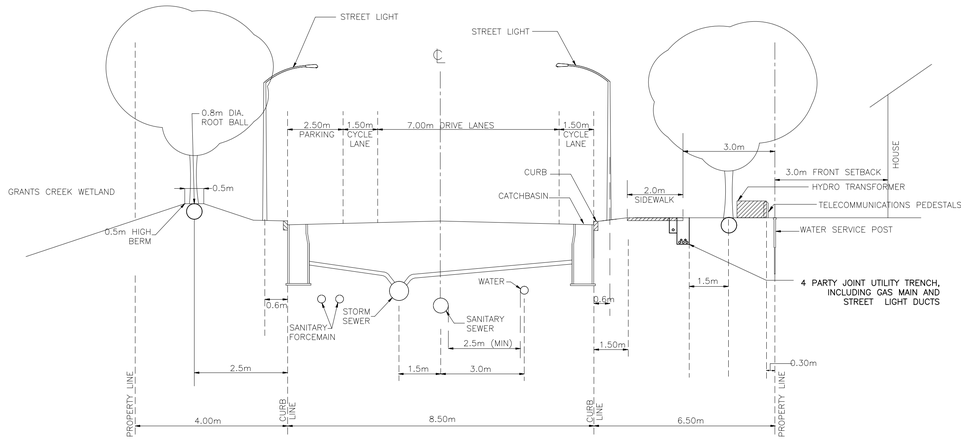
16.75 m SECTION



18.50 m SECTION



23.0 m ROW SECTION



23.0 m ROW SECTION - WINDOW STREET

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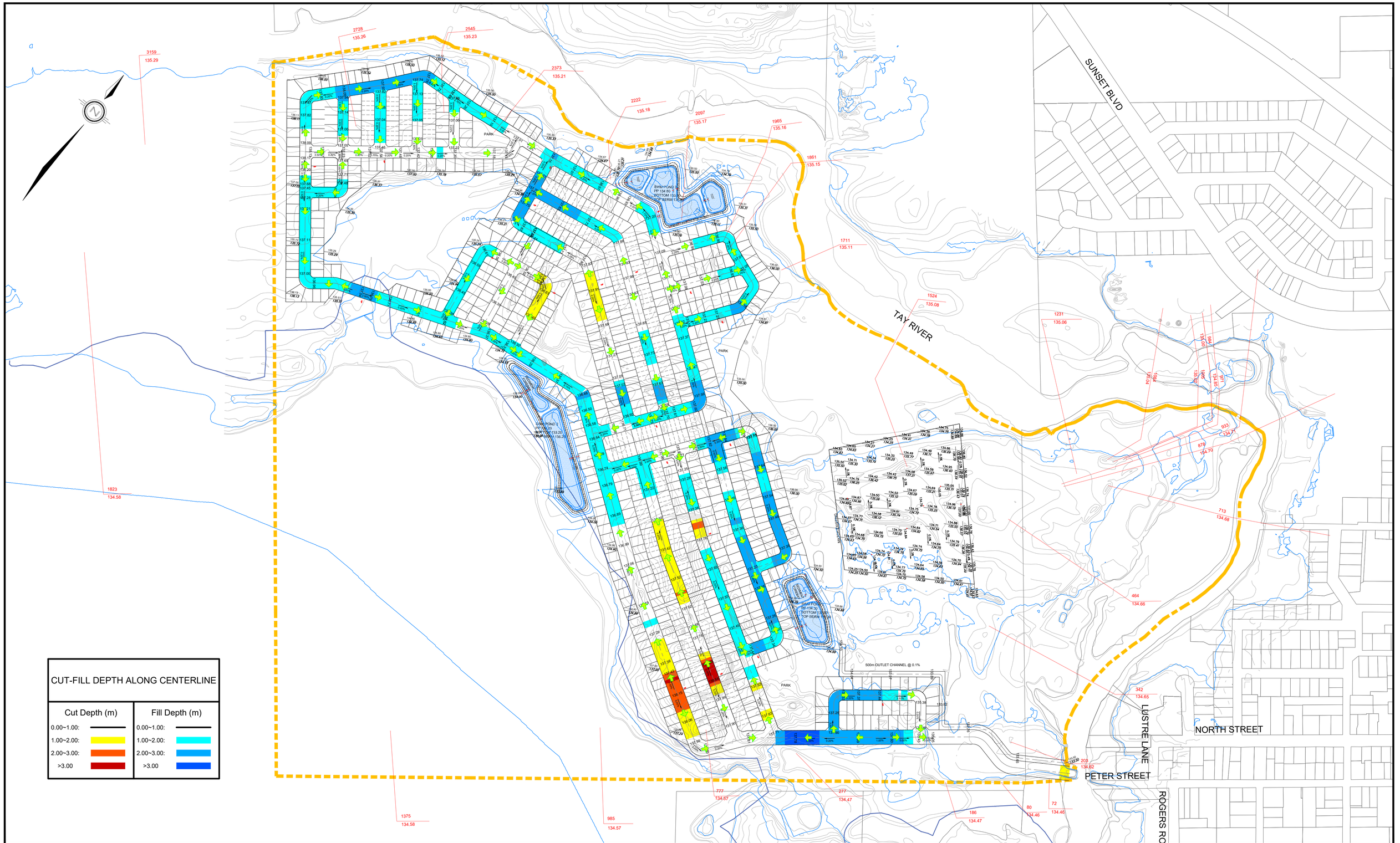
PERTH

TOWN OF PERTH

STANDARD ROW CROSS-SECTIONS

SCALE:	N.T.S.	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	9



CUT-FILL DEPTH ALONG CENTERLINE	
Cut Depth (m)	Fill Depth (m)
0.00~1.00:	0.00~1.00:
1.00~2.00:	1.00~2.00:
2.00~3.00:	2.00~3.00:
>3.00	>3.00

LEGEND

- SITE BOUNDARY
- STORM OVERLAND FLOW ARROW
- 135.45 / 135.45 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1375 / 134.58 — STATION NUMBER / REGULATORY FLOOD ELEVATION (m)

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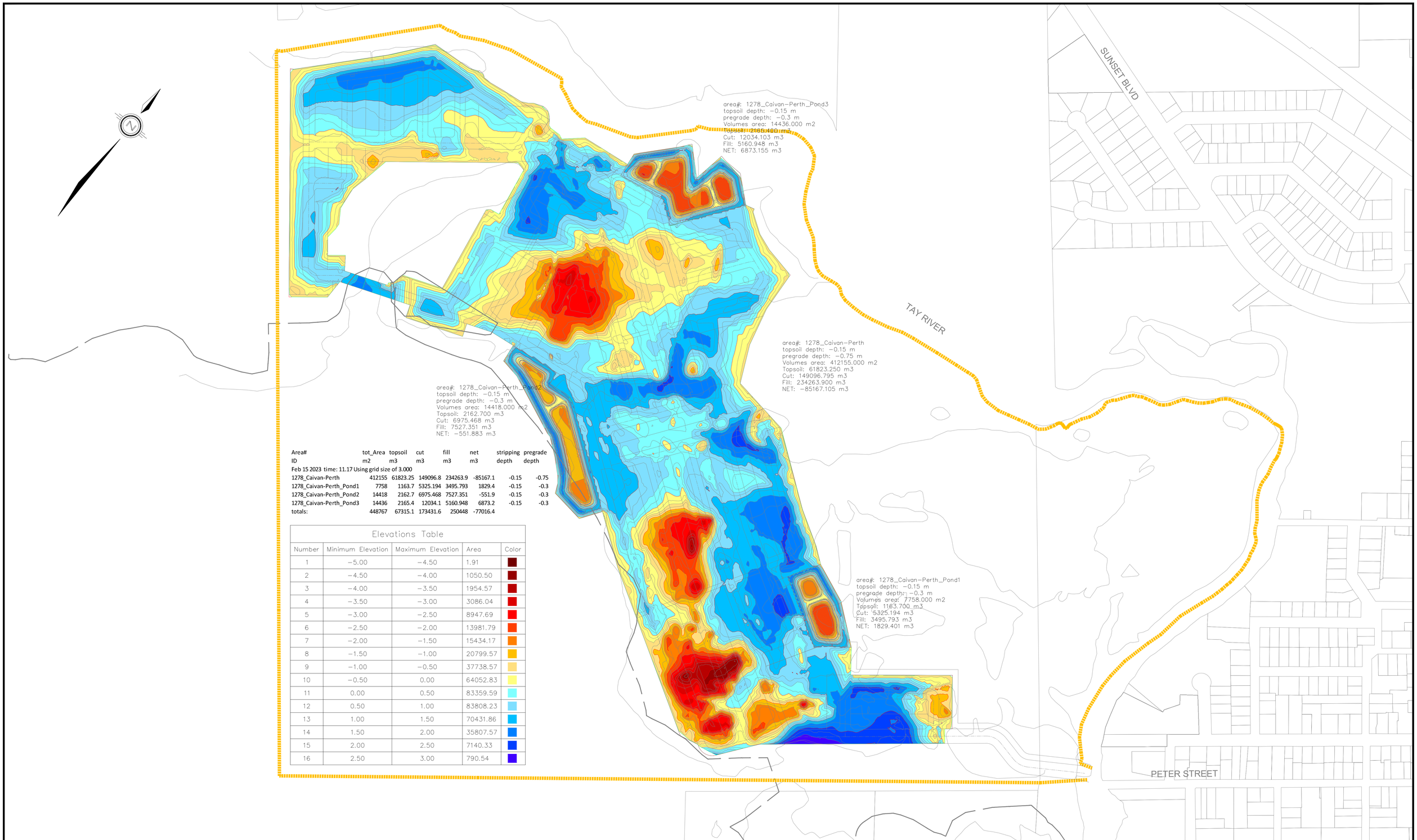
PERTH

TOWN OF PERTH

GRADING PLAN

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEBRUARY 2023	FIGURE:	10



Area# ID	tot_Area m2	topsoil m3	cut m3	fill m3	net m3	stripping depth	pregrade depth
Feb 15 2023 time: 11.17 Using grid size of 3.000							
1278_Caivan-Perth	412155	61823.25	149096.8	234263.9	-85167.1	-0.15	-0.75
1278_Caivan-Perth_Pond1	7758	1163.7	5325.194	3495.793	1829.4	-0.15	-0.3
1278_Caivan-Perth_Pond2	14418	2162.7	6975.468	7527.351	-551.9	-0.15	-0.3
1278_Caivan-Perth_Pond3	14436	2165.4	12034.1	5160.948	6873.2	-0.15	-0.3
totals:	448767	67315.1	173431.6	250448	-77016.4		

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	-5.00	-4.50	1.91	
2	-4.50	-4.00	1050.50	
3	-4.00	-3.50	1954.57	
4	-3.50	-3.00	3086.04	
5	-3.00	-2.50	8947.69	
6	-2.50	-2.00	13981.79	
7	-2.00	-1.50	15434.17	
8	-1.50	-1.00	20799.57	
9	-1.00	-0.50	37738.57	
10	-0.50	0.00	64052.83	
11	0.00	0.50	83359.59	
12	0.50	1.00	83808.23	
13	1.00	1.50	70431.86	
14	1.50	2.00	35807.57	
15	2.00	2.50	7140.33	
16	2.50	3.00	790.54	

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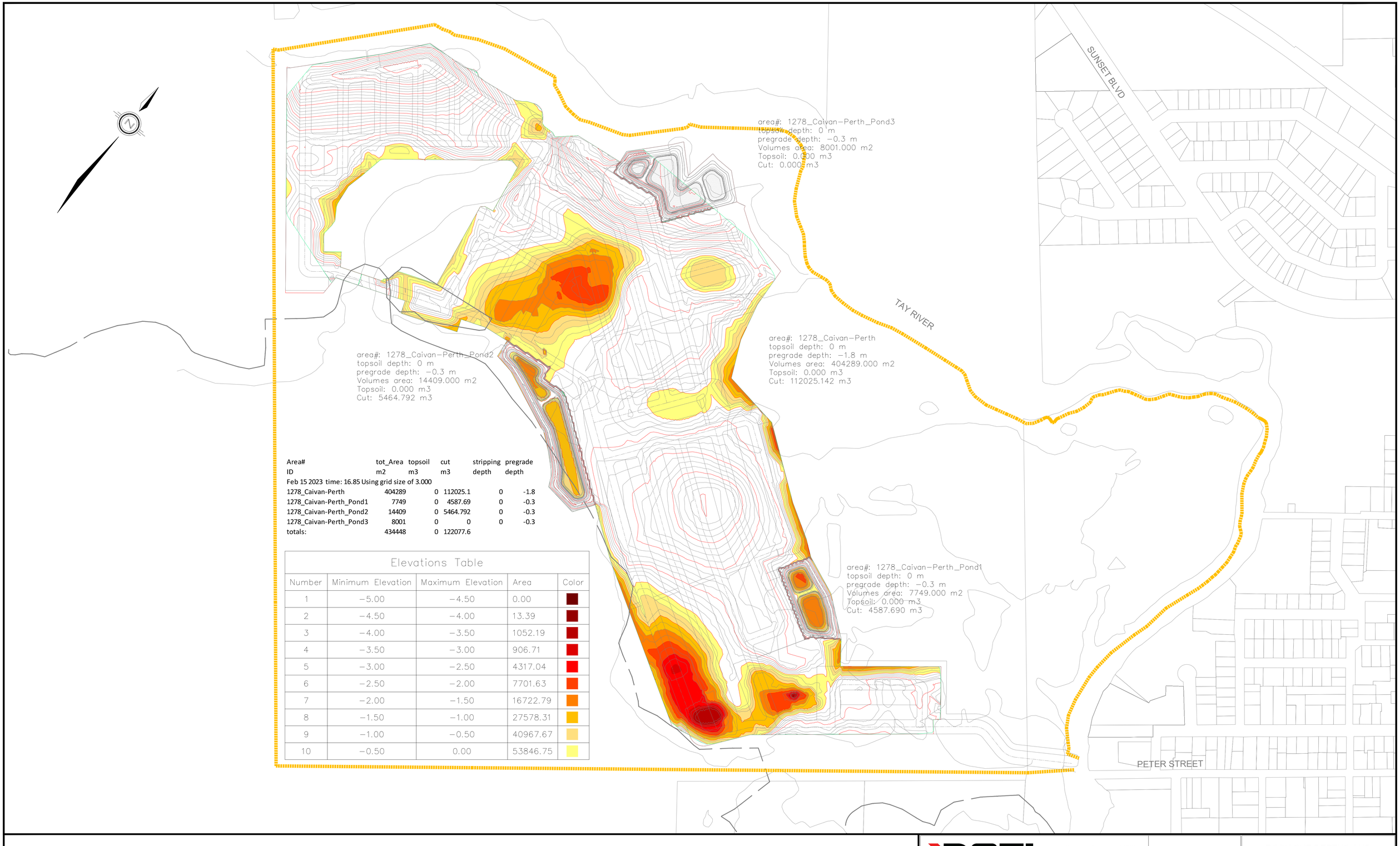
PERTH

TOWN OF PERTH

CUT AND FILL DEPTHS AND VOLUMES (0.75m PREGRADE)

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	11



Area#	tot_Area	topsoil	cut	stripping	pregrade
ID	m2	m3	m3	depth	depth
Feb 15 2023 time: 16.85 Using grid size of 3.000					
1278_Caivan-Perth	404289	0	112025.1	0	-1.8
1278_Caivan-Perth_Pond1	7749	0	4587.69	0	-0.3
1278_Caivan-Perth_Pond2	14409	0	5464.792	0	-0.3
1278_Caivan-Perth_Pond3	8001	0	0	0	-0.3
totals:	434448	0	122077.6		

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−5.00	−4.50	0.00	
2	−4.50	−4.00	13.39	
3	−4.00	−3.50	1052.19	
4	−3.50	−3.00	906.71	
5	−3.00	−2.50	4317.04	
6	−2.50	−2.00	7701.63	
7	−2.00	−1.50	16722.79	
8	−1.50	−1.00	27578.31	
9	−1.00	−0.50	40967.67	
10	−0.50	0.00	53846.75	

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TOWN OF PERTH

ROCK CUT DEPTHS AND VOLUMES

SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	11

Area#	tot_Area	topsoil	cut
ID	m2	m3	m3
Feb 16 2023	time: 14.31	Using grid size of	
FP_CUT1	38718	0	5904.901
totals:	38718	0	5904.9

Area#	tot_Area	topsoil	fill
ID	m2	m3	m3
Feb 16 2023	time: 10.81	Using grid size of	
FP_FILL1	189	0	58.241
FP_FILL2	3195	0	444.1
FP_FILL3	5850	0	1102.376
FP_FILL4	117	0	21.676
FP_FILL6	99	0	14.788
FP_FILL7	261	0	23.928
FP_FILL8	297	0	34.279
FP_FILL9	450	0	199.202
FP_FILL10	4446	0	527.138
FP_FILL11	918	0	131.548
FP_FILL12	1233	0	479.666
FP_FILL13	3690	0	27.017
FP_FILL14	1863	0	288.401
FP_FILL15	945	0	119.9
FP_FILL16	504	0	0
FP_FILL17	189	0	0
FP_FILL18	144	0	5.341
FP_FILL19	27	0	0.032
FP_FILL20	135	0	0.082
FP_FILL21	576	0	4.48
FP_FILL22	3159	0	411.759
FP_FILL23	9171	0	1545.836
totals:	37458	0	5439.8

Elevations Table

Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−1.00	−0.90	0.00	
2	−0.90	−0.80	0.00	
3	−0.80	−0.70	927.70	
4	−0.70	−0.60	1529.40	
5	−0.60	−0.50	1971.31	
6	−0.50	−0.40	2246.56	
7	−0.40	−0.30	2467.02	
8	−0.30	−0.20	2802.88	
9	−0.20	−0.10	3384.64	
10	−0.10	0.00	13937.52	
11	0.00	0.10	20444.77	
12	0.10	0.20	11711.11	
13	0.20	0.30	3736.59	
14	0.30	0.40	2057.38	
15	0.40	0.50	1264.42	
16	0.50	0.60	813.62	
17	0.60	0.70	466.95	
18	0.70	0.80	34.83	
19	0.80	0.90	101.62	

SUNSET BLVD

TAY RIVER

PETER STREET

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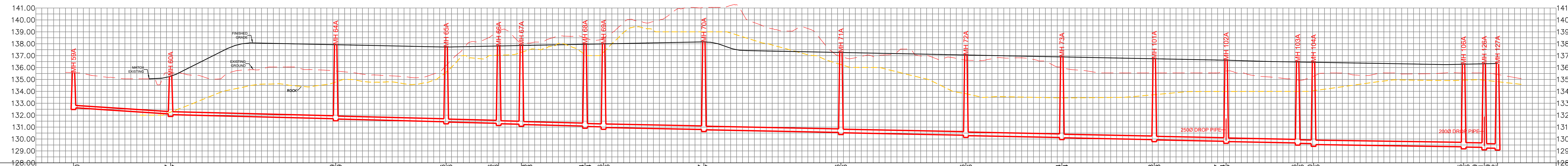
PERTH

TOWN OF PERTH

FLOODPLAIN
CUT VS FILL

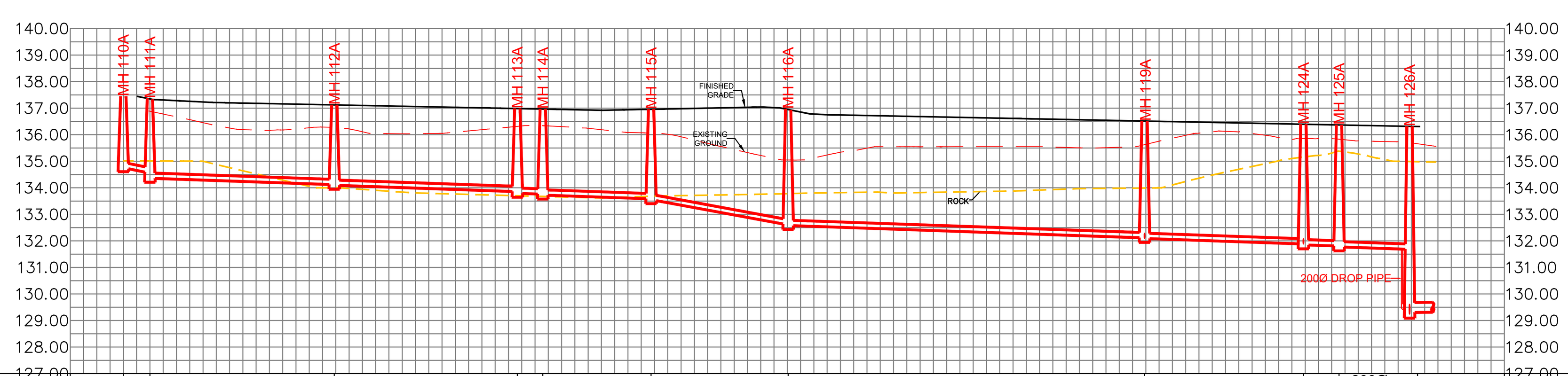
SCALE:	1:2500	PROJECT No.:	21-1278
DATE:	FEB 2023	FIGURE:	11

SAN TRUNK 1



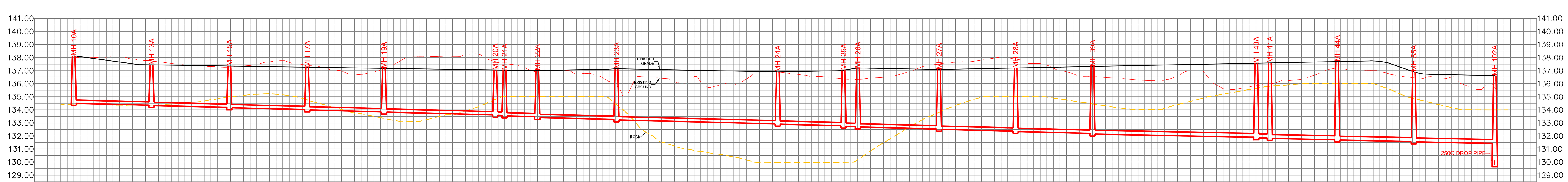
SANITARY INVERT	PROPOSED GRADES	CENTERLINE CHAINAGE
SW 132.630	135.572	0+001.707
200Ø SAN 82.0 @ 0.65%		
NE 132.097 SW 132.047	135.273	0+083.457
250Ø SAN 139.0 @ 0.25%		
NE 131.699 SW 131.679	137.917	0+222.471
250Ø SAN 93.0 @ 0.25%		
NE 131.446 SW 131.426	137.722	0+315.489
250Ø SAN 44.0 @ 0.25%		
SW 131.286 NE 131.316	137.811	0+359.668
250Ø SAN 19.0 @ 0.25%		
SW 131.218 NE 131.238	137.849	0+378.809
250Ø SAN 53.5 @ 0.25%		
NE 131.084 W 131.054	137.956	0+432.421
250Ø SAN 15.0 @ 0.25%		
E 131.016 NW 130.966	137.987	0+448.017
300Ø SAN 84.5 @ 0.20%		
SE 130.797 NW 130.777	138.149	0+532.450
300Ø SAN 115.5 @ 0.20%		
SE 130.546 NW 130.526	137.265	0+647.839
300Ø SAN 105.0 @ 0.20%		
SE 130.316 NW 130.286	137.055	0+753.059
300Ø SAN 81.0 @ 0.20%		
SE 130.124 NW 130.104	136.893	0+833.877
300Ø SAN 78.0 @ 0.20%		
SE 129.948 NW 129.928	136.738	0+911.671
300Ø SAN 60.5 @ 0.20%		
SE 129.807 NE 131.424 NW 129.787	136.617	0+972.171
300Ø SAN 60.5 @ 0.20%		
SE 129.666 W 129.636	136.466	1+032.440
300Ø SAN 13.0 @ 0.20%		
E 129.610 W 129.535	136.442	1+045.775
375Ø SAN 126.5 @ 0.15%		
E 129.345 W 129.325	136.280	1+172.122
375Ø SAN 17.5 @ 0.15%		
E 129.299 W 131.681 S 129.239	136.315	1+189.536
375Ø SAN 11.0 @ 0.15%		
N 129.222	136.337	1+200.698

SAN TRUNK 2



SANITARY INVERT	PROPOSED GRADES	CENTERLINE CHAINAGE
SE 134.757	137.448	0-010.000
200Ø SAN 31.5 @ 0.65%		
NW 134.552 SE 134.360	137.350	0-000.000
200Ø SAN 69.5 @ 0.35%		
NW 134.117 SE 134.097	137.124	0+069.430
200Ø SAN 69.5 @ 0.35%		
NW 133.854 E 133.794	136.986	0+138.353
200Ø SAN 10.5 @ 0.35%		
W 133.757 NE 133.727	136.967	0+147.927
200Ø SAN 41.0 @ 0.35%		
SW 133.583 E 133.553	136.959	0+188.716
200Ø SAN 51.5 @ 1.85%		
W 132.600 E 132.580	136.949	0+240.332
200Ø SAN 134.0 @ 0.35%		
W 132.111 E 132.091	136.515	0+374.512
200Ø SAN 60.0 @ 0.35%		
N 133.049 W 131.881 E 131.851	136.395	0+434.337
200Ø SAN 13.5 @ 0.35%		
W 131.804 E 131.774	136.368	0+447.742
200Ø SAN 26.5 @ 0.35%		
W 131.681 S 129.239 E 129.299	136.315	0+474.303
375Ø SAN 17.5 @ 0.15%		

SAN TRUNK 3



SANITARY INVERT	PROPOSED GRADES	CENTERLINE CHAINAGE
NE 134.499	138.143	0-000.000
250Ø SAN 59.5 @ 0.25%		
SW 134.350 NE 134.330	137.443	0+059.533
250Ø SAN 59.5 @ 0.25%		
SW 134.181 NE 134.161	137.354	0+119.133
250Ø SAN 59.5 @ 0.25%		
SW 134.012 NE 133.992	137.264	0+178.758
250Ø SAN 59.0 @ 0.25%		
SW 133.844 NE 133.824	137.176	0+237.508
250Ø SAN 85.5 @ 0.25%		
SW 133.610 N 133.580	137.048	0+322.752
250Ø SAN 7.5 @ 0.25%		
S 133.561 N 133.531	137.038	0+329.832
250Ø SAN 25.0 @ 0.25%		
S 133.468 E 133.408	137.000	0+354.911
250Ø SAN 60.5 @ 0.25%		
W 133.257 E 133.227	137.146	0+415.494
250Ø SAN 123.5 @ 0.25%		
W 132.918 E 132.898	136.901	0+539.063
250Ø SAN 50.5 @ 0.25%		
W 132.772 E 132.742	137.027	0+589.372
250Ø SAN 11.0 @ 0.25%		
W 132.714 SE 132.684	137.192	0+600.368
250Ø SAN 62.0 @ 0.25%		
NW 132.529 SE 132.509	137.086	0+662.433
250Ø SAN 59.0 @ 0.25%		
NW 132.361 SE 132.341	137.203	0+721.184
250Ø SAN 59.0 @ 0.25%		
NW 132.193 SE 132.143	137.321	0+779.934
300Ø SAN 125.5 @ 0.20%		
NW 131.892 S 131.862	137.571	0+905.340
300Ø SAN 11.0 @ 0.20%		
N 131.840 SW 131.810	137.592	0+915.765
300Ø SAN 52.0 @ 0.20%		
NE 131.706 SW 131.686	137.695	0+967.316
300Ø SAN 59.0 @ 0.20%		
NE 131.568 SW 131.548	136.902	1+026.067
300Ø SAN 62.0 @ 0.20%		
NE 131.424 NW 129.787 SE 129.807	136.617	1+087.962

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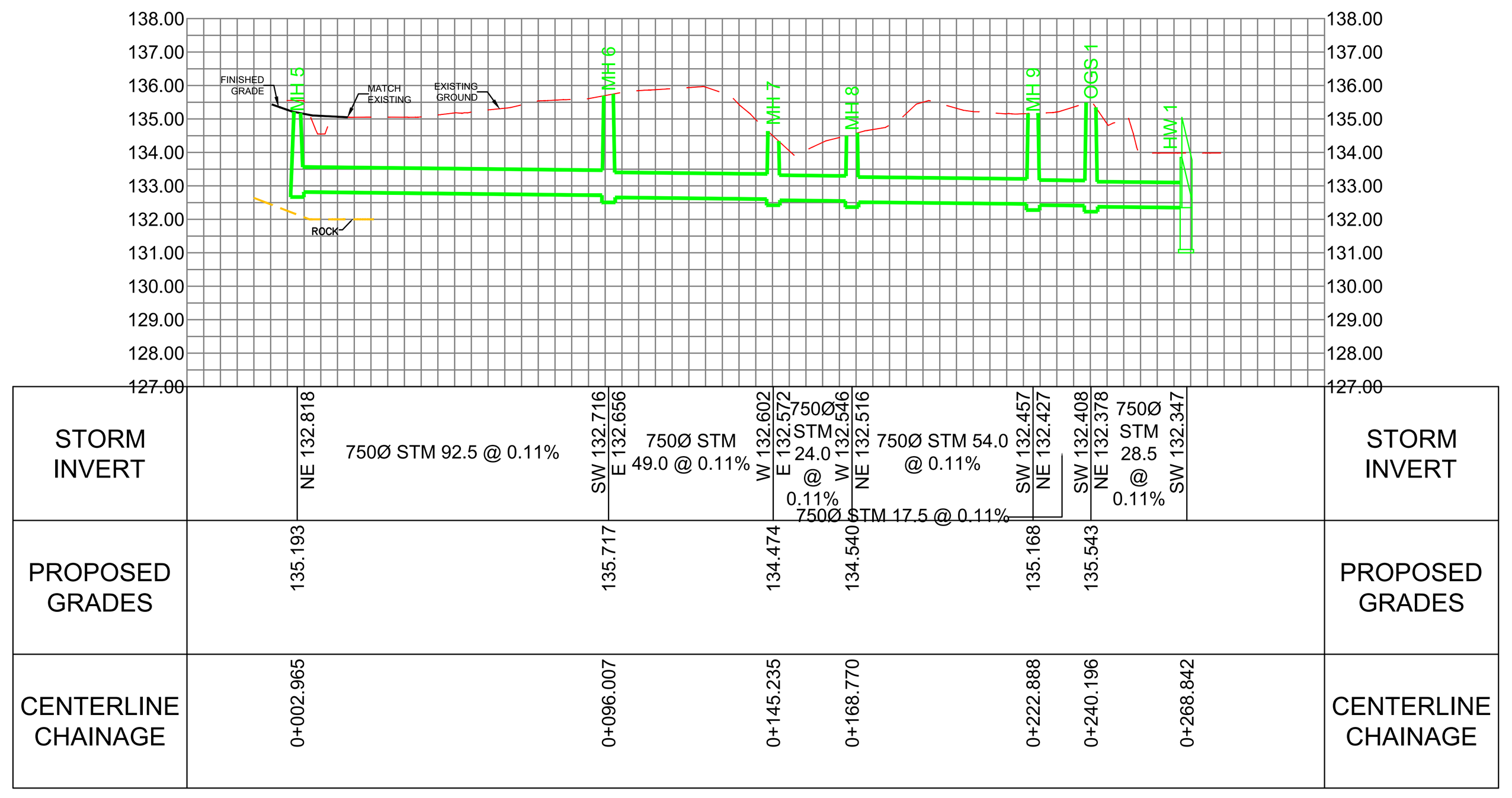
SANITARY TRUNK PROFILES

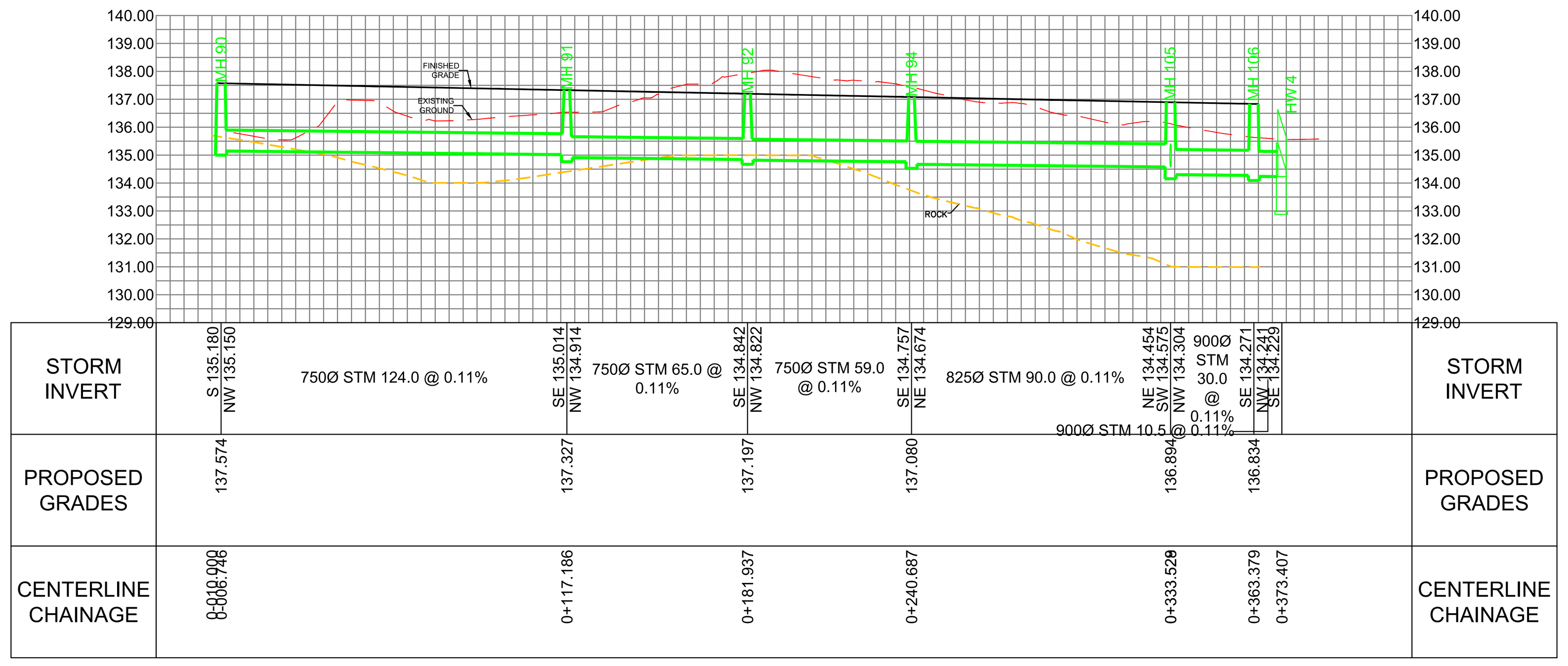
TOWN OF PERTH

PROJECT No. :	21-1278
SCALE:	1:1500
DATE:	FEBRUARY 2023
DRAWING No.	13

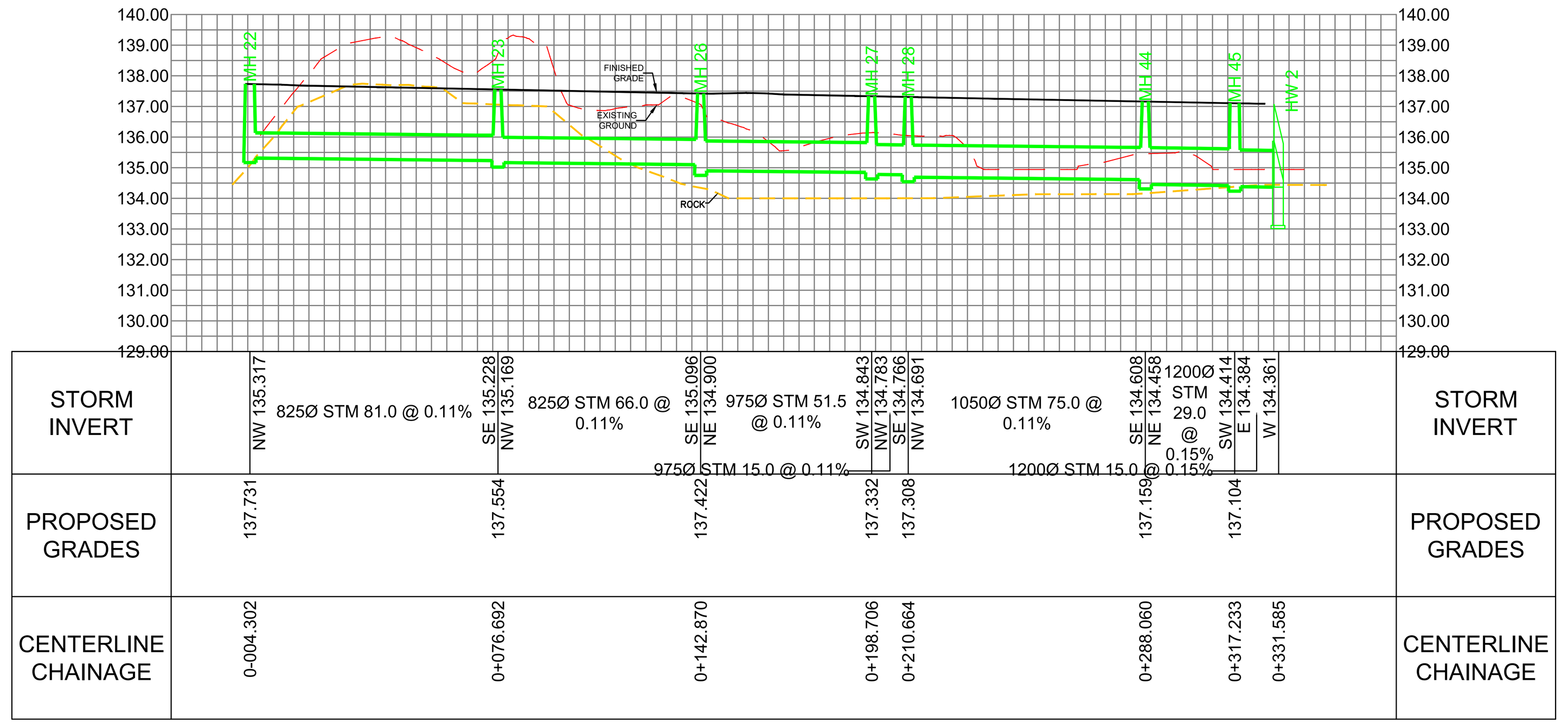
STM TRUNK 1



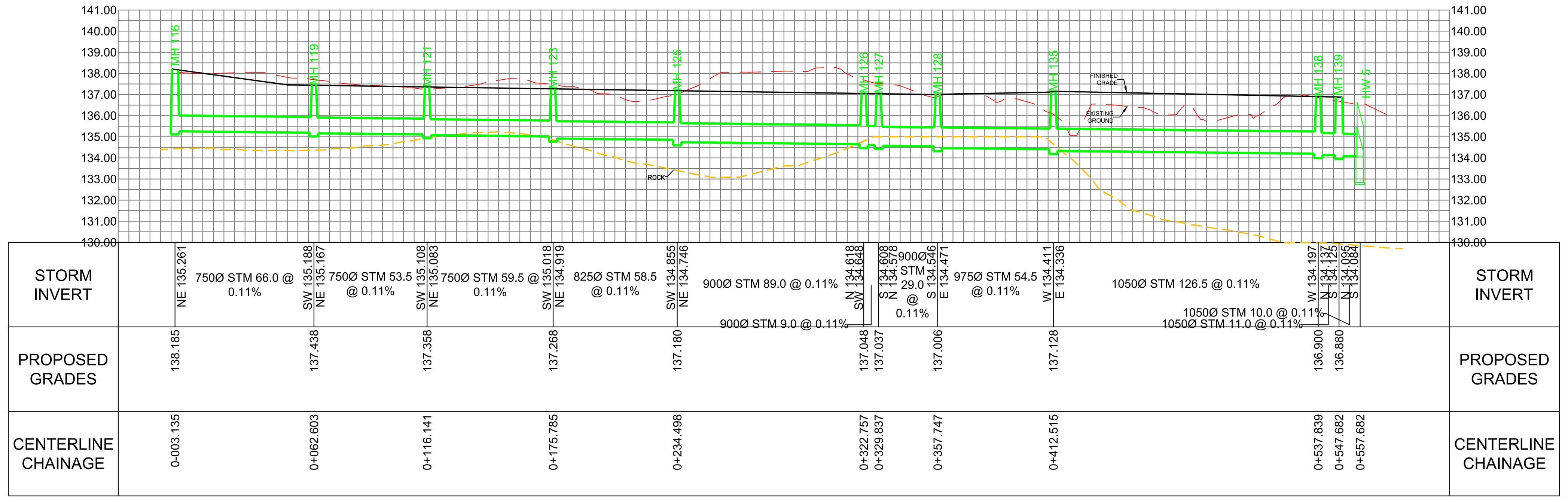
STM TRUNK 4



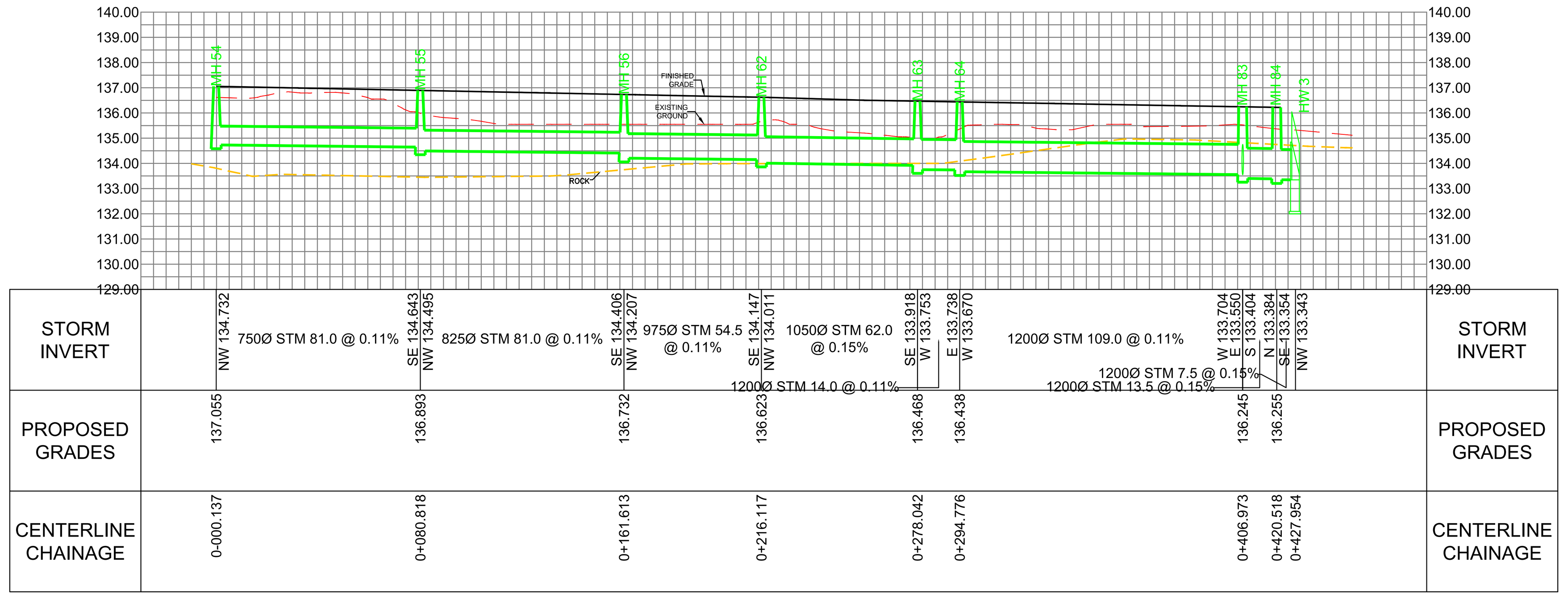
STM TRUNK 2



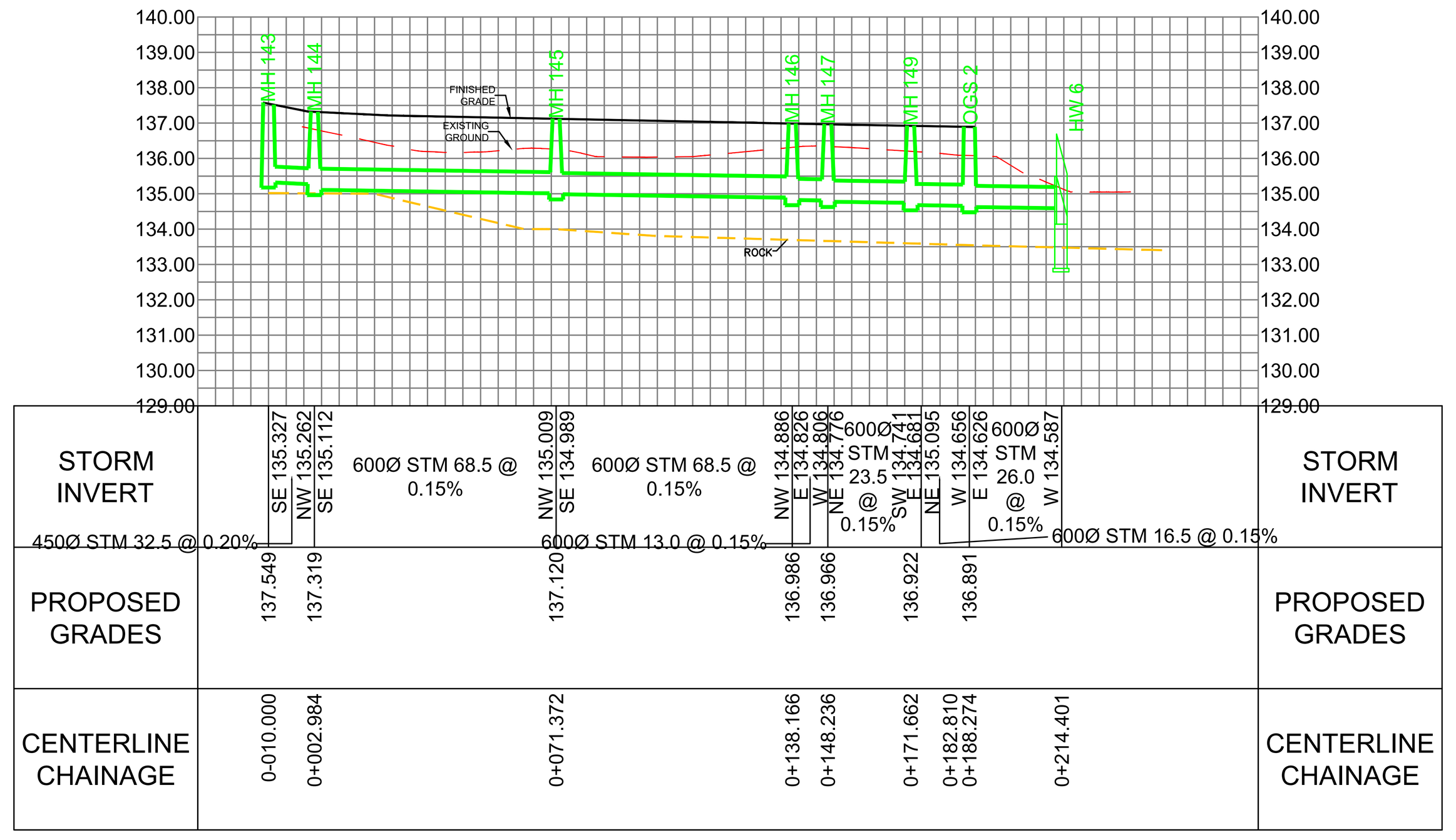
STM TRUNK 5



STM TRUNK 3



STM TRUNK 6



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STORM TRUNK PROFILES

TOWN OF PERTH

PROJECT No. :	21-1278
SCALE:	1:1500
DATE:	FEBRUARY 2023
DRAWING No.	14