



**STORMWATER BRIEF
RECREATIONAL CONCRETE PAD
100 STOKES TRAIL
MILTON (CAMPBELLVILLE), ON**

Prepared for:

IBW SURVEYORS LTD
for the Property Located at
100 Stokes Trail
Milton ON L0P 1B0

June 30, 2023

1. INTRODUCTION

Phoenix Engineering Services (**Phoenix**) was retained by IBW Surveyors Ltd. (**IBW**) to prepare a stormwater brief for an existing recreational concrete pad installation on a residential property located at 100 Stokes Trail, Milton (Campbellville), ON (**Figure 1**). The stormwater brief was requested by the Town of Milton to support approval of the existing recreational pad in the rear yard of the property. The stormwater brief is limited to assessing the pre-development and post-development runoff from the area of the existing pad and ensuring sufficient underground storage capacity is developed on site to restrict post-development runoff to pre-development condition. Due to the small area involved, the Rational Method was used to calculate runoff volume. An estimation of infiltration drawdown was performed for the infiltration gallery and French drain installation.

2. SITE DESCRIPTION

ERTL-Hunt Surveyors, a division of IBW Surveyors Ltd., conducted an existing conditions survey for the property and provided the information on a plan dated February 14, 2023 (**Appendix A**). The property is located on the west side of Stokes Trail and includes a 2-storey residence, 1-storey building, swimming pool, patios and the subject recreational concrete pad. The recreational pad is approximately 26 m long and 13 m wide (338m²). The centre of the pad is slightly elevated (0.03 m) above the perimeter with a gradual slope of 0.4% from the middle of the pad to the perimeter. The undisturbed manicured ground to the north and west slopes gently downward from the property line towards the edge of the pad. The south and east side is bordered by manicured lawn and patios. The installation includes French drains along the east and west side of the recreational pad and an infiltration gallery close to the northeast and southwest corners of the pad.

Review of publicly available well data indicates bedrock and groundwater are approximately 22 m and 28 m below ground level, respectively and therefore has no bearing on the design of the infiltration gallery. The soil is assumed to be a sandy loam.

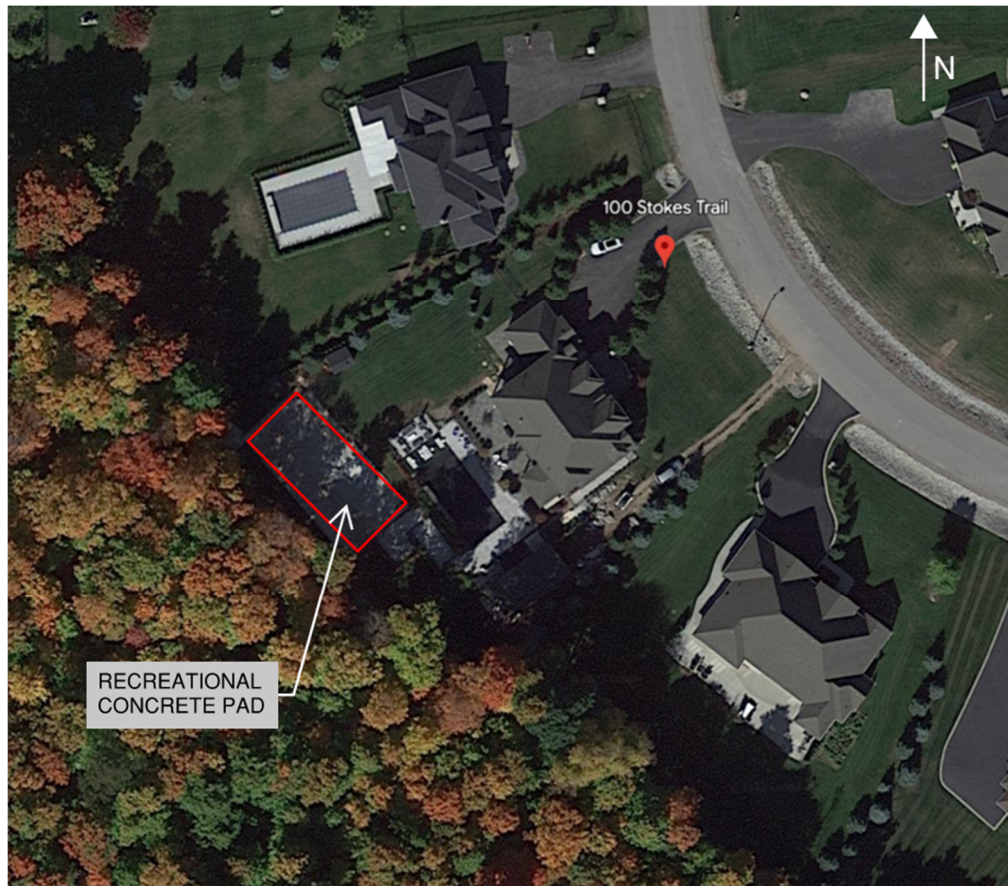


FIGURE 1: Location Plan – 100 Stokes Trail, Milton (Campbellville), ON

3. STORMWATER CALCULATIONS

The runoff volume for the area occupied by the recreational concrete pad was determined using the Rational Method of stormwater analysis utilizing Intensity-Duration-Frequency (IDF) data from the Town of Milton, Engineering and Parks Standards, 2019.

The Rational Method equation is:

$$Q = (C \times i \times A) / 360$$

where

Q = Quantity of Runoff

C = Runoff Coefficient

i = Rainfall Intensity (mm/hr)

A = Contributing Area (hectares)

The analysis was performed utilizing the IDF data presented in Table 1 below:

TABLE 1: Rainfall IDF Data – Town of Milton

Duration	2 - year (mm/hr)	5 - year (mm/hr)	10 - year (mm/hr)	25 - year (mm/hr)
5 minutes	107.4	141.5	164.2	192.7
10 minutes	79.0	103.5	119.8	140.3
15 minutes	65.3	86.5	100.7	118.5
30 minutes	43.0	57.0	66.3	78.0
60 minutes	24.3	32.2	37.5	44.1
120 minutes	14.2	19.2	22.5	26.7
360 minutes	6.2	8.5	10.1	12.1
720 minutes	3.5	4.9	5.9	7.1
1440 minutes	2.0	2.8	3.3	4.0

PRE-DEVELOPMENT CONDITION

As previously noted, the recreational concrete pad was constructed over an area which was previously a manicured lawn and a 0.25 Runoff Coefficient was utilized for the pre-development runoff calculations.

Runoff volume for the pre-development condition for various storm durations are shown below.

Storm Event/Duration	PRE-DEVELOPMENT C=0.25 (m3)
2-yr 1,440 minutes	3.9
5-yr 1,440 minutes	5.4
10-yr 1,440 minutes	6.4
25-yr 1,440 minutes	7.8

POST-DEVELOPMENT CONDITION

The recreational pad is a concrete slab and a 0.90 Runoff Coefficient was utilized for the post-development runoff calculations. The existing conditions survey indicates the central area of the recreational concrete pad has a slight elevation which promotes runoff to the perimeter of the pad. This does not impact overall runoff volume but does result in storage being required to the northeast and southwest of the pad, as shown on the attached drawing. Runoff volume for the post-development condition for various storm durations are shown below.

Storm Event/Duration	POST-DEVELOPMENT C=0.90 (m ³)
2-yr 1,440 minutes	14.0
5-yr 1,440 minutes	19.6
10-yr 1,440 minutes	23.1
25-yr 1,440 minutes	28.0

UNDERGROUND STORAGE REQUIREMENTS

In order to control post-development flows to pre-development conditions, the excess flow must be managed. For the current project, two underground infiltration galleries or soakaway pits are included in the design, along with French drains to capture sheet flow from the recreational concrete pad. The required volume to be controlled is post-development runoff of 28.0 m³ minus pre-development runoff of 7.8 m³ for a net volume of 20.2 m³ of water.

The infiltration galleries are backfilled with 50 mm clear stone with a void ratio of 40% and the French drains backfilled with 19mm clear stone with a similar void ratio. Accordingly, in order to achieve the required water volume in the infiltration galleries and French drains, the stormwater control measures will need to be constructed with a combined minimum excavation volume of 50.5 m³ (runoff volume 20.2 m³ / 0.40 voids).

Utilizing the two infiltration galleries and French drains as illustrated on the attached drawing provides sufficient capacity to control a 24-hr / 25-year storm event to pre-development conditions.

Assuming a nominal infiltration rate of 15 mm/hr results in a 50% drawdown in 18 hrs and complete drawdown in approximately 36 hours post storm event. This drawdown is deemed acceptable for this location.

As an alternative to excavations filled with clean stone, the required storage volume and infiltration can be achieved through the use of a variety of technical solutions such as modular cubes or open bottom chambers. Assessment of the alternatives is beyond the scope of the current assignment.

4. CONCLUSION

The combined size of the underground galleries and French drains backfilled with clean stone as shown on the attached drawing is 58.8 m³ and is sufficient to control post-development runoff to the pre-development conditions for a 24-hr / 25-year storm event. This volume will manage 20.2 m³ of runoff from the recreational concrete pad. The water can be managed utilizing underground infiltration galleries and French drains adjacent to the recreational concrete pad.

Should you have any questions or concerns, please contact the undersigned.

Respectfully submitted,
Phoenix Engineering Services



Steve Clark, M.Sc., P.Eng.
Senior Project Engineer

Email: steveatphoenix@gmail.com

APPENDIX

A SITE PLAN



KEY PLAN - NOT TO SCALE

- GENERAL NOTES**
1. GENERALLY, DRIVEWAY TO BE LOCATED TO MAXIMIZE SHEET FLOW DRAINAGE FROM HOUSE, DRIVEWAY, ETC.
 2. GENERALLY, DRIVEWAYS TO BE GRADED WITH 2.0% MIN. CROSS FALL.
 3. WHERE DITCHING IS REQUIRED, 9.0M MINIMUM 450MM LO-HED EQUIV. CSP'S ARE TO BE INSTALLED UNDER PROPOSED DRIVEWAYS.
 4. GENERALLY, HOUSE TO BE CONSTRUCTED UPON A 300MM, (MIN. VERTICAL) APRON WITH THE TOE OF THE APRON MEETING EXISTING GRADE OF LOT.
 5. GRADING OF THE APRON (I.E. WITHIN 2-4 M OF THE BUILDING) SHOULD BE MAINTAINED AT STANDARD GRADE OF BETWEEN 2% AND 5%. (MIN.)
 6. AREAS DISTURBED BY LOT GRADING SHALL BE LIMITED TO THOSE AREAS NECESSARY TO CONSTRUCT HOME, DRIVEWAY & SEPTIC BED.
 7. DOWNSPOUTS TO BE CONSTRUCTED TO SPLASH BLOCKS.
 8. MAINTAIN MINIMUM 1.22M COVER FOR FOOTINGS.
 9. STEP FOOTINGS WHERE REQUIRED.
 10. DRIVEWAYS TO DRAIN TO STREET.

UNDERSIDE OF FOOTING MAY BE LOWER THAN ELEVATION NOTED DUE TO EXISTING CONDITIONS. EXACT DEPTH OF FOOTING TO BE DETERMINED ON SITE DURING EXCAVATION FOR FOOTING

PLAN NOTES

ELEVATIONS ARE GEODETIC AND REFERRED TO THE CANADIAN GEODETIC VERTICAL DATUM (CGVD28) BY DIRECT MEASUREMENT TO A REAL TIME NETWORK. DISTANCES AND COORDINATES SHOWN ON THIS PLAN ARE METRIC AND CAN BE CONVERTED TO IMPERIAL BY DIVIDING BY 0.3048.

PROPERTY DIMENSIONS SHOWN HEREON ARE IN ACCORDANCE WITH IBW SURVEYORS RECORDS. (PROJECT NUMBER 39294)

REVISIONS

rev.	Date	COMMENTS
1	2023/FEB./14	ISSUED FOR REVIEW
2	2023/JULY/05	REVISED AS PER SWM REPORT
3	yyyy.mm.dd	

LEGEND

FFE	FIRST FLOOR ELEVATION	←	SWALE DRAINAGE
TFE	TOP OF FOUNDATION ELEVATION	←	SHEET DRAINAGE
BFE	BASEMENT FLOOR ELEVATION	●	ROOF LEADER
UFE	UNDERSIDE OF FOOTING ELEVATION	⊙	MH MAINTENANCE HOLE
123.45	EXISTING SPOT ELEVATION	⊙	CB CATCH BASIN
+100.00	PROPOSED ELEVATION	⊙	UP UTILITY POLE
DSE	DOOR SILL ELEVATION	⊙	WV WATER VALVE
WW	WINDOW WELL	⊙	FH FIRE HYDRANT
		⊙	AD AREA DRAIN
		⊙	DT DECIDUOUS TREE
		⊙	CT CONIFEROUS TREE
		⊙	SHRUB
		⊙	SILT FENCE

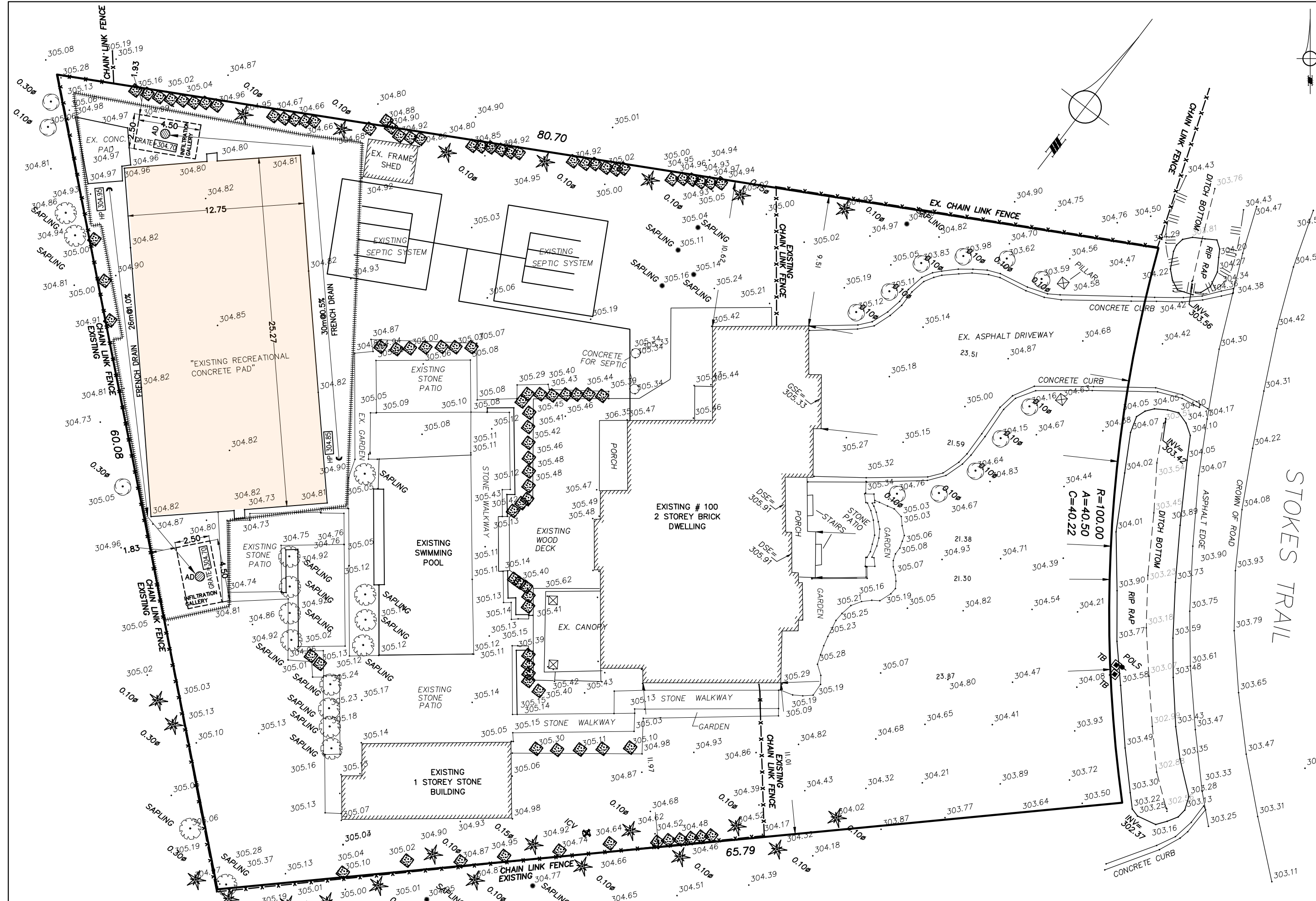
SURVEYOR'S CERTIFICATE

I HAVE REVIEWED THIS GRADING PLAN FOR THE DWELLING #100 STOKES TRAIL. IT IS MY BELIEF THAT THE GRADES AS SHOWN WILL PRODUCE ADEQUATE SURFACE DRAINAGE WITHOUT DETRIMENTAL EFFECT ON ADJACENT PROPERTIES.

JULY 05, 2023
 Date
 LAWRENCE O. ERTL
 Ontario Land Surveyor

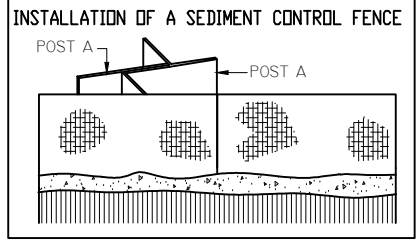
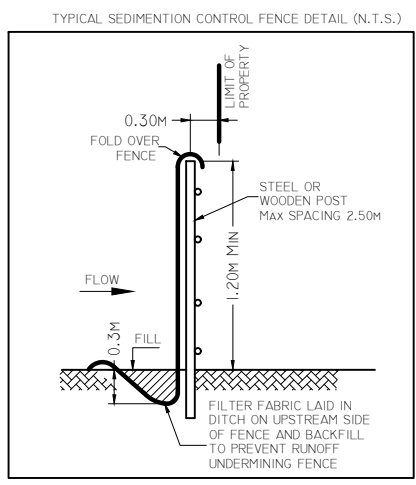
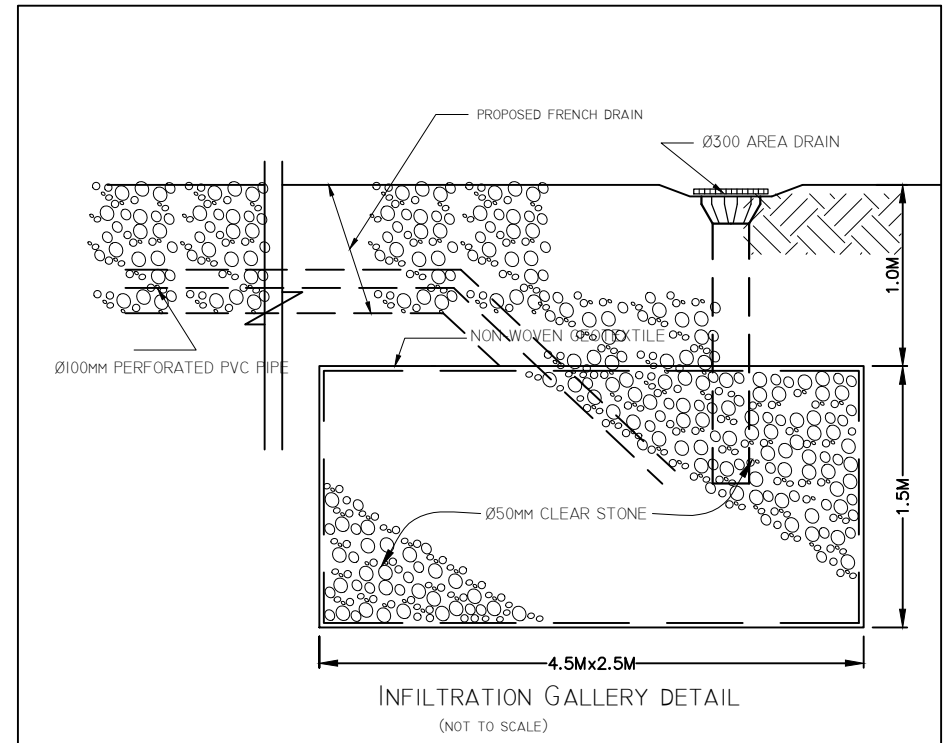
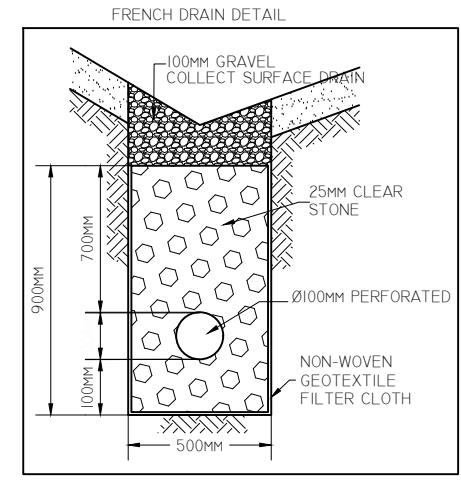
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PARTY CHIEF: DRAWN BY: FY CHECKED BY: JC
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**STORM MANAGEMENT
 (AS PER ENG. SWM REPORT)**

Need STORAGE Volume=50.5 m³
 1. Soakway Pit Volume (4.5x2.5x1.5)+(4.5x2.5x1.5)=16.8x2=33.6 m³
 2. FRENCH DRAIN (56mX0.5X0.9)=25.2 m³
 3. STORMWATER VOLUME REQUIREMENT TO CONTROL POST-DEVELOPMENT TO PRE-DEVELOPMENT FLOWS FOR THE RECREATIONAL PAD = 20.2 m³. ASSUMING 40% Voids WITH NOMINAL 50mm DIAMETER STONE BACKFILL REQUIRES EXCAVATION VOLUME OF 20.2 / 0.4 = 50.5 m³. PROPOSED EXCAVATIONS PROVIDE (33.6+25.2=58.8 m³) AND SATISFY THE STORMWATER REQUIREMENTS.



- NOTE**
1. 1.8M METAL POSTS & SNOW FENCE MUST BE USED.
 2. EXCAVATE TRENCH ALONG THE LOWER PERIMETER OF THE SITE.
 3. UNROLL FILTER FABRIC AND POSITION (ACCORDING TO DIAGRAM ABOVE) WITH THE POST ON THE DOWNSTREAM SIDE OF THE TRENCH.
 4. DRIVE POST INTO GROUND UNTIL FILTER FABRIC REACHES TRENCH BOTTOM. CURB FABRIC TOWARDS CENTER OF TRENCH AND DRIVE POST FURTHER IF NEEDED.
 5. BACKFILL AND COMPACT SOIL AGAINST THE FENCE. DO NOT TRENCH COMPLETELY.
 6. FENCE TO BE PLACED 0.60M INSIDE PROPERTY LINE.
 7. FILTER FABRIC TO BE SECURED TO SNOW FENCE WITH WIRE TIES.
 8. T-BAR POST SPACING - 5.0M.
 9. FILTER FABRIC TO BE HAVE A NON-WOVEN DENSITY OF 210G OR EQUIVALENT.

CAUTION
 THIS IS NOT A LEGAL LAND SURVEY AND SHALL NOT BE USED EXCEPT FOR THE PURPOSE INDICATED IN THE TITLE BLOCK. THE WORK AND DRAWINGS HEREIN WERE COMPLETED FOR THE EXCLUSIVE USE OF OUR CLIENT AND NO LIABILITY IS ASSUMED TO ANY THIRD PARTIES OR SUBSEQUENT OWNERS.

NOTE
 WELL RECORD DATA INDICATES DEPTH TO BEDROCK = 22m AND DEPTH TO GROUNDWATER = 28m BELOW GROUND SURFACE.

LICENCED PROFESSIONAL ENGINEER
 S. L. CLARK
 JULY 6, 2023
 PROVINCE OF ONTARIO

**FOR GRADING,
 EROSION/
 SEDIMENTATION
 CONTROL AND
 INFILTRATION**