LOON CALL KENNEDY FARM DEVELOPMENT
TOWN OF MEAFORD
FUNCTIONAL SERVICING REPORT

Prepared by:

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TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

M1 Development Inc. is proposing to develop a residential subdivision on a property located at the north end of the Town of Meaford and known as the Kennedy Farm. The property is approximately 14.0 ha and is legally described as Part Lots 4 and 14 Plan 541, Part Lot 1 Plan 16R10913 and Part Lot 1 Plan 16R5037 in the Town of Meaford.

The property is bounded by Provincial Highway #26 to the south, residential development to the east and north, and existing agricultural uses to the west.

The site location is illustrated on Figure 1.

1.2 Purpose and Scope

Pinestone Engineering Ltd (PEL) has been retained by the developer to prepare a functional servicing report (FSR) in support of a zoning amendment and draft plan of subdivision. The report describes the proposed servicing and storm water quality and quantity control strategy for the site.

2.0 REFERENCE REPORTS

The following reports and studies have been used for reference in the preparation of this Servicing and Storm Water Management Plan:

i) Ministry of the Environment and Energy's Storm Water Management Planning and Design Manual, March 2003.
ii) Sediment Control Planning Central Region Group, prepared by the Ministry of Natural Resources.
iii) Ministry of the Environment's Design Guidelines for Drinking Water Systems, 2008.
iv) Municipality of Meaford Engineering Standards, April 2019

3.0 EXISTING CONDITIONS

3.1 General

The property is currently in agricultural use and development on the site includes a residential home and several outbuildings. The western portions of the site are tree covered and there is a ravine which runs along the north property boundary.

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MEAFORD PROPERTY

SITE LOCATION PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:10000	19-11471	**FIGURE 1**

A single driveway access into the property is provided from Highway #26.

A 150mm dia. municipal watermain extends across the eastern portion of the property's Highway #26 frontage. There is no municipal sanitary service to the property.

The existing conditions are illustrated on Drawing EX-1

3.2 Topography

The topography across the site is generally mild, with gradients in the 1% - 2% range. The site generally falls from the west to the east.

Elevations on the site range between 190.0m ASL and 200.0m ASL

3.3 Site Geology

Geotechnical and Hydrogeological investigations were conducted in the spring of 2020 by Palmer Environmental. Copies of these reports have been submitted under separate cover.

The investigation showed the soil stratigraphy below the topsoil and a 0.3m to 1.1m layer of fill to be a mix of silty sand and clay till. Groundwater was only encountered in the south west corner of the site.

Adjustment of the curve numbers for the pervious component of the lands have been carried out in the computer model to represent Type C soils.

Borehole logs are included in Appendix A.

3.4 Drainage Conditions

Drainage generated on site drains overland in the form of sheet flow from west to the north-east, towards the Algonquin Drive residential subdivision and eventually to Georgian Bay. There is a well defined ravine at the north end of the property along Centreville Creek which captures drainage from the surrounding area, including portions of the subject property and directs the run-off to Georgian Bay.

4.0 PROPOSED DEVELOPMENT

The proposed subdivision includes a mix of single detached units and row townhouses. The development is proposed to be constructed in phases, with the phases to be determined by market demand.

The developer is proposing a "flex" zoning which would allow the mix of unit types as market conditions dictate. A range of between 214 and 249 units are contemplated and two (2)

development concepts have been prepared which illustrate the range of unit mixes. These are illustrated in Figures 2 and 3. Both concepts respect the environmental constraints and buffers established in the Environmental Impact Study prepared by Michalski Nielsen and Associates. For the purposes of analyzing the water and sewage demands for the development, a maximum of 249 units has been used.

Drainage from the majority of the site will be conveyed to a wet pond storm water management facility located in the SWM block at the north end of the development. Drainage from the rear yards of the most easterly lots will continue to flow overland to the east as in the existing condition.

Site vehicular access will be provided directly from Highway #26 near the west limit of the property. A secondary emergency access, which will normally be gated, is proposed to Highway #26 at the east end of the site. The internal municipal roads will be constructed to the current Municipality of Meaford urban standard, with a 20.0m right-of-way, 8.5m carriage-way, concrete curb and gutter, streetlights, sidewalk on one side of the roadway, and storm sewers to collect and convey drainage to the municipal storm water management facility.

A Traffic Impact Study for the development has been prepared by JD Engineering. That study has recommended a left turn lane at the proposed intersection once development on the site exceeds 100 units. That report is being submitted for review under separate cover.

Municipal water and sewer servicing will be extended along Highway #26 and into the site at the location of the emergency access block, near the east limit of the property.

5.0 SANITARY SEWERS

5.1 Existing Infrastructure

There is an existing 250mm dia. PVC municipal sanitary sewer located at the intersection of Grandview Drive and Ford Avenue, approximately 400m east of the property. This sewer will need to be extended west along Ford Avenue and Highway #26 to provide service to the site. It is proposed that the sanitary sewer be extended within the north boulevard for Highway #26 to minimize traffic disruption during construction. An MTO permit will be required for this work.

The Municipality of Meaford has advised that upgrades to downstream sanitary infrastructure including a pipe syphon under the Bighead River may be required to provide adequate system capacity for the entire development. The Municipality is planning to undertake a review of potential capacity constraints in order to determine which external infrastructure improvements may need to be addressed with the development of the property on a Phase by Phase basis. The Municipality has indicated a current allocation for the Kennedy Farm Property of 40 units.

Figure 4 illustrates the existing sanitary sewer network in the Municipality of Meaford.

CENTREVILLE ROAD

ALGONQIN DRIVE

HIGHWAY 26

4m LEVEL SPREADER
INV. 192.00

ENHANCED
RIP-RAP
SWALE

APPROXIMATE EDGE OF
EXISTING STREAM

(192.50)

BLOCK
= 1.78ha

30m SETBACK FROM
APPROXIMATE EDGE OF
EXISTING STREAM

STORMWATER MANAGEMENT
FACILITY BLOCK
0.60ha±

6m SWM POND
OUTLET EASEMENT

(194.00)

INV. 194.50

TOP 196.50
PERM. POOL 195.00
F.B. 193.50
POND BOTTOM
194.00
PERM. POOL 195.00

TOP BERM 196.50

6m SWM
FACILITY
ACCESS

14m MTO
SETBACK

EMERGENCY
ACCESS

LEGEND

SITE BOUNDARY

ONTARIO REGULATION 151/06 (APPROX.)

NATURAL HAZARD (APPROX.)

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MEAFORD PROPERTY - M - 1

DEVELOPMENT CONCEPT A - 214 LOTS

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:2000	19-11471	**FIGURE 2**

CENTREVILLE ROAD

4m LEVEL SPREADER
INV. 192.00

ENHANCED
RIP-RAP
SWALE

APPROXIMATE EDGE OF
EXISTING STREAM

(192.50)

BLOCK
1.78ha

30m SETBACK FROM
APPROXIMATE EDGE OF
EXISTING STREAM

STORMWATER MANAGEMENT
FACILITY BLOCK
0.60ha±

6m SWM POND
OUTLET EASEMENT

(194.00)

INV. 194.50

TOP 196.50
PERM. POOL 195.00
F.B. 193.50
POND BOTTOM
194.00
PERM. POOL 195.00

TOP BERM 196.50

6m SWM
FACILITY
ACCESS

ALGONQIN DRIVE

14m MTO
SETBACK

EMERGENCY
ACCESS

HIGHWAY 26

LEGEND

SITE BOUNDARY

ONTARIO REGULATION 151/06 (APPROX.)

NATURAL HAZARD (APPROX.)

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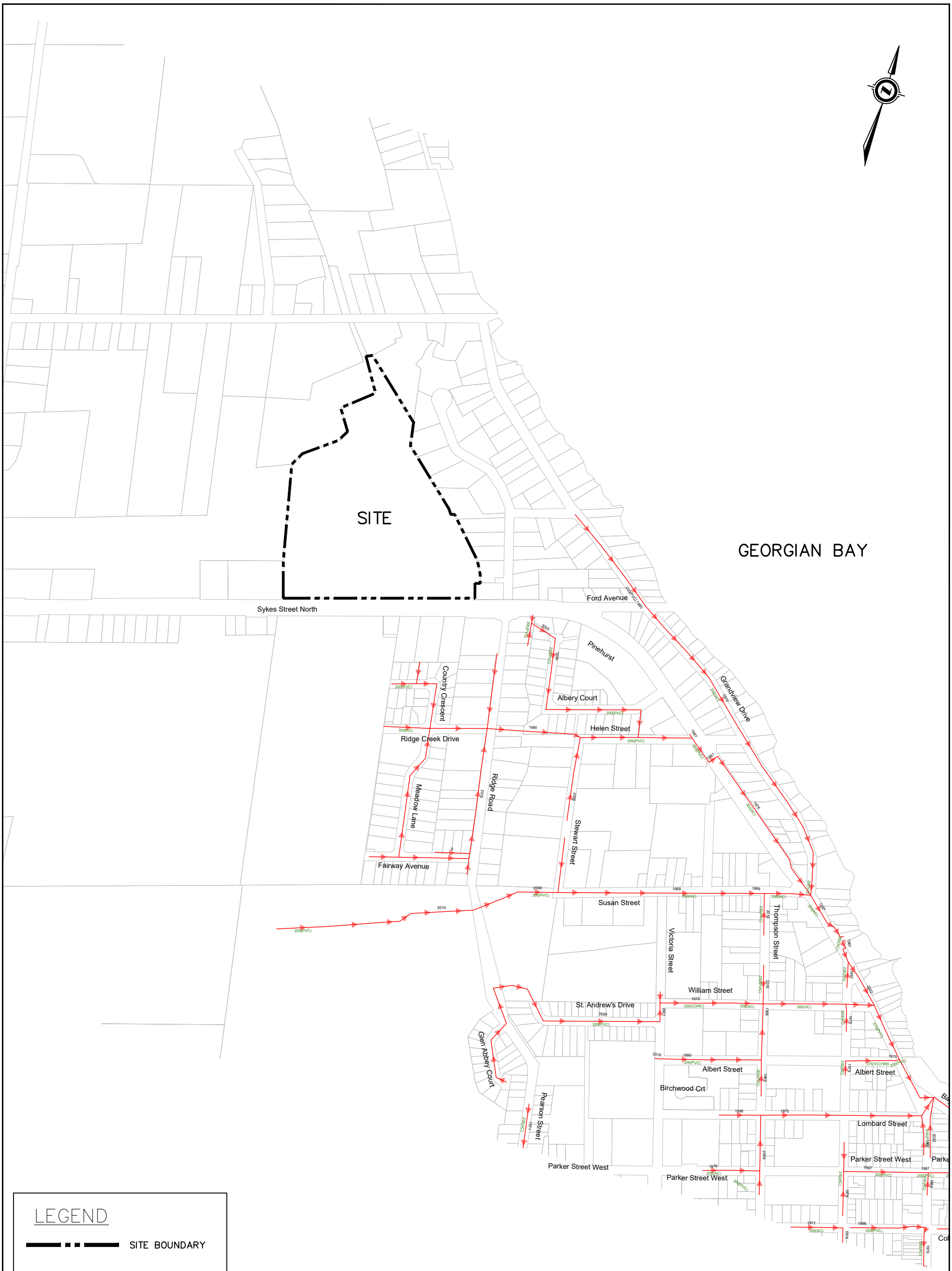
DEVELOPMENT CONCEPT B - 249 LOTS

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:2000	19-11471	**FIGURE 3**



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MEAFORD PROPERTY - M - 1

MEAFORD SANITARY SEWER NETWORK

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:8000	19-11471	**FIGURE 4**

5.2 Proposed Servicing Strategy

The proposed site development will be serviced by gravity sanitary sewers installed within the proposed municipal roads within the subdivision. Sanitary sewers will need to be extended along Ford Avenue and Highway #26 from their current terminus at the intersection of Grandview Dr. and Ford Ave. to the east limit of the development. The proposed peak sanitary design flow for the development were calculated using the following design criteria per MOECP:

- 0.0052 L/c/s for average residential flow for new development
- 3.5 people per unit
- Residential peaking factor using the Harmon Formula

The proposed peak design flow for the ultimate build out of the subdivision (249 lots) was determined to be 20.7 L/sec. A copy of the preliminary sanitary sewer design sheet is included in Appendix B and the sanitary catchment boundary plan is illustrated on Figure 5.

For the purpose of the preliminary review, additional connections along Highway #26 and Ford Avenue have not been contemplated, however there would be sufficient capacity in the new sewers extended along Highway #26 to accommodate an additional peak flow rate of 10 L/sec assuming a minimum pipe slope of 1.0%

The capacity of the existing immediate downstream reach of 250mm dia. sanitary sewer on Grandview Ave, with a gradient of 0.22%, is approximately 28 L/sec. Given that the theoretical peak flow rate from the development is approximately 71% of the capacity of the downstream receiving sewer, a monitoring program is recommended to determine when external infrastructure upgrades / upsizing is necessary. Based on the information provided by the Municipality, the downstream sewers increase to 350mm in diameter at the intersection of Susan St. and Sykes St.

Sanitary servicing within the development will be municipally owned and maintained, and an MOECP Environmental Compliance Approval will be required. The new sewer system will be constructed in accordance with the Municipality of Meaford's engineering standards.

A copy of the preliminary sanitary sewer design sheet is included in Appendix B

6.0 WATERMAIN

6.1 Existing Infrastructure

There is an existing 150mm AC watermain extending along Highway #26 to the property within the northern boulevard. A 250mm dia. ductile iron (DI) watermain crossing of the highway immediately adjacent the existing driveway access was installed in 2012 in anticipation of the existing watermain being upgraded.

CENTREVILLE ROAD

APPROXIMATE EDGE OF EXISTING STREAM

BLOCK 1.78ha

30m SETBACK FROM APPROXIMATE EDGE OF EXISTING STREAM

6m SWM POND OUTLET EASEMENT

STORMWATER MANAGEMENT FACILITY BLOCK 0.60ha±

6m SWM FACILITY ACCESS

ALGONQUIN DRIVE

305 | 1.50 | 119

304 | 0.56 | 28

303 | 0.27 | 14

302 | 0.84 | 42

301 | 0.67 | 21

306 | 0.66 | 56

307 | 0.35 | 25

308 | 0.76 | 70

316 | 0.20 | 14

310 | 0.50 | 42

309 | 1.15 | 119

311 | 1.03 | 77

315 | 0.86 | 46

312 | 0.56 | 46

313 | 1.12 | 95

314 | 0.74 | 60

SANMH 1 T/G 198.80 INV. 196.10

72m 200mmø SAN. @ 0.5%

SANMH 6 T/G 198.15 INV. 195.75

120m 200mmø SAN. @ 0.5%

SANMH 5 T/G 197.90 INV. 195.15

86m 200mmø SAN. @ 0.5%

SANMH 4 T/G 198.30 INV. 194.70

35m 200mmø SAN. @ 0.5%

53m 200mmø SAN. @ 0.9%

SANMH 3 T/G 198.50 INV. 194.50

104m 200mmø SAN. @ 0.5%

22m 200mmø SAN. @ 0.5%

SANMH 8 T/G 199.00 INV. 196.20

80m 200mmø SAN. @ 0.8%

SANMH 9 T/G 199.80 INV. 196.80

69m 200mmø SAN. @ 0.8%

SANMH 10 T/G 199.40 INV. 196.25

120m 200mmø SAN. @ 0.9%

SANMH 11 T/G 198.80 INV. 195.20

88m 200mmø SAN. @ 0.8%

SANMH 12 T/G 200.40 INV. 197.50

90m 200mmø SAN. @ 0.8%

SANMH 13 T/G 199.95 INV. 196.80

90m 200mmø SAN. @ 0.8%

SANMH 14 72m 200mmø SAN. @ 0.7% T/G 199.50 INV. 196.05

SANMH 1A T/G 198.90 W INV. 196.54 E INV. 195.11 S INV. 194.00

35m 200mmø SAN. @ 0.5%

SANMH 2 T/G 199.00 N INV. 194.00 W INV. 195.30

58m 200mmø SAN. @ 0.8%

SANMH 15 T/G 200.70 INV. 197.95

14m MTO SETBACK

80m 200mmø SAN. @ 0.5%

EMERGENCY ACCESS

SANMH 1 T/G 198.00 INV. 193.60

HIGHWAY 26

LEGEND

- SANITARY CATCHMENT BOUNDARY
- 300 — CATCHMENT NUMBER
- 0.60 | 100 — AREA (HA.) / POPULATION
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY MANHOLE

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SANITARY CATCHMENT PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
MAY. 2020	1:2000	19-11471	**FIGURE 5**

The Municipality of Meaford, through their consultant Ainley Consulting Engineers and Planners, have undertaken an analysis to review system pressures in the existing and ultimate build out condition under three (3) scenarios as follows:

- Maintain existing 150mm dia. watermain to service the development
- Upgrade to a 200mm dia. watermain along Highway #26 from Grandview Dr.
- Upgrade to a 250mm dia. watermain along Highway #26 from Grandview Dr.

The analysis determined that under the ultimate, full development scenario for the Kennedy property pressures in the south west corner of the development would be marginally lower than the 350 kPa (50 psi) identified by MOECP as preferred, but above the recommended minimum of 275 kPa (40 psi) with both the existing 150mm dia watermain and 200mm dia. watermain scenarios. Upgrading to a 250mm dia. watermain along Highway #26 would ensure all pressures would be maintained above 350 kPa.

With regard to fire flows, Ainley recommends upgrading the existing 150mm dia. watermain to either a 200mm or 250mm watermain and that providing two connections into the development site would be preferred to ensure sufficient fire flows.

Figure 6 illustrates the existing watermain network in the Municipality of Meaford. The Ainley analysis is included in Appendix B

6.2 Proposed Servicing Strategy

Water servicing for the first phase of the proposed subdivision development will be provided by the existing 150mm dia. watermain located within north boulevard of Highway #26. Prior to any further development, the existing main will be abandoned and a new 250mm dia. PVC watermain will be extended from Ford Ave. to the site along Highway #26 in the north boulevard.

Each single unit will be serviced by a 25mm dia. polyethylene water service from the internal watermains, which will be 200mm diameter and located within the internal subdivision roads in a location conforming with the Municipal road standard.

Depth of bury will be 2.0m minimum and pipe embedment and backfill will be in accordance with OPSD 802.010. A minimum 2.5m horizontal or 0.5m vertical pipe separation will be maintained between sanitary sewers and watermains.

Water servicing within the development boundary will be municipally owned and maintained and an MOECP approval will be required. The new system will be designed and constructed in accordance with the Municipality of Meaford's engineering standards.

From the Ainley analysis, the maximum day and peak hourly water demands calculations were based on the following criteria:

SITE

GEORGIAN BAY

Sykes Street North

Ford Avenue

WATER TREATMENT PLANT

LOW LIFT PUMP

Pinehurst

Albery Court

Grandview Drive

Helen Street

Country Crescent

Ridge Creek Drive

Ridge Road

Meadow Lane

Fairway Avenue

Stewart Street

Susan Street

Victoria Street

Thompson Street

William Street

St. Andrew's Drive

Glen Abbey Court

Pearson Street

Albert Street

Birchwood Crt

Lombard Street

Parker Street West

LEGEND

- SITE BOUNDARY
- WATER MAIN
- HYDRANT VALVE
- MAIN VALVE

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MEAFORD WATER SYSTEM

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:8000	19-11471	**FIGURE 6**

- average per capita flow of 300 litres/day
- a population density of at 2.4 persons/unit
- Maximum day flow factor of 1.67

Based on the criteria listed above and a maximum total of 249 units, the average day and maximum day flow is 2.08 L/sec and 3.46 L/sec respectively. Public hydrants will provide fire protection for the proposed development.

7.0 STORM WATER MANAGEMENT

7.1 Design Criteria

Based on the guidelines for sensitive receiving outlets outlined in the current MOE SWM Planning and Design Manual (MOE,2003), the design criteria for this site is as follows:

- Peak Flow attenuation to pre-development levels for all storm events up to the 100 year event for drainage directed to the ravine at the north end of the site. Conveyance of post development peak flows in excess of the 100 year flow safely from the site.

- Water quality enhancement to an 'enhanced' level of protection through the use of accepted control techniques such as detention storage, enhanced grass swales, level spreaders, infiltration facilities, and oil / grit removers.

- Preparation of a detailed erosion and sediment control and construction mitigation plan to be implemented as part of the construction program.

7.2 Design Storms

For the purposes of our preliminary storm water management analysis, we have therefore selected the following design storms as part of our evaluation:

- 5 year design storm
- 25 year design storm
- 100 year design storm

Rainfall intensity - duration frequency (IDF) values for the Owen Sound area were entered into an equation that expresses the time relationship intensity for specific frequency, in the form of:

$$i = \frac{a}{(t+b)^c}$$

where: i = *intensity, mm/hr.*
t = *Time of concentration, minutes*
a,b,c = *constants developed to fit published IDF curves*

The storm events were applied to the hydrologic model. Derivation of the design storm hyetographs were based on the "Chicago" 3 hour distribution using the intensity, duration, frequency (IDF) data.

The design storm parameters are outlined in Table 1, below:

Table 1
Design Storm Parameters
Chicago Rainfall Distribution

Rainfall Event	Parameter			Duration (min)
	A	B	C	
5 Yr	1234.576	8.297	0.851	180
25 Yr	1750.276	8.303	0.862	180
100 Yr	2171.754	8.303	0.867	180

7.3 Drainage Catchments

One (1) pre-development and one (1) post development catchments have been delineated in order to estimate the corresponding peak runoff rates for the site. The pre-development catchment areas represent the existing conditions of the site and external drainage area. The post development catchment represents the proposed grading concept for the site.

The pre-development and post-development catchment parameters are listed in Table 2.

Table 2
Sub-catchment Parameters

Catchments	Area (ha)	% Impervious	Slope	SCS Impervious Curve #	SCS Pervious Curve #
Pre-Development					
101 – Pre-development Site Drainage	12.4	0	1.5%	98	77
Post Development					
201 – Proposed Development Drainage	12.4	40.0	1.5%	98	77

The pre-development and post-development catchment boundaries for the site are illustrated on Figure 7.

Table 3, below outlines the calculated pre-development and post development peak run-off rates (without SWM controls) during the 5, 25 and 100-year design storm events.

CENTREVILLE ROAD

4m LEVEL SPREADER
INV. 192.00

ENHANCED
RIP-RAP
SWALE

APPROXIMATE EDGE OF
EXISTING STREAM

(192.50)

BLOCK
1.78ha

30m SETBACK FROM
APPROXIMATE EDGE OF
EXISTING STREAM

6m SWM POND
OUTLET EASEMENT

(194.00)

INV. 194.50

STORMWATER MANAGEMENT
FACILITY BLOCK
0.60ha±

TOP 196.50
PERM. POOL 195.00
F.B. 193.50
POND BOTTOM
194.00
PERM. POOL 195.00
TOP BERM 196.50

6m SWM
FACILITY
ACCESS

ALGONQIN DRIVE

201
12.4

14m MTO
SETBACK

EMERGENCY
ACCESS

HIGHWAY 26

LEGEND

- STORM CATCHMENT BOUNDARY
- 200 / 0.5 — CATCHMENT NUMBER / AREA (HA.)
- PROPOSED STORM SEWER
- PROPOSED STORM MANHOLE
- PROPOSED STORM CATCH BASIN MANHOLE

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PRE AND POST CATCHMENT PLAN

DATE:	SCALE:	PROJECT No.	FIGURE No.
APR. 2020	1:2000	19-11471	FIGURE 7

Table 3
MIDUSS Run-off Rates

	5Yr	25Yr	100Yr
Total Pre-development Peak Runoff Rate – Catchment 101 (m^3/sec)	**0.133**	**0.310**	**0.501**
Total Post Development Peak Runoff Rate – Catchment 201 (m^3/sec)	**1.146**	**1.725**	**2.144**

Based on the results of the hydrological modelling, runoff rates will increase as a result of the development on the site.

MIDUSS input/output calculations are included in Appendix C.

7.4 Storm Water Management Plan

Drainage from catchment 201 will be controlled to attenuate flows to pre-development conditions.

Drainage from catchment 201 will be directed to an 5092m^3 wet pond constructed on the north property limit. Grading within the subdivision will direct water to the pond through storm water sewers. The pond facility will attenuate peak flows up to the 100 year storm event to pre-development peak flows. The ponding area is proposed to be approximately 0.45ha.

Drainage from the pond will outlet to grade and be conveyed to grade south of the existing watercourse (Centreville Creek) north of the property via a proposed enhanced rip-rap swale. The drainage eventually discharges to Georgian Bay. A level spreader at the outlet will be used to minimize erosion at the outlet. With post development run-off controlled to pre-development levels, the existing conveyance features will be adequate to convey site drainage. The extended detention storage requirements for wet pond type facilities according to receiving water body sensitivity are outlined in Table 3.2 of the MOE SWM Planning and Design Manual.

Based on the contributing drainage area of 12.4 ha and 40% imperviousness, the total storage volume required in the SWM pond is 1891 cubic meters (12.4 ha x 152.5 cu.m / ha), with 1395 cu.m of permanent pool storage required, and 496 cu.m of detention storage required. The pond as designed provides 1968 cu.m of permanent pool storage (of which 488 cu.m. are provided in the forebay) and 5092 cu.m of live detention storage. Draw-down calculations for the extended detention storage component are included in Appendix D.

The stage-storage-discharge characteristics for the SWM pond are outlined in Table 4, below.

Table 4
Stage-Storage-Discharge

Elevation (m)	Discharge Rate (m^3/s)	Permanent Storage (m^3)	Live Storage (m^3)	Notes
193.50	0	0	0	Bottom of Forebay
194.00	0	74	0	Bottom of Pond
195.00	0	1968	0	125mm dia Orifice / Permanent Pool
195.10	0.00340	1968	264	
195.20	0.01170	1968	539	
195.30	0.01594	1968	825	
195.40	0.01927	1968	1122	
195.50	0.02211	1968	1429	
195.60	0.02462	1968	1747	300mm dia. Secondary Outlet Pipe
195.70	0.03321	1968	2076	
195.80	0.05124	1968	2415	
195.90	0.07510	1968	2766	
196.00	0.1210	1968	3127	
196.10	0.1426	1968	3498	Weir
196.20	0.3173	1968	3881	
196.30	0.6502	1968	4274	
196.40	1.117	1968	4678	
196.50	1.717	1968	5092	Top of Berm

The Storm Water Management Planning and Design Manual (MOE, 2003) recommends a number of suitable water quality enhancement techniques such as detention storage, enhanced grass swales, level spreaders, infiltration facilities, and oil/grit removers.

Water quality enhancement of post development run-off from Catchment 201 will be achieved through the implementation of a "treatment train" of approved measures, as follows:

- Provision of over 1968 cubic meters of permanent storage and 5092 cubic meters of live storage in the SWM facility
- Rip-rap enhanced swale and level spreader at pond outlet to prevent migration of sediment
- Maintenance of lot line vegetation to filter runoff
- Suitable construction mitigation measures to be utilized during the site development

7.5 SWM Model Results

Using the MIDUSS hydrologic model, pre-development and post development run-off hydrographs were generated for the site in response to the 5, 10, 25, and 100 year design storm events. Modelling results are shown in Table 5. The MIDUSS files are included in Appendix C.

Table 5
SWM Model Results

	5yr Storm	**25yr Storm**	**100yr Storm**
Total pre-development flow – Catchment 101 (m^3/s)	**0.133**	**0.310**	**0.501**
Post development pond outlet flow - Catchment 201 (m^3/s)	**0.037**	**0.108**	**0.210**
Maximum Live Storage Volume (m^3)	2150	3022	3645
Maximum Pond Elevation (m)	195.72	196.00	196.14

8.0 EROSION AND SEDIMENT CONTROL

Sedimentation and erosion control measures are required during construction and until such a time that site development has been completed, the internal driveway has been paved and vegetation established.

The use of various siltation control measures will be implemented to protect the adjacent properties and receiving storm sewer from migrating sediments.

These works include but may not be limited to:

- Installation of siltation fencing along the disturbed construction area.
- Filter cloth and stone placement over catch basins until the parking lot and driveway are paved and vegetation is established.
- Installation of straw bale check dams in swales / ditches.
- Installation of construction mud mat at site entrances.

A detailed sedimentation control plan will be provided during the Site Plan Application stage.

8.1 During Construction

Prior to carrying out site grading the siltation barriers and mud mat noted above shall be in place.

The storm sewer works will not be permitted to outlet to the municipal sewers until the site has been stabilized.

Other temporary installations of silt fence or other appropriate measures may be required during grading to minimize silt migration from the site. The measures will need to be removed, replaced and relocated as required during the construction period until the site works have been completed and vegetation established.

During construction all stockpiled material will be placed up-gradient of the siltation controls.

If site works are to continue through the winter and spring the engineer shall be contacted by the owner to review the measures in place with the contractor on a regular basis to ensure that the facilities are adequate and in good working order.

All reasonable methods to control erosion and sedimentation are to be taken during construction.

8.2 Monitoring and Maintenance

It is the responsibility of the contractor and owner to maintain the siltation control devices until suitable grass cover has been established.

A regular review of the facilities by the contractor shall be carried out during the construction period to ensure that the facilities are being properly maintained, and if

necessary replaced. Inspection reports are to be completed weekly and distributed to the owner, contractor, and Town.

The contractor should inspect the siltation devices immediately after each rainfall. Damaged devices should be repaired immediately and additional devices installed if necessary.

Silt should be removed from the fencing when deposits reach approximately 250mm above original ground.

8.3 Contingency Plan

Should the erosion control measures fail and sediment migrate beyond the limits of the control works, the following tasks are required to be completed:

- The Municipality of Meaford and Ministry of the Environment should be notified of the event. The area will be assessed and cleaned up to the satisfaction of the agencies.
- Additional sedimentation facilities be installed in the area of the migration and down gradient to contain the sediment.
- The Ministry of Natural Resources should be contacted in the event that sediment reaches any adjacent water bodies.

9.0 UTILITIES

Overhead hydro and buried cable television, natural gas and telephone services are immediately available to the site from Highway #26. Hydro One will need to determine if any upgrades to their existing infrastructure will be required as the development proceeds on a phase by phase basis.

Internal streetlighting will be installed in accordance with the Municipality of Meaford's Engineering Standards guide, including LED fixtures and decorative poles.

10.0 SUMMARY AND CONCLUSIONS

The findings of this report are summarized as follows:

- The existing 150mm dia. Watermain on Highway #26 is not sufficient to service the proposed development at full build out as system pressures would be lower than the Ministry of Environment guidelines. A 250mm dia. Watermain will be extended along Highway #26 from the intersection of Ford Avenue to service full the site.
- A sanitary sewer will be extended along Highway #26 from the intersection of Ford Ave. to provide service to the site. The entire site will be able to discharge by gravity to the proposed sanitary sewer extension and no pump stations will be required. The Town of Meaford is undertaking a review of existing system capacities and will identify deficiencies

in the existing sewer network that will need to be addressed in order to service the development.

- The comparison of pre-development and post development storm water flow rates indicate that peak flows will increase during major storm events as a result of the increased impervious area.

- It is understood that peak flow attenuation is required. A wet pond storage facility will be constructed adjacent to the north perimeter of the property. The pond will provide 5092 cu.m. of storage to attenuate peak flows up to the 100 year storm event.

- Storm water quality enhancement can be achieved using a "treatment train" of quality control techniques including provision of over 1968 cubic meters of permanent pool storage in the SWM facility, enhanced swales to promote cleansing and infiltration, and suitable construction mitigation measures to be utilized during the site development.

- Suitable measures can be implemented during construction to protect the adjacent properties from migrating sediments.

It is recommended that:

1) This report and drawings be submitted to the Municipality of Meaford to support planning approvals for the development.

2) The construction mitigation measures outlined in this report are utilized as a guideline for construction mitigation management on this site.

All of which is respectfully submitted.

PINESTONE ENGINEERING LTD.

Lauren Trividic, P.Eng.

Tim Harvey, P.Eng.

APPENDIX A

Soils

PINESTONE ENGINEERING LTD.

Explanation of Terms Used in the Record of Borehole

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
RC	Rock core
SC	Soil core
SS	Spoon sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils

Classification	Particle Size
Boulders	>300 mm
Cobbles	75 mm-300 mm
Gravel (Gr)	4.75 mm-75 mm
Sand (Sa)	0.075 mm-4.75 mm
Silt (Si)	0.002 mm-0.075 mm
Clay (Cl)	<0.002 mm

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	>35%

Soil Description

a) Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

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LOG OF BOREHOLE BHM1-1

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

Method: Continuous Spoon/Solid Stem Augers
Diameter: 155 mm
Date: Apr-13-2020

REF. NO.: 2001801
ENCL NO.: 1

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS/0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cm) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**TOPSOIL:** 250 mm						Concrete					
0.3	**FILL:** clayey silt, some sand, trace gravel, some organics, trace rootlets, contains layers of sand,		1	SS	5		W. L. 0.4 mBGL Apr 17, 2020		o			
0.6	dark brown to brown, moist, firm		2A	SS								Spoon wet
0.8	**SAND:** some silt, trace gravel, brown, wet, compact		2B	SS	27				o			
1	**CLAYEY SILT TILL:** some sand, trace gravel, contains seams of sand, contains cobbles, brown, moist, very stiff to hard		3	SS	46		Holeplug		o			
1.8	**SILTY SAND:** trace clay, trace gravel, brown, wet, compact		4	SS	14				o			Auger grinding
2.4	**SILTY CLAY TILL:** some sand, trace gravel, contains cobbles and boulders, brown, moist, hard		5	SS	35				o			
3			6	SS	39				o			
4							Sand					Auger grinding
							Screen					Auger grinding
			7	SS	90/230mm				o			
5												Auger grinding from 4.9m to 5.8m
	contains layers of sand		8	SS	91/280mm		Natural Pack		o—			
6.5	**END OF BOREHOLE** 1. Borehole caved to 5.9 m below ground surface (mBGS) upon completion of drilling. 2. Water was at 0.9 mBGS upon completion of drilling. 3. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 4. Water Level Readings: Date W. L. Depth (mBGS) April 17, 2020 0.42											

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▽

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; O ε=3% Strain at Failure

Palmer

LOG OF BOREHOLE BHM1-2

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

Method: Continuous Spoon/Solid Stem Augers
Diameter: 155 mm
Date: Apr-02-2020

REF. NO.: 2001801
ENCL NO.: 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) O UNCONFINED, + FIELD VANE & Sensitivity, ● QUICK TRIAXIAL, × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**CONCRETE:** 180 mm						Concrete					
0.2	**FILL:** sand and gravel, trace clay, trace silt, trace rootlets, trace organics, dark brown to brown, wet, loose		1	SS	8							
0.3							Holeplug					
0.8	**FILL:** clayey silt, some sand, trace organics, contains cobbles, brown, moist, firm to very stiff		2	SS	25							
	SILTY CLAY TILL: some sand, trace gravel, contains seams of sand, contains cobbles and boulders, brown, moist, very stiff to hard		3	SS	55							
							Sand					
			4	SS	59		Screen					Auger grinding
			5	SS	33							
							Natural Pack					
			6	SS	50/100mm							Auger grinding and spoon bouncing
3.3	**END OF BOREHOLE DUE TO AUGER AND SPOON REFUSAL** 1. Borehole caved to 2.7 mBGS upon completion of drilling 2. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 3. Water Level Readings: Date W. L. Depth (mBGS) April 17, 2020 No GW Accu.											

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$, $\times^3$: Numbers refer to Sensitivity; O $^{\varepsilon=3\%}$ Strain at Failure

Palmer.

LOG OF BOREHOLE BHM1-3

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

Method: Continuous Spoon/Solid Stem Augers
Diameter: 155 mm
Date: Apr-02-2020

REF. NO.: 2001801
ENCL NO.: 3

(m) ELEV DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface											
0.0	**CONCRETE:** 180 mm						Concrete					
0.2	**FILL:** sand and gravel, trace clay, trace silt, brown, wet, compact		1	SS	19				○			
0.3	**SILTY CLAY TILL:** some sand, trace gravel, contains pockets and seams of sand, contains cobbles and boulders, brown to grey, moist, very stiff to hard		2	SS	40		Holeplug		○			
			3	SS	19				○			
			4	SS	51				○			Auger grinding
			5	SS	57		Sand / Screen		○			
	grey below 3.1m		6	SS	88/ 250mm				○			Auger grinding
							Natural Pack					
4.0	**END OF BOREHOLE DUE TO AUGER AND SPOON REFUSAL** 1. Borehole caved to 3.5 mBGS upon completion of drilling. 2. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 3. Water Level Readings: Date W. L. Depth (mBGS) April 17, 2020 No GW Accu.		7	SS	36/ Initial 50mm							Auger grinding and spoon bouncing

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$ $\times^3$ Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

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LOG OF BOREHOLE BHM1-4

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

Method: Continuous Spoon/Solid Stem Augers
Diameter: 155 mm
Date: Apr-02-2020

REF. NO.: 2001801
ENCL NO.: 4

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface						
0.0	**CONCRETE:** 90 mm					Concrete	
0.1	**FILL:** sand, some gravel, trace silt, trace organics, dark brown to brown, wet, loose	1	SS	10			
0.5	**FILL:** clayey silt, trace sand, trace gravel, some organics, trace rootlets, dark brown to brown, moist, stiff	2	SS	35		Holeplug	Spoon wet
	SILTY SAND: trace clay, trace gravel, brown, wet, loose	3	SS	49			
	SILTY CLAY TILL: some sand to sandy, trace to some gravel, contains pockets and layers of sand, contains cobbles and boulders, brown, moist, very stiff to hard	4	SS	17			
		5	SS	30			
		6	SS	27		Sand	
						Screen	Auger grinding
		7	SS	68/ 280mm			13 21 43 23
							Auger grinding
							Auger grinding
						Natural Pack	
		8	SS	95/ 280mm			
6.5	**END OF BOREHOLE** 1. Borehole caved to 5.3 mBGS upon completion of drilling. 2. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 3. Water Level Readings: Date W. L. Depth (mBGS) April 17, 2020 No GW Accu.						

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$ $\times^3$ Numbers refer to Sensitivity ○ ε_f=3% Strain at Failure

Palmer

LOG OF BOREHOLE BHM1-5

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

Method: Solid Stem Augers
Diameter: 155 mm
Date: Apr-13-2020

REF. NO.: 2001801
ENCL NO.: 5

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface							
0.0	**TOPSOIL:** 200 mm						Concrete	
0.2	**FILL:** silty clay, trace sand, trace gravel, some rootlets, some organics, contains pockets of sand, dark brown to brown, moist, firm		1	SS	5			
0.7	**CLAYEY SILT TILL TO SILTY CLAY TILL:** some sand to sandy, trace gravel, contains seams and layers of sand, contains cobbles and boulders, brown, moist, hard		2	SS	57			Auger grinding 5 24 53 18
			3	SS	87			
			4	SS	82		Holeplug	Auger grinding
			5	SS	74			
			6	SS	60			Auger grinding
			7	SS	70		Sand Screen	
			8	SS	89/ 280mm		Natural Pack	Auger grinding
								Auger grinding
								Auger grinding
8.1	**END OF BOREHOLE DUE TO AUGER AND SPOON REFUSAL** 1. Borehole was open upon completion of drilling. 2. Upon completion of drilling, a 50mm diameter monitoring well was installed in the borehole. 3. Water Level Readings: Date W. L. Depth (mBGS) April 17, 2020 No GW Accu.							Auger grinding and spoon bouncing

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH (kPa): ○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE & Sensitivity, × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30

POCKET PEN. (Cu) (kPa)

NATURAL UNIT WT (kN/m³)

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: $+^3$ $\times^3$ Numbers refer to Sensitivity; ○ ε=3% Strain at Failure

Palmer.

LOG OF BOREHOLE BHM1-6

PROJECT: Geotechnical Investigation, Phase 2 ESA, M1
CLIENT: LC Development Group
PROJECT LOCATION: Meaford, ON
DATUM: N/A
BH LOCATION: See Borehole Location Plan

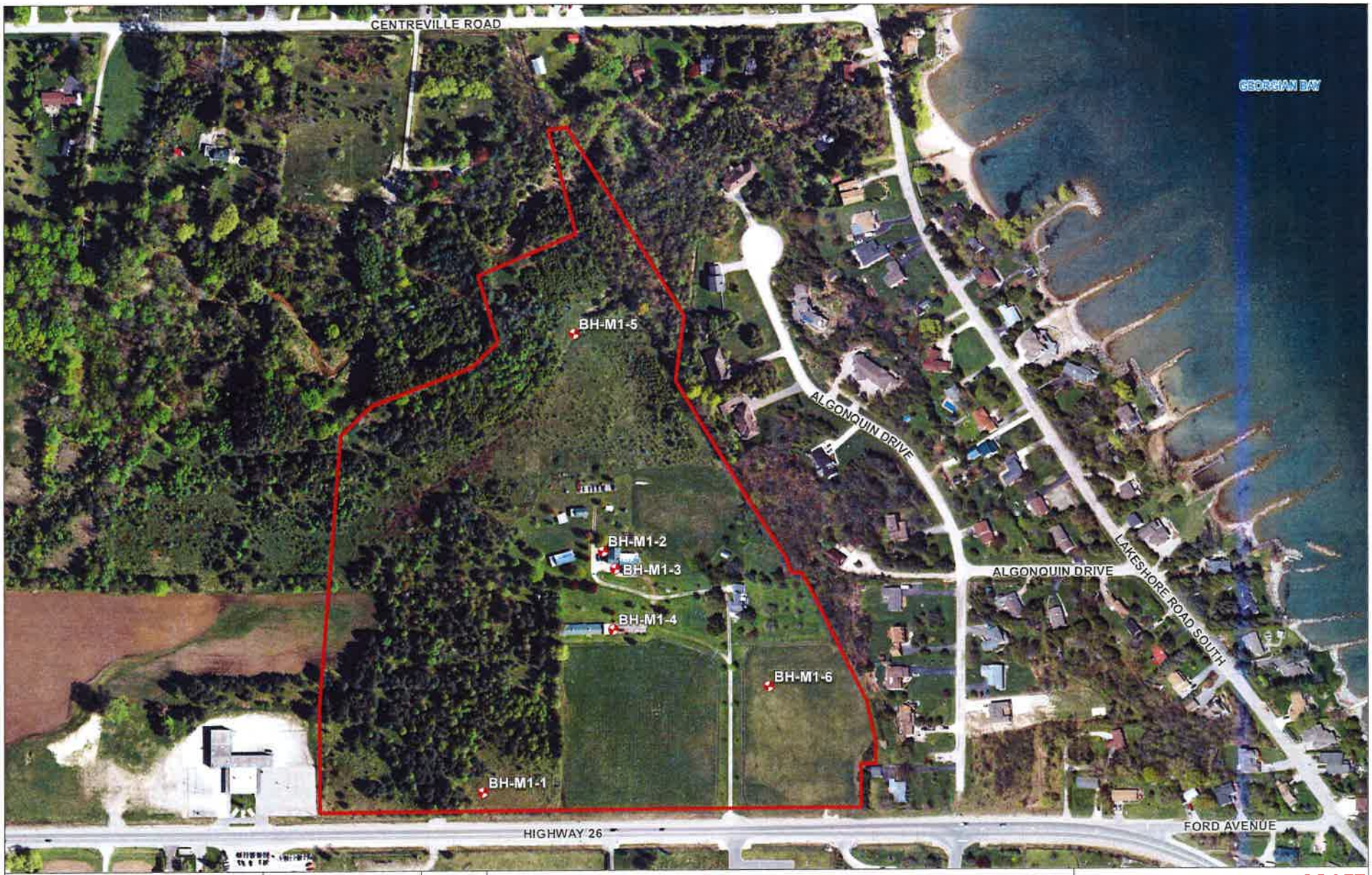
Method: Solid Stem Augers
Diameter: 155 mm
Date: Apr-13-2020

REF. NO.: 2001801
ENCL NO.: 6

SOIL PROFILE (m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	TYPE	"N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
	Ground Surface										
0.0	**TOPSOIL:** 300 mm										
0.3	**FILL:** clayey silt, some sand, trace gravel, some organics, trace rootlets, contains pockets of sand, contains cobbles, dark brown to brown, wet, soft to stiff		1	SS	4				○		
			2a	SS					○		
1.1	**CLAYEY SILT TILL TO SILTY CLAY TILL:** some sand, trace gravel, contains seams of sand, contains cobbles and boulders, brown, moist, stiff to hard		2B	SS	12				○		
			3	SS	44				○		Spoon wet
			4	SS	50/ 125mm				○		Auger grinding
											Auger grinding
3.1	contains rock fragments **END OF BOREHOLE DUE TO AUGER AND SPOON REFUSAL** 1. Borehole was open upon completion of drilling. 2. Water was at 2.7 mBGS upon completion of drilling.		5	SS	50/ Initial 50mm						Auger grinding and spoon bouncing

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES + 3, × 3, Numbers refer to Sensitivity ○ ● = 3% Strain at Failure



CLIENT: LC Development Group - LCDG INC

PROJECT: 206105 Highway 26 (M1)

PREPARED BY: Palmer™

0 20 40 60 80 100 metres

N

PROJECT NO:	2001801
REVISION:	1-1
DATE:	May 03, 2020
SCALE:	1:4000
DRAWN:	CV
DATUM:	NAD 1983
CHECKED:	ED
PROJECTION:	UTM zone 17

LEGEND:

- Subject Property
- Borehole Location

Imagery (2015) provided by Grey County WMS

DRAFT

Borehole Location Plan

Figure 4

Document Path: W:\Egnyte\Shared\Projects\Active\20018 - LC Development Group - LCDG INC\2001801 - 206105 Highway 26 (M1 & M2), Mealford\Mapping\Figures\5_ArcGIS\Ecology\M1\2001801_4-1_Borehole Location Plan.mxd

APPENDIX B

Sanitary and Water Servicing Information

PINESTONE ENGINEERING LTD.

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON, L9Y 4J5
Tel: (705) 445-3451 ▪ Fax: (705) 445-0968
E-mail collingwood@ainleygroup.com

March 9, 2020

File No. 120024

Municipality of Meaford
21 Trowbridge Street West
Meaford ON
N4L 1Y1

Attn: **Tori Perejmybida**
Director of Infrastructure Services

Ref: **Kennedy Property (206105 Highway 26)**
Review of Available Pressures and Fire Flows

Dear Ms. Perejmybida:

Per your January 27, 2020 request we have completed a review of the theoretical pressures and available fire flows at the proposed Kennedy property development. Our analysis includes a comparison of the pressures within the area of interest under average day demand (ADD), maximum day demand (MDD), peak hour (PH) and maximum day demand plus available fire flow (MDD + FF) under the following conditions:

- Existing 150mm diameter watermain on Highway 26
- Watermain on Highway 26 replaced with 200mm diameter watermain from the entrance to the Kennedy Property to Grandview Drive
- Watermain on Highway 26 replaced with 250mm diameter watermain from the entrance to the Kennedy Property to Grandview Drive

This analysis was completed using the Municipality of Meaford WaterGEMS water supply and distribution model, updated to 2013 Existing Conditions. All scenarios were modelled under both existing and ultimate build out conditions. The conditions for all scenarios are as follows:

- Internal watermain servicing is based the proposed road layout shown on Pinestone Engineering Ltd. drawing SP-1 (Drawing Loon Call Meaford Property M-1, Lot Concept Sketch, Project No. 19-11471-M, Drawing SP-1)
  - Watermain is not included on the sketch. It was assumed that the watermain would follow the proposed road layout.
  - It was assumed that the internal watermain servicing would be ~~150~~200mm diameter.
  - Connections for internal watermain to the trunk watermain on Highway 26 are not indicated on the drawing. The following potential servicing scenarios were reviewed:
    - One connection, located at the proposed entrance to the site, to the trunk watermain on Highway 26
    - One connection, located at the emergency access to the site, to the trunk watermain on Highway 26
    - Two connections, located at the emergency access to the site and at the proposed entrance to the site, to the trunk watermain on Highway 26

Ainley CONSULTING ENGINEERS PLANNERS

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- Elevations are estimated based on existing watermain in the model and also topographic information included in the Grey County GIS.
- Demands for the proposed development are consistent with future demands used in the Municipality of Meaford WaterGEMS water model updated as part of the Municipality of Meaford Water and Wastewater Servicing Master Plan. The demands were developed based on historic data
    - A population density of 2.4 people per unit was used throughout the model. The demand for existing and future residential properties was applied as a unit demand. The future unit residential average day demand used was 720 L/unit/day (300L/cap/day x 2.4 ppu = 720 L/unit/day). For maximum day demand, the maximum day factor (MDF) used for proposed development was 1.6707. This is the MDF used in the 2013 existing model.

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Existing System Conditions Plus the Proposed Kennedy Property Development

A review of pressures within the area of interest under ADD, MDD, PH and MDD + FF was completed under existing system conditions (updated to the end of 2013) plus the proposed Kennedy Property development . Under the above noted conditions the following is a summary of the theoretical pressures and available fire flows:

	Existing 150mm Diameter Watermain			Replace the 150mm Diameter Watermain on Highway 26 from Grandview Drive to the proposed Kennedy Property Development with a 200mm Diameter Watermain			Replace the 150mm Diameter Watermain on Highway 26 from Grandview Drive to the proposed Kennedy Property Development with a 250mm Diameter Watermain		
	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site
Pressure (kPa)									
ADD	360 – 395	360 – 395	360 – 400	365 - 405	365 - 405	370 – 405	370 – 405	370 – 405	370 – 405
MDD	355 – 390	355 – 390	355 – 390	360 – 395	360 – 395	360 – 395	360 – 395	360 – 395	360 – 395
PH	330 – 365	330 – 365	340 – 375	345 - 380	345 - 380	345 – 385	350 – 385	350 – 385	350 – 385
Fire Flow (L/s)									
	27 - 34	45 - 65	61 - 71	45 - 50	60 - 80	70 - 95	55 - 70	65 - 95	73 - 140

These pressures are within the range recommended in the MECP Design Guidelines for normal operating conditions (Per the MECP Design Guidelines for Drinking Water Systems 2008, Chapter 10, Section 10.2 Hydraulic Design, 10.2.2.1 Maximum and Minimum Operating Pressures: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275kPa. The maximum pressures in the distribution system should not exceed 700 kPa to avoid damage to household plumbing and unnecessary water and

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energy consumption). With the existing 150mm diameter watermain and also with 200mm diameter watermain on Highway 26 the pressures at the south west corner of the site are marginally lower than 350kPa, but above the recommended minimum of 275kPa. With 250mm diameter watermain the pressures within all areas of the proposed development are within the MECP recommended range.

With respect to theoretical available fire flows, under existing conditions with the existing 150mm diameter watermain on Highway 26 acceptable fire flows could be achieved at the site with two connections from the watermain on Highway 26 to the proposed site. Two connections to the site is also considered to be a best practice, as it provides redundancy and better water flow. Replacing the existing 150mm diameter watermain on Highway 26 with 200mm or 250mm diameter watermain will allow for much higher fire flows to the proposed site, and would be recommended as a long term planned upgrade.

Ainley CONSULTING ENGINEERS PLANNERS

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Ultimate Build Out Conditions

A review of pressures within the area of interest under ADD, MDD, PH and MDD + FF was completed under ultimate build out system conditions. Under the above noted conditions the following is a summary of the theoretical pressures and available fire flows:

	Existing 150mm Diameter Watermain			Replace the 150mm Diameter Watermain on Highway 26 from Grandview Drive to the proposed Kennedy Property Development with a 200mm Diameter Watermain			Replace the 150mm Diameter Watermain on Highway 26 from Grandview Drive to the proposed Kennedy Property Development with a 250mm Diameter Watermain		
	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site	One watermain into the site, located at the proposed driveway	One watermain into the site, located at the proposed Emergency Access	Two watermains connections to the site
Pressure (kPa)									
ADD	350 – 385	350 – 385	355 - 390	355 – 390	355 – 390	355 – 390	355 – 390	355 – 390	355 – 390
MDD	340 – 375	340 – 375	340 – 380	345 – 380	345 – 380	345 – 380	345 – 380	345 – 380	350 – 385
PH	320 – 355	325 – 355	325 - 360	330 – 365	330 – 365	330 - 370	335 - 370	335 - 370	335 - 370
Fire Flow (L/s)									
	22 - 32	40 - 60	44 - 63	46 - 60	55 - 90	68 - 100	66 - 80	75 - 105	95 - 105

These pressures are within the range recommended in the MECP Design Guidelines for normal operating conditions (Per the MECP Design Guidelines for Drinking Water Systems 2008, Chapter 10, Section 10.2 Hydraulic Design, 10.2.2.1 Maximum and Minimum Operating Pressures: The normal operating pressure in the distribution system should be approximately 350 to 480 kPa and not less than 275kPa. The maximum pressures in the distribution system should not exceed 700 kPa to avoid damage to household plumbing and unnecessary water and

Ainley & Associates Limited
280 Pretty River Parkway, Collingwood, ON, L9Y 4J5
Tel: (705) 445-3451 ▪ Fax: (705) 445-0968
E-mail collingwood@ainleygroup.com

energy consumption). The pressure at the south west end of the proposed development are marginally lower than 350kPa as a result of elevation.

A review of theoretical available fire flows indicates that replacing the 150mm diameter watermain on Highway 26 with 200mm or 250mm diameter watermain and providing two connections from the watermain on Highway 26 to the proposed development will ensure sufficient fire flow is available at the proposed development.

Please do not hesitate to contact the undersigned if you have any questions with respect to this submission.

Yours truly
AINLEY & ASSOCIATES LIMITED

Heidi Ferris, P.Eng.
Project Engineer

Encl.
c.c.

LOON CALL MEAFORD PROPERTY
Meaford

Project Number: 19-11471
Date: April 1, 2020
Design By: LT
Checked By: TH
File: Z:\Project Documents\11471M Loon Call Meaford\FSR\11471 Prelim Sanitary Sewer Design Sheet (LT).xls

SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: SAN - 1

Design Parameters

Average Daily Flow
Residential 0.0052 L/s/c
Commercial 1.5 L/s/ha
Industrial 1.0 L/s/ha
Inst. / School 2.5 L/s/ha

Mannings "*n*" 0.0130
Min. Velocity 0.60 m/sec
Max. Velocity 3.0 m/sec
Residential Harmon Peaking Factor (F)
Residential Areas Infiltration 0.28 L/s/ha

PEL
PINESTONE ENGINEERING LTD.

LOCATION				RESIDENTIAL AREAS and POPULATION						SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN						
										HECTARES AND FLOW OF EACH ZONING																		
										2.50 *L/s/ha*			1.50 *L/s/ha*			1.00 *L/s/ha*												
STREET	AREA NO.	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA	UNITS	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
				ha	*3.5pp/unit*	*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec.*	*m/s*	*m/s*
	315	15	12	0.86	13.00	0.046	0.046	4.322805	1.0228											0.86	0.86	0.2408	1.2636	58.0	0.80	200	29.3209	0.934	0.464
	312	12	13	0.56	13.00	0.046	0.091	4.254556	2.0133											0.56	1.42	0.3976	2.4109	90.0	0.80	200	29.3209	0.934	0.563
	313	13	14	1.12	27.00	0.095	0.186	4.159774	4.0125											1.12	2.54	0.7112	4.7237	90.0	0.80	200	29.3209	0.934	0.685
	314	14	1A	0.88	17.00	0.060	0.245	4.114589	5.2420											0.88	3.42	0.9576	6.1996	72.0	0.70	200	27.4272	0.873	0.706
	311	12	9	1.03	22.00	0.077	0.077	4.272948	1.7109											1.03	1.03	0.2884	1.9993	88.0	0.80	200	29.3209	0.934	0.533
	316	9	10	0.20	4.00	0.014	0.091	4.254556	2.0133											0.20	1.23	0.3444	2.3577	69.0	0.80	200	29.3209	0.934	0.559
	309	10	11	1.15	34.00	0.119	0.210	4.14024	4.5211											1.15	2.38	0.6664	5.1875	120.0	0.90	200	31.0995	0.990	0.734
	310	11	4	0.50	12.00	0.042	0.252	4.109732	5.3854											0.50	2.88	0.8064	6.1918	79.0	0.50	200	23.1802	0.738	0.625
	308	9	8	0.76	20.00	0.070	0.070	4.282859	1.5590											0.76	0.76	0.2128	1.7718	80.0	0.80	200	29.3209	0.934	0.514
	307	8	7	0.35	7.00	0.025	0.095	4.250214	2.0886											0.35	1.11	0.3108	2.3994	22.0	0.50	200	23.1802	0.738	0.476
	306	7	6	0.66	16.00	0.056	0.151	4.190561	3.2795											0.66	1.77	0.4956	3.7751	72.0	0.50	200	23.1802	0.738	0.543
	305	6	5	1.50	34.00	0.119	0.270	4.097939	5.7429											1.50	3.27	0.9156	6.6585	120.0	0.50	200	23.1802	0.738	0.637
	304	5	4	0.56	8.00	0.028	0.298	4.080013	6.3118											0.56	3.83	1.0724	7.3842	86.0	0.50	200	23.1802	0.738	0.656
	303	4	3	0.27	4.00	0.014	0.564	3.946955	11.5654											0.27	6.98	1.9544	13.5198	35.0	0.60	200	25.3927	0.809	0.821
	302	3	2	0.84	12.00	0.042	0.606	3.930011	12.3740											0.84	7.82	2.1896	14.5636	104.0	0.50	200	23.1802	0.738	0.780
	301	2	1A	0.53	6.00	0.021	0.627	3.92183	12.7765											0.53	8.35	2.3380	15.1145	35.0	0.50	200	23.1802	0.738	0.786
	300	1A	1	0.00	0.00	0.000	0.872	3.837718	17.3918											0.00	11.77	3.2956	20.6874	80.0	0.50	200	23.1802	0.738	0.834

APPENDIX C

MIDUSS Model Results

PINESTONE ENGINEERING LTD.

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                      5YR_PRE.out"
"                Licensee name:                                      Windows User"
"                Company                                                         "
"                Date & Time last used:                2020-03-09 at 1:46:09 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1234.580   Coefficient A"
"        8.297   Constant B"
"        0.851   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           134.693    mm/hr"
"             Total depth                  42.929    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          101   101 - MEAFORD PROPERTY PRE-DEVELOPMENT "
"        0.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"       12.400   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.262   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.133     0.000     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           12.400     0.000      12.400     hectare"
"              Time of concentration  105.226    0.003      105.226    minutes"
"              Time to Centroid       223.616    82.930     223.615    minutes"
"              Rainfall depth         42.929     42.929     42.929     mm"
"              Rainfall volume        5323.17    0.01       5323.17    c.m"
"              Rainfall losses        31.698     8.945      31.698     mm"
"              Runoff depth           11.230     33.984     11.231     mm"
"              Runoff volume          1392.58    0.00       1392.58    c.m"
"              Runoff coefficient     0.262      0.000      0.262      "
"              Maximum flow           0.133      0.000      0.133      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.133     0.133     0.000     0.000"
" 38           START/RE-START TOTALS 101"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    12.400    hectare"
"              Total Impervious area                    0.000    hectare"
"              Total % impervious                       0.000"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                      5YR_POST.out"
"                Licensee name:                                        Windows User"
"                Company                                                          "
"                Date & Time last used:                2020-03-09 at 1:50:58 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      360.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"           1   Chicago storm"
"     1234.580   Coefficient A"
"        8.297   Constant B"
"        0.851   Exponent C"
"        0.375   Fraction R"
"      210.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           120.463    mm/hr"
"             Total depth                  44.163    mm"
"           6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"           1   Triangular SCS"
"           2   Proportional to %"
"           1   SCS method"
"         201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.269   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.880   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.146     0.000     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           7.440      4.960      12.400     hectare"
"              Time of concentration  103.001    8.586      38.306     minutes"
"              Time to Centroid       241.644    108.716    150.559    minutes"
"              Rainfall depth         44.163     44.163     44.163     mm"
"              Rainfall volume        3285.72    2190.48    5476.20    c.m"
"              Rainfall losses        32.266     5.317      21.486     mm"
"              Runoff depth           11.897     38.846     22.677     mm"
"              Runoff volume          885.12     1926.77    2811.89    c.m"
"              Runoff coefficient     0.269      0.880      0.513      "
"              Maximum flow           0.083      1.137      1.146      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    1.146     1.146     0.000     0.000"
" 38           START/RE-START TOTALS 201"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    12.400    hectare"
"              Total Impervious area                    4.960    hectare"
"              Total % impervious                      40.000"
" 19           EXIT"
```

```
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"                MIDUSS created                                  February 7, 2010"
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"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                      5YR_SWM.out"
"                Licensee name:                                      Windows User"
"                Company                                                         "
"                Date & Time last used:                2020-03-09 at 2:04:15 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1234.576   Coefficient A"
"        8.297   Constant B"
"        0.851   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           134.692    mm/hr"
"             Total depth                  42.929    mm"
"            6   005hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.262   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.877   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.267     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           7.440      4.960      12.400     hectare"
"             Time of concentration  105.226    8.177      38.173     minutes"
"             Time to Centroid       223.616    95.510     135.105    minutes"
"             Rainfall depth         42.929     42.929     42.929     mm"
"             Rainfall volume        3193.89    2129.26    5323.15    c.m"
"             Rainfall losses        31.698     5.272      21.128     mm"
"             Runoff depth           11.230     37.657     21.801     mm"
"             Runoff volume          835.54     1867.77    2703.32    c.m"
"             Runoff coefficient     0.262      0.877      0.508      "
"             Maximum flow           0.080      1.262      1.267      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.267     1.267     0.000     0.000"
" 54          POND DESIGN"
"        1.267   Current peak flow    c.m/sec"
"        0.141   Target outflow    c.m/sec"
"       2703.3   Hydrograph volume    c.m"
"          16.   Number of stages"
"      195.000   Minimum water level    metre"
"      196.500   Maximum water level    metre"
"      195.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                195.000     0.000     0.000"
"                195.100   0.00340   264.000"
"                195.200   0.01170   539.000"
"                195.300   0.01594   825.000"
"                195.400   0.01927  1122.000"
"                195.500   0.02211  1429.000"
"                195.600   0.02462  1747.000"
"                195.700   0.03321  2076.000"
"                195.800   0.05124  2415.000"
"                195.900   0.07510  2766.000"
"                196.000    0.1210  3127.000"
"                196.100    0.1426  3498.000"
"                196.200    0.3173  3881.000"
"                196.300    0.6502  4274.000"
"                196.400     1.117  4678.000"
"                196.500     1.717  5092.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                196.100     0.900     3.000     3.000     3.000"
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                195.000     0.630    0.1250     1.000"
"                195.600     0.630    0.3000     1.000"
```

```
"             Peak outflow                  0.037    c.m/sec"
"             Maximum level               195.722    metre"
"             Maximum storage            2150.034    c.m"
"             Centroidal lag               17.356   hours"
"                  1.267     1.267     0.037     0.000 c.m/sec"
" 38          START/RE-START TOTALS 201"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      12.400    hectare"
"             Total Impervious area                      4.960    hectare"
"             Total % impervious                        40.000"
" 19          EXIT"
```

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"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
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" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      360.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1750.276   Coefficient A"
"        8.303   Constant B"
"        0.862   Exponent C"
"        0.375   Fraction R"
"      210.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           165.717    mm/hr"
"             Total depth                  59.007    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          101   101 - MEAFORD PROPERTY PRE-DEVELOPMENT "
"        0.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"       12.400   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.352   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.310     0.000     0.000     0.000 c.m/sec"
"              Catchment 101          Pervious   Impervious Total Area "
"              Surface Area           12.400     0.000      12.400     hectare"
"              Time of concentration  80.933     0.002      80.933     minutes"
"              Time to Centroid       210.916    94.556     210.916    minutes"
"              Rainfall depth         59.007     59.007     59.007     mm"
"              Rainfall volume        7316.89    0.01       7316.90    c.m"
"              Rainfall losses        38.236     10.690     38.236     mm"
"              Runoff depth           20.771     48.318     20.771     mm"
"              Runoff volume          2575.58    0.01       2575.59    c.m"
"              Runoff coefficient     0.352      0.000      0.352      "
"              Maximum flow           0.310      0.000      0.310      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    0.310     0.310     0.000     0.000"
" 38           START/RE-START TOTALS 101"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    12.400    hectare"
"              Total Impervious area                    0.000    hectare"
"              Total % impervious                       0.000"
" 19           EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
"           10   Units used:                                              ie METRIC"
"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                      25YR_POST.out"
"                Licensee name:                                         Windows User"
"                Company                                                           "
"                Date & Time last used:                2020-03-09 at 1:59:48 PM"
" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      360.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1750.276   Coefficient A"
"        8.303   Constant B"
"        0.862   Exponent C"
"        0.375   Fraction R"
"      210.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           165.717    mm/hr"
"             Total depth                  59.007    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.352   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.907   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.725     0.000     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           7.440      4.960      12.400     hectare"
"              Time of concentration  80.933     7.474      34.496     minutes"
"              Time to Centroid       210.916    106.064    144.635    minutes"
"              Rainfall depth         59.007     59.007     59.007     mm"
"              Rainfall volume        4390.14    2926.76    7316.90    c.m"
"              Rainfall losses        38.236     5.467      25.129     mm"
"              Runoff depth           20.771     53.540     33.879     mm"
"              Runoff volume          1545.35    2655.59    4200.94    c.m"
"              Runoff coefficient     0.352      0.907      0.574      "
"              Maximum flow           0.186      1.713      1.725      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    1.725     1.725     0.000     0.000"
" 38           START/RE-START TOTALS 201"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    12.400    hectare"
"              Total Impervious area                    4.960    hectare"
"              Total % impervious                      40.000"
" 19           EXIT"
```

```
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"                MIDUSS version                            Version 2.25  rev. 473"
"                MIDUSS created                                  February 7, 2010"
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"                Job folder:                              Z:\Project Documents\"
"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                      25YR_SWM.out"
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"                Company                                                          "
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"        5.000   Time Step"
"      180.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     1750.276   Coefficient A"
"        8.303   Constant B"
"        0.862   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           185.501    mm/hr"
"             Total depth                  57.451    mm"
"            6   025hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.344   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.902   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    1.869     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           7.440      4.960      12.400     hectare"
"             Time of concentration  79.119     7.123      33.339     minutes"
"             Time to Centroid       193.853    92.994     129.719    minutes"
"             Rainfall depth         57.451     57.451     57.451     mm"
"             Rainfall volume        4274.39    2849.59    7123.98    c.m"
"             Rainfall losses        37.678     5.656      24.869     mm"
"             Runoff depth           19.773     51.795     32.582     mm"
"             Runoff volume          1471.13    2569.05    4040.18    c.m"
"             Runoff coefficient     0.344      0.902      0.567      "
"             Maximum flow           0.179      1.853      1.869      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    1.869     1.869     0.000     0.000"
" 54          POND DESIGN"
"        1.869   Current peak flow    c.m/sec"
"        0.141   Target outflow    c.m/sec"
"       4040.2   Hydrograph volume    c.m"
"          16.   Number of stages"
"      195.000   Minimum water level    metre"
"      196.500   Maximum water level    metre"
"      195.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                195.000     0.000     0.000"
"                195.100   0.00340   264.000"
"                195.200   0.01170   539.000"
"                195.300   0.01594   825.000"
"                195.400   0.01927  1122.000"
"                195.500   0.02211  1429.000"
"                195.600   0.02462  1747.000"
"                195.700   0.03321  2076.000"
"                195.800   0.05124  2415.000"
"                195.900   0.07510  2766.000"
"                196.000    0.1210  3127.000"
"                196.100    0.1426  3498.000"
"                196.200    0.3173  3881.000"
"                196.300    0.6502  4274.000"
"                196.400     1.117  4678.000"
"                196.500     1.717  5092.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                196.100     0.900     3.000     3.000     3.000"
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                195.000     0.630    0.1250     1.000"
"                195.600     0.630    0.3000     1.000"
```

```
"             Peak outflow                  0.108    c.m/sec"
"             Maximum level               195.971    metre"
"             Maximum storage            3021.554    c.m"
"             Centroidal lag               14.860   hours"
"                  1.869     1.869     0.108     0.000 c.m/sec"
" 38          START/RE-START TOTALS 201"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      12.400    hectare"
"             Total Impervious area                      4.960    hectare"
"             Total % impervious                        40.000"
" 19          EXIT"
```

```
"                MIDUSS Output ------------------------------------------------>"
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"                MIDUSS created                                  February 7, 2010"
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"                                                  11471M Loon Call Meaford\MIDUSS"
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"                Licensee name:                                       Windows User"
"                Company                                                         "
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"        5.000   Time Step"
"      360.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2171.754   Coefficient A"
"        8.303   Constant B"
"        0.867   Exponent C"
"        0.375   Fraction R"
"      210.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           202.862    mm/hr"
"             Total depth                  71.271    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 101"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          101   101 - MEAFORD PROPERTY PRE-DEVELOPMENT "
"        0.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"       12.400   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        0.000   Impervious Area"
"        0.000   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.408   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.000   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    0.501     0.000     0.000     0.000 c.m/sec"
"             Catchment 101          Pervious   Impervious Total Area "
"             Surface Area           12.400     0.000      12.400     hectare"
"             Time of concentration  70.293     0.002      70.293     minutes"
"             Time to Centroid       195.749    93.927     195.749    minutes"
"             Rainfall depth         71.271     71.271     71.271     mm"
"             Rainfall volume        8837.62    0.01       8837.63    c.m"
"             Rainfall losses        42.212     11.982     42.212     mm"
"             Runoff depth           29.059     59.289     29.059     mm"
"             Runoff volume          3603.34    0.01       3603.35    c.m"
"             Runoff coefficient     0.408      0.000      0.408      "
"             Maximum flow           0.501      0.000      0.501      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    0.501     0.501     0.000     0.000"
" 38          START/RE-START TOTALS 101"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                    12.400    hectare"
"             Total Impervious area                    0.000    hectare"
"             Total % impervious                       0.000"
" 19          EXIT"
```

```
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"                                                  11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                   100YR_POST.out"
"                Licensee name:                                       Windows User"
"                Company                                                          "
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" 31          TIME PARAMETERS"
"        5.000   Time Step"
"      360.000   Max. Storm length"
"     1500.000   Max. Hydrograph"
" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2171.754   Coefficient A"
"        8.303   Constant B"
"        0.867   Exponent C"
"        0.375   Fraction R"
"      210.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           202.862    mm/hr"
"             Total depth                  71.271    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.408   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.916   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

```
"                    2.144     0.000     0.000     0.000 c.m/sec"
"              Catchment 201          Pervious   Impervious Total Area "
"              Surface Area           7.440      4.960      12.400     hectare"
"              Time of concentration  70.293     6.857      32.253     minutes"
"              Time to Centroid       195.749    104.659    141.126    minutes"
"              Rainfall depth         71.271     71.271     71.271     mm"
"              Rainfall volume        5302.57    3535.05    8837.63    c.m"
"              Rainfall losses        42.212     5.982      27.720     mm"
"              Runoff depth           29.059     65.289     43.551     mm"
"              Runoff volume          2162.01    3238.36    5400.36    c.m"
"              Runoff coefficient     0.408      0.916      0.611      "
"              Maximum flow           0.301      2.090      2.144      c.m/sec"
" 40           HYDROGRAPH Add Runoff "
"             4   Add Runoff "
"                    2.144     2.144     0.000     0.000"
" 38           START/RE-START TOTALS 201"
"             3   Runoff Totals on EXIT"
"              Total Catchment area                    12.400    hectare"
"              Total Impervious area                    4.960    hectare"
"              Total % impervious                      40.000"
" 19           EXIT"
```

```
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"                MIDUSS created                                    February 7, 2010"
"           10   Units used:                                                ie METRIC"
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"                                                      11471M Loon Call Meaford\MIDUSS"
"                Output filename:                                        100YR_SWM.out"
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" 32          STORM Chicago storm"
"            1   Chicago storm"
"     2171.754   Coefficient A"
"        8.303   Constant B"
"        0.867   Exponent C"
"        0.375   Fraction R"
"      180.000   Duration"
"        1.000   Time step multiplier"
"             Maximum intensity           227.198    mm/hr"
"             Total depth                  69.443    mm"
"            6   100hyd   Hydrograph extension used in this file"
" 33          CATCHMENT 201"
"            1   Triangular SCS"
"            2   Proportional to %"
"            1   SCS method"
"          201   201 - MEAFORD PROPERTY PROPOSED SUBDIVISION DEVELOPMENT "
"       40.000   % Impervious"
"       12.400   Total Area"
"      400.000   Flow length"
"        1.500   Overland Slope"
"        7.440   Pervious Area"
"      400.000   Pervious length"
"        1.500   Pervious slope"
"        4.960   Impervious Area"
"      266.667   Impervious length"
"        1.500   Impervious slope"
"        0.250   Pervious Manning 'n'"
"       77.000   Pervious SCS Curve No."
"        0.400   Pervious Runoff coefficient"
"        0.100   Pervious Ia/S coefficient"
"        7.587   Pervious Initial abstraction"
"        0.015   Impervious Manning 'n'"
"       98.000   Impervious SCS Curve No."
"        0.915   Impervious Runoff coefficient"
"        0.100   Impervious Ia/S coefficient"
"        0.518   Impervious Initial abstraction"
```

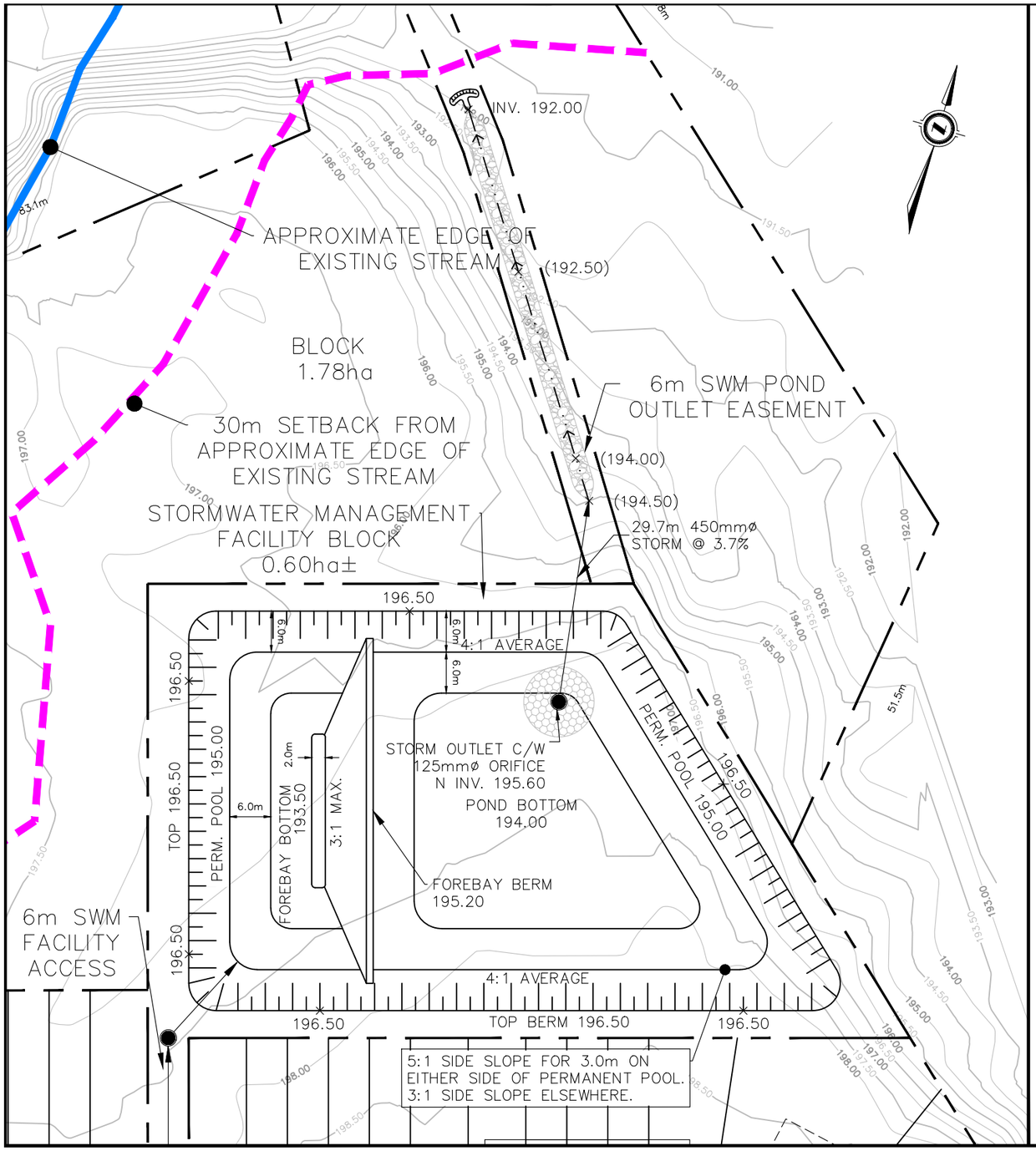
```
"                    2.370     0.000     0.000     0.000 c.m/sec"
"             Catchment 201          Pervious   Impervious Total Area "
"             Surface Area           7.440      4.960      12.400     hectare"
"             Time of concentration  67.251     6.539      30.586     minutes"
"             Time to Centroid       179.168    91.607     126.288    minutes"
"             Rainfall depth         69.443     69.443     69.443     mm"
"             Rainfall volume        5166.58    3444.39    8610.98    c.m"
"             Rainfall losses        41.666     5.916      27.366     mm"
"             Runoff depth           27.777     63.527     42.077     mm"
"             Runoff volume          2066.60    3150.96    5217.56    c.m"
"             Runoff coefficient     0.400      0.915      0.606      "
"             Maximum flow           0.291      2.338      2.370      c.m/sec"
" 40          HYDROGRAPH Add Runoff "
"            4   Add Runoff "
"                    2.370     2.370     0.000     0.000"
" 54          POND DESIGN"
"        2.370   Current peak flow    c.m/sec"
"        0.141   Target outflow    c.m/sec"
"       5217.6   Hydrograph volume    c.m"
"          16.   Number of stages"
"      195.000   Minimum water level    metre"
"      196.500   Maximum water level    metre"
"      195.000   Starting water level    metre"
"            0   Keep Design Data: 1 = True; 0 = False"
"                  Level Discharge    Volume"
"                195.000     0.000     0.000"
"                195.100   0.00340   264.000"
"                195.200   0.01170   539.000"
"                195.300   0.01594   825.000"
"                195.400   0.01927  1122.000"
"                195.500   0.02211  1429.000"
"                195.600   0.02462  1747.000"
"                195.700   0.03321  2076.000"
"                195.800   0.05124  2415.000"
"                195.900   0.07510  2766.000"
"                196.000    0.1210  3127.000"
"                196.100    0.1426  3498.000"
"                196.200    0.3173  3881.000"
"                196.300    0.6502  4274.000"
"                196.400     1.117  4678.000"
"                196.500     1.717  5092.000"
"           1.   WEIRS"
"                  Crest      Weir     Crest      Left     Right"
"              elevation coefficie   breadth sideslope sideslope"
"                196.100     0.900     3.000     3.000     3.000"
"           2.   ORIFICES"
"                Orifice   Orifice   Orifice Number of"
"                 invert coefficie  diameter  orifices"
"                195.000     0.630    0.1250     1.000"
"                195.600     0.630    0.3000     1.000"
```

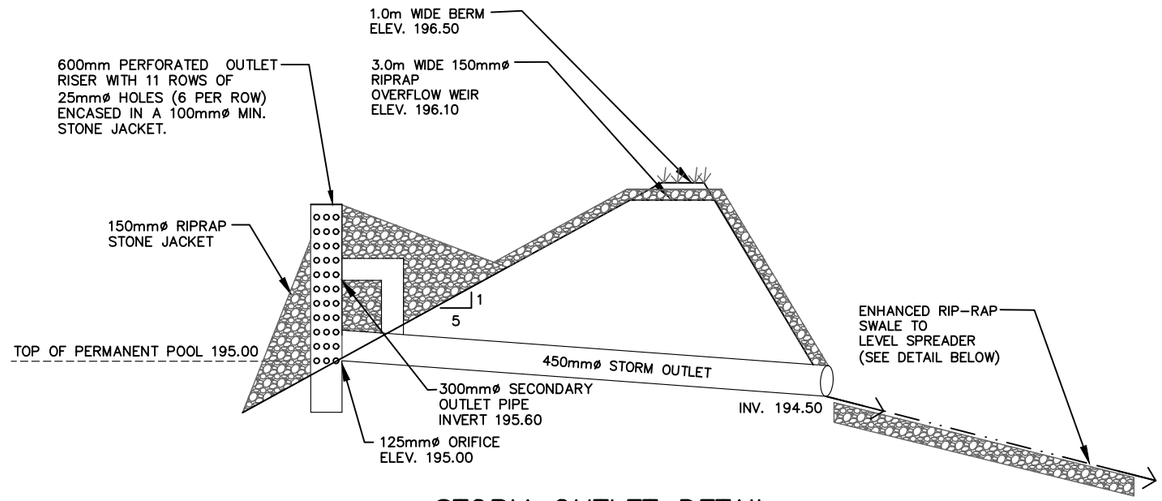
```
"             Peak outflow                  0.210    c.m/sec"
"             Maximum level               196.139    metre"
"             Maximum storage            3645.469    c.m"
"             Centroidal lag               12.861   hours"
"                  2.370     2.370     0.210     0.000 c.m/sec"
" 38          START/RE-START TOTALS 201"
"            3   Runoff Totals on EXIT"
"             Total Catchment area                      12.400    hectare"
"             Total Impervious area                      4.960    hectare"
"             Total % impervious                        40.000"
" 19          EXIT"
```

APPENDIX D

Storm Water Management Design Information

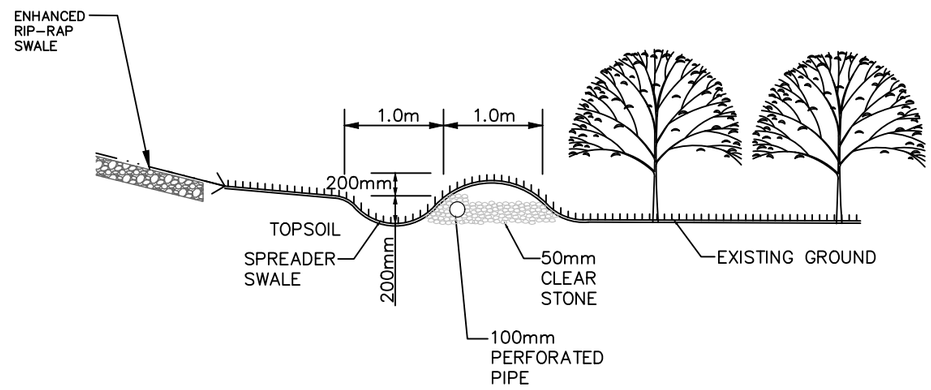
PINESTONE ENGINEERING LTD.





STORM OUTLET DETAIL

N.T.S.



LEVEL SPREADER DETAIL

N.T.S.

PEL
PINESTONE ENGINEERING LIMITED | www.pel.ca

LOON CALL
MEAFORD PROPERTY - M - 1

PROJECT NO. 19-11471

STORMWATER MANAGEMENT PLAN DETAIL

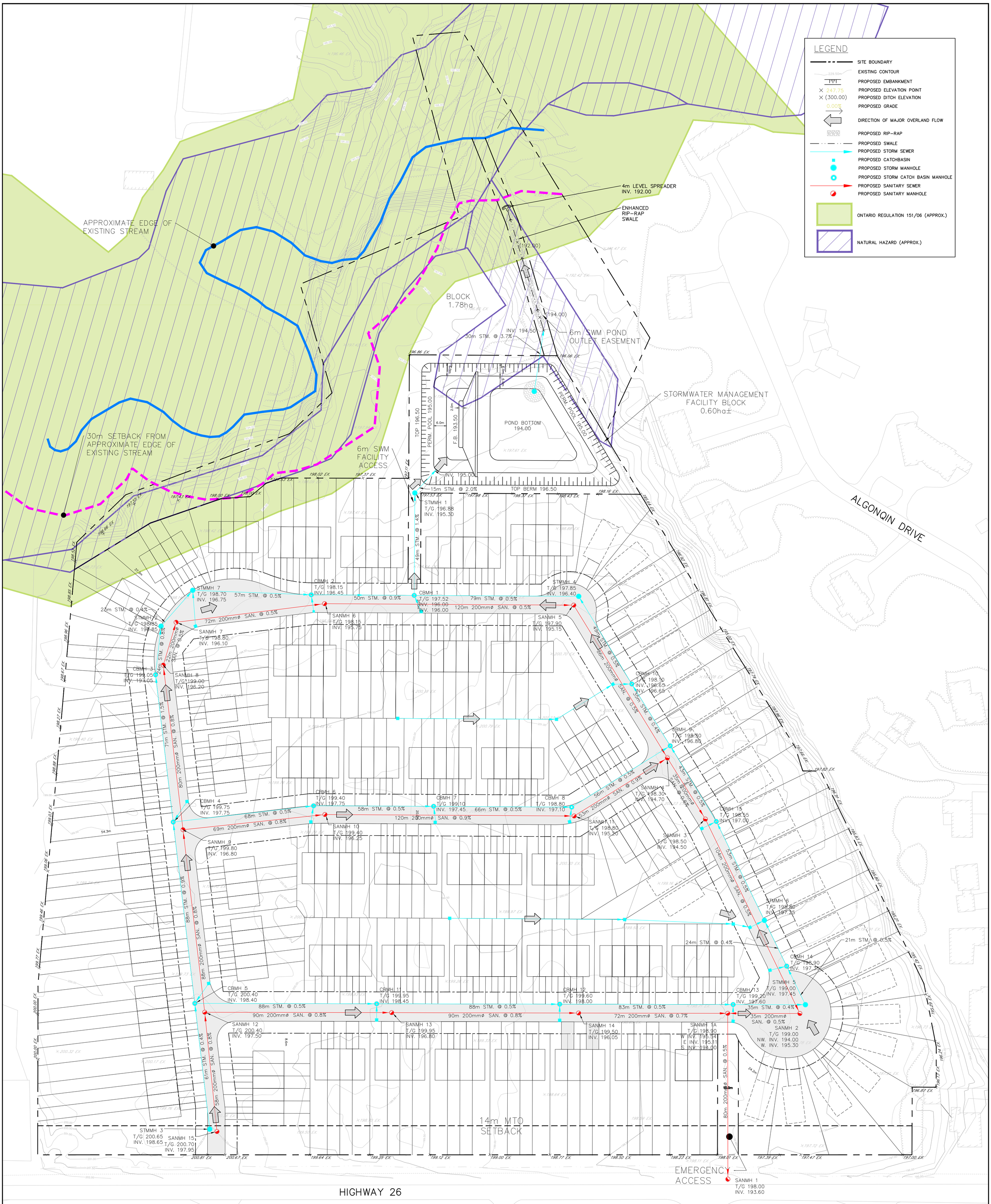
SCALE: 1:750

DATE: APRIL 2020

APPENDIX E

Drawings

PINESTONE ENGINEERING LTD.



PEL
PINESTONE ENGINEERING LIMITED | www.pel.ca

CLIENT/PROJECT

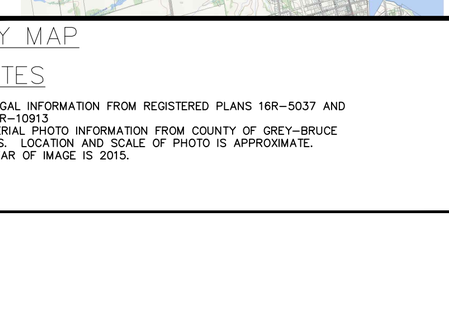
LOON CALL
MEAFORD PROPERTY - M - 1

DRAWING TITLE

PRELIMINARY GRADING AND SERVICING CONCEPT

SEAL

NORTH ARROW



PROJECT NO.	19-11471
DRAWING NO.	GP-1
DESIGN BY:	T.H.
DRAWN BY:	A.L.
CHECKED	T.H.
DATE:	Apr. 30, 2020
SCALE:	1:800

KEY MAP

NOTES

1. LEGAL INFORMATION FROM REGISTERED PLANS 16R-5037 AND 16R-10913
2. AERIAL PHOTO INFORMATION FROM COUNTY OF GREY-BRUCE GIS. LOCATION AND SCALE OF PHOTO IS APPROXIMATE. YEAR OF IMAGE IS 2015.