PROPOSED ANIMAL HOSPITAL/ OTTAWA VALLEY WILD BIRD CARE CENTRE

PRELIMINARY SEPTIC SYSTEM DESIGN
for
8520 MCARTON ROAD,
OTTAWA, ONTARIO

SEPTEMBER 10, 2021

Advanced Design, Assessment & Development Inc.
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ADVANCED DESIGN, ASSESSMENT& DEVELOPMENT Inc.

PRELIMINARY SEPTIC SYSTEM DESIGN

for

8520 MCARTON ROAD,

OTTAWA, ONTARIO

Prepared BY

Advanced Design, Assessment & Development Inc.

SUBMITTED TO:

Juliette Marczuk
Chair, Board of Directors
Ottawa Valley Wild Bird Care Centre
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1. INTRODUCTION

1.1 General:

The following report demonstrates, in brief, the septic system pre-design in support of a Site Plan Application for 8520 McArton Road, City of Ottawa, Ontario. Out of 7 hectares total area of the land, the 0.863 hectare development being proposed will potentially be the new location for the Ottawa Valley Wild Bird Centre. The development includes an animal hospital with rehabilitation centre, parking area, and all required services. Figure 1 shows summer and winter aerial views of the property.

The report covers the design for a septic system that will serve the proposed development in compliance with the City of Ottawa and provential requirements and by-laws for submission with the engineering drawings for the Ottawa Septic System Office (OSSO) of the City of Ottawa for approval.

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1.2 Report Structure:

The City of Ottawa and the Ontario Ministry of the Environment Guidelines were used where applicable.

This report is divided into three sections:

i. Introduction.

ii. Septic System Design.

iii. Stormwater Management: includes design criterion, pre-development release rate, calculation of allowable release rate, calculation of post-development release rate, storage requirements, and proposed stormwater management plan.

iv. Sewage System Management/Monitoring.

v. Two Appendices:

Appendix A: Geotechnical Investigation

Appendix B: Figures 1 & 2.

Summer view

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Winter View

Figure 1-1 – Site Location

2. SEPTIC SYSTEM DESIGN

2.1 Daily Design Sewage Flow

No sanitary sewers are servicing in this area of the city. The proposed sanitary system includes two septic tanks and two pumps, one septic tank and a pump for the building and one septic tank and a pump for the aviaries, which are connected into one equalization (balancing) tank that feed the distribution pipes in the leaching bed. As per Ontario Building Code (OBC), Clause, 8.1.2.1, the septic system would consist of a conventional Class 4 leaching bed system, which its preliminary design is presented in this report for the review and approval by the Ottawa Septic System Office (OSSO) of the City of Ottawa. Refer to the servicing drawing SS-1 for the envelope of the septic system.

2.1.1 Sanitary Servicing for the Building

The Ontario Building Code (OBC) provides information regarding the Daily Design Sanitary Sewage Flow (DDSSF) for various occupancies The building sewage demand estimated based on the maximum daily water demand. As follows:

i. The maximum number of employees is twenty (20), including six (6) practitioners; and assuming a maximum of 10 cages.

ii. As per OBC, Table 8.2.1.3.B, Item 25, the maximum daily water demand is:

Q_{daily} = 6 X 275 + (20-6) X 75 + 10 X 75 = 3,450 leter/ day

iii. As per OBC, Clause 8.2.2.3. (1) (a), the minimum working capacity of a septic tank is:

V_{STank} = 3 X 3,450 = 10, 450 leter

iv. Use a septic tank with size of 12,500 leter for the building (see drawing SS-1 for the locations of the septic system parts).

2.1.2 Servicing for Outdoor Aviaries

In the proposed design, the Birds Aviaries have a wooden roof covering half of their area (50% of their total area). The aggregate wastewater demand results from the accumulated rainwater and the required water for washing the aviaries concrete floors and the walkway between the aviaries and the building. The rainwater from the wooden roofs is drained directly (by individual gutters) to the grass area on the west and south green zones. The design of the combined storm-and-sewage system of the Birds Aviaries based on two assumptions: (i) the events of cleaning the aviaries and the peak rain are not simultaneous; and (ii) the peak rain generates the dominant water discharge. Hence, the sewers and the septic tank designed to serve both stormwater and sewage of the cleaning water of aviaries.

Area of the Aviaries (A_{BC}) = 302 m^2

As the service life of the building in the Ontario Building Design Code is limited to 50 years, then only the rain intensity for 5 years storm is considered in this calculation.

Rain intensities for five years storm for T_c = 15 mins

Intensity, $I_5 = 998.071/(T_c+6.035)^{0.814}$ (5-year, City of Ottawa):

I_5 = 83.615 mm/hr

Total rainwater accumulated over the concentration-time of 15 mins is:

$Q = (A_{BC}/2) \times I_5 \times (T_c/60) = (302/2) \times (83.615/ 1000) \times (15/60) = 3.16\ m^3$

The peak discharge per second is = $3.16 \times 10^3 / (15 \times 60) = 3.5$ L/sec

125 mm diameter sanitary sewers are proposed with a minimum slope of 1.5 % having a Manning's full flow capacity of 3.5 L/sec. The pipes are progressively accumulating the wastewater from the aviaries floors by inlets (SWTC-A1 through STWC-A18 and STWC-B1). Three manholes are provided (SST-MH-1 through SST-MH-3).

As per the Ontario Building Code, the septic tank size for the building is 2.5 times of the wastewater demand, which is around 8000 liters. Since the majority of the wastewater is rainwater, and because of the nature of the birds' wastes, the septic tank size for the aviaries is reduced to 6,000 L (see drawing SS-1 for the locations of the septic system parts). As stated earliear, the events of cleaning the aviaries and the peak rain are not simultaneous; and the peak rain generates the dominant water discharge. The cleaning of the aviaries moves majority of the birds waste to the septic tank. The rainstorm water is then only moves some waste that occosianaly exist in-between two cleaning events. Since the water draied to the septic tank during a peak rain does not need remain the full time of 2.5 days. Based on this rational the volume of the septic tank is redused by 25%.

The background assumption here is that peaks of the two demands of the water pumped to the leaching bed (from the building septic tank and from the Birds Aviaries septic tank) are not simultaneous.

2.2 Septic System Design Details

Based on Boreholes 6, that was conducted on December 16, 2019 in the subject site (the Record of Borehole sheet are provided in Appendix A), the current subsurface conditions in the area of the proposed leaching bed consist of:

- From the ground surface up to a depth of 0.5 m: very loose, moist, dark brown and brown silty sand some organics, trace gravel (remolded)
- From depth 0.5 m to depth of 1.4 m: compact, moist to wet, light brown Silty Sand, trace to some gravel
- From 1.4 m to 1.9 m: highly fractured to moderately fractured limestone bedrock
- Below 1.9 m: moderately fractured lime stone bedrock.

The water table is located at 1.0 to 1.2 m below the ground level (See Appenix A, Figure .

Given the available area for the construction of a leaching bed at the subject site, a Class 4 absorption trench leaching bed is proposed.

2.2.1 Septic Tank (Primary Treatment)

As shown in Section 2.1.1 and based on provisions in the OBC, the minimum required septic tank operating volume is 10,450 litres for the building. In addition and as shown in Section 2.1.2, the required septic tank operating volume is 6,000 litres for the outdoor aviaries. The tanks are to be CSA approved and incorporate an NSF approved effluent filter.

It is recommended the sewage pipe from the building to the septic tank and from the septic tanks to the equalization (balancing) tank be adequately bedded in compacted granular material. Furthermore, as precautionary measures, it is recommended that the pipes be installed within a protective sleeve (eg. larger diameter Ipex piping, or equivalent) and insulated for frost protection.

2.2.2 Equalization (Balancing) Tank

Given the distance between the building septic tank and the balancing tank of the proposed leaching bed, it will be necessary to pump effluent between the two locations. On the other hand, the septic tank of the outdoor aviaries is located close to the leaching bed; however, its elevation is relatively low due to long sewer lines accumulating the wastewater from the aviaries. Because pumping will be required, and given that the DDSSF will typically be generated during the daytime hours while the accumulation time of the rainwater on the aviaries is unpredictable, it is recommended that the generated septic effluent be dispersed to the dispersal field on a demand basis. Therefore providing specified water levels in the septic tanks, smaller volumes of effluent will be pumped to the bed versus larger volumes of effluent at fewer, condensed periods throughout the 24 hours. This method greatly

reduces the stress that may otherwise be applied to the system, therefore likely extending the lifespan of the system.

Given the above, it is recommended that a balancing tank with a minimum operating volume of 5,500 litres be installed - approximately the volume of one peak day of sewage generation from the building (3,500 liters) and from the aviaries (2,000 liters). It is important to ensure that the minimum stated volume is provided in the balancing tank in addition to the volume that will remain in the tank due to the maximum drawdown level of the selected pump).

The balancing tank is to be equipped with two (2) 0.5 HP effluent pumps (Myers ME50, or equivalent). The pumps are to be controlled by a programed-dosing capable panel, also capable of operating the pumps on an alternating basis, and furthermore have one pump assume the duty of the other should a pump fail.

Effluent will be transported from the pumps to the header of the leaching bed through a 50 millimetre diameter flexible pipes forcemain. It is recommended that the forcemain be adequately bedded in compacted granular material. Furthermore, as precautionary measures, it is recommended that the forcemain be installed within a protective sleeve (eg. larger diameter Ipex piping, or equivalent) and insulated for frost protection.

2.2.2.1 Flow Equalization Concept

It is assumed that the majority of the daily volume of the building sewage will be generated mainly between 7 a.m. and 7 p.m., daily. On the other hand, the volume of the outdoor aviaries sewage is dependent on the rainwater on the aviaries and the frequency of cleaning them, which are unsteady.

The control panel should be linked to a floating measurement devise in the Balancing Tank and calibrated so as to run the pump when the effluent level reach the pre-designed high level and stop the pumping when the effluent level reach the lowest level (alternating pumps between pump cycles is essential). Assuming a system output rate of approximately 200 litres per minute, about 350 litres will be transported to the leaching bed during every cycle. This will result in 10 pump cycles per 24 hour period (total output of approximately 3,500 litres) in the winter time and 16 pump cycles per 24 hour period (total output of approximately 5,500 litres) in the peak summer time .

It is recommended that upon system installation, a draw down test be performed so as to verify the actual flow rate from the pump to the dispersal field. The required alarm, both audible and visual, should be installed in a location that will ensure an alarm will be readily noticeable should a system failure occur.

2.2.3 Dispersal Field (Septic Bed)

2.2.3.1 Area of Imported Sand

Given the soil conditions in the site, all the development area is raised by average of 2.3 m. For the area of the proposed leaching bed, it is proposed that the leaching bed be fully

constructed of imported sand. The imported sand should have a percolation rate (T-Time) of between 4 and 8 minutes per centimetre and contain a maximum of 5% of finer material (material passing the no. 200 sieve).

In order to provide adequate loading area over the native soil, the minimum area of the imported sand, including mantle area, has been determined as follows:

A = V/6, where

- A = Minimum area (imported sand), (m^2)
- V = Daily Sewage Flow (Litres)

A = 5,500/6 = 917 m^2 (minimum)
An area of 1,000 m^2 has been proposed, including a 15 metre sand mantle installed in the assumed direction of flow (downward gradient).

See Figure 1 and 2 for additional details.

2.2.3.2 Distribution Piping

The minimum total length of distribution piping has been determined as follows:

L = (V * T)/200, where

- V = Daily Sewage Flow (Litres)
- T = Percolation Rate of the imported septic sand fill

L = (5,500 * 8)/200 = 220.0 m (min)

A total of 224 metres of distribution piping has been proposed.

It order to ensure equal distribution of effluent throughout the leaching bed at each pump cycle, it is proposed that the distribution piping be pressurized. The distribution piping (including the header), will consist of 50 millimetre diameter PVC piping. The piping will be placed as 10 runs each having a length of 22.4 metres, placed on 1.6 metre centres. Along each length of distribution piping (lateral), 3 millimetres orifices will be drilled at 1.2 metre spacing at the 6 o'clock position. The runs of piping will be connected to a solid header with a diameter of 50 millimetres.

It is recommended that clean-out ports be installed at the end of each lateral in order to facilitate future maintenance and cleaning of the piping.

Additional information is provided on Figures 1 and 2.

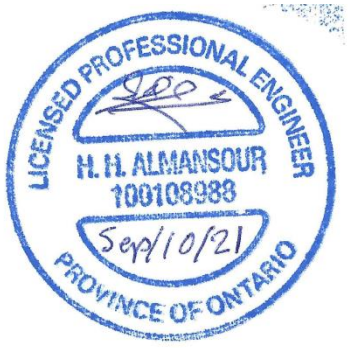
3.0 SEWAGE SYSTEM MANAGEMENT/MONITORING

Maintenance of the septic system will be the responsibility of the owner/operator of the facility or its designated maintenance provider. As a minimum, it is suggested that the maintenance include the following:

- Inspection/cleaning of the septic tank effluent filter as per manufacturer's recommendations;
- Inspection and pumping of the septic tank when determined to be necessary (typically every 3 to 5 years);
- The pump output rate be verified quarterly; and,
- Inspection and maintenance of pumps, controls, etc., per manufacturer recommendations.

All components of the system shall be inspected and maintained per the manufacturer requirements.

We trust this report provides sufficient information for your present purposes. If you have any questions concerning this report, please do not hesitate to contact our office.



Husham Almansour, P.Eng, Ph.D.

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APPENDIX A: GEOTECHNICAL INVESTIGATION

FOR THE PROPOSED WILD BIRD CARE CENTRE DEVELOPMENT LOCATED -8520 MCARTON ROAD, OTTAWA, ONTARIO

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Figure A-1 – Location of Borehole

CLIENT: Geofirma Engineering Ltd. | METHOD: Hollow Stem Augers, split spoon | **BH No.: BH105**

PROJECT: 8520 McArton Road | PROJECT ENGINEER: VN | ELEV. (m) 132.9

LOCATION: Ottawa, ON | NORTHING: 5006244 | EASTING: 417351 | PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very loose, moist, dark brown and brown silty sand, trace organics, trace gravel (remolded)	0	132.9							Borehole caved in at 1.3 mbgs, water was measured at 1.0 mbgs.
			0.3	132.6	4		1		4		
			0.6	132.3							Auger refusal on inferred bedrock at 2.4 mbgs.
▼		compact, light brown SILTY SAND, some gravel, occassional oxidization (TILL), moist	0.9	132	18	15	2		18		
		very dense, -----	1.2	131.7							
		coarse angular gravel, trace limestone, wet	1.5	131.4							
			1.8	131.1	55	9	3		55		
			2.1	130.8	50/10mm		4		50/10mm		
		END OF BOREHOLE									

LOGGED BY: RH | DRILLING DATE: December 17, 2019

REVIEWED BY: VN | Page 1 of 1

Figure A-2 – Borehole 105

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CLIENT: Geofirma Engineering Ltd.	METHOD: Hollow Stem Augers, NQ Casing		**BH No.: BH106**
PROJECT: 8520 McArton Road	PROJECT ENGINEER: VN	ELEV. (m) 132.7	
LOCATION: Ottawa, ON	NORTHING: 5006244	EASTING: 417371	PROJECT NO.: CO752.00

SAMPLE TYPE: AUGER | DRIVEN | CORING | DYNAMIC CONE | SHELBY | SPLIT SPOON

GWL (m)	SOIL SYMBOL	SOIL DESCRIPTION	DEPTH (m)	ELEVATION (m)	Shear Strength (kPa) / N-Value (Blows/300mm)	Water Content (%) PL W.C. LL	SAMPLE NO.	SAMPLE TYPE	SPT(N)	Well Construction	REMARKS
		very loose, moist, dark brown and brown silty sand some organics, trace gravel (remolded)	0 – 0.3	132.6 – 132.3			1		1		Borehole caved in at 1.2 mbgs, water was measured at 0.9 mbgs.
▼		compact, moist to wet, light brown SILTY SAND trace to some gravel occassional oxidization (TILL)	0.3 – 1.2	132.3 – 131.4	16	16	2		16		
		highly fractured / moderately fractured: Limestone Bedrock occassional oxidization RQD = 0% TCR = 96% fractures/foot= 4	1.2 – 2.1	131.4 – 130.5			3				
		moderately fractured Limestone Bedrock RQD = 78% TCR = 98% fractures/foot= 4	2.1 – 3.3	130.5 – 129.6			4				
		END OF BOREHOLE									

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Figure A-3 – Borehole 106

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APPENDIX B: PRELIMINARY SEPTIC SYSTEM DESIGN AND INSTALATION PLANS

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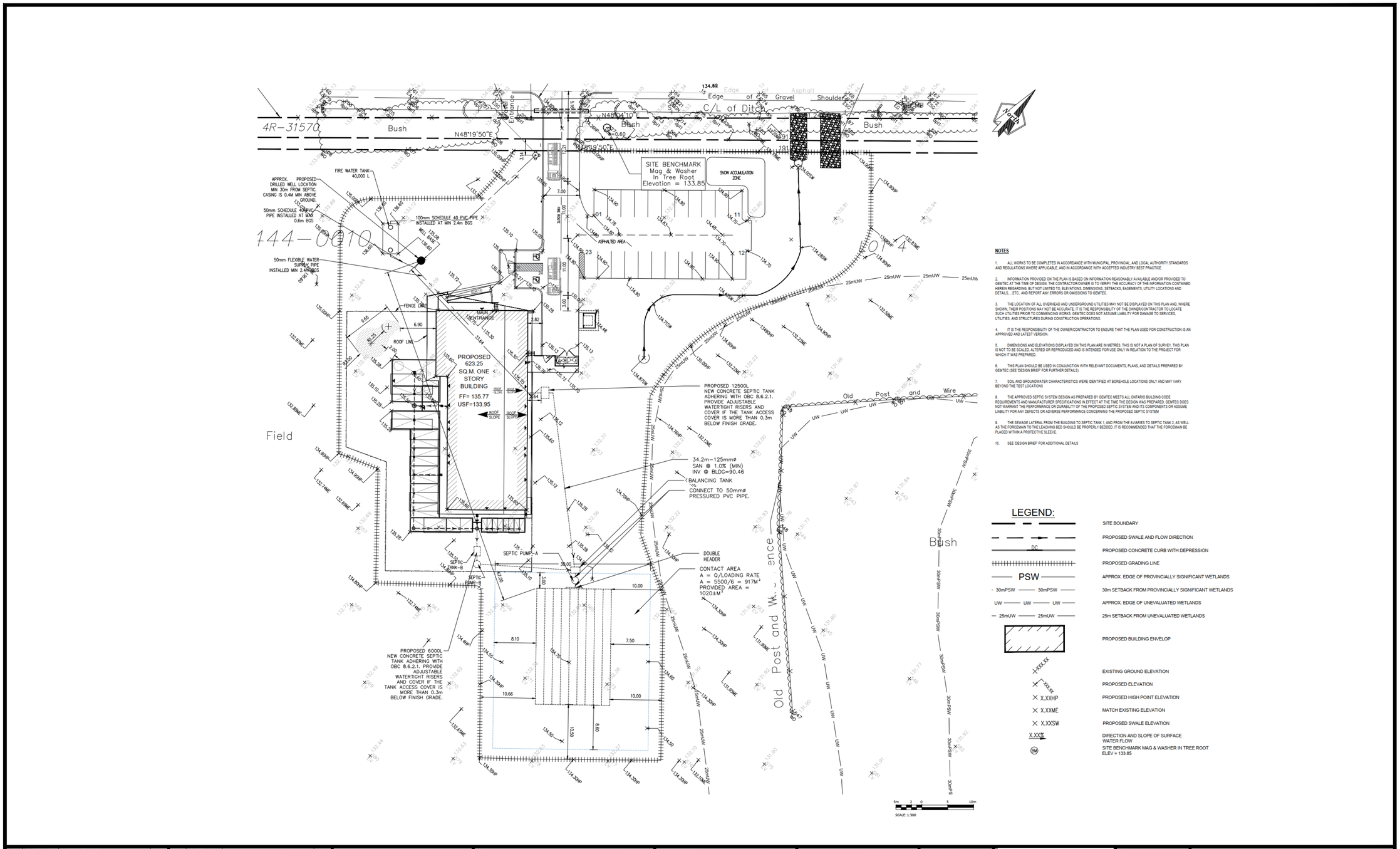
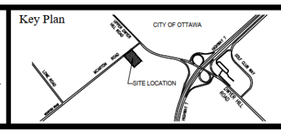


No	DATE	ISSUED FOR	App.
1	2020/07/03	SITE PLAN CONTROL	H.A.
2			
3			
4			
5			

No	DATE	REVISION	App.
1	2021/05/17	CITY COMMENTS ON 2020/09/24	H.A.
2	2021/07/16	CITY COMMENTS ON 2020/09/24	H.A.
3			
4			
5			

Key Plan



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KASTONE CONSTRUCTION MANAGEMENT

OTTAWA VALLEY WILD BIRD CARE CENTRE

ADVANCED DESIGN, ASSESSMENT & DEVELOPMENT Inc.
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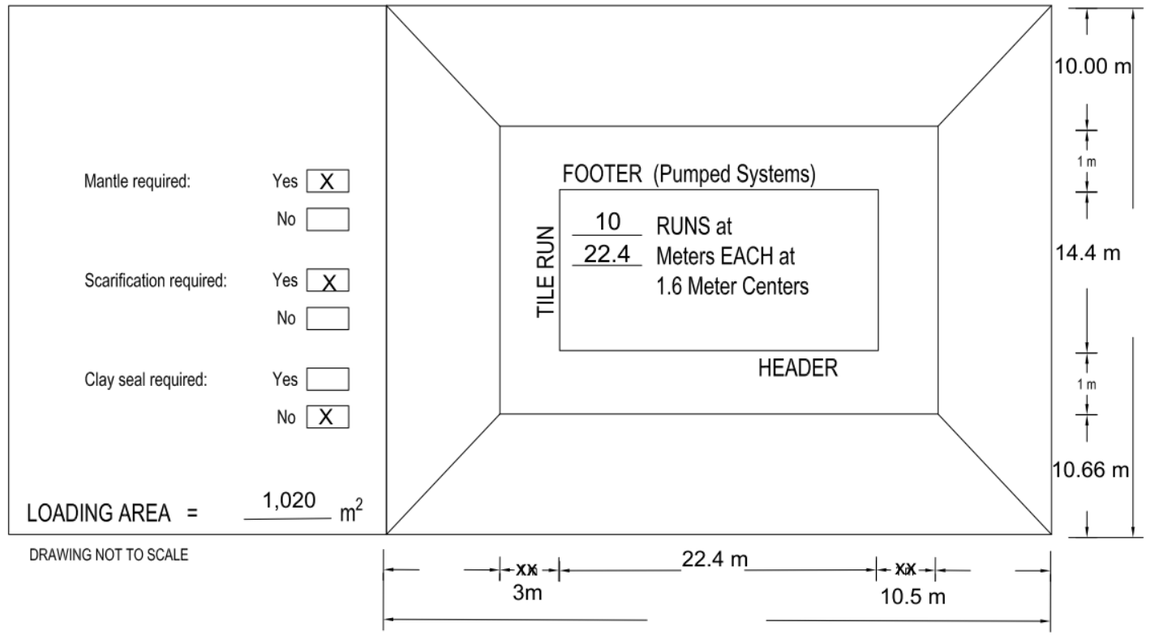
Stamps

Project
OTTAWA VALLEY WILD BIRD CARE CENTRE
8520 McArton Road, Ottawa, ON.

Title	Drawn /: A.A.	Scale
SEPTIC DESIGN PLAN	Verif. /: H.A.	1:300
Date: 2021/09/10 Revision: 1		Drawing # SS-1

Figure B-1: Septic System Design Plan

Plan View

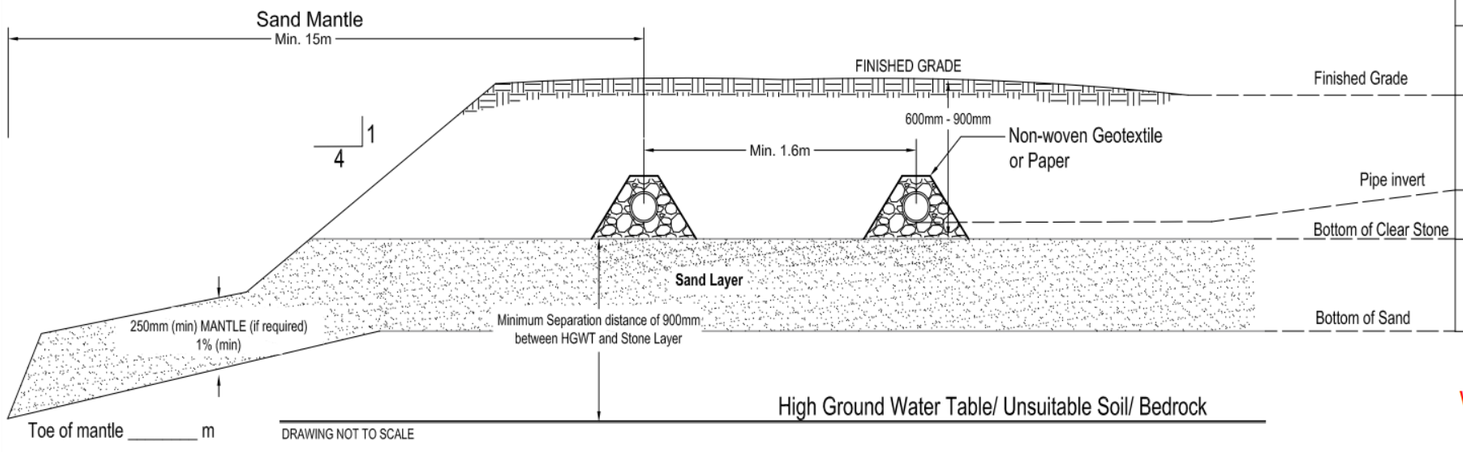


Ottawa Septic System Office / Bureau des systèmes septiques d'Ottawa

TYPICAL DRAWING A

BURIED OR RAISED TILE BED - ABSORPTION TRENCH METHOD

Cross-Section Profile



	Proposed Installation Grades	Approved Installation Grades	Existing Grade
Finished Grade	134.9		
Pipe invert	133.9		
Bottom of Clear Stone	133.5		
Bottom of Sand	132.5		

Water Table at 131.4

Figure B-2: Septic System Section and Dimensions