

Civil and Municipal
Engineering

ARK Engineering and Development

Servicing Report:
**Potable Water Supply Assessment, Sewage,
Storm and Stormwater**

6075 Bank St.
Greely Village Centre
Greely, Ontario

Prepared For
Greely Family Farm Inc.

ARK Engineering
and Development
2691 Old Highway 17
Rockland, Ontario
Tel: (613) 858-6443
ARKEngineering@rogers.com

Revised: December 2019

**POTABLE WATER SUPPLY ASSESSMENT, SEWAGE,
STORM AND STORMWATER**

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SERVICEABILITY REPORT

1.0 BACKGROUND

1.1 General

The proposed site plan situated at 6075 Bank St. located on the East-Southern side of the intersection of Parkway Rd. and Bank St. (refer to the location map SK-1 in appendix A). The proposed site plan will consist of 1 x 10,000 ft² and 3 x 6,000ft² retail/office building mix. These buildings will be serviced by some existing private infrastructure which will be described below.

1.2 Existing Services

This area of commercial development in Greely has no City sanitary, storm and watermain to service this land. All proposed services will be privately owned. The sanitary sewer will be connected to an existing private network system. The storm runoff will be directed to an existing SWM facility and private individual wells will provide the drinking water to these buildings.

An internal Road Network as shown on the location map in Appendix A, will provide this site plan with one main connection access point from Village Center Place to the existing site plan located just north of the proposal. A vehicular and pedestrian linkage sketch is also enclosed.

All utilities (Hydro, Bell Cable and Gas) are available and have been installed up to the property line.

1.3 Geotechnical Report

For all Geotechnical inquiries refer to the Paterson Group following documentation:

Report: No. PG3957-1R, dated March 27, 2017

Letter: PG4777-LET.01R, July 25, 2019

Letter: PG4777-LET.02, July 25, 2019

Letter: PG4777-LET.03, July 25, 2019

Letter: PG4777-LET.04, Sept 13, 2019

Letter: PG4777-LET.01R2, Sept 13, 2019

Letter: PG4777-LET.05, Nov 4, 2019

Letter: PG4777-LET.03R, Dec 20, 2019

Letter: PG4777-LET.01R4, Dec 20, 2019

2.0 PROPOSED SERVICES

2.1 Existing Potable Water Supply Assessment Findings

Back on November 2016, a *Potable Water Supply Assessment* was prepared by Paterson Group for this 20 acre parcel to confirm whether a well could provide adequate water supply (quantity and quality) to support a 4.7 acre commercial development.

At the time, a test well test was drilled. A pumping test was completed at this well which showed a very high yield. The drawdown was approximately 5 cm and achieved a 95% recovery almost immediately. Furthermore, as identified in Table 2 of this report the recommended pump rate for this well is 91 L/min (1.52 L/s), excerpt found in Appendix A.

This existing commercial development has an estimated peak daily water demand of 36,763 L/day, based on Table 8.2.1.3 B of the OBC (excerpt from page 16 of the approved report). This demand is still far less than the 131,040 L/day recommended pump rate of this test well.

Furthermore, as added comfort, page 15 of the approved report (excerpt found in Appendix A) states the following:

"The results of the 20 year safe yield analysis show that the well could be pumped at up to 1370 L/min continuously without causing an adverse impact to surrounding well users."

2.2 Supplemental Potable Water Supply Assessment

As part of the commercial phasing another 3.5 acres will be developed and serviced by a private well. The following will demonstrate once again that the targeted aquifer is more than adequate to support this new commercial phase.

The scope of the report is limited to the description of the potential yield quantity and quality of the bedrock water supply aquifer intercepted by a drilled well, as it relates to the future servicing potential for the proposed development within the area of the subject site.

A new drilled well (designated TW1, refer to Appendix "B" for MOE well record) was installed at the site on March 21, 2019 by D & R Drilling of St-Albert, Ontario (Well Contractor License No.3773). The new well was drilled to a total depth of 109.09 m. Steel casing was installed to a depth of approximately 70m. The test well was constructed in general conformance with the well construction requirements for the adjacent development within plan 4M-1398. As per the approved "Consolidated Terrain Analysis and Hydrogeological Study Report", which requires all wells to be cased "through the limestone formation and extend into the sandstone formation".

Table 1: Test Well summary

Well ID	Year Drilled	Depth to Bedrock (m)	Depth of Water Bearing Fractures (m)	Total Depth (m)	Recommended Pumping Rate (L/min)
A258613	2019	6.96	30.30 57.57 108.18	109.09	45.0

The pump test was conducted in general accordance with Ontario Ministry of the Environment, Conservation and Parks (MECP) guidance document Procedure D-5-5: Technical Guideline for Private Wells: Water Supply Assessment (MOEE, 1996).

A pumping test at TW1 on March 21, 2019 was conducted. A pumping rate of 54 L/min was selected with the expectation that the rate would stress the aquifer enough to result in a demonstrable reduction in potentiometric head (i.e. a lowering of the static water level) within the test well. The pumping test was carried out for a 6 hour duration.

During the test the pumping rate was monitored at regular intervals to ensure the rate of discharge remained constant (i.e. < 5% variation). Drawdown observations during pumping and recovery were recorded using manual measurements taken with an electronic water level tape.

Drawdown observations during the pumping and recovery were recorded using manual measurements using an electronic water level tape. Over the course of the pumping test, the water level in the well dropped by 0.04m within minutes then it maintained its level through out the 6 hours in which it was then allowed to recover. No real recovery data was collected for the well following the completion of pumping since the 95% recovery was achieved almost immediately.

Field testing for chlorine was carried out at the time of sampling. Groundwater samples were collected in laboratory supplied bottles and preserved in the field using established sampling protocol. The samples were stored in a dedicated sample cooler maintained at a temperature between 4 and 10 degrees Celsius. The water samples were submitted to the Eurofins within one (1) hour of collection for standard "Sub. Package", refer to Appendix "B".

Turbidity measurements were taken using a Hanna C114 turbidity meter at the well head at regular intervals during the pumping test and the reading at the time of the sampling (6 hour mark) was below 1.0 NTU. Free chlorine residual measurements were taken using a Hach™ Pocket Colorimeter IITM handheld unit immediately prior to the collection of each groundwater sample.

Table 1: Testing Results

Parameters	Results
Pumping Rate (L/min)	54.0
Static Water Level at start of test (m)	3.26
Static Water Level at end of test (m)	3.22
Total Drawdown during test (m)	0.04
Available Drawdown (m)	105.83
% Drawdown during pumping test	0.037%
Transmissivity	1,095
Specific Capacity (L/min/m)	1,350

The pumping test drawdown plot for TW1 is provided in Appendix "B". As for the recovery data since it was practically instantaneous no data was able to be recorded. The drawdown data provided was measured with reference to the top of the well casing at the test well location.

The pumping test data for the test well was analyzed using the method of Cooper and Jacob (1946). This method provides a reasonable estimate of the aquifer transmissivity.

Transmissivity was calculated using the following relationship:

$$T = \frac{2.3Q}{4\pi ds}$$

Where:

- Q = pump rate, m³/day
- ds = change in drawdown over one time log cycle, m
- T = transmissivity, m²/day

Based on the pumping test drawdown data the transmissivity of the aquifer is estimated to be about **1095m²/day**.

For the new proposed commercial buildings the daily water demand has been estimated based on the sanitary sewer design sheet flow and by increasing its demand by 20% (as instructed by the City of Ottawa). The proposed development would have an estimated demand of 31.7 L/min. Refer to Section 2.3 Sewage for a summary of the estimated sewage flow.

This is approximately 59% less than the rate utilized during the pumping test (54 L/min.). Given that the well totally recovered practically immediately of termination of pumping at a rate of 54 L/min, the water supply aquifer intercepted will provide the necessary well yield without mining the aquifer in the long term.

Based on the above there is water of sufficient quantity present in the water supply aquifer beneath the site to support the four new commercial buildings on a single well.

Water Quality

Water quality analysis data from TW1 is summarized in Table 2 (below). Laboratory certificates of analysis are included in Appendix "B".

Table 2: Groundwater Geochemistry - TW1

PARAMETER	UNITS	ODWS		6045 Bank St. Ex. Well*	NEW TW1
		TYPE	LIMIT		
MICROBIOLOGICAL PARAMETERS					
Escherichia Coli	ct/100 mL	MAC	0	0	0
Faecal Coliforms	ct/100 mL	-	-	0	0
Heterotrophic Plate Count	ct/100 mL	-	-	21	0
Total Coliforms	ct/100 mL	MAC	0	0	0
CHEMICAL PARAMETERS (HEALTH)					
F	mg/L	MAC	2.4	0.28	0.39
N-NO2	mg/L	MAC	10	<0.10	<0.10
N-NO3 (Nitrate)	mg/L	MAC	10	<0.10	<0.10
CHEMICAL PARAMETERS WITH AESTHETIC OBJECTIVES/OPERATIONAL GUIDELINES					
Alkalinity	mg/L	OG	500	223	226
Cl	mg/L	AO	250	127	122
Colour	TCU	AO	5	<2	<2
DOC	mg/L	AO	5	1.2	1.3
pH		OG	6.5-8.5	8.0	8.5
SO4	mg/L	AO	500	82	78
Hardness	mg/L	OG	100	298	297
Na	mg/L	AO	200	76	84
Fe	mg/L	AO	0.30	0.20	0.66
Mn	mg/L	AO	0.05	0.03	0.03
TDS	mg/L	AO	500	606	625
Turbidity (lab)	NTU	AO/MAC	5/1	2.1	1.3
S2-	mg/L	AO	0.05	<0.02	<0.01

* water results from 6045 Bank St. - *Potable Water Supply Assessment* prepared by Paterson Group

The water results of this targeted aquifer are well in line with the results from the 6045 Bank St. *Potable Water Supply Assessment* prepared by Paterson Group which are also included above for reference.

The analytical results show that water quality at the subject site is acceptable and that there are no exceedances of the applicable health related parameter limits of the Ontario Drinking Water Standards (ODWS).

With respect to aesthetic objectives and operational guidelines, the analytical results indicate the following exceedances:

- Hardness
- TDS
- Iron

Hardness

Hardness, an operational guideline, does not appear in the ODWS. Rather it appears in the Technical Support Documents for Drinking Water Standards, Objectives, Guidelines (Technical Support Documents) as a parameter with an operational guideline of 100 mg/L. At the measured concentrations, the water is considered to be very hard, however it is below the reasonable treatment limit of 500 mg/L specified in Table 3 of the guidance document, titled, "Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment", published by MOECC (MOE, 1995).

TDS

Total dissolved solids (TDS) refers to the concentration of inorganic substances dissolved in water. The main constituents are typically chloride, sulphates, calcium, magnesium and bicarbonates. Procedure D-5-5 does not provide a 'treatability limit' for TDS, but it does require written rationale that corrosion, encrustation, or taste problems will not occur.

The Langelier Saturation Index is used to predict the calcium carbonate stability of water. It indicates whether the water will precipitate, dissolve, or be in equilibrium with calcium carbonate. The results of the Langelier calculation ($LSI = +1.3$) indicate that the water is supersaturated with respect to calcium carbonate ($CaCO_3$) and scale forming may occur but non corrosive. Refer to Appendix "B".

Iron

The iron level at TW1 after the six hours of pumping was 0.66mg/L, which exceeds the ODWS aesthetic objective of 0.30 mg/L. The iron level is well within the MOE treatability limit of 5.0 milligrams per litre using a water softener.

Sodium

The sodium level in the water was reported to be 84 mg/L. The ODWSOG states that *"the local Medical Officer of Health should be notified when the sodium concentration exceeds 20 mg/l so that this information may be communicated to local physicians for their use with patients on sodium restricted diets."*

Well Water Treatment

The water within the bedrock aquifer displays slightly elevated hardness and iron. Installation of a standard commercial grade water softener will reduce the concentrations of hardness to acceptable levels. Some softeners can remove iron alternatively an iron filter can also be installed. Conventional water softeners introduce sodium into the water supply, so it may be appropriate to bypass the water softener with a separate tap for drinking water.

2.3 Sewage

The entire commercial development will be serviced by an existing private sanitary sewage treatment facility and an existing underground gravity sewer system all in accordance to MOE reference #2418-AVJRJ5 (refer to approved MOE report "Greely Village Centre - Sanitary sewer serviceability brief dated Aug. 2010)

This proposed development will be serviced by a new 200mm sanitary service which will be connected to the existing 200mm diameter sewer main on Village Centre Private. The design flows of the site have been determined as follows:

Design Flow for Commercial Use: 28,000 L/day/ha or 0.324 L/s/ha

Peaking Factor: 1.5

Site Area: 1.08 ha (which excludes the 20m ROW area of 0.336ha)

Extraneous Flow: 0.33 L/s/ha

Peak Design Flow (based on 12hrs of operation)

Flow = $((0.324 \text{ L/s/ha})(1.08\text{ha})(1.5) + (1.08\text{ha})(0.33 \text{ L/s/ha}))/2 = 0.44064 \text{ L/s or } 38,071 \text{ L/day}$

A sanitary sewer design sheet complete with a drainage area plan for the proposed internal sanitary sewers are provided in Appendix C. All internal sewers will be flowing well within their capacity. Further, based on the foregoing calculations, the receiving existing sanitary sewers have capacity for the proposed development.

2.4 Storm Sewer

The proposed site plan will be serviced by a network of storm sewers complete with catch basins in order to capture the runoff from the site. It will then be conveyed thru an existing open channel ditch which then discharges to the existing SWM facility.

These sewers will be designed to the 2 year event, a sewer design sheet for the proposed internal storm sewers is provided in Appendix C.

The City of Ottawa published a Technical Bulletin amending the *Sewer Design Guidelines* (October 2012) titled *Technical Bulletin PIED TB-2016-01 Revisions to Ottawa Design Guidelines - Sewer* (September 2016). The points identified in the technical bulletin applying to this development are summarized as follows.

1. Minimum storm sewer design and maximum HGL (Section 5.1.3.1) - The minimum sewer size for local streets is to the 2-year event without ponding.
2. Maximum allowable depth of flow on streets (Section 5.1.4) - The allowable flow depth in 2-year to 100-year storms is 350mm at the edge of pavement in 100-year storms + 20%.
3. Hydraulic Grade Line (HGL) in 100-year storm event (Section 5.1.4) - The HGL shall be 0.30m beneath the underside of footings of adjacent buildings in 100-year storm events.
4. The water level/HGL in the system must not touch any part of the building envelope and must remain below the lowest building opening during the 100-year storm event + 20%. (Section 5.1.4)
5. The maximum flow depth on streets (both public and private and on parking lots) under either static or dynamic conditions shall be 350mm during the 100-year storm event (Section 8.3.9.7).
6. The emergency overflow spill elevation must be 30cm below the lowest building opening. The plan view drawing must show the maximum ponding elevation based on the emergency spill contour line as opposed to the 100-year ponding limit.

Multiple storm sewer design sheets for the proposed internal storm sewers are provided in Appendix C complete with the open channel capacity calculations. All internal sewers will be flowing well within their capacity including the existing open channel ditch. Further, based on the foregoing calculations, the receiving existing storm sewers have capacity for the proposed development.

2.5 Stormwater Management

The following is to demonstrate that the proposed site plan application for 6075 Bank St. meets the SWM criteria previously approved in the J.F Sabourin report SWM Pond Design Brief - Commercial Phase Ultimate Conditions.

On the first table found in Appendix C, of the approved J.F. Sabourin report (refer to Appendix A for this table), the author applied an impervious value of 69% for entire rural commercial area identified as COM-1 (refer to enclosed Figure 4b.), the table and figure are found in Appendix "A" of my report.

The Tables 1 and 2 summarizes the modeled/approved conditions vs the proposed conditions of the imperviousness for these Blocks.

Table 1: Modeled Imperviousness

Hard (m ²)	Soft (m ²)	Area (m ²)
-	-	14,160
Runoff Coefficient		0.68
Total Impervious		69.0%

Table 2: Proposed Imperviousness

Hard (m ²)	Soft (m ²)	Total (m ²)
9,201	4,959	14,160
Runoff Coefficient		0.66
Total Impervious		66.0%

Once developed, this site will have an overall imperviousness of 66% which is still below the value of 69% applied in the modeling. Therefore, exceeding the requirements, thus, this will have no impact on stormwater management, since the pond has been designed, sized and constructed to accommodate the commercial development at an overall impervious value of 69%.

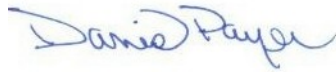
3.0 CONCLUSION

From the above statements the following can be concluded:

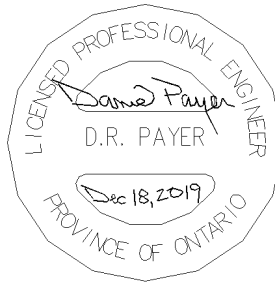
- i) This entire site can be serviced as proposed above.
- ii) The buildings will be serviced by a private sanitary/storm sewer and well.
- iii) The proposed site will drain overland towards the existing roadside ditch which ultimately discharges into an existing SWM pond which will provide adequate protection to the site and the environment.
- iv) The subject site is considered to be suitable for commercial development based on the available well water yield and quality as determined by this investigation.

Prepared by:

ARK Engineering and Development

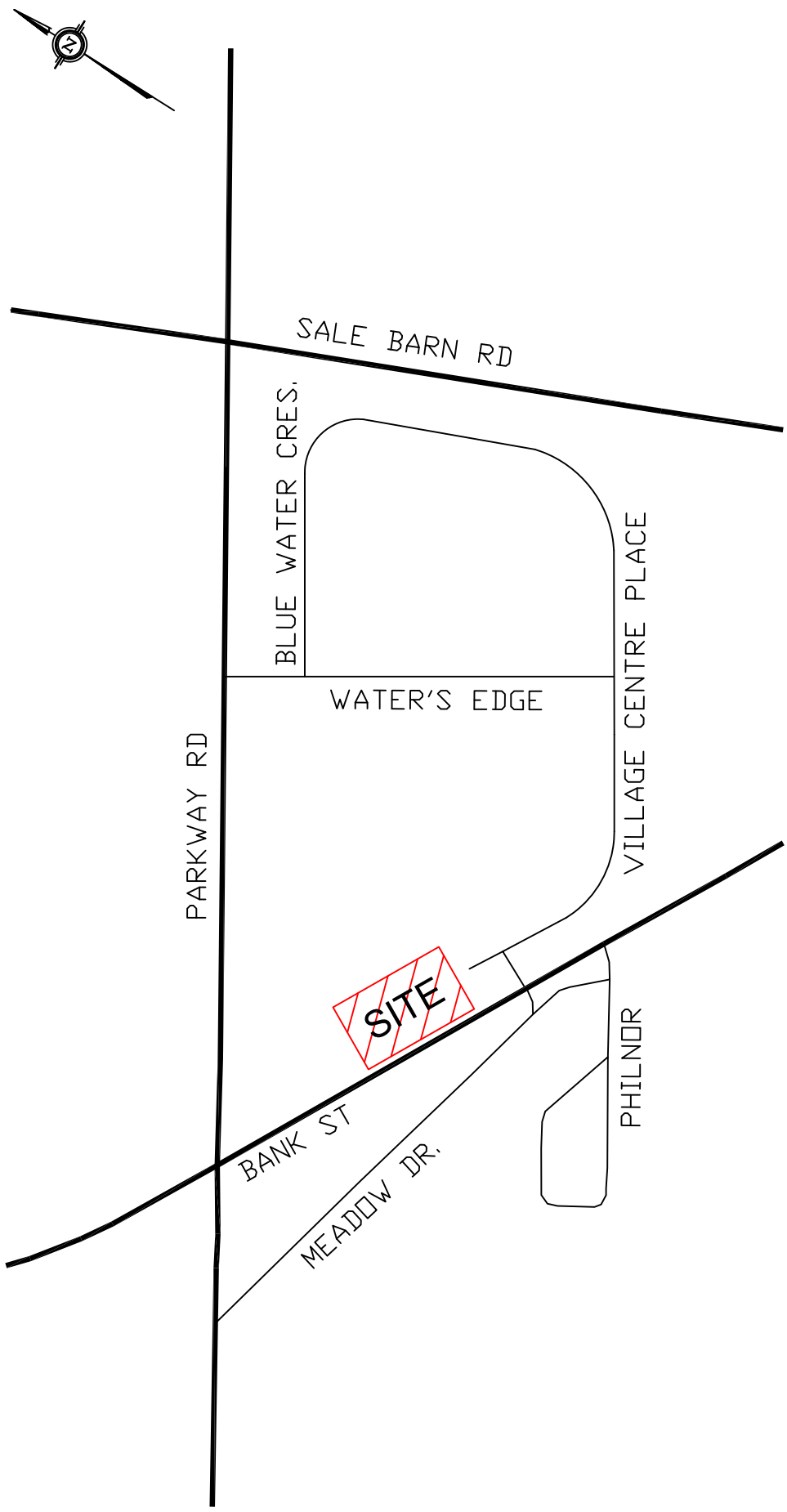


Daniel Payer, P.Eng.
President

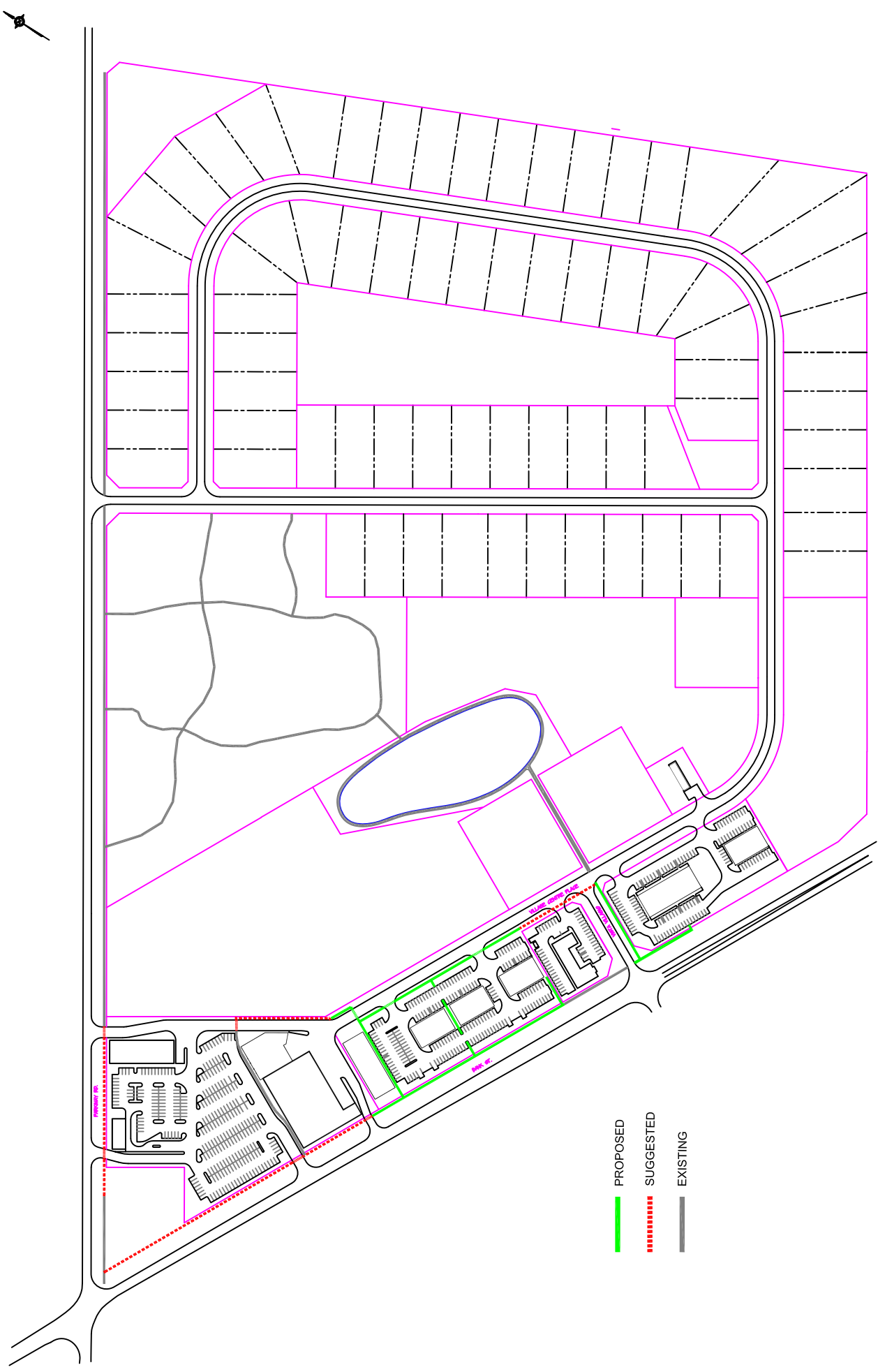


APPENDIX "A"

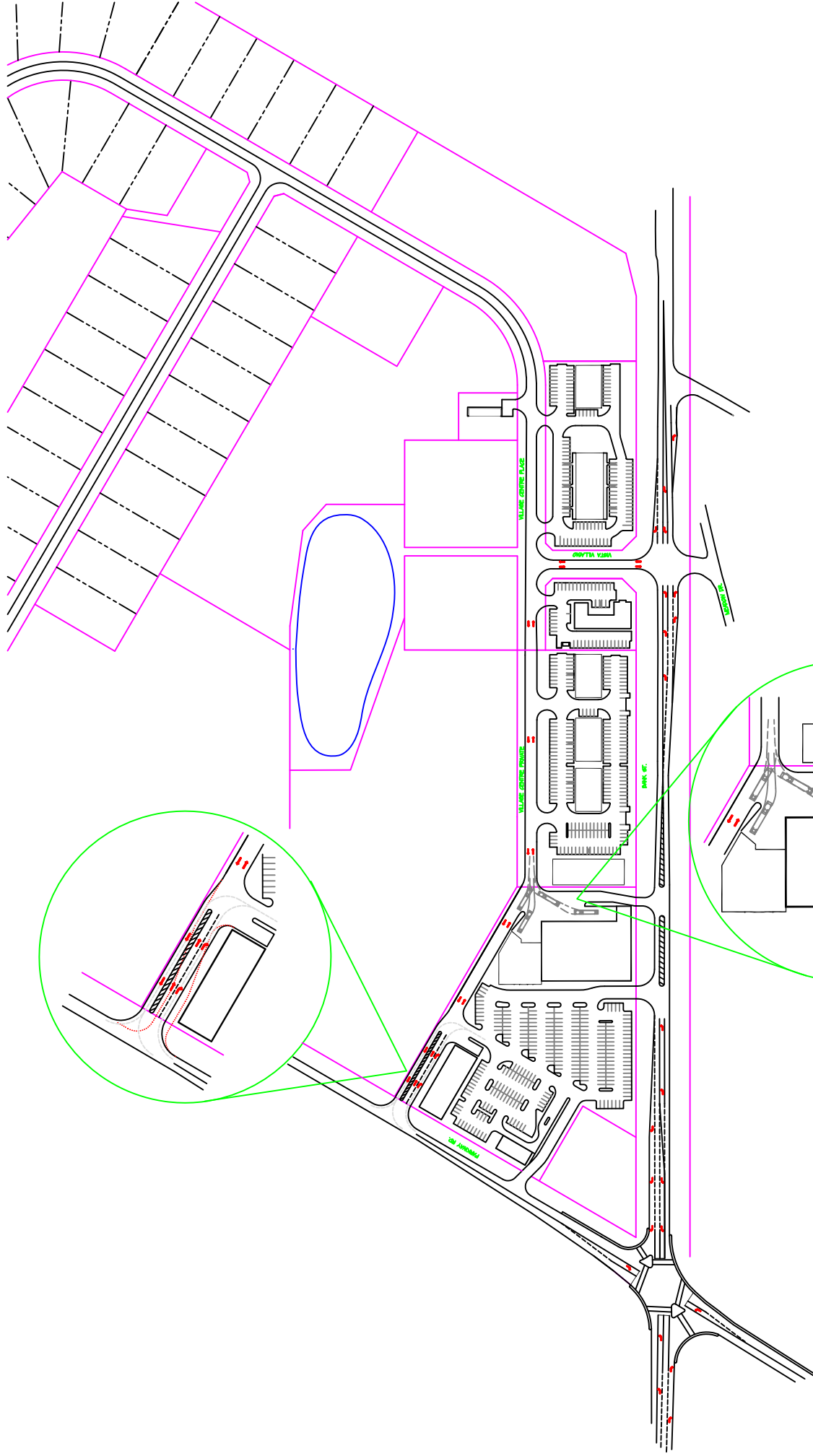
SK-1	Location Map
SK-2	Pedestrian Connections
SK-3	Vehicular Movement
Table 2	Excerpt from Approved Paterson Potable Water Supply
Page 15	Excerpt from Approved Paterson Potable Water Supply
Pond Sizing	Excerpt from Approved J.F. Sabourin SWM Report



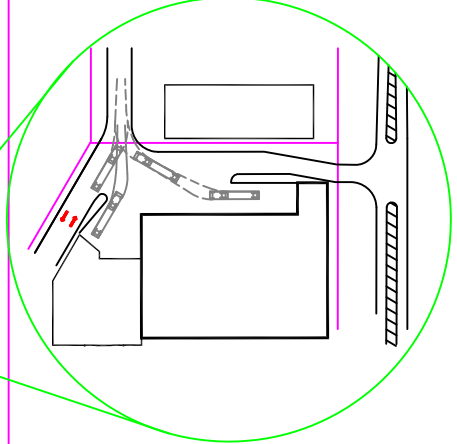
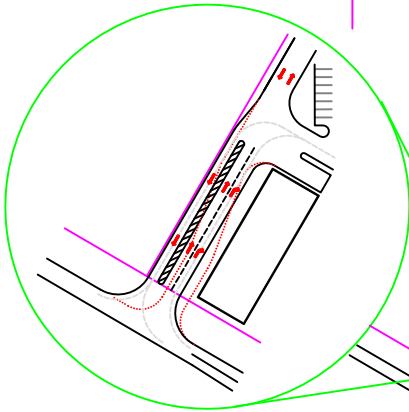
CITY OF OTTAWA - Formerly TOWNSHIP OF OSGOODE		Completed By: ARK ENGINEERING AND DEVELOPMENT		Drawing No.: SK-1	
		Scale: NTS	Date: JAN 2019		



SK-2: PEDESTRIAN CONNECTIONS



SK-3: VEHICULAR MOVEMENT





Air Rock Drilling rig at 6045 Bank Street

The test well was constructed in general conformance with the well construction requirements for the adjacent 'Water's Edge' residential subdivision and Greely Commercial Centre, which requires all wells to be cased "through the limestone formation and extend into the sandstone formation".

The existing drilled well (TW1) was used as an observation well. This well terminates in the Oxford Formation at approx. 30.5 m bgs, and the well casing only extends to 9.1 m bgs. This well configuration does not conform to the City's requirements for the adjacent developments.

Table 2 - Test Wells Summary

Test Wells Summary							
Test Well ID	Year Drilled	Depth to Bedrock (m)	Casing Depth (m)	Depth to Water Bearing Fractures (m)		Total Depth (m)	Recommended Pumping Rate (L/min)
TW2	2016	8.23	60.35	105.2		106.98	91
TW1	2005	7.62	9.14	28.0		30.48	not available
TW8	2007	8.69	56.39	61.87		64.00	91
Dental Clinic	2012	11.28	60.35	87.8	109.1	110.95	91
City Park	2015	6.10	60.35	79.2	83.8	85.95	91

Table 5 - Summary of Aquifer Characteristics

SUMMARY OF AQUIFER CHARACTERISTICS	
Parameter	TW2
Transmissivity (m ² /d)	6960
Storativity	1.0E-04
Average Test Pumping Rate (L/min)	100
Average Test Pumping Rate (m ³ /day)	144
Available Draw down (m)	102.75
Draw down at 100 mins (m)	4.511
Maximum Test Draw down (m)	4.553
Draw down at 20 years (extrapolated)	5.25
% of available draw down	5.1%
Specific Capacity (L/min/m)	22
Q20 safe well yield (m ³ /day) Farvolden	341918
Q20 safe well yield (m ³ /day) Maarthus & van der Kamp	1973
Q20 safe well yield (L/min) Maarthus & van der Kamp	1370
Farvolden, 1959	
Maarthus & van der Kamp, 2006	

Pumping at TW2 did not have any effect on the nearby wells that were monitored (TW1, City Park, Dental Clinic and TW8). Dataloggers placed on TW1 and in the City Park well did not show any response to pumping. TW8 and the Dental Clinic well were also monitored manually during the pumping test and did not show any indication of the pumping at TW2.

There appears to be a significant degree of hydraulic isolation between the upper bedrock aquifer (Oxford and March Formations) and the Nepean Sandstone aquifer. Pumping at TW2 did not have any significant effect on TW1.

5.2 Groundwater Quantity

The pumping test results show that test well TW2 has a very high yield. Drawdown at a pumping rate of 34 L/min for 24 hours was approx. 5 cm. 95% recovery was achieved almost immediately. The drawdown at a pumping rate of 100 L/min for 6 hours was 22 cm. 95% recovery was achieved approximately 4.25 hours after the end of pumping.

A determination of the long term safe yield (i.e. Q20 pumping rate) of test well TW2 was calculated using the method described by Fervolden (Fervolden, 1959) as described in Maarthus & van der Kamp, 2006. The inputs and results of the calculation are presented in Table 3 (above). The results of the 20 year safe yield analysis show that the well could be pumped at up to **1370 L/min** continuously without causing an adverse impact to surrounding well users.

Project: Greely Village Centre - Commercial Phase
Project No.: 64707

Quality Pond Sizing

Date: May 28, 2008
By: JHF

POND CMRC
Lands to be developed
 (Final Conditions)
 (All land is developed)

Catchment No.	Description	Drainage Area (ha)	Imp. (%)	Area incl.	Area (ha)	Imp (ha)
COM-1	Commercial lands	14.64	69	X	14.64	10.10
RES-1	Residential lands (Phase 1)	5.83	21			
RES-2	Residential lands (Phase 2 incl. Phase 1)	9.34	21			
POND-1	Pond block (Phase 1)	3.57	48			
POND-2	Pond block (Phase 2)	5.03	47			
PK-1	Green space	4.26	0			
UND-1	Undeveloped Lands (Phase 1 & 2)	6.85	0			
EX4	Existing Residential (EX4)	0.50	22	X	0.50	0.11
POND-C	Pond block (Commercial)	1.57	66	X	1.57	1.04

Totals= 16.71 11.25
 Avg Imp= 67.31 %

As per MOEE,
 Req'd Pond Vol.= 219 cu.m/ha
 Total Pond Volume : 3655 cu.m
 Permanent Pool= 2987 cu.m
 Ext.Det. Volume= 668 cu.m



J.F. Sabourin and Associates Inc.
 Water Resources and Environmental Consultants
 Ottawa, Ontario www.jfsa.com

JF-Salmc. Ref: 647-07
 Client: Aurel Engineering Ltd
 Dec-08



LEGEND :

Subwatershed ID

Subwatershed Area

Total Imperviousness

Subwatershed ID

Subwatershed Area

Time to Peak (hrs)

CN

Subwatershed delineation

Phase limits

Proposed subwatershed delineation

Proposed pond outline

Overland flow direction

Node

Node ID

Uncontrolled areas

NOTE: All base information provided by Atrel Engineering Inc.

Scale : 1:1250

BY : **JFSA inc.**
WATER RESOURCES AND ENVIRONMENTAL CONSULTANTS

CLIENT : **ATREL Engineering**
380 LAURIER ST. ROCKLAND, ONTARIO K4K 1C2
TEL: (613) 446-7423

PROJECT : **GREELY VILLAGE CENTRE - OTTAWA**

No.	BY	DATE	DESCRIPTION	BY

DESIGNED: J.F.F.

DRAWN: J.F.S.

VERIFIED: J.F.S.

APPROVED: J.F.S.

DATE: Dec/08

PROJECT No: 643-07

FIGURE 4b

PROPOSED DRAINAGE CONDITIONS

COMMERCIAL PHASE - DETAIL

APPENDIX "B"

MOE Well Record
Eurofins Laboratory Subdivision Package Results
Drawdown Plot
Langelier Saturation Index

Ministry of the Environment
and Climate Change

Well Tag No.

Tag#: A258613

Well Record

Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☒ Metric ☐ Imperial

Page 1 of 1

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	<input type="checkbox"/> Well Constructed by Well Owner
Greely Family Farms			
Mailing Address (Street Number/Name)	Municipality	Province	Postal Code
1705 Old Prescott Rd	Greely	ON	K4P4M9
Well Location		Telephone No. (inc. area code)	
Address of Well Location (Street Number/Name)		Lot	Concession
Bank St		1	
County/District/Municipality	City/Town/Village	Province	Postal Code
OTTAWA-CITY	Greely	Ontario	K4P4M9
UTM Coordinates: Zone	Easting	Northings	Municipal Plan and Sublot Number
NAD 83	189454669	5012311	4R-15291

Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form)

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft)
Grey	Sand	Gravel	Soft	0 to 6.96
Grey	Limestone		Hard	6.96 to 109.09

Annular Space			Results of Well Yield Testing				
Depth Set at (m/ft)	Type of Sealant Used (Material and Type)	Volume Placed (m ³ /ft ³)	After last of well yield, water was:	Draw Down		Recovery	
0 to 69.69	Quick Grout	44 Bags	<input checked="" type="checkbox"/> Clear and sand free <input type="checkbox"/> Other, specify	Time (min)	Water Level (m/ft)	Time (min)	Water Level (m/ft)
			If pumping discontinued, give reason:	Static Level	3.26		3.22
			Pump intake set at (m/ft)	1	3.25	1	3.22
			30.30	2	3.25	2	3.22
			Pumping rate (l/min / GPM)	3	3.25	3	3.22
			54:00	4	3.25	4	3.22
			Duration of pumping	5	3.25	5	3.22
			3 hrs + 2 min	10	3.25	10	3.22
			Final water level and of pumping (m/ft)	15	3.23	15	3.22
			3.22	20	3.23	20	3.22
			If flowing give rate (l/min / GPM)	25	3.22	25	3.22
				30	3.22	30	3.22
			Recommended pump depth (m/ft)	40	3.22	40	3.22
			30.30	50	3.22	50	3.22
			Recommended pump rate (l/min / GPM)	60	3.22	60	3.22
			45:00				
			Well production (l/min / GPM)				
			50:00				
			Disinfected?				
			<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				

Method of Construction		Well Use	
<input type="checkbox"/> Cable Tool	<input type="checkbox"/> Diamond	<input type="checkbox"/> Public	<input type="checkbox"/> Commercial
<input type="checkbox"/> Rotary (Conventional)	<input type="checkbox"/> Jetting	<input type="checkbox"/> Domestic	<input type="checkbox"/> Not used
<input checked="" type="checkbox"/> Rotary (Reverse) Air	<input type="checkbox"/> Driving	<input type="checkbox"/> Livestock	<input type="checkbox"/> Dewatering
<input type="checkbox"/> Boring	<input type="checkbox"/> Digging	<input type="checkbox"/> Irrigation	<input type="checkbox"/> Test Hole
<input type="checkbox"/> Air percussion		<input type="checkbox"/> Industrial	<input type="checkbox"/> Cooling & Air Conditioning
<input type="checkbox"/> Other, specify		<input type="checkbox"/> Other, specify	

Construction Record - Casing				Status of Well	
Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft)	<input checked="" type="checkbox"/> Water Supply	<input type="checkbox"/> Replacement Well
15.55	Steel	0.44	0.60 to 69.69	<input type="checkbox"/> Test Hole	<input type="checkbox"/> Recharge Well
				<input type="checkbox"/> Dewatering Well	<input type="checkbox"/> Observation and/or Monitoring Hole
				<input type="checkbox"/> Alteration (Construction)	<input type="checkbox"/> Abandoned, Insufficient Supply
				<input type="checkbox"/> Abandoned, Poor Water Quality	<input type="checkbox"/> Abandoned, other, specify
				<input type="checkbox"/> Other, specify	

Construction Record - Screen			
Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft)
			From To

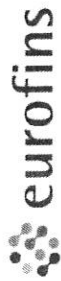
Water Details		Hole Diameter	
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested	Depth (m/ft)	Diameter (cm/in)
30.30 (m/ft)	<input type="checkbox"/> Gas <input checked="" type="checkbox"/> Other, specify Salty	From To	
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested	0 to 69.69	25.40
57.57 (m/ft)	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify Salty	0 to 109.09	15.55
Water found at Depth	Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested		
0.60 (m/ft)	<input type="checkbox"/> Gas <input type="checkbox"/> Other, specify		

Well Contractor and Well Technician Information			
Business Name of Well Contractor		Well Contractor's Licence No.	
D&R-WATER-well-Drilling		715216	
Business Address (Street Number/Name)		Municipality	
1763 - Route 90 West		NATION	
Province	Postal Code	Business E-mail Address	
ON	K0A13C0		
Bus. Telephone No. (inc. area code)		Name of Well Technician (Last Name, First Name)	
613 987 5558		Monette Karl	
Well Technician's Licence No.		Signature of Technician and/or Contractor	
317173		Date Submitted	
		20190325	

Map of Well Location			
Please provide a map below following instructions on the back.			

Comments:	

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	20190325	
Date Work Completed		Audit No. 2299783
20190326		Received



Environment Testing

Certificate of Analysis

Client: Sunset Lakes Development Corp.
6598 Pebble Trail Way
Greely, ON
K4P 0B6

Report Number: 1903947
Date Submitted: 2019-03-20
Date Reported: 2019-03-24
Project: TW1
COC #: 92656

Attention: Mr. Dan Payer
PO#:

Invoice to: Sunset Lakes Development Corp.

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.
Anions	Cl	1	mg/L	AO 250	1416283 Water
	F	0.10	mg/L	MAC 1.5	2019-03-20 TW1
	N-NO2	0.10	mg/L	MAC 1.0	
	N-NO3	0.10	mg/L	MAC 10.0	
	SO4	1	mg/L	AO 500	
General Chemistry	Alkalinity as CaCO3	5	mg/L	OG 500	
	Colour	2	TCU	AO 5	
	Conductivity	5	uS/cm		
	pH	1.00		6.5-8.5	
	S2-	0.01	mg/L	AO 0.05	
Hardness Indices/Calc	TDS (COND - CALC)	1	mg/L	AO 500	
	Turbidity	0.1	NTU	AO 5.0	
	Hardness as CaCO3	1	mg/L	OG 100	
	Ion Balance	0.01			
	Ca	1	mg/L		
Metals	Fe	0.03	mg/L	AO 0.3	
	K	1	mg/L		
	Mg	1	mg/L		
	Mn	0.01	mg/L	AO 0.05	
	Na	2	mg/L	AO 200	
Microbiology	Escherichia Coli	0	ct/100mL	MAC 0	
	Faecal Coliforms	0	ct/100mL		
	Heterotrophic Plate Count	0	ct/1mL		
	Total Coliforms	0	ct/100mL	MAC 0	
	DOC	0.5	mg/L	AO 5	
Subcontract-Inorg					1.3

Guideline = ODWSOG

* = Guideline Exceedence

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.



eurofins

Environment Testing

Certificate of Analysis

Client: Sunset Lakes Development Corp.

6598 Pebble Trail Way

Greely, ON

K4P 0B6

Attention: Mr. Dan Payer

PO#:

Invoice to: Sunset Lakes Development Corp.

Report Number:

1903947

Date Submitted:

2019-03-20

Date Reported:

2019-03-24

Project:

COC #:

92656

Group	Analyte	MRL	Units	Guideline	Lab I.D. Sample Matrix Sample Type Sampling Date Sample I.D.	1416283 Water 2019-03-20 TW1
Subcontract-Inorg	N-NH3	0.01	mg/L			0.13
	Phenols	0.001	mg/L			0.003
	Tannin & Lignin	0.1	mg/L			<0.1
	Total Kjeldahl Nitrogen	0.1	mg/L			0.2

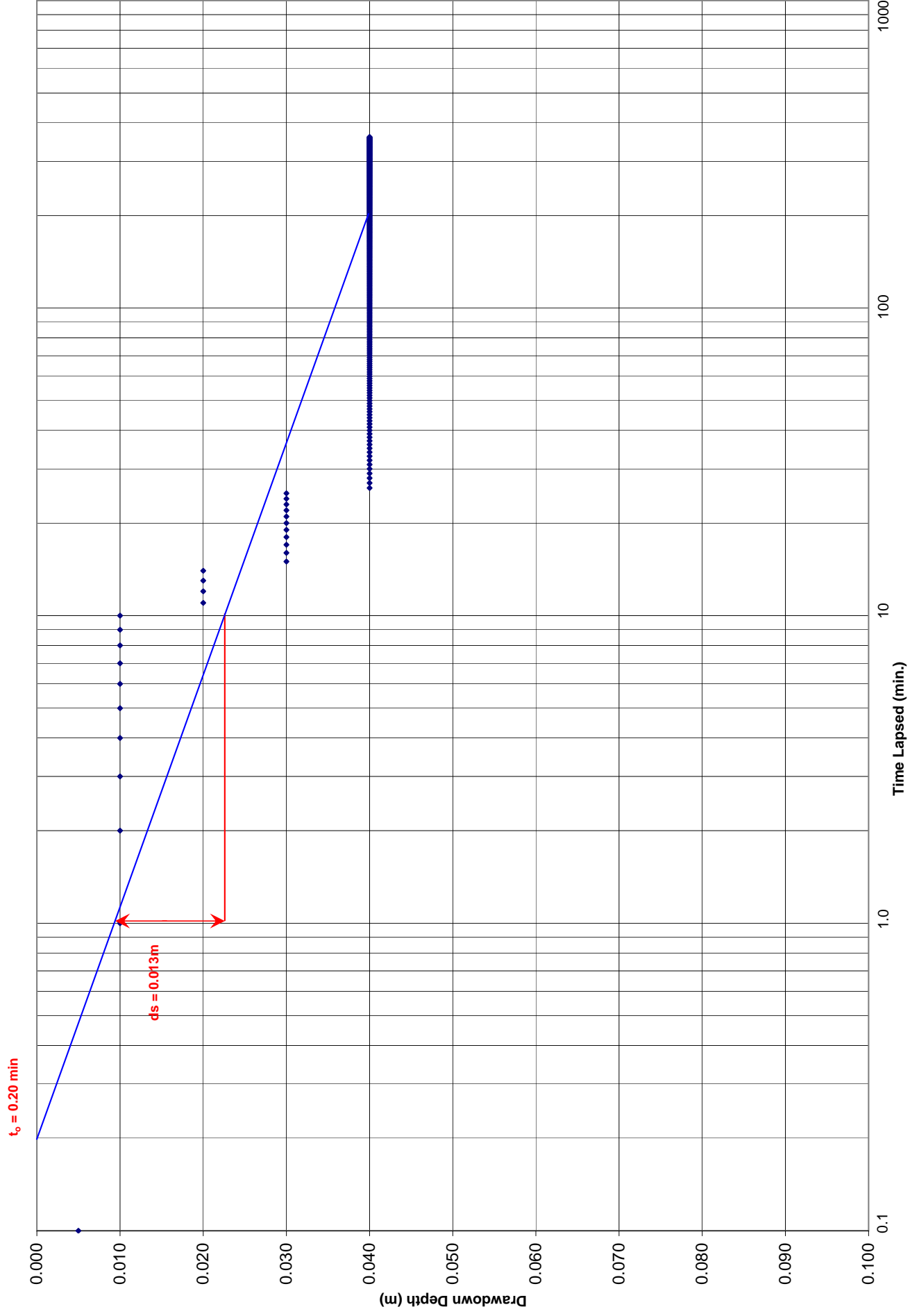
Guideline = ODWSOG

*** = Guideline Exceedence**

Results relate only to the parameters tested on the samples submitted.
Methods references and/or additional QA/QC information available on request.

MRL = Method Reporting Limit, AO = Aesthetic Objective, OG = Operational Guideline, MAC = Maximum Acceptable Concentration, IMAC = Interim Maximum Acceptable Concentration, STD = Standard, PWQO = Provincial Water Quality Guideline, IPWQO = Interim Provincial Water Quality Objective, TDR = Typical Desired Range

TW1 - Well Drawdown vs Time



Home / Calculators / Langelier index calculator

Langelier Saturation Index Calculator

This calculator helps you determine the scaling potential of the water by using the Langelier Saturation Index.

Give the values of your water analysis. All the fields with

* are required.

Table 1: Input table

pH	*	<input type="text" value="8.5"/>	
Conductivity / TDS	*	<input type="text" value="625"/>	<input type="text" value="mg/L"/> <input type="button" value="v"/>
[Ca ²⁺]	*	<input type="text" value="297"/>	<input type="text" value="mg/L"/> <input type="button" value="v"/>
[HCO ₃ ⁻]	*	<input type="text" value="226"/>	<input type="text" value="mg/L"/> <input type="button" value="v"/>
Water temperature	*	<input type="text" value="9.2"/>	<input type="text" value="degree C"/> <input type="button" value="v"/>

If you do not have a water analysis you can use table 2. Click on a button at the bottom of table 2

Table 2 : Additional data

pH =	7.7	8	8.6
TDS =	20	34483	273
[Ca ²⁺]	5	400	49
=			
[HCO ₃ ⁻]	10	140	121
=			
T =	20	20	20

Calculate the Langelier Saturation Index

Example

Seawater

Tap wat

Erase input values

Table 3: Results Langelier Saturation Index

pH _s	<input type="text" value="7.2"/>
LSI	<input type="text" value="1.3"/>
Indication based on Langelier (1936)	Water is supersaturated with respect to calcium carbonate (CaCO ₃) and
Indication based on improved Langelier by Carrier (1965)	Scale forming but non corrosive.

The Langelier Saturation Index formula is

$$LSI = pH - 1$$

For an explanation of the formula click here.

APPENDIX "C"

Sanitary Sewer Design Sheet c/w Drainage Area Plan
Storm Sewer Design Sheet
Summary of "C" Values
Open Channel Capacity Calculations

SANITARY SEWER COMPUTATION FORM

DATE: **Jan 29, 2019**
 DESIGNED BY: **DRP**

PROJECT: Greely Village Centre
 CLIENT: Greely Family Farm

q= 0.324 l/ha.s
 I= 0.330 l/ha.s
 PVC/CONC N= 0.013
 OTHER N= 0.024

LOCATION				COMMERCIAL						Infiltration FLOW	DESIGN FLOW	SEWER DATA					
				BUILDING		SITE		PEAKING FACTOR	FLOW Q(p)			DIA.	SLOPE	LENGTH	CAP.	Remaining Capacity	VEL.
FROM (Up)	TO (Down)			AREA (ha.)	CUM.	AREA (ha.)	CUM			M	(L/S)						
MH	Bldg A	MH	1	0.3540		0.3540		1.5	0.172	0.117	0.289	200	1.00	34.0	33.31	99%	1.05
MH	Bldg B	MH	1	0.4060		0.4060		1.5	0.197	0.134	0.331	200	1.00	8.0	33.31	99%	1.05
MH	1	MH	2		0.7600		0.7600	1.5	0.369	0.251	0.620	200	0.60	62.0	25.80	98%	0.81
MH	Bldg C	MH	2									200	1.00	8.0	33.31	100%	1.05
MH	Bldg D	MH	Ex. MH1	0.3200		0.3200		1.5	0.156	0.106	0.261	200	1.00	22.0	33.31	99%	1.05
MH	Ex. MH1	MH	Ex. MH2		0.3200		0.3200	1.5	0.156	0.106	0.261	200	1.00	10.5	33.31	99%	1.05
MH	2	MH	Ex. MH2		0.7600		0.7600	1.5	0.369	0.251	0.620	200	1.73	49.0	43.81	99%	1.38
MH	Ex. MH2				1.0800		1.0800	1.5	0.525	0.356	0.881						

45,350 30,793 76,143 L/day

Based on 12 hrs of operation

22,675 15,396

38,071 L/day

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The location of under/ground utilities and structures are not necessarily shown on the contract drawings, and/or where shown, the accuracy of the position of such utilities and structures is not guaranteed. The Contractor shall verify and be responsible to determine the exact location of all such utilities and structures and assumes all liability for any damage to them.

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Legend

--- DRAINAGE AREA
 (0.336ha) SANITARY DRAINAGE AREA

Revision

0. SUBMITTED FOR APPROVAL	DEC 18/19

Location Map



Seal

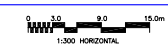
Client / Project

GREELY FAMILY FARM INC.
 6075 BANK ST.

Drawing Name

SANITARY DRAINAGE AREA PLAN

Scale



Revision

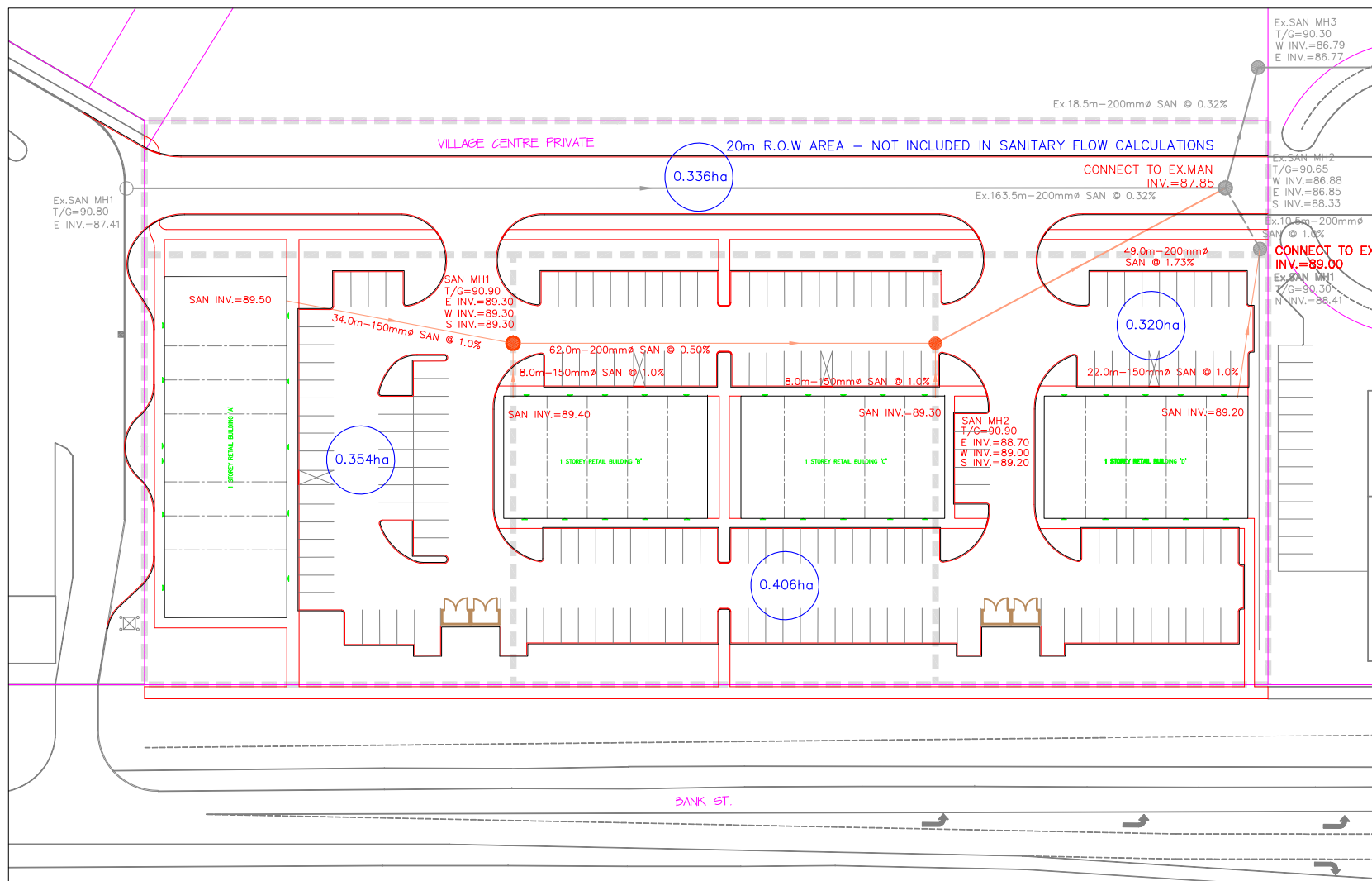
REV-0

Sheet

1 of 1

Drawing No.

DP



STORM SEWER COMPUTATION FORM - 2yr

LOCATION				AREA (ha.) RUNOFF COEFFICIENT								RATIONAL METHOD		2 YEAR		ACTUAL PIPE FLOW (L/S)	SEWER DATA							UpStream		DwStream		HGL SLOPE (%)	UpStream Hgl at UP-MH (M)	SURG AT UP MH (M)
												INDIV. 2.78AR	ACCUM. 2.78AR	TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)		DIA. (mm)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)			
MH	CB1	MH	CB2									0.27	0.27	10.00	76.81	20.47	250	1.00	35.0	60.40	66%	1.22	0.48	89.56	89.31	89.21	88.96	0.12	89.56	
MH	CB2	MH	100			0.150						0.28	0.55	10.48	75.01	40.95	250	1.00	25.0	60.40	32%	1.22	0.34	89.21	88.96	88.96	88.71	0.46	89.21	
														10.82																
MH	CB3	MH	100									0.48	0.48	10.00	76.81	37.14	250	1.00	15.5	60.40	39%	1.22	0.21	89.12	88.87	88.96	88.71	0.38	89.12	
														10.21																
MH	100	MH	101										1.03	10.82	73.79	75.97	375	0.40	36.0	104.25	27%	0.99	0.61	88.96	88.59	88.82	88.45	0.21	88.96	
														11.43																
MH	CB4	MH	CB5									0.23	0.23	10.00	76.81	17.72	200	1.00	40.0	33.31	47%	1.05	0.64	89.47	89.27	89.07	88.87	0.28	89.47	
MH	CB5	MH	101									0.24	0.47	10.64	74.45	35.31	250	1.00	25.0	60.40	42%	1.22	0.34	89.07	88.82	88.82	88.57	0.34	89.07	
														10.98																
MH	CB6	MH	101									0.41	0.41	10.00	76.81	31.24	250	1.00	15.5	60.40	48%	1.22	0.21	88.98	88.73	88.82	88.57	0.27	88.98	
														10.21																
MH	101	MH	102										1.91	11.43	71.72	137.02	450	0.30	21.0	162.91	16%	0.99	0.35	88.82	88.37	88.76	88.31	0.21	88.82	
														11.78																
MH	CB7	MH	102			0.198						0.25	0.25	10.00	76.81	19.03	200	1.00	31.0	33.31	43%	1.05	0.49	88.87	88.67	88.56	88.36	0.33	88.87	
														10.49																
MH	102	MH	103			0.147						0.18	2.34	11.78	70.58	165.31	525	0.30	78.0	245.74	33%	1.10	1.18	88.76	88.24	88.53	88.01	0.14	88.76	
MH	103	MH	104	0.093								0.23	2.57	12.96	67.03	172.59	600	0.20	15.0	286.47	40%	0.98	0.25	88.53	87.93	88.50	87.90	0.07	88.66	0.13
														13.22																
Ex.MH	105	Ex.MH	104													273.00	750	0.29	2.6	625.44	56%	1.37	0.03	88.66	87.91	88.65	87.90	0.06	88.66	
Ex.MH	104	Open Ditch											2.57	13.22	66.32	443.76	750	0.20	70.0	519.40	15%	1.14	1.02	88.65	87.90	88.51	87.76	0.15	88.65	
														14.24																

*Note: 2yr flow discharge amount taken from THE ODAN/DETECH GROUP INC. servicing report.

STORM SEWER COMPUTATION FORM - 5yr

LOCATION				AREA (ha.) RUNOFF COEFFICIENT								RATIONAL METHOD		5 YEAR		ACTUAL PIPE FLOW (L/S)	SEWER DATA							UpStream		DwStream		HGL SLOPE (%)	UpStream Hgl at UP-MH (M)	SURG AT UP MH (M)		
												INDIV. 2.78AR	ACCUM. 2.78AR	TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)		DIA. (mm)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)					
FROM (Up)	TO (Down)			0.90	0.45	0.67	0.68	0.71	0.73	0.77	0.83																					
MH	CB1	MH	CB2				0.141					0.27	0.27	10.00	104.19	27.77	250	1.00	35.0	60.40	54%	1.22	0.48	89.56	89.31		89.21	88.96	0.21	89.56		
MH	CB2	MH	100		0.150							0.28	0.55	10.48	101.73	55.54	250	1.00	25.0	60.40	8%	1.22	0.34	89.21	88.96	88.96	88.71	0.85	89.21			
MH	CB3	MH	100					0.245				0.48	0.48	10.00	104.19	50.38	250	1.00	15.5	60.40	17%	1.22	0.21	89.12	88.87	88.96	88.71	0.70	89.12			
MH	100	MH	101										1.03	10.82	100.04	102.99	375	0.40	36.0	104.25	1%	0.99	0.61	88.96	88.59	88.82	88.45	0.39	88.96			
MH	CB4	MH	CB5								0.100	0.23	0.23	10.00	104.19	24.04	200	1.00	40.0	33.31	28%	1.05	0.64	89.47	89.27	89.07	88.87	0.52	89.47			
MH	CB5	MH	101						0.120			0.24	0.47	10.64	100.95	47.88	250	1.00	25.0	60.40	21%	1.22	0.34	89.07	88.82	88.82	88.57	0.63	89.07			
MH	CB6	MH	101							0.190		0.41	0.41	10.00	104.19	42.38	250	1.00	15.5	60.40	30%	1.22	0.21	88.98	88.73	88.82	88.57	0.49	88.98			
MH	101	MH	102										1.91	11.43	97.21	185.72	450	0.30	21.0	162.91	-14%	0.99	0.35	88.82	88.37	88.76	88.31	0.39	88.84	0.02		
MH	CB7	MH	102		0.198							0.25	0.25	10.00	104.19	25.81	200	1.00	31.0	33.31	23%	1.05	0.49	88.87	88.67	88.56	88.36	0.60	88.95	0.08		
MH	102	MH	103		0.147							0.18	2.34	11.78	95.64	224.00	525	0.30	78.0	245.74	9%	1.10	1.18	88.76	88.24	88.53	88.01	0.25	88.76			
MH	103	MH	104	0.093								0.23	2.57	12.96	90.77	233.71	600	0.20	15.0	286.47	18%	0.98	0.25	88.53	87.93	88.50	87.90	0.13	88.67	0.14		
Ex.MH	105	Ex.MH	104											13.22			273.00	750	0.29	2.6	625.44	56%	1.37	0.03	88.66	87.91	88.65	87.90	0.06	88.66		
Ex.MH	104	Open Ditch										2.57	13.22	89.79		504.19	750	0.20	70.0	519.40	3%	1.14	1.02	88.65	87.90	88.51	87.76	0.19	88.65			
														14.24																		

*Note: 2yr flow discharge amount taken from THE ODAN/DETECH GROUP INC. servicing report.

STORM SEWER COMPUTATION FORM - 100yr

LOCATION				AREA (ha.) RUNOFF COEFFICIENT								RATIONAL METHOD		100 YEAR		ACTUAL PIPE FLOW (L/S)	SEWER DATA							UpStream		DwStream		HGL SLOPE (%)	UpStream Hgl at UP-MH (M)	SURG AT UP MH (M)	
												INDIV. 2.78AR	ACCUM. 2.78AR	TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)		DIA. (mm)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)				
FROM (Up)		TO (Down)		0.90	0.45	0.67	0.68	0.71	0.73	0.77	0.83																				
MH	CB1	MH	CB2				0.141					0.27	0.27	10.00	178.56	47.59	250	1.00	35.0	60.40	21%	1.22	0.48	89.56	89.31		89.21	88.96	0.62	89.80	0.24
MH	CB2	MH	100		0.150							0.28	0.55	10.48	174.29	95.15	250	1.00	25.0	60.40	-58%	1.22	0.34	89.21	88.96	88.96	88.71	2.48	89.58	0.37	
														10.82																	
MH	CB3	MH	100					0.245				0.48	0.48	10.00	178.56	86.35	250	1.00	15.5	60.40	-43%	1.22	0.21	89.12	88.87	88.96	88.71	2.04	89.28	0.16	
														10.21																	
MH	100	MH	101										1.03	10.82	171.38	176.44	375	0.40	36.0	104.25	-69%	0.99	0.61	88.96	88.59	88.82	88.45	1.15	88.96		
														11.43																	
MH	CB4	MH	CB5								0.100	0.23	0.23	10.00	178.56	41.20	200	1.00	40.0	33.31	-24%	1.05	0.64	89.47	89.27	89.07	88.87	1.53	90.07	0.60	
MH	CB5	MH	101						0.120			0.24	0.47	10.64	172.95	82.02	250	1.00	25.0	60.40	-36%	1.22	0.34	89.07	88.82	88.82	88.57	1.84	89.46	0.39	
														10.98																	
MH	CB6	MH	101							0.190		0.41	0.41	10.00	178.56	72.62	250	1.00	15.5	60.40	-20%	1.22	0.21	88.98	88.73	88.82	88.57	1.45	88.98		
														10.21																	
MH	101	MH	102									1.91	11.43	166.47		318.04	450	0.30	21.0	162.91	-95%	0.99	0.35	88.82	88.37	88.76	88.31	1.14	89.00	0.18	
														11.78																	
MH	CB7	MH	102		0.198							0.25	0.25	10.00	178.56	44.23	200	1.00	31.0	33.31	-33%	1.05	0.49	88.87	88.67	88.56	88.36	1.76	89.31	0.44	
														10.49																	
MH	102	MH	103		0.147							0.18	2.34	11.78	163.76	383.54	525	0.30	78.0	245.74	-56%	1.10	1.18	88.76	88.24	88.53	88.01	0.73	88.76		
MH	103	MH	104	0.093								0.23	2.57	12.96	155.35	399.99	600	0.20	15.0	286.47	-40%	0.98	0.25	88.53	87.93	88.50	87.90	0.39	88.80	0.27	
														13.22																	
Ex.MH	105	Ex.MH	104													273.00	750	0.29	2.6	625.44	56%	1.37	0.03	88.66	87.91	88.65	87.90	0.06	88.74	0.08	
Ex.MH	104	Open Ditch										2.57		13.22	153.66	668.64	750	0.20	70.0	519.40	-29%	1.14	1.02	88.65	87.90	88.51	87.76	0.33	88.74	0.09	
														14.24																	

*Note: 2yr flow discharge amount taken from THE ODAN/DETECH GROUP INC. servicing report.

STORM SEWER COMPUTATION FORM - 100yr + 20%

LOCATION				AREA (ha.) RUNOFF COEFFICIENT								RATIONAL METHOD		100 YEAR		ACTUAL PIPE FLOW (L/S)	SEWER DATA							UpStream		DwStream		HGL SLOPE (%)	UpStream Hgl at UP-MH (M)	SURG AT UP MH (M)	
												INDIV. 2.78AR	ACCUM. 2.78AR	TIME CONC. (MIN)	RAINF. INTENS. (MM/HR)		DIA. (mm)	SLOPE (%)	LENGTH (M)	CAP. (L/S)	Remaining Capacity (%)	VEL. (M/S)	TIME OF FLOW (MIN)	Obv. (M)	Inv. (M)	Obv. (M)	Inv. (M)				
FROM (Up)	TO (Down)			0.90	0.45	0.67	0.68	0.71	0.73	0.77	0.83																				
MH	CB1	MH	CB2				0.141					0.27	0.27	10.00	178.56	57.11	250	1.00	35.0	60.40	5%	1.22	0.48	89.56	89.31		89.21	88.96	0.89	90.17	0.61
MH	CB2	MH	100			0.150						0.28	0.55	10.48	174.29	114.18	250	1.00	25.0	60.40	-89%	1.22	0.34	89.21	88.96	88.96	88.71	3.57	89.86	0.64	
														10.82																	
MH	CB3	MH	100					0.245				0.48	0.48	10.00	178.56	103.62	250	1.00	15.5	60.40	-72%	1.22	0.21	89.12	88.87	88.96	88.71	2.94	89.42	0.30	
														10.21																	
MH	100	MH	101										1.03	10.82	171.38	211.73	375	0.40	36.0	104.25	-103%	0.99	0.61	88.96	88.59	88.82	88.45	1.65	88.96		
														11.43																	
MH	CB4	MH	CB5									0.23	0.23	10.00	178.56	49.44	200	1.00	40.0	33.31	-48%	1.05	0.64	89.47	89.27	89.07	88.87	2.20	90.65	1.18	
MH	CB5	MH	101						0.120			0.24	0.47	10.64	172.95	98.43	250	1.00	25.0	60.40	-63%	1.22	0.34	89.07	88.82	88.82	88.57	2.66	89.77	0.70	
														10.98																	
MH	CB6	MH	101							0.190		0.41	0.41	10.00	178.56	87.15	250	1.00	15.5	60.40	-44%	1.22	0.21	88.98	88.73	88.82	88.57	2.08	88.98		
														10.21																	
MH	101	MH	102										1.91	11.43	166.47	381.65	450	0.30	21.0	162.91	-134%	0.99	0.35	88.82	88.37	88.76	88.31	1.65	89.11	0.29	
														11.78																	
MH	CB7	MH	102		0.198							0.25	0.25	10.00	178.56	53.07	200	1.00	31.0	33.31	-59%	1.05	0.49	88.87	88.67	88.56	88.36	2.54	89.55	0.68	
														10.49																	
MH	102	MH	103		0.147							0.18	2.34	11.78	163.76	460.25	525	0.30	78.0	245.74	-87%	1.10	1.18	88.76	88.24	88.53	88.01	1.05	88.76		
MH	103	MH	104	0.093								0.23	2.57	12.96	155.35	479.99	600	0.20	15.0	286.47	-68%	0.98	0.25	88.53	87.93	88.50	87.90	0.56	88.82	0.29	
														13.22																	
Ex.MH	105	Ex.MH	104													273.00	750	0.29	2.6	625.44	56%	1.37	0.03	88.66	87.91	88.65	87.90	0.06	88.74	0.08	
Ex.MH	104	Open Ditch										2.57		13.22	153.66	668.64	750	0.20	70.0	519.40	-29%	1.14	1.02	88.65	87.90	88.51	87.76	0.33	88.74	0.09	
														14.24																	

*Note: 2yr flow discharge amount taken from THE ODAN/DETECH GROUP INC. servicing report.

SUMMARY OF "C" VALUES

AREA ID				"C" Value	
1	0.0930			0.90	0.0837
2	0.0120			0.20	0.0024
3	0.1270	0.20	0.0254	0.45	0.0893
	0.0710	0.90	0.0639		
	0.1980		0.0893		
4	0.0940	0.20	0.0188	0.45	0.0665
	0.0530	0.90	0.0477		
	0.1470		0.0665		
5	0.0090	0.20	0.0018	0.45	0.0063
	0.0050	0.90	0.0045		
	0.0140		0.0063		
6	0.0039	0.20	0.00078	0.45	0.00267
	0.0021	0.90	0.00189		
	0.0060		0.00267		
7	0.0350	0.20	0.007	0.77	0.1465
	0.1550	0.90	0.1395		
	0.1900		0.1465		
8	0.0300	0.20	0.006	0.73	0.087
	0.0900	0.90	0.081		
	0.1200		0.087		
9	0.0250	0.20	0.015	0.83	0.0825
	0.0750	0.90	0.0675		
	0.1000		0.0825		
10	0.0450	0.20	0.009	0.68	0.0954
	0.0960	0.90	0.0864		
	0.1410		0.0954		
11	0.0500	0.20	0.010	0.67	0.1
	0.1000	0.90	0.090		
	0.1500		0.100		
12	0.0650	0.20	0.013	0.71	0.175
	0.1800	0.90	0.162		
	0.2450		0.175		
					0.93727 1.4160
OVERALL "C" VALUE					0.66

2 yr FLOW

<u>DESCRIPTION</u>	<u>FUNCTION</u>	<u>VALUES / UNITS</u>
<u>INPUT VALUES</u>		
BOTTOM WIDTH	B=	1.50 m
SIDE SLOPE LEFT	SSL= (X:1)	3.000
SIDE SLOPE RIGHT	SSR= (X:1)	3.000
ROUGHNESS COEFFICIENT	n=	0.030
DITCH SLOPE	S=	0.20 %
<u>WATER DEPTH</u>	<u>D=</u>	0.330 m
<u>OUTPUT VALUES</u>		
AREA	A=	0.82 m ²
WET PERIMETER	P=	3.59 m
HYDRAULIC RADIUS	R= (A/P)	0.23 m
VELOCITY	V=	0.56 m/s
<u>FLOW</u>	<u>Q=</u>	459 L/s
DESIGNED BY:	ARK ENGINEERING	

APPENDIX "D"

South Nation Conservation Authority - Clearance Letter

Conservation Partners Partenaires en conservation



July 3, 2019
File: SNC-6379-2019

Via Email Transmission (sarah.mccormick@ottawa.ca)

City of Ottawa
Planning Services
110 Laurier Avenue West, 4th Floor
Ottawa, ON K1P 1J1

Attn: Sarah McCormick

**Subject: Site Plan Proposal D07-12-16-0194
6075 Bank Street
Lot 6, Concession 5, formerly Gloucester Township
Roll # 061470004511671
Greely Family Farm Inc.**

Dear Sarah,

The Conservation Partners Planning and Development Review Team have completed a review of the above noted application, which is to develop four single storey retail buildings.

South Nation Conservation (SNC) has received and reviewed the following document with respect to the above mentioned proposed development:

- Servicing Report: Potable Water Supply Assessment, Sewage, Storm and Stormwater: Prepared by ARK Engineering and Development. Signed, stamped and dated April 10, 2019
- Grading Plan: Dwg. #GP Prepared by ARK Engineering and Development. Signed, stamped and dated February 19, 2019
- Site Servicing Plan: Dwg. #SS Prepared by ARK Engineering and Development. Signed, stamped and dated February 19, 2019
- Response Letter: Prepared by Daniel Payer, P.Eng. (ARK Engineering and Development). Signed and dated June 19, 2019
- Erosion Control Plan: Dwg. #EC Prepared by ARK Engineering and Development. Signed, stamped and dated June 19, 2019
- Stormwater Management Pond Design Brief: Prepared by J. F. Sabourin and Associates Inc. dated December 2008

SNC offers the following comments regarding the above noted proposed development:

Storm Water Management

The intent of the CA's review is to confirm that the design objectives for the development's stormwater management practices as stated in the consultant's report are appropriate, considering the characteristics and sensitivity of the receiving water body, and are consistent with any policies or plans that are supported by the CA for the watershed or subwatershed in question.

In this context, SNC found that the Stormwater Management design met our expectations.

Erosion and Sediment Control

The Erosion and Sediment Control Measures should be implemented prior to construction and remain in place until vegetation is established. Regular inspection and maintenance of these measures should be undertaken. The implementation of adjustment or corrective maintenance of the erosion and sediment measures is an integral part of the stormwater management plan and should be implemented.

It should be noted however, due to the potential for clogging, geosocks with overflows are recommended over the proposed filter cloth under the catch basins/manhole covers.

Grading and Drainage Plan

The intent of the CA's review is to confirm that the design objectives for the development, as stated in the consultant's report, are appropriate with respect to the Grading and Drainage Plan and is adequate with respect to the Storm Water Management design.

I trust the above is to your satisfaction. If you have any questions please feel free to ask.

Best regards,

A handwritten signature in cursive script, appearing to read "Bradley Wright".

Bradley Wright, M.E.S, G.I.T.
Watershed Planner
South Nation Conservation
613-984-2948 ext. 371