FUNCTIONAL SERVICING REPORT

323 QUEEN STREET WEST

ST MARYS ONTARIO

PREPARED FOR

HEYBOLT ONTARIO LTD.

ST MARYS ONTARIO

PREPARED BY

MR ENGINEERING AND DESIGN LTD

145 THAMES ROAD WEST, UNIT 4

EXETER ONTARIO

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Appendicies

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1. Introduction and Background

1.1 Overview

Heybolt Ontario Ltd. (Owner) is proposing a residential development at 323 Queen Street West, St. Marys, Ontario. This report outlines a functional servicing strategy for the proposed development.

The subject site is located on a 0.2-hectare undeveloped lot at the northeast corner of Queen Street West and Ann Street. The site is bound on the north and east by existing residential land uses. The Owner proposes to construct two buildings on the site; a two-storey, three-unit residential townhouse facing Ann Street and a two-storey, six-unit residential townhouse facing Queen Street West.

This functional servicing report will provide additional information on the proposed servicing scheme for the site. Please refer to the Site Plan and, Site Grading and Servicing Plan contained in Appendix A for additional information.

Figure 1: Subject Site – 323 Queen Street West, St. Marys

1.2 Geotechnical Investigation

A geotechnical investigation was not available at the time of preparation of this report. This study will be completed prior to undertaking the final engineering design for this project.

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2. Stormwater Management

2.1 Stormwater Management Criteria

Stormwater Management (SWM) for the proposed development will be provided by the use of on-site quantity and quality controls. The following section will further describe the SWM criteria, existing and proposed development conditions.

The stormwater management criteria for this site are proposed as follows:

1. Post-development flows are to be attenuated to pre-development levels up to and including the 10-year storm event.

2. Major storm flows are to be routed overland to an appropriate outlet.

3. Quality control is required to remove suspended solids (oil and grit) from ponding areas.

Site specific storm parameters from the Ministry of Transportation of Ontario (MTO) were used to provide the mass rainfall data routing. The parameters used for the 2-year to 100-year storms are provided below in Table 1.

Return Period	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
A	23.6	31.1	36.1	42.4	47	50.6
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Table 1: MTO stormwater parameters

2.2 Pre-development Conditions

The subject site is vacant with the majority of the lot landscaped with grass. There are several mature trees along the south and east property boundaries. A chain-link fence runs along the entire perimeter of the site. The site is accessed from two existing entrances; one from Ann Street and one from Queen Street West.

Under pre-development conditions, the majority of the site drains uncontrolled overland from north to south. Small areas of the site drain uncontrolled overland towards the north and east. The stormwater catchment areas are contained in Appendix B and are summarized in Table 2 below.

Pre-Development Run-off Summary (L/s)								
Catchment	Area (ha)	Run-off Coefficient	Design Storm					
			2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
EX-1	0.03	0.20	1.4	1.9	2.2	2.6	2.9	3.1
EX-2	0.02	0.20	0.8	1.1	1.2	1.5	1.6	1.7
EX-3	0.15	0.20	7.1	9.3	10.9	12.7	14.1	15.2
Total			**9.3**	**12.3**	**14.3**	**16.8**	**18.6**	**20.0**

Table 2: Pre-development run-off summary

The existing Municipal storm sewage system in proximity to the site consists of a 300 mm diameter storm sewer on the west side of Ann Street across the west frontage of the site. There is also a 525 mm diameter storm sewer on the north side of Queen Street West across the south frontage of the site. Existing catch basins are located at the intersection of Anne Street and Queen Street West.

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2.3 Post-development Conditions

Stormwater management for the proposed development will be provided by the use of on-site quality and quantity controls. The development of this site is to be done without negative interference to existing and neighbouring properties. The 2, 5, 10, 25, 50, and 100-year design storms were calculated for the proposed development. Using site specific rainfall data supplied by the Ministry of Transportation Ontario (MTO), this office was able to model post-development flows and control post-development runoffs from up to and including the 10-year storm entirely within the footprint of the property boundaries and 70% of the 100-year storm. These stormwater calculations are provided in Appendix C and are summarized in Table 3 below.

Post-Development Run-off Summary (L/s)								
Catchment	Area (ha)	Run-off Coefficient	Design Storm					
			2-Year	5-Year	10-Year	25-Year	50-Year	100-Year
DEV-1	0.02	0.20	0.8	1.0	1.2	1.4	1.5	1.7
DEV-2	0.02	0.20	0.9	1.1	1.3	1.5	1.6	1.8
DEV-3	0.14	0.62	20.0	26.4	30.6	36.0	39.9	42.9
DEV-4	0.01	0.70	1.5	1.9	2.3	2.6	2.9	3.2
DEV-5	0.02	0.68	2.9	3.9	4.5	5.3	5.9	6.3
Total			**26.1**	**34.3**	**39.9**	**46.8**	**51.8**	**55.9**

Table 3: Post-development run-off summary

Under post-development conditions, the drainage works of the site will be accommodated by a combination of subsurface storage and surface runoff. The majority of the site and the buildings roof rainwater leaders will be directed to subsurface storage through on-site catch basins. The catch basins will outlet to a series of subsurface chambers connected to the existing 300 mm diameter municipal storm sewer via an existing street curb catch basin. Each on-site catch basin will be provided with an oil-water-debris separator to limit the amount of debris and refuse entering the subsurface chambers. An emergency overflow will also be provided in the event that the design storage capacity is surpassed. The top of foundation wall of the proposed buildings will be located at a higher elevation than the emergency overflow elevation.

The remainder of the site on the street side of the proposed buildings will drain uncontrolled overland towards Ann Street and Queen Street West similar to pre-development conditions.

2.4 Quality Control

Initial water quality treatment for stormwater directed to control outlets will begin with travelling overland across grassed surfaces towards controlled outlets. Catchbasins will be outfitted with a deep sump and a snout oil-water-debris separator by Best Management Practices. These snouts have been shown to remove 73% of total suspended solids and 62% of total petroleum hydrocarbons.

2.4 Sediment and Erosion Control

Sediment and erosion control measures will be implemented on site during construction. These measures will include:

1. Installation of silt control fencing around the perimeter of the site.

2. Preventing silt of sediment laden water from entering inlets (catchbasins and/or catchbasin manholes) by wrapping their tops with filter fabric.

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3. Maintaining sediment and erosion control structures in good repair (including periodic cleaning and repair as required) through regular routine inspections. Further, erosion control measures will be inspected after any rainfall event.

The silt fence will serve to minimize the opportunity for water borne sediments to be washed on to the adjacent properties.

Inspection and maintenance of all silt fencing will start after installation is complete. The fence will be inspected on a weekly basis during active construction or after a rainfall event of 13mm (1/2") of greater. Maintenance will be carried out within 48 hours on any part of the facility found to need repair.

Once construction and landscaping has been substantially completed, the silt fence will be removed along with any accumulated sediment.

After construction of the complete development, erosion and sediment transport will be minimal.

2.5 Maintenance Plan

To ensure that the stormwater management system continues to function as designed and constructed, we recommend that the following inspections and maintenance activities be completed on an annual basis.

1. Inspect the water level in the stormwater management facility. Has the site completely drained 24 hours after a storm?

2. Is there noticeable damage to structures (i.e. outlet structures, overflows, orifice plates)? If yes, complete any necessary repairs and/or installation of replacement structures.

3. Is there any noticeable damage to the grassed swales / overland flow paths (i.e. erosion, blockages)? If yes, complete any necessary repairs.

4. Is there any indication of a spill (i.e. frothy water, oily sheen on the water)? If yes, investigate, inform the appropriate agencies and complete the necessary clean-up and restoration.

5. Inspect the oil/grit structure and complete any necessary maintenance/repair activities as identified by the manufacturer.

6. Inspect all catchbasins, and manholes. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).

7. Inspect all swales and overflow locations. Remove and dispose of any accumulated sediment, trash/litter, debris (i.e. sediment, garbage, leaves, etc.).

Please note that any structures identified during the annual inspection to be worn, missing or damaged are to be repaired or replaced within 48 hours.

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3. Water Servicing

3.1 Existing Conditions

The existing Municipal water distribution system in proximity to the site consists of a 100 mm diameter watermain on the east side of Ann Street across the west frontage of the site. There is also a 150 mm diameter watermain on the south side of Queen Street West across the south frontage of the site. Existing fire hydrants are located at the intersection of Anne Street and Maiden Line, and the intersection of Queen Street West and Warner Street.

3.2 Domestic Water Demands

The expected domestic water demand for the site was estimated by reviewing the proposed building layout drawings and summarizing the number of fixture units for the entire development. Once summarized, a minimum service size was assigned. The hydraulic load based on the type of fixture is assigned using Table 7.6.3.2. of Division B of the Ontario Building Code (OBC). The total number of fixture units for the proposed development is summarized below in Table 4.

Water Supply – Proposed			
Fixture	**Number**	**Load**	**Fixture Units**
Water Closet	36	2.2	79.2
Urinal	0	3.0	0.0
Lavatory	36	1.0	36.0
Sink – bar	0	1.0	0.0
Sink – kitchen	9	2.0	18.0
C – Dishwasher	9	1.4	12.6
Bathtub	9	2.0	18.0
Shower	18	2.0	36.0
Clothes Washer	9	1.4	12.6
		Total	212.4

Table 4: Summary of water supply fixture units for the proposed development

Approximately 57.0m of water service piping is required to service the entire development. Through review of Table A-7.6.3.1. of the OBC Based on a total of 212.4 fixture units, a pressure range of 46 to 60 PSI and a total length of 57.0m of water service piping, a 50mmØ water service is required. It is proposed to connect the 50mmØ to the existing 100mmØ watermain located on the east side of Ann Street. Individual units will be serviced with 25mmØ water service and distribution piping.

3.3 Fire Flow Demands

Fire flow demands for the proposed development are governed by the OBC, specifically Article 9.10.20. “Firefighting”. Additional water supply for firefighting need not be provided for the proposed residential buildings as each building is less than three storeys in height and less than 600m² in building area. Existing fire hydrants are located at the intersection of Anne Street and Maiden Lane, and the intersection of Queen Street West and Warner Street.

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4. Sanitary Sewer Servicing

4.1 Existing Conditions

The existing Municipal sanitary sewage system in proximity to the site consists of a 250 mm diameter sanitary sewer along the centre of Ann Street across the west frontage of the site. There is also a 525 mm diameter sanitary sewer along the centre of Queen Street West across the south frontage of the site.

4.2 Sanitary Sewage Demands

The expected sanitary sewage demand for the site was estimated by reviewing the proposed building layout drawings and summarizing the number of fixture units for the entire development. Once summarized, a flow was assigned to the entire development. The hydraulic load based on the type of fixture is assigned using Table 7.4.9.3. of Division B of the Ontario Building Code (OBC). The total number of fixture units for the proposed development is summarized below in Table 5.

Sanitary Sewage – Proposed			
Fixture	**Number**	**Load**	**Fixture Units**
Water Closet	9	4.0	36.0
Bath Group	27	6.0	162.0
Sink	9	1.5	13.5
Sink – 3 compartment	0	2.0	0.0
C – Dishwasher	0	3.0	0.0
Ice Maker	0	1.0	0.0
Lavatory	9	1.5	13.5
Clothes Washer	9	2.0	18.0
Floor Drain	9	3.0	27.0
		Total	270.0

Table 5: Summary of sanitary sewage demand fixture units for the proposed development

It was determined that a total of 270.0 sanitary sewage fixture units are proposed for the entire development and 30 fixture units per individual unit. Table A-7.4.10.5. of the OBC indicates that the design sanitary sewage flow rate is 83 gal/min (5.2 l/s) and 33 gal/min (2.1l/s) per individual unit.

4.3 Proposed Sanitary Servicing Plan

The site will be serviced by a 150mm diameter sanitary sewer connected to the existing 250mm diameter sanitary sewer along the center of Ann Street. Individual service connections will be provided to each unit and connected into the proposed 150mm diameter sanitary service.

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5. Summary

It is the opinion of this office, based on the information provided herein, that the proposed development can be constructed, serviced and graded to satisfy the requirements of the Town of St. Marys. It is recommended that this report be reviewed and updated once a final site plan has been developed.

I trust that you will find this information satisfactory. Should any of the information contained herein differ, contact MR Engineering and Design Ltd. immediately.

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

Matt Runge, M.A.Sc., P.Eng.

MR Engineering and Design Ltd.

APPENDIX A – Site Plan / Site Grading and Servicing Plan

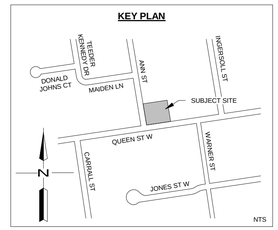
SITE LEGEND

BPED	BELL PEDESTAL
CB	CATCH BASIN
GUY	GUY-WIRE
HP	HYDRO POLE
INV	INVERT
MH	MAN HOLE
SAN	SANITARY SEWER
STM	STORM SEWER
T/G	TOP OF GRATE
WTR	WATERMAIN
190.00 m	ELEVATION CONTOUR
187.00	EXISTING ELEVATION
190.00m	PROPOSED ELEVATION
1.0%	DIRECTION AND SLOPE OF OVERLAND WATER FLOW
	PROPOSED SWALE

BENCHMARK ELEVATION: 324.31 m
TOP OF SIB 5.0 m +/- SOUTH OF SOUTHEAST CORNER OF SUBJECT PROPERTY.

1 SITE PLAN
1 : 150

KEY PLAN



TOWN OF ST MARYS
ZONING BY-LAW 121-2012 (KEY MAP 5)
RESIDENTIAL ZONE 5 (R5)

DETAIL	REQUIRED	PROPOSED	COMMENTS
LOT AREA	1,017.5 m² (min.)	2,036.8 m²	DENSITY SHALL NOT EXCEED 50 UNITS PER HECTARE
LOT FRONTAGE	47 m (min.)	45.3 m	27 m FOR FIRST 3 UNITS PLUS 6 m FOR EACH ADDITIONAL UNIT
FRONT YARD	6 m (min.)	4.5 m	---
EXTERIOR SIDE YARD	6 m (min.)	4.5 m	---
INTERIOR SIDE YARD	4.5 m (min.)	1.5 m	---
REAR YARD	7.5 m (min.)	1.5 m	---
LOT COVERAGE	35 % (max.)	41.4 %	---
LANDSCAPED OPEN SPACE	30 % (min.)	48.9 %	---
BUILDING HEIGHT	10.5 m (max.)	8 m +/-	---
GROSS FLOOR AREA PER UNIT	75 m² (min.)	160 m² +/-	3 BEDROOM DWELLING UNITS
PARKING SPACES	14 SPACES (min.)	9 SPACES	1 PARKING SPACE PER DWELLING UNIT
DRIVEWAY WIDTH	3 m - 8 m	7.8 m	---
DRIVEWAY SIDE / REAR YARD	1.5 m (min.)	2.0 m	---
DISTANCE BETWEEN DRIVEWAYS	7.5 m (min.)	5.0 m	---
SIGHT TRIANGLE - DRIVEWAY	10.8 m (min.)	4.5 m	---
SIGHT TRIANGLE - BUILDING	10.8 m (min.)	9.0 m	---
PLANTING STRIP	1.5 m (min.)	1.5 m	FENCE (SUBJECT TO SITE PLAN APPROVAL)

NOTE:
1. ITEMS IN RED REQUIRE SPECIAL PROVISION.

PART LOTS 4, 5 & 6
REGISTERED PLAN No. 210
TOWN OF ST. MARYS
COUNTY OF PERTH

NOTES:
1. PROPERTY BOUNDARIES FROM LOT GRADING SKETCH, DATED JUNE 6, 2018, BY MTE OLS LTD., ONTARIO LAND SURVEYORS, STRATFORD, ONTARIO.
2. EXISTING FEATURES FROM TOPOGRAPHIC SURVEY COMPLETED BY MR ENGINEERING AND DESIGN LTD., DATED MARCH 3, 2020.
3. SITE SKETCH IS CONCEPTUAL. FINAL SITING BY OTHERS.
4. THIS IS NOT A LEGAL SURVEY.

0m 5m 10m 15m
SCALE 1:150

NOTES:

@	AT	OHD	OVERHEAD DOOR
c/w	COMPLETE WITH	PROJ.	PROJECTION
Ø	DIAMETER	P.T.	PRESSURE TREATED
FRR	FIRE-RESISTANCE RATING	r/w	REINFORCED WITH
FDN	FOUNDATION	SG	SLIDE GATE
e/w	EACH WAY	T&G	TOUNGE AND GROOVE
EX.	EXISTING	t/o	TOP OF
H	HIGH/HORIZONTAL	TYP.	TYPICAL
h	HOUR	u/s	UNDERSIDE
LLV	LONG LEG VERTICAL	V	VERTICAL
LVL	LAMINATED VANEER LUMBER	w/	WITH
max.	MAXIMUM	W	WIDE
min.	MINIMUM	WWM	WELDED WIRE MESH
OBC	ONTARIO BUILDING CODE		
o/c	ON CENTER		

NORTH

DESIGN	**TM**	**No.**	**REVISION DESCRIPTION**	**MM/DD/YY**	**CHKD**
DRAWN	**TM**	**1.**	**PRELIMINARY - ISSUED FOR REVIEW**	**04/14/20**	**MR**
CHECKED	**MR**				
APPROVED	**MR**				
DATE	**APRIL 2020**				

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CONTRACTOR

PRELIMINARY FOR DISCUSSION ONLY

323 QUEEN ST W
ST. MARYS ON N4X 1C8

HEYBOLT ONTARIO LTD.
RESIDENTIAL DEVELOPMENT

SITE PLAN

PROJECT No. *MR19-045*

SHEET No. SP-1

SCALE As indicated

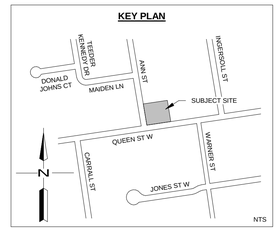
SITE LEGEND

BPED	BELL PEDESTAL
CB	CATCH BASIN
GUY	GUY-WIRE
HP	HYDRO POLE
INV	INVERT
MH	MAN HOLE
SAN	SANITARY SEWER
STM	STORM SEWER
T/G	TOP OF GRATE
WTR	WATERMAIN
190.00 m	ELEVATION CONTOUR
180.00m	EXISTING ELEVATION
190.00m	PROPOSED ELEVATION
1.0%	DIRECTION AND SLOPE OF OVERLAND WATER FLOW
	PROPOSED SWALE

BENCHMARK ELEVATION: 324.31 m
TOP OF SIB 5.0 m +/- SOUTH OF SOUTHEAST CORNER OF SUBJECT PROPERTY.

1 SITE GRADING AND SERVICING PLAN
1 : 150

KEY PLAN



STORMWATER CALCULATIONS

SURFACE	AREA
LOT	2,036.8 m²
EXISTING BUILDING	0 m²
EXISTING ASPHALT / CONCRETE / GRAVEL	0 m²
EXISTING GRASS	2,036.8 m²
EXISTING HARD SURFACE	0 m² (0.0%)
PROPOSED BUILDING	879.1 m²
PROPOSED ASPHALT / CONCRETE / GRAVEL	160.5 m²
PROPOSED GRASS	997.2 m²
PROPOSED HARD SURFACE	1,039.6 m² (51.1%)

PART LOTS 4, 5 & 6
REGISTERED PLAN No. 210
TOWN OF ST. MARYS
COUNTY OF PERTH

NOTES:

1. PROPERTY BOUNDARIES FROM LOT GRADING SKETCH, DATED JUNE 6, 2018, BY MTE OLS LTD., ONTARIO LAND SURVEYORS, STRATFORD, ONTARIO.
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0m 5m 10m 15m
SCALE 1:150

NOTES:

@	AT	OHD	OVERHEAD DOOR
c/w	COMPLETE WITH	PROJ.	PROJECTION
Ø	DIAMETER	P.T.	PRESSURE TREATED
FRR	FIRE-RESISTANCE RATING	r/w	REINFORCED WITH
FDN	FOUNDATION	SG	SLIDE GATE
e/w	EACH WAY	T&G	TOUNGE AND GROOVE
EX.	EXISTING	t/o	TOP OF
H	HIGH/HORIZONTAL	TYP.	TYPICAL
h	HOUR	u/s	UNDERSIDE
LLV	LONG LEG VERTICAL	V	VERTICAL
LVL	LAMINATED VANEER LUMBER	w/	WITH
max.	MAXIMUM	W	WIDE
min.	MINIMUM	WWM	WELDED WIRE MESH
OBC	ONTARIO BUILDING CODE		
o/c	ON CENTER		

NORTH

DESIGN	TM	No.	REVISION DESCRIPTION	MM/DD/YY	CH'KD
DRAWN	TM	1.	PRELIMINARY - ISSUED FOR REVIEW	04/14/20	MR
CHECKED	MR				
APPROVED	MR				
DATE	APRIL 2020				

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HEYBOLT ONTARIO LTD.
RESIDENTIAL DEVELOPMENT

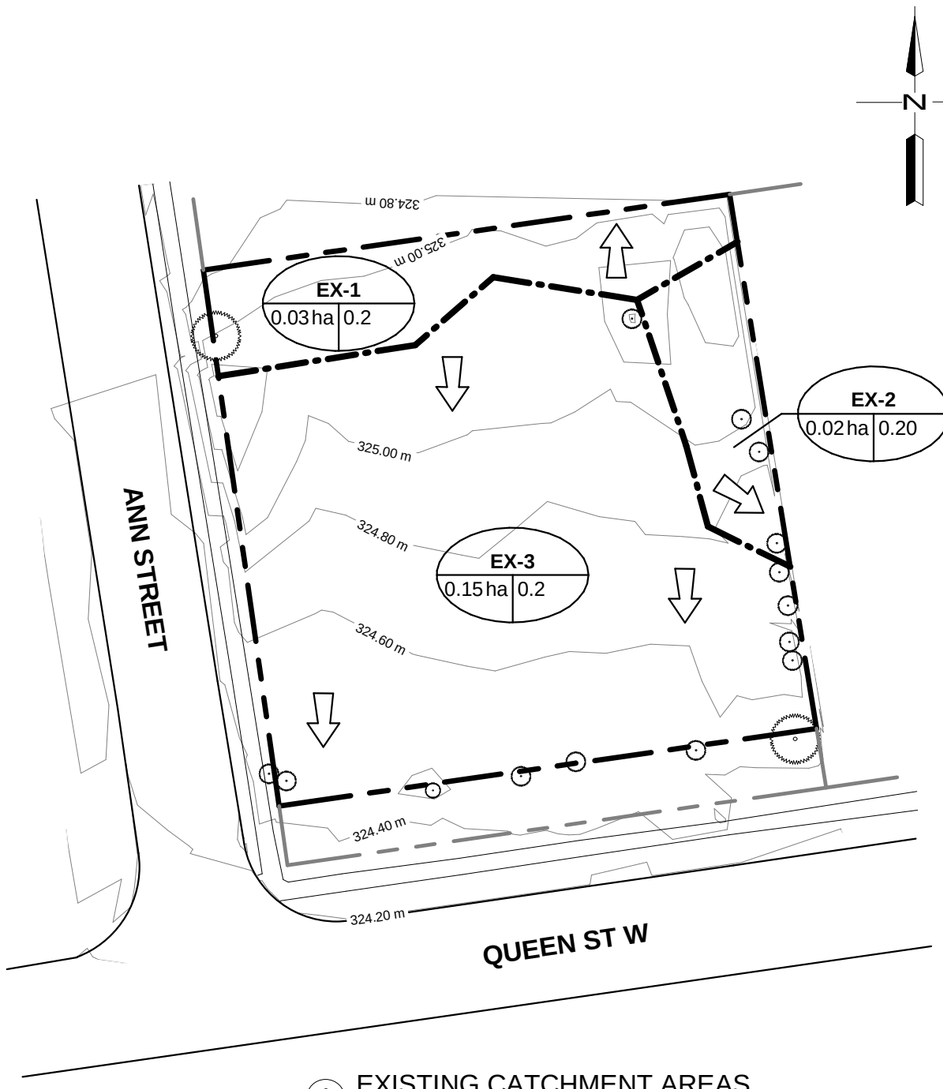
SITE GRADING AND SERVICING PLAN

PROJECT No. MR19-045

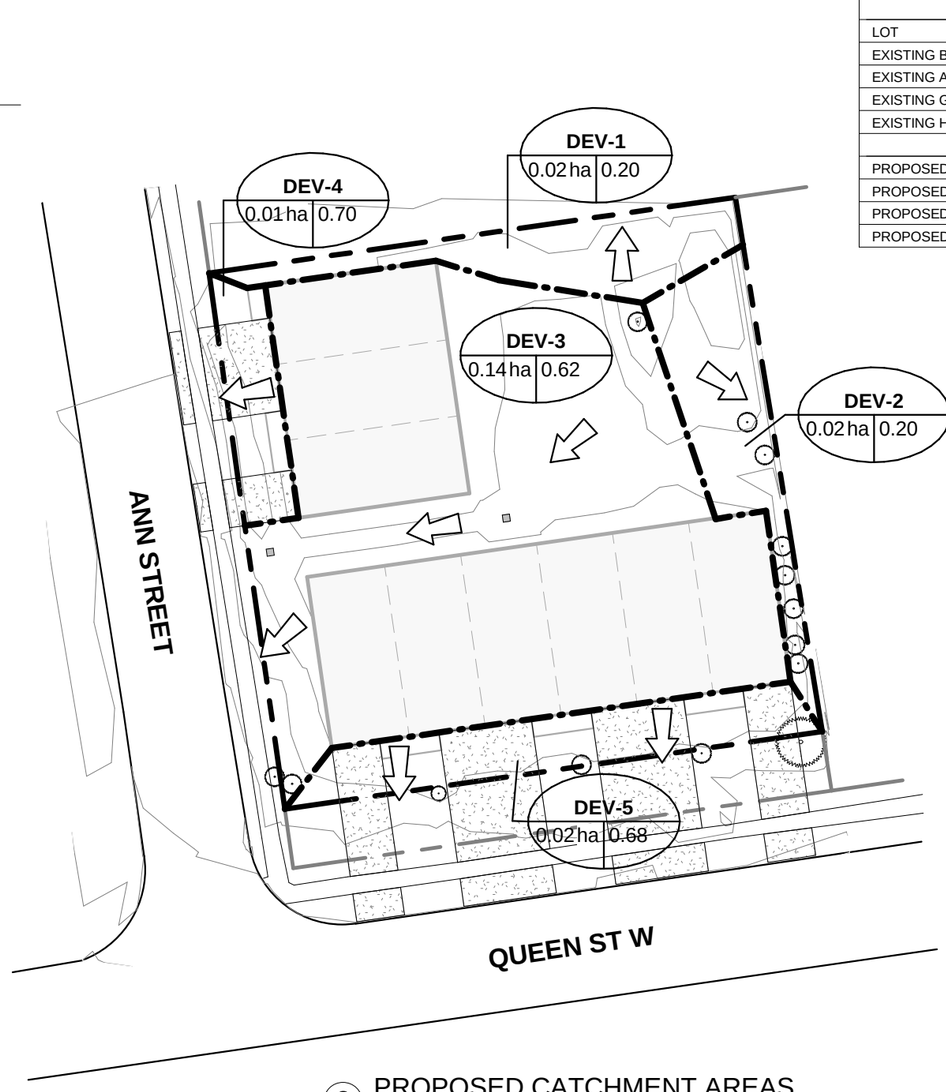
SHEET No. SP-2

SCALE As indicated

APPENDIX B – Stormwater Catchment Areas



1 EXISTING CATCHMENT AREAS
1 : 500

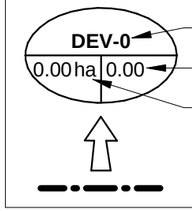


2 PROPOSED CATCHMENT AREAS
1 : 500

STORMWATER CALCULATIONS

SURFACE	AREA
LOT	2,036.8 m²
EXISTING BUILDING	0 m²
EXISTING ASPHALT / CONCRETE / GRAVEL	0 m²
EXISTING GRASS	2,036.8 m²
EXISTING HARD SURFACE	0 m² (0.0%)
PROPOSED BUILDING	879.1 m²
PROPOSED ASPHALT / CONCRETE / GRAVEL	160.5 m²
PROPOSED GRASS	997.2 m²
PROPOSED HARD SURFACE	1,039.6 m² (51.1%)

LEGEND



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CONTRACTOR

PRELIMINARY
FOR DISCUSSION ONLY

HEYBOLT ONTARIO LTD.
RESIDENTIAL DEVELOPMENT

323 QUEEN ST W
ST. MARYS ON N4X 1C8

No.	REVISION DESCRIPTION	MM/DD/YY	CHK
1	ISSUED FOR REVIEW	03/31/20	MR

STORMWATER CATCHMENT AREAS

DRAWN	TM	PROJECT No.	MR19-045
CHECKED	MR	SCALE	As indicated
APPROVED	MR	SHEET No.	C-1
DATE	APRIL 2020		

APPENDIX C – Stormwater Calculations

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Storm Data

Location: St. Marys, ON
IDF Curve Year: 2010
Source: Ministry of Transportation

Return Period	2 yr	5 yr	10 yr	25 yr	50 yr	100 yr
A	23.6	31.1	36.1	42.4	47	50.6
B	-0.699	-0.699	-0.699	-0.699	-0.699	-0.699

Rainfall Intensity (mm/hr)

	Duration								
Return Period	**5** min (5-min)	**10** min (10-min)	**15** min (15-min)	**30** min (30-min)	**60** min (1-hr)	**120** min (2-hr)	**360** min (6-hr)	**720** min (12-hr)	**1440** min (24-hr)
2 yr	134.0	82.6	62.2	38.3	23.6	14.5	6.7	4.2	2.6
5 yr	176.6	108.8	82.0	50.5	31.1	19.2	8.9	5.5	3.4
10 yr	205.0	126.3	95.1	58.6	36.1	22.2	10.3	6.4	3.9
25 yr	240.8	148.4	111.7	68.8	42.4	26.1	12.1	7.5	4.6
50 yr	267.0	164.4	123.9	76.3	47.0	29.0	13.4	8.3	5.1
100 yr	287.4	177.0	133.3	82.1	50.6	31.2	14.5	8.9	5.5

Heybolt Ontario Ltd.

323 Queen Street W, St. Marys ON

Pre-Development Conditions

Catchment	Area		Percent of Catchment
EX-1	m^2	Ha	
	314.5	0.03	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	314.5	0.03	100.0%
		0.03	100.0%

Catchment	Area		Percent of Catchment
EX-2	m^2	Ha	
	177.3	0.02	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	177.3	0.02	100.0%
		0.02	100.0%

Catchment	Area		Percent of Catchment
EX-3	m^2	Ha	
	1545	0.15	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	1545	0.15	100.0%
		0.15	100.0%

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Conditions

Areas Captured by Storm Detentrion Area (Controlled Areas)

Catchment DEV-1	**Area** m^2	Ha	Percent of Catchment
Controlled Area	0	0.00	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	0	0.00	0.0%
	Subtotal	0.00	0.0%

Area NOT Captured by Storm Water Detention Area (Uncontrolled Areas)

Catchment DEV-1	**Area** m^2	Ha	Percent of Catchment
Uncontrolled Area	164	0.02	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	164	0.02	100.0%
	Subtotal	0.02	100.0%
Total Catchment	**164**	**0.02**	**100.0%**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Conditions

Areas Captured by Storm Detentrion Area (Controlled Areas)

Catchment DEV-2	**Area** m^2	Ha	Percent of Catchment
Controlled Area	0	0.00	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	0	0.00	0.0%
	Subtotal	0.00	0.0%

Area NOT Captured by Storm Water Detention Area (Uncontrolled Areas)

Catchment DEV-2	**Area** m^2	Ha	Percent of Catchment
Uncontrolled Area	187.4	0.02	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	187.4	0.02	100.0%
	Subtotal	0.02	100.0%
Total Catchment	**187.4**	**0.02**	**100.0%**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Conditions

Areas Captured by Storm Detentrion Area (Controlled Areas)

Catchment DEV-3	**Area** m^2	Ha	Percent of Catchment
Controlled Area	1320.8	0.13	
Building	844.8	0.08	60.2%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	476	0.05	33.9%
	Subtotal	0.13	94.1%

Area NOT Captured by Storm Water Detention Area (Uncontrolled Areas)

Catchment DEV-3	**Area** m^2	Ha	Percent of Catchment
Uncontrolled Area	83.5	0.01	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	83.5	0.01	5.9%
	Subtotal	0.01	5.9%
Total Catchment	**1404.3**	**0.14**	**100.0%**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Conditions

Areas Captured by Storm Detentrion Area (Controlled Areas)

Catchment DEV-4	**Area** m^2	Ha	Percent of Catchment
Controlled Area	0	0.00	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	0	0.00	0.0%
	Subtotal	0.00	0.0%

Area NOT Captured by Storm Water Detention Area (Uncontrolled Areas)

Catchment DEV-4	**Area** m^2	Ha	Percent of Catchment
Uncontrolled Area	91.5	0.01	
Building	11.7	0.00	12.8%
Asphalt / Gravel / Concrete	53.8	0.01	58.8%
Grass / Vegetation	26	0.00	28.4%
	Subtotal	0.01	100.0%
Total Catchment	**91.5**	**0.01**	**100.0%**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Conditions

Areas Captured by Storm Detentrion Area (Controlled Areas)

Catchment DEV-5	**Area** m^2	Ha	Percent of Catchment
Controlled Area	0	0.00	
Building	0	0.00	0.0%
Asphalt / Gravel / Concrete	0	0.00	0.0%
Grass / Vegetation	0	0.00	0.0%
	Subtotal	0.00	0.0%

Area NOT Captured by Storm Water Detention Area (Uncontrolled Areas)

Catchment DEV-5	**Area** m^2	Ha	Percent of Catchment
Uncontrolled Area	189.5	0.02	
Building	22.6	0.00	11.9%
Asphalt / Gravel / Concrete	106.7	0.01	56.3%
Grass / Vegetation	60.2	0.01	31.8%
	Subtotal	0.02	100.0%
Total Catchment	**189.5**	**0.02**	**100.0%**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

2 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	82.6	1.4	
	0.03						**1.4**	**1.4 L/s**

5 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	108.8	1.9	
	0.03						**1.9**	**1.9 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

10 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	126.3	2.2	
	0.03						**2.2**	**2.2 L/s**

25 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	148.4	2.6	
	0.03						**2.6**	**2.6 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

50 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	164.4	2.9	
	0.03						**2.9**	**2.9 L/s**

100 Year Strom

Catchment EX-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.03	0.2	0.006	0.006	10	177.0	3.1	
	0.03						**3.1**	**3.1 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

2 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	82.6	0.8	
	0.02						**0.8**	**0.8 L/s**

5 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	108.8	1.1	
	0.02						**1.1**	**1.1 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

10 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	126.3	1.2	
	0.02						**1.2**	**1.2 L/s**

25 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	148.4	1.5	
	0.02						**1.5**	**1.5 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

50 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	164.4	1.6	
	0.02						**1.6**	**1.6 L/s**

100 Year Strom

Catchment EX-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	177.0	1.7	
	0.02						**1.7**	**1.7 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

2 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	82.6	7.1	
	0.15						**7.1**	**7.1 L/s**

5 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	108.8	9.3	
	0.15						**9.3**	**9.3 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

10 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	126.3	10.9	
	0.15						**10.9**	**10.9 L/s**

25 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	148.4	12.7	
	0.15						**12.7**	**12.7 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Pre-Development Flow Calculations

50 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	164.4	14.1	
	0.15						**14.1**	**14.1 L/s**

100 Year Strom

Catchment EX-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.15	0.2	0.031	0.031	10	177.0	15.2	
	0.15						**15.2**	**15.2 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

2 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	82.6	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	82.6	0.8	**0.8 L/s**
	0.02						**0.8**	**0.8 L/s**

5 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	108.8	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	108.8	1.0	**1.0 L/s**
	0.02						**1.0**	**1.0 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

10 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	126.3	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	126.3	1.2	**1.2 L/s**
	0.02						**1.2**	**1.2 L/s**

25 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	148.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	148.4	1.4	**1.4 L/s**
	0.02						**1.4**	**1.4 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

50 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	164.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	164.4	1.5	**1.5 L/s**
	0.02						**1.5**	**1.5 L/s**

100 Year Strom

Catchment DEV-1
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	177.0	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.02	0.2	0.003	0.003	10	177.0	1.6	**1.6 L/s**
	0.02						**1.6**	**1.6 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

2 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	82.6	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	82.6	0.9	**0.9 L/s**
	0.02						**0.9**	**0.9 L/s**

5 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	108.8	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	108.8	1.1	**1.1 L/s**
	0.02						**1.1**	**1.1 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

10 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	126.3	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	126.3	1.3	**1.3 L/s**
	0.02						**1.3**	**1.3 L/s**

25 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	148.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	148.4	1.5	**1.5 L/s**
	0.02						**1.5**	**1.5 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

50 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	164.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	164.4	1.7	**1.7 L/s**
	0.02						**1.7**	**1.7 L/s**

100 Year Strom

Catchment DEV-2
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	177.0	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.02	0.2	0.004	0.004	10	177.0	1.8	**1.8 L/s**
	0.02						**1.8**	**1.8 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

2 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	82.6	17.5	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	82.6	2.2	**19.6 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	82.6	0.4	**0.4 L/s**
	0.14						**20.0**	**20.0 L/s**

5 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	108.8	23.0	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	108.8	2.9	**25.9 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	108.8	0.5	**0.5 L/s**
	0.14						**26.4**	**26.4 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

10 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	126.3	26.7	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	126.3	3.3	**30.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	126.3	0.6	**0.6 L/s**
	0.14						**30.6**	**30.6 L/s**

25 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	148.4	31.4	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	148.4	3.9	**35.3 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	148.4	0.7	**0.7 L/s**
	0.14						**36.0**	**36.0 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

50 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	164.4	34.8	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	164.4	4.4	**39.1 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	164.4	0.8	**0.8 L/s**
	0.14						**39.9**	**39.9 L/s**

100 Year Strom

Catchment DEV-3
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.08	0.9	0.076	0.076	10	177.0	37.4	
Grass / Vegetation	0.05	0.2	0.010	0.010	10	177.0	4.7	**42.1 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.01	0.2	0.002	0.002	10	177.0	0.8	**0.8 L/s**
	0.14						**42.9**	**42.9 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

2 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	82.6	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	82.6	1.4	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	82.6	0.1	**1.5 L/s**
	0.01						**1.5**	**1.5 L/s**

5 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	108.8	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	108.8	1.8	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	108.8	0.2	**1.9 L/s**
	0.01						**1.9**	**1.9 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

10 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	126.3	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	126.3	2.1	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	126.3	0.2	**2.3 L/s**
	0.01						**2.3**	**2.3 L/s**

25 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	148.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	148.4	2.4	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	148.4	0.2	**2.6 L/s**
	0.01						**2.6**	**2.6 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

50 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	164.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	164.4	2.7	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	164.4	0.2	**2.9 L/s**
	0.01						**2.9**	**2.9 L/s**

100 Year Strom

Catchment DEV-4
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	177.0	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.006	0.006	10	177.0	2.9	
Grass / Vegetation	0.00	0.2	0.001	0.001	10	177.0	0.3	**3.2 L/s**
	0.01						**3.2**	**3.2 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

2 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 23.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	82.6	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	82.6	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	82.6	2.7	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	82.6	0.3	**2.9 L/s**
	0.02						**2.9**	**2.9 L/s**

5 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 31.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	108.8	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	108.8	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	108.8	3.5	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	108.8	0.4	**3.9 L/s**
	0.02						**3.9**	**3.9 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

10 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 36.1
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	126.3	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	126.3	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	126.3	4.1	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	126.3	0.4	**4.5 L/s**
	0.02						**4.5**	**4.5 L/s**

25 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 42.4
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	148.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	148.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	148.4	4.8	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	148.4	0.5	**5.3 L/s**
	0.02						**5.3**	**5.3 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Post-Development Flow Calculations

50 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 47
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	164.4	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	164.4	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	164.4	5.3	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	164.4	0.6	**5.9 L/s**
	0.02						**5.9**	**5.9 L/s**

100 Year Strom

Catchment DEV-5
Rainfall Intensity A*(T)^B Q=(A*I*R)*2.78 A 50.6
B -0.699

Description	Area (Ha)	Runoff Coefficient	A x R	Cumulative A x R	Time (min)	Rain Intensity (mm/hr)	Discharge (L/s)	
Controlled Areas								
Bldg / Asphalt / Gravel / Conc.	0.00	0.9	0.000	0.000	10	177.0	0.0	
Grass / Vegetation	0.00	0.2	0.000	0.000	10	177.0	0.0	**0.0 L/s**
Uncontrolled Areas								
Bldg / Asphalt / Gravel / Conc.	0.01	0.9	0.012	0.012	10	177.0	5.7	
Grass / Vegetation	0.01	0.2	0.001	0.001	10	177.0	0.6	**6.3 L/s**
	0.02						**6.3**	**6.3 L/s**

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

2 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	2.9	L/s		A	23.6
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec							Cumulative	
							(L)	(L)	(m^3)
5	300	134.0	31.9	9564	2.9	880	8684	8684	8.7
20	1200	50.9	12.1	10888	2.9	2641	8247	16931	16.9
35	2100	34.4	8.2	7363	2.9	2641	4722	21653	21.7
50	3000	26.8	6.4	5738	2.9	2641	3097	24751	24.8
65	3900	22.3	5.3	4777	2.9	2641	2136	26887	26.9
80	4800	19.3	4.6	4131	2.9	2641	1491	28377	28.4
95	5700	17.1	4.1	3664	2.9	2641	1023	29400	29.4
110	6600	15.4	3.7	3307	2.9	2641	666	30067	30.1
125	7500	14.1	3.4	3024	2.9	2641	384	30450	30.5
140	8400	13.1	3.1	2794	2.9	2641	153	30603	30.6
155	9300	12.2	2.9	2602	2.9	2641	-39	30565	30.6
170	10200	11.4	2.7	2439	2.9	2641	-201	30363	30.4
185	11100	10.7	2.6	2299	2.9	2641	-341	30022	30.0
200	12000	10.2	2.4	2177	2.9	2641	-463	29559	29.6
215	12900	9.7	2.3	2070	2.9	2641	-571	28988	29.0
230	13800	9.2	2.2	1975	2.9	2641	-666	28322	28.3
245	14700	8.8	2.1	1889	2.9	2641	-751	27571	27.6

Maximum Storage Required: 30.6 m^3

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

5 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	3.9	L/s		A	31.1
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec						(L)	Cumulative (L)	Cumulative (m^3)
5	300	176.6	42.0	12604	3.9	1160	11444	11444	11.4
20	1200	67.0	15.9	14348	3.9	3480	10868	22312	22.3
35	2100	45.3	10.8	9703	3.9	3480	6223	28535	28.5
50	3000	35.3	8.4	7562	3.9	3480	4082	32617	32.6
65	3900	29.4	7.0	6295	3.9	3480	2815	35431	35.4
80	4800	25.4	6.0	5444	3.9	3480	1964	37396	37.4
95	5700	22.6	5.4	4828	3.9	3480	1348	38744	38.7
110	6600	20.4	4.8	4358	3.9	3480	878	39622	39.6
125	7500	18.6	4.4	3985	3.9	3480	505	40127	40.1
140	8400	17.2	4.1	3682	3.9	3480	202	40329	40.3
155	9300	16.0	3.8	3429	3.9	3480	-51	40278	40.3
170	10200	15.0	3.6	3215	3.9	3480	-265	40013	40.0
185	11100	14.2	3.4	3030	3.9	3480	-450	39563	39.6
200	12000	13.4	3.2	2869	3.9	3480	-611	38952	39.0
215	12900	12.7	3.0	2728	3.9	3480	-752	38200	38.2
230	13800	12.2	2.9	2602	3.9	3480	-878	37322	37.3
245	14700	11.6	2.8	2490	3.9	3480	-990	36332	36.3

Maximum Storage Required: 40.3 m^3

Heybolt Ontario Ltd.

323 Queen Street W, St. Marys ON

10 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	4.5	L/s		A	36.1
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec							Cumulative	
							(L)	(L)	(m^3)
5	300	205.0	48.8	14630	4.5	1346	13284	13284	13.3
20	1200	77.8	18.5	16655	4.5	4039	12615	25899	25.9
35	2100	52.6	12.5	11263	4.5	4039	7223	33122	33.1
50	3000	41.0	9.8	8778	4.5	4039	4738	37860	37.9
65	3900	34.1	8.1	7307	4.5	4039	3267	41128	41.1
80	4800	29.5	7.0	6320	4.5	4039	2280	43408	43.4
95	5700	26.2	6.2	5604	4.5	4039	1565	44973	45.0
110	6600	23.6	5.6	5058	4.5	4039	1019	45992	46.0
125	7500	21.6	5.1	4626	4.5	4039	587	46578	46.6
140	8400	20.0	4.7	4274	4.5	4039	234	46813	46.8
155	9300	18.6	4.4	3980	4.5	4039	-59	46754	46.8
170	10200	17.4	4.1	3731	4.5	4039	-308	46446	46.4
185	11100	16.4	3.9	3517	4.5	4039	-522	45923	45.9
200	12000	15.6	3.7	3331	4.5	4039	-709	45215	45.2
215	12900	14.8	3.5	3166	4.5	4039	-873	44342	44.3
230	13800	14.1	3.4	3021	4.5	4039	-1019	43323	43.3
245	14700	13.5	3.2	2890	4.5	4039	-1149	42174	42.2

Maximum Storage Required: 46.8 m^3

Heybolt Ontario Ltd.

323 Queen Street W, St. Marys ON

25 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	5.3	L/s		A	42.4
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec							Cumulative	
							(L)	(L)	(m^3)
5	300	240.8	57.3	17183	5.3	1581	15602	15602	15.6
20	1200	91.4	21.7	19561	5.3	4744	14817	30419	30.4
35	2100	61.8	14.7	13228	5.3	4744	8484	38903	38.9
50	3000	48.2	11.5	10309	5.3	4744	5565	44468	44.5
65	3900	40.1	9.5	8582	5.3	4744	3838	48305	48.3
80	4800	34.7	8.2	7423	5.3	4744	2678	50983	51.0
95	5700	30.8	7.3	6582	5.3	4744	1838	52821	52.8
110	6600	27.8	6.6	5941	5.3	4744	1197	54018	54.0
125	7500	25.4	6.0	5433	5.3	4744	689	54707	54.7
140	8400	23.5	5.6	5020	5.3	4744	275	54982	55.0
155	9300	21.8	5.2	4675	5.3	4744	-70	54913	54.9
170	10200	20.5	4.9	4383	5.3	4744	-362	54551	54.6
185	11100	19.3	4.6	4131	5.3	4744	-613	53938	53.9
200	12000	18.3	4.3	3912	5.3	4744	-832	53105	53.1
215	12900	17.4	4.1	3719	5.3	4744	-1025	52080	52.1
230	13800	16.6	3.9	3548	5.3	4744	-1197	50883	50.9
245	14700	15.9	3.8	3395	5.3	4744	-1350	49533	49.5

Maximum Storage Required: 55.0 m^3

Heybolt Ontario Ltd.

323 Queen Street W, St. Marys ON

50 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	5.8	L/s		A	47
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec						(L)	Cumulative (L)	Cumulative (m^3)
5	300	267.0	63.5	19048	5.8	1753	17295	17295	17.3
20	1200	101.3	24.1	21683	5.8	5259	16424	33719	33.7
35	2100	68.5	16.3	14664	5.8	5259	9404	43123	43.1
50	3000	53.4	12.7	11428	5.8	5259	6169	49292	49.3
65	3900	44.4	10.6	9513	5.8	5259	4254	53546	53.5
80	4800	38.4	9.1	8228	5.8	5259	2969	56514	56.5
95	5700	34.1	8.1	7296	5.8	5259	2037	58552	58.6
110	6600	30.8	7.3	6586	5.8	5259	1327	59879	59.9
125	7500	28.1	6.7	6023	5.8	5259	764	60642	60.6
140	8400	26.0	6.2	5564	5.8	5259	305	60947	60.9
155	9300	24.2	5.8	5182	5.8	5259	-77	60870	60.9
170	10200	22.7	5.4	4858	5.8	5259	-401	60469	60.5
185	11100	21.4	5.1	4579	5.8	5259	-680	59789	59.8
200	12000	20.3	4.8	4336	5.8	5259	-923	58867	58.9
215	12900	19.3	4.6	4123	5.8	5259	-1137	57730	57.7
230	13800	18.4	4.4	3933	5.8	5259	-1326	56404	56.4
245	14700	17.6	4.2	3763	5.8	5259	-1496	54907	54.9

Maximum Storage Required: 60.9 m^3

Heybolt Ontario Ltd.

323 Queen Street W, St. Marys ON

100 Year Storm Volume Required to be Captured

Q	2.78*C*I*A			Storm Coefficients	
Q_{allow}	6.3	L/s		A	50.6
C	0.65	Composite run-off coefficient		B	-0.699
I	A(T/60)^B				
A	0.13	ha	Catchment DEV-3	$C = A_1C_1 + A_2C_2 \ldots../A_{Total}$	

Duration		Intensity (mm/hr)	Discharge (L/S)	Volume (L)	Allow Discharge (L/s)	Volume Releasable (m^3)	Required Storage		
Min	Sec							Cumulative	
							(L)	(L)	(m^3)
5	300	287.4	68.4	20507	6.3	1887	18619	18619	18.6
20	1200	109.1	25.9	23344	6.3	5662	17682	36301	36.3
35	2100	73.8	17.5	15787	6.3	5662	10125	46426	46.4
50	3000	57.5	13.7	12303	6.3	5662	6641	53067	53.1
65	3900	47.8	11.4	10242	6.3	5662	4580	57647	57.6
80	4800	41.4	9.8	8858	6.3	5662	3196	60843	60.8
95	5700	36.7	8.7	7855	6.3	5662	2193	63037	63.0
110	6600	33.1	7.9	7090	6.3	5662	1428	64465	64.5
125	7500	30.3	7.2	6484	6.3	5662	822	65287	65.3
140	8400	28.0	6.7	5990	6.3	5662	328	65616	65.6
155	9300	26.1	6.2	5579	6.3	5662	-83	65533	65.5
170	10200	24.4	5.8	5230	6.3	5662	-432	65101	65.1
185	11100	23.0	5.5	4930	6.3	5662	-732	64369	64.4
200	12000	21.8	5.2	4668	6.3	5662	-993	63375	63.4
215	12900	20.7	4.9	4438	6.3	5662	-1224	62152	62.2
230	13800	19.8	4.7	4234	6.3	5662	-1428	60724	60.7
245	14700	18.9	4.5	4051	6.3	5662	-1611	59113	59.1

Maximum Storage Required: 65.6 m^3

Heybolt Ontario Ltd.
323 Queen Street W, St. Marys ON

Storage Calculations

Description	Water Elevation (m)	Water Depth (m)	Incremental Volume (m^3)	Storage Volume (m^3)
CB-1 Outlet	323.17	0.00	0.0	
	323.58	0.41	13.9	13.9
	323.99	0.82	14.6	28.5
	324.39	1.22	5.4	33.9
T/G CB-1	324.80	1.63	0.0	33.9
Maximum Fill Level	324.95	1.78	11.9	45.8

Orifice Plate Design

Orifice Plate Diameter:	1.88	INCH
Orifice Plate Diameter:	47.6	mm
Orifice Plate Area:	1781.4	mm^2
Gravity:	9.81	m/s^2
Orifice coefficient:	0.61	

$$V = \sqrt{2gh}$$

$$Q = CAV$$

Description	Water Elevation (m)	Depth to Outlet (m)	Velocity (m/s)	Discharge (L/s)	Allowable Discharge (L/s)
CB-1 Outlet	323.17	0.00	0.0	0.0	
	323.58	0.41	2.8	3.1	
	323.99	0.82	4.0	4.3	
	324.39	1.22	4.9	5.3	
T/G CB-1	324.80	1.63	5.7	6.1	
Overflow	324.95	1.78	5.9	6.4	**6.3**