THE BEDROCK DEPOT

2062 SHANLY ROAD

CARDINAL, ON

TOWNSHIP OF EDWARDSBURGH-CARDINAL

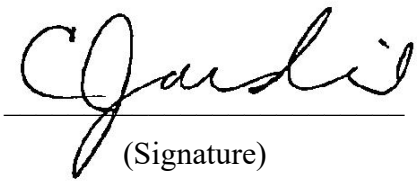
STORMWATER MANAGEMENT REPORT

PREPARED BY

EASTERN ENGINEERING GROUP INC.
CONSULTING ENGINEERS

April 11, 2024

This document entitled Stormwater Management Report was prepared by Eastern Engineering Group Inc. for the account of the Tim Markus (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in the report reflects Eastern Engineering Group's professional judgement in light of the scope, schedule and other limitations stated in the document and in the contract between Eastern Engineering Group and the Client. The opinions in the document are based on conditions and information existing at the time the document was prepared and published and do not take into account any subsequent changes. In preparing the document, Eastern Engineering Group did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Eastern Engineering Group shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions take based on this document.

Prepared by 

(Signature)

Colin A. Jardine, P. Eng

President, Eastern Engineering Group

Director of Civil Engineering

2062 SHANLY ROAD, CARDINAL, ON

STORMWATER MANAGEMENT REPORT

PROJECT

The Owner of the property at 2062 Shanly Road, Cardinal, Mr. Tim Markus, is proposing to re-develop the current residential property into a mixed commercial/residential development. The commercial portion is proposed to be a landscape depot business, selling materials for landscaping. The existing residence will remain on the site. A new small building will be constructed for the commercial portion near a new entrance of Shanly Road, just south of the existing driveway.

The area of the property being developed is approximately 0.9220 ha. A portion of the existing area is a driveway. The remaining is grass field and treed area. The treed area north of the new entrance will remain as a buffer between the residential and commercial. There are two existing wet ponds on site that will remain and be used to direct surface runoff towards. A new 8520 m2 gravel area will be constructed for the landscaping depot. The remaining land will remain grass.

SUPPORTING INFORMATION

The Preliminary Servicing Report was developed using background information provided by the Owners and the City of Brockville.

Project Name:	Tim Markus Landscape Project
Owner:	Tim Markus
	2062 Shanly Road
	Cardinal
Site Address:	2062 Shanly Road, Cardinal
Phone Number:	613-803-8061
Email:	pads29@cogeco.ca

The following documents were referenced in preparing the stormwater management design for the 2062 Shanly Road, Cardinal lot re-development:

- Stormwater Management Planning and Design Manual, Ministry of the Environment, 2003
- MTO Drainage management manual
- SNCA Design Manual

PROPOSED DEVELOPMENT

The proposed development is shown on Drawing No. C1. It consists of the following:

- 22.6 sq. m building.
- 8520 sq. m of new gravel parking lot and driving area.
- 700 sq. m of grass area.
- New road entrance from Shanly Road.
- Erosion and sediment control measures installed for construction of the facility and parking area, maintained until the vegetation has taken.

PROPOSED CONDITIONS

The change in area is 9220 sq. m from grassed surface to gravel surface.

The Runoff Coefficient for pre conditions is 0.35 (grassed field). The Runoff Coefficient for post condition is 0.58 (gravel). The area changing is 9220 sq. m.

There will be an increase in runoff from the gravel surface but the permeability of the gravel will allow stormwater to infiltrate into the soils. The direction of drainage of surface flow is directed to the existing ponds on the site.

The image below shows the existing view facing north looking at the site from Shanley Road.

Photo 1 – Site Looking North

STORM WATER MANAGEMENT

The normal requirement for a site is to match pre-development to post-development conditions. The intention of the design in this report does not aim for pre to post as the increase we feel is negligible and presents a minimal risk to the surrounding properties. As determined by a topographic survey, the natural drainage of the entire site is generally to from north to south to the pond that is on property. This drainage pattern will not be modified.

There is natural wet area south of the cleared property as well which acts as a natural filter for sediment control.

QUALITY – BEST MANAGEMENT PRACTICES

The modified area of the site is 0.922 ha, as defined in the MOE stormwater design manual, section 4.1.1, the amount of land being developed, we treat this as a smaller developable site and recommend Lot Level and Conveyance Controls should be allowed for the site.

The flow from the site will follow natural drainage paths from the west in the rear and east in th front of the property to existing ditches. To help with water quality, Best Management Practices and Low Impact Development strategies are addressed by the nature of the development which includes the following factors:

Infiltration

Long flow paths will help with the removal of sediment and keeping temperature of the water lower.

Preserve areas of undisturbed soil and vegetation

Areas that can retain their natural soils and current conditions should be included in the planning.

Fit design to terrain

The parking lot will be constructed to match existing grades where possible. The undeveloped grass land area will be utilized to promote infiltration and sediment removal.

Lot level Controls

It is now standard practice to direct roof leaders onto grassed areas, as opposed to a hard surface. Discharge from any roof drains be implemented wherever possible, increasing the likelihood of particle filtration and runoff re-absorption.

At the lot level, the effects of runoff reduction measures are enhanced by minimizing lot grades to promote natural infiltration. Due to the natural topography or relief of the site, the existing grading of the entire site will be maintained and thus allowing natural filtration and absorption to continue while maintaining base flows and reducing TSS levels.

Conveyance Control

The use of low gradient grassed waterways having minimal side slopes is one of the best conveyance controls available. The flat grades help to reduce flow velocities, reducing erosion potential.

STORMWATER QUANTITY CONTROL

PRE-DEVELOPMENT FLOW

The water quantity objective for the storage areas is to not exceed the existing stormwater flows from the area. The flow is limited to the pre-development runoff rates. Please note that it is widely recognized that the rationale method typically overestimates peak runoff flows and as a result is an extremely conservative prediction method. Any facilities that are sized using results from the rationale method are expected to function in "real world" conditions.

The total area of the proposed site is 0.9220 ha which will be converted from grass to the gravel storage yard. The surface runoff will drain to the existing ponds on the site which currently collect water runoff from the property. Swales and berms will be used to direct the water to the existing ponds. The developed site will support sheet flow from north to south.

The predevelopment runoff coefficient using MTO Design Manual is 0.35 for treed/grassed areas. The post-development runoff coefficient is calculated based on surfaces shown on engineering plans. See table below.

Runoff Coefficient Calculation

AREA 0.922 ha	IMPERVIOUS C Value	EXISTING PRE (ha)	C x Area PRE	POST CONST (ha)	C x Area POST
Grassed Area	0.35	0.922	0.323	0.070	.0245
Compacted Gravel	0.6	0	0	0.8520	.5112
			Cpre = 0.35		0.5357/0.922 Cpost = 0.58

The pre-development flow for the drainage area is calculated using the Rational Method.

$Q = 2.78\ C\ i\ A$ where Q = flow volume, L/s

C = runoff coefficient

i = rainfall intensity, mm/hr.

A = drainage area, ha.

Total area of the site = 0.922 ha.

Using the Design Guidelines, the runoff coefficient for the existing condition runoff coefficient of 0.35 is assumed based on above table.

Time of Concentration (Airport Formula)

Tc assumed to be 15 mins

Rainfall intensity of the property is calculated from the IDF curves available at MTO IDF Curve Finder

Intensity Duration Frequency calculated using online MTO curve.

i_5 = 70.9 mm/hr.

Q_5 = 2.78 * .35 * 0.922 ha * 70.9 = **115.40 L/s**

POST-DEVELOPMENT FLOW- CONTROLLED FLOW

The post development flows are calculated using Modified Rationale method for various times and rainfall intensities, to determine how much storage is required for each drainage area.

The post development runoff coefficient is calculated to be 0.58.

The allowable release rate from the site is 115.40 L/s (5 year)

5 Year Storage – A=0.922 ha, c=0.58, Q allowable 115.40 L/s

Tc (min.)	I (mm/hr.)	Q (L/s)	Qallow (L/s)	Net Runoff (L/s)	Storage (m^3)
5	152.8	227.1574918	115.40	111.76	33.53
10	94.1	139.8921465	115.40	24.49	14.70
15	70.9	105.4022655	115.40	0	0
30	43.7	64.97	115.40	0	0

100 Year Storage – A=0.922 ha, c=0.58, Q allowable 115.40 L/s

Tc (min.)	I (mm/hr.)	Q (L/s)	Qallow (L/s)	Net Runoff (L/s)	Storage (m^3)
5	255.6	379.98	115.40	264.58	79.38
10	157.4	234.00	115.40	118.60	71.16
15	118.6	176.32	115.40	60.91	54.82
30	73.1	108.67	115.40	0	0

Therefore, based on Modified Rationale Method, the storage requirement for the site modifications are for 5 year – 33.53 m3 and for 100 year - 79.38 m3. The stormwater flows overland to the swale and into the existing ponds. Overflow is to the natural wetlands south of the property.

STORAGE PROVIDED

The existing ponds will store stormwater. In spring months, there is 0.3m of storage in the ponds, and during dry months it would be 1.0 m of storage. The areas of the ponds are 878 m2 combined, for a spring storage of 263 m3 and summer storage of 878 m3.
This exceeds the requirements for 100 year storm storage.

SEDIMENT AND EROSION CONTROL

To control sediment and erosion during construction the Contractor shall install silt fences on the site as per OPSD 219.110 as needed around the construction site.

Sediment and erosion control barriers shall be monitored daily and maintained, as necessary. The Contractor shall remove the sediment and erosion control measures upon completion of construction and after re-vegetation has occurred. Care shall be taken at the removal stage to ensure that any silt that has accumulated is properly handled and disposed of.

The owner shall be responsible for monitoring and maintaining the stormwater facilities.

The Sediment and Erosion Control Plan shall be considered a 'living document' that may need to be changed or adjusted during the life of the project to be effective.

CONCLUSION – LOW RISK SITE

The area of the site being developed is a small portion of the larger 0.922 ha lot.

Stormwater runoff from the developed area of the site will flow overland to the existing pond, and overflow to the south of the property.

As the site being less than 2 ha, as defined in the MOE stormwater design manual, section 4.1.1, the amount of land being developed is much smaller and Lot Level and Conveyance Controls

should be allowed for this site. The site has controls for Lot Level controls naturally on the site with reduced grading, and large areas of grassed, vegetated land for infiltration.

The site as proposed, is a low risk with regards to stormwater runoff affecting neighboring properties due to the location of the site, the amount of area for dispersion and infiltration of runoff from the developed portion. The increase in runoff is negligible when considering the wide sheet flow and very low flow velocities of the stormwater.

Prepared by:
Eastern Engineering Group Inc.
100 Strowger Boulevard, Suite 207
Brockville, ON K6V 5J9

Colin A. Jardine, P. Eng
April 11, 2024