

# STORMWATER MANAGEMENT REPORT

GAS STATION REDEVELOPMENT

6175 ROCKDALE ROAD, VARS

Project N° 171-14602-00

Prepared for:  
**Mr. Abdu El-Arab**

Date: August 29, 2019

REV.3

—  
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# 1 INTRODUCTION

## 1.1 BACKGROUND

WSP Canada Inc. has been retained by Mr. Abdu El-Arab to complete a detailed stormwater management design for a mixed use catchment area, which includes a gas station redevelopment and car sales lot in Vars, Ontario. This Stormwater Management report addresses the stormwater collection system and stormwater management for the proposed 0.912Ha development.

# 2 GENERAL DESCRIPTION

## 2.1 GENERAL DESCRIPTION

The proposed development is located on the property known as 6175 Rockdale Road, of the Municipality of Ottawa located within ward 19. The property is located on the East Side of Rockdale road, immediately North of highway 417, approximately 2km south of the Village of Vars.

The General Site Plan, C1.2, shows a key plan which illustrates the subject property and the proposed future development of the surrounding lands.

# 3 STORMWATER COLLECTION

Stormwater is generally of concern for two main reasons: the quantity of flow generated from an event and the potential contaminants that water is carrying. The City of Ottawa and MOE have determined that quantity control will not be required for this site, however enhanced quality control is mandatory.

## 3.1 EXISTING AND PROPOSED DRAINAGE PATTERNS

The existing drainage patterns were established based on the topographical survey completed by WSP Canada Inc; the site was observed to be relatively flat, open paved land. As shown in FIG.1 – “Pre-Development Stormwater Catchment Areas”, catchment A-101 currently crowns, draining into the surrounding open ditches which run Southwards along both sides of the property. These open ditches convey the water to the north side of Highway 417, going Eastward. The approximate distance from the most norther tip of the site to the South-East corner approximately 190m comprising a mix of asphalt, average grass and dense grass.

FIG.2 – “Post-Development Stormwater Catchment Areas” illustrates the proposed overall post-development stormwater catchment areas for the site. Area A-2 of the proposed development (including the pump area and vehicle parking areas) will sheet drain a maximum 76m to a surface inlet collection point near the South-East corner of the proposed redevelopment area, to be treated

and released to the ditch on the east side of the development. The roof (area A-1) is proposed to be controlled at the roof level, with a controlled release to a surface outlet along the Northern edge of the site. This outlet is proposed to be directed through approximately 130m of ditch along the east side of the development before meeting up with the released flow from Area A-2. The remaining areas (A-3) around the perimeter of the property will sheet drain, uncontrolled to the nearest ditch. The furthest distance any part of area A-3 will flow is approximately 120m.

FIG.1 and FIG.2 may be found in Appendix B.

### 3.2 STORMWATER MANAGEMENT DESIGN CRITERIA

The City of Ottawa and MOE require 80% total suspended solids (TSS) removal. Water quantity control has not been made a criteria, however it is proposed for the proposed building roof.

### 3.3 MODIFIED RATIONAL METHOD

The modified rational method was used to compare the pre-development and post-development runoff for storm events with return periods of 5 years and 100 years. The modified rational method is a valid approximation of the peak flow generated by a storm event, provided it is used for drainage areas smaller than 100 hectares.<sup>1</sup>

### 3.4 RUNOFF COEFFICIENT

The pre-development runoff coefficient was taken as  $C = 0.5$  as per the City of Ottawa Sewer Design Guidelines (2012), Section 5.4.5.2 on page 5.26:

*“Commercial, Institutional and Industrial areas are to use on-site detention techniques to limit the runoff from the subject site to a maximum equivalent —CII coefficient of 0.5. Flows in excess of the 5 year storm release rate into the storm sewer must be detained on site. Release rates into the sewer system should not be less than that used for residential areas.”*

The post-development runoff coefficients were calculated based on runoff coefficients of 0.30 for vegetation and 0.90 for asphalt, concrete, and roof areas. A post development weighted runoff coefficient of 0.56 for the entire site was calculated using the above noted runoff coefficients and their respective areas. The post-development runoff coefficient calculations can be found in Appendix C.

### 3.5 TIME OF CONCENTRATION

The time of concentration ( $T_c$ ) represents the longest time that will take for a water droplet to run off the watershed to its discharge point, and at which time the peak flow will occur. The time of concentration for the predevelopment condition was taken from Appendix 5-D of the City of Ottawa Sewer Design Guidelines, using low slope asphalt. A  $T_c$  of 20 minutes was used.

The time of concentration for the post development conditions were calculated using the Kirpich Formula as it was found to generate conservatively shorter times than the city of Ottawa method. As a result, the post developments  $T_c$ 's were determined to be 3.2 minutes, 14.5 minutes and 14.9

---

<sup>1</sup> Singh, V. (1992). *Elementary Hydrology*. Prentice-Hall, Upper Saddle River, New Jersey. p. 599

minutes for areas A-1, A-2 and A-3 respectively. A copy of the Tc calculation sheet has been included in Appendix C.

### 3.6 RAINFALL INTENSITY

The rainfall intensity was derived from the intensity duration frequency (IDF) curve equations provided on page 5.13 in the City of Ottawa Sewer Design Guidelines (2012).

### 3.7 STORM SEWER DESIGN

The storm sewers were sized based on the peak flow event with a 100 year return period, the above design criteria and a Mannings roughness coefficient of 0.013. The runoff calculation sheets may be found in "Appendix C".

## 4 STORMWATER QUANTITY

As previously mentioned, storm water quantity control is being proposed for the proposed building roof area.

Table 4-1 and Table 4-2 below summarize the pre and post-development uncontrolled scenarios for the entire site for storm events with return periods of 5 years and 100 years respectively.

**Table 4-1 Pre Development Flows - 5 & 100 Year Period**

CATCHMENT AREA	AREA (HA)	C FACTOR	5 YEAR FLOW (L/S)	100 YEAR FLOW (L/S)
A-101	0.91	0.50	89.73	153.21
<b>Total</b>	<b>0.91</b>		<b>89.73</b>	<b>153.21</b>

**Table 4-2 Post Development Uncontrolled Flows - 5 & 100 Year Return Period**

CATCHMENT AREA	AREA (HA)	C FACTOR	5 YEAR FLOW (L/S)	100 YEAR FLOW (L/S)
A-1	0.03	0.90	13.69	23.58
A-2	0.33	0.86	68.29	116.81
A-3	0.55	0.36	45.96	78.60
<b>Total</b>	<b>0.91</b>	<b>0.56</b>	<b>127.95</b>	<b>218.99</b>

As can be seen, the total post-development flows exceed the corresponding pre-development values for both the 5 and 100 year storms, respectively. Given that storm water management is proposed for the building roof area, total post-development flows will be reduced for area A-1, but cannot be reduced to less than pre-development levels as detailed in Table 4-3 below.

**Table 4-3 Post Development controlled Flows - 5 & 100 Year Return Period**

CATCHMENT AREA	AREA (HA)	C FACTOR	5 YEAR FLOW (L/S)	100 YEAR FLOW (L/S)
A-1	0.03	0.90	0.63	0.63

A-2	0.33	0.86	(see Appendix D)	(see Appendix D)
A-3	0.55	0.36		
<b>Total</b>	<b>0.91</b>	<b>0.56</b>	<b>114.89</b>	<b>196.04</b>

Storage will therefore be required for this area in order to attenuate post-development flows to specified levels. This will be achieved using a maximum of 150mm of rooftop ponding.

Drawing C1.3 – Services Plan, illustrates the proposed building area, the roof of which is proposed to be used as a stormwater management facility for both the 5 and 100 year post development storm events. The provided storage calculations were based on a maximum water depth of 150mm.

Table 4-4 and

Table 4-5 below summarize the pre-development and post development controlled scenarios for the roof area for the 5 year and 100 year storm events respectively. Detailed required storage, provided storage and resulting out flow calculations may be found in Appendix “D”.

**Table 4-4 Controlled Stormwater Runoff for Pre/Post – 5 Year Return Period**

CATCHMENT AREA	PRE DEVELOPMENT			POST DEVELOPMENT			
	Area (Ha)	C Factor	Allowable Peak Runoff (L/s)	C Factor	Controlled Peak Runoff (L/s)	Required Storage (M <sup>3</sup> )	Provided Storage (M <sup>3</sup> )
A-2	0.03	0.50	3.28	0.90	0.63	7.63	15.51
<b>Total</b>	<b>0.03</b>		<b>3.28</b>		<b>0.63</b>	<b>7.63</b>	<b>15.51</b>

**Table 4-5 Controlled Stormwater Runoff for Pre/Post –100 Year Return Period**

CATCHMENT AREA	PRE DEVELOPMENT			POST DEVELOPMENT			
	Area (Ha)	C Factor	Allowable Peak Runoff (L/s)	C Factor	Controlled Peak Runoff (L/s)	Required Storage (M <sup>3</sup> )	Provided Storage (M <sup>3</sup> )
A-2	0.03	0.50	5.59	0.90	0.63	15.20	15.51
<b>Total</b>	<b>0.03</b>		<b>5.59</b>		<b>0.63</b>	<b>15.20</b>	<b>15.51</b>

As shown above, the provided storage is greater than the required storage values. The post development peak run-off rates are greater than would be typical for a development on this size in the City of Ottawa, however given that quantity control is not a design criteria, this is irrelevant.

## 5

## STORMWATER QUALITY

As previously mentioned, the MOE also requires 80% TSS removal, which will be achieved with a Stormceptor water treatment unit. The manufacturer’s model sizing tool was employed in the selection of the STC750 complete with extended oil storage (EOS) capacity. Additional details and calculations may be found in Appendix “D”.



The areas at risk of introducing contaminants to the surface runoff include the pump station apron and car sales parking area. These areas are proposed to be graded such that they drain exclusively into the proposed stormceptor. It is recommended that the stormceptor be equipped with the "Smartpro" remote monitoring system. This monitor triggers an alarm when the Sotrmceptor unit has reached 85% of its oil storage capacity, thus ensuring that spills do not go unnoticed.

## 6 SEDIMENT CONTROL DURING CONSTRUCTION

Straw bale flow check (as per O.P.S.D. 219.180) and light duty silt fence (as per O.P.S.D. 219.110) will be installed and maintained throughout the duration of construction, to be removed only once seeding is completed and grass in the ditches has reached a height of 150 mm.

The straw bale flow checks will be installed in the outlet ditch, while the silt fence will be installed along the perimeter of the development. This will serve to minimize sediment transport and erosion during construction of the proposed subdivision.

The straw bale flow checks and silt fence are to be monitored on a weekly basis and after significant rainfall events throughout construction and repaired or replaced as necessary to maintain functionality.

## 7 PROCESS AND SCHEDULE

This Stormwater Management Report is prepared in support of the application to MOE. The owner intends on proceeding with the construction of the stormwater collection and management systems as soon as Environment Compliance Approval (ECA) is finalized.

Please do not hesitate to contact the undersigned should you have any questions or comments.

Sincerely,

WSP



Michael Jans, P.Eng.  
Municipal Engineer

M:\2017\171-14602-00 - Vars Gas Station\3.0 Technical\3.7 Reports\171-14602-00-ServicingRpt-mj.docx

# Appendix A

**CORRESPONDANCE WITH AUTHORITIES**

## Jans, Michael

---

**From:** McCormick, Sarah <sarah.mccormick@ottawa.ca>  
**Sent:** Wednesday, November 01, 2017 3:10 PM  
**To:** Jans, Michael  
**Cc:** Morgan, Brian  
**Subject:** RE: 6175 Rockdale Road, Vars

Good afternoon Michael,

While a full stormwater management report is not required in this circumstance, a brief will need to be submitted. The stormwater brief will need to address water quality and will need to include an oil/grit separator. Given the location of the property, water quantity does not need to be controlled.

If there are any additional questions regarding the engineering requirement, you can contact Brian Morgan directly. Please copy me on all correspondence so I remain up to date on the discussions.

Thank you,

**Sarah McCormick** MCIP, RPP

**Planner / Urbaniste**

Development Review, Rural Services / Examen des projets d'aménagement, Service ruraux  
Planning, Infrastructure and Economic Development Department  
Services de planifications, d'infrastructure et de développement économique

City of Ottawa / Ville d'Ottawa

110 av Laurier Avenue West/ouest - 4th Floor/4<sup>e</sup> étage  
Ottawa, ON, K1P 1J1



613.580.2424 ext./poste 24487

---

**From:** Jans, Michael [mailto:michael.jans@wsp.com]  
**Sent:** Monday, October 30, 2017 8:20 AM  
**To:** McCormick, Sarah <sarah.mccormick@ottawa.ca>  
**Cc:** Morgan, Brian <Brian.Morgan@ottawa.ca>  
**Subject:** RE: 6175 Rockdale Road, Vars

Hi Sarah,

Ok, thanks for the heads up.

Regards,

Regards,

**Michael J. Jans, P.Eng.**

T +1 613-933-5602 #296



---

**From:** McCormick, Sarah [<mailto:sarah.mccormick@ottawa.ca>]  
**Sent:** Friday, October 27, 2017 10:25 AM  
**To:** Jans, Michael <[michael.jans@wsp.com](mailto:michael.jans@wsp.com)>  
**Cc:** Morgan, Brian <[Brian.Morgan@ottawa.ca](mailto:Brian.Morgan@ottawa.ca)>  
**Subject:** 6175 Rockdale Road, Vars

Good morning Michael,

Melanie is now working in another area of the City and I have now been assigned to this file. I have reached out to the engineer on the file to clarify the engineering requirements, and we will get back to you as soon as possible.

Regards,

**Sarah McCormick** MCIP, RPP

Planner / Urbaniste

Development Review, Rural Services / Examen des projets d'aménagement, Service ruraux  
Planning, Infrastructure and Economic Development Department  
Services de planifications, d'infrastructure et de développement économique

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110 av Laurier Avenue West/ouest - 4th Floor/4<sup>e</sup> étage  
Ottawa, ON, K1P 1J1



613.580.2424 ext./poste 24487

**From:** [webform@ottawa.ca](mailto:webform@ottawa.ca) [<mailto:webform@ottawa.ca>]  
**Sent:** Tuesday, October 24, 2017 3:14 PM  
**To:** Gervais, Melanie <[Melanie.Gervais@ottawa.ca](mailto:Melanie.Gervais@ottawa.ca)>  
**Cc:** Morgan, Brian <[Brian.Morgan@ottawa.ca](mailto:Brian.Morgan@ottawa.ca)>  
**Subject:** 6175 Rockdale Road, Vars

\*\*\*A visitor to [ottawa.ca](http://ottawa.ca) website has sent you this message through the [employee directory online contact form](#).\*\*\*

Sender's Full Name \*  
Michael Jans

Sender's E-mail \*  
[michael.jans@wsp.com](mailto:michael.jans@wsp.com)

Daytime phone number  
613-935-0539

CC  
Brian Morgan

Message \*

Hi Melanie, We've been retained by Mr. El-Arab to complete the site works design for his proposed gas station redevelopment at the above captioned address. I met with Mr. El-Arab and his architect, Ewald, yesterday to hold a kickoff meeting. I learned that at least one preconsultation meeting had taken place and received a copy of the Applicant's Study and Plan Identification List. The purpose of this email is to confirm the design criteria conveyed to me during yesterday's meeting. According to the owner and his architect, the City has expressed that stormwater management is not required for this site and that sheet drainage to any or all of the surrounding ditches is permissible. Please confirm. Following your response, further questions may arise. Regards, Michael Jans

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## Jans, Michael

---

**From:** Leavoy, Jena (MOECC) <Jena.Leavoy@ontario.ca>  
**Sent:** Monday, October 30, 2017 10:05 AM  
**To:** Jans, Michael  
**Subject:** gas station redevelopment - vars  
**Attachments:** ODO - Pre-Submission Consultation Request Fill-in Form-May 2017 v4r.docx

Hello Michael,

Please fill out the pre-submission application form attached. Once this information been submitted then the Environmental Officer (me) assigned to your file will contact you. As discussed, this gas station redevelopment would require an industrial sewage works ECA for stormwater management.

Thank you,

*Jena Leavoy*

Senior Environmental Officer  
Ontario Ministry of the Environment and Climate Change  
Operation Division, Eastern Region  
Ottawa District Office  
2430 Don Reid Drive  
Ottawa, ON K1H 1E1  
Phone: (613 )521-3450 x236  
Fax: (613) 521-5437

# Appendix B

**STORMWATER CATCHMENT AREAS**



1345 ROSEMOUNT AVENUE  
 CORNWALL, ONTARIO  
 CANADA K6J 3E5  
 PHONE: 613-933-5602 FAX: 613-936-0335  
 WWW.WSPGROUP.COM

CLIENT:

MR. ABDU EL-ARAB

CLIENT REF. #:

PROJECT:

GAS STATION REDEVELOPEMENT

PROJECT NO:

171-14602-00

DATE:

08/26/2019

ORIGINAL SCALE:

1:750

DESIGNED BY:

MJ

DRAWN BY:

BL

CHECKED BY:

MJ

IF THIS BAR IS NOT 25mm  
 LONG, ADJUST YOUR  
 PLOTTING SCALE.

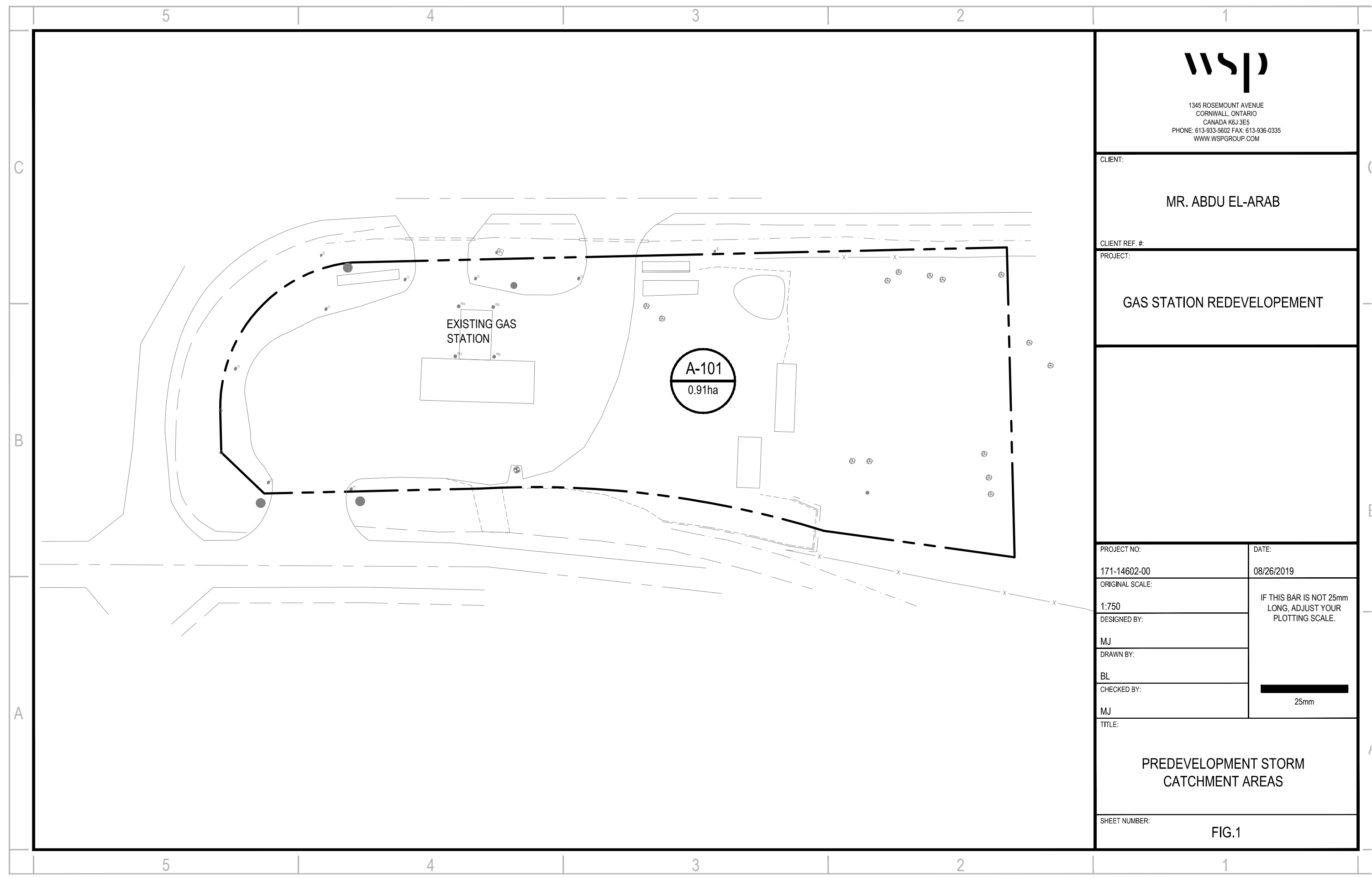


TITLE:

PREDEVELOPMENT STORM  
 CATCHMENT AREAS

SHEET NUMBER:

FIG.1








1345 ROSEMOUNT AVENUE  
 CORNWALL, ONTARIO  
 CANADA K6J 3E5  
 PHONE: 613-933-5602 FAX: 613-936-0335  
 WWW.WSPGROUP.COM

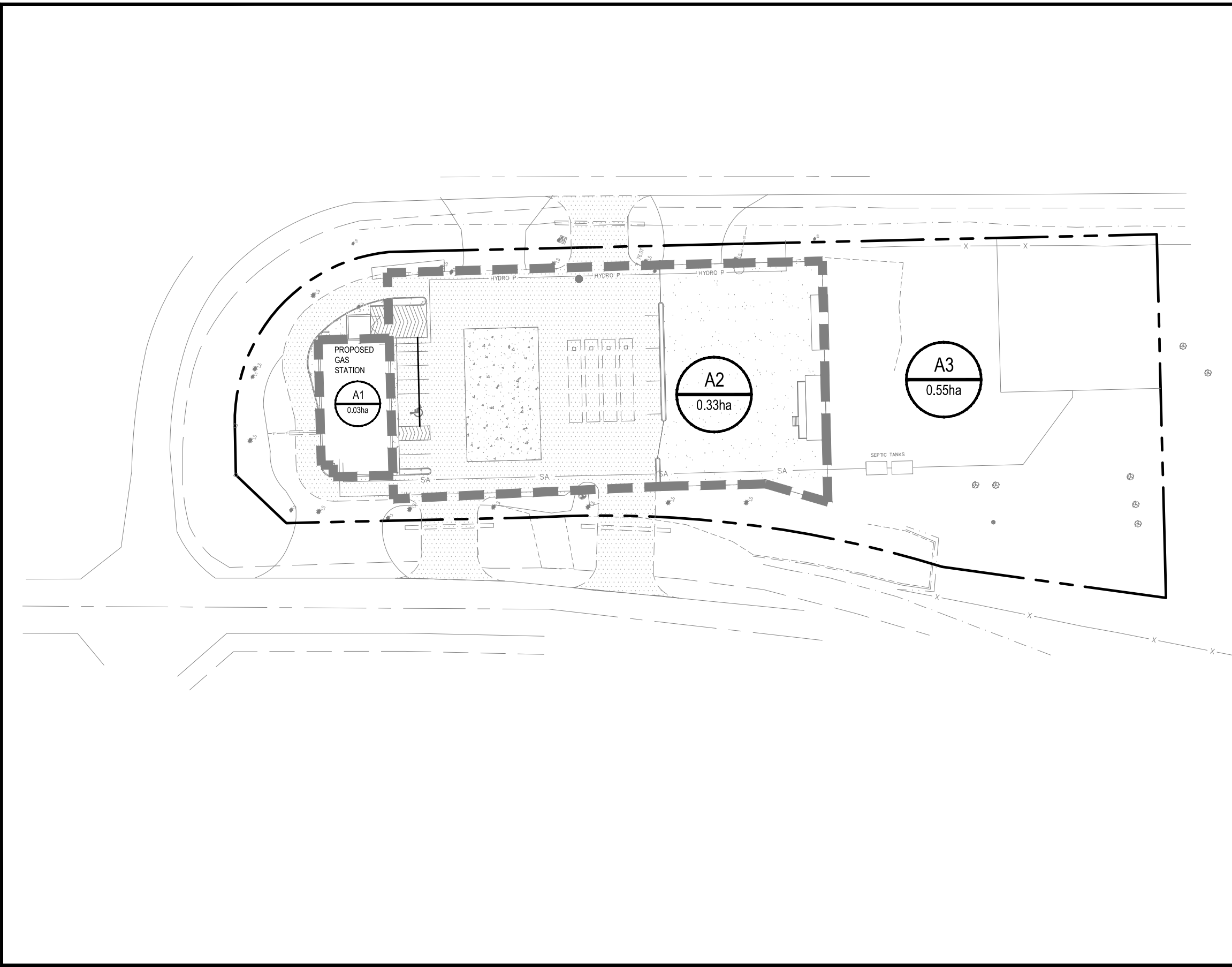
CLIENT:  
 MR. ABDU EL-ARAB

CLIENT REF. #:  
 PROJECT:  
 GAS STATION REDEVELOPEMENT

PROJECT NO: 171-14602-00	DATE: 08/26/2019
ORIGINAL SCALE: 1:750	IF THIS BAR IS NOT 25mm LONG, ADJUST YOUR PLOTTING SCALE.
DESIGNED BY: MJ	
DRAWN BY: BL	
CHECKED BY: MJ	 25mm

TITLE:  
 POST DEVELOPMENT STORM  
 CATCHMENT AREAS

SHEET NUMBER:  
 FIG.2





1345 ROSEMOUNT AVENUE  
 CORNWALL, ONTARIO  
 CANADA K6J 3E5  
 PHONE: 613-933-5602 FAX: 613-936-0335  
 WWW.WSPGROUP.COM

CLIENT:

MR. ABDU EL-ARAB

CLIENT REF. #:  
 PROJECT:

GAS STATION REDEVELOPEMENT

PROJECT NO:  
 171-14602-00

DATE:  
 08/26/2019

ORIGINAL SCALE:  
 1:750

DESIGNED BY:  
 MJ

DRAWN BY:  
 BL

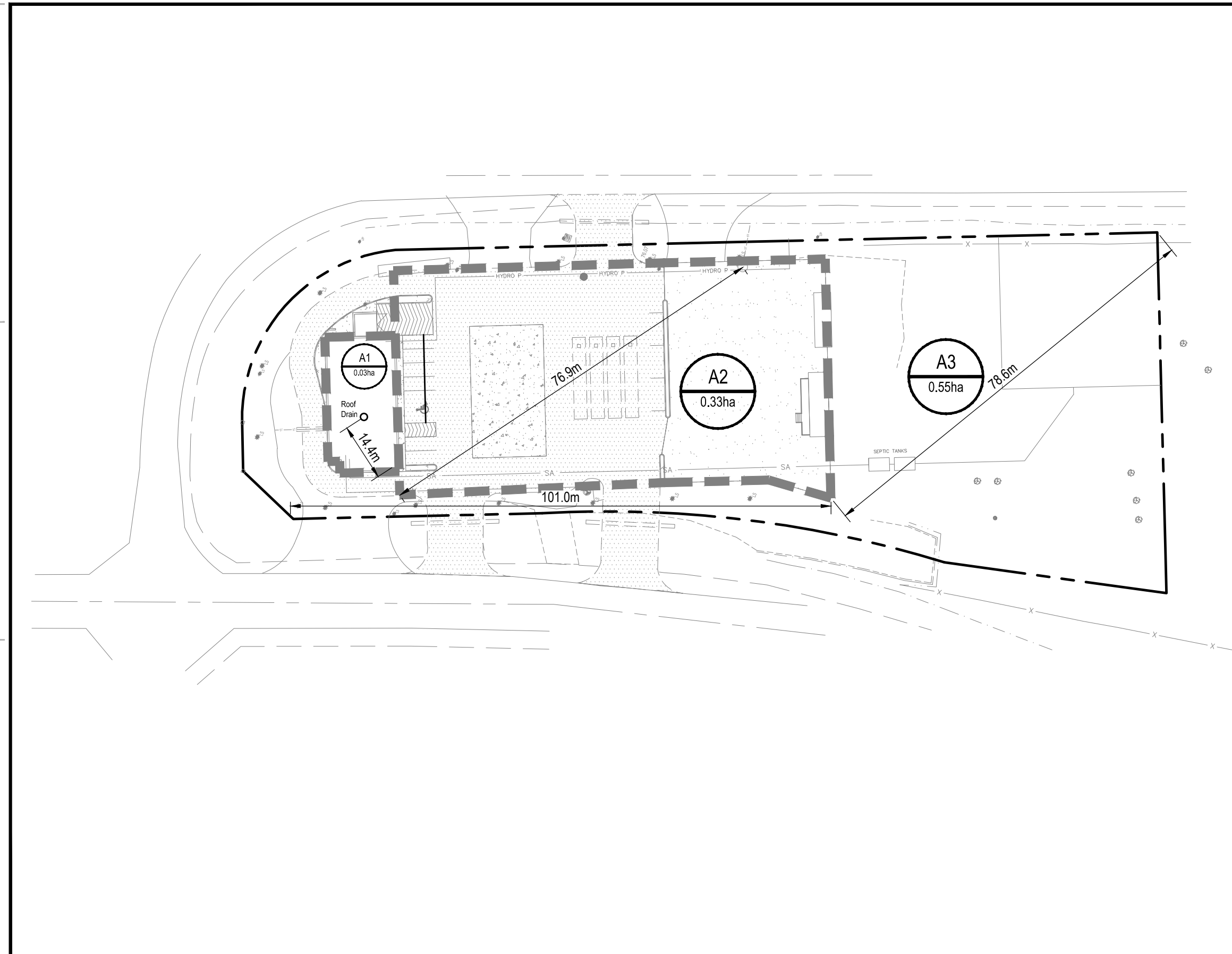
CHECKED BY:  
 MJ

IF THIS BAR IS NOT 25mm  
 LONG, ADJUST YOUR  
 PLOTTING SCALE.



TITLE:  
 RUNNOFF FLOW PATHS

SHEET NUMBER:  
 FIG.3



5	4	3	2	1
C				
B				
A				
5	4	3	2	1

# Appendix C

**WEIGHTED RUNOFF COEFFICIENTS  
RUN-OFF CALCULATIONS  
TIME OF CONCENTRATION CALCULATIONS  
STORM SEWER SIZING CALCULATIONS**

## Time of Concentration Calculation

Project Name: Gas Station, Vars, Ontario

Project #: 171-14602-00

The Kirpich formula was used:

$$t_c = \frac{58L}{A^{0.1}S_c^{0.2}}$$

Where:

$t_c$  is the time of concentration in minutes

$S_e$  is the equal area slope of the main stream projected to the catchment divide (m/km)

$L$  is the main stream length measured to the catchment divide (km)

$A$  is the area of the catchment (km<sup>2</sup>)

### **Post Development $t_c$ 's**

Area	L (km)	A (sq km)	$S_c$ (m/km)	$t_c$ (minutes)
A-1	0.014	0.003	0.02	3.2
A-2	0.076	0.033	0.014	14.5
A-3	0.12	0.055	0.0125	14.9

Vars Gas Station Project # 171-14602-00  
**Weighted Runoff Coefficient Calculations**

Building Roof

Description	C factor	Area (ha)
Asphalt/Concrete/Building	0.90	0.03
Gravel	0.80	0.00
Grass / Woodland	0.30	0.00
<b>Total Area</b>		0.03
<b>Weighted "C" Factor</b>		0.90

Pumps & Parking

Description	C factor	Area (ha)
Asphalt/Concrete/Building	0.90	0.21
Gravel	0.80	0.13
Grass / Woodland	0.30	0.00
<b>Total Area</b>		0.33
<b>Weighted "C" Factor</b>		0.86

Remainder

Description	C factor	Area (ha)
Asphalt/Concrete/Building	0.90	0.05
Gravel	0.80	0.00
Grass / Woodland	0.30	0.49
<b>Total Area</b>		0.55
<b>Weighted "C" Factor</b>		0.36

Site Average

Description	C factor	Area (ha)
Roof	0.90	0.03
Pumps & Parking	0.86	0.33
Remainder	0.36	0.55
<b>Total Area</b>		0.91
<b>Weighted "C" Factor</b>		0.56

# Gas Station Redevelopment

## RUN-OFF CALCULATIONS

PROJECT No.: 171-14602-00  
DESIGNED BY: Mike Jans, P.Eng.  
CHECKED BY: Mike Jans, P.Eng.

### Allowable Peak Run-off Rates for Entire Site (Pre-Development)

AREA		RUNOFF DATA						
		C	CA	Tc	Intensity (mm/hr)		5yr. Q (L/s)	100yr. Q (L/s)
No	Ha	PRE	PRE	(min.)	5yr.	100yr.	PRE	PRE
A-101	0.91	0.50	0.46	20.00	70.25	119.95	89.73	153.21
Total	0.91	0.50	0.46				89.73	153.21

### Post Development Run-off Rates for Entire Site (Uncontrolled)

AREA		RUNOFF DATA						
		C	CA	Tc	Intensity (mm/hr)		5yr. Q (L/s)	100yr. Q (L/s)
No	Ha	POST	POST	(min.)	5yr.	100yr.	POST	POST
A-1	0.03	0.90	0.03	3.2	163.16	280.95	13.69	23.58
A-2	0.33	0.86	0.29	14.5	85.21	145.74	68.29	116.81
A-3	0.55	0.36	0.20	22.3	65.58	111.90	35.93	61.31
Total / Average	0.91	0.56	0.51				117.92	201.70

# Appendix D

**REQUIRED STORAGE CALCULATIONS – 5 & 100 YEAR  
PERCENT IMPERVIOUSNESS CALCULATIONS  
STORMCEPTOR DESIGN SUMMARY REPORT**

# VARS GAS STATION

## REQUIRED STORMWATER STORAGE CALCULATION

PROJECT No.: 171-14602-00  
 DESIGNED BY: Mike Jans, P.Eng.  
 CHECKED BY: Mike Jans, P.Eng.

### RATIONAL METHOD STORAGE COMPUTATION

Vars, ONTARIO

Time Step 10 minute:

#### STORAGE RATE METHOD

Catchment Area = Building Roof 0.033 ha

C= 0.90

Total Allowable Release 5yr N/A l/s

Design Release Rate 0.63

#### 5 YEAR

Time (min)	Intensity (mm/hr)	Peak Flow (L/s)	Release Rate (L/s)	Storage Rate (L/s)	Storage Volume (m <sup>3</sup> )
10	104.19	8.68	0.63	8.05	4.83
20	70.25	5.85	0.63	5.22	6.27
30	53.93	4.49	0.63	3.86	6.95
40	44.18	3.68	0.63	3.05	7.32
50	37.65	3.14	0.63	2.51	7.52
60	32.94	2.74	0.63	2.11	7.61
70	29.37	2.45	0.63	1.82	7.63
80	26.56	2.21	0.63	1.58	7.60
90	24.29	2.02	0.63	1.39	7.53
100	22.41	1.87	0.63	1.24	7.42
110	20.82	1.73	0.63	1.10	7.29
120	19.47	1.62	0.63	0.99	7.14
130	18.29	1.52	0.63	0.89	6.98
140	17.27	1.44	0.63	0.81	6.79
150	16.36	1.36	0.63	0.73	6.60



# VARS GAS STATION

## REQUIRED STORMWATER STORAGE CALCULATION

PROJECT No.: 171-14602-00  
 DESIGNED BY: Mike Jans, P.Eng.  
 CHECKED BY: Mike Jans, P.Eng.

### RATIONAL METHOD STORAGE COMPUTATION

Vars, ONTARIO

Time Step: 10 minute

### STORAGE RATE METHOD

Catchment Area = Building Roof 0.033 ha

C= 0.90

Total Allowable Release 100yr N/A l/s

Design Release Rate 0.63

### 100 YEAR

Time (min)	Intensity (mm/hr)	Peak Flow (L/s)	Release Rate (L/s)	Storage Rate (L/s)	Storage Volume (m <sup>3</sup> )
10	178.56	14.88	0.63	14.25	8.55
20	119.95	9.99	0.63	9.36	11.24
30	91.87	7.65	0.63	7.02	12.64
40	75.15	6.26	0.63	5.63	13.51
50	63.95	5.33	0.63	4.70	14.10
60	55.89	4.66	0.63	4.03	14.50
70	49.79	4.15	0.63	3.52	14.78
80	44.99	3.75	0.63	3.12	14.97
90	41.11	3.43	0.63	2.80	15.09
100	37.90	3.16	0.63	2.53	15.17
110	35.20	2.93	0.63	2.30	15.20
120	32.89	2.74	0.63	2.11	15.20
130	30.90	2.57	0.63	1.94	15.17
140	29.15	2.43	0.63	1.80	15.11
150	27.61	2.30	0.63	1.67	15.03
160	26.24	2.19	0.63	1.56	14.94
170	25.01	2.08	0.63	1.45	14.83
180	23.90	1.99	0.63	1.36	14.70
190	22.90	1.91	0.63	1.28	14.57