FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

SITE PLAN SUBMISSION - DECEMBER 2025



4497 O'Keefe Court, Ottawa, Ontario
Proposed Office and Warehouse Development
KWA PROJECT: 21684
Application #D07-12-25-0085
Plan #19335

Report Prepared for:
O'Keefe Court Properties
c/o The Properties Group Mgmt Ltd.
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This report reflects best engineering judgment based on the material available at the time of its preparation. KWA Site Development Consulting Inc. accepts no responsibility for any damages to a third party that may arise as a result of decisions made or actions taken based on this report.

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1.0 INTRODUCTION

KWA Site Development Consulting Inc. (KWA) has been retained by The Properties Group to prepare a detailed Functional Servicing and Stormwater Management Report along with a corresponding grading and servicing design in support of the Site Plan Application (SPA) for the proposed development. The subject property is located at the northwest corner of O'Keefe Court at municipal address 4497 O'Keefe Court in the City of Ottawa (formerly the Municipality of Nepean). Refer to **Figure 1.1** below.

This report will:

- Provide background information regarding the subject property;
- Summarize the existing site conditions;
- Provide information regarding the proposed development conditions;
- Outline the proposed grading for the development; and
- Outline the existing and proposed municipal servicing.

The recommended servicing has been developed in accordance with the applicable design criteria and requirements of the City of Ottawa (the City).



Figure 1-1: Location Plan

1.1 PROJECT BACKGROUND

The total property is approximately 6.88ha in area at municipal address 4497 O'Keefe Court in the City of Ottawa. The existing site was previously a quarry which has not been active for many years and is now vacant greenfield.

The subject site is bound by O'Keefe Court to the south, Lytle Park to the East, Highway 416 to the west and Vacant greenfield to the north.

The existing topography of the site slopes from north-west to south-east, towards the existing ditches along O'Keefe Court. Existing elevations are 113.0-114.50 in the north-west corner sloping down to the south-east corner with elevations of 102.50-103.00. Site elevation differences of approximately 10-12 m across the length of the site.

1.2 PROPOSED DEVELOPMENT

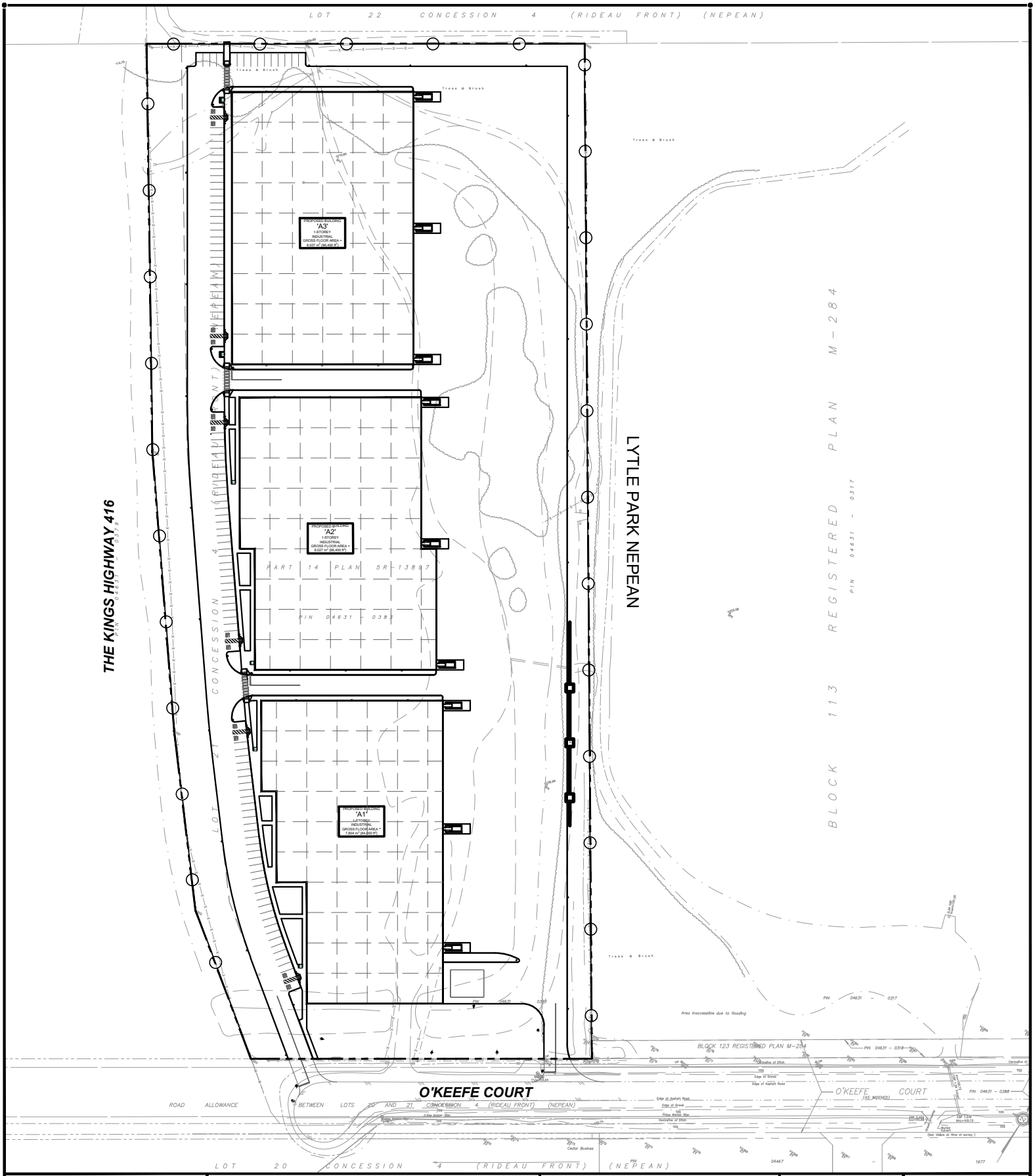
The proposed development of the site includes three (3) industrial warehouse buildings, with a total anticipated floor area of 23,858m^2 (256,800ft^2). The buildings will be surrounded by driveways, parking, and loading docks located on the east side of the buildings, with entrances facing the highway on the west side. Refer to Figure 1-1 for the proposed development plan.

1.3 SITE ACCESS

The site's main vehicular access will be two proposed entrances from O'Keefe Court.

1.4 UTILITIES

As the proposed development is located within a well-developed area of Ottawa, all utilities including telephone, cable, electricity and gas are readily available to service the subject property. Water and sanitary servicing will be further elaborated in the subsequent respective sections in this report.



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REVISION BLOCK

#	DATE	DESCRIPTION
1.	06/09/2025	FIRST SUBMISSION
2.	10/01/2025	SECOND SUBMISSION

PROPOSED DEVELOPMENT PLAN

THE PROPERTIES GROUP
O'KEEFE COURT
NEPEAN, ONTARIO

PROJECT No:	DRAWN BY:	CHECKED BY:

NORTH ARROW

METRIC SCALE

FIG 1-1

2.0 STORMWATER MANAGEMENT

2.1 EXISTING DRAINAGE CONDITIONS

The existing topography of the site slopes from north-west to south-east, towards the existing ditches along O'Keefe Court. Existing elevations are 113.0-114.50 in the north-west corner sloping down to the south-east corner with elevations of 102.50-103.00. Site elevation differences of approximately 10-12 m across the length of the site.

Most of the existing drainage from the site drains towards the east-middle of the site where drainage is conveyed by a 750mm culvert through a landscaped berm along the eastern property limit. This drainage is then conveyed towards a ditch within the neighbouring Lytle Park, where the drainage enters a water feature located on the south side of the Lytle Park property. Flows after this water feature are then conveyed along a swale on the north side of O'Keefe Court, which then crosses to the south side of O'Keefe Court through a culvert. Drainage then continues to flow south-east through conveyance swales and culverts down to Jock River, which finally flows east into the Rideau River flowing north to Ottawa River.

Although existing drainage of the subject site is tributary to the north swale of O'Keefe Court (via Lytle Park), discussions with City staff have determined that the swale along the south side of O'Keefe Court will serve as the most functionally acceptable outfall for the site (i.e. bypassing Lytle Park and the north swale), provided there is sufficient flow capacity. Therefore, the site will be designed based on the allowable outlet determined by City staff instead of existing conditions. Further discussion and analysis can be found in Section 2.7.

The pre-development rates are determined using the Modified Rational Method. The inputs are:

- Drainage area = 6.88ha
- Time of Concentration = 40 minutes (calculated using the Airport Method)
- Runoff Coefficient = 0.30
- Intensity based on the City of Ottawa IDF curves.

Table 1: Pre-development Runoff Peak Flows

Storm Event	Intensity (mm/hr)	Peak Flows (L/s)
2-yr	32.9	189
5-yr	44.2	254
10-yr	51.6	296
25-yr	61.0	350
50-yr	68.0	390
100-yr	75.1	431

Refer to **Figure F2-1** for the proposed drainage plan and **Figure F2-2** for the extent of external drainage route south-east of the site down to Jock River.

2.2 STORMWATER MANAGEMENT DESIGN CRITERIA

The proposed stormwater management design is based on the MOE 2008 Stormwater Management Planning & Design (SWMPD), the City of Ottawa Sewer Guidelines (October 2012), and the City of Ottawa Stormwater Management Design Guidelines (2012).

- **Quantity Control:** Stormwater runoff is to be controlled from pre-development to post-development peak runoff rates for storms up to and including the 100-year event using on-site detention.
    - **Ministry of Transportation (MTO):** It is understood that rooftop controls are typically not permitted for sites within MTO jurisdiction. The drainage outlets for these building rooftops drain easterly away

from the Highway 416 corridor and towards the Jock River, therefore the site would not be subject to MTO regulation and will include rooftop controls.

- **Quality Control:** Stormwater quality control measures will be provided to achieve at a minimum, Enhanced level of protection (i.e. 80% TSS removal) as described in the MOE SWMPD manual for TSS removal. Thermal mitigation through on-site Best Management Practices (BMP's) is also required.
- **Water Balance:** Based on the Jock River Reach 1 Subwatershed Study (June 2007), future development within this subwatershed should have an objective to maximize infiltration wherever possible using best management practices (BMP). Retention of the first 5mm of all rainfall events will be provided through on-site infiltration as a best efforts approach. Retention of the first 5mm of rainfall is equivalent to a 50% annual runoff reduction.
- **Construction Erosion and Sediment Control:** All applicants must include an Erosion and Sediment Control plan demonstrating that fish habitat and water quality are not affected by sediment from the property during or following site construction.
- **Ponding and Overflows:** Allowable flow depth shall not exceed 300mm in parking lot/private roadway areas. Excess runoff greater than the 100-year storm event must overflow to City ROW (O'Keefe Court).
- **Stormwater Outlet:** Stormwater drainage systems shall discharge to municipal storm sewer system where feasible. In cases where this is not possible, stormwater drainage systems may discharge to natural watercourses.

2.3 PROPOSED STORMWATER MANAGEMENT DESIGN STRATEGY

The proposed stormwater management system will include the capture and conveyance of the entire proposed development (6.88ha). The primary stormwater management will be achieved by utilization of rooftop storage using control drains. Since the rooftop of the buildings cover a significant portion of the site area, this will provide considerable and effective stormwater management for the site. Surface drainage will be captured by a series of catchbasins spread out across the site. The storm sewers will be sized to capture and convey 5-year storm flows and directed to a series of stormwater management facilities in the southeast corner of the site before outfall.

It is understood that the subject site falls within the jurisdiction of the Ministry of Transportation (MTO), where rooftop controls are typically not permitted. In this case, however, the building rooftops are controlled and ultimately discharge to the roadside ditches on O'Keefe Court, with drainage continuing through the O'Keefe drain, and ultimately to the Jock River, which lies outside MTO jurisdiction. Therefore, given that rooftop drainage is directed away from MTO drainage features, it is assumed that rooftop controls would not be subject to MTO regulation. For a depiction of the ultimate drainage outfall in both existing and proposed conditions, please refer to **Figure 2-2**.

Catchbasin inlets are designed with a 50% blockage factor to capture the 5-year flows, with storm events above the 5-year and up to the 100-year draining overland and being picked up by subsequent catchbasins. In order to ensure overland drainage up to the 100-year storm event does not spill out from the site, the final catchbasin inlet for both the west and east drive aisles have been designed to receive all overland drainage above the 5-year and up to the 100-year storm events for upstream catchments, with only the emergency overland flow route spilling out to O'Keefe Court (i.e. during rainfall events above the 100-year or clogged inlet scenarios). Inlet capacity calculations can be found in **Appendix A**.

The stormwater management facilities include a Cultec storage chamber and dry pond. An orifice and weir is designed at the outlet of the control maintenance hole at the south-east corner prior to release to a culvert that will cross O'Keefe Court and discharge to the south swale. A 170mm orifice plate has been proposed with a 1.50m rectangular weir to match post-development flows to pre-development for all storm events from the 2-year to 100-year storms.

Water balance volumes for infiltration will be achieved with proposed underground infiltration galleries located at building storm outfalls. The infiltration chambers will be sized to provide the water balance infiltration volumes for the building rooftops and drainage captured from the west side of the site. The chambers will be located such that the base of the infiltration gallery is at least 1.0m above existing groundwater and bedrock elevations. Total suspended solids treatment will be achieved primarily using a treatment inlet row (i.e. a Separator Row) located in the first row of the

chambers with final treatment by an OGS located at the south-east corner of the property prior to site discharge out to the O'Keefe Court drainage swale.

2.4 STORMWATER QUANTITY CONTROL

The quantity control criteria is to control the post-development peak runoff rates to the pre-development peak runoff rates (as found in Section 2.1) for every storm event up to the 100-year event.

In the post-development condition, the drainage areas and directions will be as follows:

- **Controlled Rooftops:** runoff from **2.39ha** of rooftops is proposed to be controlled to a rate of 42L/s/roof ha by controlled roof drains. Runoff coefficient of 0.90 (used for the purpose of Quality Control sizing).
- **Controlled Landscaped and Pavement areas:** Runoff from **4.00ha** of the landscaped areas, loading docks, and parking lots is collected by catch basins and conveyed to the on-site storm sewers that are sized to accommodate the 5-year design flows. Runoff coefficient of 0.90.
- **Uncontrolled Pavement areas:** Runoff from **0.49ha** of paved and landscape areas (composite runoff coefficient of 0.43) will discharge uncontrolled towards O'Keefe Court
- Total net developable area is **6.88ha.**

Refer to **Figure 2-1 Proposed Drainage Plan** for the drainage areas.

For the 100-year storm event, runoff coefficients are increased by a factor of 1.25 for all drainage areas.

Building rooftops (2.39ha) are proposed to be controlled at a rate of 42L/s/ha. Based on the modified rational method, the maximum rooftop storage volume required during the 100-year storm event is **1149.4m³** across the three building rooftops. Assuming the use of Zurn Z-105 Control Flo Drain's, and a maximum ponding depth of 63.5mm (less than half of the maximum allowed depth of 150mm), Building A3 and A2 will have the capacity to store 509m³, Building A1 will have the capacity to store 495.55m³ of runoff. The total storage volume provided among all three buildings equals **1,515m³**. Therefore, the rooftops will have capacity to provide the rooftop storage required. Rooftop storage calculations are provided in **Appendix A**.

A dry pond and underground chamber by Cultec (Recharger 280HD) is proposed to achieve the storage requirements for the remaining controlled site areas (4.00ha), accounting for inflows coming from the upstream controlled rooftops. To optimize attenuation of post-development flows to pre-development levels storm events up to the 100-year storm event, a 170mm orifice plate and 1.5m rectangular weir has been proposed in the control manhole located immediately downstream of the dry pond. Using the modified rational method, a maximum storage volume required during the 100-year storm event was calculated to **1,746m³**.

The dry pond has been sized to maximize the available landscape area at the south end of the site, while maintaining sufficient freeboard and horizontal clearances from the adjacent building and drive aisles, providing a total pond volume of **653m³**. The remaining storage deficit will be provided by a Cultec Recharger 280HD that is connected upstream of the dry pond by a transfer pipe and has been sized to provide up to **1,013m³** of storage volume, providing a total storage of **1,756m³**, including storage in underground sewers, manholes, and catch basins. Table 2 below summarizes the stage-storage-discharge relationship of the quantity control measures.

The uncontrolled area of 0.49 ha will discharge uncontrolled in all storm events. Refer to Table 3 below for the total release rates for the site, including the controlled and uncontrolled drainage.

Table 2: Stage-Storage-Discharge

Storm Event	Elevation (m)	Required/Provided Storage (m^3)	Post-development Release Rate (L/s)	Target Controlled Release Rate (L/s)
2-yr	104.41	1197	68	145
5-yr	104.63	1523	92	193
10-yr	104.66	1549	121	225
25-yr	104.69	1571	150	266
50-yr	104.71	1589	179	296
100-yr	104.80	1746	318	328

- The required/provided storage corresponds to the available storage in both the pond and chamber at the various elevations for each storm event
- The target controlled release rate is the total allowable release rate less the post-development uncontrolled release rate
- Post-development release rate is based on the acting head on the orifice/weir

Table 3: Comparison of Pre-development and Post-development Peak Flows

Storm Event	Pre-development Release Rates (L/s)	Post-development Release Rates (L/s)			Net Reduction
		Controlled Flows	Uncontrolled Flows	Total	
2-yr	**189**	68	45	**113**	**40%**
5-yr	**254**	92	60	**152**	**40%**
10-yr	**296**	121	71	**192**	**35%**
25-yr	**350**	150	84	**234**	**33%**
50-yr	**390**	179	94	**273**	**30%**
100-yr	**431**	318	104	**422**	**2%**

As shown in Table 3, the proposed quantity controls will have a net reduction in site flows for all storm events in post-development conditions as compared to pre-development conditions, thus achieving the required stormwater quantity criteria.

2.5 STORMWATER WATER QUALITY

2.5.1 TOTAL SUSPENDED SOLIDS

The quality control objective is to provide an enhanced protection level, which corresponds to the removal of minimum 80% TSS.

Runoff on the site will follow a treatment train approach, where rooftop flows (which is generally considered clean), will enter initial treatment through the Separator Rows of the Cultec infiltration systems. Overflows from the infiltration system will be conveyed to secondary treatment from the Oil Grit Separator (OGS), which also treats asphalted surface runoff which are captured by catchbasins on the site. The final treatment occurs at the final Separator Row of the Cultec underground storage chamber, before it is released into the downstream dry pond.

Both the Separator Row and Oil Grit Separator hold Environmental Technology Verification (ETV) and has been sized to achieve 80% TSS removal (granting a 50% TSS removal credit). The OGS unit sized and specified is a Stormceptor EFO12. Using the New Jersey Department of Environmental Protection (NJDEP) formula for TSS Removal rates for BMP's in series, the total TSS removal rate for the site was calculated to **84%**, which meets the minimum 80% TSS removal requirement for the site.

Refer to **Appendix A** for Cultec and OGS design calculations for quality control and the ETV verification statement.

2.5.2 THERMAL MITIGATION

The primary form of thermal reduction on the subject site will be achieved through capturing and conveying stormwater flows to at least one of the four underground detention chambers. Drainage from the west and from rooftops are all directed to an underground infiltration gallery, before merging with runoff from the east side of the site where then flows enter a final underground detention chamber and dry detention pond.

The performance of thermal reduction of stormwater in underground stormwater detention chambers was tested by the department of Civil Engineering at the University of Toronto in collaboration with the TRCA. The results of the analysis determined a maximum temperature reduction of 5 degrees Celsius from inlet to outlet, and outlet temperatures remained within the thermal regime for Coldwater fish habitat throughout the evaluation period (which lasted 6 months). The nominal outlet temperature ranged from 10C in the spring to a high of 13C by the end of the summer. This finding was published in the journal Water, 21 January 2016, an excerpt of the journal article is included in **Appendix A**. Based on these results and the existing high thermal capacity of the subsurface soils, it is expected that the underground chamber would provide a similar order of magnitude thermal benefit to the stormwater for the site.

2.6 WATER BALANCE

The Jock River Reach 1 Subwatershed Study (June 2007) identifies maximizing infiltration through the application of best management practices as a key objective for future developments within the subwatershed. The subcatchment is underlain predominantly by silty clay soils, which provide limited opportunity for groundwater recharge. With the introduction of additional impervious surfaces through development, the potential for infiltration is further reduced, resulting in an estimated infiltration deficit of approximately **58 mm/year** (*as per Table 6.3.9 of the Jock River Reach 1 Subwatershed Study*). Therefore, there will be a net reduction of 58 mm, which is a result of the urbanization of the entire subwatershed without any infiltration measures applied.

The 58 mm/ year deficit represents the amount of water that should infiltrate into the ground over the course of a year to maintain pre-development hydrology. To express this requirement on a daily basis, this annual value can be converted into an equivalent daily rainfall depth. Figure 1a of the City of Toronto Wet Weather Flow Management Guidelines (November 2016) lists daily rainfall depths corresponding to annual rainfall. By using this relationship, the annual infiltration deficit can be translated into a daily rainfall deficit (or daily infiltration requirement), which can then be applied to size infiltration measures accordingly. The total rainfall (100% of rain) for the O'Keefe subwatershed is expected to be 944 mm/year. Infiltration must be provided for the first 6% (58/ 944 mm) of rainfall, which is equivalent to a daily rainfall depth of **0.64 mm**. The infiltration requirement for the 6.88 ha site is approximately **44 m³**. Refer to **Appendix A** for the conversion of yearly infiltration deficit to daily rainfall depth.

To address the water balance requirements for the subject site, retention and infiltration will be achieved using Cultec chambers installed downstream of the storm stub at each building. The chambers will be constructed as open-bottom systems, with the stone base set a minimum of 1.0 m above the highest observed groundwater elevation identified in the hydrogeological investigation. The chambers are designed to infiltrate all rooftop runoff with an overflow to the downstream storm sewer system, should the chambers be full before the next rainfall event. Although roof water is generally considered clean, each chamber will include a Separator Row to provide pretreatment and remove suspended solids prior to distribution within the infiltration system.

Based on review of the hydrogeological investigation in relation to the site plan and servicing plan, the following limitations were determined:

- Infiltration is most suitable north of the site, and directly adjacent to building storm outfalls
- Infiltration near the outfall of the site is not feasible due to high groundwater and poor soil infiltration rates
- Connecting storm sewers from the east side of the buildings into the infiltration galleries will be logistically challenging, as the sewers will be sloped against the slope of the surface.

Based on the above limitations, a best-efforts approach for infiltration has been assumed for the subject site, of which only the drainage areas on the west of the site and rooftops will be captured and retained. The total drainage area captured is 3.59ha (2.39ha of rooftop, 1.20ha of impervious) where infiltration of the first 5 mm of rainfall is proposed. Three infiltration chambers serving each building rooftop have been sized with a total retention volume of **179.5m³**. This is greater than the 44 m³ requirement, which means the yearly infiltration deficit of 58 mm will be satisfied with the proposed infiltration chambers. Refer to **Figure 2-3 Proposed Infiltration Drainage Plan** for the drainage area to each infiltration gallery.

A 48-hour drawdown time for the infiltration chambers was selected based on recommendations from the Sustainable Technologies Evaluation Program (STEP) for the 50th percentile interevent time (i.e. 50% probability of the next rainfall event happening in 48 hours) for the Ottawa Region. Drawdown calculations were completed and confirms that retained water can infiltrate within a 48-hour drawdown period. For supporting calculations on infiltration, drawdown, and Cultec sizing, please refer to **Appendix A**. Excerpts of the selection of drawdown time per STEP recommendations can be found in **Appendix E.**

2.7 Stormwater Emergency Overland Flow Route

The site has been graded such that drainage up to the 100-year storm event will be contained within the site. All catchbasin inlets have been sized to ensure capture of the 5-year storm event. For storm events above the 5-year and up to the 100-year, flows will drain overland where the final catchbasin has been sized to capture the 100-year (less the 5-year) storm event. The designed grading pattern ensures a maximum 0.30m ponding for each inlet catchment while ensuring a distinctive overland flow route towards the emergency outfall at O'Keefe Court during extreme storm events (beyond the 100-year event), where then drainage will be conveyed through the ditches on O'Keefe Court.

The City of Ottawa stormwater management criteria requires that the overland flow route be designed for the 100-year post development flow from the site + 20% as a safety factor.

The post development uncontrolled 100-yr flow generated from the subject site is 1294L/s, therefore the design flow with 20% addition is **1553L/s**. Further analysis of this flow in relation to the capacity of the O'Keefe swales is discussed in the following section. Refer to **Appendix A** for swale design calculations.

2.8 Proposed Stormwater Outfall

It has been determined that the existing swale along the south side of O'Keefe Court will serve as the most functionally acceptable outfall, provided there is sufficient flow capacity. This swale flows easterly along the southern shoulder of O'Keefe Court, where then the drainage continues southerly through conveyance swales and culverts down to the Jock River, which finally flows east into the Rideau River. The drainage route is similar to that in existing conditions, and is represented in **Figure 2-2**.

An analysis of the existing swale was completed to determine flow capacity relative to the anticipated contributing flows. The site outlet will consist of a 600mm diameter culvert under O'Keefe Court (between structures STM DITCH INLET and STM MH25) to direct site flows and flows from the north swale along O'Keefe Court, south of the subject site, to the south swale along O'Keefe Court. Culvert sizing calculations have been provided in **Appendix A**.

Based on the characteristics of the south swale, an analysis was completed using the Manning's equation to estimate a minimum flow capacity of **2275L/s**. This calculation was based on the following characteristics observed from available data on the south swale:

- A top width of approximately **7.0m** (i.e. measured between Top of Slope's from the topographic survey)
- An assumed freeboard of **0.30m,** resulting in a flow depth of **0.87m** for a triangular shaped swale
- A minimum observed slope of **0.30%** between the O'Keefe cul-de-sac bulb to approximately 383m east (where the swale diverts southwards)
- Existing side slopes of **3:1**
- Manning's 'n' coefficient of **0.03**

Based on topographical survey of the existing swale, there appears to be few locations of filled material and reverse slope conditions. It is therefore recommended that remedial improvements to the swale be completed, including regrading the swale to a more consistent slope to provide sufficient flow conveyance.

Based on review of the topographic survey, LIDAR information, existing record drawings (specifically the Storm Drainage Area Plan, drawing 500 for the 416 Lands by IBI Group), and Google imagery, the south swale is assumed to capture drainage from the subject site, Lytle Park, and the O'Keefe ROW (total contributing drainage area of 17.9ha). Based on these contributing drainage areas, the estimated 100-year contributing flow to the O'Keefe south swale is approximately **1356L/s** in post-development conditions.

As per Section 2.8, the overland flow route shall be designed such that the 100-year post development flow (with a 20% surcharge) can safely be conveyed from the site. This flow was estimated to be 1553L/s for the subject site, and totals **2477L/s** when accounting for 100-year flows from the remaining contributing drainage areas to the south swale.

Due to the different drainage areas contributing to separate sections of the proposed south swale, three separate swale geometries are proposed to convey the corresponding flows of that section. Swale #1 will capture flows from the north and south O'Keefe ROW. As per the "Calculation of Contributing Flow to O'Keefe South Swale" document in **Appendix A,** the 100-year flow rate for this swale equals 401.9 L/s. Swale #1 is sized with a channel capacity of 425 L/s. Swale #2 and #3 will include the additional tributary flows from the subject site (controlled and uncontrolled) and Ltyle Park for a total 100-year flow rate of 1356 L/s. As noted in the paragraph above, the overland flow route is designed such that the 100-year post development flow with a 20% surcharge can be safely conveyed from the site. Therefore, including the site overland flow conditions, the max flow required for Swale #2 and #3 is 2477 L/s. Swale #2 has been sized with a channel capacity of 2542 L/s and Swale #3 has been sized with a channel capacity of 2546 L/s. The south swale is sufficiently sized to convey flows in post-development conditions.

The proposed sewer infrastructure is shown on the Servicing Plans and Grading Plans. For detailed calculations on swale capacity and contributing flows, refer to **Appendix A.** For the cross-sections and profiles of the existing south swale, as well as the drainage area plan for this swale, please refer to the figures in **Appendix D**. Grading plans of the proposed swale design can be found in drawing **GSW-1** in **Appendix F**.

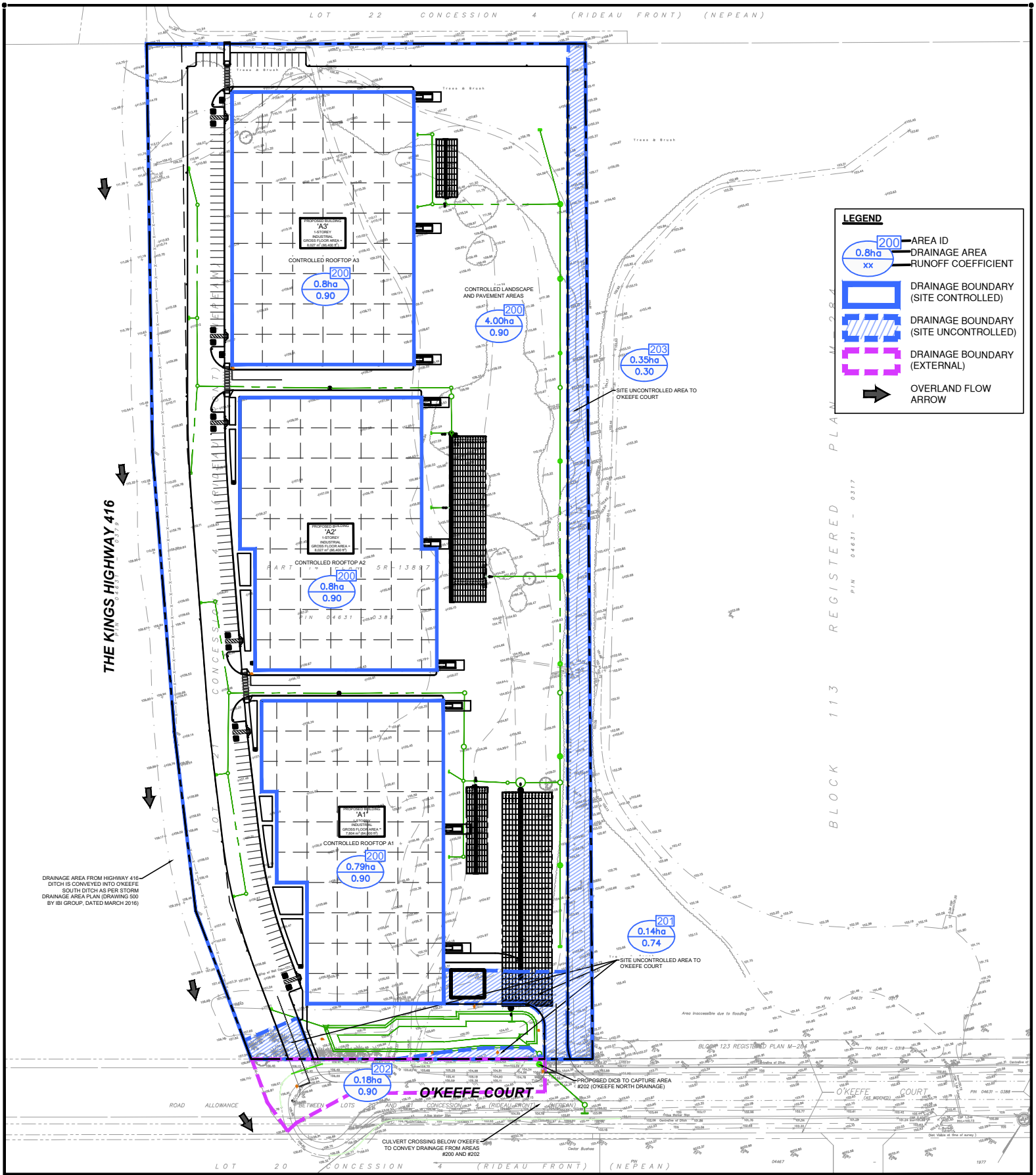
2.9 Construction Erosion and Sediment Control

Best practices are implemented to control erosion and sedimentation during construction and prior to build-out of stormwater quantity and quality control measures. All measures will be designed in accordance with the Sustainable Technologies Evaluation Program (STEP) "Erosion and Sediment Control Guideline for Urban Construction" dated 2019, and City of Ottawa design criteria. In general, the ESC approach can be outlined as:

- Silt fence to be installed around the site perimeter.
- A construction access (mud mat) is to be provided at the entrance off O'Keefe Court
- Cut-off swales and sediment traps provided on site and prior to discharging to the O'Keefe swales
- Catch basins and catch basin manholes on adjacent streets to have underside of the grate covered with Terrafix 240R non-woven geotextile.

These ESC measures should be regularly inspected and maintained to ensure they are operating as designed.

Refer to **Appendix F** for the **Erosion and Sediment Control Plan**.



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REVISION BLOCK

#	DATE	DESCRIPTION
1.	06/09/2025	FIRST SUBMISSION
2.	10/01/2025	SECOND SUBMISSION
3.	12/15/2025	THIRD SUBMISSION

PROPOSED DRAINAGE PLAN

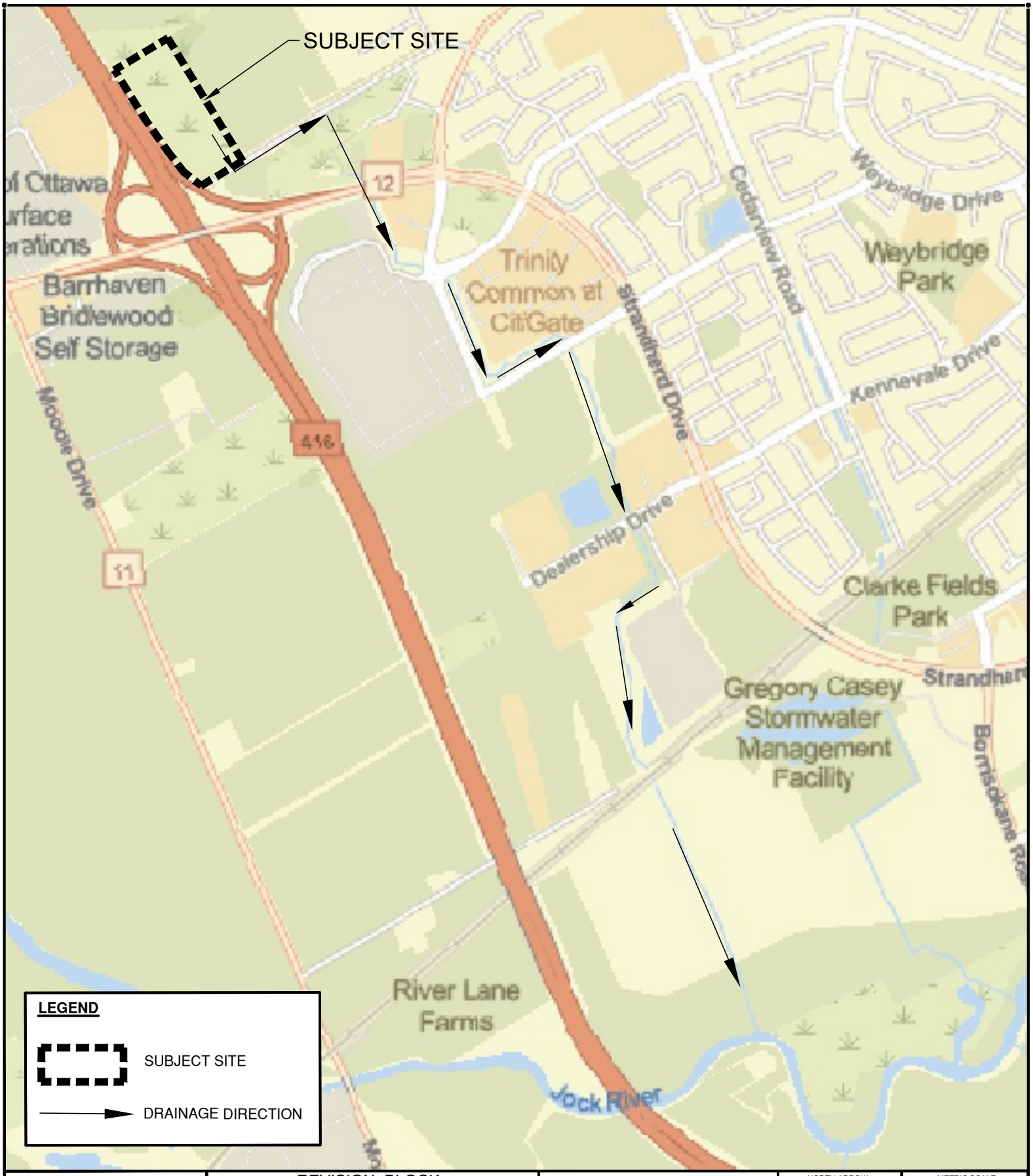
THE PROPERTIES GROUP
O'KEEFE COURT
NEPEAN, ONTARIO

PROJECT No:	DRAWN BY:	CHECKED BY:

NORTH ARROW

METRIC SCALE

2-1



KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

REVISION BLOCK

#	DATE	DESCRIPTION
1.	02/12/2025	FIRST SUBMISSION

DRAINAGE ROUTE TO ULTIMATE OUTFALL

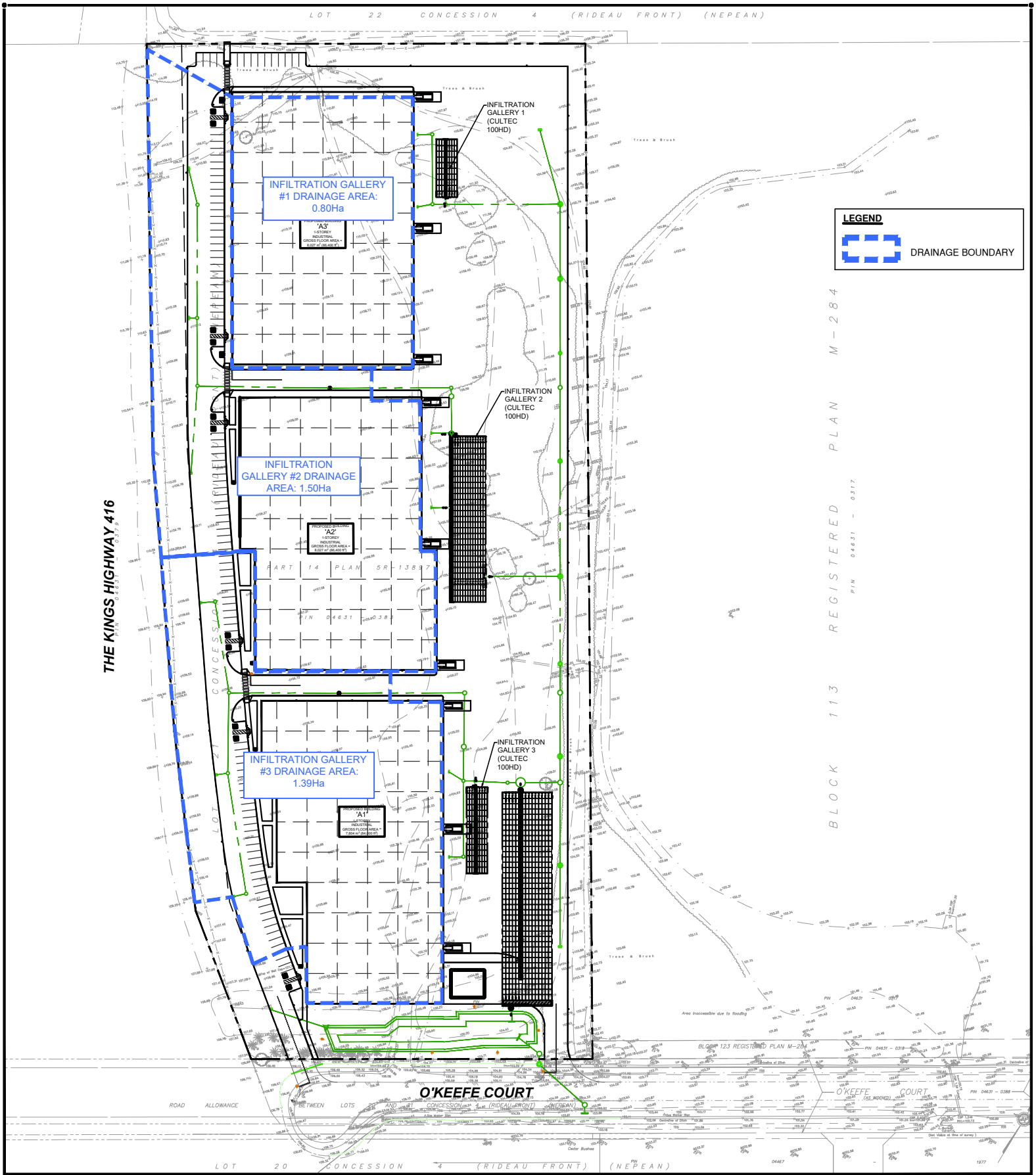
THE PROPERTIES GROUP
O'KEEFE COURT
NEPEAN, ONTARIO

PROJECT No: | DRAWN BY: | CHECKED BY:

NORTH ARROW

METRIC SCALE

FIG 2-2



KWA SITE DEVELOPMENT CONSULTING INC.
2453 Auckland Drive
Burlington, ON L7L 7A9

REVISION BLOCK

#	DATE	DESCRIPTION
1.	06/09/2025	FIRST SUBMISSION
2.	10/01/2025	SECOND SUBMISSION
3.	12/15/2025	THIRD SUBMISSION

PROPOSED INFILTRATION DRAINAGE PLAN

THE PROPERTIES GROUP
O'KEEFE COURT
NEPEAN, ONTARIO

PROJECT No:	DRAWN BY:	CHECKED BY:

NORTH ARROW

METRIC SCALE

2-3

3.0 SANITARY SERVICING

3.1 EXISTING SANITARY SERVICING

A development application for the 416 Lands to the south of the subject development indicates there are sanitary sewers proposed and partially constructed as part of this development (City File No. D07-16-13-0013, City Plan No. 17492).

The advancement of the 416 Lands development and availability of the remaining sanitary sewers to be constructed as part of this development is currently not known, and therefore it is assumed that there are no available sanitary sewers in the vicinity of the subject site.

Record drawings for the General Plan of Services for the 416 Lands development can be found in the supporting documentation in **Appendix E**.

3.2 PROPOSED SANITARY SERVICING

Design flows for the proposed development has been calculated using the Ottawa Sewer Design Guidelines (Second Edition – Technical Bulletin ISTB-2018-1 Update March 21, 2018). The internal sanitary sewer drainage system for the subject site is designed to accommodate peak sanitary sewage flows as per the City of Ottawa's design criteria.

The total peak sanitary flow for the proposed development (including the infiltration allowance) has been calculated as **3.24L/s**. Refer to **Appendix B** for details of the calculations.

As there are no gravity sanitary sewer infrastructure available for the site, the proposed design involves an on-site septic system to treat and manage sanitary sewage and is to be completed by others in separate reports and design documents.

Sanitary site servicing for industrial warehouse buildings will consist of a 150 mm diameter connection at a 1.0% slope. These sewers will then be conveyed and discharged to the proposed on-site sanitary sewage treatment facility located at the south-east corner of the property.

The proposed and existing servicing is shown on the **Servicing Drawings**.

4.0 WATER SERVICING

4.1 EXISTING WATER SERVICING

The existing site servicing details obtained from the City of Ottawa engineering plan and profiles and a topographical survey completed of the area, indicate that there is watermain infrastructure in the vicinity of the site. The following watermain infrastructure is adjacent to the subject site;

- A 610mm diameter watermain located along the south side of O'Keefe Court, which extends west from Fallowfield Road to the end of the cul-de-sac in front of the subject site
- A 300mm diameter watermain which was recently constructed extending down Lusk Street to the end of storm water management pond
- A 300mm diameter watermain located in Foxtail Avenue, approximately 750m east of the subject site.

4.2 PROPOSED WATER SERVICING

The proposed water servicing design and calculations are based on the Ottawa Design Guidelines – Water Distribution (July 2010) with all relevant Technical Bulletins issued for the guideline. This includes Technical Bulletin ISTB-2021-03 and ISTB-2010-02. Based on the available record drawings indicated above there is the obvious primary connection made to the existing 610mm watermain located within O'Keefe Court. Through preliminary consultation the city requires that a secondary watermain connection be provided under such conditions in which the existing 610mm watermain were to require shut down for maintenance an alternative water supply be provided to the site. There are two primary considerations for this configuration, which are explained further below.

4.2.1 EXTERNAL WATERMAIN OPTIONS

Previous reports and analyses had contemplated a connection through the future anticipated proposed development to the south. But as discussed previously, there is some uncertainty in the advancement of this development, and should it not proceed, alternative options should be considered such that the site can proceed and be serviced independently of this site.

1. The first option would be to provide a new 300mm waterline along O'Keefe Court, and then connect south to the existing 300mm watermain located in the newly installed and extended watermain in Lusk Street. This watermain would need to remain outside of the private properties so would need to be proposed through the public drainage right-of-way that currently serves for the drainage swale and culvert for the drainage outlet of O'Keefe Court. This watermain would be installed at the very edge of Block 15 such that it does not impact any function or access of the block drainage conveyance infrastructure.
2. The second option would be to extend the watermain further down O'Keefe Court all the way to the 300mm watermain at Lusk Street and O'Keefe Court. This would be the secondary option but would require longer lengths of pipe to be installed and an increased disturbance for the O'Keefe Court right-of-way, but it is possible should the first option not be considered acceptable to the City.

Through discussions with the City, the preferred option is Option 2, and will be the subject of the hydraulic network analysis in the following sections. For the off-site watermain servicing options, please refer to **Figure WAT-E** in **Appendix D**.

4.2.2 FLOW DEMANDS

Domestic water demand was calculated based on the Ottawa Design Guidelines for Water Distribution and Technical Bulletin ISTB-2010-02. An industrial flow rate of 35,000 L/ha/day was used to determine the average water demand for the proposed development. The average day water demand was calculated to be **0.97 L/s**. A maximum day factor of 1.50 (applied to the average day demand) and a peak hour factor of 1.80 (applied to the maximum day demand) were used in determining maximum day and peak hour demands The maximum day and peak hour demands were calculated to be **1.45L/s** and **2.61L/s**, respectively. Calculations are provided in **Appendix C**.

Fire flow calculations we completed based on the Fire Underwriters Survey Water Supply for Public Fire Protection, 2020. Under proposed conditions the development is anticipated to have a fire flow demand of **167L/s** for the worst-

case scenario building A3, at the north end of the property, the largest building and furthest distance for the watermain connection. The anticipated maximum day + fire flow demand thus be 168.5L/s.

4.2.3 HYDRAULIC NETWORK ANALYSIS

Model Setup

A hydraulic network analysis was completed for Option 2 to evaluate the serviceability of the proposed development with the planned watermain extension on O'Keefe Court.

A hydrant flow test, carried out by Hydrant Testing Ontario (HTO) on September 18, 2025, was used to calibrate the model boundary conditions. The residual hydrant selected was the first hydrant on Lusk Street, south of O'Keefe Court, closest to the future watermain extension. The test recorded a static pressure of 70.5 psi and a maximum flow of 243 L/s, with an observed pressure variation of 11%.

The hydraulic model was prepared in Bentley WaterCAD (EPANET engine) providing nodes at key locations. Boundary conditions were represented using a reservoir and pump configuration to replicate the flow and pressure response observed in the hydrant test. Ground elevations were assigned using LiDAR survey data.

The hydrant flow test and a schematic of the model setup for Option 2 can be found in **Appendix C**.

Modelling Results

Two flow demand scenarios were analyzed in the model:

1. Peak Hour
2. Maximum Day + Fire

A table summarizing the model inputs for the different scenarios can be found in **Appendix C**.

The proposed watermain on O'Keefe Court was sized to 300mm up to and including the combined fire and domestic water service for the subject development.

Based on the modelling results, all pipe velocities were observed to be within allowable limits (i.e. 2.0m/s for peak hour demands, and 3.0m/s for fire flow demands). In all demand scenarios, all nodes were observed to maintain a residual pressure of above 140kPa (20.3psi) and 275kPa (40psi) during maximum day+fire and peak hour scenarios, respectively. Therefore, it is expected that the proposed watermain through O'Keefe Court will adequately service the subject development.

The water demand calculations, modelling results, and model schematics are shown in **Appendix C** and the proposed and existing watermain infrastructure are shown on the Servicing Drawings. For the preliminary design of watermain Option 2, please refer to the plan & profile drawings for this watermain extension found in **PP1-PP5** in **Appendix F**.

4.3 FIRE HYDRANT COVERAGE

There are four (4) proposed fire hydrants to provide sufficient fire protection coverage, three of which are proposed private within the subject site, and one of which is a future hydrant as part of ongoing off-site works on O'Keefe Court. The coverage radius is shown and indicated by a dashed circle on the servicing plan to show sufficient coverage is provided for fire protection.

5.0 CONCLUSION

The proposed development consists of three industrial buildings across a 6.88ha site area. The proposed development can be serviced utilizing the existing and proposed infrastructure outlined in the Servicing Drawings. Our conclusions and recommendations for servicing of the proposed development is summarized as follows:

Stormwater Management Servicing:

- The proposed development will match post-development flows to pre-development levels for all storm events between the 2-year and 100-year storm events. Quantity controls will be achieved by the use of rooftop controls, Cultec chambers and an on-site dry pond.
- Stormwater quality will be achieved by a treatment train approach, primarily through ETV certified technologies including a Separator Row and Oil Grit Separator
- Water balance will be met by infiltrating the initial 5mm rainfall depth of roof runoff and the west drainage area, which achieves approximately 52.2% of the total 5mm volume requirement for the site. This infiltration design provides a total retention volume of **179.5m^3**. This is greater than the 44 m^3 requirement, which means the yearly infiltration deficit of 58 mm will be satisfied with the proposed infiltration chambers.
- Sediment and erosion control measures to be taken during construction have been presented in this report.

Sanitary Servicing:

- The anticipated peak sanitary peak flow for the proposed development is 3.24L/s.
- There are no existing or future planned sanitary sewer infrastructure on O'Keefe Court, therefore the subject site proposes an on-site septic system to manage sanitary sewage. This design is to be completed by others.

Water Servicing:

- The calculated maximum day and peak hour demands were calculated as 1.45L/s and 2.61L/s, respectively.
- The calculated fire flow demand for the proposed development is 167L/s, based on the furthest and largest building (Building A3)
- The proposed development will be serviced by a proposed 300mm watermain primary connection made to the existing 610mm watermain on O'Keefe Court. A secondary connection for the site will be made to a future 300mm local watermain extension on O'Keefe Court.
- Additional confirmation of the fire and domestic branch sizing and fire flow requirements should be provided by the Mechanical Consultant at the Building Permit stage of approval.

5.1 RECOMMENDATIONS:

The following recommendations are presented:

- The contractor shall locate and verify all dimensions, levels, inverts, and datums onsite and report any discrepancies or omissions to the engineer prior to construction.

In summary, the site can be adequately serviced in respect to water supply, sanitary drainage, stormwater drainage, and stormwater management. The stormwater quantity and quality controls can be implemented in accordance to The City of Ottawa Sewer Guidelines (October 2012), and The City of Ottawa Stormwater Management Design Guidelines (2012).

Accordingly, we hereby recommend the adoption of this report as it relates to the provision of servicing works, and for the purposes of site plan application, and building permit application approvals. We trust that this Functional Servicing and Stormwater Management Report is sufficient for your purposes. If you have any questions or comments, please do not hesitate to contact the undersigned.

Yours very truly,

KWA Site Development Consulting Inc.

Ted Fair, P.Eng.

ted.fair@kwasitedev.com

APPENDIX A

STORMWATER CALCULATIONS

Project Name: O'Keefe Court	
Project #: 21684	Prepared by: TG
Date: 12/12/2025	Checked by: TF

ROOF CONTROLLED STORM FLOW RATE DESIGN

Designed based on ZURN Control-Flo Selecta-Drain Design brochure specifications - ZURN Z-105 Control-Flo Drain

Building A3 -

Area =	8027	m2
Target Control Flow =	33.71	L/s
	2022.804	LPM
Area per Notch	802.7	m2
Number of notches	10.0	
Number of Drains =	10	
Notches per drain =	1.0	
Control Flow per Notch	57	LPM
	0.95	L/s
Maximum Depth =	63.5	mm
Storage Volume =	509.7145	m3
Total Flow Roof Release Rate =	9.5	L/s

Building A2

Area =	8027	m2
Target Control Flow =	33.7134	L/s
	2022.804	LPM
Area per Notch	232	m2
Number of notches	10.0	
Number of Drains =	10	
Notches per drain =	1.0	
Control Flow per Notch	57	LPM
	0.95	L/s
Maximum Depth =	63.5	mm
Storage Volume =	509.7145	m3
Total Flow Roof Release Rate =	9.5	L/s

Building A1

Area =	7804	m2
Target Control Flow =	32.7768	L/s
	1966.608	LPM
Area per Notch	232	m2
Number of notches	10	
Number of Drains =	10	
Notches per drain =	1.0	
Control Flow per Notch	57	LPM
	0.95	L/s
Maximum Depth =	63.5	mm
Storage Volume =	495.55	m3
Total Flow Roof Release Rate =	9.50	L/s

Total Storage Volume= 1514.98 m3

Pre-development Site Statistics

	Drainage Area #1	Area (ha)	Runoff Coefficient	AxC
1)	Landscape	6.88	0.30	2.06
	Total	6.88		2.06

Composite Runoff Coefficient = 0.30

Time of Concentration - Airport Formula (Runoff Coefficient less than 0.40)

Catchment Area =	6.88	ha
Max. Catchment Elevation =	114.5	
Min. Catchment Elevation =	102.5	
Catchment Length =	440	
Catchment Slope =	2.7	%
Runoff C =	0.30	
Time of Concentration =	39.29	min

Time of Concentration - Bransby William Formula (Runoff Coefficient more than 0.40)

Catchment Area =	6.88	ha
Max. Catchment Elevation =	110.5	
Mni. Catchment Elevation =	102.5	
Catchment Length =	380	
Catchment Slope =	2.1	%
Time of Concentration =	15.39	min

Pre-development Flow Rates

From calculations above, pre-development Time of Concentration = 40 min

Storm Event	Intensity (mm/hr)	Flow Rate (L/s)
2 year	32.9	188.6
5 year	44.2	253.5
10 year	51.6	296.2
25 year	61.0	349.8
50 year	68.0	389.9
100 year	75.1	431.2

Uncontrolled Flow and Allowable Release Rate Calculation

Uncontrolled area (ha) =	0.49
Runoff Coefficient =	0.43
Time of Concentration (min) =	10

Storm Event	Intensity (mm/hr)	Uncontrolled Flow Rate (L/s)	Pre-Development Flow Rate (L/s)	Target Release Rate for Orifice (L/s)
2 year	76.8	44.5	188.6	144.0
5 year	104.2	60.4	253.5	193.1
10 year	122.1	70.8	296.2	225.4
25 year	144.7	83.9	349.8	265.9
50 year	161.5	93.6	389.9	296.3
100 year	178.6	103.5	431.2	327.6

MODIFIED RATIONAL METHOD

Site (Vault) | ***Controlled Rooftop***

2-Year

	Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
Controlled	4.00	0.90	2.39	0.90	42
Uncontrolled	0.49	0.43			
	4.49				

Orifice Control Flow (L/s) = 68.25

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Inflow $Q_{in} + Q_{in,roof}$ (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff $Q_{in,roof}$ (L/s)	Roof Flow $Q_{out,roof}$ (L/s)	Storage Required V (m^3)
10	76.8	869.0	68.25	480.48	459.28	100.38	215.34
15	61.8	718.5	68.25	585.27	369.36	100.38	242.08
20	52.0	621.1	68.25	663.43	311.14	100.38	252.91
25	45.2	552.4	68.25	726.24	270.09	100.38	254.56
30	40.0	501.1	68.25	779.19	239.45	100.38	250.33
40	32.9	429.3	68.25	866.48	196.52	100.38	230.74
60	24.6	346.2	68.25	1000.44	146.85	100.38	167.29
70	21.9	319.7	68.25	1056.01	131.03	100.38	128.74
80	19.8	298.8	68.25	1106.81	118.58	100.38	87.35
90	18.1	282.0	68.25	1153.99	108.49	100.38	43.80
100	16.7	267.7	68.25	1196.90	100.14	100.14	0.00
120	14.6	232.8	68.25	1184.84	87.08	87.08	0.00
140	12.9	206.7	68.25	1162.63	77.30	77.30	0.00
160	11.7	186.3	68.25	1133.02	69.67	69.67	0.00
180	10.6	169.9	68.25	1097.75	63.54	63.54	0.00
200	9.8	156.4	68.25	1058.01	58.50	58.50	0.00
240	8.5	135.5	68.25	968.29	50.68	50.68	0.00
280	7.5	119.9	68.25	868.35	44.86	44.86	0.00
320	6.7	107.9	68.25	760.87	40.35	40.35	0.00
360	6.1	98.2	68.25	647.57	36.74	36.74	0.00

$V = (Q_{in} - Q_{out,con}) * t_d$

Max Storage (m^3) = 1196.90
Total Outflow (L/s) = 68.25
Target Release Rate (L/s) = 144.03

Max Roof Storage (m^3) = 254.56

Site (Vault) | ***Controlled Rooftop***

5-Year

	Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
Controlled	4.00	0.90	2.39	0.90	42
Uncontrolled	0.49	0.43			
	4.49				

Orifice Control Flow (L/s) = 91.87

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Storm Runoff Q_{in} (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff Q_{in} (L/s)	Roof Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)
10	104.2	1143.1	91.87	630.76	623.05	100.38	313.60
15	83.6	936.6	91.87	760.27	499.65	100.38	359.35
20	70.3	803.5	91.87	853.89	420.09	100.38	383.65
25	60.9	709.8	91.87	926.93	364.14	100.38	395.65
30	53.9	640.1	91.87	986.78	322.48	100.38	399.77
40	44.2	542.6	91.87	1081.69	264.21	100.38	393.20
60	32.9	430.1	91.87	1217.53	196.99	100.38	347.81
70	29.4	394.3	91.87	1270.33	175.64	100.38	316.08
80	26.6	366.2	91.87	1316.83	158.84	100.38	280.59
90	24.3	343.5	91.87	1358.55	145.24	100.38	242.24
100	22.4	324.6	91.87	1396.54	133.99	100.38	201.66
120	19.5	295.2	91.87	1464.03	116.41	100.38	115.43
140	17.3	273.2	91.87	1523.15	103.26	100.38	24.20
160	15.6	248.7	91.87	1505.49	93.02	93.02	0.00
180	14.2	226.7	91.87	1456.20	84.79	84.79	0.00
200	13.0	208.6	91.87	1401.03	78.03	78.03	0.00
240	11.3	180.6	91.87	1277.26	67.54	67.54	0.00
280	10.0	159.7	91.87	1140.07	59.74	59.74	0.00
320	9.0	143.6	91.87	993.00	53.71	53.71	0.00
360	8.2	130.7	91.87	838.31	48.88	48.88	0.00

$V = (Q_{in} - Q_{out,con}) * t_d$

Max Storage (m^3) = 1523.15
Total Outflow (L/s) = 91.87
Target Release Rate (L/s) = 193.10

Max Roof Storage (m^3) = 399.77

MODIFIED RATIONAL METHOD

Site (Vault) | ***Controlled Rooftop***

10-Year

	Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
Controlled	4.00	0.90	2.39	0.90	42
Uncontrolled	0.49	0.43			
	4.49				

Orifice Control Flow (L/s) = 120.54

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Storm Runoff Q_{in} (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff Q_{in} (L/s)	Roof Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)
10	122.1	1322.8	120.54	721.34	730.38	100.38	378.00
15	97.9	1079.7	120.54	863.22	585.13	100.38	436.28
20	82.2	923.1	120.54	963.12	491.60	100.38	469.46
25	71.2	813.2	120.54	1038.96	425.90	100.38	488.28
30	63.0	731.3	120.54	1099.43	377.00	100.38	497.92
40	51.6	617.0	120.54	1191.48	308.68	100.38	499.91
60	38.5	485.2	120.54	1312.77	229.93	100.38	466.39
70	34.3	443.4	120.54	1355.84	204.93	100.38	439.12
80	31.0	410.5	120.54	1391.60	185.27	100.38	407.49
90	28.3	383.8	120.54	1421.82	169.37	100.38	372.55
100	26.1	361.8	120.54	1447.71	156.22	100.38	335.01
120	22.7	327.4	120.54	1489.65	135.67	100.38	254.08
140	20.1	301.7	120.54	1521.90	120.30	100.38	167.35
160	18.1	281.7	120.54	1547.09	108.34	100.38	76.40
180	16.5	264.0	120.54	1549.13	98.74	98.74	0.00
200	15.2	242.9	120.54	1467.97	90.84	90.84	0.00
240	13.1	210.1	120.54	1290.12	78.60	78.60	0.00
280	11.6	185.8	120.54	1096.77	69.50	69.50	0.00
320	10.4	167.0	120.54	891.99	62.46	62.46	0.00
360	9.5	152.0	120.54	678.43	56.83	56.83	0.00

$V = (Q_{in} - Q_{out,con}) * t_d$

Max Storage (m^3) = 1549.13
Total Outflow (L/s) = 120.54
Target Release Rate (L/s) = 225.36

Max Roof Storage (m^3) = 499.91

Site (Vault) | ***Controlled Rooftop***

25-Year

	Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
Controlled	4.00	0.90	2.39	0.90	42
Uncontrolled	0.49	0.43			
	4.49				

Orifice Control Flow (L/s) = 150.32

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Storm Runoff Q_{in} (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff Q_{in} (L/s)	Roof Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)
10	144.7	1548.5	150.32	838.89	865.23	100.38	458.91
15	115.8	1259.6	150.32	998.35	692.64	100.38	533.03
20	97.3	1073.7	150.32	1108.06	581.56	100.38	577.42
25	84.2	943.2	150.32	1189.32	503.59	100.38	604.81
30	74.5	846.1	150.32	1252.41	445.57	100.38	621.34
40	61.0	710.5	150.32	1344.48	364.56	100.38	634.03
60	45.4	554.4	150.32	1454.64	271.27	100.38	615.21
70	40.4	504.9	150.32	1489.06	241.68	100.38	593.45
80	36.5	465.9	150.32	1514.88	218.41	100.38	566.56
90	33.4	434.4	150.32	1534.22	199.60	100.38	535.79
100	30.8	408.4	150.32	1548.47	184.04	100.38	501.98
120	26.7	367.8	150.32	1565.48	159.75	100.38	427.50
140	23.7	337.4	150.32	1571.14	141.60	100.38	346.23
160	21.3	313.7	150.32	1568.55	127.47	100.38	260.04
180	19.4	294.7	150.32	1559.68	116.13	100.38	170.09
200	17.9	279.1	150.32	1545.84	106.81	100.38	77.18
240	15.4	246.9	150.32	1391.41	92.36	92.36	0.00
280	13.7	218.3	150.32	1141.74	81.64	81.64	0.00
320	12.3	196.1	150.32	878.79	73.34	73.34	0.00
360	11.2	178.4	150.32	605.61	66.71	66.71	0.00

$V = (Q_{in} - Q_{out,con}) * t_d$

Max Storage (m^3) = 1571.14
Total Outflow (L/s) = 150.32
Target Release Rate (L/s) = 265.91

Max Roof Storage (m^3) = 634.03

MODIFIED RATIONAL METHOD

	Site (Vault)			*Controlled Rooftop*		
50-Year		Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
	Controlled	4.00	0.90	2.39	0.90	42
	Uncontrolled	0.49	0.43			
		4.49				
	Orifice Control Flow (L/s) =	178.51				

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Storm Runoff Q_{in} (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff Q_{in} (L/s)	Roof Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)
10	161.5	1716.4	178.51	922.72	965.56	100.38	519.11
15	129.2	1393.6	178.51	1093.59	772.70	100.38	605.09
20	108.5	1186.0	178.51	1208.94	648.63	100.38	657.90
25	93.9	1040.2	178.51	1292.57	561.55	100.38	691.76
30	83.1	931.8	178.51	1355.94	496.78	100.38	713.52
40	68.0	780.5	178.51	1444.69	406.35	100.38	734.32
60	50.5	606.2	178.51	1539.83	302.25	100.38	726.73
70	45.0	551.0	178.51	1564.41	269.24	100.38	709.20
80	40.7	507.6	178.51	1579.44	243.29	100.38	685.96
90	37.2	472.4	178.51	1587.25	222.31	100.38	658.41
100	34.3	443.4	178.51	1589.42	204.96	100.38	627.48
120	29.7	398.1	178.51	1580.96	177.88	100.38	557.99
140	26.4	364.2	178.51	1559.92	157.64	100.38	480.98
160	23.7	337.9	178.51	1529.71	141.89	100.38	398.49
180	21.6	316.7	178.51	1492.51	129.25	100.38	311.83
200	19.9	299.3	178.51	1449.82	118.87	100.38	221.88
240	17.2	272.4	178.51	1351.85	102.77	100.38	34.47
280	15.2	242.8	178.51	1080.92	90.83	90.83	0.00
320	13.6	218.1	178.51	760.78	81.59	81.59	0.00
360	12.4	198.4	178.51	429.30	74.20	74.20	0.00
			Max Storage (m^3) =	**1589.42**		**Max Roof Storage (m^3) =**	**734.32**
$V = (Q_{in} - Q_{out,con}) * t_d$			**Total Outflow (L/s) =**	**178.51**			
			Target Release Rate (L/s) =	**296.28**			

	Site (Vault)			*Controlled Rooftop*		
100-Year		Area	Runoff C	Area	Runoff C	Unit Rate (L/s/ha)
	Controlled	4.00	1.13	2.39	1.13	42
	Uncontrolled	0.49	0.53			
		4.49				
	Orifice Control Flow (L/s) =	317.75				

Storm Duration t_d (min)	Rainfall Intensity i (mm/h)	Storm Runoff Q_{in} (L/s)	Controlled Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)	Storm Runoff Q_{in} (L/s)	Roof Flow $Q_{out,con}$ (L/s)	Storage Required V (m^3)
10	178.6	2344.1	317.75	1215.80	1340.61	100.38	744.14
15	142.9	1895.9	317.75	1420.36	1072.84	100.38	875.22
20	120.0	1607.6	317.75	1547.85	900.58	100.38	960.24
25	103.8	1405.3	317.75	1631.29	779.68	100.38	1018.95
30	91.9	1254.8	317.75	1686.61	689.74	100.38	1060.85
40	75.1	1044.6	317.75	1744.50	564.19	100.38	1113.14
60	55.9	802.7	317.75	1745.92	419.65	100.38	1149.39
70	49.8	726.0	317.75	1714.71	373.82	100.38	1148.44
80	45.0	665.7	317.75	1670.24	337.79	100.38	1139.57
90	41.1	617.0	317.75	1615.74	308.66	100.38	1124.70
100	37.9	576.7	317.75	1553.41	284.57	100.38	1105.16
120	32.9	513.7	317.75	1411.00	246.97	100.38	1055.47
140	29.2	466.7	317.75	1251.10	218.87	100.38	995.33
160	26.2	430.1	317.75	1078.48	197.00	100.38	927.59
180	23.9	400.7	317.75	896.16	179.46	100.38	854.05
200	22.0	376.6	317.75	706.21	165.04	100.38	775.96
240	19.0	339.2	317.75	308.83	142.69	100.38	609.32
280	16.8	311.4	317.75	0.00	126.11	100.38	432.29
320	15.1	290.0	317.75	0.00	113.28	100.38	247.61
360	13.7	272.8	317.75	0.00	103.02	100.38	57.04
			Max Storage (m^3) =	**1745.92**		**Max Roof Storage (m^3) =**	**1149.39**
$V = (Q_{in} - Q_{out,con}) * t_d$			**Total Outflow (L/s) =**	**317.75**			
			Target Release Rate (L/s) =	**327.63**			

ORIFICE SIZING

Orifice Equation: $Q = C \times A \times \sqrt{2gh}$

Weir Equation: $Q = (C)(L)(H)^{\frac{3}{2}}$

Orifice Details

Orifice 1		Weir	
Orifice Location =	Chamber Outlet	Orifice Location =	Chamber Outlet
Orifice Type =	Plate		
Discharge Coefficient =	0.62	Discharge Coefficient =	1.81
Orifice Diameter =	170	Weir Width =	1.50
Orifice Area =	0.02		
Orifice Invert =	103.13	Weir Invert =	104.60

Storm Event	Volume Required	Headwater Elevation	Total Head	Orifice Release Rate, a		Orifice Release Rate, b		Target Release Rate	Difference [Target - Flow] (L/s)	Proportion [Flow/ Target] (%)
	(m^3)	(m)	(m)	(L/s)		(L/s)				
2-Year	1197	104.41	1.20	68		68		145	76.75	47%
5-Year	1523	104.63	1.42	92		92		193	101.23	48%
10-Year	1549	104.66	1.45	121		121		225	104.82	53%
25-Year	1571	104.69	1.48	150		150		266	115.58	57%
50-Year	1589	104.71	1.50	179		179		296	117.77	60%
100-Year	1746	104.80	1.58	318		318		328	9.88	97%

STAGE STORAGE DISCHARGE

Orifice 1		Weir	
$Q = (C)(A)\sqrt{2g\Delta h}$		$Q = (C)(L)(H)^{\frac{3}{2}}$	
Invert	103.13	Invert	104.6
Size (mm)	170	Width	1.50
Area (m2)	0.0227		
Type	Plate		
Cd	0.62	Cd	1.81

Elevation (m)	Total Storage (cu.m)	Pond	Cultec	Stage (m)	Orifice 1 Discharge	Weir Discharge	TOTAL DISCHARGE
104.80	1755.93	653.17		1.00	78.48	242.84	321.31
104.78	1647.74	634.98		0.98	77.93	203.72	281.65
104.75	1620.87	608.11		0.95	77.18	154.43	231.60
104.72	1594.48	581.72		0.92	76.42	109.91	186.33
104.69	1568.57	555.81		0.89	75.65	70.75	146.41
104.66	1543.15	530.39		0.86	74.88	37.83	112.70
104.63	1518.21	505.45	1012.76	0.83	74.09	12.65	86.75
104.60	1475.96	480.98	994.98	0.80	73.43	0.34	73.76
104.58	1442.13	464.94	977.19	0.77	72.75	0.00	72.75
104.55	1400.69	441.28	959.41	0.75	72.07	0.00	72.07
104.53	1367.38	425.76	941.62	0.72	71.38	0.00	71.38
104.50	1326.72	402.88	923.84	0.70	70.69	0.00	70.69
104.48	1293.95	387.90	906.05	0.67	69.98	0.00	69.98
104.46	1270.27	373.12	897.15	0.66	69.63	0.00	69.63
104.44	1236.63	358.55	878.08	0.64	68.92	0.00	68.92
104.41	1194.01	337.08	856.93	0.61	68.20	0.00	68.20
104.39	1155.02	323.03	831.99	0.58	67.47	0.00	67.47
104.36	1106.96	302.34	804.62	0.56	66.74	0.00	66.74
104.34	1064.28	288.81	775.47	0.53	65.99	0.00	65.99
104.31	1013.78	268.90	744.88	0.51	65.24	0.00	65.24
104.29	969.03	255.88	713.15	0.48	64.48	0.00	64.48
104.26	917.15	236.73	680.42	0.46	63.71	0.00	63.71
104.23	864.87	218.04	646.83	0.43	62.93	0.00	62.93
104.21	818.29	205.84	612.45	0.41	62.14	0.00	62.14
104.18	765.34	187.91	577.43	0.38	61.34	0.00	61.34
104.16	718.05	176.21	541.84	0.36	60.53	0.00	60.53
104.13	664.29	159.04	505.25	0.33	59.71	0.00	59.71
104.11	616.22	147.85	468.37	0.30	58.88	0.00	58.88
104.08	562.63	131.43	431.20	0.28	58.03	0.00	58.03
104.06	514.48	120.73	393.75	0.25	57.18	0.00	57.18
104.03	461.07	105.06	356.01	0.23	56.31	0.00	56.31
104.01	412.56	94.86	317.70	0.20	55.43	0.00	55.43
103.98	358.97	79.93	279.04	0.18	54.53	0.00	54.53
103.95	305.67	65.44	240.23	0.15	53.61	0.00	53.61
103.93	256.66	56.03	200.63	0.13	52.69	0.00	52.69
103.90	203.24	42.28	160.96	0.10	51.74	0.00	51.74
103.88	154.50	33.35	121.15	0.08	50.78	0.00	50.78
103.85	101.53	20.33	81.20	0.05	49.80	0.00	49.80
103.83	52.99	11.89	41.10	0.03	48.80	0.00	48.80
103.80	0.00	0.00	0.00	0.00	47.77	0.00	47.77

Quality Control Calculations

	Device	TSS Removal Efficiency
BMP1	Separator Row-1	50%
BMP2	OGS	50%
BMP3	Separator Row-2	50%

NJDEP Calculation for TSS removal rates for BMP in Series:
R = A + B - [(AxB)/100]
A = TSS Removal rate from First (Upstream BMP)
B = TSS Removal rate from Second (Downstream BMP)

Land Type	Area (m^2)	Starting TSS Removal (A)	TSS Removal (B_1)	TSS Removal (B_2)	TSS Removal (B_3)	Notes
Roof	23,900	90%	95%	98%	99%	*Roof is treated by all three BMPs*
Landscape	1,400	90%	90%	95%	98%	*Landscape does not get treated by BMP1*
Impervious	43,500	0%	0%	50%	75%	*Impervious does not get treated by BMP1*
TOTAL	68,800	**33%**	**35%**	**67%**	**84%**	

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/02/2025

Province:	Ontario
City:	OTTAWA
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	4.83
Runoff Coefficient 'c':	0.83

Particle Size Distribution:	Fine
Target TSS Removal (%):	80.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	129.39
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	4877
Estimated Average Annual Sediment Volume (L/yr):	3965

Project Name:	O'Keefe Court
Project Number:	21684
Designer Name:	Theodor Gheonea
Designer Company:	KWA Site Development Consulting Inc.
Designer Email:	theo.gheonea@kwasitedev.com
Designer Phone:	647-886-0146
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	44
EFO5	53
EFO6	60
EFO8	72
EFO10	79
EFO12	84

Recommended Stormceptor EFO Model: EFO12

Estimated Net Annual Sediment (TSS) Load Reduction (%): 84

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

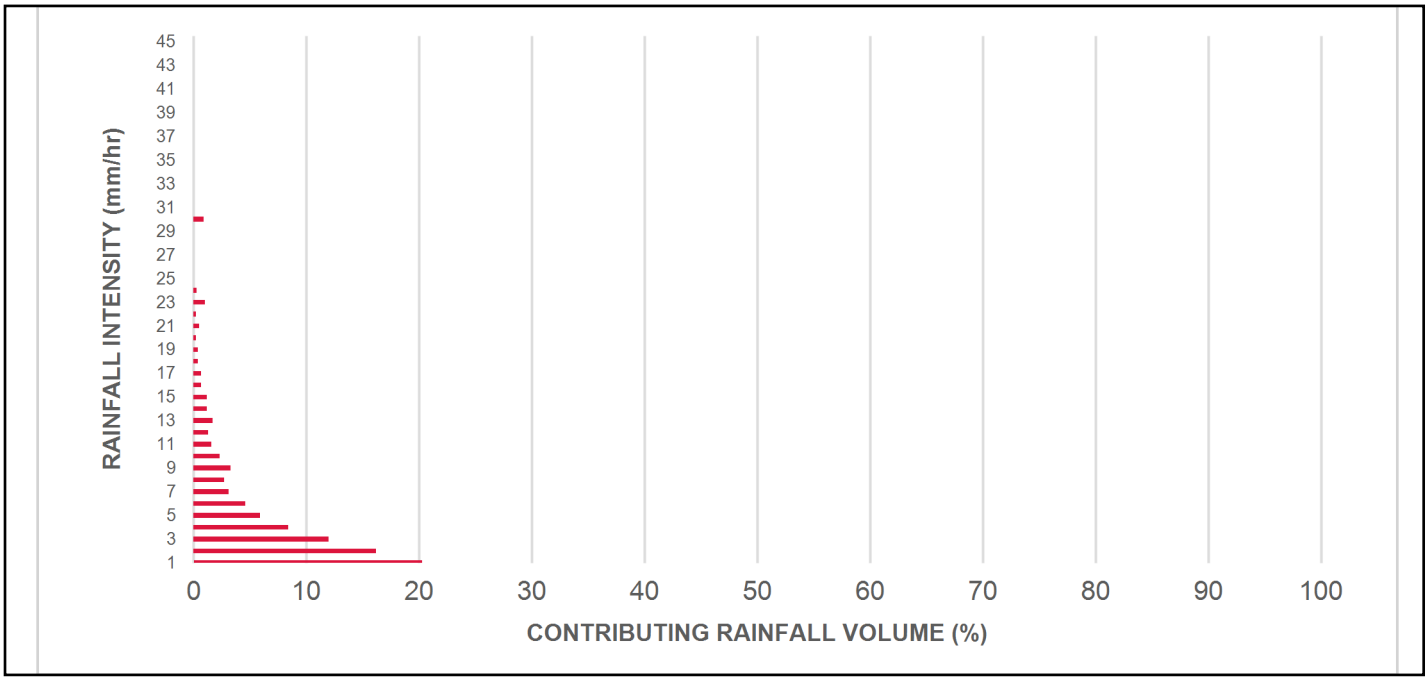
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

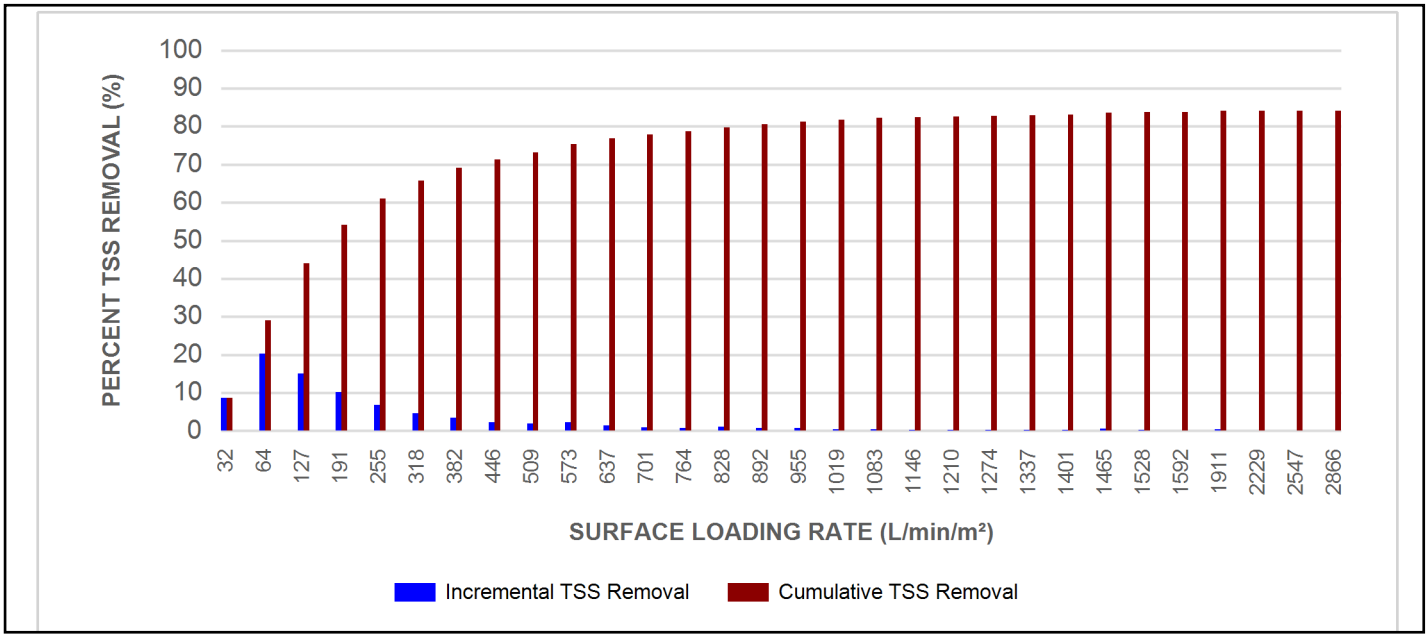
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	5.57	334.0	32.0	100	8.6	8.6
1.00	20.3	29.0	11.14	669.0	64.0	100	20.3	29.0
2.00	16.2	45.2	22.29	1337.0	127.0	93	15.1	44.1
3.00	12.0	57.2	33.43	2006.0	191.0	84	10.1	54.2
4.00	8.4	65.6	44.58	2675.0	255.0	81	6.8	61.0
5.00	5.9	71.6	55.72	3343.0	318.0	78	4.6	65.7
6.00	4.6	76.2	66.87	4012.0	382.0	75	3.5	69.1
7.00	3.1	79.3	78.01	4681.0	446.0	72	2.2	71.3
8.00	2.7	82.0	89.16	5349.0	509.0	69	1.9	73.2
9.00	3.3	85.3	100.30	6018.0	573.0	66	2.2	75.4
10.00	2.3	87.6	111.45	6687.0	637.0	64	1.5	76.9
11.00	1.6	89.2	122.59	7356.0	701.0	64	1.0	77.9
12.00	1.3	90.5	133.74	8024.0	764.0	63	0.8	78.7
13.00	1.7	92.2	144.88	8693.0	828.0	63	1.1	79.8
14.00	1.2	93.5	156.03	9362.0	892.0	62	0.8	80.6
15.00	1.2	94.6	167.17	10030.0	955.0	62	0.7	81.3
16.00	0.7	95.3	178.32	10699.0	1019.0	61	0.4	81.7
17.00	0.7	96.1	189.46	11368.0	1083.0	60	0.4	82.2
18.00	0.4	96.5	200.61	12036.0	1146.0	58	0.2	82.4
19.00	0.4	96.9	211.75	12705.0	1210.0	57	0.2	82.6
20.00	0.2	97.1	222.89	13374.0	1274.0	55	0.1	82.8
21.00	0.5	97.5	234.04	14042.0	1337.0	54	0.2	83.0
22.00	0.2	97.8	245.18	14711.0	1401.0	52	0.1	83.1
23.00	1.0	98.8	256.33	15380.0	1465.0	50	0.5	83.6
24.00	0.3	99.1	267.47	16048.0	1528.0	48	0.1	83.8
25.00	0.0	99.1	278.62	16717.0	1592.0	46	0.0	83.8
30.00	0.9	100.0	334.34	20061.0	1911.0	38	0.4	84.1
35.00	0.0	100.0	390.07	23404.0	2229.0	33	0.0	84.1
40.00	0.0	100.0	445.79	26747.0	2547.0	29	0.0	84.1
45.00	0.0	100.0	501.51	30091.0	2866.0	26	0.0	84.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**84 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

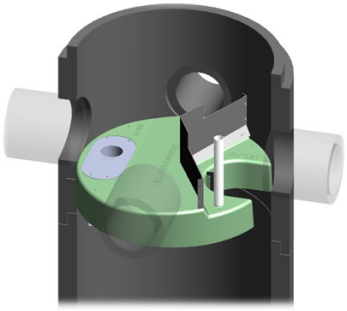
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

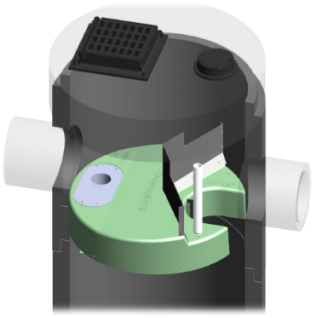
DESIGN FLEXIBILITY

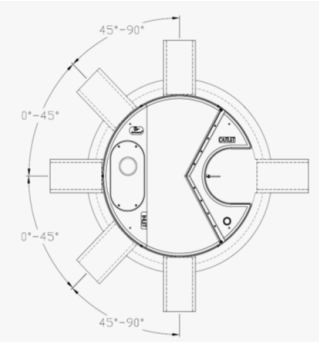
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid

Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/02/2025

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	0.73
% Imperviousness:	90.00

Runoff Coefficient 'c': 0.84

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	19.79
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	536
Estimated Average Annual Sediment Volume (L/yr):	436

Project Name:	O'Keefe - Infil Gal. 2
Project Number:	21684
Designer Name:	Theodor Gheonea
Designer Company:	KWA Site Development Consulting Inc.
Designer Email:	theo.gheonea@kwasitedev.com
Designer Phone:	647-886-0146
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	53
EFO5	57
EFO6	60
EFO8	64
EFO10	67
EFO12	68

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 60

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

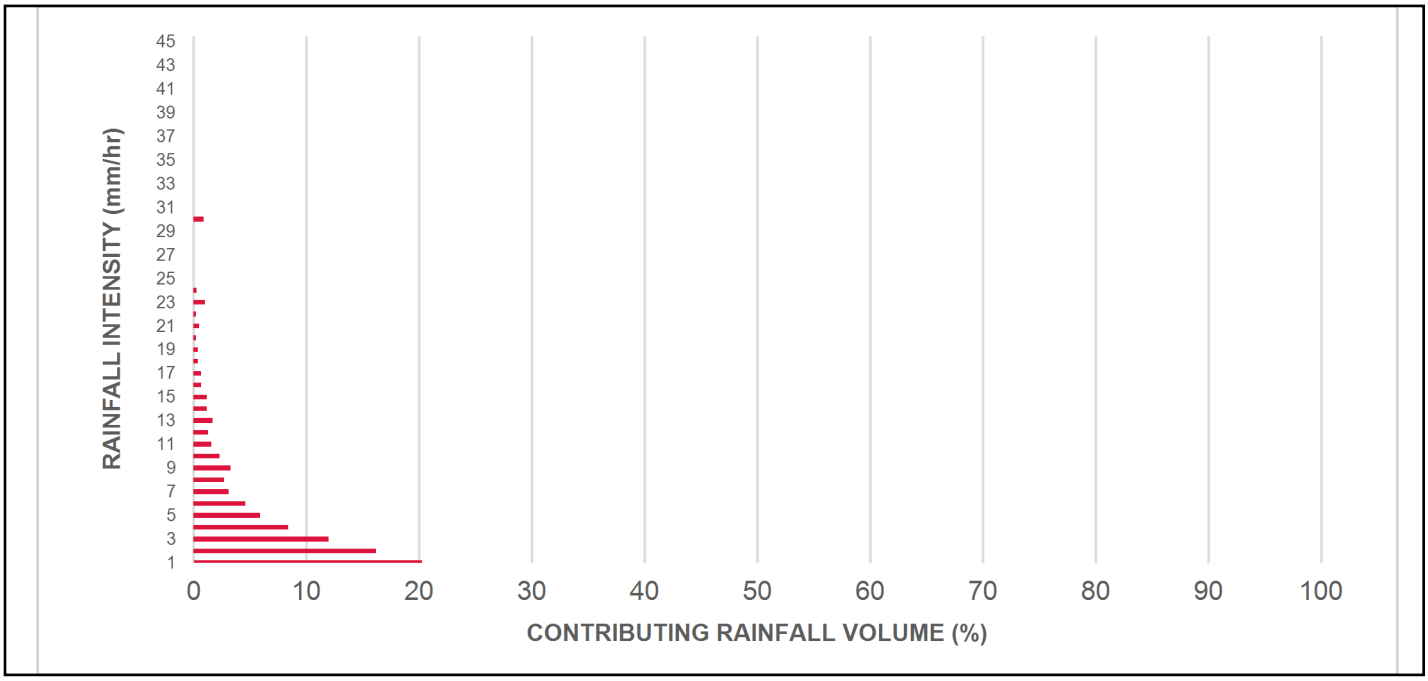
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

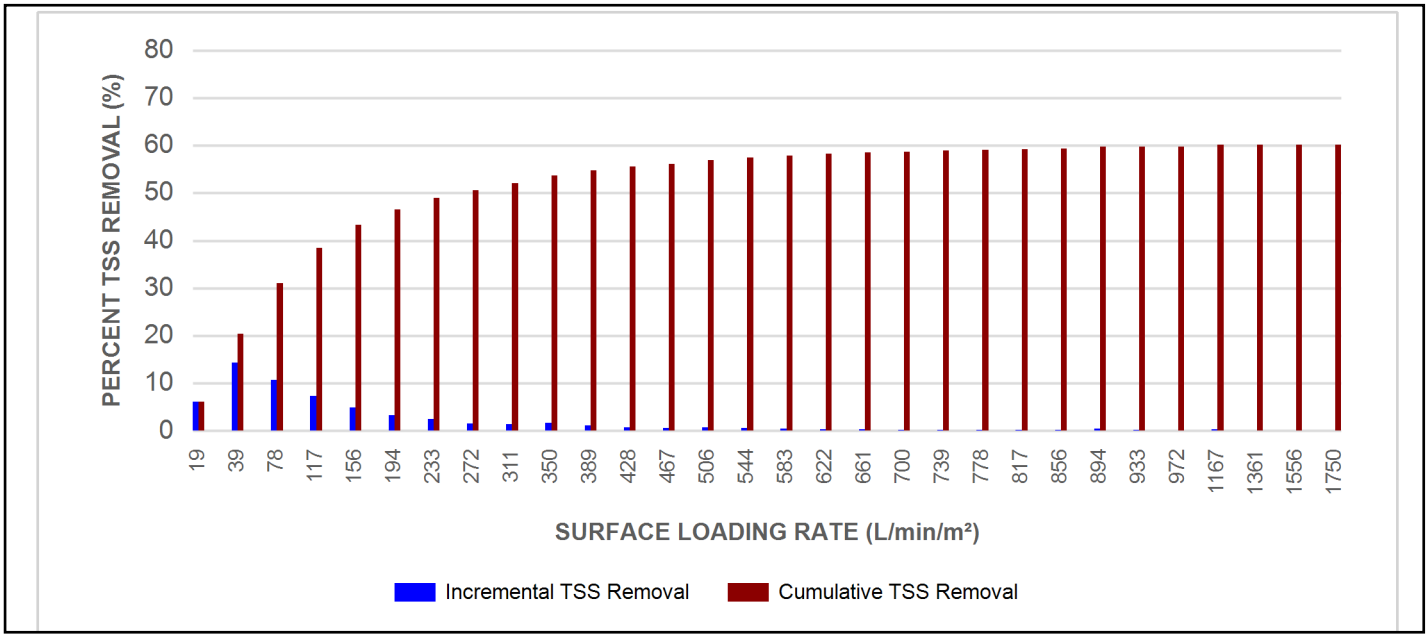
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.85	51.0	19.0	70	6.1	6.1
1.00	20.3	29.0	1.70	102.0	39.0	70	14.3	20.4
2.00	16.2	45.2	3.41	205.0	78.0	66	10.6	31.0
3.00	12.0	57.2	5.11	307.0	117.0	62	7.4	38.4
4.00	8.4	65.6	6.82	409.0	156.0	58	4.9	43.3
5.00	5.9	71.6	8.52	511.0	194.0	55	3.3	46.6
6.00	4.6	76.2	10.23	614.0	233.0	53	2.5	49.0
7.00	3.1	79.3	11.93	716.0	272.0	52	1.6	50.6
8.00	2.7	82.0	13.64	818.0	311.0	51	1.4	52.0
9.00	3.3	85.3	15.34	921.0	350.0	50	1.7	53.7
10.00	2.3	87.6	17.05	1023.0	389.0	49	1.1	54.8
11.00	1.6	89.2	18.75	1125.0	428.0	47	0.7	55.5
12.00	1.3	90.5	20.46	1227.0	467.0	46	0.6	56.1
13.00	1.7	92.2	22.16	1330.0	506.0	45	0.8	56.9
14.00	1.2	93.5	23.87	1432.0	544.0	44	0.5	57.4
15.00	1.2	94.6	25.57	1534.0	583.0	43	0.5	57.9
16.00	0.7	95.3	27.28	1637.0	622.0	42	0.3	58.2
17.00	0.7	96.1	28.98	1739.0	661.0	42	0.3	58.5
18.00	0.4	96.5	30.68	1841.0	700.0	42	0.2	58.7
19.00	0.4	96.9	32.39	1943.0	739.0	41	0.2	58.9
20.00	0.2	97.1	34.09	2046.0	778.0	41	0.1	59.0
21.00	0.5	97.5	35.80	2148.0	817.0	41	0.2	59.2
22.00	0.2	97.8	37.50	2250.0	856.0	41	0.1	59.3
23.00	1.0	98.8	39.21	2352.0	894.0	41	0.4	59.7
24.00	0.3	99.1	40.91	2455.0	933.0	40	0.1	59.8
25.00	0.0	99.1	42.62	2557.0	972.0	40	0.0	59.8
30.00	0.9	100.0	51.14	3068.0	1167.0	38	0.4	60.1
35.00	0.0	100.0	59.66	3580.0	1361.0	35	0.0	60.1
40.00	0.0	100.0	68.19	4091.0	1556.0	31	0.0	60.1
45.00	0.0	100.0	76.71	4603.0	1750.0	27	0.0	60.1
Estimated Net Annual Sediment (TSS) Load Reduction =								**60 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

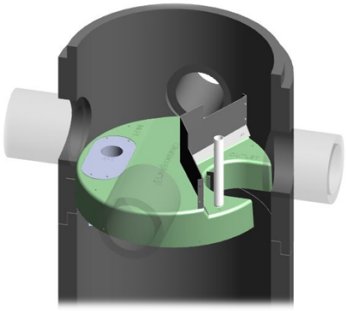
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

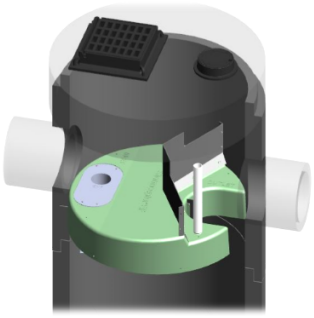
DESIGN FLEXIBILITY

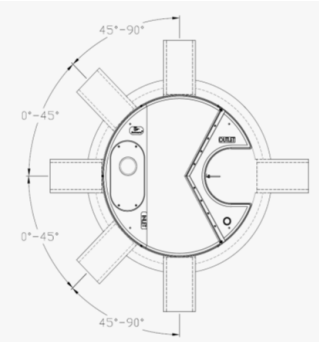
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

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Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-

entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

Imbrium® Systems
ESTIMATED NET ANNUAL SEDIMENT (TSS) LOAD REDUCTION

12/02/2025

Province:	Ontario
City:	Ottawa
Nearest Rainfall Station:	OTTAWA CDA RCS
Climate Station Id:	6105978
Years of Rainfall Data:	20

Site Name:	

Drainage Area (ha):	0.63
% Imperviousness:	90.00

Runoff Coefficient 'c': 0.84

Particle Size Distribution:	CA ETV
Target TSS Removal (%):	60.0

Required Water Quality Runoff Volume Capture (%):	90.00
Estimated Water Quality Flow Rate (L/s):	17.08
Oil / Fuel Spill Risk Site?	Yes
Upstream Flow Control?	No
Peak Conveyance (maximum) Flow Rate (L/s):	
Influent TSS Concentration (mg/L):	200
Estimated Average Annual Sediment Load (kg/yr):	471
Estimated Average Annual Sediment Volume (L/yr):	383

Project Name:	Okeefe - Infil Gal. 3
Project Number:	21684
Designer Name:	Theodor Gheonea
Designer Company:	KWA Site Development Consulting Inc.
Designer Email:	theo.gheonea@kwasitedev.com
Designer Phone:	647-886-0146
EOR Name:	
EOR Company:	
EOR Email:	
EOR Phone:	

Net Annual Sediment (TSS) Load Reduction Sizing Summary

Stormceptor Model	TSS Removal Provided (%)
EFO4	54
EFO5	58
EFO6	61
EFO8	65
EFO10	67
EFO12	69

Recommended Stormceptor EFO Model: EFO6

Estimated Net Annual Sediment (TSS) Load Reduction (%): 61

Water Quality Runoff Volume Capture (%): > 90

imbrium

THIRD-PARTY TESTING AND VERIFICATION

►**Stormceptor® EF and Stormceptor® EFO** are the latest evolutions in the Stormceptor® oil-grit separator (OGS) technology series, and are designed to remove a wide variety of pollutants from stormwater and snowmelt runoff. These technologies have been third-party tested in accordance with the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators** and performance has been third-party verified in accordance with the **ISO 14034 Environmental Technology Verification (ETV)** protocol.

PERFORMANCE

►**Stormceptor® EF and EFO** remove stormwater pollutants through gravity separation and floatation, and feature a patent-pending design that generates positive removal of total suspended solids (TSS) throughout each storm event, including high-intensity storms. Captured pollutants include sediment, free oils, and sediment-bound pollutants such as nutrients, heavy metals, and petroleum hydrocarbons. Stormceptor is sized to remove a high level of TSS from the frequent rainfall events that contribute the vast majority of annual runoff volume and pollutant load. The technology incorporates an internal bypass to convey excessive stormwater flows from high-intensity storms through the device without resuspension and washout (scour) of previously captured pollutants. Proper routine maintenance ensures high pollutant removal performance and protection of downstream waterwavs.

PARTICLE SIZE DISTRIBUTION (PSD)

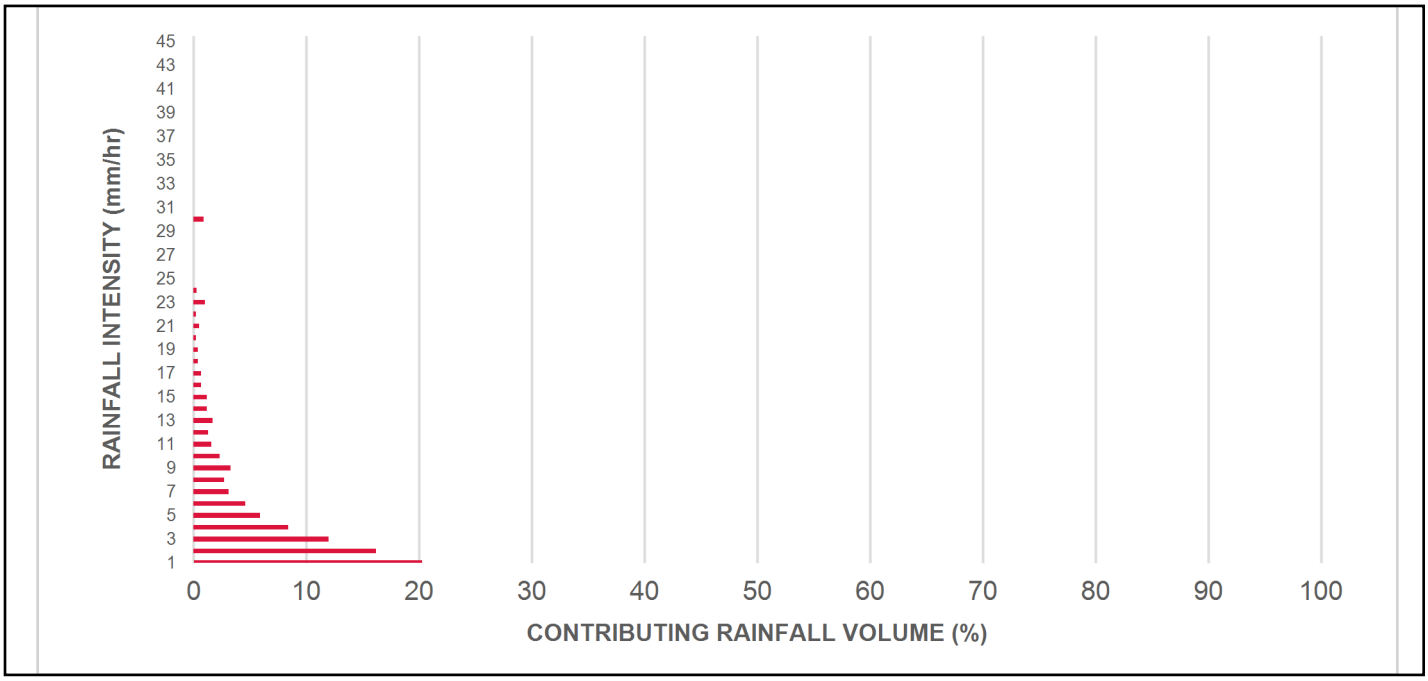
►The **Canadian ETV PSD** shown in the table below was used, or in part, for this sizing. This is the identical PSD that is referenced in the Canadian ETV ***Procedure for Laboratory Testing of Oil-Grit Separators*** for both sediment removal testing and scour testing. The Canadian ETV PSD contains a wide range of particle sizes in the sand and silt fractions, and is considered reasonably representative of the particle size fractions found in typical urban stormwater runoff.

Particle Size (µm)	Percent Less Than	Particle Size Fraction (µm)	Percent
1000	100	500-1000	5
500	95	250-500	5
250	90	150-250	15
150	75	100-150	15
100	60	75-100	10
75	50	50-75	5
50	45	20-50	10
20	35	8-20	15
8	20	5-8	10
5	10	2-5	5
2	5	<2	5

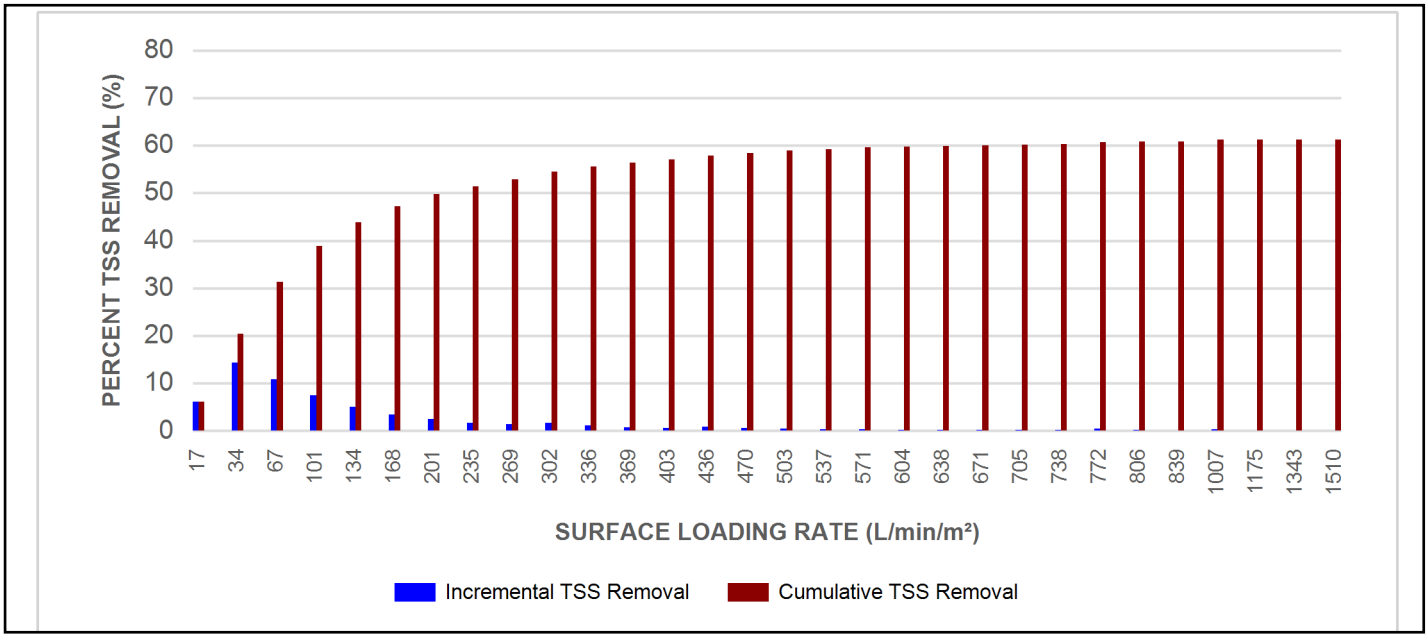
Rainfall Intensity (mm / hr)	Percent Rainfall Volume (%)	Cumulative Rainfall Volume (%)	Flow Rate (L/s)	Flow Rate (L/min)	Surface Loading Rate (L/min/m²)	Removal Efficiency (%)	Incremental Removal (%)	Cumulative Removal (%)
0.50	8.6	8.6	0.74	44.0	17.0	70	6.1	6.1
1.00	20.3	29.0	1.47	88.0	34.0	70	14.3	20.4
2.00	16.2	45.2	2.94	177.0	67.0	67	10.9	31.3
3.00	12.0	57.2	4.41	265.0	101.0	62	7.5	38.8
4.00	8.4	65.6	5.88	353.0	134.0	60	5.1	43.8
5.00	5.9	71.6	7.36	441.0	168.0	57	3.4	47.2
6.00	4.6	76.2	8.83	530.0	201.0	54	2.5	49.7
7.00	3.1	79.3	10.30	618.0	235.0	53	1.6	51.4
8.00	2.7	82.0	11.77	706.0	269.0	52	1.4	52.8
9.00	3.3	85.3	13.24	794.0	302.0	51	1.7	54.5
10.00	2.3	87.6	14.71	883.0	336.0	50	1.2	55.6
11.00	1.6	89.2	16.18	971.0	369.0	49	0.8	56.4
12.00	1.3	90.5	17.65	1059.0	403.0	48	0.6	57.0
13.00	1.7	92.2	19.13	1148.0	436.0	47	0.8	57.8
14.00	1.2	93.5	20.60	1236.0	470.0	46	0.6	58.4
15.00	1.2	94.6	22.07	1324.0	503.0	45	0.5	58.9
16.00	0.7	95.3	23.54	1412.0	537.0	44	0.3	59.2
17.00	0.7	96.1	25.01	1501.0	571.0	43	0.3	59.6
18.00	0.4	96.5	26.48	1589.0	604.0	42	0.2	59.7
19.00	0.4	96.9	27.95	1677.0	638.0	42	0.2	59.9
20.00	0.2	97.1	29.42	1765.0	671.0	42	0.1	60.0
21.00	0.5	97.5	30.89	1854.0	705.0	42	0.2	60.2
22.00	0.2	97.8	32.37	1942.0	738.0	41	0.1	60.3
23.00	1.0	98.8	33.84	2030.0	772.0	41	0.4	60.7
24.00	0.3	99.1	35.31	2118.0	806.0	41	0.1	60.8
25.00	0.0	99.1	36.78	2207.0	839.0	41	0.0	60.8
30.00	0.9	100.0	44.14	2648.0	1007.0	40	0.4	61.2
35.00	0.0	100.0	51.49	3089.0	1175.0	37	0.0	61.2
40.00	0.0	100.0	58.85	3531.0	1343.0	35	0.0	61.2
45.00	0.0	100.0	66.20	3972.0	1510.0	32	0.0	61.2
Estimated Net Annual Sediment (TSS) Load Reduction =								**61 %**

Climate Station ID: 6105978 *Years of Rainfall Data*: 20

RAINFALL DATA FROM OTTAWA CDA RCS RAINFALL STATION



INCREMENTAL AND CUMULATIVE TSS REMOVAL FOR THE RECOMMENDED STORMCEPTOR® MODEL



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Maximum Pipe Diameter / Peak Conveyance

Stormceptor EF / EFO	Model Diameter		Min Angle Inlet / Outlet Pipes	Max Inlet Pipe Diameter		Max Outlet Pipe Diameter		Peak Conveyance Flow Rate	
	(m)	(ft)		(mm)	(in)	(mm)	(in)	(L/s)	(cfs)
EF4 / EFO4	1.2	4	90	609	24	609	24	425	15
EF5 / EFO5	1.5	5	90	762	30	762	30	710	25
EF6 / EFO6	1.8	6	90	914	36	914	36	990	35
EF8 / EFO8	2.4	8	90	1219	48	1219	48	1700	60
EF10 / EFO10	3.0	10	90	1828	72	1828	72	2830	100
EF12 / EFO12	3.6	12	90	1828	72	1828	72	2830	100

SCOUR PREVENTION AND ONLINE CONFIGURATION

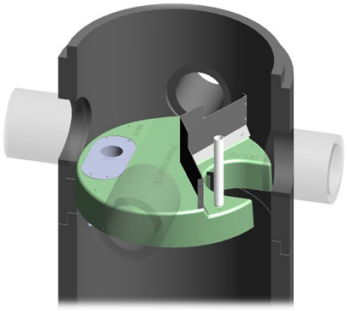
►**Stormceptor® EF and EFO** feature an internal bypass and superior scour prevention technology that have been demonstrated in third-party testing according to the scour testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**, and the exceptional scour test performance has been third-party verified in accordance with the ISO 14034 ETV protocol. As a result, Stormceptor EF and EFO are approved for online installation, eliminating the need for costly additional bypass structures, piping, and installation expense.

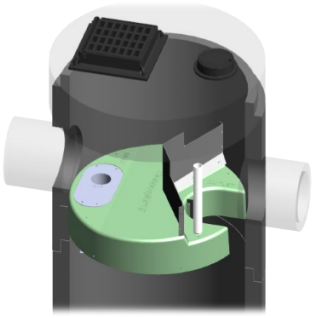
DESIGN FLEXIBILITY

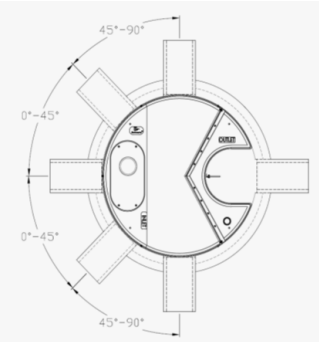
►**Stormceptor® EF** and **EFO** offers design flexibility in one simplified platform, accepting stormwater flow from a single inlet pipe or multiple inlet pipes, and/or surface runoff through an inlet grate. The device can also serve as a junction structure, accommodate a 90-degree inlet-to-outlet bend angle, and can be modified to ensure performance in submerged conditions.

OIL CAPTURE AND RETENTION

►While Stormceptor® EF will capture and retain oil from dry weather spills and low intensity runoff, **Stormceptor® EFO** has demonstrated superior oil capture and greater than 99% oil retention in third-party testing according to the light liquid re-entrainment testing provisions of the Canadian ETV **Procedure for Laboratory Testing of Oil-Grit Separators**. Stormceptor EFO is recommended for sites where oil capture and retention is a requirement.







INLET-TO-OUTLET DROP

Elevation differential between inlet and outlet pipe inverts is dictated by the angle at which the inlet pipe(s) enters the unit.
0° - 45° : The inlet pipe is 1-inch (25mm) higher than the outlet pipe.
45° - 90° : The inlet pipe is 2-inches (50mm) higher than the outlet pipe.

HEAD LOSS

The head loss through Stormceptor EF is similar to that of a 60-degree bend structure. The applicable K value for calculating minor losses through the unit is 1.1. For submerged conditions the applicable K value is 3.0.

Pollutant Capacity

Stormceptor EF / EFO	Model Diameter		Depth (Outlet Pipe Invert to Sump Floor)		Oil Volume		Recommended Sediment Maintenance Depth *		Maximum Sediment Volume *		Maximum Sediment Mass **	
	(m)	(ft)	(m)	(ft)	(L)	(Gal)	(mm)	(in)	(L)	(ft^3)	(kg)	(lb)
EF4 / EFO4	1.2	4	1.52	5.0	265	70	203	8	1190	42	1904	5250
EF5 / EFO5	1.5	5	1.62	5.3	420	111	305	10	2124	75	2612	5758
EF6 / EFO6	1.8	6	1.93	6.3	610	160	305	12	3470	123	5552	15375
EF8 / EFO8	2.4	8	2.59	8.5	1070	280	610	24	8780	310	14048	38750
EF10 / EFO10	3.0	10	3.25	10.7	1670	440	610	24	17790	628	28464	78500
EF12 / EFO12	3.6	12	3.89	12.8	2475	655	610	24	31220	1103	49952	137875

*Increased sump depth may be added to increase sediment storage capacity
** Average density of wet packed sediment in sump = 1.6 kg/L (100 lb/ft^3)

Feature	Benefit	Feature Appeals To
Patent-pending enhanced flow treatment and scour prevention technology	Superior, verified third-party performance	Regulator, Specifying & Design Engineer
Third-party verified light liquid capture and retention for EFO version	Proven performance for fuel/oil hotspot locations	Regulator, Specifying & Design Engineer, Site Owner
Functions as bend, junction or inlet structure	Design flexibility	Specifying & Design Engineer
Minimal drop between inlet and outlet	Site installation ease	Contractor
Large diameter outlet riser for inspection and maintenance	Easy maintenance access from grade	Maintenance Contractor & Site Owner

STANDARD STORMCEPTOR EF/EFO DRAWINGS

For standard details, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

STANDARD STORMCEPTOR EF/EFO SPECIFICATION

For specifications, please visit http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-ef

Table of TSS Removal vs Surface Loading Rate Based on Third-Party Test Results
Stormceptor® EFO

SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL	SLR (L/min/m²)	TSS % REMOVAL
1	70	660	42	1320	35	1980	24
30	70	690	42	1350	35	2010	24
60	67	720	41	1380	34	2040	23
90	63	750	41	1410	34	2070	23
120	61	780	41	1440	33	2100	23
150	58	810	41	1470	32	2130	22
180	56	840	41	1500	32	2160	22
210	54	870	41	1530	31	2190	22
240	53	900	41	1560	31	2220	21
270	52	930	40	1590	30	2250	21
300	51	960	40	1620	29	2280	21
330	50	990	40	1650	29	2310	21
360	49	1020	40	1680	28	2340	20
390	48	1050	39	1710	28	2370	20
420	47	1080	39	1740	27	2400	20
450	47	1110	38	1770	27	2430	20
480	46	1140	38	1800	26	2460	19
510	45	1170	37	1830	26	2490	19
540	44	1200	37	1860	26	2520	19
570	43	1230	37	1890	25	2550	19
600	42	1260	36	1920	25	2580	18
630	42	1290	36	1950	24	2600	26

STANDARD PERFORMANCE SPECIFICATION FOR "OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, and designing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV).

1.2 REFERENCE STANDARDS & PROCEDURES

ISO 14034:2016 Environmental management – Environmental technology verification (ETV)

Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**

1.3 SUBMITTALS

1.3.1 All submittals, including sizing reports & shop drawings, shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail all OGS components, elevations, and sequence of construction.

1.3.2 Alternative devices shall have features identical to or greater than the specified device, including: treatment chamber diameter, treatment chamber wet volume, sediment storage volume, and oil storage volume.

1.3.3 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be signed and sealed by a local registered Professional Engineer, based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record.

PART 2 – PRODUCTS

2.1 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a protected volume for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The minimum sediment & petroleum hydrocarbon storage capacity shall be as follows:

2.1.1	4 ft (1219 mm) Diameter OGS Units:	1.19 m^3 sediment / 265 L oil
	5 ft (1524 mm) Diameter OGS Units:	1.95 m^3 sediment / 420 L oil
	6 ft (1829 mm) Diameter OGS Units:	3.48 m^3 sediment / 609 L oil
	8 ft (2438 mm) Diameter OGS Units:	8.78 m^3 sediment / 1,071 L oil
	10 ft (3048 mm) Diameter OGS Units:	17.78 m^3 sediment / 1,673 L oil
	12 ft (3657 mm) Diameter OGS Units:	31.23 m^3 sediment / 2,476 L oil

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in the sizing report for the specified device. Sizing of the OGS shall be determined by use of a minimum ten (10) years of local historical rainfall data provided by Environment Canada. Sizing shall also be determined by use of the sediment removal performance data derived from the ISO 14034 ETV third-party verified laboratory testing data from testing conducted in accordance with the Canadian ETV protocol Procedure for Laboratory Testing of Oil-Grit Separators, as follows:

3.2.1 Sediment removal efficiency for a given surface loading rate and its associated flow rate shall be based on sediment removal efficiency demonstrated at the seven (7) tested surface loading rates specified in the protocol, ranging 40 L/min/m^2 to 1400 L/min/m^2, and as stated in the ISO 14034 ETV Verification Statement for the OGS device.

3.2.2 Sediment removal efficiency for surface loading rates between 40 L/min/m^2 and 1400 L/min/m^2 shall be based on linear interpolation of data between consecutive tested surface loading rates.

3.2.3 Sediment removal efficiency for surface loading rates less than the lowest tested surface loading rate of 40 L/min/m^2 shall be assumed to be identical to the sediment removal efficiency at 40 L/min/m^2. No extrapolation shall be allowed that results in a sediment removal efficiency that is greater than that demonstrated at 40 L/min/m^2.

3.2.4 Sediment removal efficiency for surface loading rates greater than the highest tested surface loading rate of 1400 L/min/m^2 shall assume zero sediment removal for the portion of flow that exceeds 1400 L/min/m^2, and shall be calculated using a simple proportioning formula, with 1400 L/min/m^2 in the numerator and the higher surface loading rate in the denominator, and multiplying the resulting fraction times the sediment removal efficiency at 1400 L/min/m^2.

The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 2.1.

3.3 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.**

3.3.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

3.4 LIGHT LIQUID RE-ENTRAINMENT SIMULATION TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of completed third-party Light Liquid Re-entrainment Simulation Testing in accordance with the Canadian ETV **Program's Procedure for Laboratory Testing of Oil-Grit Separators,** with results reported within the Canadian ETV or ISO 14034 ETV verification. This re-

entrainment testing is conducted with the device pre-loaded with low density polyethylene (LDPE) plastic beads as a surrogate for light liquids such as oil and fuel. Testing is conducted on the same OGS unit tested for sediment removal to assess whether light liquids captured after a spill are effectively retained at high flow rates.

3.4.1 For an OGS device to be an acceptable stormwater treatment device on a site where vehicular traffic occurs and the potential for an oil or fuel spill exists, the OGS device must have reported verified performance results of greater than 99% cumulative retention of LDPE plastic beads for the five specified surface loading rates (ranging 200 L/min/m^2 to 2600 L/min/m^2) in accordance with the Light Liquid Re-entrainment Simulation Testing within the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** However, an OGS device shall not be allowed if the Light Liquid Re-entrainment Simulation Testing was performed with screening components within the OGS device that are effective at retaining the LDPE plastic beads, but would not be expected to retain light liquids such as oil and fuel.

water

MDPI

Article

Performance of an Underground Stormwater Detention Chamber and Comparison with Stormwater Management Ponds

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Academic Editors: Kelly T. Morgan and Monica Ozores-Hampton
Received: 21 January 2016; Accepted: 11 May 2016; Published: 20 May 2016

Abstract: The transportation of pollutants from impervious surfaces during runoff events to receiving water bodies is a serious environmental problem. Summer runoff is also heated by impervious surfaces, causing thermal enrichment in receiving water body systems and degradation of coldwater aquatic ecosystems. End-of-pipe stormwater management facilities that are open to the environment can result in further elevated temperatures due to exposure to solar radiation. Receiving water systems that provide coldwater habitat require cool water temperatures to sustain healthy conditions for cold water flora and fauna (e.g., trout, dace). Underground Stormwater Detention Chambers (USDC) are a technology for the detention and treatment of stormwater runoff that can potentially solve the thermal issues associated with sun-exposed detention facilities while still providing an equivalent level of treatment services for stormwater pollutants. A field study of an USDC located in Southern Ontario was undertaken to characterize its treatment performance and effect on water temperature. The results were: the USDC was found to provide similar levels of stormwater treatment as wet detention ponds. On average, outlet maximum temperatures were 5 °C cooler than inlet maximum temperatures, and outlet water temperatures remained within the thermal regime for coldwater fish habitat throughout the evaluation period. There was little to no stratification of temperature, nor dissolved solids, but stratification of dissolved oxygen was observed mid-winter and into the spring.

Keywords: stormwater detention; end-of-pipe; underground detention chambers; ponds; water quality; temperature

1. Introduction

Stormwater management is a key issue in the design of urban infrastructure. Sustained increases in urbanization have resulted in large-scale replacement of pervious land by impervious surfaces, which reduces infiltration rates and available surface storage [1]. Due to these changes, a larger proportion of urban precipitation becomes runoff. Runoff from urban areas causes non-point source pollution by transporting pollutants-which are deposited on impervious surfaces through human activities and atmospheric deposition-to receiving water bodies [2,3].

Stormwater management (SWM) ponds have been the most widely employed management practice in urban drainage for over 40 years [4]. SWM ponds have been widely documented to improve stormwater quality reducing concentrations of suspended sediments [5], metals [5], nutrients [5,6] and bacteria [7]. Ponds are often assumed to provide high removal efficiency for total suspended solids

Mannings Equation - Trapezoidal Channel

Project Name: O'Keefe Court
Project Number: 21684
Location: Nepean, Ontario
Date: 12/3/2025
Prepared By: LP

EXISTING SWALE - Flow Capacity

Parameter	Value		Units	
Flow depth	0.87		m	
Freeboard	0.3			*assumed*
Side slope Ratio	3	:1	H:V	*existing side slopes approx. 2:1*
Bed width	0		m	*assume triangular - per cross sections*
Top width	7		m	*existing top width is >7m*
Area	2.253		m^2	
Wetted Perimeter	5.481		m	
Slope	0.3		%	*MINIMUM SLOPE ALONG SOUTH SWALE BETWEEN CUL-DE-SAC AND BLOCK 15 INLET*
Mannings 'n'	0.03			
Channel Capacity	2.275		m^3/s	
Channel Capacity	**2275**		**L/s**	*FLOW CAPACITY OF DITCH AT WORST CASE SCENARIO*
Channel Capacity	1.009		m/s	

REINSTATED SWALE (SWALE No. 1) - Flow Capacity

Parameter	Value		Units			
Flow depth	0.30		m			
Freeboard	0					
Side slope Ratio	3	:1	H:V	*existing side slopes approx. 2:1*		
Bed width	0		m	*assume triangular - per cross sections*		
Top width	1.8		m	*existing top width is >7m*		
Area	0.270		m^2			
Wetted Perimeter	1.897		m			
Slope	3		%			
Mannings 'n'	0.03					
Channel Capacity	0.425		m^3/s			
Channel Capacity	**425**		**L/s**		***Required Capacity***	***401.8636*** **L/s**
Channel Capacity	1.574		m/s			

REINSTATED SWALE (SWALE No. 2) - Flow Capacity

Parameter	Value		Units			
Flow depth	0.72		m			
Freeboard	0					
Side slope Ratio	2	:1	H:V	*existing side slopes approx. 2:1*		
Bed width	0.5		m			
Top width	3.88		m	*existing top width is >7m*		
Area	1.397		m^2			
Wetted Perimeter	3.720		m			
Slope	1.1		%			
Mannings 'n'	0.03					
Channel Capacity	2.542		m^3/s			
Channel Capacity	**2542**		**L/s**		***Required Capacity***	***2476.813*** **L/s**
Channel Capacity	1.820		m/s			

REINSTATED SWALE (SWALE No. 3) - Flow Capacity

Parameter	Value		Units			
Flow depth	0.78		m			
Freeboard	0					
Side slope Ratio	2	:1	H:V	*existing side slopes approx. 2:1*		
Bed width	0.6		m			
Top width	4.32		m	*existing top width is >7m*		
Area	1.685		m^2			
Wetted Perimeter	4.088		m			
Slope	0.67		%			
Mannings 'n'	0.03					
Channel Capacity	2.546		m^3/s			
Channel Capacity	**2546**		**L/s**		***Required Capacity***	***2476.8*** **L/s**
Channel Capacity	1.511		m/s			

Total Site - Uncontrolled Flow

Uncontrolled area (ha) =	6.88
Runoff Coefficient =	0.9
Time of Concentration (min) =	40

Storm Event	Intensity (mm/hr)	Uncontrolled Flow Rate (L/s)
2 year	32.9	565.7
5 year	44.2	760.6
10 year	51.6	888.6
25 year	61.0	1049.4
50 year	68.0	1169.7
100 year	75.1	1293.5

100-year Flow + 20% Surcharge = 1552.2

Calculation of Contributing Flow to O'Keefe South Swale (Up to Block 15 Inlet)

					Rainfall Intensity (mm/hr)		Rational Flow (L/s)	
*Drainage ID	Description	Area (ha)	**ToC (min)	Runoff C	2 year	100 year	2 year	100 year
200	Subject Site - Controlled Flow	6.74	***Flow is predetermined - Refer to SWM Calcs***				166.5	379.8
201	Subject Site - Uncontrolled Flow	0.14	***Flow is predetermined - Refer to SWM Calcs***				22.1	51.4
202a	O'Keefe ROW - North	0.57	15	0.90	61.8	142.9	88.1	203.8
202b	O'Keefe ROW - South	0.66	20	0.90	52.0	120.0	85.9	198.1
203	Lytle Park	9.8	50	0.30	28.0	64.0	229.2	522.7
		17.91						
						Total Flow (L/s)	**591.8**	**1355.8**

IDF curve equations (Intensity in mm/hr)

100 year Intensity = $1735.688 / (\text{Time in min} + 6.014)^{0.820}$
50 year Intensity = $1569.580 / (\text{Time in min} + 6.014)^{0.820}$
25 year Intensity = $1402.884 / (\text{Time in min} + 6.018)^{0.819}$
10 year Intensity = $1174.184 / (\text{Time in min} + 6.014)^{0.816}$
5 year Intensity = $998.071 / (\text{Time in min} + 6.053)^{0.814}$
2 year Intensity = $732.951 / (\text{Time in min} + 6.199)^{0.810}$

Ditch Capacity =	**4153**	L/s
Total Tributary Flow (2-year) =	**591.8**	L/s
Total Tributary Flow (100-year) =	**1355.8**	L/s
***Site Overland Flow Conditions =	**2476.8**	L/s

Operating Capacities

2-year	**14%**
100-year	**33%**
Overland Flow	**60%**

*Refer to Figure PDP-A in Appendix E

**time of concentration calculated using Airport Formula (RC<0.4) and Bransby William Formula (RC>0.4)

***site overland flow conditions based on uncontrolled flow of total site (with 20% surcharge) + 100-year flows from areas 202a, 202b, 203

Culvert Sizing

Pipe Size =	600	mm
Pipe Grade % =	2	
Full Wetted Area =	0.28	m2
Full Wetted Perimeter =	1.88	m
Mannings Coefficient	0.024	
Full Flow Velocity =	**1.66**	**m/s**
Full Flow Capacity =	**470.4**	**L/s**

	Area (m^2)	**Runoff C**	**ToC (min)**	
Area #202	1828	0.75	10	*O'Keefe north ROW drainage*

Pre-Development Flow (L/s)

	2 year	**5 year**	**10 year**	**25 year**	**50 year**	**100 year**
Area 202	29.27	39.71	46.55	55.15	61.54	68.06
Site (Area 200)	151.00	166.41	202.35	266.16	317.97	378.29
% of FFC	38%	44%	53%	68%	81%	95%

Convert Annual Precipitation to Daily Rainfall Depth

Project Name: O'Keefe Court
Project Number: 21684
Location: Nepean, Ontario
Date: 12/10/2025
Prepared By: PB

Average Annual Rainfall (mm) **944.00**

Approximate Average Annual Rainfall Percent *	Average Annual Rainfall (mm/yr)	Rainfall Depth (mm) *
0%	0	0
48%	453.12	5
70%	660.8	10
83%	783.52	15
90%	849.6	20
95%	896.8	25
97%	915.68	30
99%	934.56	35
100%	944	40

** Source: Appendix B.1, Toronto Wet Weather Flow Management Guidelines, November 2016*

*** Source: Figure 1a - % of Total Annual Average Rainfall Depth vs Daily Rainfall Amounts (Based on 1991 Toronto Rainfall data from 16 Rain Gauge Stations) , Toronto Wet Weather Flow Management Guidelines, November 2016*

Infiltration Deficit (mm/yr) **58.00**
Daily Rainfall Depth (mm) **0.64**

Project:	**O'Keefe Court**
Project #:	21684
Designed By:	L.P.
Checked By:	T.F
Date:	11-Dec-2025

Site Total - Infiltration Rate & Drawdown Time

Infiltration Storage Required

Rainfall Retention Depth =	**5.00**	mm
Site Area =	**6.88**	ha
Total Water Balance Volume Required =	**344.00**	m^3

due to site and hydrogeological constraints, only rooftop areas will be retained and infiltrated

Combined Rooftop Area =	**2.39**	ha
West Drainage Area =	**1.20**	ha
Total Target Water Balance Volume =	**179.50**	m^3
Total Water Balance Volume Provided =	**184.50**	m^3
% of total volume requirement =	53.6%	

Project:	**O'Keefe Court**
Project #:	21684
Designed By:	T.G
Checked By:	T.F
Date:	11-Dec-2025

Infiltration Gallery - 1 (Cultec 100HD Stormwater System) - Infiltration Rate & Drawdown Time

Infiltration Rate

Infiltration Rate =	25.8	mm/hr	*as per Hydrogeological Investigation (Gemtech) dated 09/04/24*
Safety Correction Factor =	2.5		
Total Target Water Balance Volume Pr	10.32	mm/hr	

Infiltration Storage Required

Rainfall Retention Depth =	**5.00**	mm
Building A3 Area =	**0.80**	ha
Total Target Water Balance Volume	**40.00**	m^3

Cultec 100HD Stormwater System Dimensions

Footprint	**203.99**	m2
Volume	**40.00**	m3

	Vol of Infiltration (m^3)	**Infiltration Rate (m/hr)**	**Area of Infiltration (m^2)**	**Infiltration Vol. Rate (m^3/hr)**	**Drawdown Time (hrs)***
Infiltration	40.00	0.0103	203.99	2.1	19.0
Total	**40.00**				

*Max allowable drawdown time = 72 hours (3 days)

**effective depth of water from Cultec stage-storage sheet multiplied by 0.40 (water volume/bulk volume ratio)

Project:	**O'Keefe Court**
Project #:	21684
Designed By:	T.G
Checked By:	T.F
Date:	11-Dec-2025

Infiltration Gallery - 2 (Cultec 100HD Stormwater System) - Infiltration Rate & Drawdown Time

Infiltration Rate

Infiltration Rate =	4.3	mm/hr	*as per Hydrogeological Investigation (Gemtech) dated 09/04/24*
Safety Correction Factor =	2.5		
Total Target Water Balance Volume Pr	1.72	mm/hr	

Infiltration Storage Required

Rainfall Retention Depth =	**5.00**	mm
Building A2 Area =	**1.50**	ha
Total Target Water Balance Volume	**75.00**	m^3

Cultec 100HD Stormwater System Dimensions

Footprint	**987.84**	m2
Volume	**75.00**	m3

	Vol of Infiltration (m^3)	Infiltration Rate (m/hr)	Area of Infiltration (m^2)	Infiltration Vol. Rate (m^3/hr)	Drawdown Time (hrs)*
Infiltration	75.00	0.0017	987.84	1.7	44.1
Total	**75.00**				

*Max allowable drawdown time = 72 hours (3 days)

**effective depth of water from Cultec stage-storage sheet multiplied by 0.40 (water volume/bulk volume ratio)

Project:	**O'Keefe Court**
Project #:	21684
Designed By:	T.G
Checked By:	T.F
Date:	11-Dec-2025

Infiltration Gallery - 3 (Cultec 100HD Stormwater System) - Infiltration Rate & Drawdown Time

Infiltration Rate

Infiltration Rate =	13.2	mm/hr	*as per Hydrogeological Investigation (Gemtech) dated 09/04/24*
Safety Correction Factor =	2.5		
Total Target Water Balance Volume Pr	5.28	mm/hr	

Infiltration Storage Required

Rainfall Retention Depth =	**5.00**	mm
Building A1 Area =	**1.39**	ha
Total Target Water Balance Volume	**69.50**	m^3

Cultec 100HD Stormwater System Dimensions

Footprint	**302.70**	m2
Volume	**69.50**	m3

	Vol of Infiltration (m^3)	**Infiltration Rate (m/hr)**	**Area of Infiltration (m^2)**	**Infiltration Vol. Rate (m^3/hr)**	**Drawdown Time (hrs)***
Infiltration	69.50	0.0053	302.70	1.6	43.5
Total	**69.50**				

*Max allowable drawdown time = 72 hours (3 days)

**effective depth of water from Cultec stage-storage sheet multiplied by 0.40 (water volume/bulk volume ratio)

O'KEEFE COURT
OTTAWA, ON

DRAWING INDEX

TITLE	SHEET NO.
COVER SHEET	1 OF 8
INFILTRATION GALLERY 1 LAYOUT SHEET	2 OF 8
INFILTRATION GALLERY 2 LAYOUT SHEET	3 OF 8
INFILTRATION GALLERY 3 LAYOUT SHEET	4 OF 8
STORAGE CHAMBER 1 LAYOUT SHEET	5 OF 8
SYSTEM OVERLAY SHEET	6 OF 8
100HD DETAIL SHEET	7 OF 8
280HD DETAIL SHEET	8 OF 8

PROJECT INFORMATION						
PROJECT NO:	25-1243					
CULTEC SALES REP:	DOMINIC TURNER 438-266-4033 DOMINIC.TURNER@CULTEC.COM					
CULTEC TECHNICAL SALES ENGINEER:						
CULTEC PROJECT COORDINATOR:	TYLER BRUSH 475-289-7120 TYLER.BRUSH@CULTEC.COM					
ENGINEER OF RECORD	KWA SITE DEVELOPMENT CONSULTING INC					
REVISIONS:	ITERATION	DATE	BY	COMMENTS	EOR SHEET REFERENCE	DATE (MM/DD/YYYY)
	00	11/19/2025	SRA	INITIAL SUBMITTAL DRAWINGS	SERVICING PLAN S1 & S2	10/06/2025
	01	11/25/2025	SRA	REVISED PER UPDATED SERVICING PLAN	SERVICING PLAN S1 & S2	10/06/2025

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PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

NOTE: THESE SHOP DRAWINGS MAY CONTAIN COMPONENTS INCLUDING BUT NOT LIMITED TO MANHOLES, CATCH BASINS, STORM PIPES AND FITTINGS, MANIFOLDS, CASTINGS AND OTHER NECESSARY APPURTENANCES THAT MAY NOT BE SUPPLIED BY CULTEC, INC. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND/OR SUPPLIER TO CONFIRM WITH CULTEC THE MATERIALS PROVIDED.

BEFORE YOU BEGIN - REQUIRED MATERIALS AND EQUIPMENT

1. PROPER GEOTECHNICAL SOIL EVALUATION BY A QUALIFIED ENGINEER OR SOIL SCIENTIST TO DETERMINE SUITABILITY OF STRUCTURAL INSTALLATION
2. OSHA COMPLIANCE
3. CULTEC WARNING TAPE, OR EQUIVALENT
4. ASSURANCES FROM LOCAL UTILITIES THAT NO UNDERGROUND GAS, ELECTRICAL OR OTHER POTENTIALLY DANGEROUS PIPELINES OR CONDUITS ARE ALREADY BURIED AT THE SITE
5. ACCEPTABLE 1- 2 INCH (25 - 51 mm) WASHED, CRUSHED STONE AS DETAILED IN CULTEC'S INSTALLATION INSTRUCTIONS. CLEANLINESS OF STONE TO BE VERIFIED BY ENGINEER.
6. ACCEPTABLE FILL MATERIAL AS SHOWN IN CULTEC'S INSTALLATION INSTRUCTIONS.
7. ALL CULTEC CHAMBERS AND ACCESSORIES AS SPECIFIED IN THE ENGINEER'S PLANS INCLUDING CULTEC NO. 410 NON-WOVEN GEOTEXTILE, CULTEC STORMFILTER AND CULTEC NO. 4800 WOVEN GEOTEXTILE, WHERE APPLICABLE.
8. RECIPROCATING SAW OR ROUTER
9. STONE BUCKET
10. STONE CONVEYOR AND/OR TRACKED EXCAVATOR
11. TRANSIT OR LASER LEVEL MEASURING DEVICE
12. COMPACTION EQUIPMENT WITH MAXIMUM GROSS VEHICLE WEIGHT OF 12,000 LBS (5,440 KGS). VIBRATORY ROLLERS MAY ONLY BE USED ON THE STONE BASE PRIOR TO THE INSTALLATION OF CHAMBERS.
13. CHECK CULTEC CHAMBERS FOR DAMAGE PRIOR TO INSTALLATION. DO NOT USE DAMAGED CULTEC CHAMBERS, CONTACT YOUR SUPPLIER IMMEDIATELY TO REPORT DAMAGE OR PACKING-LIST DISCREPANCIES.

REQUIREMENTS FOR CULTEC CHAMBER SYSTEM INSTALLATIONS

1. INSTALLING CONTRACTORS ARE EXPECTED TO COMPREHEND AND USE THE MOST CURRENT INSTALLATION INSTRUCTIONS PRIOR TO BEGINNING A SYSTEM INSTALLATION. IF THERE IS ANY QUESTION AS TO WHETHER YOU POSSESS THE MOST CURRENT INSTRUCTIONS, CONTACT CULTEC AT (203) 775-4416 OR VISIT WWW.CULTEC.COM.
2. CONTACT CULTEC AT LEAST THIRTY DAYS PRIOR TO SYSTEM INSTALLATION TO ARRANGE FOR A PRE-CONSTRUCTION MEETING.
3. ALL CULTEC SYSTEM DESIGNS MUST BE CERTIFIED BY A REGISTERED PROFESSIONAL ENGINEER.
4. USE CULTEC INSTALLATION INSTRUCTIONS AS A GUIDELINE ONLY FOR MINIMUM/MAXIMUM REQUIREMENTS. ACTUAL DESIGN MAY VARY. REFER TO APPROVED CONSTRUCTION DRAWINGS FOR JOB-SPECIFIC DETAILS. BE SURE TO FOLLOW THE ENGINEER'S DRAWINGS AS YOUR PRIMARY GUIDE.
5. THE FOUNDATION STONE SHALL BE LEVEL AND COMPACTED PRIOR TO CHAMBER INSTALLATION.
6. OVERLAPPING RIB CONNECTIONS OF CHAMBERS SHALL BE FULLY SHOULDERED PRIOR TO STONE PLACEMENT.
7. CENTER-TO-CENTER SPACING SHALL BE CHECKED AND MAINTAINED THROUGHOUT INSTALLATION PROCESS.
8. ANY DISCREPANCIES WITH THE SYSTEM SUB-GRADE SOIL'S BEARING CAPACITY MUST BE REPORTED TO THE DESIGN ENGINEER.
9. NON-WOVEN GEOTEXTILE MUST BE USED AS SPECIFIED IN THE ENGINEER'S DRAWINGS.
10. CULTEC REQUIRES THE CONTRACTOR TO REFER TO CULTEC'S INSTALLATION INSTRUCTIONS CONCERNING VEHICULAR TRAFFIC. RESPONSIBILITY FOR PREVENTING VEHICLES THAT EXCEED CULTEC'S REQUIREMENTS FROM TRAVELING ACROSS OR PARKING OVER THE CHAMBER SYSTEM LIES SOLELY WITH THE CONTRACTOR THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS. THE PLACEMENT OF WARNING TAPE, TEMPORARY FENCING, AND/OR APPROPRIATELY LOCATED SIGNS IS HIGHLY RECOMMENDED. IMPRINTED WARNING TAPE IS AVAILABLE FROM CULTEC. FOR ACCEPTABLE VEHICLE LOAD INFORMATION, REFER TO CULTEC INSTALLATION INSTRUCTIONS.
11. TRAFFIC OF INSTALLATION EQUIPMENT OR OTHER VEHICULAR TRAFFIC OVER TOP OF THE CULTEC STORMWATER SYSTEM IS STRICTLY RESTRICTED AND PROHIBITED UNTIL SATISFACTORY COVER AND COMPACTION IS ACHIEVED ACCORDING TO CULTEC'S MANUFACTURER INSTALLATION INSTRUCTIONS.
12. EROSION AND SEDIMENT-CONTROL MEASURES MUST MEET LOCAL CODES AND THE DESIGN ENGINEER'S SPECIFICATIONS THROUGHOUT THE ENTIRE SITE CONSTRUCTION PROCESS.
13. CULTEC SYSTEMS MUST BE DESIGNED AND INSTALLED IN ACCORDANCE WITH CULTEC'S MINIMUM REQUIREMENTS. FAILURE TO DO SO WILL VOID THE LIMITED WARRANTY.
14. CONTACT CULTEC, INC. AT 203-775-4416 WITH ANY QUESTIONS OR FURTHER CLARIFICATION OF REQUIREMENTS.
15. PLACEMENT OF EMBEDMENT STONE MUST BE IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS. STONE COLUMN HEIGHT DEFERENTIAL MUST NEVER EXCEED 12" (305 mm) BETWEEN CHAMBER ROWS, ADJACENT CHAMBERS OR STONE PERIMETER. STONE MUST BE PLACED OVER THE CROWN OF THE CHAMBERS TO ANCHOR THE CHAMBERS IN PLACE AND MAINTAIN ROW SPACING.
16. EMBEDMENT STONE MUST ONLY BE PLACED BY EXCAVATOR OR TELESCOPING CONVEYOR BOOM. PLACEMENT OF EMBEDMENT STONE WITH BULLDOZER IS NOT AN ACCEPTABLE METHOD OF INSTALLATION AND MAY CAUSE DAMAGE TO THE CHAMBERS. ANY CHAMBERS DAMAGED USING AN UNACCEPTABLE METHOD OF BACKFILL ARE NOT COVERED UNDER THE CULTEC LIMITED WARRANTY.

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING HAS BEEN PREPARED BASED ON INFORMATION PROVIDED TO CULTEC UNDER THE DIRECTION OF THE PROJECT ENGINEER OF RECORD OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM'S DESIGN IS IN FULL COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER REQUIREMENTS.

PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER)
*ENGINEER TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

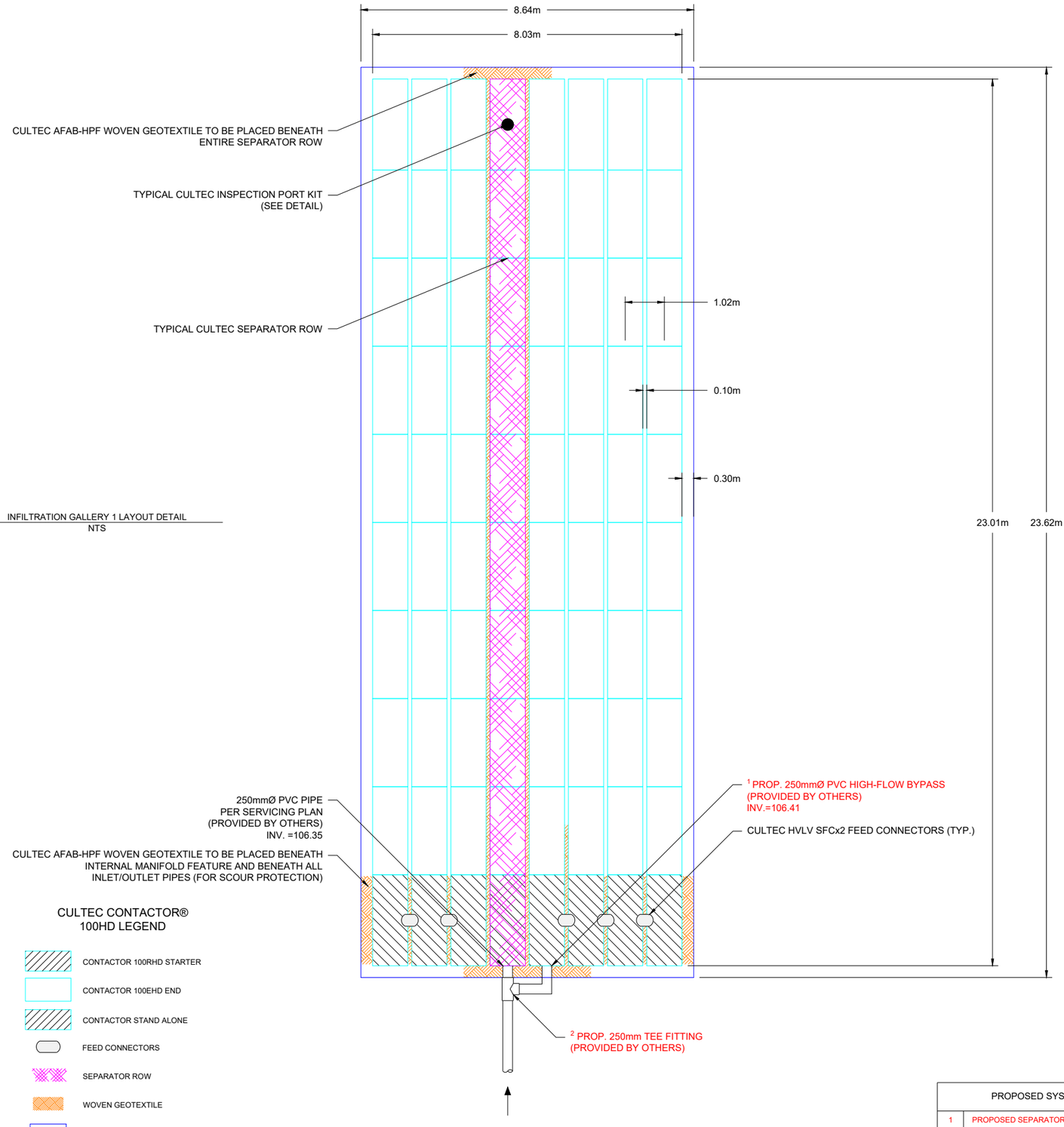
MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	110.33
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	107.07
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	107.02
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	107.02
TOP OF STONE ELEVATION	106.82
TOP OF CHAMBER ELEVATION	106.67
250mm HIGH-FLOW BYPASS PIPE INVERT	106.41
250mm INLET PIPE INVERT	106.35
BOTTOM OF CHAMBER ELEVATION	106.35
BOTTOM OF STONE ELEVATION	106.20

CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY	
TOTAL STORAGE REQUIRED (m^3) BELOW ELEV. 106.56	40.00
TOTAL STORAGE PROVIDED (m^3) BELOW ELEV. 106.56	44.84
% STONE POROSITY	40
SYSTEM AREA (m^2)	203.99
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	152
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	102

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC CONTACTOR 100HD STARTER/STAND ALONE	100RHD	8	PIECES
CULTEC CONTACTOR 100HD END	100EHD	72	PIECES
CULTEC HVLV FEED CONNECTORS	SFCx2	5	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	701	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	36	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	95	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	N/A	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	N/A	SQ. METERS



1 INFILTRATION GALLERY 1 LAYOUT DETAIL
NTS

CULTEC CONTACTOR® 100HD LEGEND

- CONTACTOR 100RHD STARTER
- CONTACTOR 100EHD END
- CONTACTOR STAND ALONE
- FEED CONNECTORS
- SEPARATOR ROW
- WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE	
1	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE
2	PROPOSED TEE FITTING, ROTATED TO MATCH BYPASS INVERT

CULTEC STORMWATER CHAMBER

DATE: (MM/DD/YYYY) 11/25/2025
CHECKED BY: TNB
SHEET NO: 2 OF 8
PROJECT NO: 25-1243.01
DESIGNED BY: SRA
SCALE: N.T.S

O'KEEFE COURT
OTTAWA, ON

INFILTRATION GALLERY 1 LAYOUT SHEET

CULTEC
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CT-tech@cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE USED BY THE ENGINEER OF RECORD AS AN INSTRUMENT OF SERVICE TO SUPPORT THE DESIGN OF THE PROPOSED SYSTEM OR OTHER PROJECT REPRESENTATIVE. IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM IS DESIGNED AS A FULL FLOW FABRICATED STEEL TANK, INSTALLED WITH ALL APPLICABLE LOCAL, REGULATIONS AND MANUFACTURER REQUIREMENTS.

1.02

PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER)
*ENGINEER TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	109.01
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	105.75
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	105.70
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	105.70
TOP OF STONE ELEVATION	105.50
TOP OF CHAMBER ELEVATION	105.35
200mm HIGH-FLOW BYPASS PIPE INVERT	105.09
(2) 250mm OUTLET PIPE INVERT	105.03
150mm SIDE INLET PIPE INVERT	105.03
250mm INLET PIPE INVERT	105.03
BOTTOM OF CHAMBER ELEVATION	105.03
BOTTOM OF STONE ELEVATION	104.80

CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY

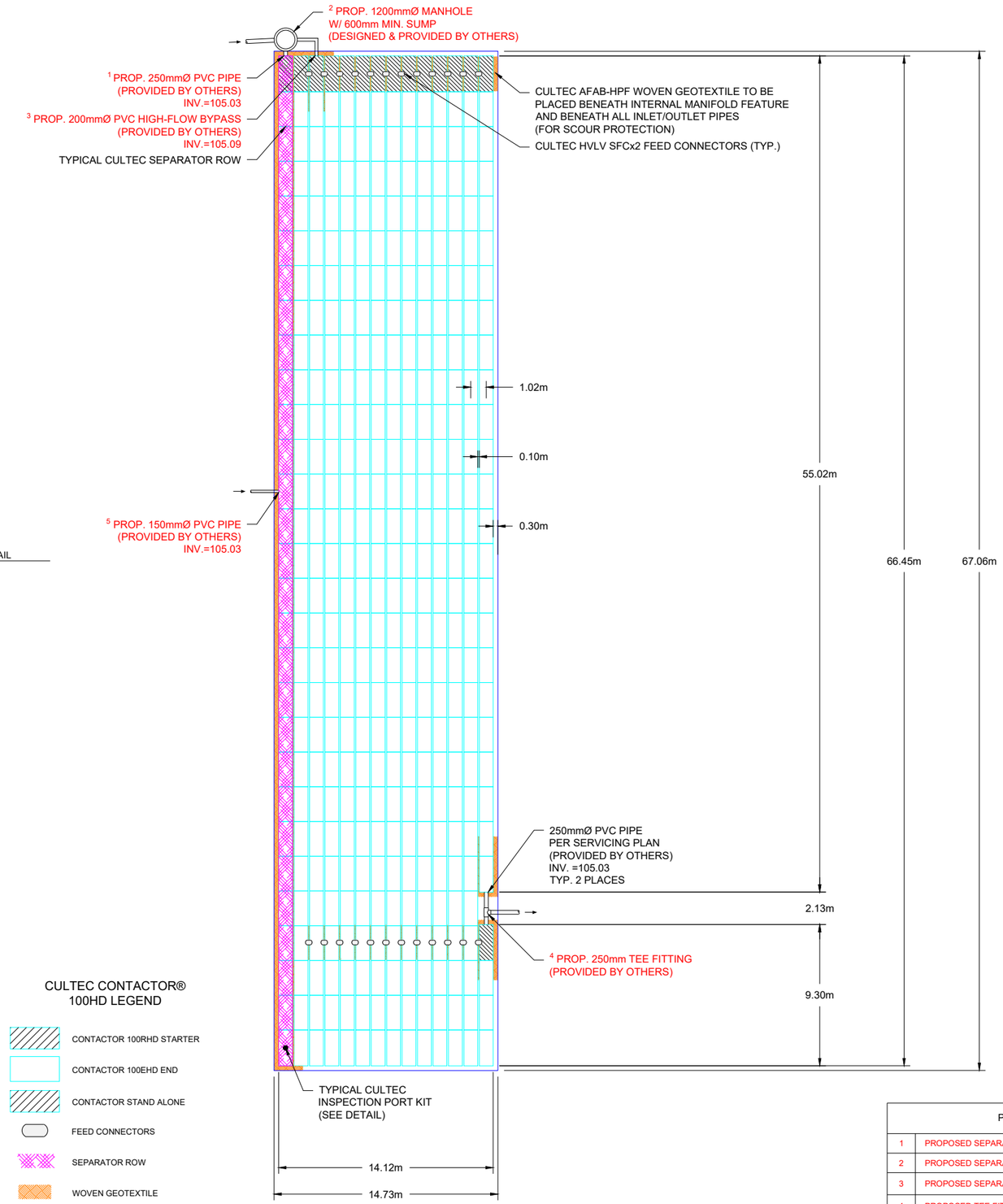
TOTAL STORAGE REQUIRED (m^3) BELOW ELEV. 105.03	70.00
TOTAL STORAGE PROVIDED (m^3) BELOW ELEV. 105.03	90.33
% STONE POROSITY	40
SYSTEM AREA (m^2)	987.84
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	229
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	102

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC CONTACTOR 100HD STARTER/STAND ALONE	100RHD	15	PIECES
CULTEC CONTACTOR 100HD END	100EHD	390	PIECES
CULTEC HVLV FEED CONNECTORS	SFCx2	24	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	3,139	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	109	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	528	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	N/A	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	N/A	SQ. METERS

1 INFILTRATION GALLERY 2 LAYOUT DETAIL
NTS



CULTEC CONTACTOR® 100HD LEGEND

- CONTACTOR 100RHD STARTER
- CONTACTOR 100EHD END
- CONTACTOR STAND ALONE
- FEED CONNECTORS
- SEPARATOR ROW
- WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE

1	PROPOSED SEPARATOR ROW ACCESS PIPE
2	PROPOSED SEPARATOR ROW ACCESS MANHOLE
3	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE
4	PROPOSED TEE FITTING. MAXIMUM PIPE CONNECTION TO SIDE OF CHAMBER = 150mm PVC
5	PROPOSED PIPE MATERIAL CHANGE. MAXIMUM PIPE CONNECTION TO SIDE OF CHAMBER = 150mm HDPE OR PVC

CULTEC STORMWATER CHAMBER

DATE: (MM/DD/YYYY) 11/25/2025
CHECKED BY: TNB
SHEET NO: 3 OF 8
PROJECT NO: 25-1243.01
DESIGNED BY: SRA
SCALE: N.T.S

O'KEEFE COURT
OTTAWA, ON

INFILTRATION GALLERY 2 LAYOUT SHEET

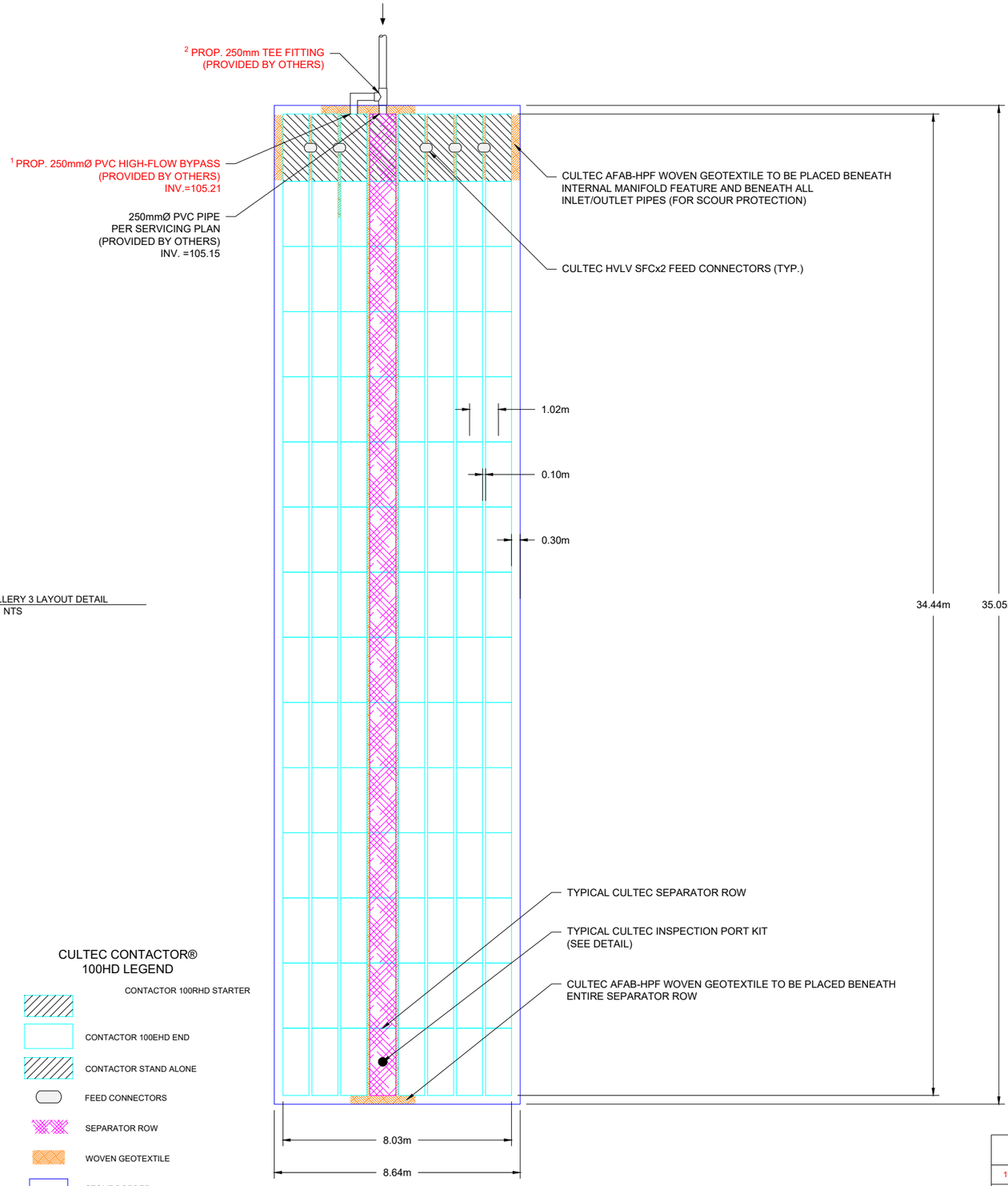
CULTEC
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PH: 1(800) 4-CULTEC
CT-tech@cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE USED BY THE ENGINEER OF RECORD AS AN INSTRUMENT OF SERVICE TO FACILITATE THE CONSTRUCTION OF THE PROJECT. THE USE OF THIS DRAWING BY ANY OTHER PROJECT REPRESENTATIVE IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM IS DESIGNED AND INSTALLED COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER RECOMMENDATIONS.

PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER)
*ENGINEER TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	109.13
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	105.87
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	105.82
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	105.82
TOP OF STONE ELEVATION	105.62
TOP OF CHAMBER ELEVATION	105.47
250mm HIGH-FLOW BYPASS PIPE INVERT	105.21
250mm INLET PIPE INVERT	105.15
BOTTOM OF CHAMBER ELEVATION	105.15
BOTTOM OF STONE ELEVATION	104.90
CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY	
TOTAL STORAGE REQUIRED (m^3) BELOW ELEV. 105.36	70.00
TOTAL STORAGE PROVIDED (m^3) BELOW ELEV. 105.36	79.04
% STONE POROSITY	40
SYSTEM AREA (m^2)	302.70
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	254
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	102



1 INFILTRATION GALLERY 3 LAYOUT DETAIL
NTS

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC CONTACTOR 100HD STARTER/STAND ALONE	100RHD	8	PIECES
CULTEC CONTACTOR 100HD END	100EHD	112	PIECES
CULTEC HVLV FEED CONNECTORS	SFCx2	5	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	1,046	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	49	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	171	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	N/A	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	N/A	SQ. METERS

CULTEC CONTACTOR® 100HD LEGEND

- CONTACTOR 100RHD STARTER
- CONTACTOR 100EHD END
- CONTACTOR STAND ALONE
- FEED CONNECTORS
- SEPARATOR ROW
- WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE

1	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE
2	PROPOSED TEE FITTING, ROTATED TO MATCH BYPASS INVERT

CULTEC STORMWATER CHAMBER

DATE: (MM/DD/YYYY)	11/25/2025
CHECKED BY:	TNB
SHEET NO:	4 OF 8
PROJECT NO:	25-1243.01
DESIGNED BY:	SRA
SCALE:	N.T.S

OKEEFE COURT
OTTAWA, ON

INFILTRATION GALLERY 3 LAYOUT SHEET

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CT-tech@cultec.com

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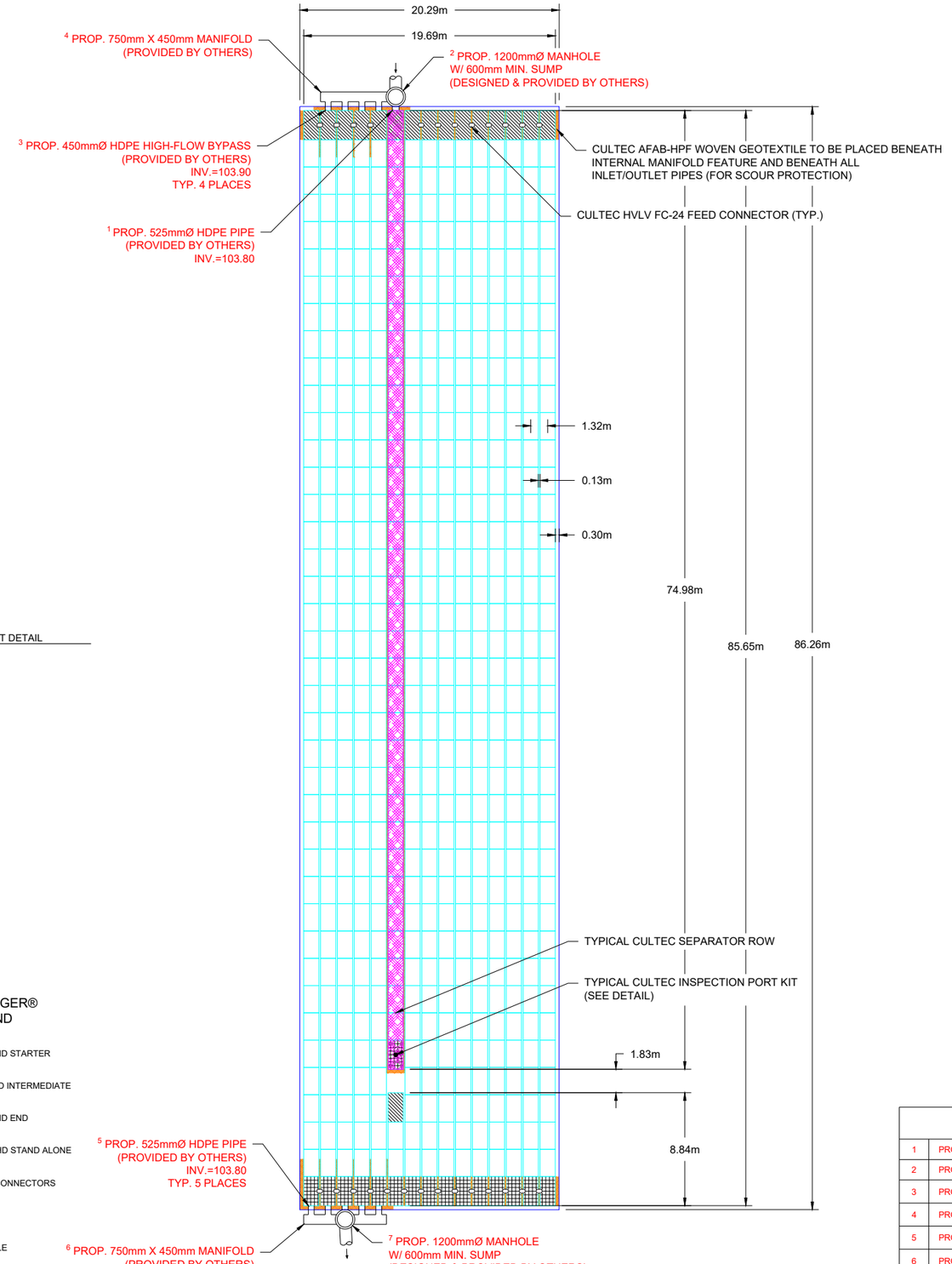
PROPOSED STORMWATER MANAGEMENT SYSTEM ELEVATIONS

(TO BE APPROVED BY ENGINEER OF RECORD)
*ENGINEER OF RECORD TO CONFIRM MINIMUM AND MAXIMUM BURIAL REQUIREMENTS ARE MET)

MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT OR UNPAVED)	108.13
MINIMUM ALLOWABLE GRADE (UNPAVED TRAFFIC)	104.88
MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT)	104.83
MINIMUM ALLOWABLE GRADE (TOP OF RIGID PAVEMENT)	104.83
TOP OF STONE ELEVATION	104.62
TOP OF CHAMBER ELEVATION	104.47
(4) 450mm HIGH-FLOW BYPASS PIPE INVERT	103.90
(5) 450mm OUTLET PIPE INVERT	103.80
525mm INLET PIPE INVERT	103.80
BOTTOM OF CHAMBER ELEVATION	103.80
BOTTOM OF STONE ELEVATION	103.65

CULTEC STORMWATER MANAGEMENT SYSTEM SUMMARY

TOTAL STORAGE REQUIRED (m^3)	1,091.00
TOTAL STORAGE PROVIDED (m^3)	1,119.60
% STONE POROSITY	40
SYSTEM AREA (m^2)	1,750.52
DEPTH OF EMBEDMENT STONE (mm)	152
DEPTH OF BEDDING STONE (mm)	152
STONE PERIMETER (mm)	305
SPACING BETWEEN CHAMBER ROWS (mm)	127



1 STORAGE CHAMBER 1 LAYOUT DETAIL
NTS

NOTE: ALL EXTERNAL SYSTEM STRUCTURES, INLET/OUTLET PIPES AND PROPOSED ELEVATIONS MUST BE DESIGNED AND APPROVED BY THE ENGINEER OF RECORD. ALL PROPOSED SYSTEM ELEVATIONS PROVIDED MUST BE VERIFIED BY THE ENGINEER OF RECORD AND THE ENGINEER OF RECORD MUST ENSURE CHAMBER BURIAL REQUIREMENTS ARE MET

MATERIALS LIST SUPPLIED BY CULTEC

PRODUCT DESCRIPTION	SKU	QUANTITY	UNIT OF MEASURE
CULTEC RECHARGER 280HD STARTER	280SHD	16	PIECES
CULTEC RECHARGER 280HD INTERMEDIATE	280IHD	567	PIECES
CULTEC RECHARGER 280HD END	280EHD	16	PIECES
CULTEC HVLV FEED CONNECTORS	FC-24	26	PIECES
CULTEC NO. 410 NON-WOVEN GEOTEXTILE	75NWG410	5,433	SQ. METERS
CULTEC AFAB-HPF WOVEN GEOTEXTILE	75WGHPF	149	METERS
CULTEC INSPECTION PORT KIT	1299CGC	1	PIECES
MATERIALS LIST NOT SUPPLIED BY CULTEC			
1-2 INCH WASHED, CRUSHED STONE	---	987	CUBIC METERS
8 OZ. NON-WOVEN GEOTEXTILE	---	N/A	SQ. METERS
30 MIL. PVC THERMOPLASTIC LINER	---	N/A	SQ. METERS

CULTEC RECHARGER® 280HD LEGEND

- RECHARGER 280SHD STARTER
- RECHARGER 280IHD INTERMEDIATE
- RECHARGER 280EHD END
- RECHARGER 280RHD STAND ALONE
- HVLV FC-24 FEED CONNECTORS
- SEPARATOR ROW
- WOVEN GEOTEXTILE
- STONE BORDER

PROPOSED SYSTEM ALTERATION TABLE

1	PROPOSED SEPARATOR ROW ACCESS PIPE
2	PROPOSED SEPARATOR ROW ACCESS MANHOLE
3	PROPOSED SEPARATOR ROW HIGH-FLOW BYPASS PIPE
4	PROPOSED 750mm x 450mm INLET MANIFOLD
5	PROPOSED OUTLET PIPE
6	PROPOSED 750mm x 450mm OUTLET MANIFOLD
7	PROPOSED OUTLET MANHOLE

CULTEC STORMWATER CHAMBER

PROJECT NO:	25-1243.01
DESIGNED BY:	SRA
SCALE:	N.T.S
DATE: (MM/DD/YYYY)	11/25/2025
CHECKED BY:	TNB
SHEET NO:	5 OF 8

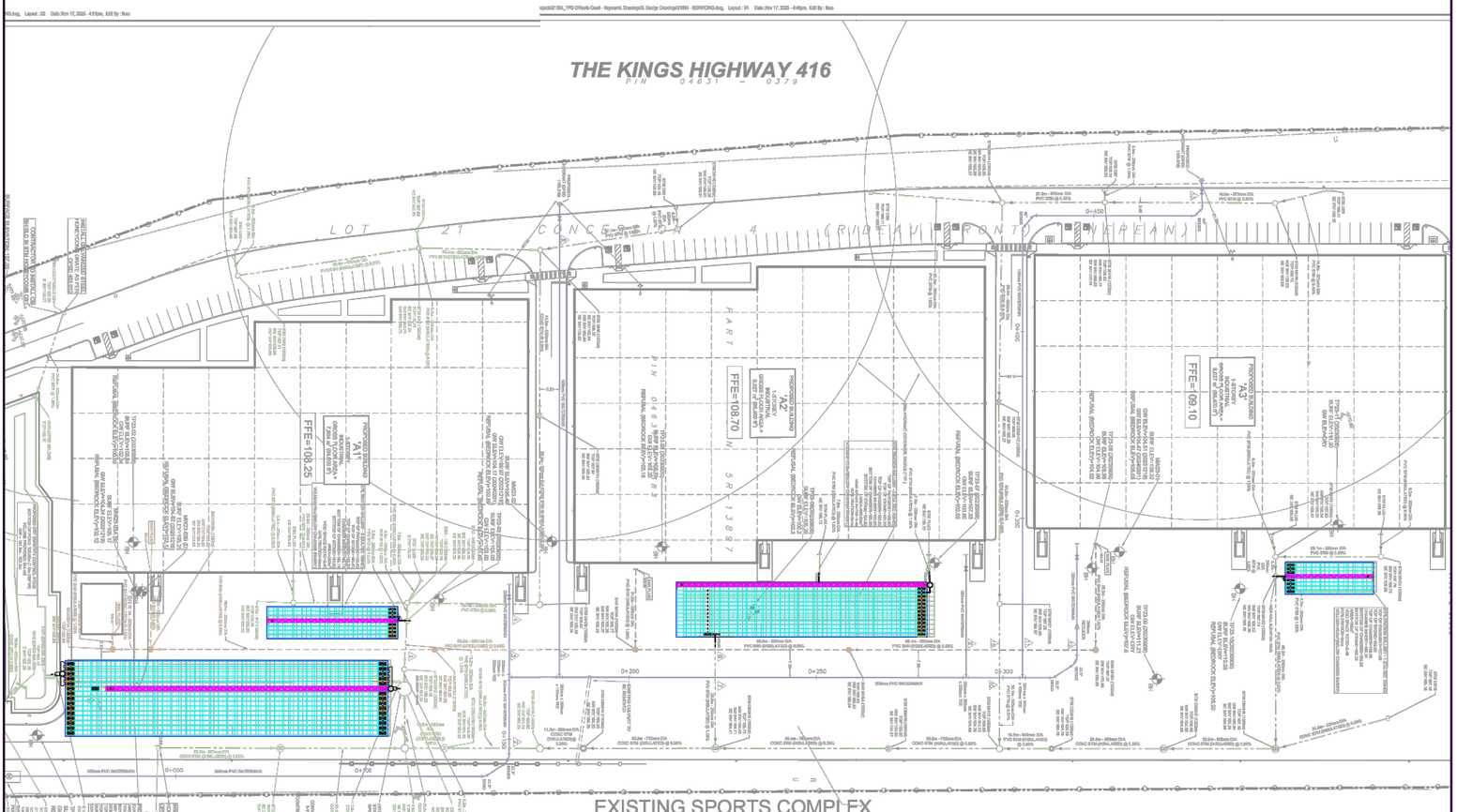
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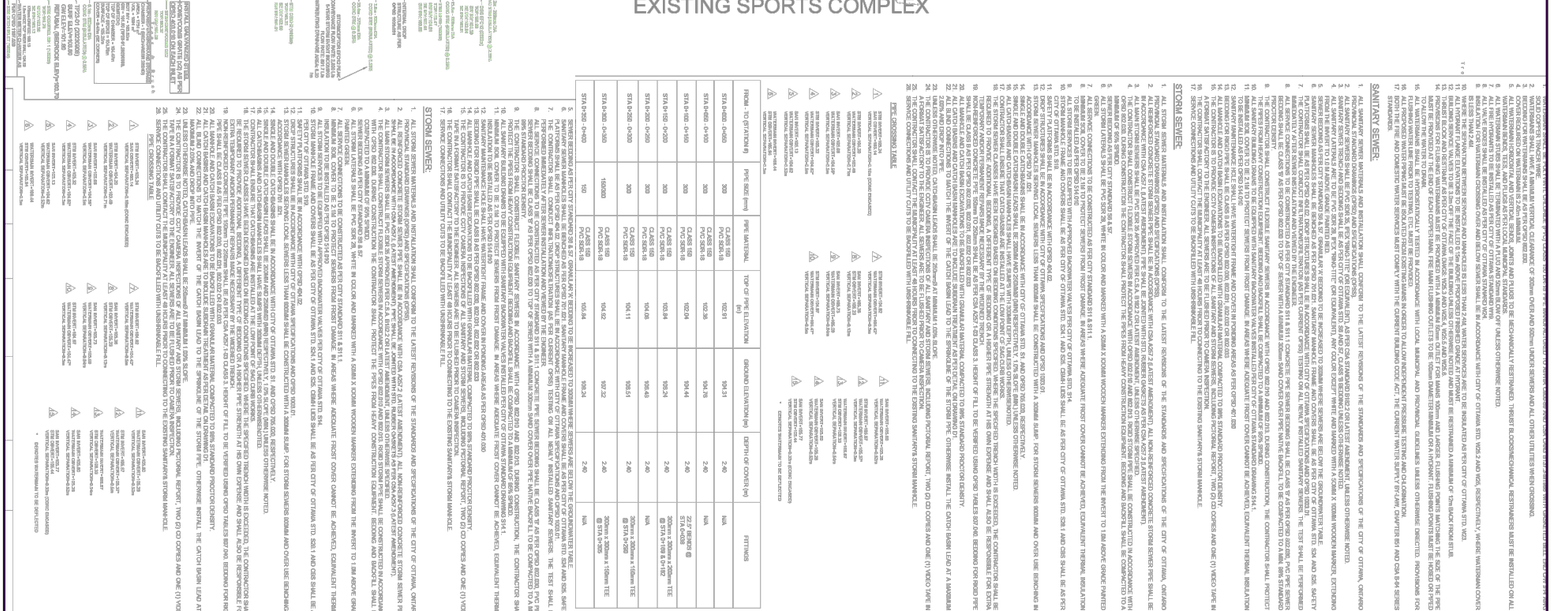
STORAGE CHAMBER 1 LAYOUT SHEET

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1.02





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1.02

O'KEEFE COURT

OTTAWA, ON

SYSTEM OVERLAY SHEET

CULTEC STORMWATER CHAMBER

PROJECT NO:	25-1243.01	**DATE:** (MM/DD/YYYY)	11/25/2025
DESIGNED BY:	SRA	**CHECKED BY:**	TNB
SCALE:	N.T.S	**SHEET NO:**	6 OF 8

CULTEC CONTACTOR® 100HD CHAMBER PRODUCT SPECIFICATIONS

GENERAL
CULTEC CONTACTOR 100HD CHAMBERS ARE DESIGNED FOR UNDERGROUND STORMWATER MANAGEMENT. THE CHAMBERS MAY BE USED FOR RETENTION, RECHARGING, DETENTION OR CONTROLLING THE FLOW OF ON-SITE STORMWATER RUNOFF.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR.
3. THE CHAMBER SHALL BE ARCHED IN SHAPE.
4. THE CHAMBER SHALL BE OPEN-BOTTOMED.
5. THE CHAMBER SHALL BE JOINED USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS OR SEPARATE END WALLS.
6. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC CONTACTOR 100HD SHALL BE 12.5 INCHES (318 mm) TALL, 36 INCHES (914 mm) WIDE AND 8 FEET (2.44 m) LONG. THE INSTALLED LENGTH OF A JOINED CONTACTOR 100HD SHALL BE 7.5 FEET (2.29 m).
7. MAXIMUM INLET OPENING ON THE CHAMBER ENDWALL IS 10 INCHES (250 mm).
8. THE CHAMBER SHALL HAVE TWO SIDE PORTALS TO ACCEPT CULTEC HVLV® SFCX2 FEED CONNECTORS TO CREATE AN INTERNAL MANIFOLD. THE NOMINAL INSIDE DIMENSIONS OF EACH SIDE PORTAL SHALL BE 5.75 INCHES (146 mm) HIGH BY 7.5 INCHES (191 mm) WIDE. MAXIMUM ALLOWABLE OUTER DIAMETER (O.D.) PIPE SIZE IN THE SIDE PORTAL IS 6.9 INCHES (175 mm).
9. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV SFCX2 FEED CONNECTOR SHALL BE 7.6 INCHES (194 mm) TALL, 12 INCHES (305 mm) WIDE AND 19.7 INCHES (500 mm) LONG.
10. THE NOMINAL STORAGE VOLUME OF THE CONTACTOR 100HD CHAMBER SHALL BE 1.866 FT³ / FT (0.173 m³ / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF A JOINED CONTACTOR 100HD SHALL BE 13.995 FT³ / UNIT (0.396 m³ / UNIT) - WITHOUT STONE.
11. THE NOMINAL STORAGE VOLUME OF THE HVLV SFCX2 FEED CONNECTOR SHALL BE 0.294 FT³ / FT (0.027 m³ / m) - WITHOUT STONE.
12. THE CONTACTOR 100HD CHAMBER SHALL HAVE FORTY-FOUR DISCHARGE HOLES BORED INTO THE SIDEWALLS OF THE UNIT'S CORE TO PROMOTE LATERAL CONVEYANCE OF WATER.
13. THE CONTACTOR 100HD CHAMBER SHALL HAVE 16 CORRUGATIONS.
14. THE ENDWALL OF THE CHAMBER, WHEN PRESENT, SHALL BE AN INTEGRAL PART OF THE CONTINUOUSLY FORMED UNIT. SEPARATE END PLATES CANNOT BE USED WITH THIS UNIT.
15. THE CONTACTOR 100RHD STARTER UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO FULLY FORMED INTEGRAL ENDWALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS.
16. THE CONTACTOR 100EHD MIDDLE/END UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY FORMED INTEGRAL ENDWALL AND ONE FULLY OPEN END WALL AND HAVING NO SEPARATE END PLATES OR END WALLS.
17. THE HVLV SFCX2 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE CONTACTOR 100HD AND ACT AS CROSS FEED CONNECTIONS.
18. CHAMBERS MUST HAVE HORIZONTAL STIFFENING FLEX REDUCTION STEPS BETWEEN THE RIBS.
19. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
20. HEAVY DUTY UNITS ARE DESIGNATED BY A COLORED STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
21. THE CHAMBER SHALL HAVE A RAISED INTEGRAL CAP AT THE TOP OF THE ARCH IN THE CENTER OF EACH UNIT TO BE USED AS AN OPTIONAL INSPECTION PORT OR CLEAN-OUT.
22. THE UNITS MAY BE TRIMMED TO CUSTOM LENGTHS BY CUTTING BACK TO ANY CORRUGATION.
23. THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2015 CERTIFIED FACILITY.
24. THE CHAMBER SHALL BE DESIGNED AND MANUFACTURED TO MEET THE MATERIAL AND STRUCTURAL REQUIREMENTS OF IAPMO PS 63-2019, INCLUDING RESISTANCE TO AASHTO H-10 AND H-20 HIGHWAY LIVE LOADS, WHEN INSTALLED IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS.
25. MAXIMUM ALLOWED COVER ON TOP OF UNIT SHALL BE 12.0 FEET [3.66 m]

CULTEC HVLV® SFCx2 FEED CONNECTOR

GENERAL
CULTEC HVLV SFCx2 FEED CONNECTORS ARE DESIGNED TO CREATE AN INTERNAL MANIFOLD FOR CULTEC CONTACTOR 100HD STORMWATER CHAMBERS.

CHAMBER PARAMETERS

1. THE CHAMBERS SHALL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR.
3. THE CHAMBER SHALL BE ARCHED IN SHAPE.
4. THE CHAMBER SHALL BE OPEN-BOTTOMED.
5. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV SFCX2 FEED CONNECTOR SHALL BE 7.6 INCHES (194 mm) TALL, 12 INCHES (305 mm) WIDE AND 19.7 INCHES (500 mm) LONG.
6. THE NOMINAL STORAGE VOLUME OF THE HVLV SFCX2 FEED CONNECTOR SHALL BE 0.294 FT3 / FT (0.027 m3 / m) - WITHOUT STONE.
7. THE HVLV SFCX2 FEED CONNECTOR CHAMBER SHALL HAVE 3 CORRUGATIONS.
8. THE HVLV SFCX2 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT SHALL FIT INTO THE SIDE PORTALS OF THE CONTACTOR 100HD STORMWATER CHAMBER AND ACT AS CROSS FEED CONNECTIONS CREATING AN INTERNAL MANIFOLD.
9. THE CHAMBER SHALL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
10. THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2008 CERTIFIED FACILITY.

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE
CULTEC NO. 410™ NON-WOVEN GEOTEXTILE MAY BE USED WITH CULTEC CONTACTOR® AND RECHARGER® STORMWATER INSTALLATIONS TO PROVIDE A BARRIER THAT PREVENTS SOIL INTRUSION INTO THE STONE.

GEOTEXTILE PARAMETERS

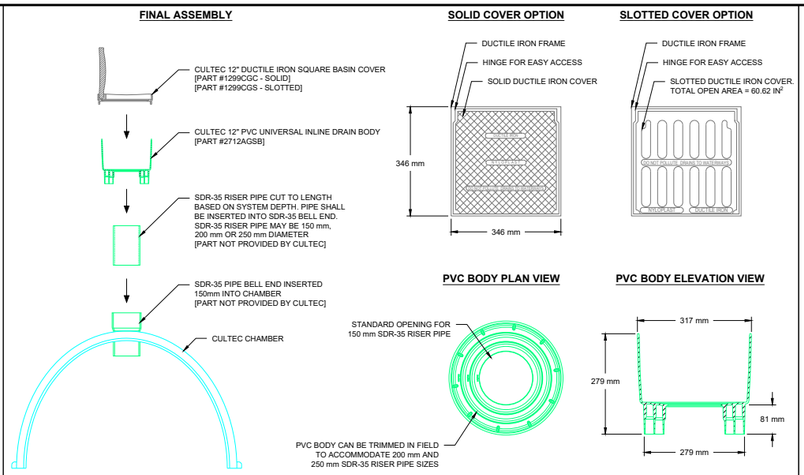
1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK AND WHITE IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TYPICAL WEIGHT OF 4.5 OZ/SY (142 G/M).
4. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH VALUE OF 120 LBS (533 N) PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE AN ELONGATION @ BREAK VALUE OF 50% PER ASTM D4632 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A MULLEN BURST VALUE OF 225 PSI (1551 KPA) PER ASTM D3786 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A PUNCTURE STRENGTH VALUE OF 65 LBS (289 N) PER ASTM D4833 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE VALUE OF 340 LBS (1513 N) PER ASTM D6241 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A TRAPEZOID TEAR VALUE OF 50 LBS (222 N) PER ASTM D4533 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A AOS VALUE OF 70 U.S. SIEVE (0.212 MM) PER ASTM D4751 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY VALUE OF 1.7 SEC-1 PER ASTM D4491 TESTING METHOD.
12. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATE VALUE OF 135 GAL/MIN/SF (5500 L/MIN/SM) PER ASTM D4491 TESTING METHOD.
13. THE GEOTEXTILE SHALL HAVE A UV STABILITY @ 500 HOURS VALUE OF 70% PER ASTM D4355 TESTING METHOD.

CULTEC AFAB-HPF™ WOVEN GEOTEXTILE
CULTEC AFAB-HPF WOVEN GEOTEXTILE IS DESIGNED AS A UNDERLAYMENT TO PREVENT SCOURING CAUSED BY WATER MOVEMENT WITHIN THE CULTEC CHAMBERS AND FEED CONNECTORS UTILIZING THE CULTEC MANIFOLD FEATURE. IT MAY ALSO BE USED AS A COMPONENT OF THE CULTEC SEPARATOR ROW TO ACT AS A BARRIER TO PREVENT SOIL/CONTAMINANT INTRUSION INTO THE STONE WHILE ALLOWING FOR MAINTENANCE.

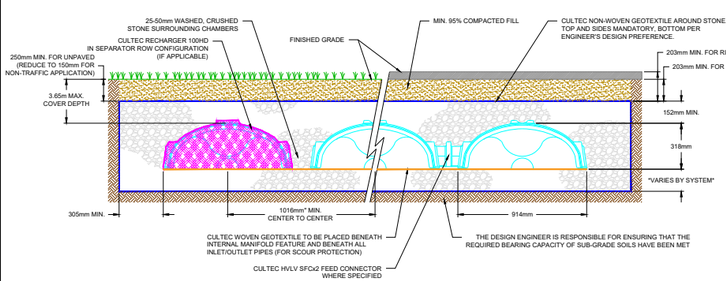
GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH OF 320 X 320 LBS (1,420 X 1,420 N) PER ASTM D4632 TESTING METHOD.
4. THE GEOTEXTILE SHALL HAVE A ELONGATION @ BREAK RESISTANCE OF 15 X 15% PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE A WIDE WIDTH TENSILE RESISTANCE OF 3,563 X 3,563 LBS/FT (52 X 52 KN/M) PER ASTM D4595 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE RESISTANCE OF 1,500 LBS (6,670 N) PER ASTM D6241 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A TRAPEZOIDAL TEAR RESISTANCE OF 120 X 120 LBS (540 X 540 N) PER ASTM D4533 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE AN APPARENT OPENING SIZE OF 30 US STD. SIEVE (0.60 MM) PER ASTM D4751 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY RATING OF 0.2 SEC-1 PER ASTM D4491 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATING OF 22 GPM/FT2 (900 LPM/M2) PER ASTM D4491 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A UV RESISTANCE OF 70% @ 500 HRS. PER ASTM D4355 TESTING METHOD.

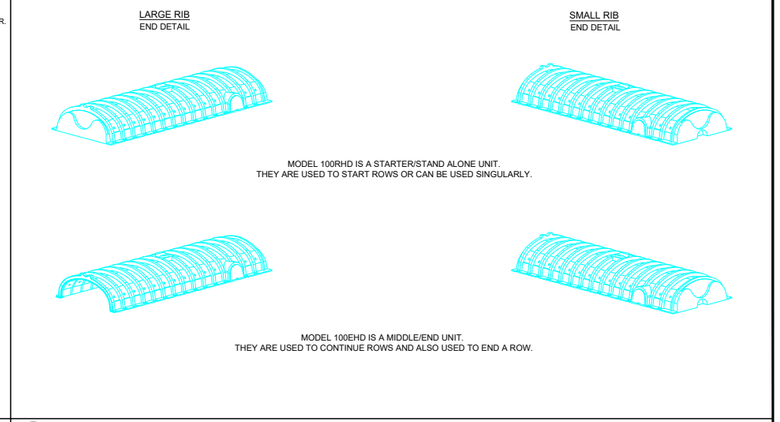
100HD 1.0 **GENERAL NOTES**



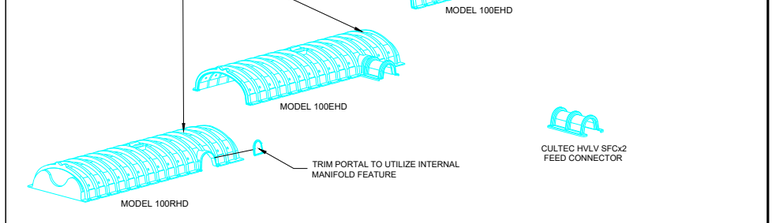
100HD 2.0 **CULTEC UNIVERSAL INSPECTION PORT KIT DETAIL**



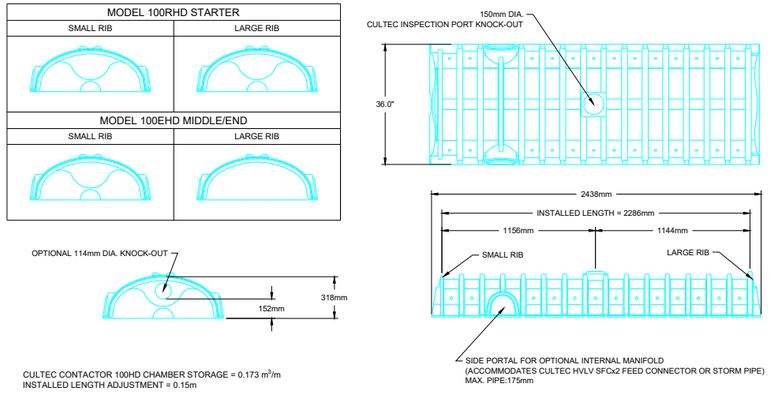
100HD 4.0 **CULTEC RECHARGER 100HD HEAVY DUTY CROSS SECTION**

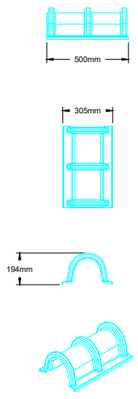


100HD 5.0 **CULTEC RECHARGER 100HD HEAVY DUTY END DETAIL INFORMATION**

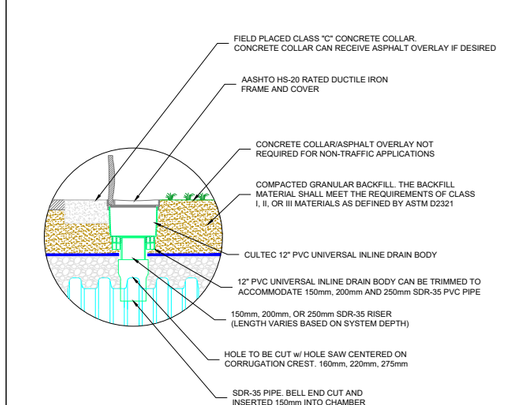


100HD 6.0 **CULTEC RECHARGER 100HD HEAVY DUTY THREE VIEW**

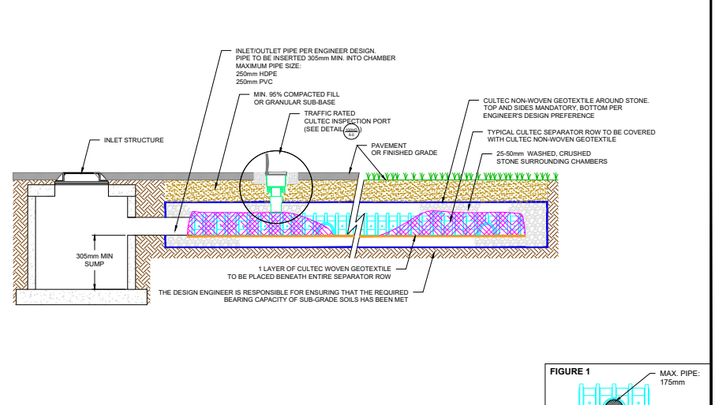




100HD 7.0 **CULTEC HVLV SFCx2 FEED CONNECTOR THREE VIEW**



100HD 8.0 **CULTEC INSPECTION PORT - ZOOM DETAIL**



100HD 9.0 **CULTEC SEPARATOR ROW - CULTEC INSPECTION PORT DETAIL (IF APPLICABLE)**

CULTEC STORMWATER CHAMBER

DATE: (MM/DD/YYYY) 11/25/2025
CHECKED BY: TNB
SHEET NO: 7 OF 8
PROJECT NO: 25-1243.01
DESIGNED BY: SRA
SCALE: N.T.S

OKEEFE COURT
OTTAWA, ON

100HD SYSTEMS DETAIL SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
www.cultec.com
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE USED BY THE PROJECT ENGINEER OF RECORD AS A TEMPLATE TO DEVELOP THE FINAL PROJECT DRAWINGS. THE PROJECT ENGINEER OF RECORD OR OTHER PROJECT REPRESENTATIVE IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM IS DESIGN & INSTALLED COMPLYING WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURERS REQUIREMENTS.

1 /02

CULTEC RECHARGER® 280HD SPECIFICATIONS

GENERAL

CULTEC RECHARGER 280HD CHAMBERS ARE DESIGNED FOR UNDERGROUND STORMWATER MANAGEMENT. THE CHAMBERS MAY BE USED FOR RETENTION, RECHARGING, DETENTION OR CONTROLLING THE FLOW OF ON-SITE STORMWATER RUNOFF.

CHAMBER PARAMETERS

1. THE CHAMBERS WILL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR.
3. THE CHAMBER WILL BE ARCHED IN SHAPE.
4. THE CHAMBER WILL BE OPEN-BOTTOMED.
5. THE CHAMBER WILL BE JOINED USING AN INTERLOCKING OVERLAPPING RIB METHOD. CONNECTIONS MUST BE FULLY SHOULDERED OVERLAPPING RIBS, HAVING NO SEPARATE COUPLINGS OR SEPARATE END WALLS.
6. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC RECHARGER 280HD SHALL BE 26.5 INCHES (673 mm) TALL, 47 INCHES (1194 mm) WIDE AND 8 FEET (2.44 m) LONG. THE INSTALLED LENGTH OF A JOINED RECHARGER 280HD SHALL BE 7 FEET (2.13 m).
7. MAXIMUM INLET OPENING ON THE CHAMBER ENDWALL IS 18 INCHES (450 mm) HDPE.
8. THE CHAMBER WILL HAVE TWO SIDE PORTALS TO ACCEPT CULTEC HVLV® FC-24 FEED CONNECTORS TO CREATE AN INTERNAL MANIFOLD. NOMINAL INSIDE DIMENSIONS OF THE SIDE PORTAL SHALL HAVE A WIDTH OF 11.25" [286 mm] AND HEIGHT OF 11.5" [292 mm]. THE SIDE PORTAL CAN ACCEPT A MAXIMUM OUTER DIAMETER (O.D.) PIPE SIZE OF 12.25 INCHES [311 mm].
9. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV® FC-24 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 24.2 INCHES (614 mm) LONG.
10. THE NOMINAL STORAGE VOLUME OF THE RECHARGER 280HD CHAMBER WILL BE 6.079 FT3 / FT (0.565 m³ / m) - WITHOUT STONE. THE NOMINAL STORAGE VOLUME OF A JOINED RECHARGER 280HD SHALL BE 42.553 FT³ / UNIT (1.205 m³ / UNIT) - WITHOUT STONE.
11. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-24 FEED CONNECTOR WILL BE 0.913 FT³ / FT (0.085 m³ / m) - WITHOUT STONE.
12. THE RECHARGER 280HD CHAMBER WILL SEVENTY-TWO DISCHARGE HOLES BORED INTO THE SIDEWALLS OF THE UNIT'S CORE TO PROMOTE LATERAL CONVEYANCE OF WATER.
13. THE RECHARGER 280HD CHAMBER SHALL HAVE 15 CORRUGATIONS.
14. THE ENDWALL OF THE CHAMBER, WHEN PRESENT, WILL BE AN INTEGRAL PART OF THE CONTINUOUSLY FORMED UNIT. SEPARATE END PLATES CANNOT BE USED WITH THIS UNIT.
15. THE RECHARGER 280RHD STAND ALONE UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO FULLY FORMED INTEGRAL ENDWALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS.
16. THE RECHARGER 280SHD STARTER UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY FORMED INTEGRAL ENDWALL AND ONE PARTIALLY FORMED INTEGRAL ENDWALL WITH A LOWER TRANSFER OPENING OF 9 INCHES (229 mm) HIGH X 35 INCHES (889 mm) WIDE.
17. THE RECHARGER 280IHD INTERMEDIATE UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY OPEN ENDWALL AND ONE PARTIALLY FORMED INTEGRAL ENDWALL WITH A LOWER TRANSFER OPENING OF 9 INCHES (229 mm) HIGH X 35 INCHES (889 mm) WIDE.
18. THE RECHARGER 280EHD END UNIT MUST BE FORMED AS A WHOLE CHAMBER HAVING ONE FULLY FORMED INTEGRAL ENDWALL AND ONE FULLY OPEN END WALL AND HAVING NO SEPARATE END PLATES OR END WALLS.
19. THE HVLV FC-24 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT WILL FIT INTO THE SIDE PORTALS OF THE RECHARGER 280HD AND ACT AS CROSS FEED CONNECTIONS.
20. CHAMBERS MUST HAVE HORIZONTAL STIFFENING FLEX REDUCTION STEPS BETWEEN THE RIBS.
21. THE CHAMBER WILL HAVE A RAISED INTEGRAL CAP AT THE TOP OF THE ARCH IN THE CENTER OF EACH UNIT TO BE USED AS AN OPTIONAL INSPECTION PORT OR CLEAN-OUT.
22. THE UNITS MAY BE TRIMMED TO CUSTOM LENGTHS BY CUTTING BACK TO ANY CORRUGATION.
23. THE CHAMBER SHALL BE MANUFACTURED IN AN IN AN ISO 9001:2015 CERTIFIED FACILITY
24. THE CHAMBER WILL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S INSTALLATION INSTRUCTIONS.
25. THE CHAMBER SHALL BE DESIGNED AND MANUFACTURED TO MEET THE MATERIAL AND STRUCTURAL REQUIREMENTS OF IAPMO PS 63-2019, INCLUDING RESISTANCE TO AASHTO H-10 AND H-20 HIGHWAY LIVE LOADS, WHEN INSTALLED IN ACCORDANCE WITH CULTEC'S INSTALLATION INSTRUCTIONS.
26. MAXIMUM ALLOWED COVER OVER TOP OF UNIT SHALL BE 12 FEET (3.65 m).

CULTEC HVLV® FC-24 FEED CONNECTOR PRODUCT SPECIFICATIONS

GENERAL

CULTEC HVLV FC-24 FEED CONNECTORS ARE DESIGNED TO CREATE AN INTERNAL MANIFOLD FOR CULTEC RECHARGER 280HD STORMWATER CHAMBERS.

CHAMBER PARAMETERS

1. THE CHAMBERS WILL BE MANUFACTURED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE CHAMBER SHALL BE VACUUM THERMOFORMED OF HIGH MOLECULAR WEIGHT HIGH DENSITY POLYETHYLENE (HMWHDPE) WITH A BLACK INTERIOR AND BLUE EXTERIOR.
3. THE CHAMBER WILL BE ARCHED IN SHAPE.
4. THE CHAMBER WILL BE OPEN-BOTTOMED.
5. THE NOMINAL CHAMBER DIMENSIONS OF THE CULTEC HVLV FC-24 FEED CONNECTOR SHALL BE 12 INCHES (305 mm) TALL, 16 INCHES (406 mm) WIDE AND 24.2 INCHES (614 mm) LONG.
6. THE NOMINAL STORAGE VOLUME OF THE HVLV FC-24 FEED CONNECTOR WILL BE 0.913 FT³ / FT (0.085 m³ / m) - WITHOUT STONE.
7. THE HVLV FC-24 FEED CONNECTOR CHAMBER SHALL HAVE 2 CORRUGATIONS.
8. THE HVLV FC-24 FEED CONNECTOR MUST BE FORMED AS A WHOLE CHAMBER HAVING TWO OPEN END WALLS AND HAVING NO SEPARATE END PLATES OR SEPARATE END WALLS. THE UNIT WILL FIT INTO THE SIDE PORTALS OF THE CULTEC RECHARGER STORMWATER CHAMBER AND ACT AS CROSS FEED CONNECTIONS CREATING AN INTERNAL MANIFOLD.
9. THE CHAMBER WILL BE DESIGNED TO WITHSTAND TRAFFIC LOADS WHEN INSTALLED ACCORDING TO CULTEC'S RECOMMENDED INSTALLATION INSTRUCTIONS.
10. THE CHAMBER SHALL BE MANUFACTURED IN AN ISO 9001:2015 CERTIFIED FACILITY.

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE

CULTEC NO. 410™ NON-WOVEN GEOTEXTILE MAY BE USED WITH CULTEC CONTACTOR® AND RECHARGER® STORMWATER INSTALLATIONS TO PROVIDE A BARRIER THAT PREVENTS SOIL INTRUSION INTO THE STONE.

GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC, INC. OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK AND WHITE IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TYPICAL WEIGHT OF 4.5 OZ/SY (142 G/M).
4. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH VALUE OF 120 LBS (533 N) PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE AN ELONGATION @ BREAK VALUE OF 50% PER ASTM D4632 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A MULLEN BURST VALUE OF 225 PSI (1551 KPA) PER ASTM D3786 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A PUNCTURE STRENGTH VALUE OF 65 LBS (289 N) PER ASTM D4833 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE VALUE OF 340 LBS (1513 N) PER ASTM D6241 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A TRAPEZOID TEAR VALUE OF 50 LBS (222 N) PER ASTM D4533 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A AOS VALUE OF 70 U.S. SIEVE (0.212 MM) PER ASTM D4751 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY VALUE OF 1.7 SEC-1 PER ASTM D4491 TESTING METHOD.
12. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATE VALUE OF 135 GAL/MIN/SF (5500 L/MIN/SM) PER ASTM D4491 TESTING METHOD.
13. THE GEOTEXTILE SHALL HAVE A UV STABILITY @ 500 HOURS VALUE OF 70% PER ASTM D4355 TESTING METHOD.

CULTEC AFAB-HPF™ WOVEN GEOTEXTILE

CULTEC AFAB-HPF WOVEN GEOTEXTILE IS DESIGNED AS A UNDERLAYMENT TO PREVENT SCOURING CAUSED BY WATER MOVEMENT WITHIN THE CULTEC CHAMBERS AND FEED CONNECTORS UTILIZING THE CULTEC MANIFOLD FEATURE. IT MAY ALSO BE USED AS A COMPONENT OF THE CULTEC SEPARATOR ROW TO ACT AS A BARRIER TO PREVENT SOIL/CONTAMINANT INTRUSION INTO THE STONE WHILE ALLOWING FOR MAINTENANCE.

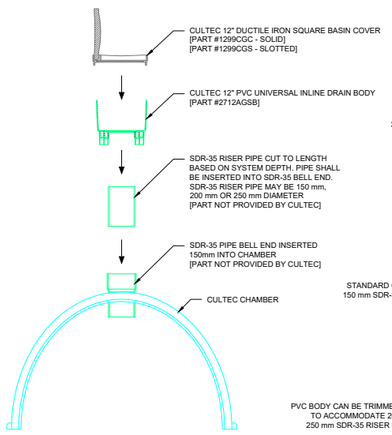
GEOTEXTILE PARAMETERS

1. THE GEOTEXTILE SHALL BE PROVIDED BY CULTEC OF BROOKFIELD, CT. (203-775-4416 OR 1-800-428-5832)
2. THE GEOTEXTILE SHALL BE BLACK IN APPEARANCE.
3. THE GEOTEXTILE SHALL HAVE A TENSILE STRENGTH OF 320 X 320 LBS (1,420 X 1,420 N) PER ASTM D4632 TESTING METHOD.
4. THE GEOTEXTILE SHALL HAVE A ELONGATION @ BREAK RESISTANCE OF 15 X 15% PER ASTM D4632 TESTING METHOD.
5. THE GEOTEXTILE SHALL HAVE A WIDE WIDTH TENSILE RESISTANCE OF 3,563 X 3,563 LBS/FT (52 X 52 KN/M) PER ASTM D4595 TESTING METHOD.
6. THE GEOTEXTILE SHALL HAVE A CBR PUNCTURE RESISTANCE OF 1,500 LBS (6,670 N) PER ASTM D6241 TESTING METHOD.
7. THE GEOTEXTILE SHALL HAVE A TRAPEZOIDAL TEAR RESISTANCE OF 120 X 120 LBS (540 X 540 N) PER ASTM D4533 TESTING METHOD.
8. THE GEOTEXTILE SHALL HAVE AN APPARENT OPENING SIZE OF 30 US STD. SIEVE (0.60 MM) PER ASTM D4751 TESTING METHOD.
9. THE GEOTEXTILE SHALL HAVE A PERMITTIVITY RATING OF 0.2 SEC-1 PER ASTM D4491 TESTING METHOD.
10. THE GEOTEXTILE SHALL HAVE A WATER FLOW RATING OF 22 GPM/FT2 (900 LPM/M2) PER ASTM D4491 TESTING METHOD.
11. THE GEOTEXTILE SHALL HAVE A UV RESISTANCE OF 70% @ 500 HRS. PER ASTM D4355 TESTING METHOD.

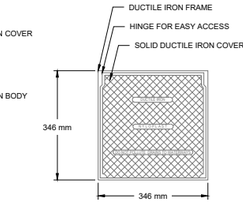
280HD 1.0

GENERAL NOTES

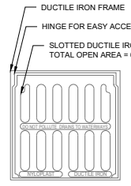
FINAL ASSEMBLY



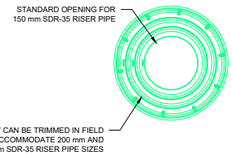
SOLID COVER OPTION



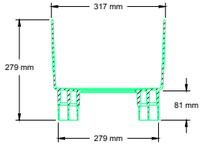
SLOTTED COVER OPTION



PVC BODY PLAN VIEW

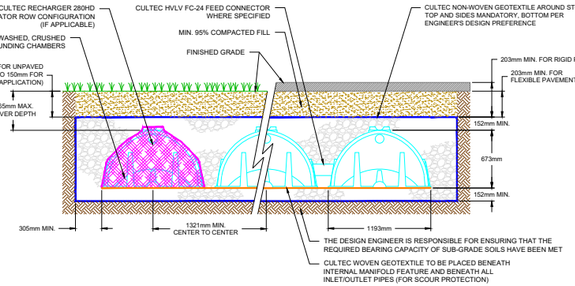


PVC BODY ELEVATION VIEW



280HD 2.0

CULTEC UNIVERSAL INSPECTION PORT KIT DETAIL



280HD 4.0

CULTEC RECHARGER 280HD HEAVY DUTY CROSS SECTION

280HD 5.0

CULTEC RECHARGER 280HD HEAVY DUTY END DETAIL INFORMATION

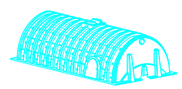
LARGE RIB END DETAIL

SMALL RIB END DETAIL

MODEL 280RHD STARTER UNITS ARE USED AS SINGLE STAND ALONE SECTIONS.



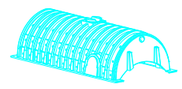
MODEL RHD



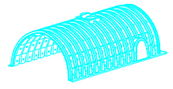
MODEL 280SHD STARTER UNITS ARE USED TO BEGIN A LINE.



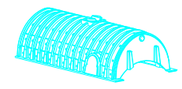
MODEL SHD



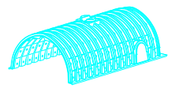
MODEL 280IHD INTERMEDIATE UNITS ARE USED AS MIDDLE SECTIONS TO EXTEND THE LENGTH OF A LINE.



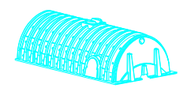
MODEL IHD



MODEL 280EHD END UNITS ARE USED TO END THE LENGTH OF A LINE.

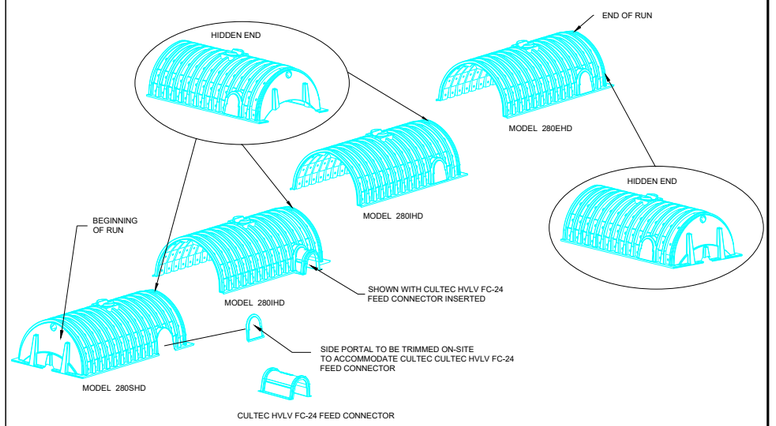


MODEL EHD



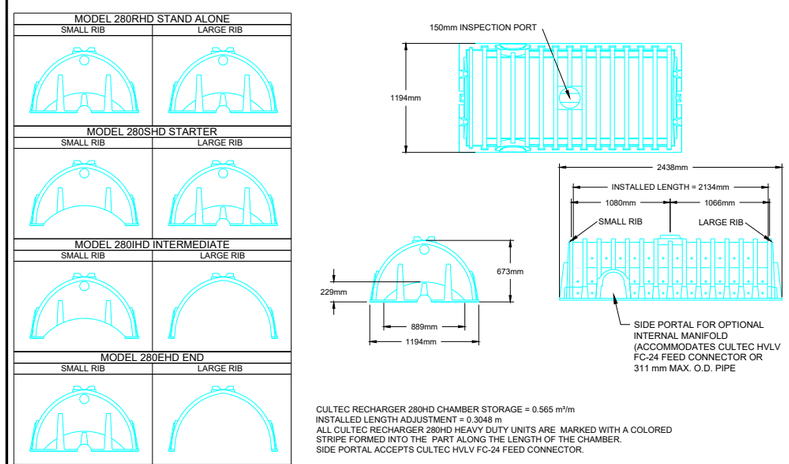
280HD 3.0

CULTEC RECHARGER 280HD HEAVY DUTY TYPICAL INTERLOCK



280HD 6.0

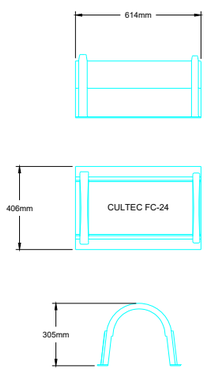
CULTEC RECHARGER 280HD HEAVY DUTY THREE VIEW



CULTEC RECHARGER 280HD CHAMBER STORAGE = 0.565 m³/m
INSTALLED LENGTH ADJUSTMENT = 0.3048 m
ALL CULTEC RECHARGER 280HD HEAVY DUTY UNITS ARE MARKED WITH A COLORED STRIPE FORMED INTO THE PART ALONG THE LENGTH OF THE CHAMBER.
SIDE PORTAL ACCEPTS CULTEC HVLV FC-24 FEED CONNECTOR.

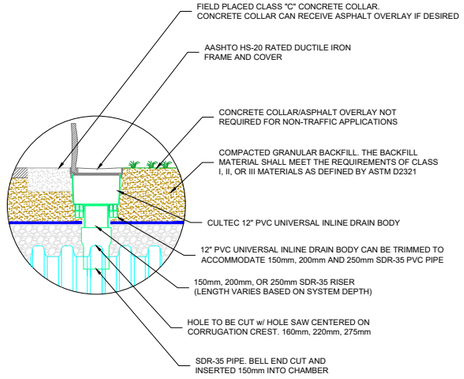
280HD 7.0

CULTEC HVLV FC-24 FEED CONNECTOR THREE VIEW



280HD 8.0

CULTEC INSPECTION PORT - ZOOM DETAIL



280HD 9.0

CULTEC SEPARATOR ROW - CULTEC INSPECTION PORT DETAIL (IF APPLICABLE)

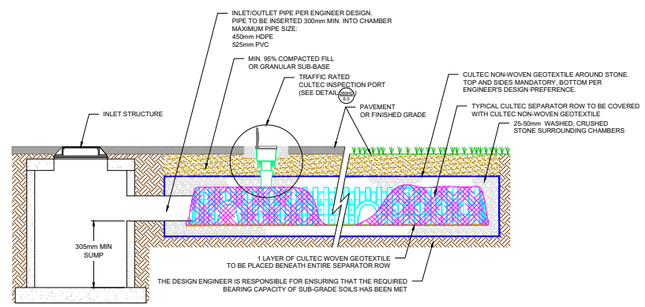
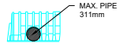


FIGURE 1



ZOOM OF SIDE PORTAL SHOWING MAX. PIPE O.D.

CULTEC STORMWATER CHAMBER

DATE: (MM/DD/YYYY) 11/25/2025
CHECKED BY: TNB
SHEET NO: 8 OF 8
PROJECT NO: 25-1243.01
DESIGNED BY: SRA
SCALE: N.T.S

OKEEFE COURT
OTTAWA, ON

280HD SYSTEM DETAIL SHEET

CULTEC
Subsurface Stormwater Management Systems
878 Federal Road
Brookfield, CT 06804
PH: 1(203) 775-4416
PH: 1(800) 4-CULTEC
CT-tech@cultec.com
www.cultec.com

THIS DRAWING HAS BEEN PREPARED TO SUPPORT THE PROJECT ENGINEER OF RECORD FOR THE PROPOSED SYSTEM. THIS DRAWING MAY BE USED BY THE PROJECT ENGINEER OF RECORD AS A TEMPLATE TO BE MODIFIED AS NECESSARY TO REFLECT THE SITE SPECIFIC DESIGN OR OTHER PROJECT REPRESENTATIVE IT IS ULTIMATE RESPONSIBILITY OF THE PROJECT ENGINEER OF RECORD TO ENSURE THAT THE CULTEC SYSTEM IS DESIGNED AND INSTALLED COMPLIANCE WITH ALL APPLICABLE LAWS, REGULATIONS AND MANUFACTURER REQUIREMENTS.

CULTEC Separator Row Sizing Tool

Project Information

Project Information:

Project Name	O'Keefe Court
Address	
City	Ottawa
State/Province	Ontario
ZIP/Postal Code	
CULTEC Project #	25-1243.01 Inf 3

Calculations By:

Name	Tyler Brush
Company	Cultec
Address	
City	
State/Province	
ZIP/Postal Code	
Date	11/26/2025

Chamber Model

Chamber Model:	**Contactor 100HD**
TSS Removal Percentage:	**78.6%**

Site Information

Area:	1.39	ha
% Impervious:		%
Rational C Value:	0.90	
Rainfall Station:	Ottawa, ON	
Particle Size Dist'n:	ETV	

Chamber Unit Information

Installed Length:	2.29	m
Width:	0.91	m
Height:	0.32	m

Separator Row Characteristics

Chamber Bottom Area:	1.65	m²
Chamber Installed Length:	2.29	m
Chambers in Separator Row:	15	u
Separator Row Length:	34.29	m
Total Separator Row Area:	24.82	m²
Geotextile Used:	CULTEC No. 4800 Woven Geotextile	

CULTEC Contacts

Engineering:	Tyler Brush (tbrush@cultec.com)
Sales Rep.:	Dom Turner (dturner@cultec.com)

Estimated Annual Removal Efficiency

Intensity (mm/hr)	Fraction of Rainfall (%)	TSS Removal Efficiency (%)	Net Annual Efficiency (%)	Flow Rate (L/s)	Loading Rate (L/s/m²)
0.5	0.1%	83.7%	0.1%	1.74	0.07
1.0	14.1%	83.3%	11.7%	3.48	0.14
1.5	14.2%	82.9%	11.8%	5.22	0.21
2.0	14.1%	82.5%	11.6%	6.96	0.28
2.5	4.2%	82.2%	3.5%	8.69	0.35
3.0	1.5%	81.8%	1.2%	10.43	0.42
3.5	8.5%	81.4%	6.9%	12.17	0.49
4.0	5.4%	81.0%	4.4%	13.91	0.56
4.5	1.2%	80.6%	1.0%	15.65	0.63
5.0	5.5%	80.3%	4.4%	17.39	0.70
6.0	4.3%	79.5%	3.4%	20.87	0.84
7.0	4.5%	78.7%	3.5%	24.34	0.98
8.0	3.1%	78.0%	2.4%	27.82	1.12
9.0	2.3%	77.2%	1.8%	31.30	1.26
10.0	2.6%	76.5%	2.0%	34.78	1.40
20.0	9.2%	68.9%	6.3%	69.56	2.80
30.0	2.6%	61.3%	1.6%	104.33	4.20
40.0	1.2%	53.7%	0.6%	139.11	5.60
50.0	0.5%	46.1%	0.2%	173.89	7.01
100.0	0.7%	8.2%	0.1%	347.78	14.01
150.0	0.1%	0.0%	0.0%	521.67	21.02
200.0	0.0%	0.0%	0.0%	695.56	28.02
Cumulative Net Annual Treatment:			**78.6%**		

Notes:

Removal efficiencies are based on ETV Test Protocols and modeled off the verified results.
Design engineer responsible for ensuring compliance with applicable regulations.
Contributing tributary area and rational "C" value provided by design engineer.
Proper installation as per CULTEC instructions/guidance is essential to proper operation of the Separator Row.
Indicated geotextile material shall be used to ensure proper performance.
Regular maintenance is required to ensure continued proper operation of the Separator Row.

CULTEC Separator Row Sizing Tool

Project Information

Project Information:

Project Name	O'Keefe Court
Address	
City	Ottawa
State/Province	Ontario
ZIP/Postal Code	
CULTEC Project #	25-1243.01 Inf 2

Calculations By:

Name	Tyler Brush
Company	Cultec
Address	
City	
State/Province	
ZIP/Postal Code	
Date	11/26/2025

Chamber Model

Chamber Model:	**Contactor 100HD**
TSS Removal Percentage:	**81.9%**

Site Information

Area:	1.04	ha
% Impervious:		%
Rational C Value:	0.90	
Rainfall Station:	Ottawa, ON	
Particle Size Dist'n:	ETV	

Chamber Unit Information

Installed Length:	2.29	m
Width:	0.91	m
Height:	0.32	m

Separator Row Characteristics

Chamber Bottom Area:	1.65	m²
Chamber Installed Length:	2.29	m
Chambers in Separator Row:	29	u
Separator Row Length:	66.29	m
Total Separator Row Area:	47.99	m²
Geotextile Used:	CULTEC No. 4800 Woven Geotextile	

CULTEC Contacts

Engineering:	Tyler Brush (tbrush@cultec.com)
Sales Rep.:	Dom Turner (dturner@cultec.com)

Estimated Annual Removal Efficiency

Intensity (mm/hr)	Fraction of Rainfall (%)	TSS Removal Efficiency (%)	Net Annual Efficiency (%)	Flow Rate (L/s)	Loading Rate (L/s/m²)
0.5	0.1%	83.9%	0.1%	1.30	0.03
1.0	14.1%	83.8%	11.8%	2.60	0.05
1.5	14.2%	83.6%	11.9%	3.90	0.08
2.0	14.1%	83.5%	11.8%	5.20	0.11
2.5	4.2%	83.3%	3.5%	6.51	0.14
3.0	1.5%	83.2%	1.2%	7.81	0.16
3.5	8.5%	83.0%	7.1%	9.11	0.19
4.0	5.4%	82.9%	4.5%	10.41	0.22
4.5	1.2%	82.7%	1.0%	11.71	0.24
5.0	5.5%	82.6%	4.5%	13.01	0.27
6.0	4.3%	82.3%	3.5%	15.61	0.33
7.0	4.5%	82.0%	3.7%	18.21	0.38
8.0	3.1%	81.7%	2.5%	20.82	0.43
9.0	2.3%	81.4%	1.9%	23.42	0.49
10.0	2.6%	81.1%	2.1%	26.02	0.54
20.0	9.2%	78.2%	7.2%	52.04	1.08
30.0	2.6%	75.3%	2.0%	78.06	1.63
40.0	1.2%	72.3%	0.9%	104.08	2.17
50.0	0.5%	69.4%	0.3%	130.10	2.71
100.0	0.7%	54.7%	0.4%	260.21	5.42
150.0	0.1%	40.0%	0.0%	390.31	8.13
200.0	0.0%	25.4%	0.0%	520.42	10.84
Cumulative Net Annual Treatment:			**81.9%**		

Notes:

Removal efficiencies are based on ETV Test Protocols and modeled off the verified results.
Design engineer responsible for ensuring compliance with applicable regulations.
Contributing tributary area and rational "C" value provided by design engineer.
Proper installation as per CULTEC instructions/guidance is essential to proper operation of the Separator Row.
Indicated geotextile material shall be used to ensure proper performance.
Regular maintenance is required to ensure continued proper operation of the Separator Row.

CULTEC Separator Row Sizing Tool

Project Information

Project Information:

Project Name	O'Keefe Court
Address	
City	Ottawa
State/Province	Ontario
ZIP/Postal Code	
CULTEC Project #	25-1243.01 Inf 1

Calculations By:

Name	Tyler Brush
Company	Cultec
Address	
City	
State/Province	
ZIP/Postal Code	
Date	11/26/2025

Chamber Model

Chamber Model:	**Contactor 100HD**
TSS Removal Percentage:	**79.3%**

Site Information

Area:	0.80	ha
% Impervious:		%
Rational C Value:	0.90	
Rainfall Station:	Ottawa, ON	
Particle Size Dist'n:	ETV	

Chamber Unit Information

Installed Length:	2.29	m
Width:	0.91	m
Height:	0.32	m

Separator Row Characteristics

Chamber Bottom Area:	1.65	m²
Chamber Installed Length:	2.29	m
Chambers in Separator Row:	10	u
Separator Row Length:	22.86	m
Total Separator Row Area:	16.55	m²
Geotextile Used:	CULTEC No. 4800 Woven Geotextile	

CULTEC Contacts

Engineering:	Tyler Brush (tbrush@cultec.com)
Sales Rep.:	Dom Turner (dturner@cultec.com)

Estimated Annual Removal Efficiency

Intensity (mm/hr)	Fraction of Rainfall (%)	TSS Removal Efficiency (%)	Net Annual Efficiency (%)	Flow Rate (L/s)	Loading Rate (L/s/m²)
0.5	0.1%	83.7%	0.1%	1.00	0.06
1.0	14.1%	83.4%	11.8%	2.00	0.12
1.5	14.2%	83.1%	11.8%	3.00	0.18
2.0	14.1%	82.7%	11.7%	4.00	0.24
2.5	4.2%	82.4%	3.5%	5.00	0.30
3.0	1.5%	82.1%	1.2%	6.00	0.36
3.5	8.5%	81.8%	6.9%	7.01	0.42
4.0	5.4%	81.4%	4.4%	8.01	0.48
4.5	1.2%	81.1%	1.0%	9.01	0.54
5.0	5.5%	80.8%	4.4%	10.01	0.60
6.0	4.3%	80.1%	3.4%	12.01	0.73
7.0	4.5%	79.5%	3.6%	14.01	0.85
8.0	3.1%	78.8%	2.4%	16.01	0.97
9.0	2.3%	78.2%	1.8%	18.01	1.09
10.0	2.6%	77.5%	2.0%	20.02	1.21
20.0	9.2%	71.0%	6.5%	40.03	2.42
30.0	2.6%	64.4%	1.7%	60.05	3.63
40.0	1.2%	57.9%	0.7%	80.06	4.84
50.0	0.5%	51.3%	0.3%	100.08	6.05
100.0	0.7%	18.6%	0.1%	200.16	12.10
150.0	0.1%	0.0%	0.0%	300.24	18.14
200.0	0.0%	0.0%	0.0%	400.32	24.19
Cumulative Net Annual Treatment:			**79.3%**		

Notes:

Removal efficiencies are based on ETV Test Protocols and modeled off the verified results.
Design engineer responsible for ensuring compliance with applicable regulations.
Contributing tributary area and rational "C" value provided by design engineer.
Proper installation as per CULTEC instructions/guidance is essential to proper operation of the Separator Row.
Indicated geotextile material shall be used to ensure proper performance.
Regular maintenance is required to ensure continued proper operation of the Separator Row.

Project Name: O'KEEFE COURT
Project #: 21684
Date: 12/15/2025

Prepared by: LP
Checked by: TF,LP

LOCATION: OTTAWA
STORM SEWER DESIGN SHEET
STORM EVENT (yr) 5

a = 998.071
b = 6.053
c = 0.814

$i = a[(T+b)/60]^{-c}$, where i (mm/h) ; T (min)
$Q = A(i)C/3600 + C.\ FLOW \times (42)$, where A ($m^2$) ; i (mm/h)
AC = AREA x RUNOFF COEFFICIENT
C. FLOW = CONTROLLED FLOW

	STREET	UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	AREA (m^2) C=0.90	AC (m^2)	CUMULATIVE AC (m^2)	ToC (min)	C. FLOW @42L/s/ha (m^2)	CUMULATIVE C. FLOW (m^2)	i (mm/h)	Q (L/s)	PIPE SIZE (mm)	GRADE (%)	CAPACITY (L/s)	VELOCITY (m/s)	LENGTH (m)	% CAPACITY
0	STUB - BLDG A3-1	STM MH24	0	0	0	10.00	4000	4000	104.19	16.8	250	0.50	42.0	0.9	6.0	40%
1	STUB - BLDG A3-2	STM MH23	0	0	0	10.00	4000	4000	104.19	16.8	250	1.00	59.5	1.2	6.2	28%
2	STM MH24	STM MH23	0	0	0	10.12		4000	2901.97	16.8	250	0.50	42.0	0.9	28.1	40%
3	STM MH23	STM MH22	0	0	0	10.66		8000	2824.47	33.6	250	1.00	59.5	1.2	5.1	57%
4	STM MH22	INFIL GALLERY 1	0	0	0	10.73		8000	2814.86	33.6	250	1.00	59.5	1.2	2.7	57%
5	INFIL GALLERY 1	STM CBMH8	0	0	0	10.77		8000	100.29	33.6	250	1.00	59.5	1.2	42.5	57%
3	STM CB10	STM CBMH8	4900	4410	4410	10.00		0	104.19	127.6	525	0.30	235.6	1.1	31.0	54%
4	STM CBMH8	STM CBMH7	1700	1530	5940	11.36		8000	97.54	194.5	600	0.30	336.3	1.2	30.1	58%
5	STM CBMH7	STM CBMH6	1800	1620	7560	11.78		8000	95.66	234.5	600	0.30	336.3	1.2	29.9	70%
6	STM CBMH6	STM MH12	1600	1440	9000	12.20		8000	93.87	268.3	600	0.30	336.3	1.2	13.9	80%
7	STM CB8	STM MH16	2500	2250	2250	10.00		0	104.19	65.1	375	0.70	146.7	1.3	14.9	44%
8	STM MH16	STM MH15	0	0	2250	10.19		0	103.21	64.5	375	0.70	146.7	1.3	45.6	44%
9	STM CB7	STM MH15	1600	1440	1440	10.00		0	104.19	41.7	250	1.10	62.4	1.3	3.4	67%
10	STM MH15	STM MH14	0	0	3690	10.76		0	100.35	102.9	375	0.70	146.7	1.3	27.4	70%
11	STM CB6	STM MH14	2100	1890	1890	10.00		0	104.19	54.7	300	0.80	86.5	1.2	35.2	63%
12	STM MH14	STM CBMH12	0	0	5580	11.10		0	98.71	153.0	450	0.70	238.5	1.5	53.4	64%
13	STM CBMH12	STM MH21	1000	900	6480	11.70		0	96.02	172.8	525	0.50	304.1	1.4	48.8	57%
14	STM MH21	OGS EF06	0	0	6480	12.27		0	93.54	168.4	525	0.55	318.9	1.5	3.5	53%
15	OGS EF06	STM MH26	0	0	6480	12.31		0	93.38	168.1	525	0.55	318.9	1.5	14.6	53%
16	STUB - BLDG A2-1	STM MH26	0	0	0	10.00	4500	4500	104.19	18.9	250	0.94	57.7	1.2	8.3	33%
17	STM MH26	INFIL GALLERY 2	0	0	6480	12.48		4500	92.70	185.8	525	0.50	304.1	1.4	1.2	61%
18	STUB - BLDG A2-2	INFIL GALLERY 2	0	0	0	10.00	3600	3600	104.19	15.1	250	1.00	59.5	1.2	7.8	25%
19	INFIL GALLERY 2	STM CBMH5	0	0	6480	12.49		8100	92.64	200.8	525	1.00	430.1	2.0	29.8	47%
20	STM CBMH5	STM CBMH4	2700	2430	8910	12.74		8100	91.64	260.8	825	0.30	786.2	1.5	35.2	33%
21	STM CBMH4	STM CBMH3	1300	1170	10080	13.14		8100	90.08	286.2	825	0.30	786.2	1.5	11.7	36%
22	STM CB5	STM MH10	1800	1620	1620	10.00		0	104.19	46.9	250	2.00	84.1	1.7	6.2	56%
23	STM MH10	STM MH6	0	0	1620	10.06		0	103.88	46.7	250	2.00	84.1	1.7	37.1	56%
24	STM HONEYCOMB CB1	STM MH9	800	720	720	10.00		0	104.19	20.8	250	0.40	37.6	0.8	15.9	55%
25	STM MH9	STM MH8	0	0	720	10.35		0	102.40	20.5	250	0.40	37.6	0.8	31.9	54%
26	STM CB3	STM MH8	2100	1890	1890	10.00		0	104.19	54.7	300	1.00	96.7	1.4	5.5	57%
27	STM MH8	STM MH7	0	0	2610	11.04		0	99.00	71.8	375	0.40	110.9	1.0	49.1	65%
27.5	STM CB4	STM MH7	1900	1710	1710	10.00		0	104.19	49.5	300	1.00	96.7	1.4	5.1	51%
28	STM MH7	STM MH6	0	0	4320	11.85		0	95.32	114.4	450	0.40	180.3	1.1	32.4	63%
29	STM MH6	STM CBMH11	0	0	5940	12.33		0	93.31	154.0	525	0.30	235.6	1.1	44.3	65%
30	STM CBMH11	STM MH20	700	630	6570	13.01		0	90.59	165.3	525	0.25	215.0	1.0	50.6	77%
31	STM MH20	OGS EF06-2	0	0	6570	13.86		0	87.44	159.6	900	0.30	991.6	1.6	25.6	16%
32	OGS EF06-2	STM MH27		0	6570	14.13		0	86.47	157.8	525	0.25	215.0	1.0	13.7	73%
33	STM HONEYCOMB CB2	STM CBMH2	2000	1800	1800	10.00		0	104.19	52.1	375	0.30	96.0	0.9	32.7	54%
34	STM CBMH2	STM MH19	0	0	1800	10.63		0	100.99	50.5	375	0.30	96.0	0.9	6.3	53%
35	STM MH19	OGS EF12	1200	1080	2880	10.75		0	100.41	80.3	900	0.30	991.6	1.6	15.9	8%
36	STUB - BLDG A1-1	STM MH27	0	0	0	10.00	4400	4400	104.19	18.5	250	0.50	42.0	0.9	7.0	44%
37	STUB - BLDG A1-2	STM MH29	0	0	0	10.00	3400	3400	104.19	14.3	250	0.50	42.0	0.9	5.9	34%
38	STM MH29	STM MH27	0	0	0	10.11		3400	103.59	14.3	250	0.50	42.0	0.9	30.6	34%
39	STM MH27	STM MH30	0	0	6570	14.36		7800	85.68	189.1	525	1.00	430.1	2.0	4.9	44%
40	STM MH30	INFIL GALLERY 3	0	0	6570	14.40		7800	85.54	188.9	525	1.00	430.1	2.0	2.5	44%
41	INFIL GALLERY 3	STM MH2	0	0	6570	14.42		7800	85.47	188.7	525	1.00	430.1	2.0	13.0	44%

Project Name: O'KEEFE COURT
Project #: 21684
Date: 12/15/2025

Prepared by: LP
Checked by: TF,LP

LOCATION: OTTAWA
STORM SEWER DESIGN SHEET
STORM EVENT (yr) 5

a = 998.071
b = 6.053
c = 0.814

$i = a[(T+b)/60]^{-c}$, where i (mm/h) ; T (min)
$Q = A(i)C/3600$ + C. FLOW x (42), where A (m^2) ; i (mm/h)
AC = AREA x RUNOFF COEFFICIENT
C. FLOW = CONTROLLED FLOW

STREET		UPSTREAM STRUCTURE	DOWNSTREAM STRUCTURE	AREA (m^2) C=0.90	AC (m^2)	CUMULATIVE AC (m^2)	ToC (min)	C. FLOW @42L/s/ha (m^2)	CUMULATIVE C. FLOW (m^2)	i (mm/h)	Q (L/s)	PIPE SIZE (mm)	GRADE (%)	CAPACITY (L/s)	VELOCITY (m/s)	LENGTH (m)	% CAPACITY
	42	STM MH2	OGS EF12	0	0	6570	14.53		7800	85.10	188.1	525	1.98	605.2	2.8	6.7	31%
	43	OGS EF12	CULTEC	0	0	9450	14.57		7800	84.96	255.8	900	1.00	1810.3	2.8	3.2	14%
	44	CULTEC	HW1 (OPSD 804.030)	0	0	9450	14.59		7800	84.90	255.6	900	0.55	1342.6	2.1	7.5	19%

Inlet Capcity Analysis

Project Name: O'Keefe Court
Project Number: 21684
Location: Nepean, Ottawa
Date: 12/10/2025

Prepared By: T.G
Checked By: T.F

Rainfall Data		
Location:	Nepean, Ottawa	
Event	5 year	100 year
a	998.071	1735.688
b	6.053	6.014
c	0.814	0.820

Drain ID	Structure Name	Overland Outlet	Drain Catchment Area (m^2)	Runoff Coefficient	Tc (min)	Intensity (mm/hr)	Flow (m^3/s)	Drain Type	Depth of Ponding (m)	Inlet Capacity (m^3/s)	Inlet Capacity with 50% Blockage (m^3/s)	OK with 50% Blockage?
1	STM CB8	West	2500	0.90	10.00	104.2	0.065	Single CB	0.30	0.220	0.110	OK
2	STM CB10	East	4900	0.90	10.00	104.2	0.128	Twin CB	0.30	0.405	0.203	OK
3	STM CBMH8	East	1700	0.90	10.00	104.2	0.044	Single CB	0.20	0.155	0.078	OK
4	STM CBMH7	East	1800	0.90	10.00	104.2	0.047	Single CB	0.20	0.155	0.078	OK
5	STM CB7	West	1600	0.90	10.00	104.2	0.042	Single CB	0.20	0.155	0.078	OK
6	STM CBMH9	East	3400	0.90	10.00	104.2	0.089	Single CB	0.30	0.220	0.110	OK
7	STM CBMH5	East	2700	0.90	10.00	104.2	0.070	Single CB	0.25	0.180	0.090	OK
8	STM CBMH4	East	1300	0.90	10.00	104.2	0.034	Single CB	0.15	0.120	0.060	OK
9	STM CBMH10	East	3100	0.90	10.00	104.2	0.081	Single CB	0.25	0.180	0.090	OK
10	STM CBMH2	East	2000	0.90	10.00	104.2	0.052	Single CB	0.20	0.155	0.078	OK
11	**STM HONEYCOMB CB2**	**East - Final Catchment***	**1200**	**0.90**	**10.00**	**178.6**	**0.504**	**Twin Honeycomb CB**	**0.20**	**1.202**	**0.601**	OK
12	STM CBMH11	East	700	0.90	10.00	104.2	0.018	Single CB	0.10	0.060	0.030	OK
13**	**STM HONEYCOMB CB1**	**West - Final Catchment***	**800**	**0.90**	**10.00**	**178.6**	**0.259**	**Honeycomb CB**	**0.25**	**0.672**	**0.336**	OK
14	STM CB3	West	2100	0.90	10.00	104.2	0.055	Single CB	0.30	0.220	0.110	OK
15	STM CB4	West	1900	0.90	10.00	104.2	0.050	Single CB	0.30	0.220	0.110	OK
16***	STM CB5	West	1800	0.90	10.00	104.2	0.047	Single CB	0.30	0.220	0.110	OK
17	STM CB6	West	2100	0.90	10.00	104.2	0.055	Single CB	0.30	0.220	0.110	OK
18	STM CBMH6	East	1600	0.90	10.00	104.2	0.042	Single CB	0.30	0.220	0.110	OK
19	STM CBMH12	East	1000	0.90	10.00	104.2	0.026	Single CB	0.12	0.085	0.043	OK

*Flow calculated for the final catchments in each overland outlet is based on the 100-year storm flow for that catchment plus the flow difference (100-year minus 5-year) for all upstream catchments

Overland Flow Route Design (East Outlet)

Return Period	ToC (min)	i (mm/hr)	Runoff Coefficient	Area (m2)	Flow (m3/s)	
5-year	10	104.19	0.9	24200	0.631	
100-year	10	178.56			1.081	
				Flow Difference (m3/s) =	**0.450**	<- Flow added to 100-yr Flow of Drain #11

Overland Flow Route Design (West Outlet)

Return Period	ToC (min)	i (mm/hr)	Runoff Coefficient	Area (m2)	Flow (m3/s)	
5-year	10	104.19	0.9	12000	0.313	
100-year	10	178.56			0.536	
				Flow Difference (m3/s) =	**0.223**	<- Flow added to 100-yr Flow of Drain #13

****Example calculation provided below.**

Honeycomb inlet capacities are derived using the orifice discharge equation:

$$Q = C \times A \times \sqrt{2gh}$$

Q=volumetric flow rate (m3/s)
C=discharge coefficient=0.61
A=Effective Area (A) of honeycomb grate opening
g=Acceleration due to gravity
h=Head of liquid above orifice. In this situation, ponding depth.

Using drainage ID No. 13 as an example and using the following variables:
C=discharge coefficient=0.61
A=0.50m2, determined on CAD, as per OPSD 403.010.
g=9.81
h=0.25m

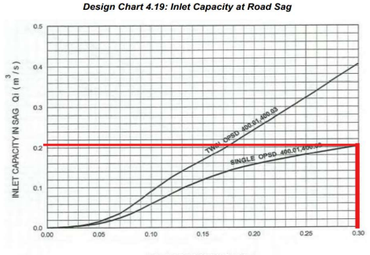
The orifice discharge equation would produce Q=**0.67m3/s**. This would be the inlet capacity of STM Honeycomb CB1.

*****Example calculation provided below.**

Inlet capacites for typical single and double CB's (OPSD 400.01 and 400.03) are derived using Design Chart 4.19 "Inlet Capacity at Road Sag" from the MTO Hydrotechnical Design Charts dated January 2023.

Looking at drainage ID No. 16 as an example, for a single CB with a depth of ponding of 0.3m, the inlet capacity is **0.22m3**/s (as per Design Chart 4.19).

Design Chart 4.19: Inlet Capacity at Road Sag



KWA Site Development Consulting
2453 Auckland Drive
Burlington, ON
L7L 7A9

APPENDIX B

SANITARY CALCULATIONS

Project Name : **4497 O'Keefe Court, Ottawa**
Project # : **21684**
Sanitary Servicing Analysis

Prepared by: TF
Checked by: TF
Date: February 20, 2025

Standards = Ottawa

Formulas
Peaking Factor (Harmon) = $1+14/[4+(P/1000)^{1/2}]$
Peak Flow = p(q)M(unit conversion) + infiltration

Existing Sanitary Design Flow

Land Type	Area (m^2)	# of Units /Floor Area	Density	Population (p)	Average Flow (q)	Peaking Factor (M)	Peak Flow (Q) (L/s)
Infiltration Allowance	68836				0.33 L/ha/d		2.27
Total	**68836**						**2.27**

Proposed Sanitary Design Flow

Land Type	Area (m^2)	Floor Area (Ha)	Density	Population (p)	Average Flow (q)	Peaking Factor (M)	Peak Flow (Q) (L/s)
Infiltration Allowance	68836				0.33 L/ha/d		2.27
BUILDING A1	7804	0.7804			35000 L/day/ha of floor	1.00	0.32
BUILDING A2	8027	0.8027			35000 L/day/ha of floor	1.00	0.33
BUILDING A3	8027	0.8027			35000 L/day/ha of floor	1.00	0.33
Total	**68836**						**3.24**

Summary

Existing Sanitary Design Flow =	2.27	L/s
Proposed Sanitary Design Flow =	3.24	L/s
Increased Flow =	0.97	L/s

Service Connection	Diameter (m)	Slope (%)	Velocity (m/s)	Full Flow Capacity (L/s)	Spare Capacity (L/s)	Usage Increased (%)	Total Usage (%)
Residential	150	1.0	0.86	15.23	11.99	-	21.3%
San. Main	250	0.5	0.86	42.05	38.81	2.3%	7.7%

Notes
1. The proposed development would be an increase of 0.97 L/s of peak sanitary flow to the downstream sanitary sewer system.
2. This increase is equal to 2.3% of the total pipe capacity of the 250mm municipal sanitary sewer.
3. This flow is equal to 21.3% of the total pipe capacity of a 150mm diameter service connection.

APPENDIX C

WATER CALCULATIONS

4497 O'Keefe Court, Ottawa Prepared by: **LP**

Project Number 21684 Checked by: **TF**

Required Fire Flow - BLDG A3 Date: **September 22, 2025**

as per Fire Underwriters Survey Water Supply for Public Fire Protection, 2020

1. Initial Required Fire Flow (Step A, B, C)

Construction Type =	Type II Noncombustible Construction		
Construction Coefficient, C =	0.8		
Total Effective Area, A* =	8027	m^2	*largest/furthest building*
Required Fire Flow, RFF =	15768.46	LPM	
RFF, rounded =	**16000**	**LPM**	

2. Occupancy and Contents Adjustment Factor (Step D)

Contents =	Combustible contents	
Adjustment Factor =	0%	
RFF =	**16000**	**LPM**

3. Automatic Sprinkler Protection (Step E)

Sprinkler Design	Designed	Building Coverage	Credit
Automatic sprinkler protection designed and installed in accordance with NFPA 13	Yes	100%	30%
Water supply is standard for both the system and Fire Department hose lines	Yes	100%	10%
Fully supervised system	Yes	100%	10%
	Total Sprinkler Credit =		50%

Reduction = 8000 LPM

4. Exposure Adjustment Charge (Step F)

Direction	Distance	Charge
North	Greater than 30	0%
South	10.1m to 20m	15%
East	Greater than 30	0%
West	Greater than 30	0%
	Total Charge =	15%
	Charge =	**2400 LPM**

5. Final Required Fire Flow (Step G)

RFF =	16000	LPM
Reduction =	8000	LPM
Charge =	2400	LPM
RFF =	10400	LPM

Final RFF, rounded =	**10000**	**LPM**
	2642	**GPM**
	167	**L/s**

4497 O'Keefe Court, Ottawa Prepared by: **LP**

Project Number 21684 Checked by: **TF**

Domestic Demand Date: **September 22, 2025**

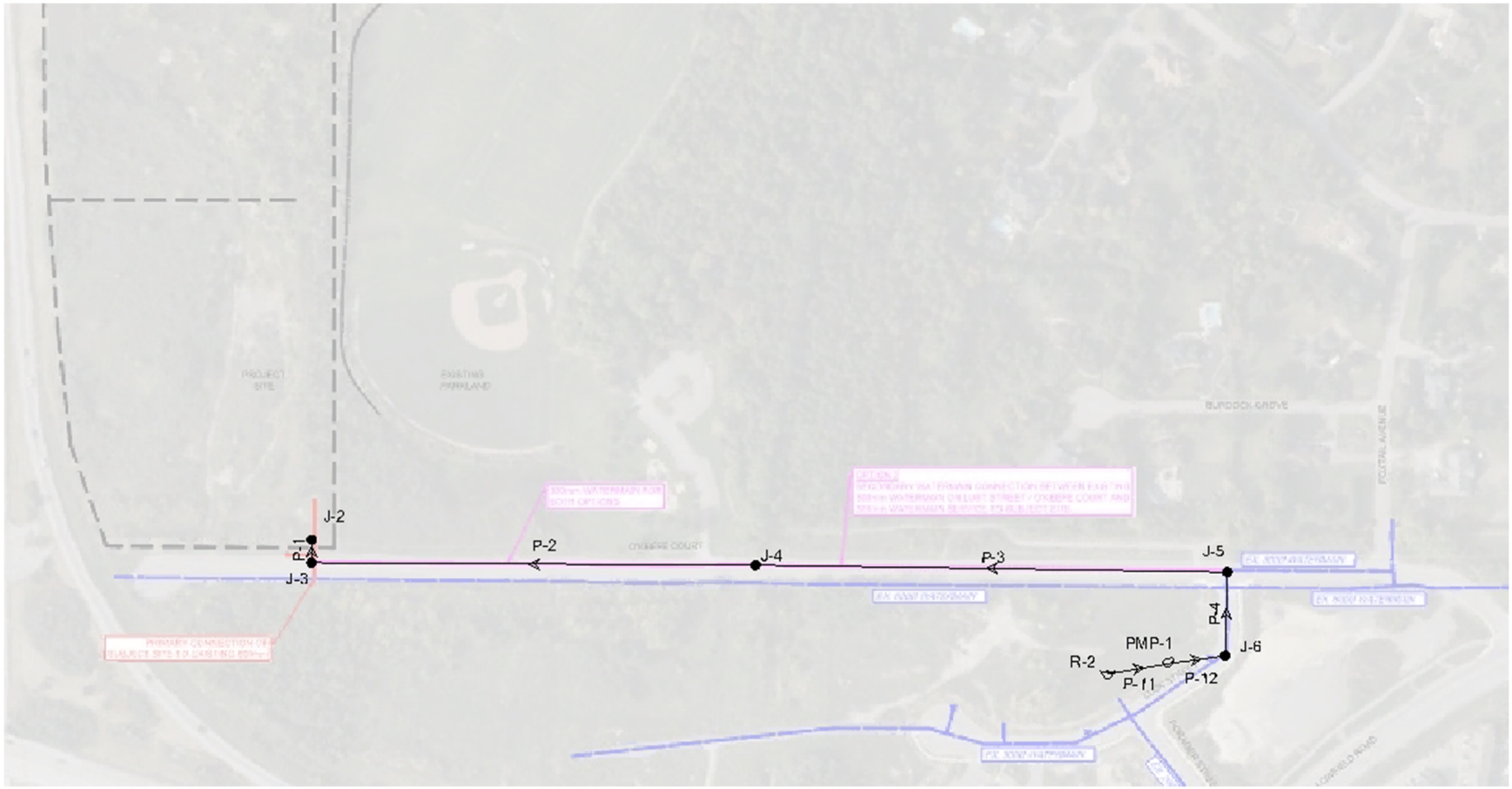
as per CITY OF OTTAWA DESIGN GUIDELINES

TOTAL BUILDING AREA =	2.39	ha
FLOW =	35000	L/ha/day
Average Daily Demand =	83503	L/day
	0.97	L/s

	Average Day	Maximum Day	Peak Hour*	
Peaking Factor	n/a	1.50	1.80	
Demand	**0.97**	**1.45**	**2.61**	**L/s**
	15.32	22.98	41.36	GPM

*Peak Hour Factor applies to the maximum day demand as per Technical Bulletin ISTB 2010-02

Model Setup – Node & Pipe ID's



Hydrant Testing Ontario
Tel: 289-354-1942
Info@HTOntario.ca

REPORT
N°. 2692

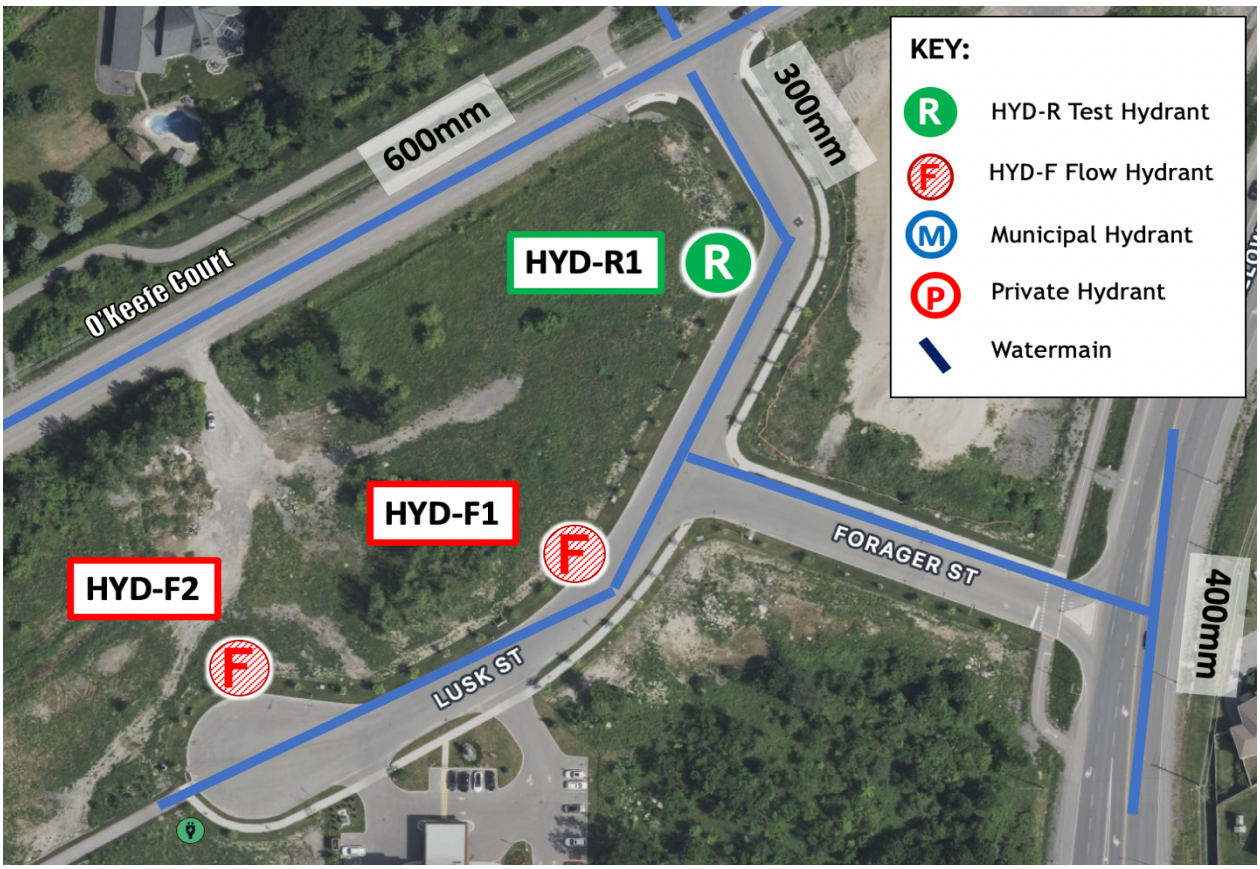
September 18, 2025

To: Ted Fair, P. Eng.
KWA Site Development Consulting Inc.
ted.fair@kwasitedev.com
2453 Auckland Dr,
Burlington, ON L7L 7A9

RE: Hydrant Flow Test - 4497 O'Keefe Court, Ottawa

Please find the Report for the following works

Scope: Conducted Hydrant Flow Test as per NFPA291 Recommended Practices for Water Flow Testing and Marking of Hydrants.



HYDRANT FLOW TEST

OTTAWA

TEST 1

DATE: September 18, 2025 TIME: 11:00 AM

R -TEST HYDRANT LUSK ST/O'KEEFE CRT - 300mr HYDRANT No. HYD-R1

HYDRANT MODEL: AVK COLOUR: BLUE

STATIC PRESSURE psi (hr-20^0.54): **70.5** VARIANCE: 6%

Q - FLOW HYDRANT 125 LUSK ST/FORAGER ST HYDRANT No. HYD-F1

HYDRANT MODEL: AVK COLOUR: BLUE

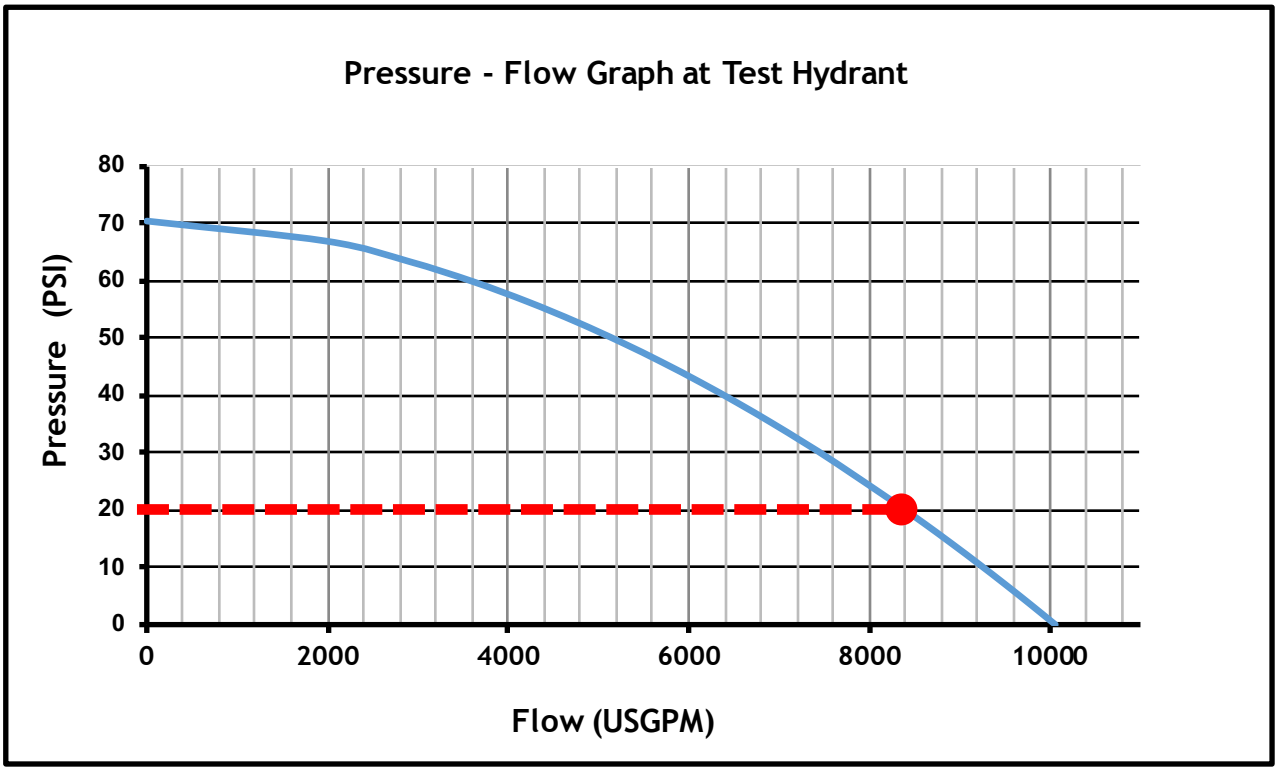
No. Outlets	Residual Pressure (hf-R^0.54)	Orifice Dia Dia. (in.) (d^2)	Coefficient	Nozzle PSI $(\sqrt{psi})$	Q = Flow (USGPM) $Q = 29.83\,(c)\,(d2)\,(\sqrt{psi})$
1	68.5	2.5	0.9	52	1210
2	66	2.5	0.9	46	1138
			Q_F = Total Flow (USGPM)		**2276**

Q_R = flow predicted @ 20 psi

$Q_R = Q_F * (H_r - 20^{\wedge 0.54}) / (H_f - R^{\wedge 0.54})$

8399	USGPM
530	L/s

NFPA Rating: **CLASS AA - BLUE**



HYDRANT FLOW TEST

OTTAWA

TEST 2

DATE: September 18, 2025 TIME: 11:00 AM

R -TEST HYDRANT	LUSK ST/O'KEEFE CRT - 300mr	HYDRANT No.	HYD-R1
HYDRANT MODEL:	AVK	COLOUR:	BLUE
STATIC PRESSURE psi (hr-20^0.54):	**70.5**	VARIANCE:	11%
Q - FLOW HYDRANT	125 LUSK STREET	HYDRANT No.	HYD-F1/2
HYDRANT MODEL:	AVK	COLOUR:	BLUE

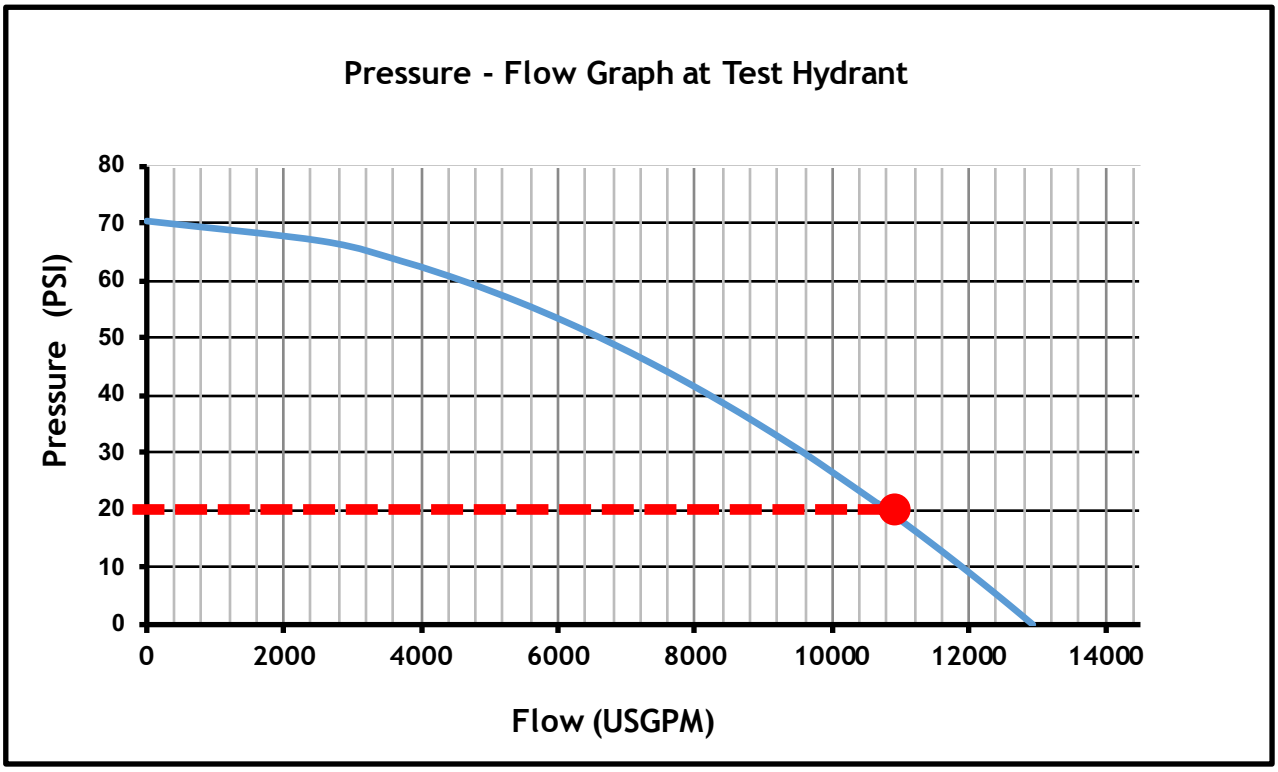
No. Outlets	Residual Pressure (hf-R^0.54)	Orifice Dia Dia. (in.) (d^2)	Coefficient	Nozzle PSI $(\sqrt{psi})$	Q = Flow (USGPM) $Q = 29.83\,(c)\,(d2)\,(\sqrt{psi})$
3	65.5	2.5	0.9	40	1061
4	63	2.5	0.9	33	964
			Q_F = Total Flow (USGPM)		**3856**

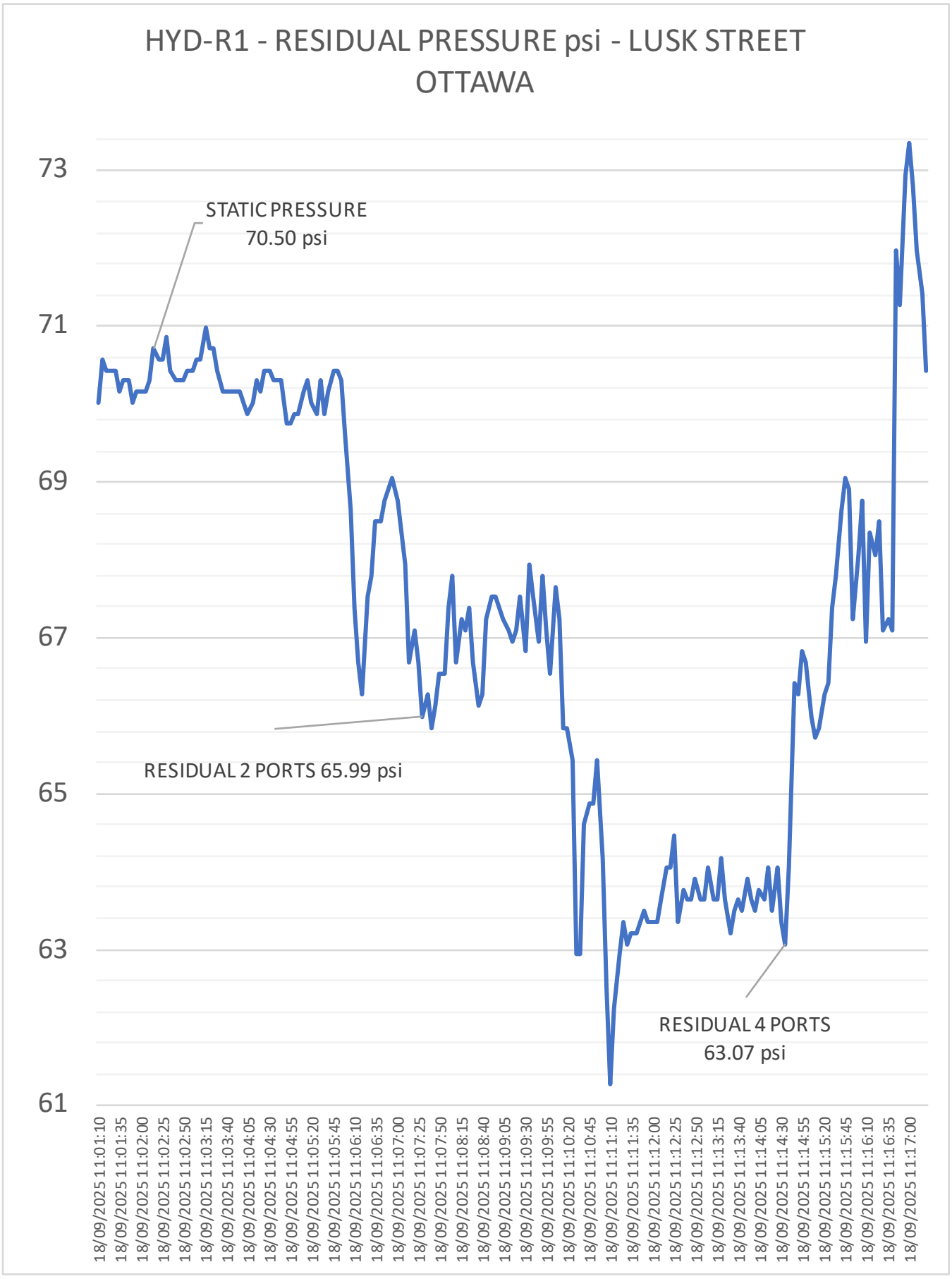
Q_R = flow predicted @ 20 psi

$Q_R = Q_F * (H_r - 20^{\wedge 0.54}) / (H_f - R^{\wedge 0.54})$

10798	USGPM
681	L/s

NFPA Rating: **CLASS AA - BLUE**




HYD-R1 - RESIDUAL PRESSURE psi - LUSK STREET OTTAWA
73
71
69
67
65
63
61
STATIC PRESSURE
70.50 psi
RESIDUAL 2 PORTS 65.99 psi
RESIDUAL 4 PORTS
63.07 psi
18/09/2025 11:01:10
18/09/2025 11:01:35
18/09/2025 11:02:00
18/09/2025 11:02:25
18/09/2025 11:02:50
18/09/2025 11:03:15
18/09/2025 11:03:40
18/09/2025 11:04:05
18/09/2025 11:04:30
18/09/2025 11:04:55
18/09/2025 11:05:20
18/09/2025 11:05:45
18/09/2025 11:06:10
18/09/2025 11:06:35
18/09/2025 11:07:00
18/09/2025 11:07:25
18/09/2025 11:07:50
18/09/2025 11:08:15
18/09/2025 11:08:40
18/09/2025 11:09:05
18/09/2025 11:09:30
18/09/2025 11:09:55
18/09/2025 11:10:20
18/09/2025 11:10:45
18/09/2025 11:11:10
18/09/2025 11:11:35
18/09/2025 11:12:00
18/09/2025 11:12:25
18/09/2025 11:12:50
18/09/2025 11:13:15
18/09/2025 11:13:40
18/09/2025 11:14:05
18/09/2025 11:14:30
18/09/2025 11:14:55
18/09/2025 11:15:20
18/09/2025 11:15:45
18/09/2025 11:16:10
18/09/2025 11:16:35
18/09/2025 11:17:00

Test Conclusion

The system at the time of testing produced a theorectical projected flow rate of:

LOCATION	Total USGPM	USGPM at 20 psi	lps at 20 psi	Test #
LUSK STREET	3856	10798	681	2

Hydrants are classified in accordance with their rated capacities as per NFPA291.

COLOUR	CLASS	Available Flow @ 20psi
BLUE	AA	1500 GPM or more
GREEN	A	1000 – 1499 GPM
ORANGE	B	500 – 999 GPM
RED	C	Below 500 GPM

We strongly feel that all attempts have been made to ensure that the required data as stipulated was captured, stored and presented in an accurate, efficient and timely manner for the required period.

We look forward to working with you in the future.

Please feel free to contact the undersigned should you require any further information.

Best Regards



Rob Gamache E.P
Manager of Operations
Hydrant Testing Ontario
Info@HTOntario.ca

Modelling Results
O'Keefe Court
Ottawa, Ontario

Peak Hour

Node Table

Node ID	Node Description	Elevation	Demand	Head	HGL	Pressure
		m	L/s	m	m	psi
J-2	Subject site	103.56	2.61	46.92	150.48	66.7
J-3		103.4	0.00	47.07	150.47	66.9
J-4	O'Keefe & easement	101.07	0.00	49.41	150.48	70.3
J-5	Lusk & O'Keefe	102.62	0.00	47.86	150.48	68.1
J-6	Residual hydrant	101.39	0.00	49.09	150.48	69.8
				MIN	**150.47**	**66.7**
				MAX	**150.48**	**70.3**

Pipe Table

Link ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity	Headloss
			m	mm		L/s	m/s	(m)
P-1	J-2	J-3	10	300	120	2.61	0.04	0.0001
P-2	J-3	J-4	260	300	120	2.61	0.04	0.0023
P-3	J-4	J-5	300	300	120	2.61	0.04	0.0026
P-4	J-5	J-6	60	300	120	2.61	0.04	0.0005
						MAX	**0.04**	

*Elevations are approximate, based on LiDAR information

Modelling Results
O'Keefe Court
Ottawa, Ontario

Maximum Day + Fire

Node Table

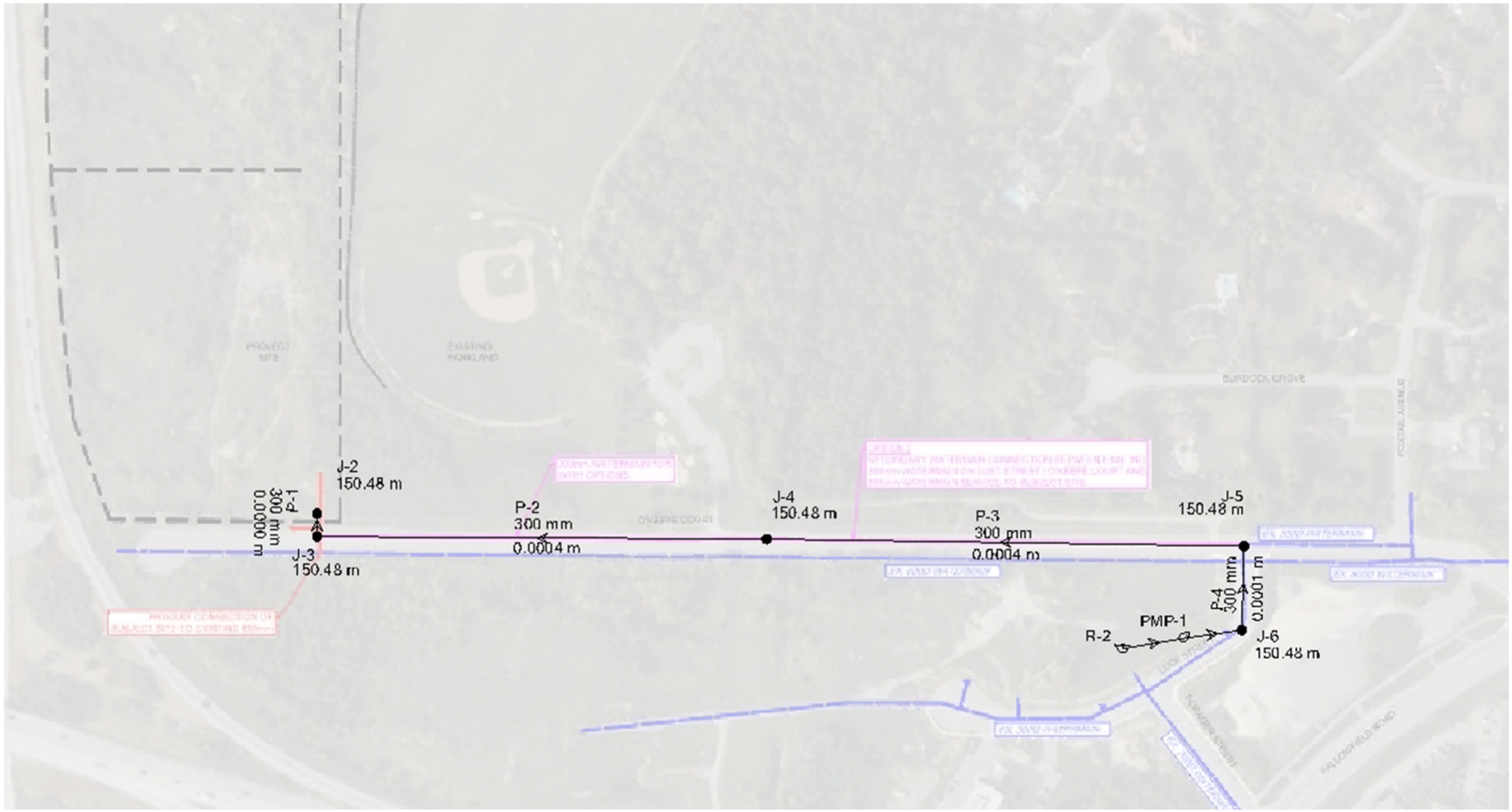
Node ID	Node Description	Elevation	Demand	Head	HGL	Pressure
		m	L/s	m	m	psi
J-2	Subject site	103.56	168.45	32.08	135.64	45.6
J-3		103.4	0.00	32.43	135.83	46.1
J-4	O'Keefe & easement	101.07	0.00	39.86	140.93	56.7
J-5	Lusk & O'Keefe	102.62	0.00	44.18	146.8	62.8
J-6	Residual hydrant	101.39	0.00	46.59	147.98	66.2
				MIN	**135.64**	**45.6**
				MAX	**147.98**	**66.2**

Pipe Table

Link ID	From Node	To Node	Length	Diameter	Roughness	Flow	Velocity	Headloss
			m	mm		L/s	m/s	(m)
P-1	J-2	J-3	10	300	120	168.45	2.38	0.1958
P-2	J-3	J-4	260	300	120	168.45	2.38	5.0902
P-3	J-4	J-5	300	300	120	168.45	2.38	5.8733
P-4	J-5	J-6	60	300	120	168.45	2.38	1.1747
						MAX	**2.38**	

*Elevations are approximate, based on LiDAR information

Modeling Results (Average Day)



Legend

Nodes	Pipes
Junction ID	Pipe ID
HGL	Pipe Size
	Headloss

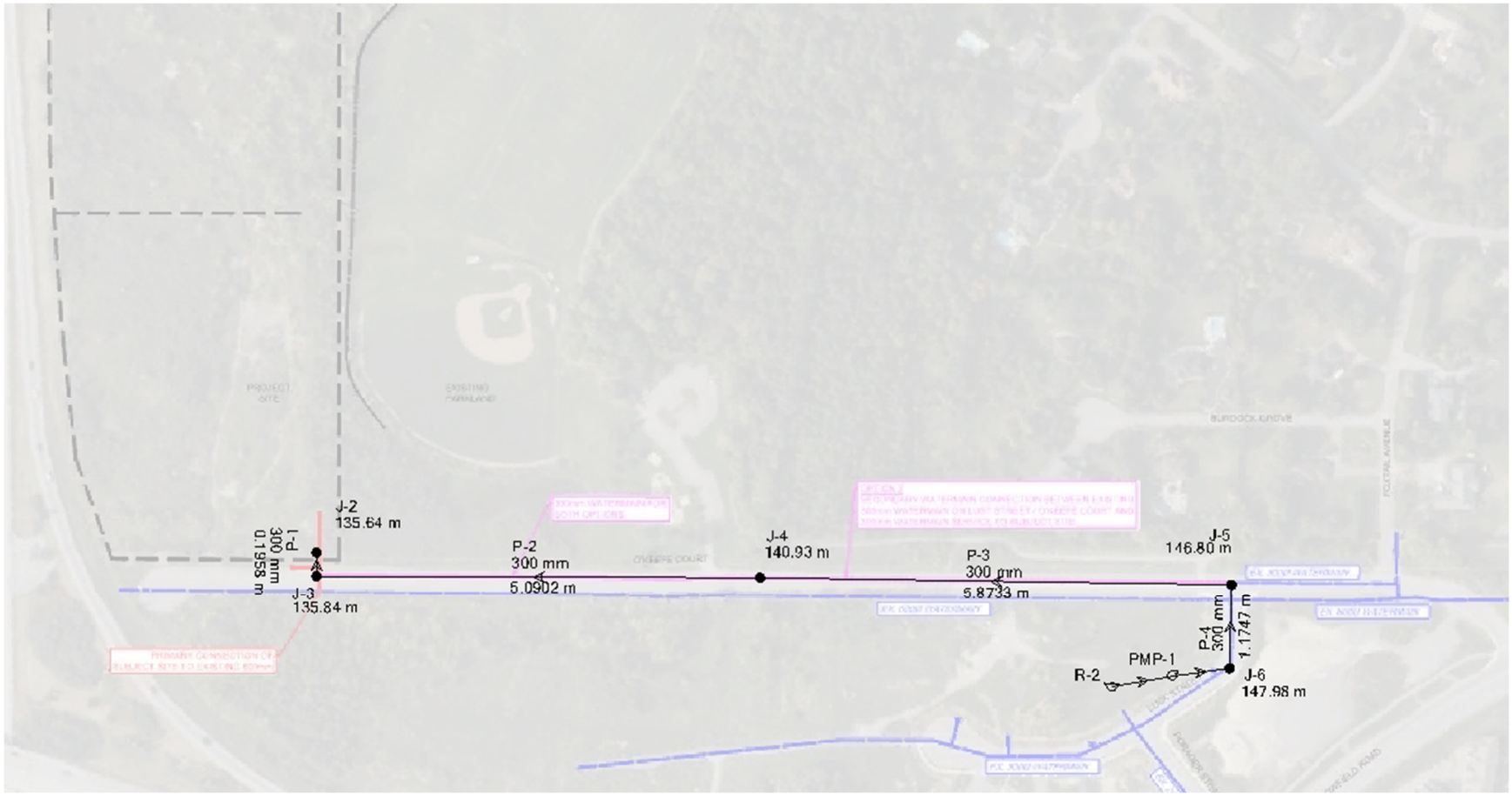
Modeling Results (Peak Hour)



Legend

Nodes	Pipes
Junction ID	Pipe ID
HGL	Pipe Size
	Headloss

Modeling Results (Max Day + Fire)

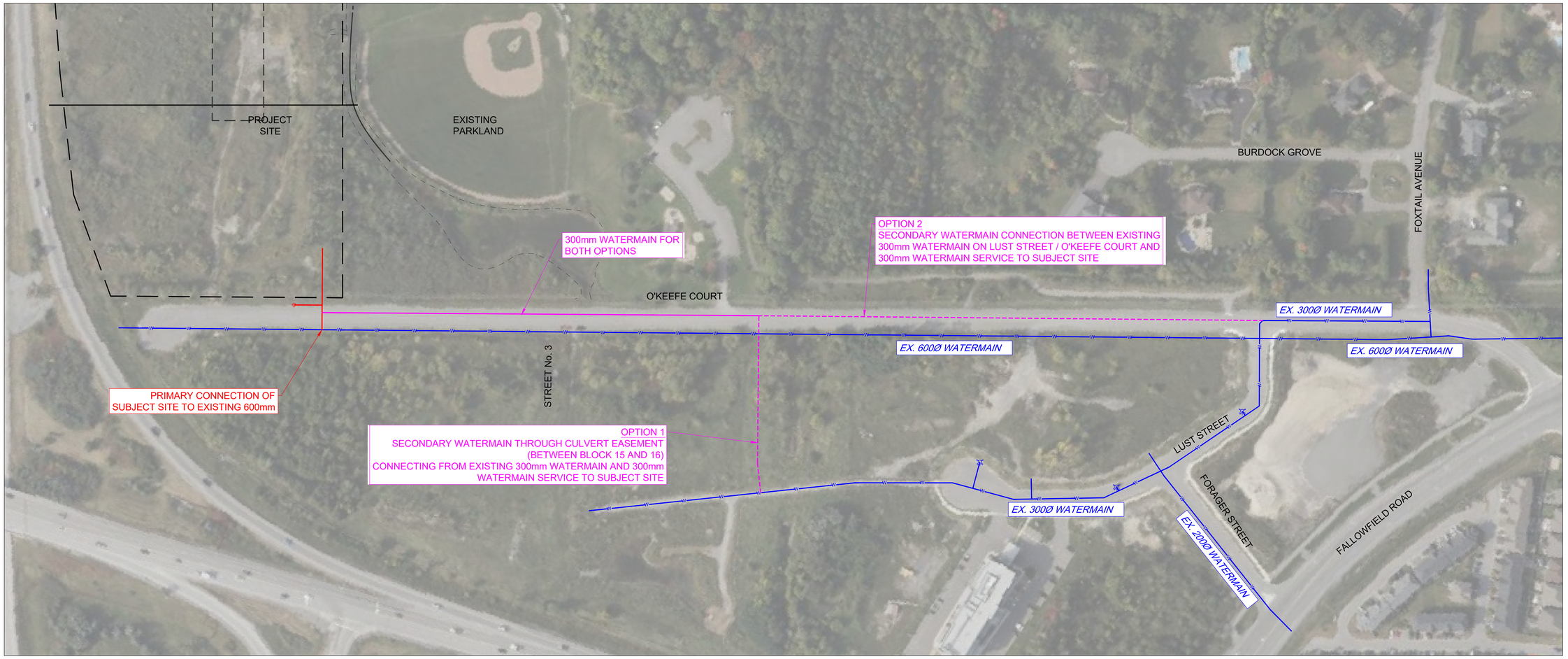


Legend

Nodes	Pipes
Junction ID	Pipe ID
HGL	Pipe Size
	Headloss

APPENDIX D

OFFSITE WORKS EXHIBITS



LEGEND

- EXISTING WATERMAIN
- EXISTING HYDRANT
- PROPOSED WATERMAIN (KWA)
- PROPOSED HYDRANT (KWA)
- FUTURE WATERMAIN (BY OTHERS)
- FUTURE HYDRANT (BY OTHERS)

REVISION BLOCK

#	DATE	DESCRIPTION

KWA SITE DEVELOPMENT CONSULTING INC.
210 Broadway Ave. E.
Suite 201
Brampton, ON L7A 1E9

NORTH ARROW

METRIC SCALE

N.T.S

WATERMAIN SERVICING EXHIBIT

THE PROPERTIES GROUP

PROPOSED OFFICE & WAREHOUSE DEVELOPMENT

NEPEAN, ONTARIO

PROJECT No: 21984 | DRAWN BY: ARV | CHECKED BY: COB

WAT-E

PROPOSED BUILDING "A3" 1-STOREY INDUSTRIAL GROSS FLOOR AREA = ±8,027 m² (±86,400 ft²)

PROPOSED BUILDING "A2" 1-STOREY INDUSTRIAL GROSS FLOOR AREA = ±8,027 m² (±86,400 ft²)

200
6.74ha
0.90

CONTROLLED ROOFTOPS + CONTROLLED SITE AREA

PROPOSED BUILDING "A1" ±4 STOREY INDUSTRIAL GROSS FLOOR AREA = ±7,804 m² (±84,000 ft²)

DRAINAGE AREA FROM HIGHWAY 416 DITCH IS CONVEYED INTO O'KEEFE SOUTH DITCH AS PER STORM DRAINAGE AREA PLAN (DRAWING 500 BY IBI GROUP, DATED MARCH 2016)

201
0.14ha
0.74

SITE UNCONTROLLED AREA TO O'KEEFE COURT

SEPTIC PAD (BY OTHERS) ELEV=108.00

LYTLE PARK DRAINAGE AREA (INTO O'KEEFE SWALES VIA LYTLE PARK POND)

203
9.8ha
0.30

202a
0.40ha
0.90

O'KEEFE NORTH DRAINAGE AREA

CULVERT CROSSING

CULVERT CROSSING

INLET TO BLOCK 15 DRAINAGE SWALE/CULVERT

O'KEEFE SOUTH DRAINAGE AREA

202b
0.66ha
0.90

LEGEND

- 200 / 0.8ha / xx — AREA ID, DRAINAGE AREA, RUNOFF COEFFICIENT
- DRAINAGE BOUNDARY (SITE CONTROLLED)
- DRAINAGE BOUNDARY (SITE UNCONTROLLED)
- DRAINAGE BOUNDARY (EXTERNAL)
- OVERLAND FLOW ARROW

© 2025 Microsoft Corporation © 2025 Maxar ©CNES (2025) Distribution Airbus DS © 2025 TMAP MOBILITY Earthstar Geographics SIO

REVISION BLOCK

#	DATE	DESCRIPTION
1.	MM/DD/YY	DESCRIPTION

KWA SITE DEVELOPMENT CONSULTING INC.
2433 A Princess St.
Kingston, ON, K7L 7A9

NORTH ARROW

METRIC SCALE
1:750

DRAINAGE PLAN (FOR SOUTH SWALE)

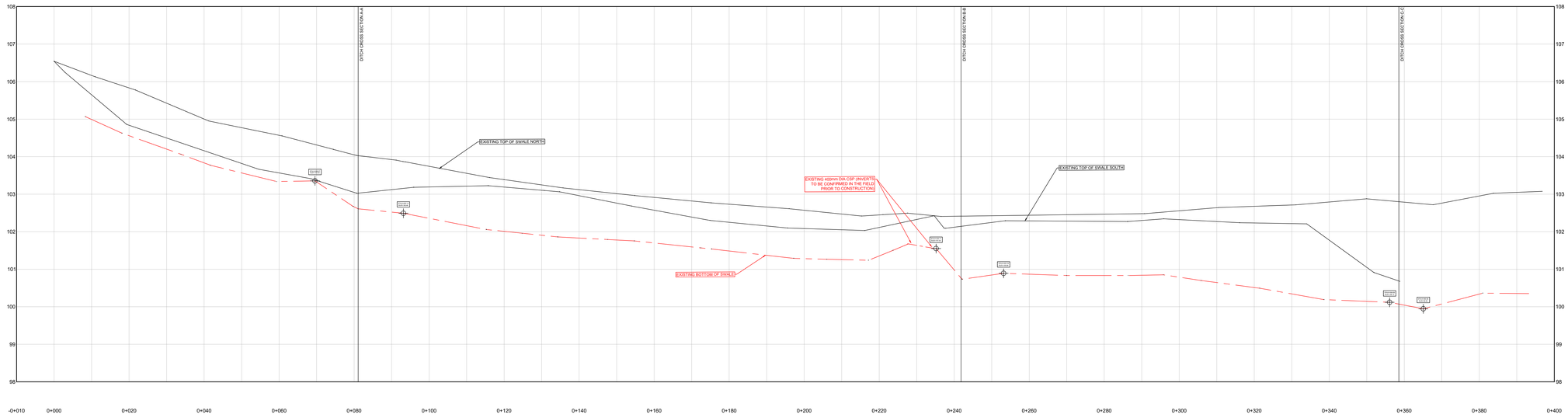
THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)
NEPEAN, ONTARIO

PROJECT No.21664 | DRAWN BY:LP | CHECKED BY:TF

PDP-A



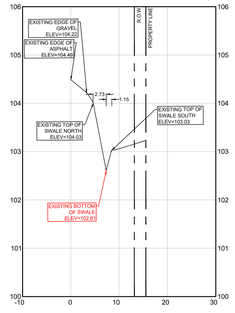
O'KEEFE COURT MODEL VIEW
SCALE = 1:500



EXISTING DITCH AND TOP OF SLOPE PROFILE

HORIZONTAL SCALE = 1:500
VERTICAL SCALE = 1:50

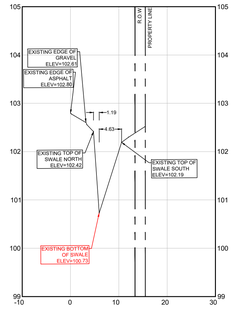
A-A



EXISTING DITCH CROSS SECTION A-A

HORIZONTAL SCALE = 1:500
VERTICAL SCALE = 1:50

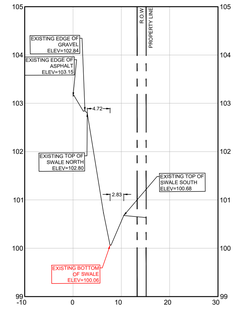
B-B



EXISTING DITCH CROSS SECTION B-B

HORIZONTAL SCALE = 1:500
VERTICAL SCALE = 1:50

C-C



EXISTING DITCH CROSS SECTION C-C

HORIZONTAL SCALE = 1:500
VERTICAL SCALE = 1:50

REVISION BLOCK

#	DATE	DESCRIPTION
1.	MM/DD/YY	DESCRIPTION

KWA SITE DEVELOPMENT CONSULTING INC.
210-1 Antares Drive
Ottawa, ON K2E 7Z9

NORTH ARROW

METRIC SCALE
AS NOTED

EXISTING DITCH CROSS SECTION

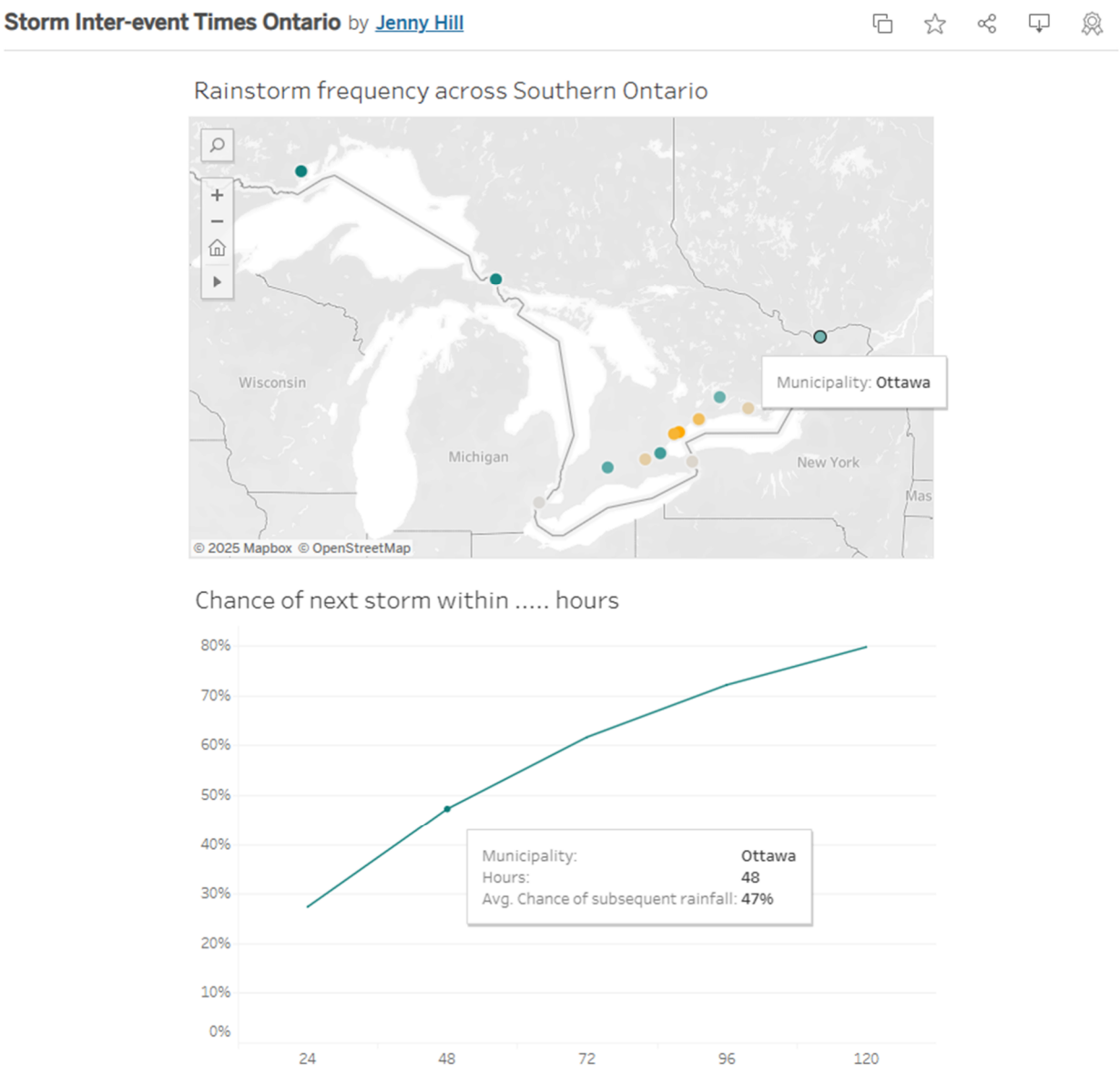
THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)
NEPEAN, ONTARIO

PROJECT No: 21684 | DRAWN BY: RC | CHECKED BY: RA

X-SEC

APPENDIX E

SUPPORTING DOCUMENTATION



Source:

https://wiki.sustainabletechnologies.ca/wiki/Drainage_time
https://public.tableau.com/app/profile/jenny.hill/viz/StormIntereventTimesOntario/Dashboard1

project-specific basis and are not considered in the Conceptual Fisheries Compensation Plan completed for the Barrhaven South community.

3.7 WATER BALANCE

Cursory water balance calculations were conducted for a portion of Reach 1 as part of the master drainage planning for the South Nepean growth area. The study identified the following water budget conditions for existing and estimated proposed future conditions, summarized in **Table 3.7.1**:

Table 3.7.1 South Nepean Master Drainage Plan Water Balance Results (CG&S, 1997)

Component	Existing	Urbanized to 40% Imperviousness
Precipitation	Rainfall: 663 mm Snowfall (as liquid water): 217 mm Total: 880 mm	880 mm
Evapotranspiration	550 mm – 600 mm	370 mm – 410 mm
Water Yield (Surface runoff plus contribution to groundwater)	300 mm – 350 mm	470 mm – 510 mm
Surface Runoff	100 mm – 150 mm	350 mm – 400 mm
Net Contribution to Water Table	200 mm	70 mm – 160 mm

As part of this Subwatershed study, a more detailed water budget analysis was prepared. Hydrogeotechnical input on the water holding capacities of the existing soils was used in conjunction with Meteorological Service of Canada (Environment Canada) modeling data and Ministry of the Environment (MOE) surplus water (i.e. infiltration factor) data to generate water budget results.

Marine clay is the predominant soil in the study area. The South Nepean Master Servicing Study (1998) included correspondence from Jaques Whitford Limited (JWL) estimating the permeability for each of the identified soil units and assessing their suitability for stormwater management infiltration practices (based on MOE SWM guidelines). The permeability estimates are summarized in **Table 3.7.2** (refer to **Figure 3.4.1** for soil units). Based on the suggested permeability, it is shown that only a minor fraction (14%) of the proposed Barrhaven South Community will be suitable for infiltration practices due to the limited areas with sandy soil.

Table 3.7.2 Permeability Estimate and Infiltration Suitability for Surficial Materials (from Jacques Whitford, 1994 & 1995)

Soil Unit	Soil Description	Permeability (m/s)	Suitable for Infiltration?
1	Glacial Till (silty sand/dense sand)	$1 \times 10^{-5} – 1 \times 10^{-4}$	No
2	Fluvioglacial Deposits (stratified sand and gravel)	$1 \times 10^{-1} – 1 \times 10^{-4}$	Yes
3	Champlain Sea Silty Clay (silty 'Leda' clay)	$1 \times 10^{-5} – 1 \times 10^{-8}$	No
4	Beach Deposits (coarse sand containing gravel/cobbles)	$1 \times 10^{-1} – 1 \times 10^{-4}$	Yes
5	Marine Sand (uniform, fine-grained sand)	$1 \times 10^{-3} – 1 \times 10^{-6}$	Yes
8	Abandoned River Channel Deposits (silt to silty clay & sand)	$1 \times 10^{-7} – 1 \times 10^{-4}$	Marginal
10	Organic Deposits (peat, poorly-drained)	$<< 1 \times 10^{-7}$	No

3.7.1 Methodology

Environment Canada uses the Thornthwaite & Mather methodology and Ottawa International Airport mean long-term (1939-2004) monthly precipitation data to generate annual potential and actual evapotranspiration and surplus water estimates. This information is based on type of soil (holding capacity), precipitation input (rain and snow), variations in soil storage throughout the year, and solar input (latitude). MOE infiltration factors are then used to determine the fraction of water surplus that is infiltration and runoff, based on soil type, cover, and topography. In addition, an assumption for urban impervious surfaces is applied to reallocate the infiltration and evapotranspiration components from these surfaces directly to runoff (conservative simplification).

Due to the variations in soil distribution and land cover, and in the interest of understanding the water contribution to the existing tributaries of the Jock River, the water balance was subdivided into several subcatchments corresponding with the hydrologic modeling areas (See **Drawing PRE-1**).

3.7.2 Results

Results of the annual water budget analysis are presented in **Table 3.7.3**. Detailed calculations are provided in **Appendix F**.

Table 3.7.3 Existing Condition Annual Water Balance Results

Catchment	Area (ha)	Total Evapotranspiration		Total Infiltration		Total Runoff	
		(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)
OKEEFE	531	2,896,695	546	958,980	181	1,156,965	218
FOSTER	335	1,232,320	368	394,156	118	1,535,924	458
FRASER	90	532,945	592	167,299	186	149,356	166
KEN_BU	281	1,044,908	372	334,921	119	1,272,812	453
W_CLAR	65	382,166	588	134,858	207	96,576	149
E_CLAR	85	496,745	584	170,592	201	135,063	159
TODD	201	1,180,605	587	368,817	183	348,018	173
CORRIG	75	420,836	561	145,674	194	141,491	189
MILLS	139	765,280	551	239,367	172	307,514	221
JOCKVA	226	1,337,355	592	417,945	185	378,140	167
S_1	349	2,009,745	576	724,166	207	560,649	161
S_2	112	634,255	566	201,658	180	221,367	198
DESIRE	24	106,464	444	33,653	140	86,443	360
Total	2,513	13,040,318	519	4,292,084	171	6,390,318	254

The overall results indicate general concurrence with the previous master drainage plan water budget assessment, with differences attributed to the degree of development considered 'existing' as shown in **Drawing PRE-1**. Evapotranspiration (519 mm) accounts for a significant fraction of total rainfall (944 mm). Of the 425 mm of available rainfall, 171 mm infiltrates and 254 mm is converted into surface runoff.

Subcatchments with development exhibit reduced evapotranspiration and infiltration rates, with a corresponding increase in runoff. The O'Keefe drain in the northwest corner of Reach 1 exhibits reduced infiltration from the drains south of the river due to the prevalence of silty clay over the majority of the subcatchment and the presence of urban development north of Fallowfield Road. Areas that show presence of sand and woodlots such as the east and west Clarke drains, Mills, S_1 and SW_1, have higher infiltration rates and consequently lower runoff. The Heart's Desire community, although estate-type development, has limited vegetative cover and therefore produces very low evapotranspiration and infiltration rates.

Overall, the majority of the Reach is within tight-natured soils thereby limiting the recharge potential. A component not directly reflected is the presence of tile drainage in the northern agricultural portion of the reach, which reduces the potential for infiltration/recharge as water is diverted to the many municipal and non-municipal drains.

classified as poor. The observation that the water quality in the upstream reaches of the Jock River is consistent with the water quality of this reach implies that a holistic approach to water quality improvement should be taken at a watershed level. However, the proposed developments in Reach 1 have an opportunity to improve water quality by providing enhanced level treatment to urban runoff. Hence all the proposed developments should make sufficient efforts in improving water quality of the Jock River and the SWM facilities must be designed to meet water quality criteria established in this study.

The combination of urbanization and stormwater treatment will reduce net loading of phosphorus to the Jock River.

Stormwater management facilities in Reach 1 are required to provide Enhanced Level treatment of urban runoff corresponding to 80% TSS removal (*MOE, March 2003*).

An integrated watershed based approach is required to improve the water quality of the Jock River.

6.3.5 Water Balance

The increase in surface imperviousness due to urbanization of lands has two major impacts in water balance – decreased infiltration and evaporation and increased runoff volume and peak flows. In the areas of critical hydrogeological function, reduction in infiltration becomes a serious concern as it has the potential to deplete the groundwater levels over a longer period. Therefore it is important to identify net changes in infiltration due to development. A subwatershed scale post development water balance analysis was completed to assess the potential change in infiltration using the MOE method as described in **Section 3.7**. Impervious areas were considered to have no infiltration capacity. The summary of the post development water balance for the subwatershed is presented in **Table 6.3.9**. The results show that as a result of urbanization of the subwatershed, there will be a net reduction in infiltration by approximately 58mm if no infiltration BMPs are implemented. The details are included in **Appendix F**.

Table 6.3.9 Post Development Annual Water Balance

Catchment	Area (ha)	Total Evapotranspiration		Total Infiltration		Total Runoff	
		(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)	(m^3/yr)	(mm/yr)
OKEEFE	448	1,422,280	317	500,764	112	2,306,076	515
FOSTER	373	931,560	250	294,462	79	2,295,098	615
FRASER	90	376,148	418	120,007	133	353,445	393
KEN_BU	281	701,165	250	221,635	79	1,729,840	616

		Total Evapotranspiration		Total Infiltration		Total Runoff	
W_CLAR	243	761,221	313	361,456	149	1,171,243	482
TODD	195	608,305	312	200,405	103	1,032,090	529
CORRIG	149	451,200	303	149,668	100	805,692	541
MILLS	139	476,015	342	150,948	109	685,197	493
JOCKVA	252	698,670	277	220,847	88	1,459,364	579
S_1	245	1,358,525	555	429,424	175	524,851	214
S_2	102	574,155	563	182,812	179	205,913	202
DESIRE	24	99,810	416	31,550	131	95,201	397
Total	2,541	8,459,054	333	2,863,977	113	12,664,009	498

The majority of surficial soils of the subwatershed have very low permeability, with only about 14% of the surface soils within the CDP area being suitable for infiltration measures. Low existing permeability and the reduction in pervious surface area due to development are expected to further reduce the total infiltration within the subwatershed.

To maximize infiltration, non-structural infiltration BMPs should be implemented throughout the subwatershed.

In the areas where suitable soils for infiltration are present, structural BMPs should be implemented to maintain the existing rate of recharge.

Any future development of the quarry area should ensure that the existing rate of recharge, at a minimum, is maintained.

Hydrogeological investigations suggest that the groundwater derived from the deeper bedrock formations is likely recharged in the upstream areas near the Village of Richmond. Some recharge of overburden groundwater is expected from the existing gravel quarry area as the area has higher infiltration rate, however expected recharge of deeper formation is likely minimal due to underlying impermeable soils. The existing quarry area lies to the south-east corner of the subwatershed. Although currently outside the urban area, it may have potential for future development should the land use designation change. Even though this area in not likely to recharge the deeper ground water, higher infiltration in the area contributes to the baseflow through interflow. Therefore any future developments should ensure that at least the existing rate of recharge is maintained. Further analysis will be required to quantify the amount of existing recharge from this area.

For the rest of the subwatershed, structural Best Management Practices (BMPs) such as soakaway pits or infiltration trenches may not be effective, due to low permeability of thick layer

APPENDIX F

DRAWINGS

VACANT LAND

LOT 22 CONCESSION 4 (RIDEAU FRONT)
PART 1 EXPROPRIATION PLAN N626069 (MTO PLAN P-6118-23)

PROPOSED BUILDING
'A3'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
8,027 m² (86,400 ft²)
FFE=109.10

PROPOSED BUILDING
'A2'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
8,027 m² (86,400 ft²)
FFE=108.70

EXISTING SPORTS COMPLEX

THE KINGS HIGHWAY 416

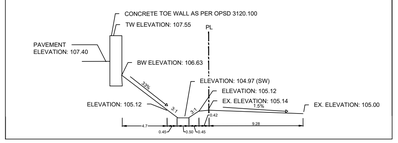
GENERAL NOTES:

1. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CURRENT "*OCCUPATIONAL HEALTH AND SAFETY ACT* AND *REGULATIONS FOR CONSTRUCTION PROJECTS*". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
2. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: TEMPORARY CONDITIONS FIELD EDITION.
3. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY , THE REGION AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
4. IT IS CONTRACTUALLY AGREED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
5. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
5. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT OF WAY, THE CONTRACTOR OR DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITYS RIGHT-OF-WAY MANAGEMENT UNIT. ROAD OCCUPANCY/ACCESS PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOW.
6. ALL WORK TO BE DESIGNED AND COMPLETED AS PER OPSS, OPSD, AND MTOD.
7. NO ALTERATIONS TO EXISTING BOUNDARY ELEVATIONS OR ADJACENT LANDS SHALL BE UNDERTAKEN UNLESS WRITTEN AGREEMENT WITH THE ADJACENT PROPERTY OWNER IS OBTAINED AND SUBMITTED IN A FORMAT ACCEPTABLE TO THE CITY.

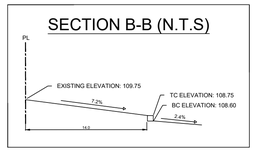
SITE GRADING:

1. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER WITH SOD ON MIN 100mm TOPSOIL. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.
2. ALL GRANULAR BASE AND SUB-BASE MATERIALS SHALL BE GRADED AND COMPACTED TO 98% STANDARD PROCTOR DENSITY, FREE OF DEPRESSIONS AS PER THE GEOTECHNICAL REPORT.
3. THE PAVEMENT STRUCTURE SHALL BE CONSTRUCTED BASED ON SPECIFICATIONS AS PER THE GEOTECHNICAL REPORT.
4. PROVIDE SUBDRAINS, MINIMUM LENGTH OF 3.0m, EXTENDING FROM ALL CATCHBASINS AND CATCHBASIN MANHOLES TO DRAIN THE GRANULAR SUB-BASE LAYER AS PER DETAIL ON DRAWING D1.
5. ALL BARRIER CURB WITHIN THE SITE TO BE CONSTRUCTED AS PER DETAIL ON DRAWING D1, UNLESS OTHERWISE SPECIFIED.
6. TRENCH BACKFILL WITHIN THE RIGHT OF WAY SHALL BE UNSHRINKABLE FILL AND SHALL EXTEND TO THE BASE OF ASPHALT. LANDSCAPED AREA MAY BE EXEMPTED.
7. ALL WORK SHALL BE SUBJECT TO THE CONDITIONS AND REQUIREMENTS OF CITY ROAD OCCUPANCY PERMIT.
8. INSPECTIONS: ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING. ALL WORK RELATING TO WATERMAINS AND SEWERS TO BE INSPECTED BY THE MUNICIPALITY WHEN REQUIRED BY THE MUNICIPALITY.
9. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON DRAWING D1. ALL JOINTS MUST BE SEALED AS PER DETAIL.
10. TRANSITIONS WITHIN THE SUBGRADE WITHIN 1.2m FROM THE TOP OF PAVEMENT SHOULD INCLUDE 3H:1V TRANSITIONS AS PER DETAIL ON DRAWING D1.
11. EMBANKMENTS TO BE SLOPED AT MAX. 3:1, UNLESS OTHERWISE SPECIFIED.
12. ALL PAVEMENT MARKING, LINE PAINTING, DIRECTIONAL LINES/ARROWS ETC. SHALL BE PLACED IN ACCORDANCE WITH THE ARCHITECTURAL SITE PLAN OR THE OWNER'S TRAFFIC ENGINEERING CONSULTANT'S DRAWINGS. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT IN ACCORDANCE WITH OPSS 1712.
13. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS FOR THE RETAINING WALL (INCLUDE RAILINGS IF APPLICABLE) TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY STRUCTURAL AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.
14. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DRAWINGS.

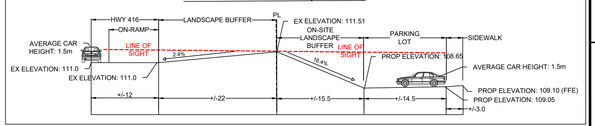
SECTION A-A (N.T.S)



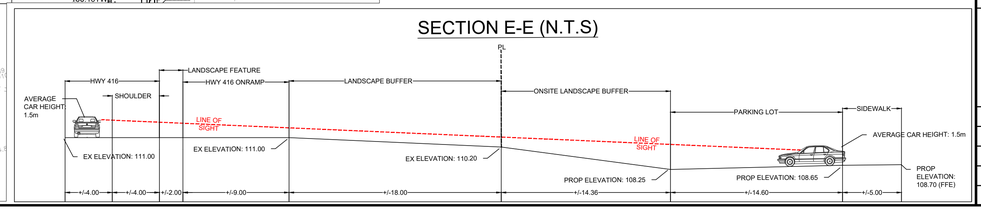
SECTION B-B (N.T.S)

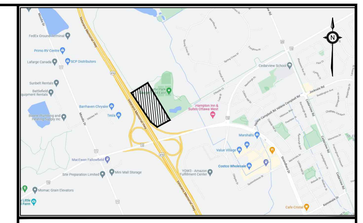


SECTION D-D (N.T.S)



SECTION E-E (N.T.S)





KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- PROPOSED ITEMS (200.00 0.5% MH 1A)
- EXISTING ITEMS (200.00 0.5% EX MH 1A)
- LIMIT OF PROPERTY LINE
- LIMIT OF BUILDING STRUCTURE
- PROP ELEVATION TO MATCH EXISTING (× 200.00)
- EMERGENCY OVERLAND FLOW ROUTE
- SANITARY MH
- STM MH / CBMH / DCBMH
- CB / DCB
- HYDRANT / SIAMESE
- VALVE BOX

BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM		
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05		
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23		
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
2	SITE PLAN APPROVAL - SUBMISSION 2	25/10/06	T.F.
1	SITE PLAN APPROVAL - SUBMISSION 1	25/06/09	T.F.
NO.	ISSUE	DATE	BY

NOT FOR CONSTRUCTION

1. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF KWA. THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT FROM KWA IS STRICTLY PROHIBITED.
2. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER DRAWINGS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
3. THIS DRAWING IS NOT TO BE ISSUED FOR CONSTRUCTION UNTIL ALL REQUIRED PERMITS HAVE BEEN ISSUED.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, INVERTS AND DATA ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO KWA 48 HOURS PRIOR TO ANY CONSTRUCTION.

KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

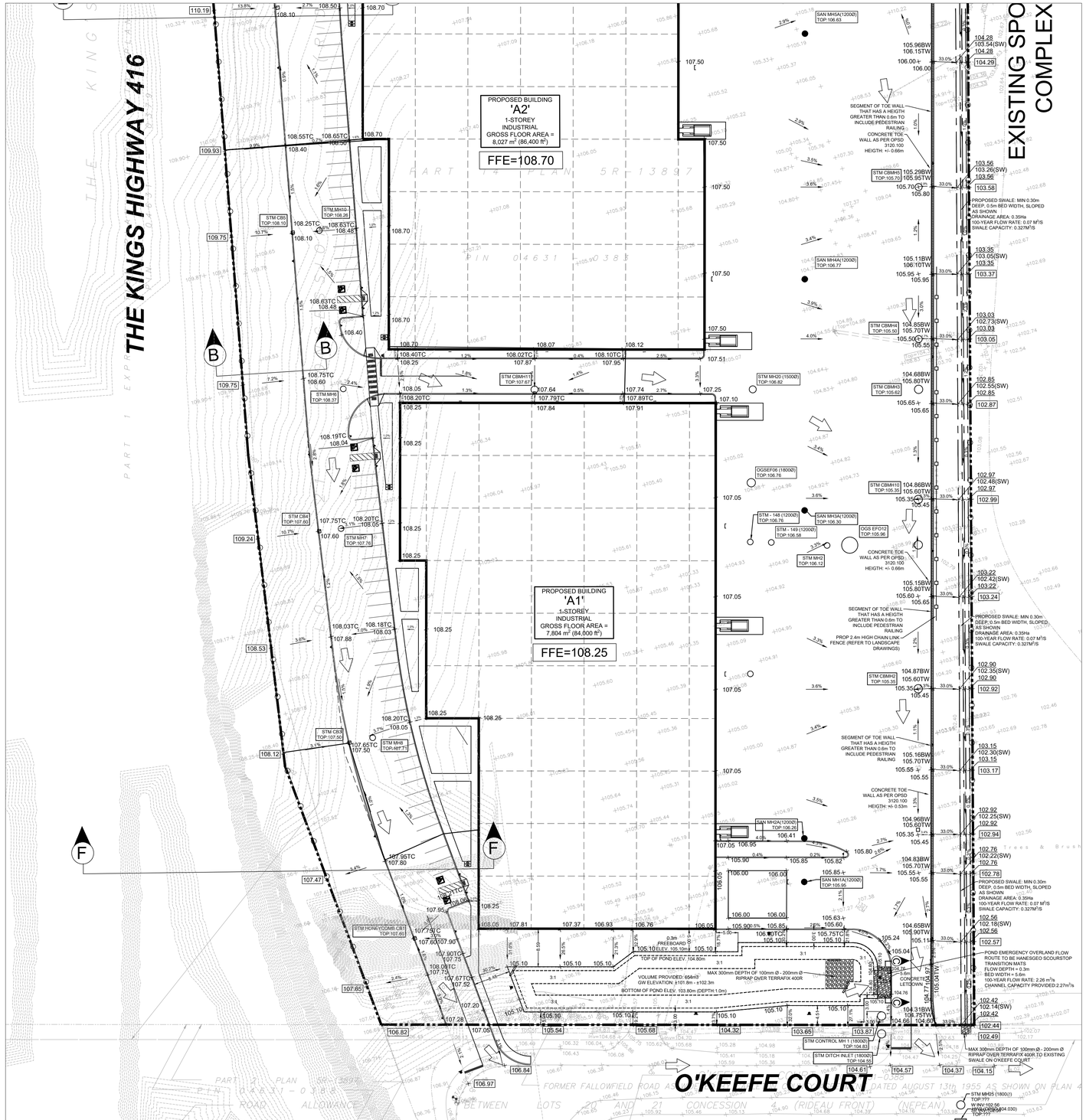
THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

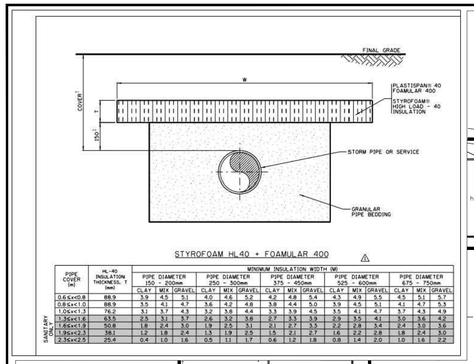
GRADING PLAN

SCALE:	1:500 (10m)	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	G1
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

File : G:\Projects\21684_TPG O'Keefe Court - Nepean\4. Drawings\3. Design Drawings\21684 - GRADING.dwg Layout : G1 Date : Dec 12, 2025 - 4:56pm Edit By : tnoo

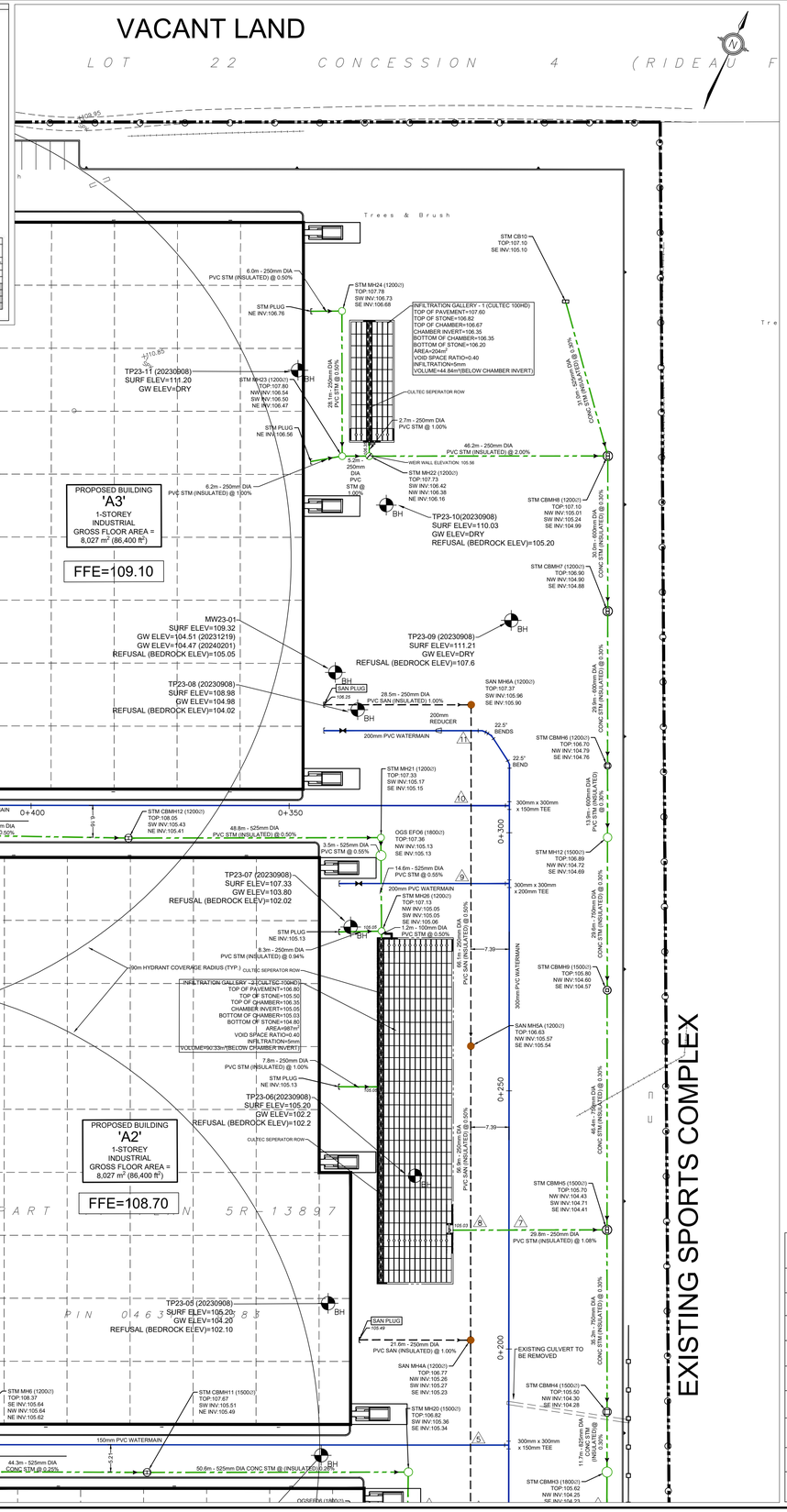

THE KINGS HIGHWAY 416
EXISTING SPORTS COMPLEX
PROPOSED BUILDING
'A2'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
8,027 m² (86,400 ft²)
FFE=108.70
PROPOSED BUILDING
'A1'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
7,804 m² (84,000 ft²)
FFE=108.25
O'KEEFE COURT
SEGMENT OF TOE WALL THAT HAS A HEIGTH GREATER THAN 0.6m TO INCLUDE PEDESTRIAN RAILING
CONCRETE TOE WALL AS PER OPSD 3120.100
HEIGTH: +/- 0.66m
PROPOSED SWALE: MIN 0.30m DEEP, 0.5m BED WIDTH, SLOPED AS SHOWN
DRAINAGE AREA: 0.35Ha
100-YEAR FLOW RATE: 0.07 M³/S
SWALE CAPACITY: 0.327M³/S
PROP 2.4m HIGH CHAIN LINK FENCE (REFER TO LANDSCAPE DRAWINGS)
POND EMERGENCY OVERLAND FLOW ROUTE TO BE HANESGEO SCOURSTOP TRANSITION MATS
FLOW DEPTH = 0.3m
BED WIDTH = 5.6m
100-YEAR FLOW RATE: 2.26 m³/s
CHANNEL CAPACITY PROVIDED:2.27m³/s
MAX 300mm DEPTH OF 100mm Ø - 200mm Ø RIPRAP OVER TERRAFIX 400R
VOLUME PROVIDED: 66m³/0
GW ELEVATION: 101.8m - ±102.3m
BOTTOM OF POND ELEV: 103.80m (DEPTH 1.0m)
0.3m FREEBOARD
TOP OF POND ELEV: 104.80m
STM CONTROL MH 1 (1800Ø)
STM DITCH INLET (1800Ø)
CONCRETE LETDOWN
PART 1 EXPROPRIATION PLAN 4D–84 (MTQ PLAN P-4116–87)
PART 1 PLAN 5R-13897
PART 2 PLAN 5R-13896
PART 4 EXPROPRIATION PLAN 4D–84
PART 10 PLAN 4R–7852
PART 9 PLAN 4R–7852
THE KING'S HIGHWAY 416
PIN 04462–0044
PIN 04467–0063
LOT 21
CONCESSION 4 (RIDEAU FRONT) (NEPEAN)
FORMER FALLOWFIELD ROAD ALLOWANCE BETWEEN LOTS 20 AND 21 CONCESSION 4 (RIDEAU FRONT) (NEPEAN)
PIN 04631–0383
PIN 04631–0385
PIN 04631–0386
PIN 04631–0387
PIN 04631–0388
PIN 04631–0389
PIN 04631–0390
PIN 04631–0391
PIN 04631–0392
PIN 04631–0393
PIN 04631–0394
PIN 04631–0395
PIN 04631–0396
PIN 04631–0397
PIN 04631–0398
PIN 04631–0399
PIN 04631–0400
PIN 04631–0401
PIN 04631–0402
PIN 04631–0403
PIN 04631–0404
PIN



STYROFOAM HL40 + FOAMULAR 400 ⚠

PIPE COVER (m)	INSULATION THICKNESS, T (mm)	MINIMUM INSULATION WIDTH (W) PIPE DIAMETER 250 - 300mm CLAY	MIX	GRAVEL	PIPE DIAMETER 375 - 450mm CLAY	MIX	GRAVEL	PIPE DIAMETER 525 - 600mm CLAY	MIX	GRAVEL	PIPE DIAMETER 675 - 750mm CLAY	MIX	GRAVEL
	ALL				ALL			ALL			ALL		
0.6≤x<0.8	88.9	3.9	4.5	5.1	4.0	4.6	5.2	4.2	4.8	5.4	4.3	4.9	5.5
0.8≤x<1.0	88.9	3.5	4.1	4.7	3.6	4.2	4.8	3.8	4.4	5.0	3.9	4.5	5.1
1.0≤x<1.3	76.2	3.1	3.7	4.3	3.2	3.8	4.4	3.3	3.9	4.5	3.5	4.1	4.7
1.3≤x<1.6	63.5	2.8	3.3	3.9	2.9	3.4	3.9	3.0	3.5	4.1	3.2	3.8	4.3
1.6≤x<1.9	50.8	2.5	2.9	3.4	2.6	3.0	3.5	2.7	3.2	3.7	2.9	3.4	3.9
1.9≤x<2.3	38.1	2.2	2.6	3.0	2.3	2.7	3.1	2.4	2.8	3.3	2.5	3.0	3.5
2.3≤x<2.5	25.4	1.9	2.2	2.5	1.9	2.3	2.6	2.0	2.4	2.7	2.1	2.5	2.8

SAMPLE BY OWNER



GENERAL NOTES:

1. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CURRENT "*OCCUPATIONAL HEALTH AND SAFETY ACT AND REGULATIONS FOR CONSTRUCTION PROJECTS*". THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
2. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: TEMPORARY CONDITIONS FIELD EDITION.
3. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY , THE REGION AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
4. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
5. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
5. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT OF WAY, THE CONTRACTOR OR DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT UNIT. ROAD OCCUPANCY/ACCESS PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOW.
6. ALL WORK TO BE DESIGNED AND COMPLETED AS PER OPSS, OPSD, AND MTOD.
7. NO ALTERATIONS TO EXISTING BOUNDARY ELEVATIONS OR ADJACENT LANDS SHALL BE UNDERTAKEN UNLESS WRITTEN AGREEMENT WITH THE ADJACENT PROPERTY OWNER IS OBTAINED AND SUBMITTED IN A FORMAT ACCEPTABLE TO THE CITY.

WATERMAINS:

1. WATERMAIN SHALL BE POLYVINYL CHLORIDE (PVC) CLASS 150 DR-18 PIPE MANUFACTURED TO AWWA C900-89 AND CSA CAN3 B137.3-M1986 WITH GASKETED BELL END C/W #14 AWG SOLID COPPER TRACER WIRE.
2. WATERMAINS SHALL HAVE A MINIMUM VERTICAL CLEARANCE OF 300mm OVER AND 500mm UNDER SEWERS AND ALL OTHER UTILITIES WHEN CROSSING.
3. BEDDING FOR WATERMAINS SHALL BE AS PER OPSD 802.030.
4. COVER REQUIRED ON WATERMAIN IS 2.40m MINIMUM.
5. ALL WATERMAIN HORIZONTAL AND VERTICAL BENDS, JOINTS AND PLUGS TO BE MECHANICALLY RESTRAINED. THRUST BLOCKS/MECHANICAL RESTRAINERS MUST BE INSTALLED ON ALL WATERMAIN BENDS, TEES, AND PLUGS AS PER LOCAL MUNICIPAL STANDARDS.
6. ALL WATERMAIN STUBS SHALL BE TERMINATED WITH A PLUG AND 50mm BLOW OFF UNLESS OTHERWISE NOTED.
7. ALL FIRE HYDRANTS TO BE INSTALLED AS PER CITY OF OTTAWA STANDARD W19.
8. ALL VALVE BOXES SHALL BE INSTALLED AS PER CITY OF OTTAWA STANARD W24.
9. INSULATION FOR WATERMAIN CROSSING OVER AND BELOW SEWER SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. W25.2 AND W25, RESPECTIVELY, WHERE WATERMAN COVER IS LESS THAN 2.4M.
10. WHERE THE SEPARATION BETWEEN SERVICES AND MANHOLES IS LESS THAN 2.4M, WATER SERVICES ARE TO BE INSULATED AS PER CITY OF OTTAWA STD. W23.
11. ALL HYDRANT FLANGE ELEVATIONS TO BE INSTALLED 0.15m ABOVE PROPOSED FINISHED GRADE AT HYDRANT.
12. BUILDING SERVICE VALVES TO BE 3.0m OFF THE FACE OF THE BUILDING UNLESS OTHERWISE NOTED AND MUST BE RESTRAINED A MINIMUM OF 12m BACK FROM STUB.
13. THRUST BLOCK AND RESTRAINT AS PER CITY OF OTTAWA DWGS: W25.3 AND W25.4, W25.5 AND W25.6.
14. PROVISIONS FOR FLUSHING WATERMAINS MUST BE PROVIDED WITH A MINIMUM 50mm OUTLET FOR MAINS 100mm AND LARGER. FLUSHING POINTS MATCHING THE SIZE OF THE PIPE MUST BE PROVIDED AT THE END OF EACH COPPER MAIN. FIRE MAIN FLUSHING OUTLETS TO BE 100mm DIAMETER MINIMUM OR A HYDRANT. FLUSHING POINTS MUST BE HOSED OR PIPED TO ALLOW THE WATER TO DRAIN.
15. ALL WATERMAINS SHALL BE HYDROSTATICALLY TESTED IN ACCORDANCE WITH LOCAL MUNICIPAL AND PROVINCIAL GUIDELINES UNLESS OTHERWISE DIRECTED. PROVISIONS FOR FLUSHING WATER LINE PRIOR TO TESTING, ETC. MUST BE PROVIDED.
16. ALL PROPOSED WATER PIPING MUST BE ISOLATED FROM EXISTING MAINS IN ORDER TO ALLOW INDEPENDENT PRESSURE TESTING AND CHLORINATION.
17. BOTH THE FIRE AND DOMESTIC WATER SERVICES MUST COMPLY WITH THE CURRENT BUILDING CODE ACT, THE CURRENT WATER SUPPLY BY-LAW, CHAPTER 851 AND CSA B-64 SERIES STANDARDS.

SANITARY SEWER:

1. ALL SANITARY SEWER MATERIALS AND INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS).
2. ALL SANITARY SEWERS SHALL BE PVC SDR 35, IPEX "RING-TITE" (OR EQUIVALENT), AS PER CSA STANDARD B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE NOTED.
3. SANITARY SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B BEDDING UNLESS OTHERWISE NOTED.
4. ALL SANITARY LATERALS ARE TO BE PVC SDR 28 IPEX "RING-TITE" (OR EQUIVALENT), ANY COLOR EXCEPT WHITE AND MARKED WITH A 50MM X 100MM WOODEN MARKER, EXTENDING FROM THE INVERT TO 1.0 M ABOVE GRADE PAINTED RED.
5. SEWER BEDDING AS PER CITY STANDARD S6 & S7. GRANULAR 'A' BEDDING TO BE INCREASED TO 300MM WHERE SEWERS ARE BELOW THE GROUNDWATER TABLE.
6. SANITARY SEWER MANHOLES SHALL BE BENCHED AS PER OPSD 701.021. SANITARY MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24 AND S25. SAFETY PLATFORMS SHALL BE AS PER OPSD 404.02. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA SPECIFICATIONS AND OPSD 1003.01.
7. THE CONTRACTOR SHALL CONDUCT INFILTRATION/EXFILTRATION (AS PER CURRENT OPSS) TESTING ON ALL NEWLY INSTALLED SANITARY SEWERS. THE TEST SHALL BE PERFORMED IMMEDIATELY AFTER SEWER INSTALLATION AND VIEWED BY THE ENGINEER.
8. ALL SERVICE CONNECTIONS TO BE CONSTRUCTED AS PER CITY STANDARD S11 & S11.1 CONCRETE PIPE SEWER BEDDING SHALL BE CLASS 'B' AS PER OPSD 802.030, PVC PIPE SEWER BEDDING SHALL BE CLASS 'B' AS PER OPSD 802.030 TO TOP OF SEWER WITH A MINIMUM 300mm SAND COVER OVER PIPE NATIVE BACKFILL TO BE COMPACTED TO A MIN. 98% STANDARD PROCTOR DENSITY.
9. THE CONTRACTOR SHALL CONSTRUCT FLEXIBLE SANITARY SEWERS IN ACCORDANCE WITH OPSD 802.010 AND 802.013. DURING CONSTRUCTION, THE CONTRACTOR SHALL PROTECT THE PIPES FROM HEAVY CONSTRUCTION EQUIPMENT. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 95% SPMDD.
10. ALL SANITARY BUILDING DRAINS TO BE EQUIPPED WITH SANITARY BACKWATER VALVES INSTALLED PER CITY OF OTTAWA STANDARD DRAWING S14.1.
11. MINIMUM SOIL COVER TO BE 2.1M TO PROTECT SEWERS FROM FROST DAMAGE. IN AREAS WHERE ADEQUATE FROST COVER CANNOT BE ACHIEVED, EQUIVALENT THERMAL INSULATION TO BE INSTALLED AS PER OPSD S14.010
12. SANITARY MAINTENANCE HOLE SHALL HAVE WATERTIGHT FRAME AND COVER IN PONDING AREAS AS PER OPSD 401.030
13. BEDDING FOR RIGID PIPE SHALL BE CLASS B AS PER OPSD 802.030, 802.031, 802.032 OR 802.033
14. ALL MANHOLE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY.
15. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY AND STORM SEWERS, INCLUDING PICTORIAL REPORT, TWO (2) CD COPIES AND ONE (1) VIDEO TAPE IN A FORMAT SATISFACTORY TO THE ENGINEER. ALL SEWERS ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION.
16. THE CONTRACTOR SHALL CONTACT THE MUNICIPALITY AT LEAST 48 HOURS PRIOR TO CONNECTING TO THE EXISTING SANITARY& STORM MANHOLE.
17. SERVICE CONNECTIONS AND UTILITY CUTS TO BE BACKFILLED WITH UNSHRINKABLE FILL.

STORM SEWER:

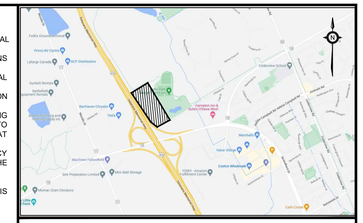
1. ALL STORM SEWER MATERIALS AND INSTALLATION SHALL CONFORM TO THE LATEST REVISIONS OF THE STANDARDS AND SPECIFICATIONS OF THE CITY OF OTTAWA, ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD) AND SPECIFICATIONS (OPSS)
2. ALL REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.2 (LATEST AMENDMENT). ALL NON-REINFORCED CONCRETE STORM SEWER PIPE SHALL BE IN ACCORDANCE WITH CSA A257.1 (LATEST AMENDMENT). PIPE SHALL BE JOINTED WITH STD. RUBBER GASKETS AS PER CSA A257.3 (LATEST AMENDMENT).
3. ALL MAIN STORM SEWERS SHALL BE PVC SDR 35 APPROVED PER C.S.A. B182.2 OR LATEST AMENDMENT, UNLESS OTHERWISE SPECIFIED.
4. THE CONTRACTOR SHALL CONSTRUCT FLEXIBLE STORM SEWERS IN ACCORDANCE WITH OPSD 802.010 AND 802.013. RIGID STORM PIPE SHALL BE CONSTRUCTED IN ACCORDANCE WITH OPSD 802.030. DURING CONSTRUCTION THE CONTRACTOR SHALL PROTECT THE PIPES FROM HEAVY CONSTRUCTION EQUIPMENT. BEDDING AND BACKFILL SHALL BE COMPACTED TO A MINIMUM OF 95% SPMDD.
5. STORM SEWER TO BE INSULATED, AS INDICATED, AS PER DETAIL ON THIS DRAWING.
6. SEWER BEDDING AS PER CITY STANDARD S6 & S7.
7. ALL STORM LATERALS SHALL BE PVC SDR 28, WHITE IN COLOR AND MARKED WITH A 50MM X IOOMM WOODEN MARKER EXTENDING FROM THE INVERT TO 1.0M ABOVE GRADE PAINTED GREEN.
8. ALL SERVICE CONNECTIONS TO BE CONSTRUCTED AS PER CITY STANDARD S11 & S11.1.
9. MINIMUM SOIL COVER TO BE 2.1M TO PROTECT SEWERS FROM FROST DAMAGE. IN AREAS WHERE ADEQUATE FROST COVER CANNOT BE ACHIEVED, EQUIVALENT THERMAL INSULATION TO BE INSTALLED AS PER OPSD S14.010
10. ALL STORM SERVICES TO BE EQUIPPED WITH APPROVED BACKWATER VALVES PER CITY OF OTTAWA STD. S14.
11. STORM MANHOLE FRAME AND COVERS SHALL BE AS PER CITY OF OTTAWA STD. S24.1 AND S25. CBMH LIDS SHALL BE AS PER CITY OF OTTAWA STD. S28.1 AND CBS SHALL BE AS PER CITY OF OTTAWA STD. S19.
12. SAFETY PLATFORMS SHALL BE IN ACCORDANCE WITH OPSD 404.02.
13. DROP STRUCTURES SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA SPECIFICATIONS AND OPSD 1003.01.
14. STORM SEWER MANHOLES SERVING LOCAL SEWERS LESS THAN 900MM SHALL BE CONSTRUCTED WITH A 300MM SUMP. FOR STORM SEWERS 900MM AND OVER USE BENCHING IN ACCORDANCE WITH OPSD 701 .021.
15. SINGLE AND DOUBLE CATCHBASINS SHALL BE IN ACCORDANCE WITH CITY OF OTTAWA STD. S1, AND OPSD 705.020, RESPECTIVELY.
16. SINGLE AND DOUBLE CATCHBASIN LEADS SHALL BE 200MM AND 250MM Ø MINIMUM RESPECTIVELY, 1.0% SLOPE (MIN.) UNLESS OTHERWISE NOTED.
17. ALL CATCHBASINS AND CATCHBASIN MANHOLES SHALL HAVE SUMPS WITH 300MM DEPTH, UNLESS OTHERWISENOTED.
18. CONTRACTOR SHALL ENSURE THAT CATCHBASINS ARE INSTALLED AT THE LOW POINT OF SAG CURB WORKS.
19. THE STORM SEWERS HAVE BEEN DESIGNED FACED ON BEDDING CONDITIONS SPECIFIED. WHERE THE SPECIFIED TRENCH WIDTH IS EXCEEDED, THE CONTRACTOR SHALL BE REQUIRED TO PROVIDE ADDITIONAL BEDDING, A DIFFERENT TYPE OF BEDDING OR A HIGHER PIPE STRENGTH AT HIS OWN EXPENSE AND SHALL ALSO BE RESPONSIBLE FOR EXTRA TEMPORARY AND/OR PERMANENT REPAIRS MADE NECESSARY BY THE WIDENED TRENCH.
20. NON-REINFORCED CONCRETE PIPE 150mm TO 250mm SHALL BE AS PER CSA A257.1-03 CLASS 3. HEIGHT OF FILL TO BE VERIFIED USING OPSD TABLES 807.040. BEDDING FOR RIGID PIPE SHALL BE CLASS B AS PER OPSD 802.030, 802.031, 802.032 OR 802.033
21. ALL MANHOLE AND CATCH BASIN EXCAVATIONS TO BE BACKFILLED WITH GRANULAR MATERIAL COMPACTED TO 98% STANDARD PROCTOR DENSITY.
22. ALL CATCH BASINS AND CATCH BASIN MANHOLES ARE TO INCLUDE SUBDRAIN TREATMENT AS PER DETAIL ON DRAWING D1.
23. ALL BLIND CONNECTIONS TO MATCH THE INVERT OF THE CATCH BASIN LEAD TO THE SPRINGLINE OF THE STORM PIPE. OTHERWISE INSTALL THE CATCH BASIN LEAD AT A MAXIMUM 2.00% AND DROP INTO PIPE.
24. UNLESS OTHERWISE NOTED, CATCHBASIN LEADS SHALL BE 250mmØ AT MINIMUM 1.00% SLOPE.
25. THE CONTRACTOR IS TO PROVIDE CCTV CAMERA INSPECTIONS OF ALL SANITARY AND STORM SEWERS, INCLUDING PICTORIAL REPORT, TWO (2) CD COPIES AND ONE (1) VIDEO TAPE IN A FORMAT SATISFACTORY TO THE ENGINEER. ALL SEWERS ARE TO BE FLUSHED PRIOR TO CAMERA INSPECTION.
26. THE CONTRACTOR SHALL CONTACT THE MUNICIPALITY AT LEAST 48 HOURS PRIOR TO CONNECTING TO THE EXISTING SANITARY& STORM MANHOLE.
27. SERVICE CONNECTIONS AND UTILITY CUTS TO BE BACKFILLED WITH UNSHRINKABLE FILL.

PIPE CROSSING TABLE

1. STM INVERT=105.24
SAN OBVERT=105.14
VERTICAL SEPARATION=0.10m (CONC ENCASED)
2. STM INVERT=104.20
WATERMAIN OBVERT=103.49
VERTICAL SEPARATION=0.71m
3. SAN INVERT=105.06
WATERMAIN OBVERT=104.56*
VERTICAL SEPARATION=0.5m
4. STM INVERT=105.32
WATERMAIN OBVERT=104.82*
VERTICAL SEPARATION=0.5m
5. SAN INVERT=105.13
WATERMAIN OBVERT=104.62
VERTICAL SEPARATION=0.52m
6. WATERMAIN INVERT=106.44
STM OBVERT=105.94
VERTICAL SEPARATION=0.5m
7. STM INVERT=104.92
WATERMAIN OBVERT=104.42*
VERTICAL SEPARATION=0.5m
8. SAN INVERT=105.36
STM OBVERT=105.23
VERTICAL SEPARATION=0.13m
9. SAN INVERT=105.73
WATERMAIN OBVERT=105.09
VERTICAL SEPARATION=0.64m
10. SAN INVERT=105.80
WATERMAIN OBVERT=105.28
VERTICAL SEPARATION=0.52m
11. SAN INVERT=105.80
WATERMAIN OBVERT=105.28
VERTICAL SEPARATION=0.52m
12. STM INVERT=106.01
WM OBVERT=105.51*
VERTICAL SEPARATION=0.5m (CONC ENCASED)

* DENOTES WATERMAIN TO BE DEFLECTED

FROM - TO (STATION #)	PIPE SIZE (mm)	PIPE MATERIAL	TOP OF PIPE ELEVATION (m)	GROUND ELEVATION (m)	DEPTH OF COVER (m)	FITTINGS
STA 0+000 - 0+050	300	CLASS 150 PVC SDR-18	102.91	104.31	2.40	N/A
STA 0+050 - 0+100	300	CLASS 150 PVC SDR-18	102.36	104.76	2.40	N/A
STA 0+100 - 0+150	300	CLASS 150 PVC SDR-18	102.04	104.44	2.40	22.5° BENDS @ STA 0+038
STA 0+150 - 0+200	300	CLASS 150 PVC SDR-18	103.84	106.24	2.40	300mm x 300mm x 200mm TEE @ STA 0+169 & 0+182
STA 0+200 - 0+250	300	CLASS 150 PVC SDR-18	104.08	106.48	2.40	N/A
STA 0+250 - 0+300	300	CLASS 150 PVC SDR-18	104.11	106.51	2.40	300mm x 300mm x 150mm TEE @ STA 0+290
STA 0+300 - 0+350	150/300	CLASS 150 PVC SDR-18	104.92	107.32	2.40	300mm x 300mm x 150mm TEE @ STA 0+305
STA 0+350 - 0+400	150	CLASS 150 PVC SDR-18	105.84	108.24	2.40	N/A
STA 0+400 - 0+450	150	CLASS 150 PVC SDR-18	106.44	108.84	2.40	45° BEND @ STA 0+431



KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- 200.00 0.5% / MH 1A — PROPOSED ITEMS
- 200.00 0.5% / EX MH 1A — EXISTING ITEMS
- LIMIT OF PROPERTY LINE
- LIMIT OF BUILDING STRUCTURE
- SANITARY SEWER
- STORM SEWER
- WATERMAIN
- SAN MH / PIPE STUB / PIPE OUTLET
- STM MH / CBMH / DCBMH
- CB / DCB
- HYDRANT / SIAMESE
- VALVE BOX
- WAT BENDS: 11.25° / 22.5° / 45° / 90°
- WAT TEE / CROSS / REDUCER

BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM		
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05		
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23		
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
2	SITE PLAN APPROVAL - SUBMISSION 2	25/10/06	T.F.
1	SITE PLAN APPROVAL - SUBMISSION 1	25/06/09	T.F.
NO.	ISSUE	DATE	BY

NOT FOR CONSTRUCTION

1. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF KWA. THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT FROM KWA IS STRICTLY PROHIBITED.
2. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER DRAWINGS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
3. THIS DRAWING IS NOT TO BE ISSUED FOR CONSTRUCTION UNTIL ALL REQUIRED PERMITS HAVE BEEN ISSUED.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, INVERTS AND DATA ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO KWA 48 HOURS PRIOR TO ANY CONSTRUCTION.

KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

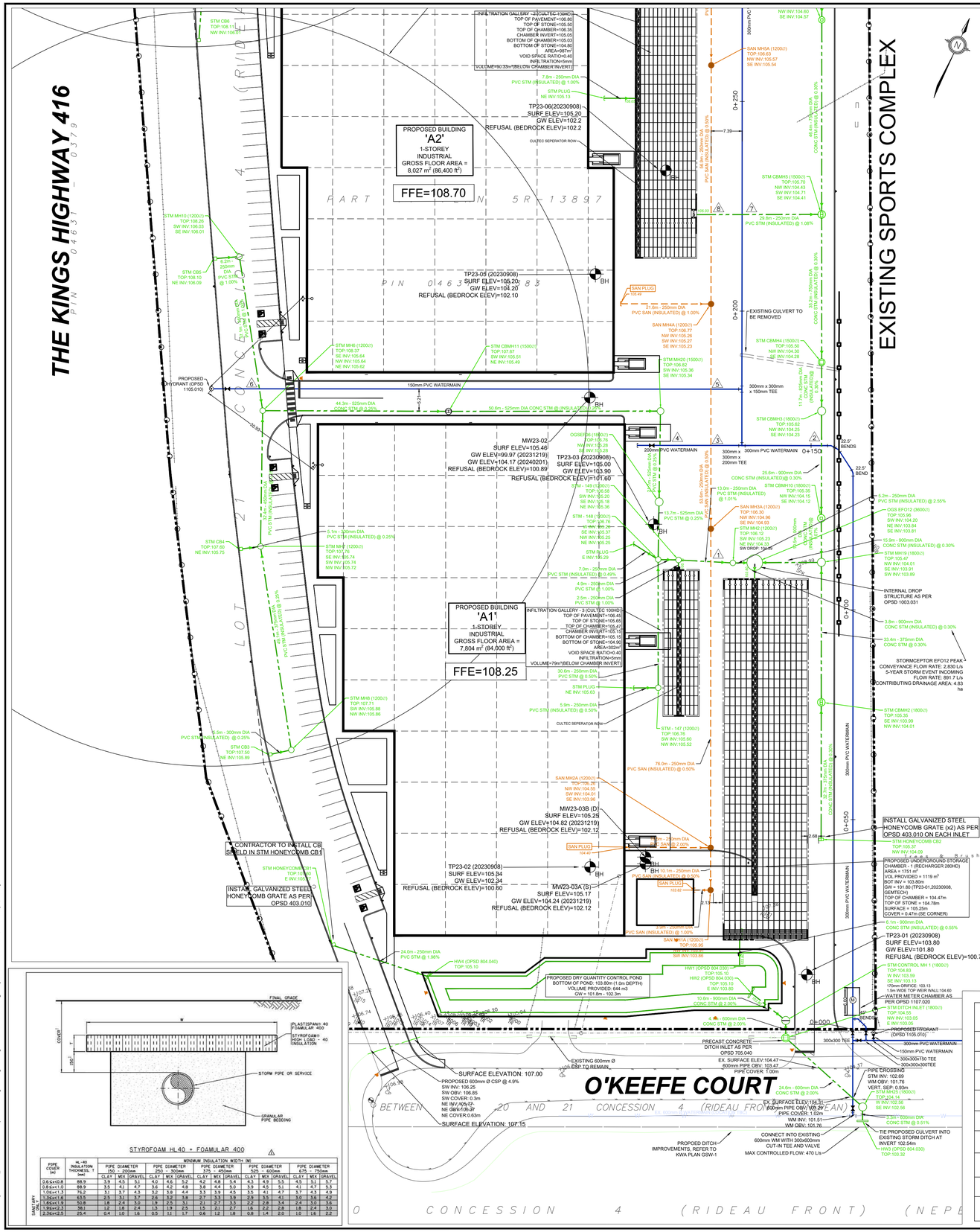
THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

SERVICING PLAN

SCALE:	1:500 (10m)	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	S1
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

File: G:\Projects\21684_TPG O'Keefe Court - Nepean\4. Drawings\3. Design Drawings\21684 - SERVICING.dwg Layout : S1 Date: Dec 12, 2025 - 4:53pm Edit By: theo

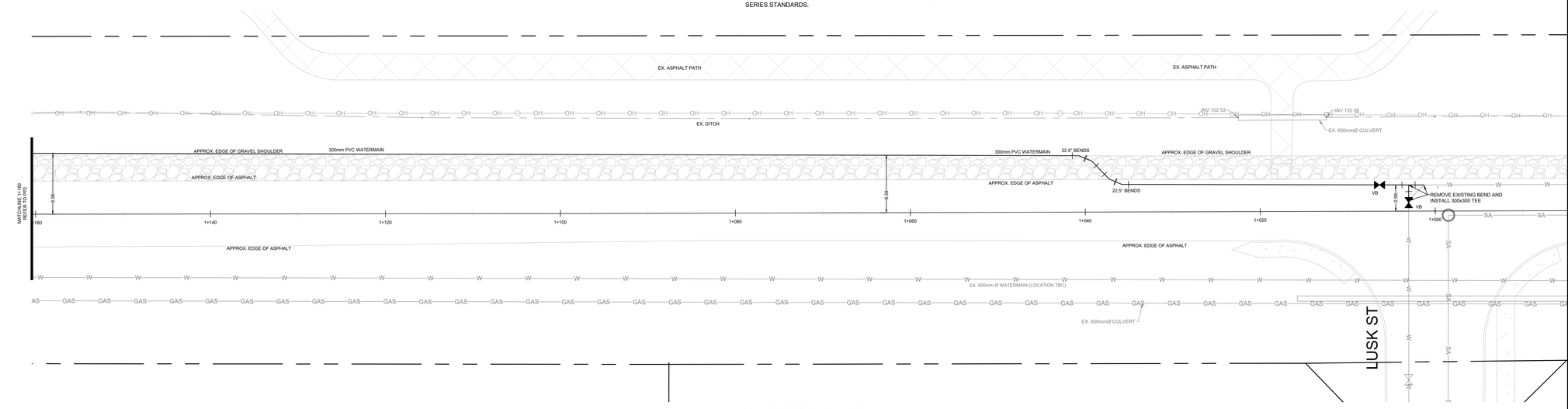

THE KINGS HIGHWAY 416
PIN 04637 - 0179
EXISTING SPORTS COMPLEX
PROPOSED BUILDING
'A2'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
8,027 m² (86,400 ft²)
FFE=108.70
PROPOSED BUILDING
'A1'
1-STOREY
INDUSTRIAL
GROSS FLOOR AREA =
7,804 m² (84,000 ft²)
FFE=108.25
PART 5R-13897
PIN 04637 - 0183
O'KEEFE COURT
BETWEEN 20 AND 21 CONCESSION 4 (RIDEAU FRONT) (NEPEAN)
0 CONCESSION 4 (RIDEAU FRONT) (NEPE
SURFACE ELEVATION: 107.00
SURFACE ELEVATION: 107.15
EXISTING 600mm Ø WATERMAIN TO REMAIN
PROPOSED DRY QUANTITY CONTROL POND
BOTTOM OF POND: 103.80m (1.0m DEPTH)
VOLUME PROVIDED: 644 m3
GW = 101.8m - 102.3m
INFILTRATION GALLERY - 2 (CULTEC 100HD)
TOP OF PAVEMENT=106.80
TOP OF STONE=105.50
TOP OF CHAMBER=106.35
CHAMBER INVERT=105.05
BOTTOM OF CHAMBER=105.03
BOTTOM OF STONE=104.80
AREA=687m²
VOID SPACE RATIO=0.40
INFILTRATION=5mm
VOLUME=90.33m³/(BELOW CHAMBER INVERT)
INFILTRATION GALLERY - 3 (CULTEC 100HD)
TOP OF PAVEMENT=106.45
TOP OF STONE=105.63
TOP OF CHAMBER=105.47
CHAMBER INVERT=105.13
BOTTOM OF CHAMBER=105.10
BOTTOM OF STONE=104.90
AREA=302m²
VOID SPACE RATIO=0.40
INFILTRATION=5mm
VOLUME=73m³/(BELOW CHAMBER INVERT)
TP23-06(20230908)
SURF ELEV=105.20
GW ELEV=102.2
REFUSAL (BEDROCK ELEV)=102.2
TP23-05 (20230908)
SURF ELEV=105.20
GW ELEV=104.20
REFUSAL (BEDROCK ELEV)=102.10
TP23-02 (20230908)
SURF ELEV=105.84
GW ELEV=102.34
REFUSAL (BEDROCK ELEV)=100.80
MW23-02
SURF ELEV=105.46
GW ELEV=99.97 (20231219)
GW ELEV=104.17 (20240201)
REFUSAL (BEDROCK ELEV)=100.89
TP23-03 (20230908)
SURF ELEV=105.00
GW ELEV=103.90
REFUSAL (BEDROCK ELEV)=101.60
MW23-03B (D)
SURF ELEV=105.25
GW ELEV=104.82 (20231219)
REFUSAL (BEDROCK ELEV)=102.12
MW23-03A (S)
SURF ELEV=105.17
GW ELEV=104.24 (20231219)
REFUSAL (BEDROCK ELEV)=102.12
TP23-01 (20230908)
SURF ELEV=103.80
GW ELEV=101.80
REFUSAL (BEDROCK ELEV)=100.70
STM CB6 TOP:108.15 NW INV:106.97
STM MH10 (1200ⵁ) TOP:108.26 SW INV:106.03 SE INV:106.01
STM CB5 TOP:108.10 NE INV:106.09
STM MH9 (1200ⵁ) TOP:108.37 SE INV:105.64 NW INV:105.64 NE INV:105.62
STM CBMH11 (1500ⵁ) TOP:107.67 SW INV:105.51 NE INV:105.49
STM CB4 TOP:107.80 NE INV:105.75
STM MH8 (1200ⵁ) TOP:107.71 SW INV:105.88 NW INV:105.86
STM CB3 TOP:107.50 NE INV:105.89
STM MH7 (1200ⵁ) TOP:107.76 SE INV:105.74 SW INV:105.74 NW INV:105.72
STM MH6 (1200ⵁ) TOP:107.76 SE INV:105.76 SW INV:105.58 NW INV:105.56
STM MH5 (1200ⵁ) TOP:107.76 SE INV:105.37 SW INV:105.25 NE INV:105.25
STM MH4 (1200ⵁ) TOP:107.76 SE INV:105.27 SW INV:105.15 NE INV:105.15
STM MH3 (1200ⵁ) TOP:107.76 V-INV:105.29 SE INV:105.27 SW INV:105.25 NE INV:105.25
STM MH2 (1200ⵁ) TOP:107.76 SE INV:105.29 SW INV:105.17 NW INV:105.17
STM MH1 (1200ⵁ) TOP:107.76 SE INV:105.31 SW INV:105.19 NW INV:105.19
STM CB2 TOP:107.76 SE INV:105.33 NW INV:105.33
STM CB1 TOP:107.76 SE INV:105.35 NW INV:105.35
STM MH20 (1500ⵁ) TOP:106.82 SW INV:105.36 SE INV:105.34
STM CBMH4 (1500ⵁ) TOP:105.50 NW INV:104.30 SE INV:104.28
STM CBMH3 (1800ⵁ) TOP:105.62 NW INV:104.25 SE INV:104.23
STM MH19 (1800ⵁ) TOP:105.47 NW INV:104.01 SE INV:103.91 SW INV:103.89
STM CBMH2 (1800ⵁ) TOP:105.35 SE INV:103.99 NW INV:104.01
STM MH18 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH17 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH16 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH15 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH14 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH13 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH12 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH11 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH10 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH9 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH8 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH7 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH6 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH5 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH4 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH3 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH2 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM MH1 (1800ⵁ) TOP:105.35 NW INV:104.15 SE INV:104.12
STM CONTROL MH 1 (1800ⵁ) TOP:104.83 W INV:103.59 SE INV:103.13
170mm ORIFICE: 103.13
1.5m WIDE TOP WEIR WALL:104.60
WATER METER CHAMBER AS PER OPSD 1107.020
STM DITCH INLET (1800ⵁ) TOP:104.55 NW INV:103.05 E INV:103.05

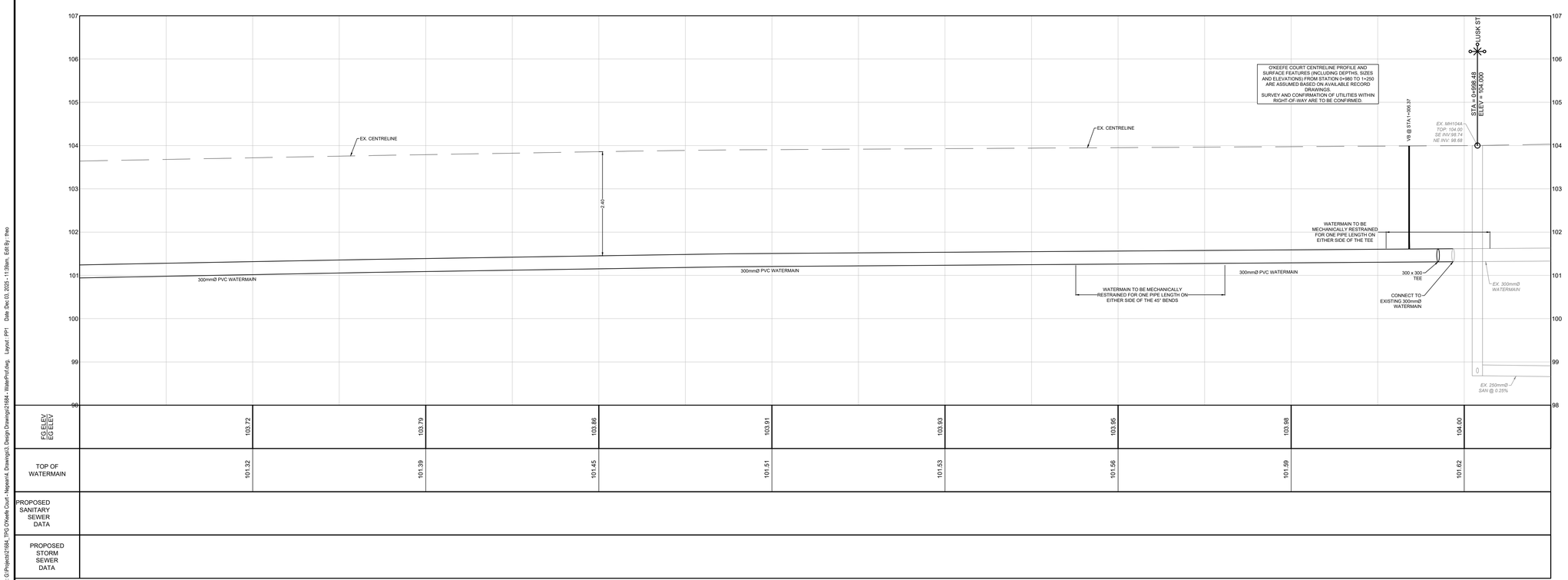
GENERAL NOTES:

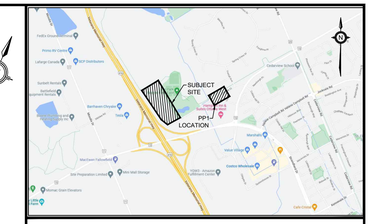
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6. WATER SERVICES ARE TO BE TYPE K SOFT COPPER AS PER CITY OF OTTAWA STD. W26 UNLESS OTHERWISE SPECIFIED. ALL WATER SERVICES CROSSING SEWERS ARE TO BE INSTALLED AS PER CITY OF OTTAWA STD. W38.
7. WATER SERVICES SHALL BE MARKED WITH A "50MM X IOOMM", EXTENDING FROM THE INVERT TO 1.0M ABOVE GRADE PAINTED BLUE. STAND POSTS/SHUT-OFFS SHALL BE INSTALLED AT THE PROPERTY LINE.
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KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- SA — EXISTING SANITARY SEWER
- W — EXISTING WATERMAIN
- GAS — GAS — EXISTING GAS MAIN
- EXISTING VALVE BOX
- PROPOSED WATERMAIN
- PROPOSED VALVE BOX
- PROPOSED HYDRANT
- PROPOSED STORM SEWER

BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23

NO.	ISSUE	DATE	BY
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
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KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

WATERMAIN EXTENSION

SCALE:	HORIZONTAL 1:250 VERTICAL 1:50	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	PP1
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

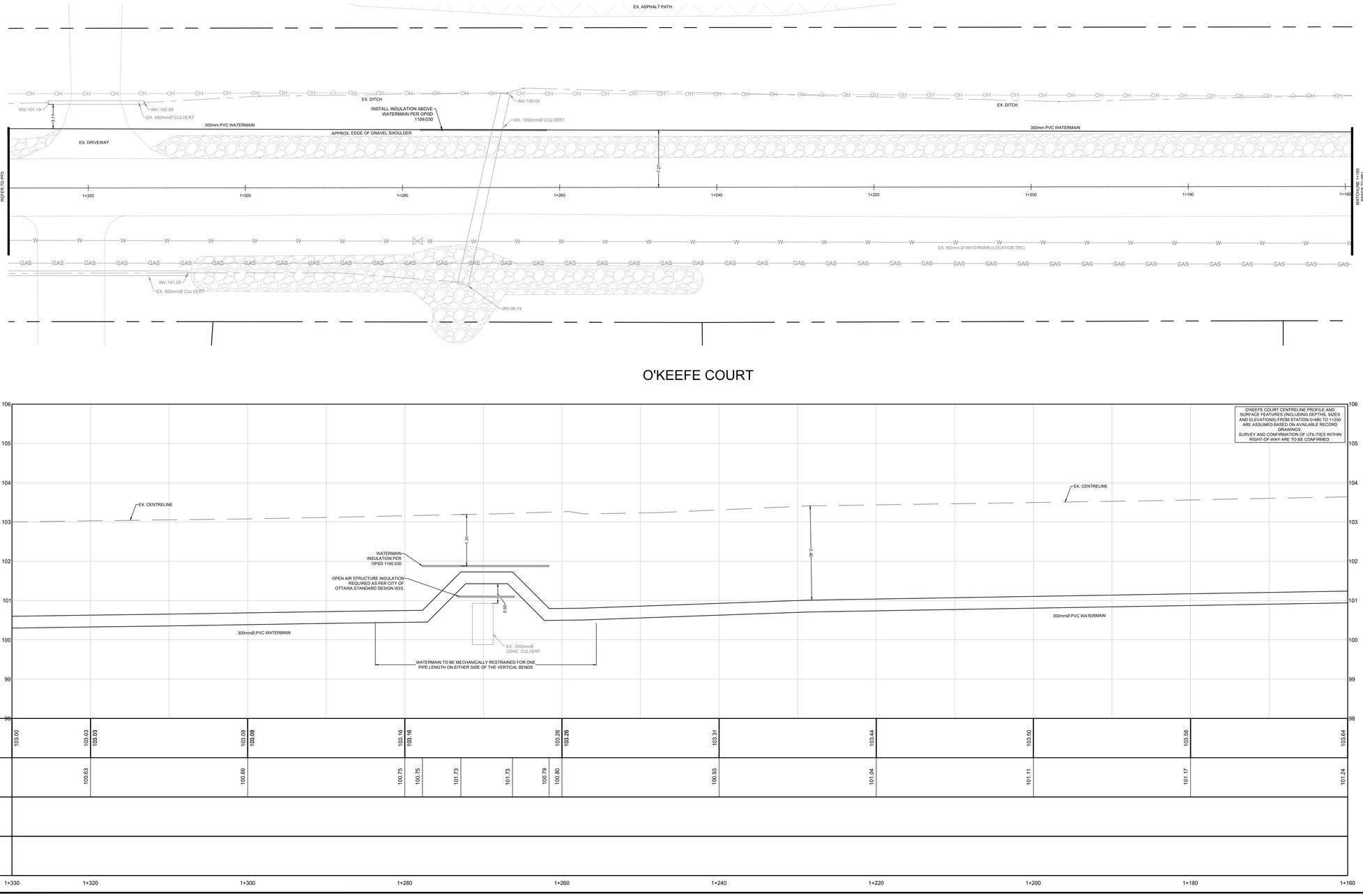
File: G:\Projects\21684 - TPG O'Keefe Court - Nepean\4. Drawings\3. Design Drawings\21684 - WaterProf.dwg Layout: PP1 Date: Dec 03, 2023 - 11:38am, Edit By: tneo

GENERAL NOTES:

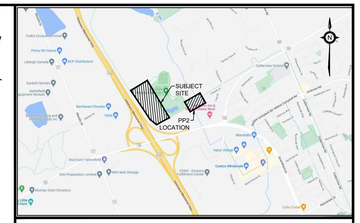
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O'KEEFE COURT



KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING GAS MAIN
- EXISTING VALVE BOX
- PROPOSED WATERMAIN
- PROPOSED VALVE BOX
- PROPOSED HYDRANT
- PROPOSED STORM SEWER

BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23

NO.	ISSUE	DATE	BY
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
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2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

WATERMAIN EXTENSION

SCALE:	HORIZONTAL 1:250 VERTICAL 1:50	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	PP2
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

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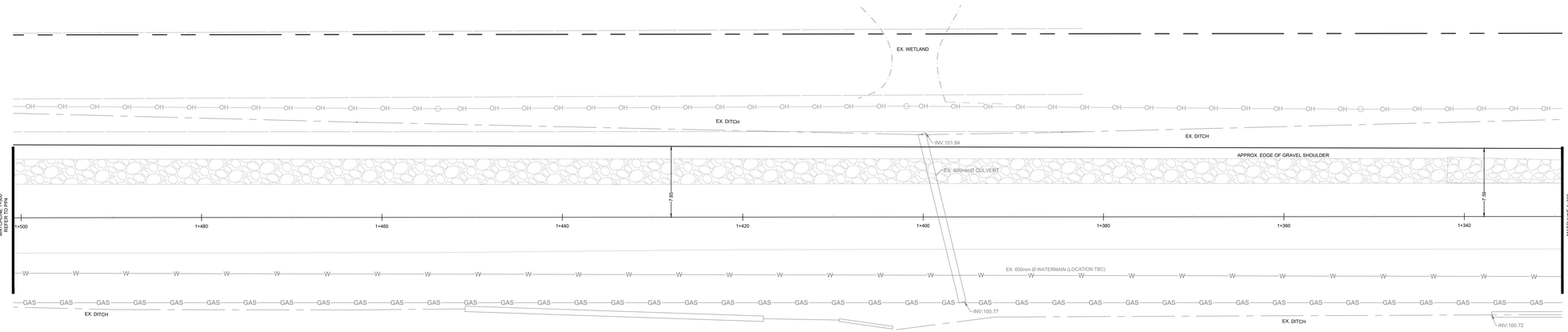
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PLAN#19335

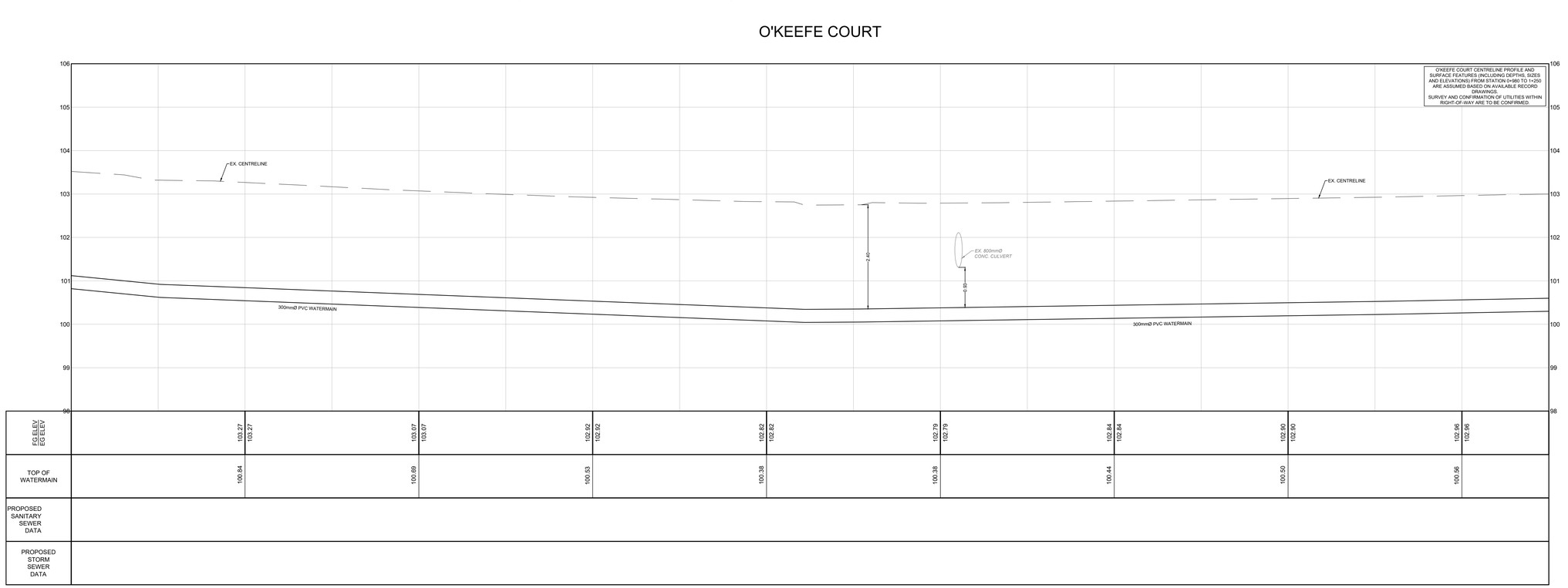
GENERAL NOTES:

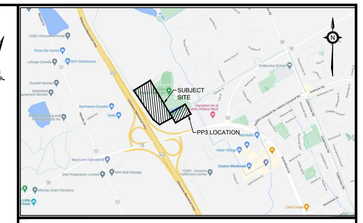
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KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING GAS MAIN
- EXISTING VALVE BOX
- PROPOSED WATERMAIN
- PROPOSED VALVE BOX
- PROPOSED HYDRANT
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BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23

NO.	ISSUE	DATE	BY
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
2	SITE PLAN APPROVAL - SUBMISSION 2	25/10/06	T.F.
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KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

WATERMAIN EXTENSION

SCALE:	HORIZONTAL 1:250 VERTICAL 1:50	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	PP3
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

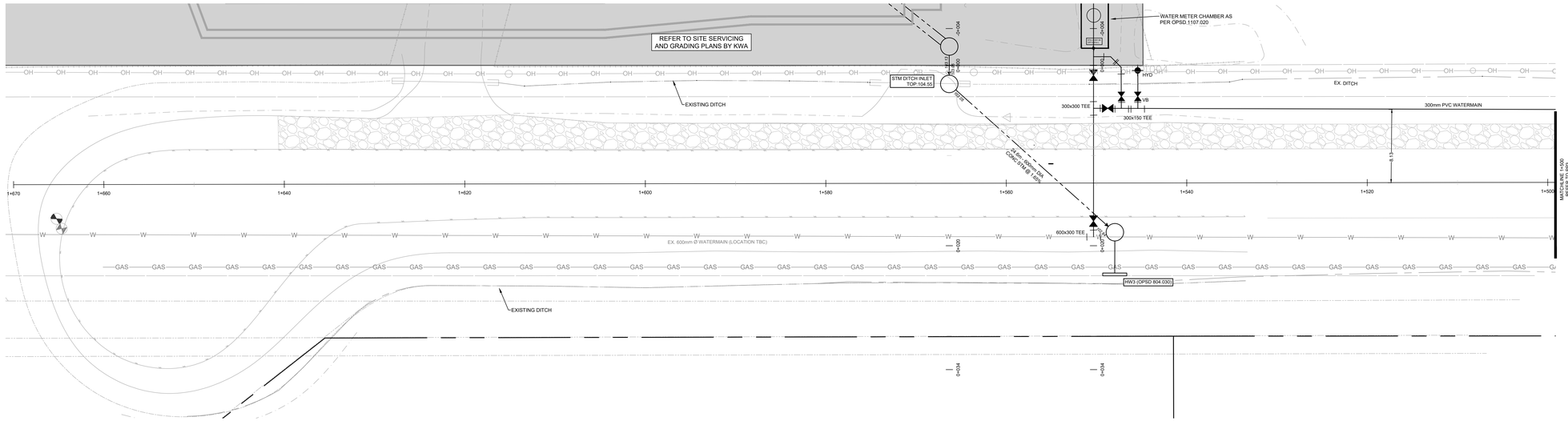
File: G:\Projects\21684_TPG O'Keefe Court - Nepean\4. Drawings\3. Design Drawings\21684 - WaterProf.dwg Layout: PP3 Date: Dec 03, 2025 - 11:41am, Edit By: theo

GENERAL NOTES:

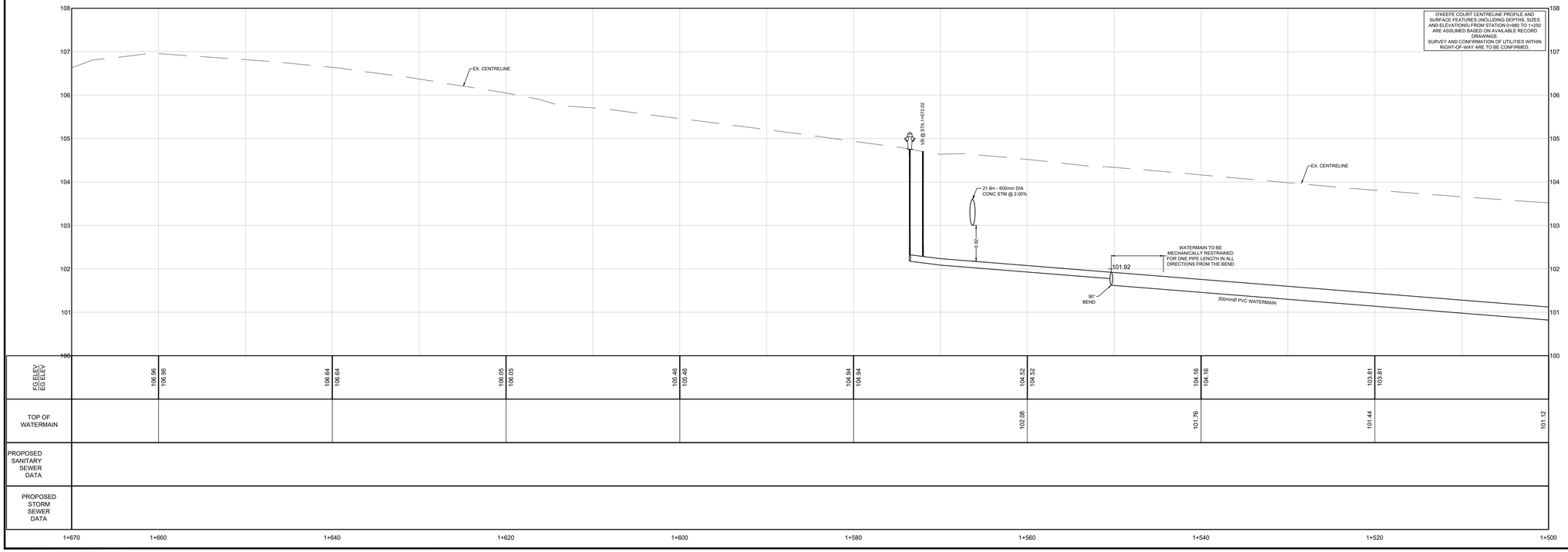
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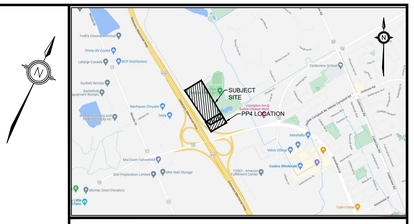
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O'KEEFE COURT



	1+670	1+660	1+640	1+620	1+600	1+580	1+560	1+540	1+520	1+500
FG ELEV / EG ELEV	109.96 / 109.96		106.64 / 106.64	106.05 / 106.05	105.46 / 105.46	104.94 / 104.94	104.52 / 104.52	104.16 / 104.16	103.81 / 103.81	
TOP OF WATERMAIN							102.08	101.76	101.44	101.12
PROPOSED SANITARY SEWER DATA										
PROPOSED STORM SEWER DATA										



KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- SA — EXISTING SANITARY SEWER
- W — EXISTING WATERMAIN
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- PROPOSED VALVE BOX
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BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM		
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05		
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23		
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
2	SITE PLAN APPROVAL - SUBMISSION 2	25/10/06	T.F.
1	SITE PLAN APPROVAL - SUBMISSION 1	25/06/09	T.F.
NO.	ISSUE	DATE	BY

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2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

WATERMAIN EXTENSION

SCALE:	HORIZONTAL 1:250 VERTICAL 1:50	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	PP4
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

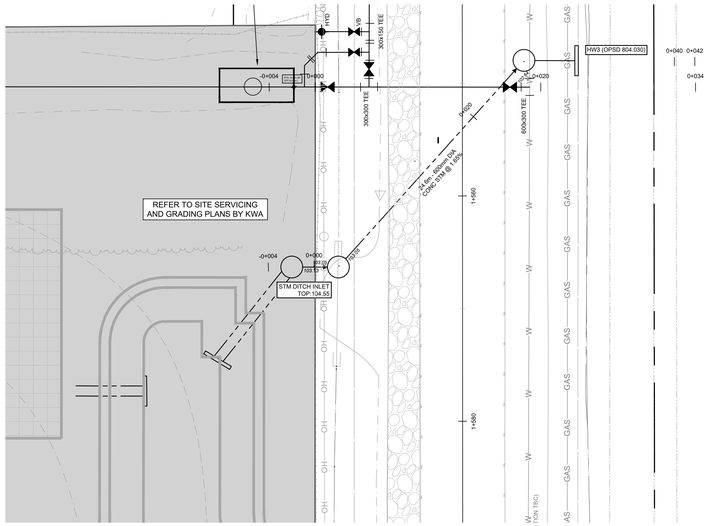
File: G:\Projects\21684_TPG O'Keefe Court - Nepean\4_Drawings\3_Design Drawings\21684 - WaterProf.dwg Layout: PP4 Date: Dec 03, 2023 - 11:42am Edit By: tneo

GENERAL NOTES:

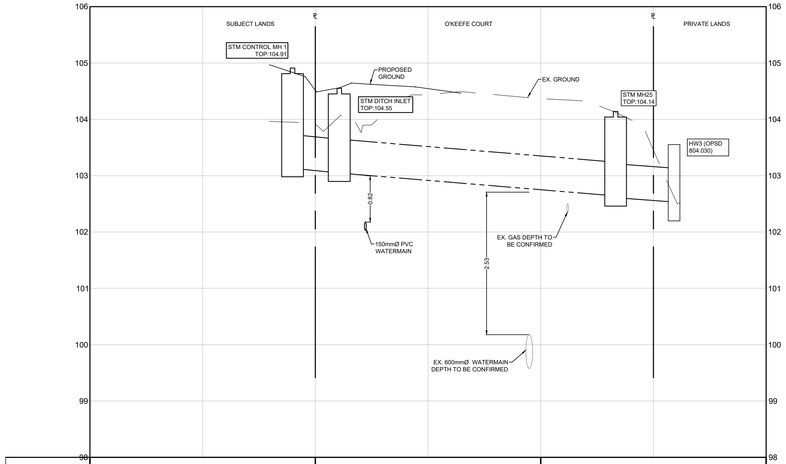
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26. BOTH THE FIRE AND DOMESTIC WATER SERVICES MUST COMPLY WITH THE CURRENT BUILDING CODE ACT, THE CURRENT WATER SUPPLY BY-LAW, CHAPTER 851 AND CSA B-64 SERIES STANDARDS.

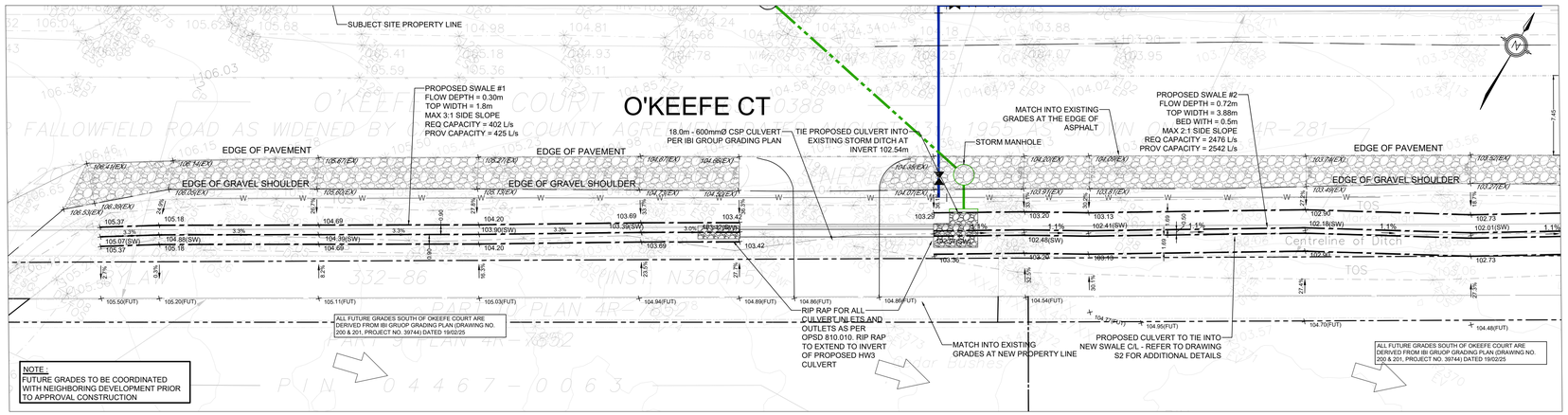


O'KEEFE COURT STORM SEWER OUTLET



| | | |

GS - 1



REFER TO GS-2 FOR CONTINUATION OF PLAN

GS - 2

REFER TO GS-1 FOR CONTINUATION OF PLAN

REFER TO GS-3 FOR CONTINUATION OF PLAN

GS - 3

REFER TO GS-2 FOR CONTINUATION OF PLAN

SWALE #1 - TYPICAL CROSS SECTION

SWALE #2 - TYPICAL CROSS SECTION

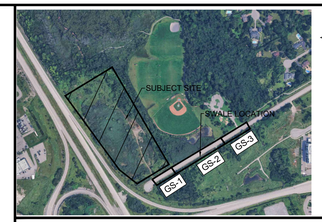
SWALE #3 - TYPICAL CROSS SECTION

GENERAL NOTES:

1. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH THE CURRENT *"OCCUPATIONAL HEALTH AND SAFETY ACT* AND *REGULATIONS FOR CONSTRUCTION PROJECTS"*. THE GENERAL CONTRACTOR SHALL BE DEEMED TO BE THE CONSTRUCTOR AS DEFINED IN THE ACT.
2. ALL TEMPORARY TRAFFIC CONTROL AND SIGNAGE DURING CONSTRUCTION SHALL BE IN ACCORDANCE WITH CURRENT ONTARIO TRAFFIC MANUAL BOOK 7: TEMPORARY CONDITIONS FIELD EDITION.
3. ALL THE CONSTRUCTION WORK FOR THIS PROJECT SHALL COMPLY WITH THE STANDARD DRAWINGS AND SPECIFICATIONS OF THE CITY , THE REGION AND THE ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS.
4. THE CONTRACTOR IS ADVISED THAT WORKS BY OTHERS MAY BE ONGOING DURING THE PERIOD OF THIS CONTRACT. THE CONTRACTOR SHALL COORDINATE CONSTRUCTION ACTIVITIES WITH ALL OTHER CONTRACTORS AND PREVENT CONSTRUCTION CONFLICTS.
5. THE INFORMATION SHOWN FOR EXISTING UTILITIES WAS PROVIDED BY OTHERS. THE CONTRACTOR IS RESPONSIBLE FOR LOCATING AND PROTECTING ALL UTILITIES DURING CONSTRUCTION. ALL EXISTING UTILITIES MUST BE LOCATED AND VERIFIED BY EACH UTILITY PRIOR TO COMMENCEMENT OF WORK. ANY VARIANCE IS TO BE IMMEDIATELY REPORTED TO THE ENGINEER. LOST TIME DUE TO FAILURE OF THE CONTRACTOR TO CONFIRM UTILITY LOCATIONS AND NOTIFY THE ENGINEER OF CONFLICTS PRIOR TO CONSTRUCTION WILL BE AT THE CONTRACTORS EXPENSE.
5. PRIOR TO COMMENCING ANY WORK WITHIN THE MUNICIPAL RIGHT OF WAY, THE CONTRACTOR OR DEVELOPER OR CONSULTANT WILL OBTAIN ALL NECESSARY ROAD OCCUPANCY PERMITS FROM THE CITY'S RIGHT-OF-WAY MANAGEMENT UNIT. ROAD OCCUPANCY/ACCESS PERMIT MUST BE OBTAINED 48 HOURS PRIOR TO COMMENCING ANY WORKS WITHIN THE MUNICIPAL ROAD ALLOW.
6. ALL WORK TO BE DESIGNED AND COMPLETED AS PER OPSS, OPSD, AND MTOD.
7. NO ALTERATIONS TO EXISTING BOUNDARY ELEVATIONS OR ADJACENT LANDS SHALL BE UNDERTAKEN UNLESS WRITTEN AGREEMENT WITH THE ADJACENT PROPERTY OWNER IS OBTAINED AND SUBMITTED IN A FORMAT ACCEPTABLE TO THE CITY.

SITE GRADING:

1. ALL DISTURBED GRASSED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER WITH SOD ON MIN 100mm TOPSOIL. THE RELOCATION OF TREES AND SHRUBS SHALL BE SUBJECT TO APPROVAL BY THE PROJECT LANDSCAPE ARCHITECT OR ENGINEER.
2. ALL GRANULAR BASE AND SUB-BASE MATERIALS SHALL BE GRADED AND COMPACTED TO 98% STANDARD PROCTOR DENSITY, FREE OF DEPRESSIONS AS PER THE GEOTECHNICAL REPORT.
3. THE PAVEMENT STRUCTURE SHALL BE CONSTRUCTED BASED ON SPECIFICATIONS AS PER THE GEOTECHNICAL REPORT.
4. PROVIDE SUBDRAINS, MINIMUM LENGTH OF 3.0m, EXTENDING FROM ALL CATCHBASINS AND CATCHBASIN MANHOLES TO DRAIN THE GRANULAR SUB-BASE LAYER AS PER DETAIL ON DRAWING D1.
5. ALL BARRIER CURB WITHIN THE SITE TO BE CONSTRUCTED AS PER DETAIL ON DRAWING D1, UNLESS OTHERWISE SPECIFIED.
6. TRENCH BACKFILL WITHIN THE RIGHT OF WAY SHALL BE UNSHRINKABLE FILL AND SHALL EXTEND TO THE BASE OF ASPHALT. LANDSCAPED AREA MAY BE EXEMPTED.
7. ALL WORK SHALL BE SUBJECT TO THE CONDITIONS AND REQUIREMENTS OF CITY ROAD OCCUPANCY PERMIT.
8. INSPECTIONS: ALL WORK ON THE MUNICIPAL RIGHT OF WAY AND EASEMENTS TO BE INSPECTED BY THE MUNICIPALITY PRIOR TO BACKFILLING. ALL WORK RELATING TO WATERMAINS AND SEWERS TO BE INSPECTED BY THE MUNICIPALITY WHEN REQUIRED BY THE MUNICIPALITY.
9. STEP JOINTS ARE TO BE USED WHERE PROPOSED ASPHALT MEETS EXISTING ASPHALT AS PER DETAIL ON DRAWING D1. ALL JOINTS MUST BE SEALED AS PER DETAIL.
10. TRANSITIONS WITHIN THE SUBGRADE WITHIN 1.2m FROM THE TOP OF PAVEMENT SHOULD INCLUDE 3H:1V TRANSITIONS AS PER DETAIL ON DRAWING D1.
11. EMBANKMENTS TO BE SLOPED AT MAX. 3:1, UNLESS OTHERWISE SPECIFIED.
12. ALL PAVEMENT MARKING, LINE PAINTING, DIRECTIONAL LINES/ARROWS ETC. SHALL BE PLACED IN ACCORDANCE WITH THE ARCHITECTURAL SITE PLAN OR THE OWNER'S TRAFFIC ENGINEERING CONSULTANT'S DRAWINGS. LINE PAINTING AND DIRECTIONAL SYMBOLS SHALL BE APPLIED WITH A MINIMUM OF TWO COATS OF ORGANIC SOLVENT BASED PAINT IN ACCORDANCE WITH OPSS 1712.
13. WHERE APPLICABLE THE CONTRACTOR IS TO SUBMIT SHOP DRAWINGS FOR THE RETAINING WALL (INCLUDE RAILINGS IF APPLICABLE) TO THE ENGINEER FOR APPROVAL PRIOR TO CONSTRUCTION. SHOP DRAWINGS MUST BE SITE SPECIFIC, SIGNED AND SEALED BY A LICENSED STRUCTURAL ENGINEER. THE CONTRACTOR WILL ALSO BE REQUIRED TO SUPPLY STRUCTURAL AND GEOTECHNICAL CERTIFICATION OF THE AS-CONSTRUCTED RETAINING WALL TO THE ENGINEER PRIOR TO FINAL ACCEPTANCE.
14. THE CONTRACTOR SHALL PROVIDE TO THE ENGINEER 1 (ONE) SET OF AS CONSTRUCTED SITE SERVICING, GRADING, AND SITE ELECTRICAL DRAWINGS.



KEY PLAN
N.T.S.

ADDRESS:
PART OF LOT 21, CONCESSION 4 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
CITY OF OTTAWA

LEGEND

- 200.00 0.5% MH 1A — PROPOSED ITEMS
- 200.00 0.5% EX MH 1A — EXISTING ITEMS
- LIMIT OF PROPERTY LINE
- PROP SWALE
- DIRECTION OF DRAINAGE

BENCHMARK:	ELEVATIONS ARE GEODETIC AND ARE REFERRED TO THE CGVD28 GEODETIC DATUM		
SITE PLAN:	KWA SITE DEVELOPMENT CONSULTING INC., 2025/06/05		
SURVEY:	ANNIS, O'SULLIVAN, VOLLEBEKK LTD., 2008/01/23		
3	SITE PLAN APPROVAL - SUBMISSION 3	25/12/05	T.F.
2	SITE PLAN APPROVAL - SUBMISSION 2	25/10/06	T.F.
1	SITE PLAN APPROVAL - SUBMISSION 1	25/06/09	T.F.
NO.	ISSUE	DATE	BY

NOT FOR CONSTRUCTION

1. THIS DRAWING IS THE EXCLUSIVE PROPERTY OF KWA. THE REPRODUCTION OF ANY PART WITHOUT PRIOR WRITTEN CONSENT FROM KWA IS STRICTLY PROHIBITED.
2. THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER DRAWINGS AND DOCUMENTS APPLICABLE TO THIS PROJECT.
3. THIS DRAWING IS NOT TO BE ISSUED FOR CONSTRUCTION UNTIL ALL REQUIRED PERMITS HAVE BEEN ISSUED.
4. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, ELEVATIONS, INVERTS AND DATA ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO KWA 48 HOURS PRIOR TO ANY CONSTRUCTION.

KWA SITE DEVELOPMENT CONSULTING INC.
2453 AUCKLAND DRIVE BURLINGTON, ON L7L 7A9

THE PROPERTIES GROUP

THE PROPERTIES GROUP
O'KEEFE COURT (NEPEAN)

O'KEEFE SWALE

SCALE:	1:250 (5m)	PROJECT #	21684
DATE:	JANUARY 2025		
DRAWN BY:	T.G.	DRAWING #	GSW-1
DESIGNED BY:	T.G.		
CHECKED BY:	T.F.		

APPLICATION#D07-12-25-0085
PLAN#19335

File : G:\Projects\21684_TPG O'Keefe Court - Nepean\4_Drawings\3_Design Drawings\21684_CSD_Ditch Volume - VP.dwg Layout : GSW-1 Date : Dec 12, 2025 - 5:00pm Edit By : theo