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FUNCTIONAL SERVICING REPORT

AT

0th FORKS Road,
CITY OF PORT COLBORNE, ONTARIO

PREPARED FOR:

Xue Ju Zheng

March 30th , 2026

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SUMMARY

King EPCM (the Engineer) was retained by Xue Ju Zheng (the Client) to conduct civil engineering designs for a proposed development, including the creation of a Functional Servicing Report (FSR). The property was located at 0th Forks Road, Part of Lots 23 to 25, Con 4, East of the Welland Canal, City of Port Colborne, Ontario (the Site).

The purpose of the development is to construct an industrial development (recycling construction waste, indoor/outdoor processing, outdoor storage, offices) with a trailer park on site.

The equivalent population for industrial purposes is 0.0272 persons/GFA (m^2). Therefore, for an area of 186 m^2, the total population is 5 persons.

No City's water main or sanitary services are available in the vicinity of the Site. A well with a Tag no. of 6604938 (A004380) is located on the subject property and is currently in active use. According to a pumping test conducted on October 01, 2025, for a duration of 160 minutes, the average discharge of the well was approximately 110 L/min.

The average daily demand, maximum daily, and maximum hourly demands are 1.11, 1.98, and 2.99 L/min, respectively.

The required firefighting flow is calculated as 4,000 L/min (1057 GPM), and the required capacity of the storage holding tanks is found as $360m^3$, provided by six (6) model H60S precast concrete water holding tanks from Wilkinson Heavy Precast Limited, each with a capacity of 36 m^3.

As a septic system will be used to provide sanitary service for the site, the design flow is determined solely based on the average daily sanitary flow generated by the population within the site. Therefore, for a population of 5, the design flow for designing the septic is 1,500 L/d.

The peak runoff in pre-development conditions is 179.2 and 415.1 l/s for 2 and a 100-year return period event, respectively. At the post-development conditions, the amounts will be 193 and 446 l/s, respectively.

A Grass Swale started from the middle driveway to the north and then continued along the northern limit of the developed area and directed to the south towards the existing culvert, which directed flows to the existing municipal drain.

1. INTRODUCTION

King EPCM (the Engineer) was retained by Xue Ju Zheng (the Client) to conduct civil engineering designs for a proposed development, including the creation of a Functional Servicing Report (FSR). The property was located at 0th Forks Road, Part of Lots 23 to 25, Con 4, East of the Welland Canal, City of Port Colborne, Ontario (the Site). The FSR is presented here to assess the existing municipal infrastructures in the vicinity of the project, identify any external drainage conditions, illustrate designing the stormwater conveyance system, provide the best management plan to control on-site erosion and sedimentation during construction, and finally, to indicate the synchrony of the proposed development's FS and SWM with the existing water, sanitary, and stormwater infrastructures.

1.1. PROPERTY INFORMATION

While the total area of the Site is approximately 33.1 ha, the developed part is 21,656.3 m^2. The Site, under its present conditions, is vacant. More data about the Site is provided below:

Site Address:	0^{th} Forks Road, Port Colborne, Ontario
PIN:	64456-0099 (LT)
Legal Description:	PART OF LOTS 23, 24, and 25, Plan 59R - 12468.

1.2. PROPOSED DEVELOPMENTS

The purpose of the development is to construct an industrial development (recycling construction waste, indoor/outdoor processing, outdoor storage, offices) with a trailer park on site. The details of the development are as follows:

- Total Site area = 330,929.4 m^2
- Developed area = 21,656.3 m^2 (TIMP = 10.93%@2,367.3 m^2)
  - Building = 93.0 m^2
  - Parking = 74.3 m^2
  - Concrete pad = 459.7 m^2
  - Storage area = 746.0 m^2
  - Gravel driveway/walkway = 994.3 m^2
  - Parkland (grass and trees) = 19,289.0 m^2

An aerial photo of the Site is presented in Figure 1. The site plan and the topographic information under pre-development conditions are provided in Appendix I. The site plan and site servicing plan under post-development conditions is presented in Appendix II.

Figure 1–An aerial view of 0th Forks Rd E., Port Colborne, Ontario

2. EQUIVALENT POPULATION

Following the City of Toronto (2021), the equivalent population for industrial purposes is 0.0272 persons/GFA (m^2). Therefore, for an area of 186 m^2, the total population is 5 persons.

3. WATER SERVICING

3.1. AVAILABLE WATER SERVICES

No City's water main or sanitary services are available in the vicinity of the Site. A well with a Tag no. of 6604938 (A004380) is located on the subject property and is currently in active use. According to a pumping test conducted on October 01, 2025, for a duration of 160 minutes, the average discharge of the well was approximately 110 L/min.

3.2. DOMESTIC DEMAND

The water demand for the Site is calculated based on the City of Welland (2013) as follows:

-Average daily domestic demand: 320 L/c/d

-Maximum daily domestic demand: 570 L/c/d
-Peak domestic rate: 860 L/c/d
-Fire demand should be considered in accordance with the Insurer's Advisory Organization's (formerly Canadian Underwriters Association) requirements.

In Table 1, the domestic water demand requirements for the Average Daily, Maximum Daily, and Peak Hourly demand scenarios are indicated.

Table 1. Post -Development Domestic Water Demands

Population A	Average Daily Demand B (l/min)	Max. Daily Peaking Factor C	Max. Hourly Peaking Factor D	Max. Daily Demand E (l/min)	Max. Hourly Demand F (l/min)
5	1.11	1.78	2.69	1.98	2.99

A Population = 186 m^2 ×0.0272 persons/m^2 = 5 persons
B Average Daily Demand = 320 l/cap/day × 5 persons = 1,200 l/d
C Max. Daily Peaking Factor = 1.78 (refer to City of Welland, 2013)
D Max. Hourly Peaking Factor = 2.69 (refer to City of Welland, 2013)
E Max. Daily Demand = Average Daily Demand × Max. Daily Peaking Factor
F Max. Hourly Demand = Average Daily Demand × Max. Hourly peaking Factor

3.3. FIREFIGHTING FLOW DEMAND

According to the information provided by the architect (see Appendix III), the building is classified as Group F, Division 3 (Table 9.10.2.1) under Part 9 of the Ontario Building Code and is not equipped with a sprinkler system. Based on this classification, and in accordance with the Fire Underwriters Survey (FUS, 2020), the building is identified as Type V (Wooden Frame Construction), and the required firefighting flow has been estimated using FUS guidelines.

In accordance with the Fire Underwriters Survey (FUS) guidelines, the required firefighting flow is estimated to be approximately 4,000 L/min. This flow must be sustained for a minimum duration of 1.50 hours as specified by the guidelines. Based on these requirements, the total storage capacity needed is calculated to be 360 m³ to ensure an adequate water supply for firefighting purposes. To meet this demand, six precast concrete water holding tanks model H60S from Wilkinson Heavy Precast Limited, each with a capacity of 60 m³, have been selected to provide the necessary storage volume.

In Table 2, a summary of the total water demand, including domestic and firefighting flow, is presented.

The detailed calculations for the firefighting flow requirement are presented in Appendix IV. Details for the storage holding tanks are presented in Appendix II.

Table 2. Estimated required maximum day and maximum hours demands, plus the firefighting requirement flow

Water Use Type	Population	Ave. Day Demand (L/min)	Max. Daily Demand (L/min)	Peak Hour Demand (L/min)	Fire Flow (L/min)	Max. Daily Plus Fire Flow (L/min)
Industrial	5	1.11	1.98	2.99	4,000	4,002

4. SANITARY SEWAGE SERVICING

4.1. EXISTING CONDITIONS

As stated above, there are no City's infrastructures near the Site. Therefore, a septic system should be constructed to provide the service to the Site.

4.2. SANITARY DEMAND

As per the Niagara Region 2021 Master Servicing Plan, the following design criteria for projecting wastewater flow are used to predict the sanitary flow:

- Residential flow Generation: 255 Lpcd
- Employment Flow Generation: 310 Lpcd
- Peaking Factor based on the Harmon formula with values between 2 and 4.
- Extraneous Flow Design allowance:
  - 0.4 L/s/ha for existing areas
  - 0.286 L/s/ha for new development

As a septic system will be used to provide sanitary service for the site, the design flow is determined solely based on the average daily sanitary flow generated by the population within the site. Therefore, for a population of 5, the design flow for designing the septic is 1500 L/d. The details of the designed septic system are as follows:

- Daily discharge: 1,500 L
- Filter bed size: 20 m^2
- Filter bed width: 4 m
- Filter bed length: 5 m
- Distribution pipe runs: 3
- Total bed area: 260 m^2
- Septic tank size: 4,500 L
- Pump tank size: 1,500 L

For more details of the septic system, see Appendix V.

5. STORMWATER MANAGEMENT

It should be noted that a separate Stormwater Management Report is available, and the information below is only a summary.

5.1. PRE-DEVELOPMENT CONDITIONS

The site conditions prior to development can be broken down into several groups of information:

5.1.1. Topographic Elevation & Base Precipitation

- The Site is situated in the physiographical region known as Haldimand clay plain along the shoreline of Lake Erie, where an intermixture of lacustrine clay and glacial clay till occurs above a shallow limestone bedrock of the Bois Blanc formation.
- Site survey & topographic information are in Appendix I.
- The south portion of the site is in the watershed of the Indian Creek Municipal Drain, and the north portion is in the watershed of the Lyons Creek Municipal Drain, with Clay Hydrologic Soil Group D. The north portion of the property is not abutting the Forkes Road allowance and has no access to it, while the south limit of the parcel abuts the municipal drain.
- Base yearly precipitation is 1000.9 mm/year (EC Welland-Pelham monitoring station-1977 to 2006, Climate ID: 6139445, Appendix VI)

5.1.2. Vegetation & Evapotranspiration

- The site property is considered irregular in shape, measures approximately 31 ha, and is located on the east side of Welland Canal/Canal Road, northwest of the intersection of Third Concession and Ramey Road, City of Port Colborne.
- 1.9 ha / 89.0% of the Site (developed area) is a grassy lawn, along with dense tree covers.
- The estimated site's actual evapotranspiration is 583.3mm/year (Appendix VI)

5.1.3. Stormwater Run-Off

- There are no city-maintained stormwater sewers, with stormwater generally infiltrated by clay soils or collected by the interior ditches and discharged to the Municipal Indian Creek Drain, along the southern boundary.

- The historical well records and a new monitoring borehole drilled by the engineer within the Site, near the proposed development, confirm that the seasonal groundwater level in this property is low.

- All minor & major storm site drainage is to be collected on-site and outlet towards the municipal drain (Indian Creek).

- Based on an in-situ infiltration test using the ETC Pask Permeameter Apparatus, the infiltration rate of the upper clay layer mixed with gravel was 39.2 min/cm = 0.26 mm/min = 15.3 mm/hour.

- Native permeable infiltration rate should use a non-factored infiltration rate of 15.3 mm/hour because the predominant soil material of this site is composed of clay mixed with gravel to a depth of more than 1 meter, and a factored engineering design infiltration rate of 6.1 mm/hour with a safety factor of 2.5 for infiltration purposes.

- According to the NPCA Stormwater Management Policies and Guidelines (Section 7.2), when estimating flows for designing SWM structures, the modelling approach can be as simple as estimating peak flows with the Rational Method. The Rational Method is one of the earlier developed methods of calculating peak flows from the IDF curve.

- Pre-development 2-year, 5-year, 10-year, 25-year, 50-year, and 100- year return period design storm events, peak flow conditions are calculated as follows:

- Peak flow rate Modified Rational Formula: $Qp = 2.78 \times A \times C \times Ca \times i$

    - A = area in ha = 2.17
    - C = runoff coefficient = 0.39 (Clay, parkland & grass, 6.0% TIMP, flat, MTO 1997 design chart 1.07 for rural & urban and Table 4.1, Niagara Region SWM Guidelines. See Appendix IX for more details).
    - Ca = Antecedent Precipitation Factor = 1.0 for 2, 5, and 10-year, 1.10 for 25-year, 1.20 for 50-year, and 1.25 for 100-year.
    - i = average rainfall intensity in mm/hour using the Rational Method with a,b, and c values of 3-parameter design storm as: Intensity = $a/(t+c)^b$, where t is time of concentration in hours; a, b, and c are constants (Table 1).

- The minimum time of concentration per City standards is 10 minutes, which will be used in the following hydrological calculations for both pre and post-development scenarios.

- See Table 2: Pre-development peak flows for the 2-year through 100-year design storms based on the Rational Method with a,b,c values of 3-parameter design storm as: Intensity = $a/(t+c)^b$ and $Q = 2.8CC_aIA$. The Rational Method calculations are included in Appendix VII for reference.

Table 2 - Existing peak flows and rainfall intensities based on the Rational Method in pre-development conditions

Design Storm	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
a	755	830	860	900	960	1020
b	0.789	0.777	0.763	0.745	0.736	0.731
c	8	7.3	6.5	5.2	5.1	4.7
Intensity (mm/hr)	77.2	90.6	101.3	118.5	130.2	143.0
Total Runoff Q_p (l/s)	179.2	210.4	235.2	302.8	362.8	415.1

5.2. STORMWATER MANAGEMENT PLAN

The SWM plan has been prepared in accordance with the MOE Stormwater Management Planning and Design Manual, City of Port Colborne Standards, and NPCA Stormwater Management Policies and Guidelines, as detailed in Section 12. The SWM plan is subject to review and approval by the City and NPCA and is presented in the following sections.

5.3. DESIGN CRITERIA

The following design criteria are to be satisfied in the proposed SWM plan:

- The stormwater management plan must maintain existing stormwater runoff rates at the site outlet by restricting post development peak flow rates to pre-development levels for the 2-year through 100-year design storms;

- The stormwater management plan must provide quantity control storage for storm events up to and including the 100-year design storm, in addition to the 25 mm storm runoff volume;

- Safe conveyance of the 2-year to 100-year peak flows through the site to the downstream drainage system must be provided for surface runoff generated within the development;

- The storage requirements for the grass swale have been calculated based on Table 3.2 of the *Stormwater Management Planning and Design Manual* (MOE, 2003) to ensure it meets water quality treatment objectives; and

- Protect life and property from flooding and erosion.

5.4. PROPOSED SWM PLAN

The Client has proposed the implementation of industrial development (recycling construction waste, indoor/outdoor processing, outdoor storage, offices) with a trailer park on site, mostly on the existing impervious concrete pad, on the southwest corner of the Site, while the existing site consists of primarily open, undeveloped lands to the north with sparse trees and shrubs and only the south portion of the site, directly adjacent to the intersection of Ramey Rd and Third Concession has been developed, with site property post-development Total Impervious Surface Area (TIMP) = 2367.3 m^2 / 10.9%.

Due to the low groundwater level in the historical boreholes and newly drilled borehole logs, no groundwater observed during borehole drilling in the last month, and low draining soil surrounding the site, the Engineer proposes that rooftop downspouts along with runoff captured by driveway/parking will be directed to the pervious grass area to allow infiltration of stormwater runoff generated by the impervious areas, and then directed towards the existing interior ditches including proposed check-dams through sheet flow, to encourage passive infiltration of stormwater, provide linear storage in the conveyance system to dampen hydrologic response, and provide pre-treatment of stormwater prior to discharge to the municipal drain.

Below is a summary of the proposed site conditions:

- Total developed area = 2.17 ha
- Total pervious surface area (grassy lawn+trees) = 1.93 ha (89.1%)
- Total impervious surface area (TIMP) = 0.237 ha (10.9%)
  - 93.0 m^2 – new building
  - 841.3 m^2 – existing driveways
  - 37.3 m^2 – proposed walkway
  - 115.7 m^2 – proposed driveway
  - 74.3 m^2 – proposed parking lot
  - 459.7 m^2 – existing concrete pad
  - 746.0 m^2 – proposed outdoor storage

- The existing property is not serviced by any storm sewer or stormwater management facilities, except the main branch of the Indian Creek municipal drain along the southern boundary.

- All roof leaders will be discharged into the grassy lawn through splash pads and infiltrate into the ground.
- The runoff captured by the existing driveway/proposed parking/walkway will be directed into the grass area through the grading, and if there is any overflow in less frequent events, the water is directed to the interior ditches through the sheet flow and flows south towards the Indian Creek.

- Post-development peak flow conditions are calculated as follows:

- Peak flow rate Modified Rational Formula: $Qp = 2.78 \times A \times C \times Ca \times i$
  - A = 2.17 ha
  - C = runoff coefficient = 0.42 (Clay, grassy lawn & trees, 10.9% TIMP, flat, MTO 1997 design chart 1.07 for rural & urban and Table 4.1, Niagara Region SWM Guidelines)
  - Ca = Antecedent Precipitation Factor = 1.0 for 2, 5, and 10-year, 1.10 for 25-year, 1.20 for 50-year, and 1.25 for 100-year.
  - i = average rainfall intensity in mm/hour using the Rational Method with a,b, and c values of 3-parameters design storm.
  - The minimum time of concentration per city standards is 10 minutes.

- See Table 3: Post-development peak flows for the 2-year through 100-year design storms based on the Rational Method, along with appropriate pre-development peak flows for the developed catchment area. The Rational Method calculations are included in Appendix VII for reference.

Table 3 – Proposed peak flows based on the Rational Method

Design Storm	**Return Period (years)**					
	2	**5**	**10**	**25**	**50**	**100**
Intensity (mm/hr)	77.2	90.6	101.3	118.5	130.2	143.0
Developed Catchment Runoff Q_p (l/s)	193.0 (179.2)	226.5 (210.4)	253.2 (235.2)	325.9 (302.8)	390.5 (362.8)	446.8 (415.1)
Allowable Runoff Q_p (l/s)	179.2	210.4	235.2	302.8	362.8	415.1

Note: (*179.2*) denotes pre-development peak flow.

5.5. LIDS DIMENSIONS

A Grass Swale started from the middle driveway to the north and then continued along the northern limit of the developed area and directed to the south towards the existing culvert, which directed flows to the existing municipal drain. The swale has a 0.5 m depth, 1.2m bottom width, and 200 m Length, with a static storage capacity of approximately 60 m^3 between check dams to control post-development peak flows to pre-development levels for all storms up to and including the 100-year storm, and for detaining a 25 mm storm for 24 hours (Figure 2).

It can be concluded that the designed capacity of the proposed LID is equal to 60 m^3, and it can be able to manage most of the minor and major storms with 2 to 100-year return periods (See Appendix VIII for more details).

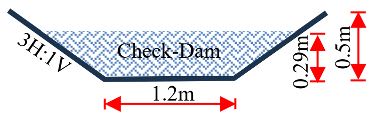

Figure 2- Proposed enhanced swale cross-sections

5.6. GRASS SWALE

Swales are one of several LIDs for the treatment of stormwater runoff from project areas that are anticipated to produce pollutants of concern (e.g., roadways). A grassed swale is a graded and engineered landscape feature appearing as a linear, shallow, open channel with a trapezoidal or parabolic shape. The swale is vegetated with flood-tolerant, erosion-resistant plants.

Grass swales (also referred to as vegetated open channels or water quality swales) are conveyance channels engineered to capture and treat the water quality volume for a drainage area. They differ from a normal drainage channel or conventional swale because they incorporate specific features that enhance stormwater pollutant removal effectiveness. Swales are designed with limited longitudinal slopes to force the stormwater flow to be slow and shallow, thus allowing for particulates to settle and limiting the effects of erosion. Berms and/or check dams installed perpendicular to the flow path promote settling and infiltration.

In swales, stormwater is slowed by the strategic placement of check-dams, which encourage ponding, and these ponds in turn facilitate water quality improvements through infiltration, filtration, and sedimentary deposition. Collected stormwater is expected to drain away through the soil within several hours or days.

- Flatbed swales (Trapezoidal shape) with check dams along the western site boundary (for Retained Lot) and along the western/eastern site boundaries (for Severed Lot), and designed to receive a short duration of 4 hours, 25 mm storm event, per the City's standards. The total number of check dams will be three.

- Swales are designed at 0.5 m depth, 1.2 m bottom width at 3H:1V sloped sides, cross-sectional area of 1.35 m^2.

- Rockfill check dams with a pond height of 0.29 m are usually installed based on ditch grading along the swale (See Table 4 for details)

- The total static storage volume behind check dams is approximately 60 m^3, and the dynamic infiltration volume per hour is 3.7 m^3/hour from the total area of the channel bottom.

- Swales grade north, east, and south at roughly 0.5%, and it is recommended to plant small landscaping shrubs, grasses, and forbs on the bank and the channel bed to retain their long-term shape.

- Swales collect stormwater from all impermeable surfaces (rooftops/pavements).

- Assumes 100% of rooftops and captured volumes from the pavements are infiltrated/recharged into groundwater, and the rest would be directed to the downstream waterway.

- Drawdown time is 47.5 hours for the ponding water with a maximum water depth of 0.29 m, with a conservative engineering infiltration rate of 6.1 mm/hour for the ditch bed.

Drawdown Time (hr) = 290 (mm) / 6.1 (mm/hr) = 47.5 hr

Figure 3 – Sample grass swale with check dams (LID)

Table 4 – Design of check dams for retention

Length (m)	Grading (%)	Distance between check dams (m)	Number of Check Dams (#)	Water Volume Capacity (m^3)**	Infiltration Footprint Area (m^2)*	Infiltration (m^3/hr)
200	0.5	58	3	60	176.0	3.7

* Infiltration footprint area = $(B + 2 \times h \times (1+z^2)^{0.5}) \times$ Distance
** Water Volume Capacity = $(h^2 \times (h \times z + B)) / 2S$

5.7. VOLUME CONTROL

In Table 4, the total runoff volume control target for the post-development scenario (25 mm storm event) and the volume capacity of the proposed LIDs are shown. As can be seen, the total volume of stormwater runoff produced due to a 25 mm rainfall event from the total impervious area of the developed area is 59.3 m^3, which is less than the storage capacity intended for storm runoff at the site, 60 m^3 (only static storage capacity). The table shows that runoff volume reduction is met, and the post-construction runoff volume shall be captured and retained on the site from a 25 mm rainfall event from the total impervious area.

Table 4 – Runoff volume control target (25 mm) and values provided by post-development design (m^3/s)

Parameter	Developed Area					
	Building	**Driveway/ Walkway**	**Parking**	**Storage**	**Concrete Pad**	**Total**
TIMP Area (m^2)	93	994.3	74.3	746	459.7	2367.3
25 mm runoff volume control (m^3)	2.33	24.9	1.9	18.7	11.5	**59.3**
Grass Swale LID volume capacity = 60m^3 (static storage capacity) versus a volume control target of 59.3 m^3.						

6. RELIANCE & SIGNATURE

This report is the intellectual property of King EPCM, and has been prepared for the sole use of Xue Ju Zheng (the Client). King EPCM accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than the Client. The Client may submit this report to the City of Port Colborne, Niagara Peninsula Conservation Authority (NPCA), and Regional Municipality of Niagara (Niagara Region) regarding the Client's industrial development project at 0th Forks Road, Part of Lots 23 to 25, Con. 4, East of the Welland Canal, City of Port Colborne, ON.

LICENSED PROFESSIONAL ENGINEER
E. Amiri-T
E. AMIRI TOKALDANY
100610212
2026/05/15
PROVINCE OF ONTARIO

Respectfully,

E. Amiri-T

Ebrahim Amiri Tokaldany, PhD, P.Eng.
Senior Engineer – Civil and Water Resources
King EPCM

A. Samadi

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Amir Samadi, PhD, P.Eng.
Senior Engineer – Water Resources
King EPCM

7. REFERENCES

City of Toronto (2021). Design Criteria for Sewers and Watermains, Second Edition.

City of Welland (2013). The Corporation of the City of Welland, Municipal Standards, Last Update.

MOE (2003). Stormwater Management Planning and Design Manual.

MTO (1997). Drainage Management Manual, Ministry of Transportation, Ontario

APPENDIX I – SITE PLAN AND SITE TOPOGRAPHY IN PRE-DEVELOPMENT CONDITIONS

Plan of Survey of

PART OF LOTS 23, 24 AND 25
AND PART OF THE ROAD ALLOWANCE BETWEEN LOTS 24 AND 25
CONCESSION 4

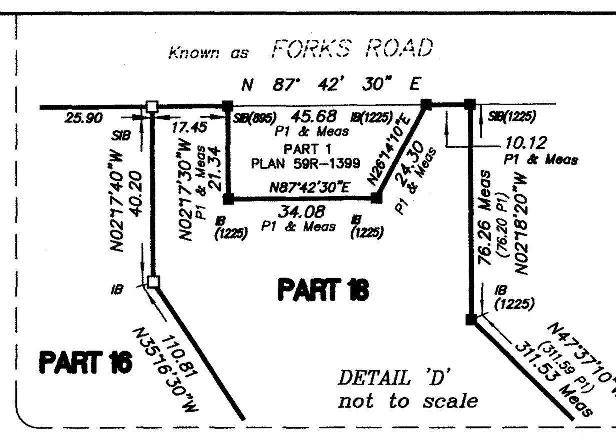
Geographic Township of Humberstone

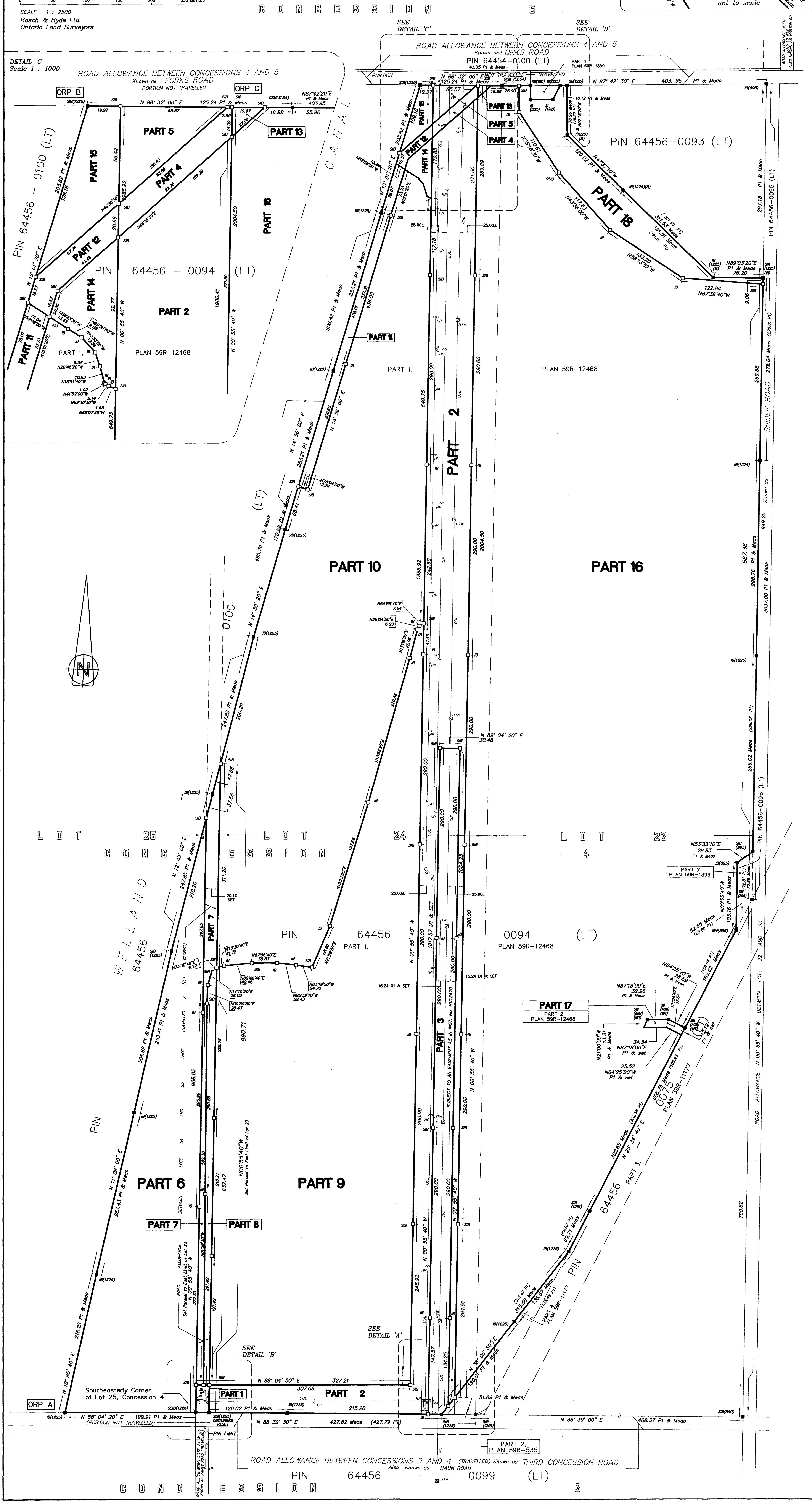
CITY OF PORT COLBORNE

REGIONAL MUNICIPALITY OF NIAGARA

SCALE 1 : 2500

Rasch & Hyde Ltd.
Ontario Land Surveyors





I REQUIRE THIS PLAN TO BE DEPOSITED UNDER THE LAND TITLES ACT.

MARCH 18, 2015
DATE

HAROLD D. HYDE
ONTARIO LAND SURVEYOR

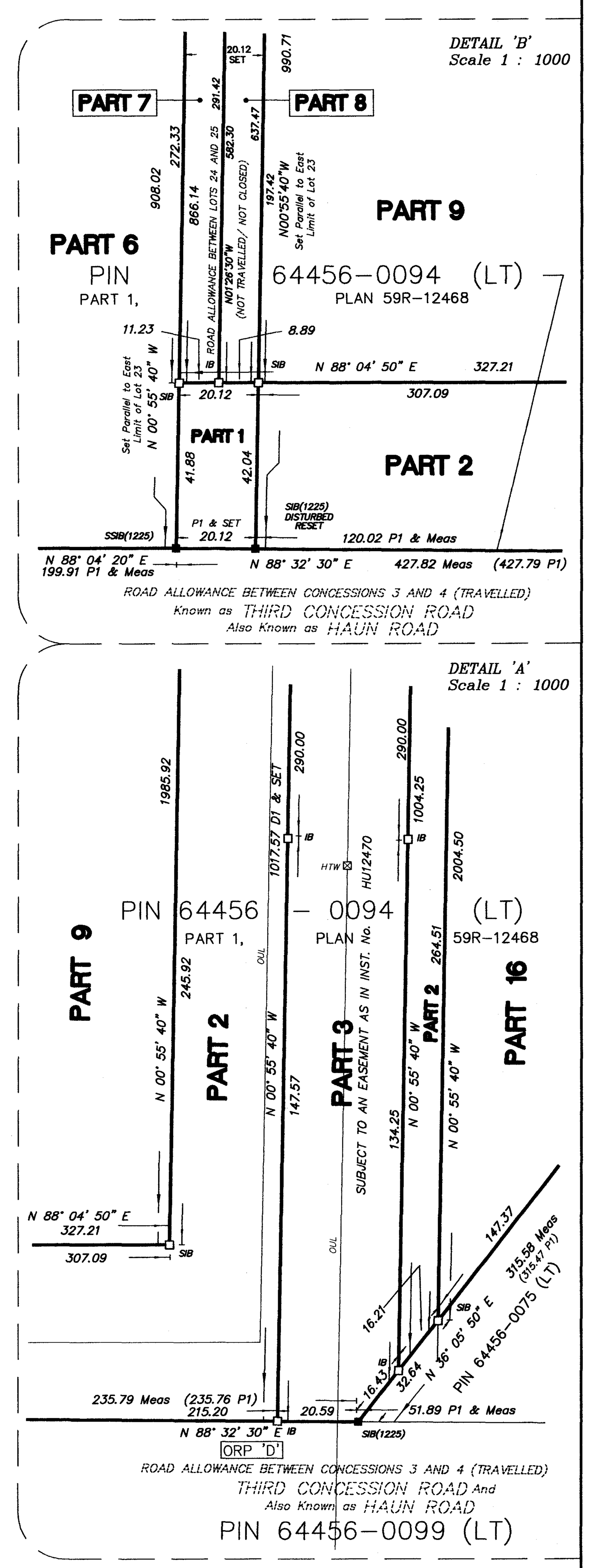
PLAN 59R-15310

RECEIVED AND DEPOSITED
March 18/15
DATE
R Lane
REPRESENTATIVE FOR LAND REGISTRAR FOR THE LAND TITLES DIVISION OF NIAGARA SOUTH (No. 59)

SCHEDULE

PART	LOCATION	CON	AREA (±)	PIN NO
1	ROAD ALLOWANCE BETWEEN LOTS 24 AND 25	4	844.2 SQ.M	ALL OF 64456-0094(LT)
2	PART OF LOT 24		11.7609 Ha.	
3			3.0947 Ha.	
4			1410 SQ.M.	
5			1948 SQ.M	
6	PART OF LOT 25		9.3134 Ha.	
7	ROAD ALLOWANCE BETWEEN LOTS 24 AND 25		1.0912 Ha.	
8			7342 SQ.M	
9	PART OF LOT 24		23.7780 Ha.	
10			21.3523 Ha.	
11			7831 SQ.M	
12			1146 SQ.M	
13			180.5 SQ.M.	
14			1957 SQ.M.	
15			2529 SQ.M	
16	PART OF LOTS 23 AND 24		64.3294 Ha.	
17	PART OF LOT 23		737.0 SQ.M	
18			1.9922 Ha.	

PART 3 – IS SUBJECT TO HYDRO EASEMENT AS IN INST No. HU12470



METRIC NOTE

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

LEGEND

─□─	DENOTES	SURVEY MONUMENT PLANTED
─■─	DENOTES	SURVEY MONUMENT FOUND
SIB	DENOTES	STANDARD IRON BAR (25mmX25mmX120cm)
SSIB	DENOTES	SHORT STANDARD IRON BAR (25mmX25mmX60cm)
IB	DENOTES	IRON BAR (15mmX15mmX60cm)
IB Ø	DENOTES	ROUND IRON BAR (20mm DIA X 60cm)
IT	DENOTES	IRON TUBE
(CSM)	DENOTES	CUT STONE MONUMENT
WIT	DENOTES	WITNESS
OU	DENOTES	ORIGIN UNKNOWN
PIN	DENOTES	PROPERTY IDENTIFIER NUMBER
(1321)	DENOTES	RASCH & HYDE O.L.S.
(1225)	DENOTES	D. B. SEARLES SURVEYING LTD.
(895)	DENOTES	DOUGLAS A. LANE, O.L.S.
(860)	DENOTES	J. E. LANTHIER, O.L.S.
(SLSA)	DENOTES	ST. LAWRENCE SEAWAY AUTHORITY
(CNR)	DENOTES	CANADIAN NATIONAL RAILWAYS
(AGM)	DENOTES	ARCHIBALD, GRAY AND MACKAY LIMITED
P1	DENOTES	PLAN 59R-12468
D1	DENOTES	INST. No. HU12470 (PIN 64456-0094(LT))
HP	DENOTES	HYDRO/UTILITY POLE
OUL	DENOTES	OVERHEAD UTILITY/HYDRO LINE
HTW	DENOTES	HYDRO TOWER
ORP	DENOTES	OBSERVED REFERENCE POINTS
─)	DENOTES	GUY ANCHOR
GP	DENOTES	GUY POLE
(B)	DENOTES	BURIED 0.30 BELOW GRADE

NOTES

AREAS NOTED IN SCHEDULE ARE ±
ALL DISTANCES ARE ROUNDED TO NEAREST 0.01 meter

CAUTION

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

DISTANCES ARE ADJUSTED GROUND DISTANCES AND CAN BE CONVERTED TO GRID DISTANCES BY MULTIPLYING BY THE AVERAGE COMBINED SCALE FACTOR (CSF = 0.99983563)

ALL COORDINATES ARE IN METRES AND ARE UTM-ZONE 17, (NAD 83-CSRS (Epoch 1997.0)) (CENTRAL MERIDICAN 81° WEST LONGITUDE).

COORDINATE VALUES ARE TO AN URBAN ACCURACY IN ACCORDANCE WITH SECTION 14 (2) OF O. REG 216/10.

INTEGRATION DATA

POINT	NORTHING	EASTING
ORP 'A' IB(1225)	4754410.272	643843.479
ORP 'B' SIB(1225)	4756454.651	644317.493
ORP 'C' SIB(1321)	4756456.915	644405.813
ORP 'D' IB(1321)	4754426.111	644398.418

ROTATION NOTE

TO COMPARE THE GRID BEARINGS SHOWN ON THIS PLAN WITH THE BEARINGS SHOWN ON P1 APPLY A COUNTER-CLOCKWISE ROTATION OF 01° 01' 00" TO THE BEARINGS SHOWN P1. BEARINGS NOMINALLY AGREE WITH P1 WHEN THE ROTATION IS APPLIED UNLESS NOTED OTHERWISE.

BEARING NOTE

BEARINGS HEREON ARE GRID, UTM ZONE 17, (NAD 83-CSRS (Epoch 1997.0)) DERIVED FROM OBSERVED REFERENCE POINTS (ORPs) USING THE CAN-NET VRS NETWORK AND ARE REFERRED TO THE CENTRAL MERIDIAN OF UTM ZONE 17 (81° WEST LONGITUDE).

SURVEYOR'S CERTIFICATE

I CERTIFY THAT :

1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THIS SURVEY WAS COMPLETED ON THE 15th DAY OF DECEMBER 2014.

MARCH 18, 2015
Date

HAROLD D. HYDE
ONTARIO LAND SURVEYOR

RASCH + HYDE LTD.
Ontario Land Surveyors

P.O. Box 6, 1333 Highway #3 East, Unit B
DUNNVILLE, ONT, N1A 2X1
905-774-7188
(FAX 905-774-4000)

P.O. Box 550, 74 Jarvis Street
FORT ERIE, ONT, L2A 5Y1
905-871-9757
(FAX 905-871-9748)

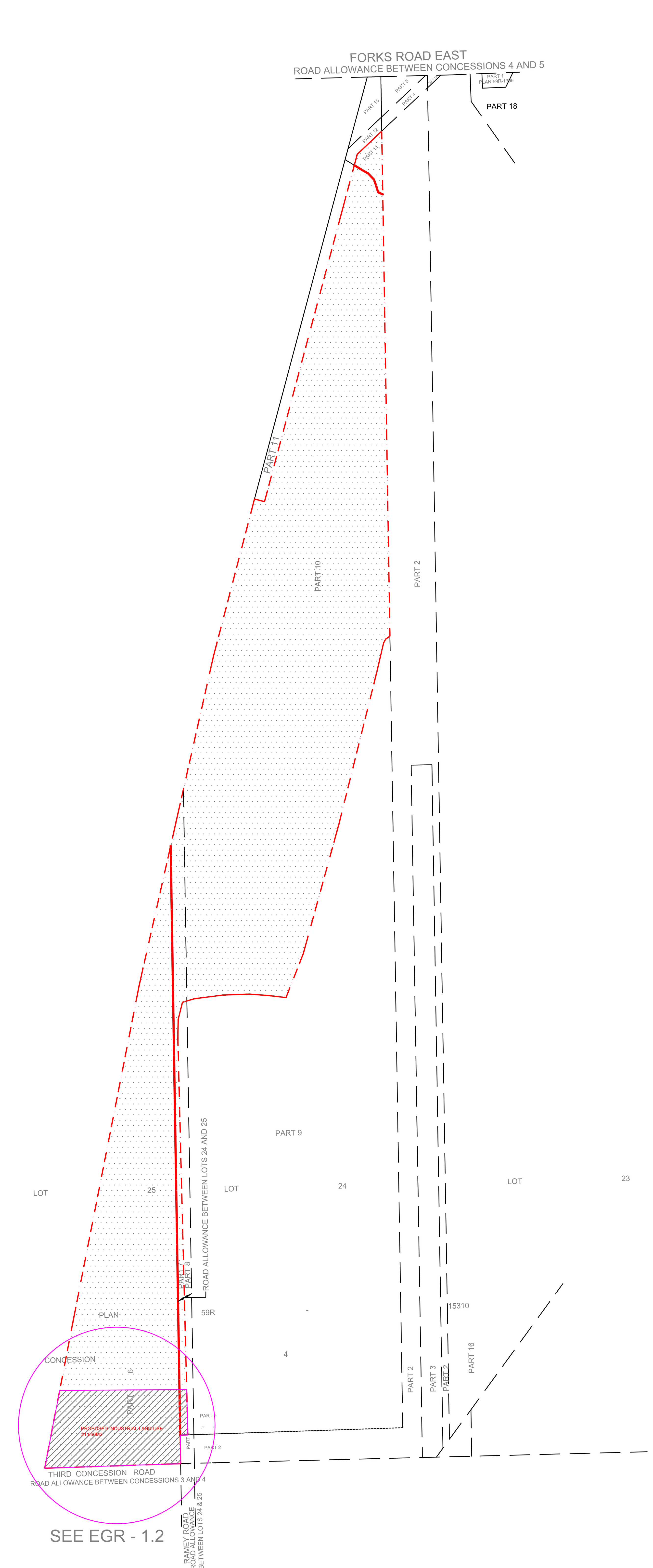
R. DESMOND RASCH O.L.S.
HAROLD D. HYDE O.L.S.

SCALE 1 : 2500 | SURVEY : 14F004 | DRWN BY : A.W. / G.P.

APPENDIX II- SITE PLAN AND SITE SERVICING IN POST-DEVELOPMENT CONDITIONS

LEGEND:

PROPERTY LINE



SEE EGR - 1.2

SCALE 1:5000
1cm = 50m
0m 250m 500m

Municipality Notes

DRAWN	STAMP
S.L/S.P	LICENSED PROFESSIONAL ENGINEER A. SAMADI 100569767 2026.05.13 PROVINCE OF ONTARIO
DATE	
MAY 04, 2026	

KEY MAP
N.T.S.

KING EPCM
3780 14th Ave, Unit 211
Markham, ON, L3R 9Y5
www.KingEPCM.com
647-459-5647

CLIENT
XUE JU (JACK) ZHENG
2789475 ONTARIO INC.

PROJECT NAME
0TH FORKS ROAD

PROJECT LOCATION
0TH FORKS ROAD
COLBORNE

PRINT TITLE
SITE KEY PLAN

FILE No.
EGR - 1.1

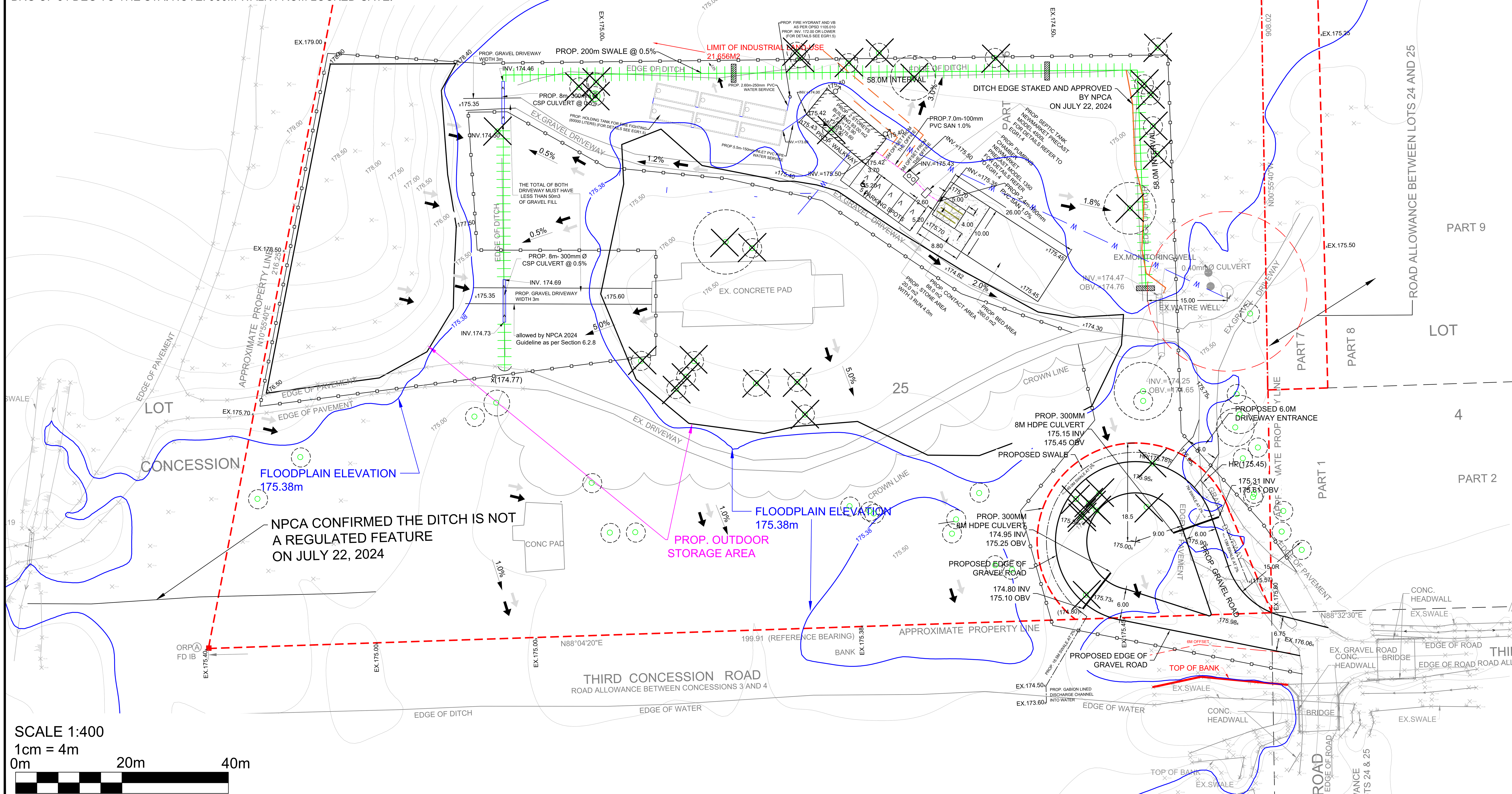
No.	ISSUED FOR:	DATE	DRAW BY	CHECK
V1	ISSURED FOR PERMITS	APR 29, 2024	SL	TW
V4	ISSUED FOR PERMITS	JUN 26 2025	SP	AA
V5	ISSUED FOR PERMITS	JUL 22 2025	SP	TW
V7	ISSUED FOR PERMITS	JAN 07 2026	SP	TW
V10	ISSUED FOR PERMITS	MAY 04 2026	SP	TW

GENERAL NOTES:

- TOPO SURVEY WAS CONDUCTED ON MARCH 7, 2024 AND OCTOBER 1, 2025 BY KING EPCM. NATURAL HERITAGE FEATURE STAKING SURVEY WAS CONDUCTED ON JULY 22, 2024
- ALL MEASUREMENTS STATED IN METRES.
- PROPERTY BOUNDARY WAS REFERENCED BY RASCH + HYDE LTD., DATED MARCH 18, 2015.
- THIS IS NOT A PLAN OF SURVEY. DO NOT USE FOR BOUNDARY.
- ELEVATIONS ARE GEODETIC, OBTAINED FROM GNSS AND USING CAN-NET DERIVED FROM RTK SOLUTIOIN AND GEOID MODEL HTv.2.0 SOLUTION, REFERRED TO CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28:78) AND BENCHMARK No. 0011980U014, HAVING AN ELEVATION OF 173.81M . THE BENCHMARK IS IN MANHOLE ALONG E SIDE OF WELLAND CANAL AND 2.4KM N OF JCT OF WELLAND ST AND MAIN ST E. LOC 1.0 KM N OF SERVICE RD GATE, 34 M NE OF CONC POWER POLE #317, 24.3 M W OF MAIN SERVICE RD C/L, 20.5 M E OF CANAL SHORE AND 10.0M E OF SMALLER SERVICE RD C/L. AN ORANGE CYL WITNESS SIGN WAS SET 0.71 M AWAY AT A MAG BRG OF 84 DEG TO THE STA. NOTE: 900M WALK FROM LOCKED GATE.

LEGEND:

	PROPERTY LINE
x 175.54	EXISTING ELEVATION
175.00	CONTOUR LINE
	WATERWELL
CONC.	CONCRETE
IB	IRON BAR
ORP	OBSERVED REFERENCE POINTS
	CHECK DAM
	GRASS SWALE
	TREE TO BE RETAINED
	TREE TO BE REMOED



SCALE 1:400

1cm = 4m

0m 20m 40m

Municipality Notes

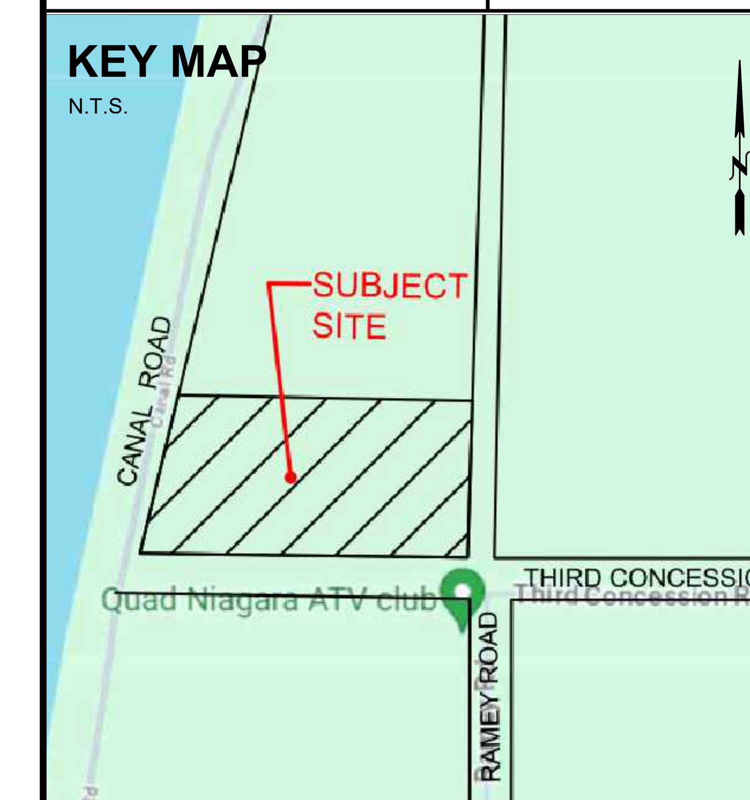
DRAWN: TW

DATE: MAY 04, 2026

STAMP: LICENSED PROFESSIONAL ENGINEER A. SAMADI 100569767 2026.05.13 PROVINCE OF ONTARIO

KEY MAP

N.T.S.



KING EPCM

3780 14th Ave, Unit 211
Markham, ON, L3R 9Y5
www.KingEPCM.com
647-459-5647

CLIENT: XUE JU (JACK) ZHENG 2789475 ONTARIO INC.

PROJECT NAME: 0TH FORKS ROAD

PROJECT LOCATION: 0TH FORKS ROAD COLBORNE

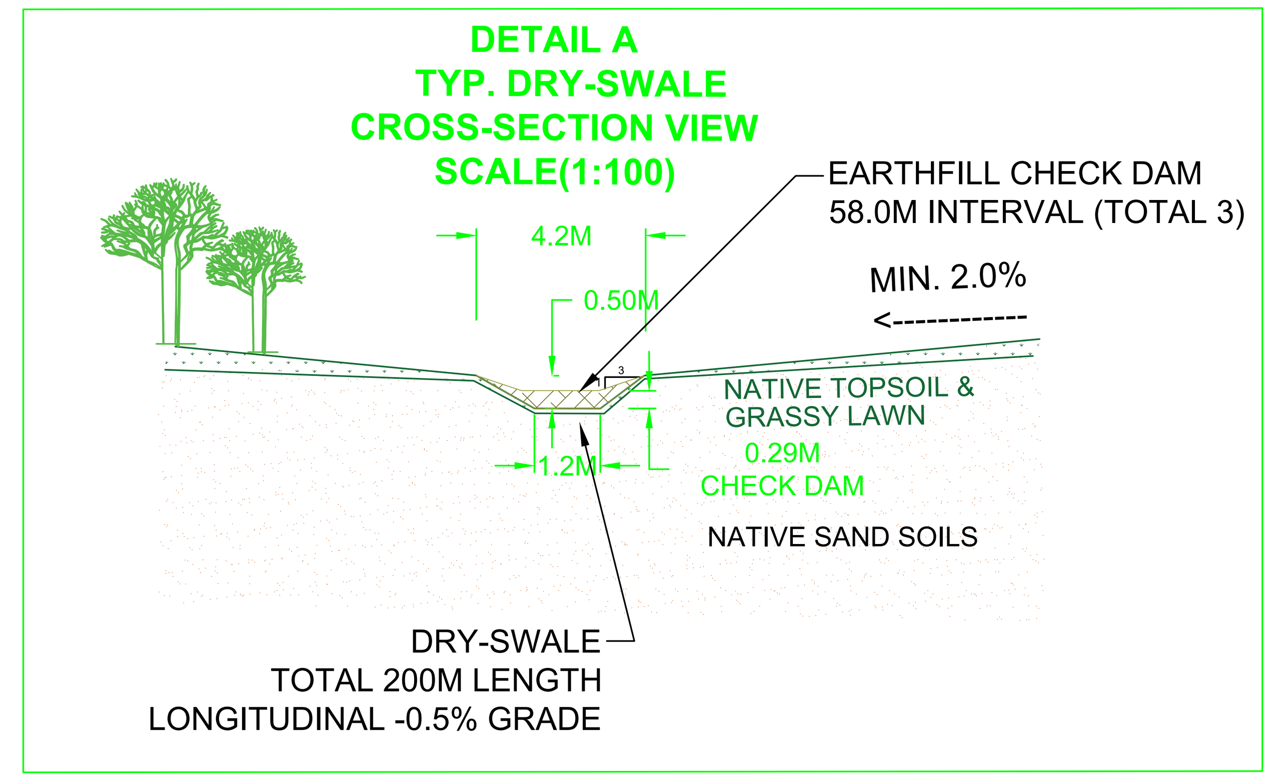
PRINT TITLE: SITE PLAN

FILE No.: EGR - 1.2

No.	ISSUED FOR:	DATE	DRAW BY	CHECK
V1	ISSUED FOR PERMITS	APR 29, 2024	SL	TW
V4	ISSUED FOR PERMITS	JUN 26 2025	SP	AA
V5	ISSUED FOR PERMITS	JUL 22 2025	SP	TW
V8B	ISSUED FOR PERMITS	MAR 18, 2026	SP	TW
V10	ISSUED FOR PERMITS	MAY 04, 2026	SP	TW

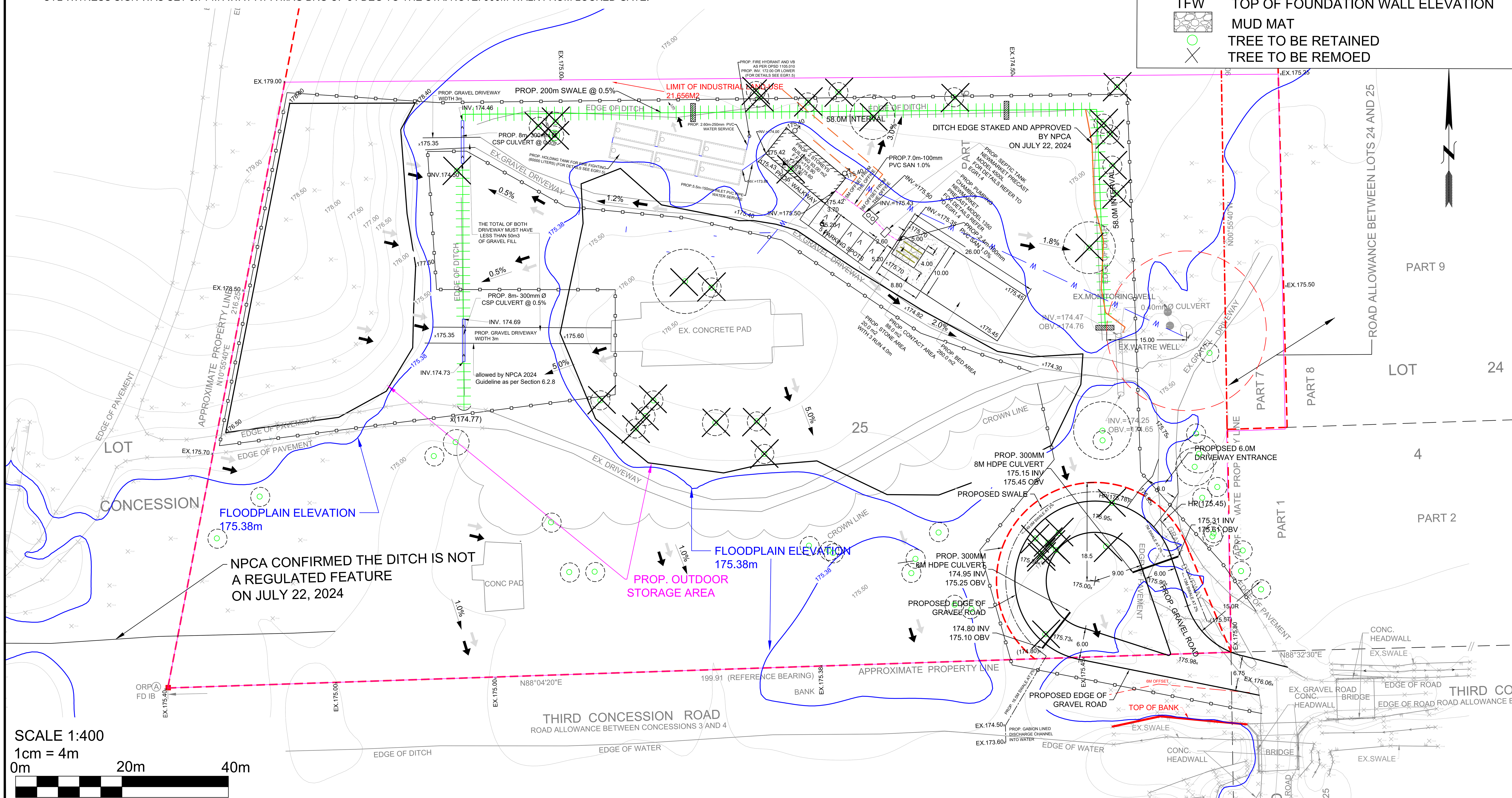
GENERAL NOTES:

1. CONTRACTOR TO BE RESPONSIBLE TO ENSURE THAT THIS LOT AND ADJOINING AREAS OF SITE ARE KEPT CLEAN AND FREE OF CONSTRUCTION DEBRIS, AND THAT ROADWAYS ARE KEPT CLEAN OF MUD AND DEBRIS
2. ALL MEASUREMENTS STATED IN METERS, PIPE SIZES IN MILLIMETERS, UNLESS OTHERWISE SPECIFIED EQUIVALENTS
3. GRASS SWALES SHALL BE CONSTRUCTED WITH 3:1 SIDE SLOPES, WITH AN AVERAGE DEPTH OF 150MM BELOW GRADE. SWALES SHALL HAVE A MINIMUM OF 50MM OF TOPSOIL, THEN SEEDED WITH LAWN GRASS DURING MAY - SEPTEMBER, WATERED WEEKLY UNTIL FULLY ROOTED
4. LANDSCAPING SHRUBS OR OTHER SMALL-FORM VEGETATION MAY BE PLANTED WITHIN THE GRASS SWALES. ROOT-BALL AND RAISED SOIL AROUND EACH SHRUB MAY FORM A DAM UP TO 600MM IN HEIGHT WITHIN THE SWALE, BUT NOT FULLY OBSTRUCT THE SWALE
5. EXTERIOR FOUNDATION WALLS SHALL ABOVE FINISHED GRADE ELEVATION BY AT MINIMUM 150mm
6. CONTRACTOR SHALL CHECK AND VERIFY ALL GIVEN GRADE ELEVATIONS AND DRAINAGE PRIOR TO CONSTRUCTION
7. RUNOFF SHALL BE DIRECTED IN SUCH WAY THAT IT DOES NOT ADVERSELY IMPACT ADJACENT PROPERTIES.
8. ELEVATIONS ARE GEODETIC, OBTAINED FROM GNSS AND USING CAN-NET DERIVED FROM RTK SOLUTIOIN AND GEOID MODEL HTv.2.0 SOLUTION, REFERRED TO CANADIAN GEODETIC VERTICAL DATUM OF 1928 (CGVD28:78) AND BENCHMARK No. 0011980U014, HAVING AN ELEVATION OF 173.81M . THE BENCHMARK IS IN MANHOLE ALONG E SIDE OF WELLAND CANAL AND 2.4KM N OF JCT OF WELLAND ST AND MAIN ST E. LOC 1.0 KM N OF SERVICE RD GATE, 34 M NE OF CONC POWER POLE #317, 24.3 M W OF MAIN SERVICE RD C/L, 20.5 M E OF CANAL SHORE AND 10.0M E OF SMALLER SERVICE RD C/L. AN ORANGE CYL WITNESS SIGN WAS SET 0.71 M AWAY AT A MAG BRG OF 84 DEG TO THE STA. NOTE: 900M WALK FROM LOCKED GATE.



LEGEND:

x 223.01	EXISTING ELEVATION
x 223.03	PROPOSED SURFACE ELEVATION
	PROPERTY LINE
x (223.03)	PROPOSED SWALE INVERT ELEVATION
	EXISTING SURFACE FLOW ROUTE
	PROPOSED SURFACE FLOW ROUTE
	TREE PROTECTION ZONE
	ROOF WATER DOWNSPOUT
	SILT FENCE CONTROL
W	PROP. WATERMAIN
FFE	FINISHED FLOOR ELEVATION
USF	UNDERSIDE FOOTING ELEVATION
DS	DOOR SILL ELEVATION
TFW	TOP OF FOUNDATION WALL ELEVATION
	MUD MAT
	TREE TO BE RETAINED
	TREE TO BE REMOED



SCALE 1:400
1cm = 4m
0m 20m 40m

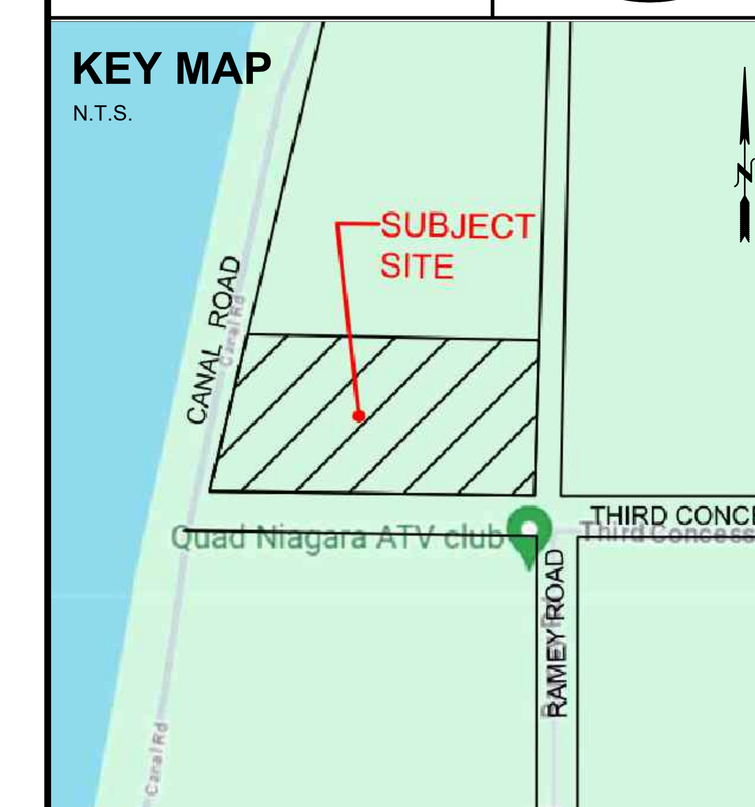
Municipality Notes

DRAWN: S.L/S.P

STAMP: LICENSED PROFESSIONAL ENGINEER A. SAMADI 100569767 2026.05.13 PROVINCE OF ONTARIO

DATE: MAY 04, 2026

KEY MAP
N.T.S.



KING EPCM
3780 14th Ave, Unit 211
Markham, ON, L3R 9Y5
www.KingEPCM.com
647-459-5647

CLIENT: XUE JU (JACK) ZHENG 2789475 ONTARIO INC.

PROJECT NAME: 0TH FORKS ROAD

PROJECT LOCATION: 0TH FORKS ROAD COLBORNE

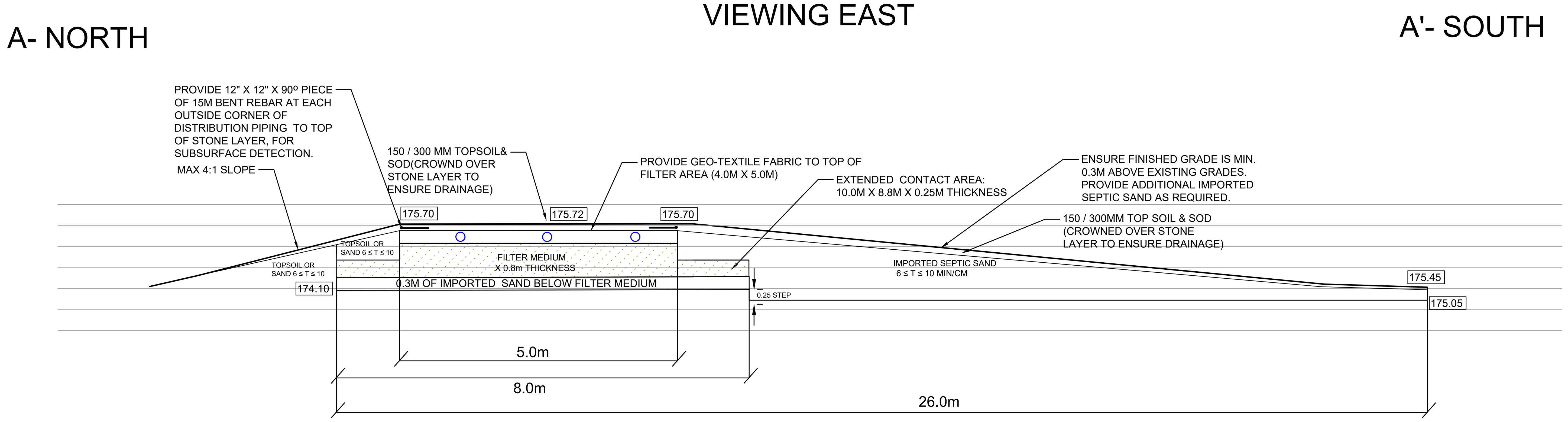
PRINT TITLE: SITE GRADING AND SERVICING

FILE No. EGR - 1.3

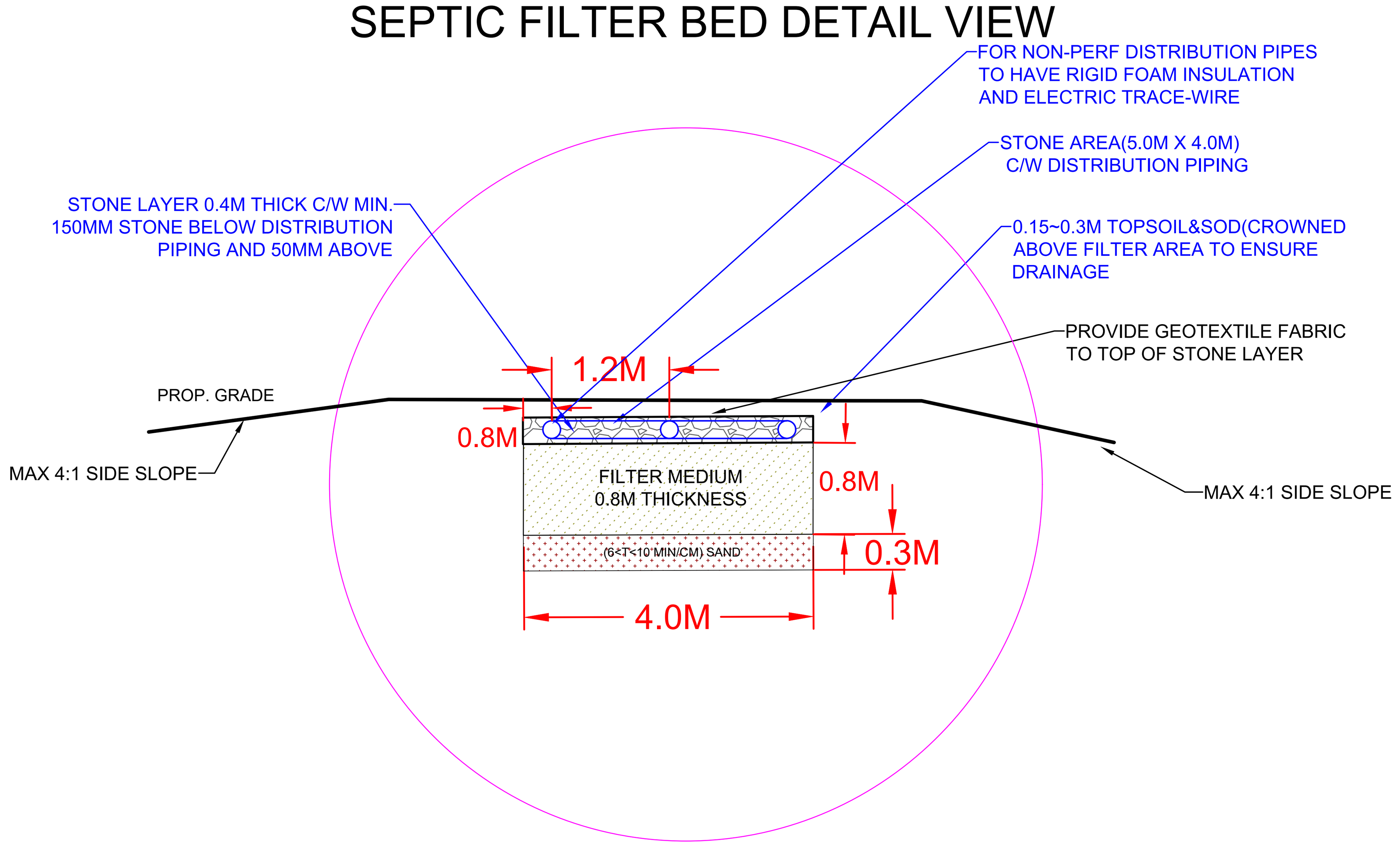
No.	ISSUED FOR:	DATE	DRAW BY	CHECK
V1	ISSUED FOR PERMITS	APR 29, 2024	SL	TW
V4	ISSUED FOR PERMITS	JUN 26 2025	SP	AA
V5	ISSUED FOR PERMITS	JUL 22 2025	SP	TW
V7	ISSUED FOR PERMITS	JAN 07 2026	SP	TW
V10	ISSUED FOR PERMITS	MAY 04 2026	SP	TW

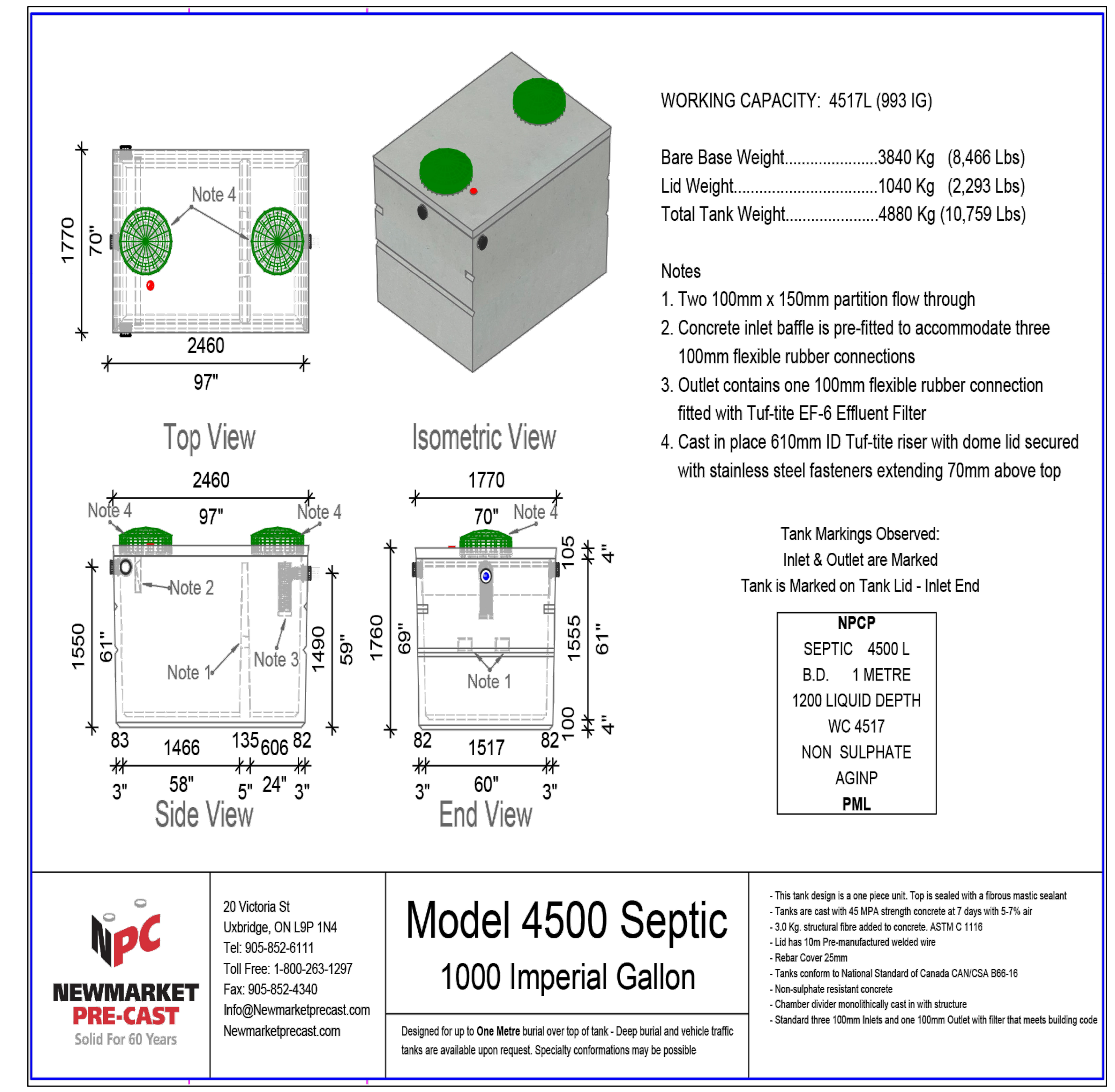
DETAIL A
FILTER BED
CROSS SECTION

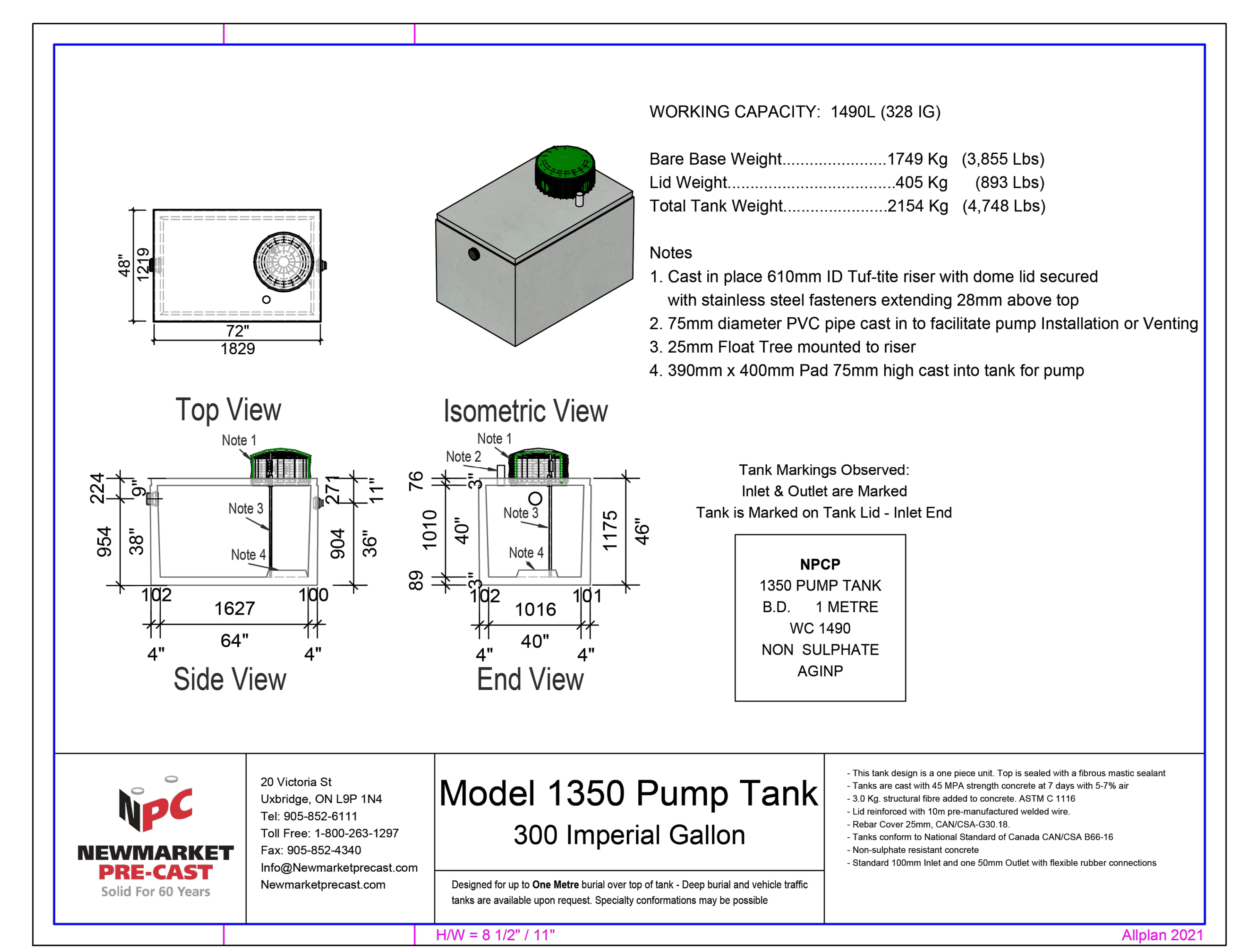
VIEWING EAST



DETAIL A (N.T.S)
SEPTIC FILTER BED DETAIL VIEW







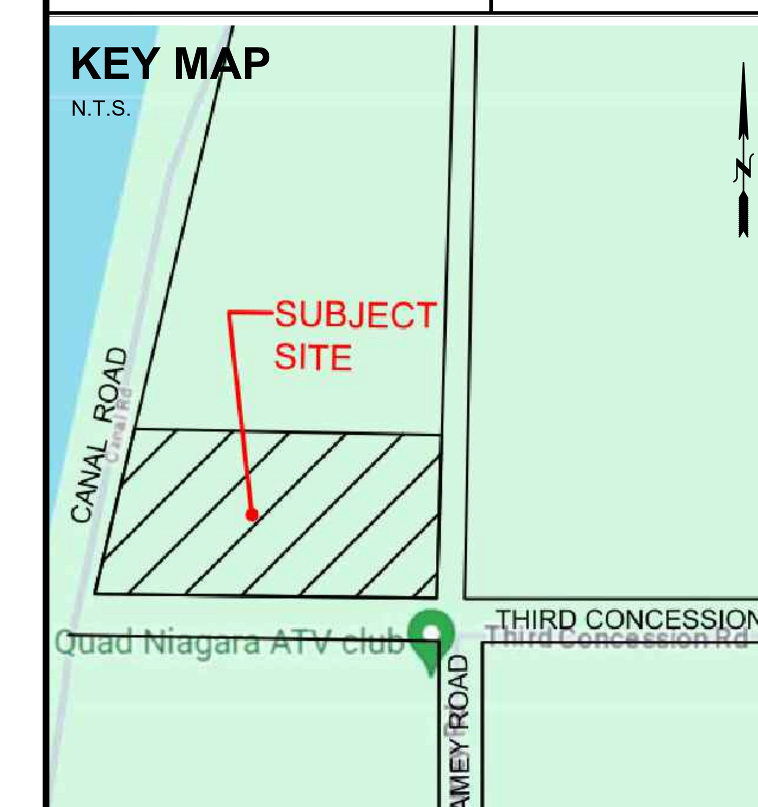
Municipality Notes

DRAWN: S.L./S.P.

DATE: MAY 04, 2026

STAMP: LICENSED PROFESSIONAL ENGINEER A. SAMADI 100569767 2026.05.13 PROVINCE OF ONTARIO

KEY MAP
N.T.S.



KING EPCM
3780 14th Ave, Unit 211
Markham, ON, L3R 9Y5
www.KingEPCM.com
647-459-5647

CLIENT
XUE JU (JACK) ZHENG
2789475 ONTARIO INC.

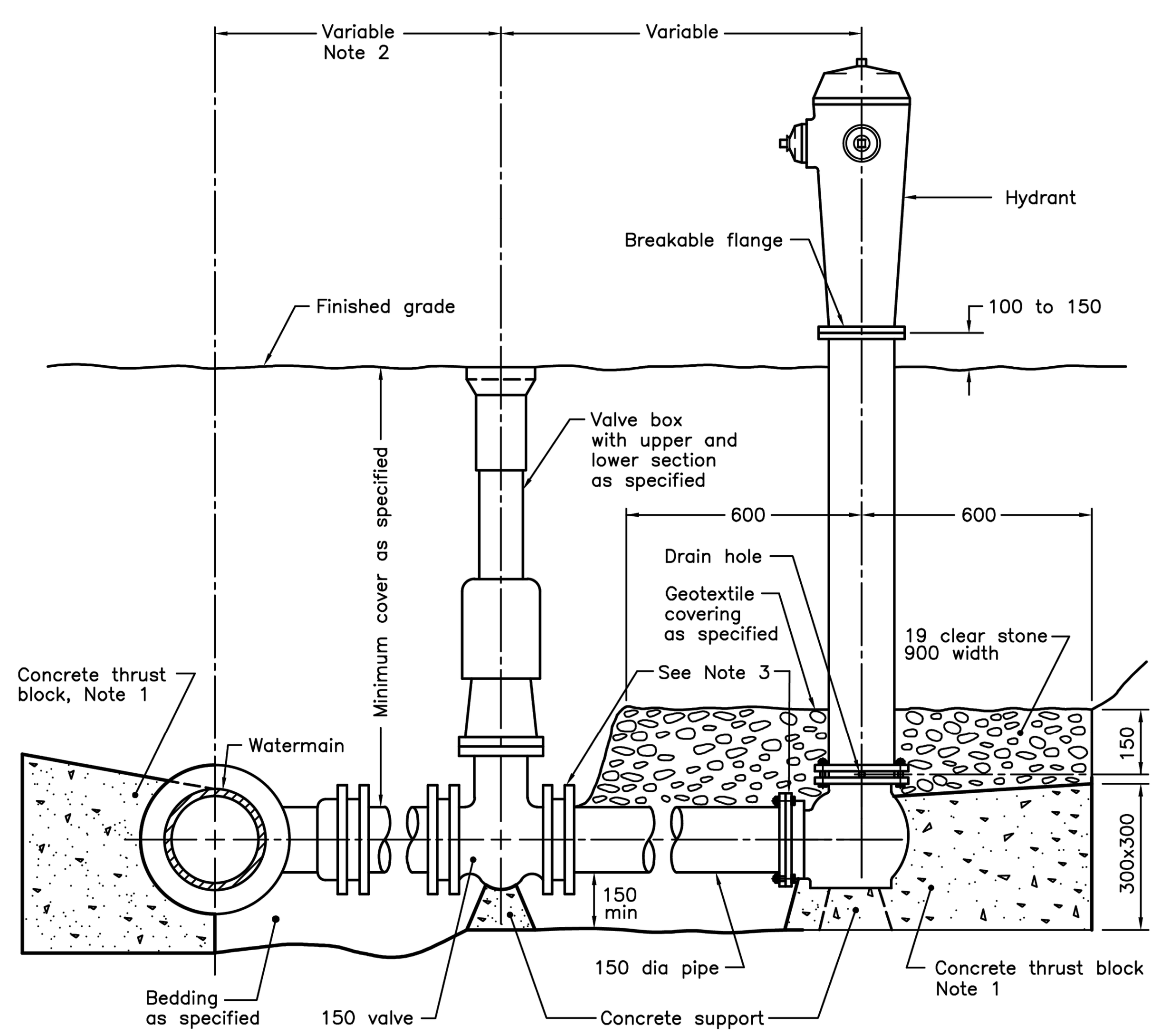
PROJECT NAME
0TH FORKS ROAD

PROJECT LOCATION
0TH FORKS ROAD
COLBORNE

PRINT TITLE
SEPTIC DETAIL

FILE No.
EGR - 1.4

No.	ISSUED FOR:	DATE	DRAW BY	CHECK
V1	ISSURED FOR PERMITS	APR 29, 2024	SL	TW
V4	ISSURED FOR PERMITS	JUN 26 2025	SP	AA
V5	ISSURED FOR PERMITS	JUL 22 2025	SP	TW
V7	ISSURED FOR PERMITS	JAN 07 2026	SP	TW
V10	ISSURED FOR PERMITS	MAY 04 2026	SP	TW



NOTES:
1 All concrete thrust blocks shall be poured against undisturbed ground.
2 When specified, for watermains 400mm and less, locate valve within 1.0m of centreline of watermain. Retaining and restraining devices shall be utilized. For watermains 600mm and over, bolt valve with flanged end directly to flanged tee.
3 Retaining and restraining devices shall be as specified.
A Bond breaker shall be used between the concrete and the fittings and appurtenances.
B Bolts and nuts for buried flange to flange connections shall be stainless steel.
C When required, flange of standpipe extensions shall not be in frost zone.
D This OPSD shall be read in conjunction with OPSD 1103.010 and 1103.020.
E Backfill material within 500mm of service box shall be native or imported, as specified.
F Tracer wire shall be installed as specified.
G All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2018	Rev 3
HYDRANT INSTALLATION	OPSD 1105.010	

60,000 LITRE CONCRETE WATER HOLDING TANK MODEL H60S

WILKINSON HEAVY PRECAST
WWW.WILKINSONHEAVYPRECAST.COM
DUNDAS, ONTARIO 1-800-263-8503

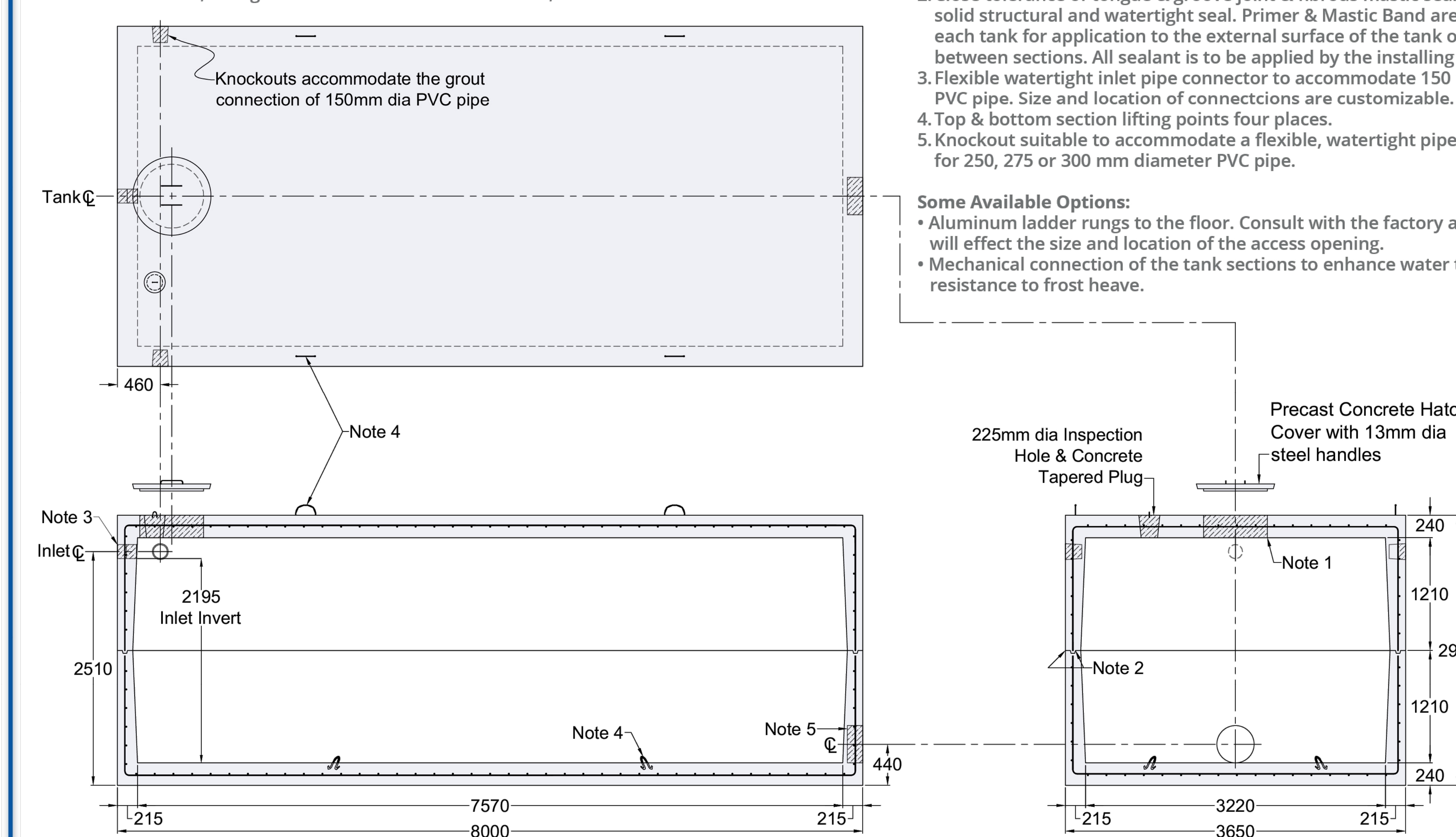
CONSTRUCTION DETAILS:
Concrete: 35 MPa at 28 Days, 5 to 8% Air Entrainment.

Reinforcing: Designed for a maximum 1 metre burial over the top slab in firm soil. Optional reinforcing for CHBDC vehicular loading available upon request.

WEIGHT:	CAPACITY:
Top Section - 31,500 kg	Per Vertical Metre - 24,917 Ltires
Bottom Section - 31,500 kg	To Underside of Roof Slab - 60,299 Litres

NOTES:
1. Large 685 mm diameter roof access openings facilitate tank maintenance. Unless otherwise specified when ordered this tank will be shipped with 840 mm diameter concrete roof access cover only. Please see Access Riser section for available riser & hatch options.
2. Close tolerance of tongue & groove joint & fibrous mastic sealant ensures a solid structural and watertight seal. Primer & Mastic Band are supplied with each tank for application to the external surface of the tank over the joint between sections. All sealant is to be applied by the installing contractor.
3. Flexible watertight inlet pipe connector to accommodate 150 mm diameter PVC pipe. Size and location of connectcions are customizable.
4. Top & bottom section lifting points four places.
5. Knockout suitable to accommodate a flexible, watertight pipe connectoin for 250, 275 or 300 mm diameter PVC pipe.

Some Available Options:
- Aluminum ladder rungs to the floor. Consult with the factory as to how this will effect the size and location of the access opening.
- Mechanical connection of the tank sections to enhance water tightness and resistance to frost heave.



Dimensions in mm
N.T.S.

*Product designed for a **Maximum 1 Metre** burial over the top slab in firm soil away from any area of vehicular traffic.

For recommended installation proceedures refer to Wilkinson Installation Guidelines.

WARNING! IMPROPER INSTALLATION ESPECIALLY IN UNSTABLE SOIL CAN RESULT IN THE STRUCTURAL FAILURE OF THIS PRODUCT

November 15, 2021

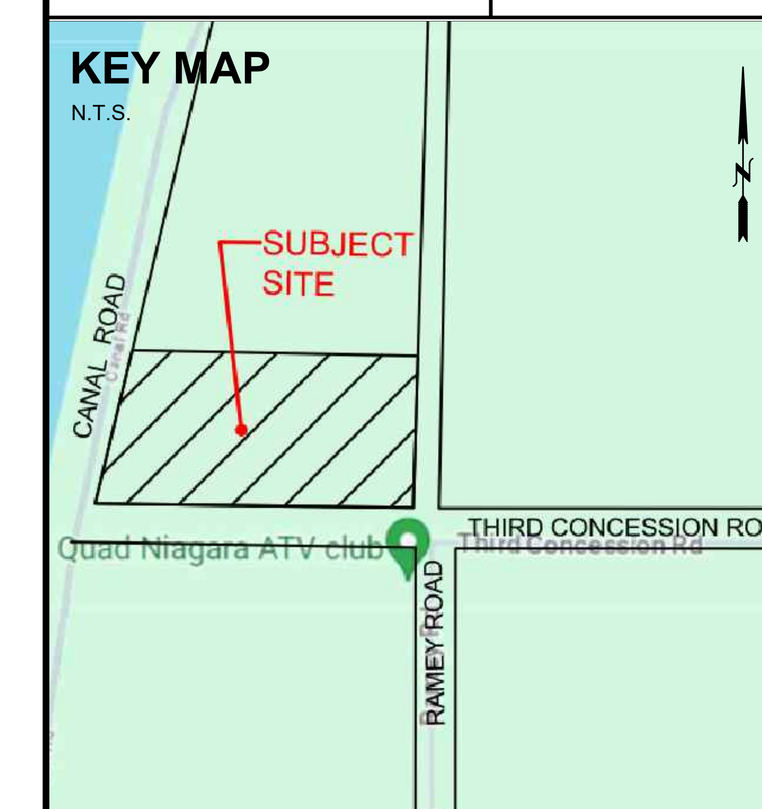
Municipality Notes

DRAWN
S.L./S.P.

DATE
MAY 04, 2026

STAMP
LICENSED PROFESSIONAL ENGINEER
A. SAMADI
100569767
2026.05.13
PROVINCE OF ONTARIO

KEY MAP
N.T.S.



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647-459-5647

CLIENT
XUE JU (JACK) ZHENG
2789475 ONTARIO INC.

PROJECT NAME
0TH FORKS ROAD

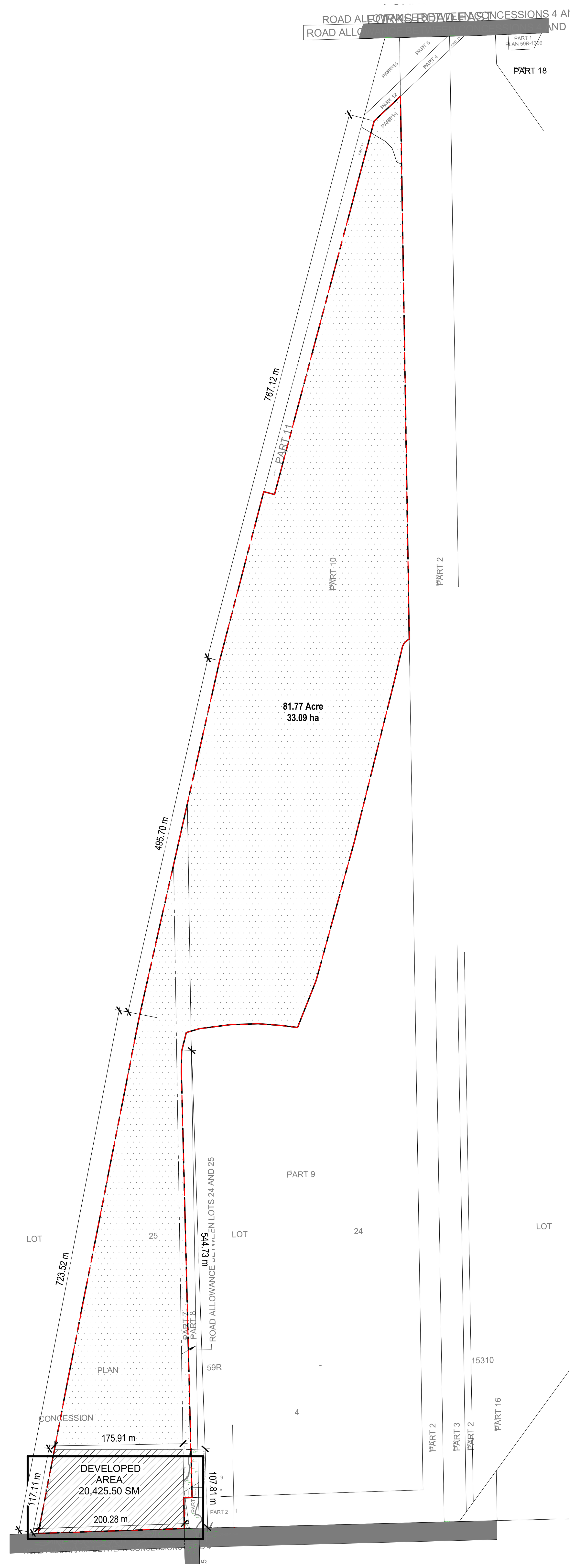
PROJECT LOCATION
0TH FORKS ROAD
COLBORNE

PRINT TITLE
FIRE HYDRANT DETAIL

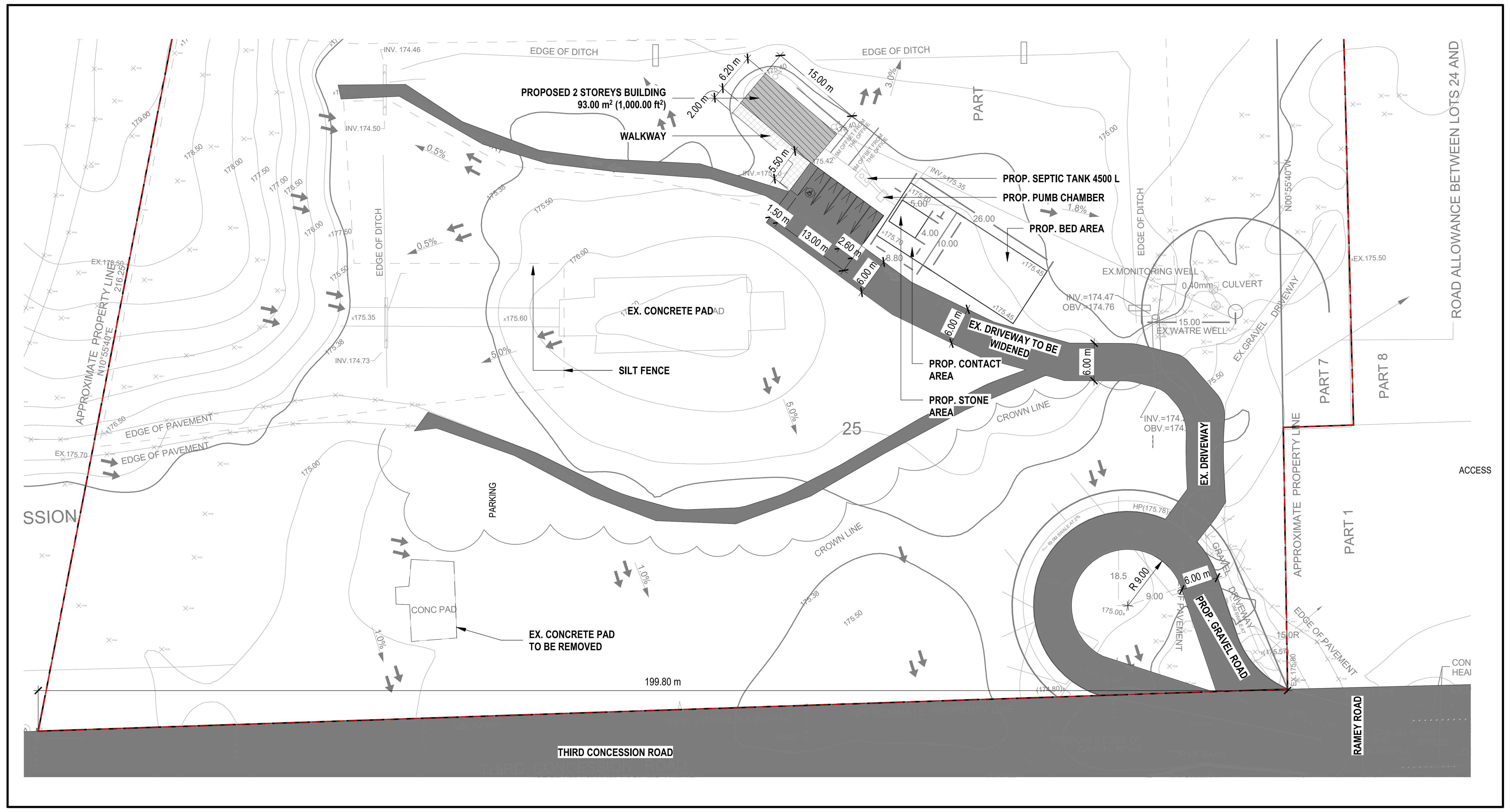
FILE No.
EGR - 1.5

No.	ISSUED FOR:	DATE	DRAW BY	CHECK
V1	ISSURED FOR PERMITS	APR 29, 2024	SL	TW
V4	ISSURED FOR PERMITS	JUN 26 2025	SP	AA
V5	ISSURED FOR PERMITS	JUL 22 2025	SP	TW
V7	ISSURED FOR PERMITS	JAN 07 2026	SP	TW
V10	ISSURED FOR PERMITS	MAY 04 2026	SP	TW

APPENDIX III- SITE DEVELOPMENT INFORAMATION



1 A-001 KEY PLAN
SCALE: 1 : 4000



2 A-001 SITE PLAN
SCALE: 1 : 500

Statistics

ZONING	ID- 47-H - (BY-LAW # 6575/30/18 & 5989/95-2013)		
LEGAL DESCRIPTION	PIN 64456-0099(LT) PART OF LOTS 23, 24 AND 25 PLAN 59R - 12468	TOTAL LOT AREA	319,420.15 SM 31.94 HA 78.92=3 ACRE
LOT FRONTAGE	200.28 M	LOT DEPTH	1,986.34 M

DESCRIPTION	EXISTING	PROPOSED	REQUIRED	SECTION
MIN.LOT FRONTAGE	200.28 M	NO CHANGE	30.00 M	27.4
MIN. LOT WIDTH	EXISTING	NO CHANGE	N/A	
MIN. LOT AREA	319,420.15 SM	NO CHANGE		
MAX.BUILDING HEIGHT		8.00 M	MAX. 11.00 M	27.4
NO. OF STORIES		2		
DRIVEWAY WIDTH	2.00 M	6.00 M		
BUILDING AREA		93.00 SM (1,000.00 SF)		
GROSS FLOOR AREA				
GROUND FLR SECOND FLR		93 SM 93 SM	**TOTAL 186 SM (2,000.00 SF)**	
FLOOR SPACE INDEX (FSI)				
		$\frac{186\ SM}{319{,}420.15\ SM}$ =0.00		

SETBACK	EXISTING	PROPOSED	REQUIRED	SECTION
FRONT (NORTH)		12.60 M	7.50 M	27.4
SIDE (EAST)		59.97 M	15.00 M	27.4
SIDE (WEST)		132.12 M	15.00 M	27.4
REAR (SOUTH)		> 100.00 M	8.00 M	27.4

AREAS	EXISTING	PROPOSED		REQUIRED	SECTION
PROPOSED DEVELOPED AREA		100 %	20,425.50 SM		
PROPOSED BUILDING AREA		0.5 %	93.00 SM		
DRIVEWAY & PARKING SPACES		6.0 %	1,217.02 SM		
EXISTING CONCRETE PAD		1.8 %	360.00 SM		
LANDSCAPED AREA		91.8 %	18,755.48 SM		

PARKING	EXISTING	PROPOSED	REQUIRED	SECTION
TOTAL PARKING		4 SPACES	1 SPACE PER 100 SM GFA	3.1.2
INCLUDING ACCESIBLE PARKING		1 SPACES	1 SPACES	3.3

LOADING	EXISTING	PROPOSED	REQUIRED	SECTION
NUMBER OF LOADING SPACES			3.5M X 9 M	3.10

OBC CLASSIFICATION: PART 9 - GROUP F DIVISION 3
NOT SPRINKLERED

PROPOSED BUILDING
ROAD / STREET
SITE BOUNDARY

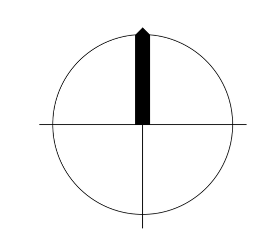
DO NOT SCALE DRAWINGS.

CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON SITE.

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ARCHITECT.

No.	Issues	Date	By
1	For Client Review	2023-06-12	TM
2	Revision	2023-09-25	TM
3	SPA Submission	2024-04-29	TM
5	Issued for Review	2026-04-29	OS

KEY MAP



TAES Architects Inc.
98 SCARSDALE ROAD,
TORONTO, ONTARIO, M3B 2R7
T: 416 800 3284
F:416 800 3485

XUE JU (JACK) ZHENG

INDUSTRIAL DEVELOPMENT

0TH FORK ROAD, LOTS 23 TO 25
PORT COLBORNE

Project No.		T2023027	
Drawn		Scale	As indicated
Checked		Date	2023-06-06

Site Plan

Drawing No.
A-001

APPENDIX IV- FIRE FIGHTING CALCULATIONS

0th Forks Road, Port Colborne
Fire Fighting Calculations
Based On Water Supply for Public Fire Protection - Fire Underwrite Suvey (2020)

Building Type	Ground area (m^2)	Type V - Fire Resistive Construction- No Sprinkler (FF in LPM)							
		Total Area (m^2)	C	Sprinkler (%)	Occupancy (%)	Exposure (%)	Fire Flow	Rounded flow	Required Volume (m^3)
I **	93.00	186.00	1.50	0.00	0.00	0.00	5,000	**4,000**	**360,000**

Type of Costruction	**Type V - Wooden Frame Construction**
C	**1.5**
Major Occupancy	**Industrial**
Other assembly occupancies	**F3**
Other occupancy	**(-)**

Calculating Total Area (m^2)

For types III, IV-C, IV-D, and V

No. of floors	2
Main/Ground Floor	93
Area of floor two	93
Area of floor three	0
Area of floor four	0
Area of floor five	0
Area of floor six	0
Area of floor seven	0
Area of floor eight	0
Basement area	0
% of basement below grade	0
Total area (m^2)	**186**

Table 1 Required Duration of Fire Flow

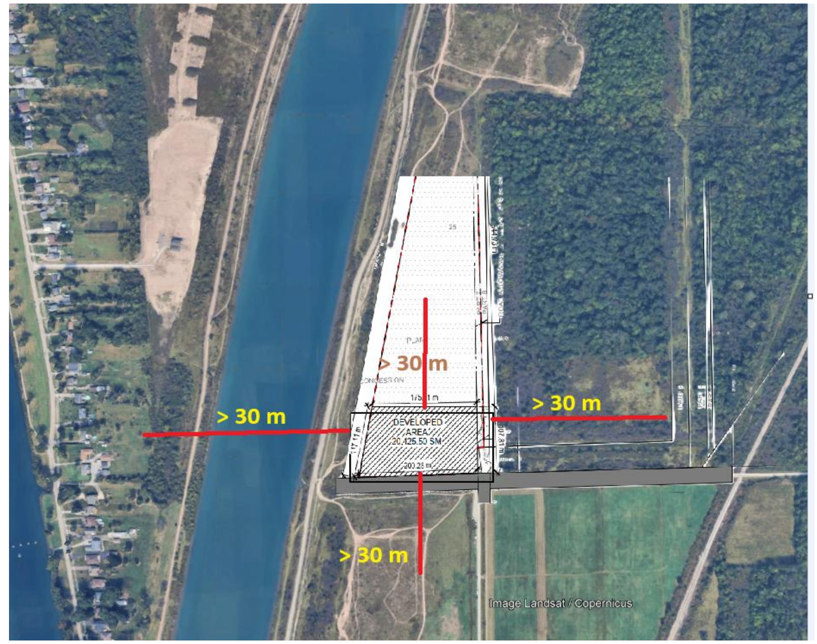
Fire Flow Required (litres per minute)	Duration(hours)
2,000 or less	1.0
3,000	1.25
4, 000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

*** Interpolate for intermediate figures***

Calculating Total Area (m^2)

For types I, II, IV-A, and IV-B

No. of floors	2
Main/Ground Floor	93
Area of floor two	93
Area of floor three	0
Area of floor four	0
Area of floor five	0
Area of floor six	0
Area of floor seven	0
Area of floor eight	0
Basement area	0
% of basement below grade	0
Total area (m^2)	**116.25**



Automatic Sprinkler Protection

Sprinkler Credits	Credit
Fully Sprinklered Building	0
Water Supply is standard	0
fully Supervised system	0
Total	**0**

Occupancy and Contents Adjusment Factor

Descriptive of Major Occupancies	Group	Division	Occupancy and Contents	Adjustment Factor (%)
Other Occupation Assembly	F	3	(-)	0

Exposure Adjusment Charge

Description	North	South	East	West
Distance to the exposure (m)	>30	>30	>30	>30
Length-height factor	(-)	(-)	(-)	(-)
Property type	(-)	(-)	(-)	(-)
Exposure adjustment	0	0	0	0
Total adjustment	0			

APPENDIX V- DETAILS FOR SEPTIC DESIGN

0th Forks Road, Port Colborne
Fire Fighting Calculations
Based On Water Supply for Public Fire Protection - Fire Underwrite Suvey (2020)

Building Type	Ground area (m^2)	Type V - Fire Resistive Construction- No Sprinkler (FF in LPM)							
		Total Area (m^2)	C	Sprinkler (%)	Occupancy (%)	Exposure (%)	Fire Flow	Rounded flow	Required Volume (m^3)
I	93.00	186.00	1.50	0.00	0.00	0.00	4,500	**4,000**	360,000

Type of Costruction	Type V - Wooden Frame Construction
C	1.5
Major Occupancy	Industrial
Other assembly occupancies	F3
Other occupancy	(-)

Calculating Total Area (m^2)
For types III, IV-C, IV-D, and V

No. of floors	2
Main/Ground Floor	93
Area of floor two	93
Area of floor three	0
Area of floor four	0
Area of floor five	0
Area of floor six	0
Area of floor seven	0
Area of floor eight	0
Basement area	0
% of basement below grade	0
Total area (m^2)	**186**

Table 1 Required Duration of Fire Flow

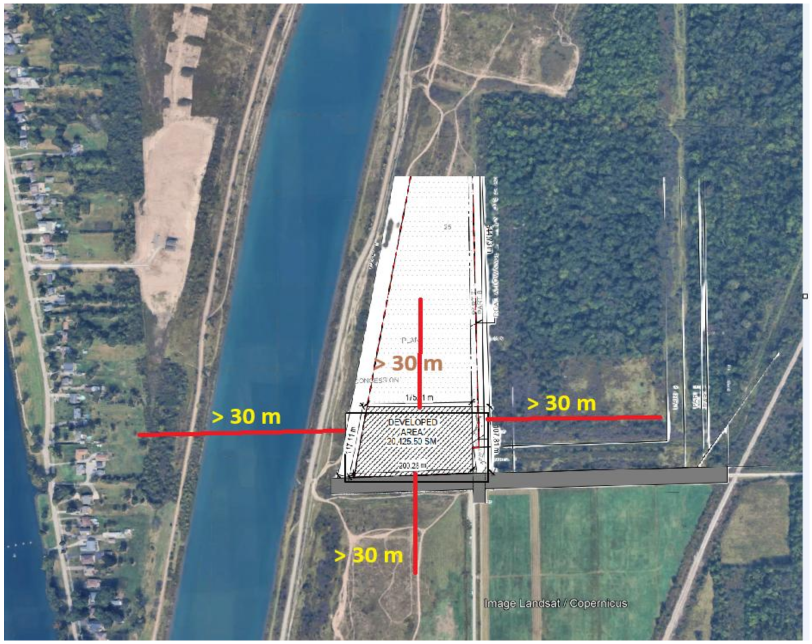
Fire Flow Required (litres per minute)	Duration(hours)
2,000 or less	1.0
3,000	1.25
4, 000	1.5
5,000	1.75
6,000	2.0
8,000	2.0
10,000	2.0
12,000	2.5
14,000	3.0
16,000	3.5
18,000	4.0
20,000	4.5
22,000	5.0
24,000	5.5
26,000	6.0
28,000	6.5
30,000	7.0
32000	7.5
34,000	8.0
36,000	8.5
38,000	9.0
40,000 and over	9.5

** Interpolate for intermediate figures*

Calculating Total Area (m^2)

For types I, II, IV-A, and IV-B

No. of floors	2
Main/Ground Floor	93
Area of floor two	93
Area of floor three	0
Area of floor four	0
Area of floor five	0
Area of floor six	0
Area of floor seven	0
Area of floor eight	0
Basement area	0
% of basement below grade	0
Total area (m^2)	**116.25**



Automatic Sprinkler Protection

Sprinkler Credits	Credit
Fully Sprinklered Building	0
Water Supply is standard	0
fully Supervised system	0
Total	**0**

Occupancy and Contents Adjusment Factor

Descriptive of Major Occupancies	Group	Division	Occupancy and Contents	Adjustment Factor (%)
Other Occupation Assembly	F	3	(-)	0

Exposure Adjusment Charge

Description	North	South	East	West
Distance to the exposure (m)	>30	>30	>30	>30
Length-height factor	(-)	(-)	(-)	(-)
Property type	(-)	(-)	(-)	(-)
Exposure adjustment	0	0	0	0
Total adjustment	0			

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Date:	Friday, January 9, 2026
www.KingEPCM.com	King EPCM
Unit 26, 570 Hood Road	Tony Wang, P.Eng
Markham, ON, L3R 4N6	Principal Engineer
	Twang@KingEPCM.com
	Cell: 647-459-5647

Septic calculation tool

Legend:

	= user input location
	= important output value

Project Info

Project Client Name		
Street Address	0th Forks Rd	
Municipality	Port Colborne	
Region	Niagara	
Project Type	Commercial	Note: industrial, commercial, or residential

Soil Information

Soil Stratigraphy		
0-0.3m	Backfill & gravel	
0.3-0.9m	Brown sand, moist	
0.9-4m	Brwon sandy clay	
Average Slope	2%	Note: cannot be greater than 25% due to OBC 8.7.2.1
Groundwater, Bedrock, or dense clay T>50 min/cm mbgl	100.0	Note: MUST BE ENTERED; USE 100 FOR NO GROUNDWATER

T-time

T-time (sieve) min/cm	0	Note: if there is no information, input zero 0
T-time (infiltration) min/cm	50	Note: if there is no information, input zero 0, there must be at least one value

Residential Daily Sewage Flow DSF "Q" Input

Total # of Bedrooms		
Water Closet (toilet)	2	Note: do NOT double count those already within bathroom group
Bathtub or shower	0	Note: do NOT double count those already within bathroom group
Washbasin (sink)	2	Note: do NOT double count those already within bathroom group
Laundry Tub	0	
Clothes Washer	0	
Dish Washer	0	
Kitchen Sink	0	Note: per 1 faucet head
Bathroom Group	0	Note: only 3 or 4 piece bathroom, max of only 1 toilet and 3 of any other item
Other Fixture Units	0	Note: 0.5 bathroom group is a powder room (1 sink + 1 toilet), enter above
Total Fixture Unit	11	
First Floor Area m2	93	Note: confirm first floor area does NOT include attached garage
Second Floor Area m2	93	
Third Floor Area m2		
Other Floor Area m2		Note: do not count basement floor area
Calculated GFA m2	190	Note: always round up to the nearest 10m2
0<GFA<200	190	
200<GFA<400	0	
400<GFA<600	0	
GFA>600	0	

"Q" Calculation

Base Flow Rate L/day	error	OBC Table 8.2.1.3.A Item 4 (a) - (e)
Additional Bedroom L/day	0	OBC Table 8.2.1.3.A Item 4 (f) (i)
GFA L/day	0	OBC Table 8.2.1.3.A Item 4 (f) (ii)
Fixture Units L/day	0	OBC Table 8.2.1.3.A Item 4 (f) (iii)
Calculated Q L/day	1500	Base Flow Rate + max of i, ii, or iii

Project Summary

Project:	- 0th Forks Rd, Port Colborne, Niagara Region	
Groundwater, Bedrock, or dense clay T>50 min/cm mbgl	100.0	
T-time min/cm	50	
Calculated Q L/day	1500	
Design Q L/day	1500	Note: You may choose to have a higher design Q instead of calculated Q

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King EPCM
Tony Wang, P.Eng
Principal Engineer
Twang@KingEPCM.com
Cell: 647-459-5647

Project Summary

Project:	0th Forks Rd, Port Colborne
Project Type	Commercial
Groundwater, Bedrock, or dense clay T>50 min/cm mbgl	100.0
T-time min/cm	50
Design Q L/day	1500

Proposed system: Filter Bed as per OBC 8.7.5

Filter Bed Sizing	Q <= 3000		
Minimum Total Stone Area	A = Q / 75	20	m2
Number of Filter Beds		1	Filter Beds
Minimum Filter Bed Size		20	m2
Designed Filter Bed Size		20	m2
Designed Filter Bed Width		4.0	m width
Designed Filter Bed Length		5.0	m long
Designed Distribution Pipe Runs, distribution pipes are 1.2m O/C and 0.5m from edge		3	runs
Designed Distribution Pipe Length		4.0	runs
Minimum Extended Contact Area (base of Filter Sand) A = QT/850		88	m2
Designed Extended Contact Area (base of Filter Sand)		88	m2
Minimum Mantle Length		4	Required
Loading Rates for Fill Based Systems from Table 8.7.4.1.A		6	L/m2/day
Minimum Loading Area due to Loading Rates for Fill Based Systems		250	m2
Designed total bed area (6<T<10 Sand Fill area)		260	m2

Septic Tank Minimum Size	4,500	Litres Working Capacity
Designed Septic Tank Size	4,500	Litres Working Capacity
Tank Manufacturer		
Tank Model Name		
Minimum Dosing Volume	0	litres per dose, for 75mm distribution pipes >=150m, as per OBC 8.6.1.3
Designed Dosing Method	0	Note: Gravity Syphon or Electric Pump
Designed Pump Tank Size	1,500	Litres Working Capcity
Tank Manufacturer		
Tank Model Name		
Flow Divider Required	No	Quanics Flow Divider GDS-Z300, or similar, forcemain to split into two filter beds

APPENDIX VI- ESTIMATED SITE'S ACTUAL EVAPOTRANSPIRATION

Climate Data

Welland
Climate Station ID: 6139445

Year	Month	Ave. T (^oC)	Ave P (mm)
1977-2006	1	-4.7	81.7
1977-2006	2	-4.0	57.6
1977-2006	3	0.7	70.9
1977-2006	4	7.3	77.6
1977-2006	5	13.5	81.6
1977-2006	6	18.7	80.4
1977-2006	7	21.6	82.8
1977-2006	8	20.8	84.4
1977-2006	9	16.6	104.1
1977-2006	10	10.1	89.7
1977-2006	11	4.6	96.3
1977-2006	12	-1.2	93.8

Climate Data

Welland
Climate Station ID: 6139445

Month	PET	P	P-PET	Soil Moisture	AET	PET-AET	Snow Storage	Surplus
January	9.6	81.7	45.3	198.1	9.6	0.1	40.8	42.3
February	11.3	57.6	44.6	199.6	11.3	0.0	42.4	43.1
March	21.5	70.9	79.6	200.0	21.5	0.0	12.3	79.2
April	39.7	77.6	50.2	199.8	39.7	0.0	0.0	50.4
May	72.4	81.6	9.1	189.6	72.4	0.0	0.0	19.3
June	105.3	80.4	-24.9	160.7	103.1	2.2	0.0	6.2
July	125.2	82.8	-42.4	125.3	115.7	9.5	0.0	2.5
August	101.6	84.4	-17.3	115.7	91.3	10.3	0.0	2.6
September	60.5	104.1	43.6	144.9	58.2	2.3	0.0	16.8
October	32.2	89.7	57.4	175.6	32.2	0.0	0.0	26.8
November	17.3	96.3	78.9	191.9	17.3	0.0	0.1	62.5
December	11.0	93.8	69.0	196.7	11.0	0.0	14.0	64.2
Annual Rate (mm/yr)	607.7	1000.9	393.2	2097.9	583.3	24.3	109.6	415.9

APPENDIX VII- DETAILED CALCULATIONS – RATIONAL METHOD

STORMWATER MANAGEMENT CALCULATIONS

Pre-Development Peak Flows

Storm (yrs)	City of Port Colborne Coeff A	Coeff B	Coeff C	Modified Rational Method Q= CaCIA/360	
2	755	0.789	8.0	Where:	
5	830	0.777	7.3	Q-	Flow Rate (m3/s)
10	860	0.763	6.5	Ca-	Peaking Coefficient
25	900	0.745	5.2	C-	Rational Method Runoff Coefficient
50	960	0.736	5.1	I-	Storm Intensity (mm/hr)
100	1020	0.731	4.7	A-	Area (ha)

Area #	Developed Area	
Area	2.17	ha
Runoff Coefficient	0.39	
Time of Concentration	10.0	min
Return Rate	2	year
Peaking Coefficient	1.0	
Rainfall Intensity	77.19	mm/hr
Pre-Development Peak Flow	179.25	l/s
Return Rate	5	year
Peaking Coefficient	1.0	
Rainfall Intensity	90.60	mm/hr
Pre-Development Peak Flow	210.39	l/s
Return Rate	10	year
Peaking Coefficient	1.0	
Rainfall Intensity	101.29	mm/hr
Pre-Development Peak Flow	235.22	l/s
Return Rate	25	year
Peaking Coefficient	1.1	
Rainfall Intensity	118.51	mm/hr
Pre-Development Peak Flow	302.75	l/s
Return Rate	50	year
Peaking Coefficient	1.2	
Rainfall Intensity	130.18	mm/hr
Pre-Development Peak Flow	362.78	l/s
Return Rate	100	year
Peaking Coefficient	1.25	
Rainfall Intensity	142.99	mm/hr
Pre-Development Peak Flow	415.07	l/s

Post-Development Peak Flows

Storm (yrs)	City of Port Colborne Coeff A	Coeff B		Modified Rational Method Q= CaCIA/360	
				Where:	
2	755	0.789	8.0	Q-	Flow Rate (m3/s)
5	830	0.777	7.3	Ca-	Peaking Coefficient
10	860	0.763	6.5	C-	Rational Method Runoff Coefficient
25	900	0.745	5.2	I-	Storm Intensity (mm/hr)
50	960	0.736	5.1	A-	Area (ha)
100	1020	0.731	4.7		

Area #	Developed Area	
Area	2.17	ha
Runoff Coefficient	0.42	
Time of Concentration	10.0	min
Return Rate	2	year
Peaking Coefficient	1.0	
Rainfall Intensity	77.19	mm/hr
Post-Development Peak Flow	192.97	l/s
Return Rate	5	year
Peaking Coefficient	1.0	
Rainfall Intensity	90.60	mm/hr
Post-Development Peak Flow	226.50	l/s
Return Rate	10	year
Peaking Coefficient	1.0	
Rainfall Intensity	101.29	mm/hr
Post-Development Peak Flow	253.22	l/s
Return Rate	25	year
Peaking Coefficient	1.1	
Rainfall Intensity	118.51	mm/hr
Post-Development Peak Flow	325.92	l/s
Return Rate	50	year
Peaking Coefficient	1.2	
Rainfall Intensity	130.18	mm/hr
Post-Development Peak Flow	390.54	l/s
Return Rate	100	year
Peaking Coefficient	1.25	
Rainfall Intensity	142.99	mm/hr
Post-Development Peak Flow	446.83	l/s

Allowable Release Rate

$$Q = P_{pre} - Q_U$$

Where:

Q = Allowable Post-Development Release Rate
Q_{PRE} = Pre-Development Flow
Q_U = Post-Development Uncontrolled Flow

Storm	Pre-Development Flow	Post- Development Uncontrolled Flow	Allowable Outflow
(yrs)	Qpre (l/s)	Q_U (l/s)	Q (l/s)
2	179.2	0.0	179.2
5	210.4	0.0	210.4
10	235.2	0.0	235.2
25	302.7	0.0	302.7
50	362.8	0.0	362.8
100	415.1	0.0	415.1

Quantity Control Volume Calculations

Developed catchment Area

Drainage Area (ha)	**2.17**
Runoff Coeff. (C)	**0.42**
Time of Concentration	10 min
Time Step	1 min
Controlled Release Rate (Q_C) (l/s)	179.2 - 415.1
Max. Storage Required (m3)	**59**

Results

Storm Event (yr)	Storage (m3)	Time (min)
2	21.7	5
5	26.2	5
10	30.3	5
25	42	4
50	50.1	4
100	59	4

Required Storage Volumes (2yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	133.37	336.1	20.2	10.8	9.4
2	122.73	309.3	37.1	21.5	15.6
3	113.84	286.9	51.6	32.3	19.4
4	106.29	267.8	64.3	43.0	21.3
5	99.78	251.4	75.4	53.8	21.7
6	94.11	237.2	85.4	64.5	20.9
7	89.13	224.6	94.3	75.3	19.0
8	84.70	213.5	102.5	86.0	16.4
9	80.75	203.5	109.9	96.8	13.1
10	77.19	194.5	116.7	107.5	9.2

:Maximum Storage Volume

Required Storage Volumes (5yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	160.31	404.0	24.2	12.6	11.6
2	146.75	369.8	44.4	25.2	19.1
3	135.55	341.6	61.5	37.9	23.6
4	126.14	317.9	76.3	50.5	25.8
5	118.09	297.6	89.3	63.1	26.2
6	111.13	280.1	100.8	75.7	25.1
7	105.05	264.7	111.2	88.4	22.8
8	99.67	251.2	120.6	101.0	19.6
9	94.89	239.1	129.1	113.6	15.5
10	90.60	228.3	137.0	126.2	10.7

:Maximum Storage Volume

Required Storage Volumes (10yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	184.85	465.8	28.0	14.1	13.8
2	168.02	423.4	50.8	28.2	22.6
3	154.35	389.0	70.0	42.3	27.7
4	143.00	360.4	86.5	56.5	30.0
5	133.41	336.2	100.9	70.6	30.3
6	125.19	315.5	113.6	84.7	28.9
7	118.05	297.5	124.9	98.8	26.1
8	111.78	281.7	135.2	112.9	22.3
9	106.24	267.7	144.6	127.0	17.5
10	101.29	255.2	153.1	141.1	12.0

:Maximum Storage Volume

Required Storage Volumes (25yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	231.16	640.8	38.4	18.2	20.3
2	206.79	573.2	68.8	36.3	32.5
3	187.69	520.3	93.7	54.5	39.2
4	172.27	477.5	114.6	72.7	42.0
5	159.53	442.2	132.7	90.8	41.8
6	148.79	412.5	148.5	109.0	39.5
7	139.61	387.0	162.5	127.2	35.4
8	131.65	364.9	175.2	145.3	29.8
9	124.68	345.6	186.6	163.5	23.1
10	118.51	328.5	197.1	181.6	15.5

:Maximum Storage Volume

Required Storage Volumes (50yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	253.67	767.1	46.0	21.8	24.3
2	226.85	686.0	82.3	43.5	38.8
3	205.89	622.6	112.1	65.3	46.8
4	188.98	571.5	137.2	87.1	50.1
5	175.02	529.3	158.8	108.8	49.9
6	163.27	493.7	177.7	130.6	47.1
7	153.23	463.4	194.6	152.4	42.2
8	144.53	437.1	209.8	174.1	35.7
9	136.91	414.0	223.6	195.9	27.7
10	130.18	393.7	236.2	217.7	18.5

:Maximum Storage Volume

Required Storage Volumes (100yr)

T	$I = A/(t+B)^C$	$Q_R = 0.0028(C.Ca.I.A)$	$V_R = Q_R.T.60$	$V_C = Q_C.T.60$	$V = V_R - V_C$
Time	Rainfall Intensity	Runoff	Runoff Vol.	Controlled Release Vol.	Storage Vol.
(min)	(mm/hr)	(l/s)	(m3)	(m3)	(m3)
1	285.80	900.3	54.0	24.9	29.1
2	253.94	799.9	96.0	49.8	46.2
3	229.39	722.6	130.1	74.7	55.4
4	209.80	660.9	158.6	99.6	59.0
5	193.76	610.4	183.1	124.5	58.6
6	180.35	568.1	204.5	149.4	55.1
7	168.95	532.2	223.5	174.3	49.2
8	159.12	501.2	240.6	199.2	41.4
9	150.54	474.2	256.1	224.1	31.9
10	142.99	450.4	270.2	249.0	21.2

:Maximum Storage Volume

PRE-DEVELOPMENT (Runoff coefficient)

Ref.: Runoff Coefficients, Section 22, Appendix C, MTO Drainage Management Manual 1997 design chart 1.07 for rural & urban and Table 4.1, Stormwater Management Guidelines, Niagara Region, 2022.

Entire Site Boundary

Land Use	Runoff Coefficient "C"	% Imperviousness	Total Area (m^2)	A × C	A × % Imp.
Concrete Pad	0.95	100	459.7	436.7	459.7
Driveway	0.95	100	841.3	799.2	841.3
Parkland	0.35	0.0	329628.4	115369.9	0.0
Weighted Average			**330929.4**	**0.35**	**0.39%**

Developed Area

Land Use	Runoff Coefficient "C"	% Imperviousness	Total Area (m^2)	A × C	A × % Imp.
Concrete Pad	0.95	100	459.7	436.7	459.7
Driveway	0.95	100	841.3	799.2	841.3
Parkland	0.35	0.0	20355.3	7124.3	0.0
Weighted Average			**21656.3**	**0.39**	**6.0%**

POST-DEVELOPMENT (Runoff coefficient)

Ref.: Runoff Coefficients, Section 22, Appendix C, MTO Drainage Management Manual 1997 design chart 1.07 for rural & urban and Table 4.1, Stormwater Management Guidelines, Niagara Region, 2022.

Entire Site Boundary

Land Use	Runoff Coefficient "C"	% Imperviousness	Total Area (m^2)	A × C	A × % Imp.
Building	0.95	100	93	88.4	93
Driveway/Walkway	0.95	100	994.3	944.6	994.3
Parking	0.95	100	74.3	70.6	74.3
Concrete Pad	0.95	100	459.7	436.8	459.7
Storage	0.95	100	746	708.7	746
Parkland	0.35	0.0	328,562.1	114,996.7	0.0
Weighted Average			**330929.4**	**0.35**	**0.72%**

Developed Area

Land Use	Runoff Coefficient "C"	% Imperviousness	Total Area (m^2)	A × C	A × % Imp.
Building	0.95	100	93	88.4	93
Driveway	0.95	100	994.3	944.6	994.3
Parking	0.95	100	74.3	70.6	74.3
Concrete Pad	0.95	100	459.7	436.8	459.7
Storage	0.95	100	746	708.7	746
Parkland	0.35	0.0	19,289.0	6751.1	0.0
Weighted Average			**21656.3**	**0.42**	**10.9%**

APPENDIX VIII- DETAILS FOR LID

Swale Size Calculation

S = 0.5%, Width = 1.2m, Depth = 0.5m, Freeboard = 0.1 m

Manning Formula Uniform Trapezoidal Channel Flow at Given Slope and Depth

0th Forks Rd

Swale Flow Capacity

Inputs

Bottom width, b	1.2	m
Side slope 1 (horiz./vert.)	3	
Side slope 2 (horiz./vert.)	3	
Manning roughness, n ? ◯Strickler ◯B/B (See notes)	0.03	
Channel slope, S	0.5	% rise/run
Flow depth, y	0.40	m
Bend Angle ? (for riprap sizing)	0	
Rock specific gravity (2.65)	2.65	
Design rock size, D50 ◯Isbash ◯Maynord ◯Searcy * 1.25 (See notes)	0	m

Results

Flow area, a	0.9600	m^2
Wetted perimeter, P_w	3.7298	m
Hydraulic radius, R_h	0.2574	m
Velocity, v	0.9537	m/s
Flow, Q	915.5675	l/s
Velocity head, h_v	0.0464	m
Top width, T	3.6000	m
Froude number, F	0.59	
Average shear stress (tractive force), tau	12.6196	N/m^2
n for design rock size per Strickler	0.0277	
n for design rock size per Blodgett	0.0390	
n for design rock size per Bathurst	0.0252	
Blodgett vs. Bathurst	Blodgett	
Required bottom angular rock size, D50 (Isbash & MC) ?	0.0345	m
Required side slope 1 angular rock size, D50 (Isbash & MC) ?	0.0364	m
Required side slope 2 angular rock size, D50 (Isbash & MC) ?	0.0364	m
Required angular rock size, D50 (Maynord, Ruff, and Abt 1989)	0.0306	m
Required angular rock size, D50 (Searcy 1967)	0.0200	m