Committee of the Whole

Meeting Date: **October 12, 2021**

Submitted by: **Durk Vanderwerff, Director of Planning**

SUBJECT: **PROPOSED PLAN OF CONDOMINIUM, MUNICIPALITY OF MIDDLESEX CENTRE, FILE NO. 39T-MC-CDM2002, 10919 LONGWOODS ROAD INC.**

BACKGROUND:

10919 Longwoods Road Inc. is proposing to develop an industrial plan of condominium on a 6.64 ha (16.4 ac) property within Delaware. The development would create 15 vacant land condominium units (lots) for industrial development on municipal water and private septic systems, 1 block for a stormwater management pond, and an internal private road.

The subject lands are within the 'Settlement Employment' designation of the Middlesex Centre Official Plan. The lands are vacant but were previously used for agriculture and contained single detached dwellings that have been removed. The surrounding land uses include agricultural uses immediately to the east, west and south, residential uses immediately to the west and within proximity to the east and north, and industrial and commercial uses within proximity to the north, east and west.

The proposed units would front onto private roadway and range in size from 0.3 ha (0.74 ac) to 0.46 ha (1.13 ac). The application material indicates that potential future uses of the units would be for light-industrial uses such as cabinet maker, electrician, plumbing, etc.

This plan of condominium was processed under the integrated planning model that has been developed between the County and the Municipality. This included a combined circulation process and a common planning review and analysis. The municipal planning reports, authored by Marion-Frances Cabral, as provided to Middlesex Centre Council, are attached along with a location map, a copy of the proposed plan, and the proposed conditions of draft plan approval.

This report is a short summary of the issues from the perspective of the County as the Approval Authority and recommends draft plan approval of this condominium subject to conditions.

ANALYSIS:

The submission was accepted as complete on September 15, 2020, and the Municipality held a statutory public meeting on November 25, 2020. Middlesex Centre Council supported the application on September 22, 2021. It is noted that there was some delay in processing the plan of condominium as a result of the identification of need for additional engineering analysis to address several matters including stormwater management and the extension of a municipal water main. During the local process public input included concerns related to adequacy of servicing, compatibility, and site details such as drainage and fencing.

An agency / ministry circulation was undertaken, and the comments received were either addressed (through additional engineering) or can appropriately be addressed as conditions of draft plan approval. The draft plan conditions include matters to satisfy the Upper Thames River Conservation Authority (storm water management), the Municipality (development agreement, stormwater management, servicing, etc.), and the County of Middlesex (enhancements to Longwoods Road including turning lanes).

The Provincial Policy Statement (PPS) and the County Official Plan encourages new development to occur in settlement areas where full municipal services exist or will be provided. The County Official Plan designates Delaware as a 'Community Settlement Area' and the lands are located within the ‘Settlement Employment' designation of the Middlesex Centre Official Plan. Municipal sanitary services are not available within Delaware however the planning policies provide for continued development on partial services where appropriately engineered sanitary services can be provided. The Municipality are satisfied in this regard.

The planning policies encourage municipalities to promote economic development and competitiveness by providing for a mix of employment uses and diversified economic base to meet long-term needs. This includes maintaining a range and choice of suitable sites for employment uses that consider existing and future businesses. A proposal such as this provides future economic opportunities for smaller light-industrial businesses.

The attached municipal planning reports address the land use planning issues in detail and also outlines the documents and studies submitted in support of the proposal. I have reviewed this material throughout the process and am satisfied that the proposed plan is consistent with the Provincial Policy Statement, conforms with the County’s Official Plan, conforms with the Municipality’s Official Plan, and represents sound land use planning. I am, therefore, recommending draft plan approval of the plan of condominium subject to conditions.

FINANCIAL IMPLICATIONS:

The budget expense related to the Provincially delegated Approval Authority responsibility for local official plans is offset, to an extent, through the collection of

application fees. The approval of development and the accompanied community growth has indirect long-term financial implications.

ALIGNMENT WITH STRATEGIC FOCUS:

This report aligns with the following Strategic Focus, Goals, or Objectives:

Strategic Focus	**Goals**	**Objectives**
Strengthening Our Economy	Encourage a diverse and robust economic base throughout the county	• Create an environment that enables the attraction and retention of businesses, talent, and investments • Support the development and prosperity of downtown core areas in Middlesex County

RECOMMENDATION:

That the proposed Plan of Condominium (File No. 39T-MC-CDM2002) be granted draft plan approval subject to conditions and that a Notice of Decision be circulated as required by the Planning Act and that the Notice of Decision indicate that all written and oral submissions received on the application were considered; the effect of which helped to make an informed recommendation and decision.

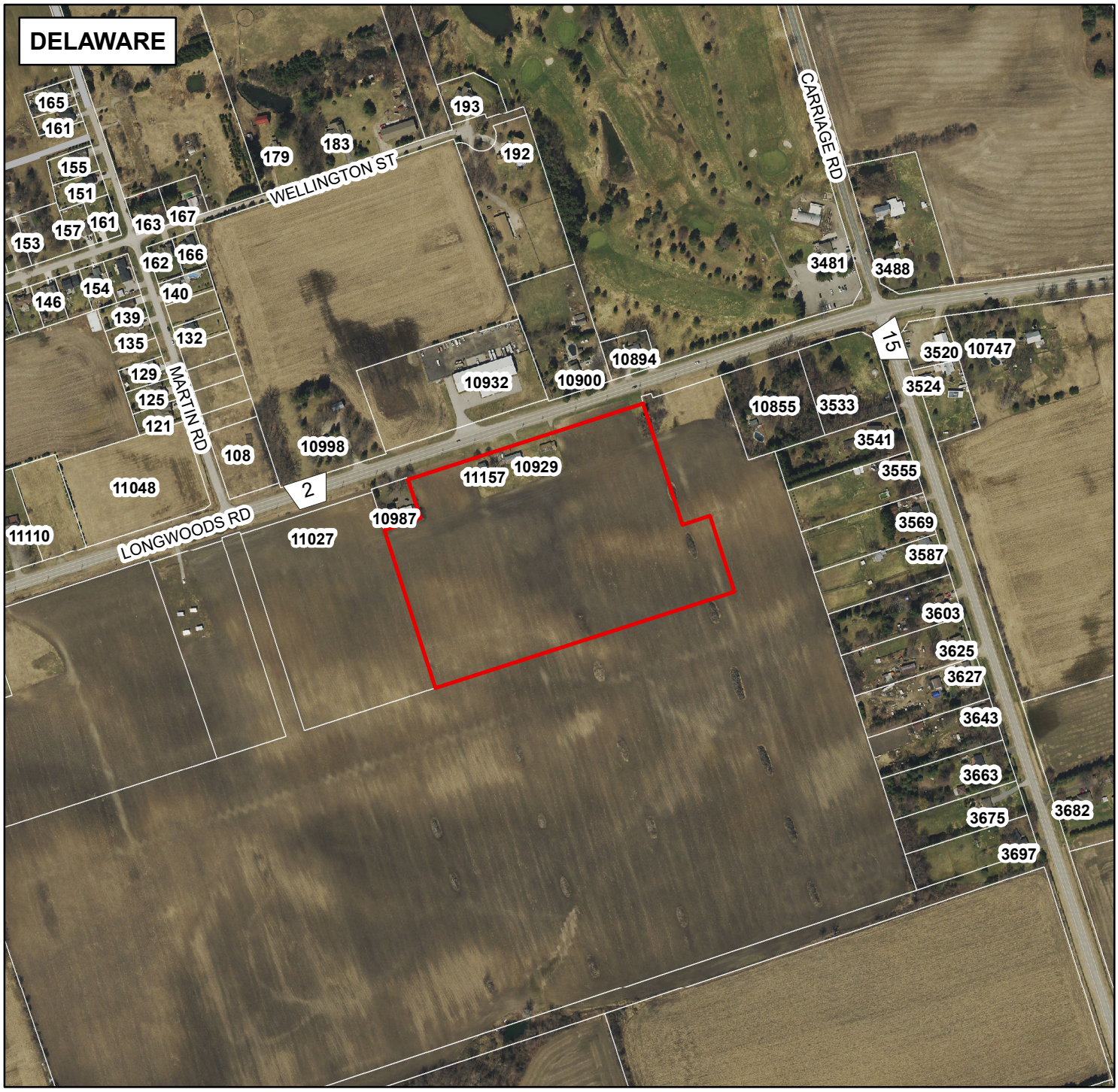
Attachment 1 Location Map

Attachment 2 Proposed Plan of Condominium

Attachment 3 Preliminary Draft Conditions

Attachment 4 Local Planning Report September 22, 2021

Attachment 5 Local Planning Report November 25, 2020



LOCATION MAP

Description:
PROPOSED PLAN OF CONDOMINIUM
MUNICIPALITY OF MIDDLESEX CENTRE

File Number:
39T-MC-CDM2002

Prepared by: Planning Department
The County of Middlesex, July 28, 2020.

LEGEND

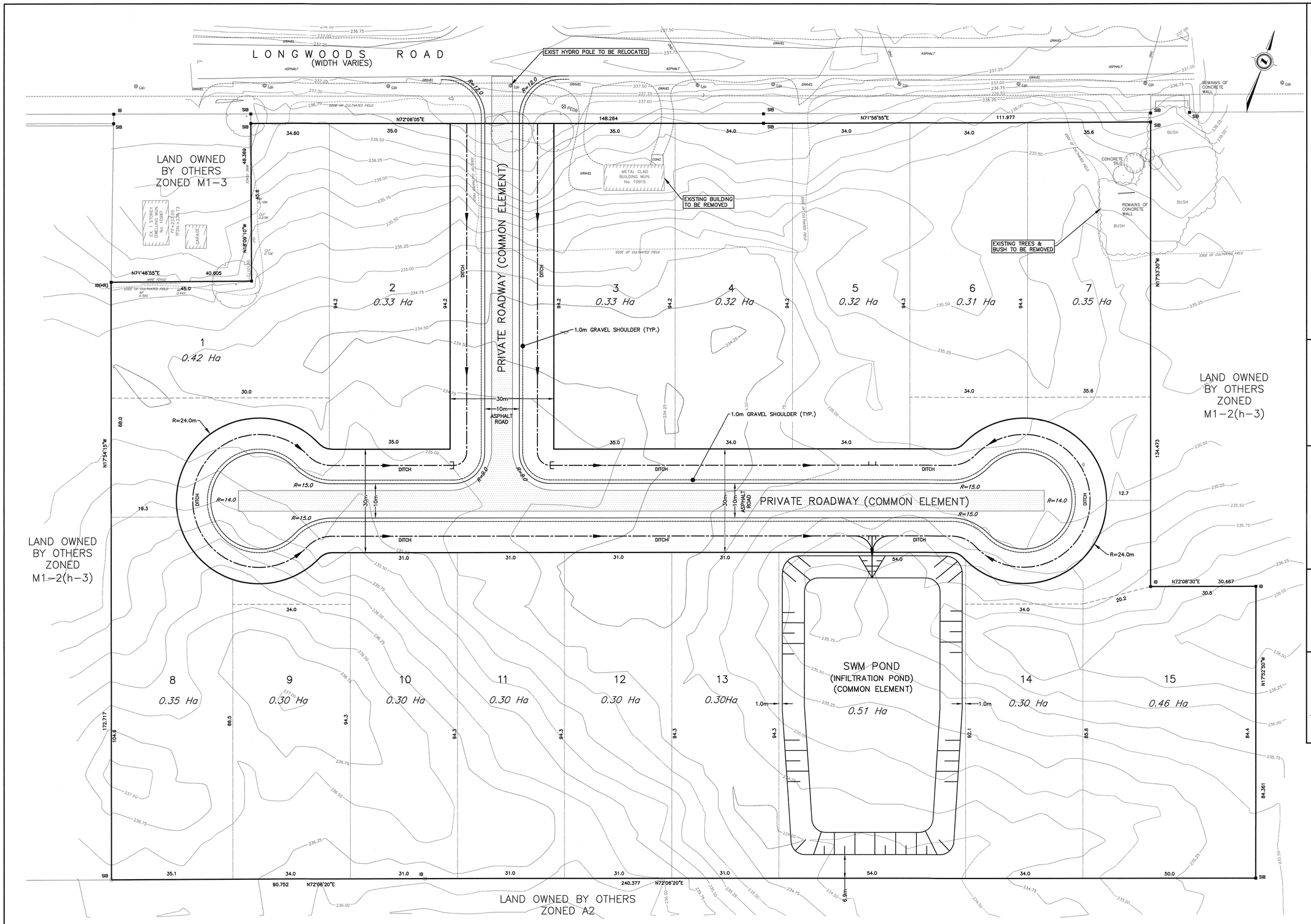
SUBJECT LANDS

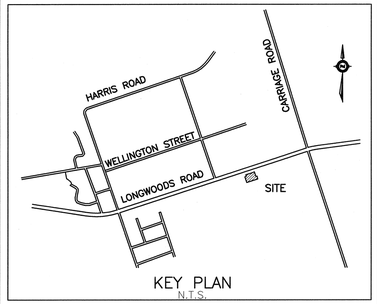
N

1:6,000

0 150 300

Meters





KEY PLAN
N.T.S.

DRAFT PLAN OF VACANT LAND CONDOMINIUM

PART OF

LOT 6, CONCESSION 1

IN THE

MUNICIPALITY OF MIDDLESEX CENTRE

(GEOGRAPHIC TOWNSHIP OF DELAWARE)

COUNTY OF MIDDLESEX

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE THE SUBMISSION OF THIS PLAN IN DRAFT FORM.

July 9 2020

GUY RIOPELLE — DATE
10919 LONGWOODS ROAD INC.
I HAVE AUTHORITY TO BID THE COROPATION

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED, AS SHOWN ON THIS PLAN, AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

July 6/20

P.R. LEVAC — DATE
ONTARIO LAND SURVEYOR

REQUIREMENTS of SECTION 51(17) of the PLANNING ACT

	(E) SEE PLAN	
(A) SEE PLAN	(F) SEE PLAN	(I) SAND, SILT & CLAY
(B) SEE PLAN	(F.1) N/A	(J) SEE PLAN
(C) SEE PLAN	(G) SEE PLAN	(K) MUNICIPAL WATER SERVICE ONLY
(D) SEE PLAN	(H) MUNICIPAL WATER	(L) SEE PLAN

SCHEDULE OF LAND USE (IN Ha)

LIGHT INDUSTRIAL	LOTS 1-15	4.96
ROAD CORRIDOR	COMMON ELEMENT	1.17
SWM POND	COMMON ELEMENT	0.51
TOTAL		6.64 Ha

6.0m WIDE FIRE ROUTE
C\L RADIUS = 12m

FIRE ROUTE SIGNS SHALL BE PLACED ON BOTH SIDES OF ROADWAY WITH 30m SPACINGS

EXISTING ZONING OF LANDS = M1-2(h-3)

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	KAM
DRAWN BY	IRA
CHECKED	KAM
APPROVED	KAM
DATE	JULY/20

No.	REVISIONS	DATE	CONSULTANT

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE - 1 : 500
5m 0 10m

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE
DRAFT PLAN OF VACANT LAND CONDOMINIUM

PROJECT No. 45013-200
SHEET No. 1
PLAN FILE No.

Applicant:	10919 Longwoods Road Inc.	**Date of Decision:**	DRAFT
File No.:	39T-MC-CDM2002	**Date of Notice:**	DRAFT
Municipality:	Municipality of Middlesex Centre	**Last Date of Appeal:**	DRAFT
Subject Lands:	Delaware Con 1 PT Lot 6 RP 33R17432 Par 9	**Lapsing Date:**	DRAFT

The conditions and amendments to final plan of approval for registration of this Condominium as provided by the County of Middlesex are as follows:

No.	Conditions

1) That this approval applies to the draft plan of condominium prepared and signed by P.R. Levac, OLS dated July 6, 2020 which shows:
   - Units 1 to 15 for light industrial development;
   - Private Road; and
   - Storm water Management Pond.

2)
   a) No development of the Plan of Condominium may begin until all external infrastructure and services required for the development of the Plan of Condominium are in place or there is an executed agreement to complete the external infrastructure and services; including municipal water supply, treatment and conveyance infrastructure and sewage treatment and waste water conveyance infrastructure. For the purpose of these conditions, services being "in place" means that the infrastructure exists and is operational to the satisfaction of the Municipality and that capacity in such infrastructure has been formally allocated by the Municipality for use in connection with the development of the Plan of Condominium. External capacity of any services will be formally allocated through the execution of a Development Agreement for each phase of the development as Municipal capacity allows. Should the Municipal Engineer deem there to be insufficient external capacity for any of the required municipal services, the Municipality has no obligation to provide such capacity within the lapse period, or at any time. The Municipality may include language in each Development Agreement regarding the allocation of external capacity.

   b) that, in connection with all financing proposals and commitments and all offers and agreements of purchase and sale made by or to the Owner involving all or any part of the land covered by the Plan of Condominium that has not been registered, there shall be a written acknowledgement given by the other party or parties of item 2.a. above and of receiving a copy of the draft plan conditions which acknowledgement will be produced by the Owner to the Municipality on request.

3) That the Plan of Condominium shall be developed on municipal water services, and on-site private sewage system and private storm water management practices. Prior to final approval of the development, the Municipality shall confirm that municipal and private services are 'in place' as described in Condition No. 2.

4) That the Owner extend a municipal watermain to service the site and ensure potable water is provided to the entire development. The Municipality will pay a portion of the cost to extend the watermain. A clause shall be included in the development agreement identifying the cost sharing proportions of the developer and the Municipality, and the timing of such payment as required.

5) For the purposes of firefighting, the Owner is required to identify an appropriate flow rate through the extended municipal watermain. If the flow rate is not acceptable for fire suppression, the Owner is required to install individual dry hydrant water tanks within the common areas of the condominium as approved by the Fire Chief.

6) That the Owner install gravity sanitary sewers for a future connection to a sanitary system on external lands.

7) That the Owner provide private stormwater quality and quantity control for the entire development to the satisfaction of the Municipality.

PRELIMINARY

8) That the Owner install groundwater elevation monitoring adjacent to the Stormwater Management Pond block to the satisfaction of the Municipality for a period of up to 3 years after 80% of the units are built upon, and that monthly reads are provided to the Municipality.

9) That the street be named and the units shall be addressed to the satisfaction of the Municipality in consultation with the County of Middlesex. This shall include permanent and temporary road names and municipal address signage during all stages of construction which shall and will be required through the subdivision agreement.

10) That prior to final approval, the County is to be advised by the Municipality that appropriate zoning is in effect for the Plan of Condominium.

11) That the Owner and the Municipality enter into a development agreement ("Development Agreement") pursuant to Section 51 (26) of the Planning Act to be registered on title of the lands to which it applies prior to the Plan of Condominium being registered. Further that the Development Agreement shall include provisions that it will also be registered against the lands to which it applies once the plan of condominium has been registered.

12) That the Development Agreement satisfy all requirements of the Municipality related to financial, legal, planning and engineering matters including but not limited to; grading and drainage, planting of trees, landscaping, provision of community mailboxes, fencing, buffering, street lighting and other amenities, the provision and installation of full municipal water and sanitary services for future use (not to be connected until a future outlet is established through the adjacent lands), the installation of underground electrical services, and other matters which may be required by the Municipality respecting the development of the Plan of Condominium, including the payment of Municipal Development Charges in accordance with the Municipality's Development Charge By-Law.

13) If necessary, that the Owner shall enter into an agreement with Canada Post Corporation for the installation of community mailboxes.

14) The Owner shall enter into an agreement with the appropriate service providers for the installation of underground communication / telecommunication utility services for these lands to enable, at a minimum, the effective delivery of the broadband internet services and communication / telecommunication services for 911 Emergency Services.

15) That the Development Agreement shall ensure that the persons who first purchase the subdivided land after the final approval of the plan of condominium are informed, at the time the land is transferred, of all the development charges related to the development, pursuant to Section 59(4) of the Development Charges Act.

16) That such easements as may be required for utility, servicing, or drainage purposes shall be granted to the appropriate authority, at the expense of the Owner.

17) That prior to final approval, arrangements shall be made to the satisfaction of the Municipality for the relocation of any utilities required for the development of the Plan, which relocation shall be undertaken and provided at the expense of the Owner.

18) That prior to final approval the developer provide the following relevant studies to the satisfaction of the Municipality:

    a) Hydrogeological study

    b) Geotechnical study

PRELIMINARY

c) Stormwater management report

d) Servicing report

e) Sewage Impact Assessment demonstrating compliance with MECP Procedure D-5-4 to the full satisfaction of the Municipality.

f) Archaeological study

g) Noise study

h) Development Assessment Report (DAR)

i) Traffic impact study

19) That prior to final approval, a Licensed Archaeologist shall provide a letter to the Municipality and the County indicating that there are no concerns for impacts to archaeological sites on the subject lands. This is to be accompanied by a Ministry of Tourism, Culture and Sport letter indicating that the licensee has met the Terms and Conditions for Archaeological Licensing and that the report has been entered into the Ontario Public Register of Archaeological Reports.

20) That the Owner install fencing along the shared property boundary of 10987 Longwoods Road to the satisfaction of the Municipality.

21) That the Development Agreement for the condominium acknowledge that individual site plan agreements must be entered into with the Municipality for new development proposed on Units 1 through 15, and that the site plan agreements conform to the Development Agreement for the condominium.

22) That a Hold symbol be placed on Units 1 to 15 until a Noise Study and Servicing Report is completed to the satisfaction of the Municipality prior to new development on each Unit.

23) That the developer construct all municipal servicing (storm, sanitary, and water) to municipal standards and construct all private roads in accordance with the municipal site plan design criteria and all of which shall be to the satisfaction of the Municipality.

24) That the Owner convey up to 2% of the land included in this plan to the Municipality for park purposes. Alternatively, the Municipality will require cash-in-lieu of all or a portion of the conveyance.

25) That prior to final approval, the Owner shall submit for the review and approval of the Upper Thames River Conservation Authority, County of Middlesex (County Engineer) and the Municipality a final storm water management plan, and the sediment and erosion control measures incorporated into the plans to enhance the quality of storm water discharges and to control erosion and sedimentation during and after construction. The final sediment and erosion control plan, and final detailed servicing and grading plans shall identify drainage and sediment and erosion control strategies.

26) The Hydrogeological study shall include a Chloride Impact Assessment and will be completed to the satisfaction of the Ministry of the Environment, Conservation and Parks (MECP) and the Municipality, and shall obtain the necessary approvals from the MECP.

27) The Owner will be required to dedicate lands up to 18 metres from the centerline of construction of County Road 2 (Longwoods Road) for road widening purposes to the County of Middlesex.

PRELIMINARY

28) That any open sides of road allowances along County Road 2 (Longwoods Road) created by this draft plan shall be terminated in 0.3 metre reserves to be conveyed to the County of Middlesex.

29) That the Owner construct a right and left turn lane suitable for industrial traffic including large trucks at the entrance to the site to the satisfaction of the County of Middlesex.

30) That the Owner obtain a work or entrance permit prior to construction or any work completed within the County road allowance.

31) That prior to final approval, the County is to be advised in writing by the Municipality of Middlesex Centre how conditions 1 through 26 have been satisfied.

32) That prior to final approval, the County is to be advised in writing by the Upper Thames River Conservation Authority how condition 25 has been satisfied.

33) That prior to final approval, the County is to be advised in writing by the County Engineer, how conditions 25, and 27 through 30 have been satisfied.

NOTES TO DRAFT APPROVAL

1. Draft approval for this plan of condominium is for a period of three (3) years from the date of decision. Any request made by the Owner to the Approval Authority to extend the lapsing date must be made 60 days prior to the lapsing date and include a written confirmation from the municipality endorsing the extension.

2. It is the applicant's responsibility to fulfill the conditions of draft approval and to ensure that the required clearance letters are forwarded by the appropriate agencies to the approval authority, quoting the file number.

3. It is suggested that the applicant be aware of:

   a) subsection 144 (1) of The Land Titles Act, which requires all new plans be registered in a land titles system;

   b) subsection 144 (2) - allows certain exceptions.

4. Inauguration, or extension of a piped water supply, a communal sewage system or a storm water management system, is subject to the approval of the Ministry of Environment under Section 52 and Section 53 of the Ontario Water Resources Act.

5. The Ministry of Environment must be advised immediately should waste materials or other contaminants be discovered during the development of this plan of condominium.

6. A copy of the Development Agreement must be provided to the County of Middlesex (Planning Department) prior to final plan approval.

7. If the agency's condition concerns a condition in the Development Agreement, a copy of the agreement should be sent to them. This will expedite clearance of the final plan.

8. When the zoning by-law amendment required in Condition 5 is being prepared, reference to this condominium application file number should be included in the explanatory note. This will expedite the County of Middlesex and other agencies' consideration of the by-law.

9. Clearance is required from the following agencies:

PRELIMINARY

Municipality of Middlesex Centre | 10227 Ilderton Road, Coldstream N0M 2A0

Upper Thames River Conservation Authority | 1424 Clarke Road, London, N5V 5B9

County Engineer – County of Middlesex | 399 Ridout Street North, London, ON N6A 2P1

10. All measurements in condominium final plans must be presented in metric units.

11. The final plan approved by the County of Middlesex must include the following paragraph on all copies (3 Mylars and 4 paper) for signature purposes:

    "Approval Authority Certificate
    This Final Plan of Condominium is approved by the County of Middlesex under Section 51(58) of the Planning Act, R.S.O. 1990, on this _____ day of _____, 201____ .

    _____
    Director of Planning"

12. The final plan must be submitted digitally in AutoCAD (DWG) and Portable Document Format (PDF) with the appropriate citation from the Planning Act used. The AutoCAD (DWG) file must be consistent with the following standards:

    - Georeferenced to the NAD83 UTM Zone 17N coordinate system.
    - All classes of features must be separated into different layers.
    - Each layer should be given a descriptive name so that the class of feature it contains is recognizable.

13. The final plan approved by the County of Middlesex must be registered within 30 days or the County may withdraw its approval under Subsection 51(59) of the Planning Act.

PRELIMINARY

Meeting Date: **September 22, 2021**

Submitted by: **Marion-Frances Cabral, Planner**

Report No: **PLA-80-2021**

Subject: **Application for Draft Plan of Condominium (39T-MC-CDM2002); Filed by 10919 Longwoods Road Inc.**

Recommendation:

THAT the County of Middlesex be advised that Middlesex Centre recommends draft plan approval for the land known legally as Concession 1 Part Lot 6 RP 33R17432 Part 9, former Township of Delaware, Middlesex Centre, County File: 39T-MC-CDM2002, subject to the draft plan conditions appended to the Middlesex Centre report PLA-80-2021, and subject to a three (3) year lapse period;

AND THAT Council direct staff to prepare a zoning by-law amendment subject to the Planning Act requirements to place a Holding symbol (h-2) on the lands legally described as Concession 1 Part Lot 6 RP 33R17432 Part 9, in which the precondition for the removal of the holding symbol shall be a site plan agreement entered into with the Municipality.

Purpose:

The purpose of this report is to provide Council with a recommendation for a draft plan of condominium proposal for the property known municipally as 10915, 10929 and 11157 Longwoods Road and legally described as Concession 1 Part Lot 6 RP 33R17432 Part 9 in Delaware.

A location map is included as Attachment 1 and proposed plan of condominium as Attachment 2.

Background:

The subject property is located within the Delaware Community Settlement Area is located on the south side of Longwoods Road (County Road 2) east of Martin Road and west of Carriage Road.

The subject property is irregularly shaped and is 6.64 ha (16.4 ac) in area. There is an existing metal shed that will be removed and the remnant of the parcel is actively farmed. Previously, residential uses were present on the property. The subject property is

surrounded by actively farmed land to the east, west and south. Residential uses exist immediately to the west and to the east along Carriage Road, and industrial, commercial and residential uses exist on the north side of Longwoods Road.

The subject property is designated ‘Settlement Employment’ and within “Special Policy Area # 5” within the Delaware Community Settlement Area. The property is zoned ‘Light Industrial exception 2 with Hold (M1-2)(h-3)’.

Preconsultation with staff occurred in December 2019. A formal submission was made by the applicant and the application was deemed completed on September 15, 2020. A Notice of Complete Application was circulated to area residents and agencies.

The plan proposes to create 15 units for light industrial uses and a block for stormwater management. The units are proposed to front onto private roadway and range in size from 0.3 ha (0.74 ac) to 0.46 ha (1.13 ac). Seven (7) units will back onto Longwoods Road on the northern portion of the property, and the remaining 8 units and block will be located on the southern portion of the property. Each unit will be serviced by municipal water as a result of a watermain extension and will contain an individual septic system.

The private roadway will be a common element within the plan of condominium and will be the only access permitted off Longwoods Road. The roadway is proposed to terminate on each end with a permanent turning circle as future road extensions or connections are not proposed or anticipate. A ditch will be located on each side of the roadway and will direct water runoff to the stormwater pond. The block containing the stormwater management pond is 0.51 ha (1.26 ac) in area.

The proposed plan of condominium is included as Attachment 2. The following supporting reports are also appended to this report.

- Final Noise Feasibility Assessment Letter - Attachment 4
- Groundwater Sampling Nitrate Loading Assessment - Attachment 5
- Preliminary Stormwater Management Report - Attachment 6
- Stage 1 and 2 Archaeological Assessment - Attachment 7
- Geotechnical Investigation - Attachment 8
- Infiltration Results - Attachment 9
- Preliminary Erosion Plan - Attachment 10
- Preliminary Grading Plan - Attachment 11
- Preliminary Details - Attachment 12

A Public Meeting was held on November 25, 2020. Staff received comments from area residents which are noted below and appended to this report as Attachment 13 and 14.

Policy Regulation:

The Middlesex County Official Plan identifies Delaware as a settlement area and defers to municipal official plans to delineate the boundaries of the settlement area. The subject property is within the Delaware Community Settlement Area and is designated as 'Settlement Employment' within Middlesex Centre's Official Plan. Additionally, the property is subject to Special Policy Area (SPA) #5. The subject property is zoned 'Light Industrial exception 2 with Hold (M1-2)(h-3)' within the Middlesex Centre's Comprehensive Zoning By-law.

As such, the policies and provisions below are applicable to the subject property.

Provincial Policy Statement, 2020:

The Planning Act states that all decisions made by planning authorities/municipalities "shall be consistent with the policy statements issued" under subsection 3. The Provincial Policy Statement, 2020 (PPS) document is comprised of several policy statements and those that are applicable to the proposed development are noted below:

Generally, the PPS promotes healthy, liveable and safe communities by supporting efficient land use patterns that facilitate economic growth, create liveable communities, and protect the environment and public health and safety.

Section 1.1 – Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns identifies that healthy communities are sustained by accommodating an appropriate range and mix of uses, avoiding development patterns that cause environmental concerns, and promoting cost-effective development patterns that optimize the use of planned and future infrastructure.

Section 1.1.3 – Settlement Areas establishes that settlement areas shall be based on densities and mix of land uses, including employment uses, that efficiently use land, are appropriate for infrastructure and avoid the need for uneconomical expansion, and are freight-supportive.

Section 1.3 – Employment requires municipalities to promote economic development and competitiveness by providing for a mix of employment uses and diversified economic base to meet long-term needs. This includes maintaining a range and choice of suitable sites for employment uses that consider existing and future businesses. Municipalities must also facilitate conditions for economic investment including monitoring the availability and suitability of employment sites including market-ready sites and addressing barriers to investment. Municipalities are to encourage compact, mixed-use development that incorporate compatible employment uses to support liveable resilient communities in consideration of section 1.4 – Housing.

Section 1.3.2 – Employment Areas contain a variety of policies for the protection and preservation of employment areas for current and future uses, and to ensure the necessary infrastructure is provided to supports its need. Section 1.3.2.3 states that within employment areas planned for industrial or manufacturing uses, municipalities shall prohibit residential uses and prohibit or limit other sensitive land uses that are not ancillary to the primary employment uses in order to maintain land use compatibility. Employment areas planned for industrial or manufacturing uses should include an appropriate transition to adjacent non-employment areas. Section 1.3.2.6 requires planning authorities to protect employment areas in proximity to major goods movement facilities and corridors, such as primary transportation routes, for employment uses that require those locations.

Sections 1.6 – Infrastructure and Public Service Facilities directs that infrastructure and be provided in an efficient manner that also prepares for the impacts of a changing climate. Section 1.6.3 directs municipalities to consider optimizing the use of existing infrastructure before consideration is given to developing new infrastructure. Infrastructure should be strategically located to support the effective and efficient delivery of services.

Section 1.6.6 – Sewage, Water and Stormwater directs future growth and development to efficiently use and optimize existing services such as municipal sewage and water services, when available. Municipal sewage and water services are the preferred form of servicing for settlement areas. However, private services can be supported where it is suitable for the long-term provision of such services with no negative impacts.

In settlement areas, individual on-site sewage services may be used for infilling and minor rounding out of existing development. At the time of the official plan review or update, planning authorities should assess the long-term impacts of individual on-site sewage services and water services on the environmental health of the settlement area.

Section 1.6.6.7 promotes planning for stormwater management that minimizes or prevents an increase in negative impacts on the environment and water system; does not increase risks to human health and safety and property damage; and uses best practices, vegetation, and pervious surfaces as part of an effective stormwater management system. Stormwater management best practices shall be promoted including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

Section 1.6.7 – Transportation Systems directs transportation and land use coordination to be considered at all stages of the planning process. Transportation networks should be safe, energy efficient and facilitate the movement of people and goods. Efficient development patterns, and a mix of uses and densities should also be promoted to minimize the number of vehicle trips and support active transportation.

Middlesex County's Official Plan:

The County of Middlesex Official Plan (County Plan) identifies the subject property as within the Delaware 'Settlement Area'.

Section 2.3.4 – Policy Framework-Economic Development identified that economic development is an important component of the County's Growth Management policy framework. Diversifying the economic base is an important factor to foster new opportunities within the County. The County encourages local municipalities to monitor the supply of employment land to ensure there is sufficient supply and particularly in those municipalities with access to provincial highways and major arterials roads.

Section 2.3.8 – Policy Framework-Settlement Areas of the County Plan recognizes that Settlement Areas will be the focus for future growth including commercial and industrial uses. These areas are intended to have a wide range of land uses and full municipal servicing in conjunction with 2.4.5 of the County Plan. Additionally, section 2.3.8.1 – Urban Areas permit new development fully serviced by municipal or communal water and sewage disposal systems.

Where there is substantial vacant land between the built-up area and the Urban Area boundary, the local municipality shall ensure the development proceeds in a logical, phased manner.

Section 2.4.2 – Transportation Network recognizes the importance of roads, highways, and railways within the network. The County Road system provide inter-municipal service moving people and goods throughout the County, and functions as an arterial or collector road. For high-volume arterial roads, access shall be strictly controlled. Agricultural, industrial, commercial and open space land uses are considered to be appropriate land use adjacent to arterial County Roads.

With regard to municipal sanitary sewers and water services, section 2.4.5 – Sanitary Sewers and Water of the County Plan promotes efficient and environmentally responsible development that can be supported by full municipal systems servicing. Where partial municipal services are considered the supporting studies of new development shall address all servicing options. Additionally, municipalities are also encouraged to implement suitable and economically viable methods of reducing urban storm water runoff and to improve its quality.

Section 3.2 – Detailed Land Use Policies-Settlement Areas provides additional development policies for lands within Settlement Areas. The County Plan further supports that Settlement Areas, including Urban Areas, permit a variety of uses including commercial and industrial uses.

Middlesex Centre's Official Plan:

The Middlesex Centre Official Plan (Official Plan) designates the subject property as 'Settlement Employment' within the Delaware Community Settlement Area on Schedule A-4. Additionally, the property is located within Special Policy Area (SPA) #5.

Section 5.5 – Settlement Employment Areas pertains to lands designated 'Settlement Employment Area' within Urban and Community Settlement Areas. The Official Plan encourages the development of industrial and business uses within settlement areas on full municipal services wherever possible. Within Urban and Community Settlement Areas industrial land uses shall have access to public roads of reasonable construction and year-round maintenance. Development is encouraged on hard-surface, dust-free roads. Within Community Settlement Areas, industrial land uses shall be dry in nature.

Industrial uses shall be adequately buffered where adjacent to residential uses or other sensitive land uses. New industrial operations that product significant amounts of noise, dust, odours, particulate emissions, or heavy truck movements shall not be permitted to locate in proximity to existing residential areas or in locations within settlement areas that would negatively affect the quality of life or character of the settlement area. Proposed industrial uses not meeting this policy are encouraged to locate within existing Rural Industrial designations outside of settlement areas where they are not located in proximity to sensitive agricultural uses. Additionally, new development shall be subject to the policies of Section 6.0 – Municipal Design Policies and Section 10.5 – Site Plan Control, and shall have regard for the Municipality's site plan manual and urban design guidelines.

Permitted uses within the Settlement Employment designation include industrial uses (e.g. manufacturing, processing, wholesaling, repair and servicing and storage of goods and materials). Within Community Settlement Areas, where municipal water supply is not provided, such uses must be dry in nature. Other uses include office park and limited retail and personal service uses that are compatible with industrial uses and located within an office building or industrial use.

Section 5.6 – Protection of Employment Lands directs council to support the protection of designated Settlement Employment areas within the municipality including lands that are designated for clusters of business and economic activities including, but not limited to, manufacturing, warehousing, offices and secondary uses.

Section 9.3 – Municipal Infrastructure and Services Policies states that the Delaware Settlement Area has full municipal water, and that municipal sanitary sewer infrastructure is Delaware is possible within the planning period of the Official Plan. Development within settlement areas are to proceed on the basis of full municipal services with partial services potentially permitted on an interim basis where proper justification is provided. Additionally, all lots affected by an application for a plan of subdivision/condominium shall be sized such that there is sufficient space for a building envelope, sewage envelope, sewage system contingency area, and potable water supply if municipal water is not available.

Section 9.4 – Transportation and Utilities Policies supports the efficient movement of people and goods to and from the Municipality, and within the Municipality. This can be supported by limiting direct access to County Roads where access is available by a local road.

Section 10.4 – Plan of Subdivision Policies details policies for draft plans of subdivision and draft plans of condominium applications and are as follows:

a) Plans of subdivision/condominium will not be required where three or fewer new lots are proposed to be created or where circumstances exist where a plan of subdivision is not considered by the Municipality to be necessary. Where more than three new lots are to be created, the Municipality may exercise flexibility in determining whether a plan of subdivision process is required. Notwithstanding the above, in all cases where the creation or extension of municipal streets and/or services is proposed, a plan of subdivision process will be required.

b) When considering plans of subdivision/condominium applications, the review is to consider whether the proposed development is premature. One key consideration of this review relates to the availability of appropriate services and capacity. Other relevant factors may also be considered.

c) The review of plans of subdivision/condominium within the Municipality will be based in part on consideration of design policies included in Section 6.0 of this Plan and the Municipality's Urban Design Guidelines.

d) Where possible, plans of subdivision/condominium within the Municipality will incorporate a mixture of housing types and levels of affordability in keeping with policies included in Residential policies included in Section 5.2 of this Plan.

e) All lots within a proposed plan of subdivision must have frontage on a public road which is or will be opened and maintained on a year round basis, and constructed to an acceptable Municipal standard.

f) Plans of subdivision/condominium that respect natural contours and topography will be encouraged. All unique natural features and assets, as well as heritage features, should be preserved and integrated into the subdivision design.

g) For large plans of subdivision/condominium, consideration of appropriate staging or phasing will be included.

h) It is the policy of this Plan that all new plans of subdivision/condominium be subject to a subdivision agreement between the Municipality and the owner / developer. This agreement shall address various matters pertaining to the plan of subdivision/condominium, as determined by the Municipality.

i) Park land dedication provided to the Municipality in keeping with Section 9.5 of this Plan, must be considered suitable for park land purposes and acceptable to the Municipality. Under no circumstances shall Municipal Council be obligated to accept park land which is being offered by an applicant for a proposed plan of subdivision. Park land dedications shall be reviewed in the context of public realm policies included in Section 6.0 of this Plan.

j) The extent to which the plan's design optimizes the available supply, means of supplying, efficient use and conservation of energy.

k) The interrelationship between the design of the proposed plan of subdivision and site plan control matters relating to any development on the land, if the land is also located within a site plan control area.

l) That highways, including pedestrian pathways, bicycle pathways and public transit rights of way, be dedicated as the approval authority considers necessary.

The subject property is also subject to Special Policy Area (SPA) #5 and subject to the following policy: Notwithstanding the Settlement Employment designation of the subject lands, prior to the consideration of enactment of an implementing zoning by-law amendment, a noise impact assessment is required to be prepared by a qualified consultant and approved by the Municipality which determines the appropriate uses that are to be permitted on the land; and provides recommendations for appropriate mitigation measures to be incorporated into subdivision design and site plan design.

Middlesex Centre Zoning By-law:

The subject property is currently zoned 'Light Industrial exception 2 with Hold (M1-2)(h-3)' within Middlesex Centre's Comprehensive Zoning By-law.

The site-specific zone permits all the uses within the 'Light Industrial (M1)' zone and a *contractor's yard or shop*, *machine shop* and *service shop*. The minimum lot area for the zone is 3, 000 m^2 (0.75 ac) and minimum lot frontage is 0.0 m (0.0 ft).

Further, the precondition for removal of the holding symbol (h-3) shall be that a Noise Impact Analysis be prepared by a qualified professional in association with the site plan approval process for any proposed development on the lands to which the holding symbol applies and that any recommendations for noise mitigation arising from the Noise Impact Analysis have been incorporated into the site plan such that the proposed development will meet the Ministry of Environment (MOE) noise criteria.

Consultation:

Notice of the application has been circulated to agencies, as well as property owners in accordance with the *Planning Act* and Ontario Regulation 544/06.

Public Comments:

At the time of the Public Meeting in November 2020, planning staff received the following comments from an area resident:

- The proposed plan of condominium abuts the neighbouring property to the north and west. In preparation of the public meeting on November 25, 2020 the landowner requested to review supporting materials (e.g. hydrogeological, geotechnical, etc.) that was submitted with the application. Further, the landowner would like to know if noise impact assessments would be conducted on current or future surrounding residential areas, and if so, what measures are being proposed. Lastly, the landowner would like to know what fencing, berms or buffers are required around the site.

Further, at the public meeting an area land owner presented concerns with the development especially where the subject property abut their property and the overall use of the site and compatibility in consideration of future development on their lands. The applicant was open to further discussions with the area land owner in consideration of drainage and future servicing connections that may occur on abutting properties. The area land owner also provided written comments to the Municipality.

A copy of the letters are appended to this report as Attachments 13 and 14.

Agency Comments:

At the time of the Public Meeting in November 2020 the following comments were received. Following the Public Meeting staff worked with the applicant to address the comments and it is reflect in the draft plan conditions and site design.

The Municipality's Chief Building Official has not concerns with the condominium proposal and will provide additional comments at the time of site plan review.

The Municipality's Public Works and Engineering Department has reviewed the applications and provide the following comments:

- The property is assessed into a municipal drain. Further discussion is needed to establish how the assessment will be split.

- Surface water should be contained internally where possible, especially around the existing residential property.

- The applicant should consider the use of storm sewers instead of road side ditches.

- A greater slope within the roadside ditches is preferred. The same applies to the swale located in the rear of lots 8-15. The minimum slope in a swale is 2% per the municipality's infrastructure design standards.

- There appears to be an error in the average ditch depth mentioned in the SWM letter report

- The emergency overflow is not shown on the grading plan, further details should be provided on where the overflow would go on the adjoining property. The pond should be sized for the 100 year, 24 hour storm as a minimum before overflow. Please confirm the impact of the 250 year, 24 hour storm.

- Servicing drawings will need to be provided during the detailed design stage. These drawings should include the watermain extension along Longwoods Road.

- PWE would prefer to see the grade breaks on lots 8-15 shifted so that a minimum side yard slope of 1% can be achieved where possible.

- The 100 year water level in the pond is 235.95 which is higher than the berm at the rear of lots 12-15. The rear yard swales would have some flooding. The flooding limit should be shown in the ditches and the swales.

- With no SWM outlet the pond should have sufficient freeboard (ideally containing the 250 year)

- Based on the findings of the nitrate loading study, using a conventional septic system on all the proposed lots would not meet the 10 mg/L requirement. The Municipality's practice is that lot sizes shall be based on conventional septic system in order to meet nitrate loading requirements. Staff would like to have a further conversation with the applicant's consultant (MTE) on this matter to ensure the lots are sized appropriately. Some modification to the lot sizes may be needed based on the discussions.

- In addition to the already submitted materials, PWE would like to review:

    - Site plan, showing concept for driveways, septic layout, etc.

    - Servicing brief

    - Servicing plans, with plan and profile drawings of the watermain extension along Longwoods Road

    - Detailed grading plans

    - Lighting plan with photometrics

    - Landscape plan

The County's Safety and Standards Officer requests that one (1) municipal street 911 address off Longwoods Road is proposed, and the units are issued individual numbers. When the units are developed ensure the unit numbers are posted on the face of the

building and in a consistent location (e.g. above the main entrance door) of each unit so emergency responders can easily identify the units.

The Lower Thames Valley Conservation Authority (LTVCA) has not provided comments at the time of writing this report.

Canada Post reviewed the proposal and advised the applicant to consult with Canada Post to determine a suitable permanent location for a community mailbox and that the applicant agrees to provide a walkway, curb and base pad for the community mailbox. Canada Post requests to be notified of any changes or approval to the plan of condominium.

Analysis:

The plan of condominium is generally supported by the PPS, 2020 and County Official Plan. To consider the appropriateness of the proposed plan of condominium it must conform to the policies of the Middlesex Centre Official Plan.

a) **Plans of subdivision/condominium will not be required where three or fewer new lots are proposed to be created or where circumstances exist where a plan of subdivision is not considered by the Municipality to be necessary. Where more than three new lots are to be created, the Municipality may exercise flexibility in determining whether a plan of subdivision process is required. Notwithstanding the above, in all cases where the creation or extension of municipal streets and/or services is proposed, a plan of subdivision process will be required.**

   A total of 15 units or lots within the plan of condominium will be created for future industrial and employment uses, 1 block for a stormwater management pond and a private road to access all units. The proposed plan of condominium will have access to Longwoods Road and proposes to extend municipal water services.

b) **When considering plans of subdivision/condominium applications, the review is to consider whether the proposed development is premature. One key consideration of this review relates to the availability of appropriate services and capacity. Other relevant factors may also be considered.**

   The Delaware settlement area does not contain municipal sanitary services and it is acknowledged that each unit will be serviced with individual private sanitary systems. Staff recommend that a Hold be placed on the property to require a site plan agreement to be entered into with the Municipality to ensure servicing and other detailed site plan matters are addressed. At the time of site plan approval for the development of each unit, the Municipality will review the servicing capacity to the satisfaction of the Municipality.

Further, the Municipality has requested a special Condition (#6) which will provide an opportunity to connect to a sanitary system should it become available in the future.

c) **The review of plans of subdivision/condominium within the Municipality will be based in part on consideration of design policies included in Section 6.0 of this Plan and the Municipality's Urban Design Guidelines.**

The plan of condominium will be designed to meet municipal standards including the private roads, curbing and intersection at Longwoods Road.

At the time of site plan approval for each unit the proponent will need to consider Section 7 of the Municipality's Urban Design Guidelines as it relates to building massing, fenestration, façade design and pedestrian and vehicular safety within the proposed development.

d) **Where possible, plans of subdivision/condominium within the Municipality will incorporate a mixture of housing types and levels of affordability in keeping with policies included in Residential policies included in Section 5.2 of this Plan.**

Housing is not proposed for this development.

e) **All lots within a proposed plan of subdivision must have frontage on a public road which is or will be opened and maintained on a year round basis, and constructed to an acceptable Municipal standard.**

The units will have frontage onto a private road constructed to the satisfaction of the Municipality, and the development will have a single access onto Longwoods Road constructed to the satisfaction of the County.

f) **Plans of subdivision/condominium that respect natural contours and topography will be encouraged. All unique natural features and assets, as well as heritage features, should be preserved and integrated into the subdivision design.**

The subject property is relatively level and does not contain any natural heritage features or regulated areas.

g) **For large plans of subdivision/condominium, consideration of appropriate staging or phasing will be included.**

The plan of subdivision will occur in a single phase. However, each unit may be developed at different times in the future depending on update and demand for industrial and employment lands.

h) **It is the policy of this Plan that all new plans of subdivision/condominium be subject to a subdivision agreement between the Municipality and the**

owner / developer. This agreement shall address various matters pertaining to the plan of subdivision/condominium, as determined by the Municipality.

The application will be required to enter into a Development Agreement with the Municipality prior to final plan approval of the development. The Development Agreement will need to address all draft plan conditions seen in Attachment 3.

i) **Park land dedication provided to the Municipality in keeping with Section 9.5 of this Plan, must be considered suitable for park land purposes and acceptable to the Municipality. Under no circumstances shall Municipal Council be obligated to accept park land which is being offered by an applicant for a proposed plan of subdivision. Park land dedications shall be reviewed in the context of public realm policies included in Section 6.0 of this Plan.**

Parkland dedication, at the rate of 2% of the total lands, is not considered on-site as part of this development. In conformity with the Middlesex Centre Official Plan and Planning Act, the applicant will be required to provide cash-in-lieu of parkland dedication and it will be requested through the Development Agreement.

j) **The extent to which the plan's design optimizes the available supply, means of supplying, efficient use and conservation of energy.**

The proposed plan of condominium optimizes existing infrastructure and available lands within the Delaware settlement areas, and maintains the industrial and employment corridor along Longwoods Road.

k) **The interrelationship between the design of the proposed plan of subdivision and site plan control matters relating to any development on the land, if the land is also located within a site plan control area.**

Staff recommend that each unit be required to enter into a site plan agreement with the Municipality prior to development occurring on the site in conformity with the Site Plan Control By-law.

l) **That highways, including pedestrian pathways, bicycle pathways and public transit rights of way, be dedicated as the approval authority considers necessary.**

The subject property fronts onto Longwoods Road (County Road 2). The County of Middlesex will consider the appropriate dedication of land to maintain and enhance the County right-of-way to ensure the safe and efficient movement of traffic and pedestrians.

No trails, pedestrian or bicycle pathways, and public transit rights-of-way are considered within the proposed development.

Staff reviewed the proposed plan of condominium with the existing 'Light Industrial exception 2 (M1-2)' zoning for the property. The proposed plan conforms to the zoning by-law and applies a Holding Symbol (h-3) for the requirement of a Noise Impact Assessment in conformity with Special Policy Area #5 of the Official Plan. To ensure the appropriate and consistent development of each unit, staff recommend that an additional Holding Symbol (h-2) be placed on the subject property to require a site plan agreement prior to any development.

The proposed development will contain a private stormwater management system basin which will provide a stormwater outlet connected to ditches located within the private road corridor that captures runoff from each unit. The Ministry of the Environment, Conservation and Parks (MECP) has also requested further study of chloride levels within the groundwater which can have multiple sources including storm runoff. A special draft plan condition (# 26) is included to address chloride levels as part of the hydrogeological study and overall stormwater management plan.

The proposed private road will terminate as a turning circle on each end and will be required to be constructed to a permanent standard. The Municipality does not contemplate an extension or connection to other lands for future development.

Condition # 4 was added to address the extension of the municipal watermain to service the subject property. Details of the cost-sharing agreement, including proportions and timing of payment, will be identified within the Development Agreement.

Further, Condition # 5 is to ensure there is sufficient water flow through the extended watermain for fire fighting purposes. Should the flor rate not be acceptable, the owner is required to install individual dry hydrant water tanks as approved by the Fire Chief.

A special condition (# 20) is added to provide fencing along the shared property line between the subject property and 10987 Longwoods Road immediately to the west. Fencing around individual units will be considered during site plan approval.

The subject property is wholly located within the jurisdiction of the Lower Thames Valley Conservation Authority (LTVCA). However, it is within proximity to the Upper Thames River watershed. As a standard condition of draft plan approval, the County requests that a conservation authority reviews the stormwater management plan prior to final plan approval. The LTVCA acknowledged that the Upper Thames River Conservation Authority will be responsible for the review of the stormwater management plan and it is reflected in condition # 25. Further, due to the subject property's frontage along Longwoods Road the County Engineer will also review the stormwater management plan to their satisfaction.

The County Engineer has requested special conditions including the dedication of a 0.3 metre reserve along Longwoods Road (#28), the construction of a right and left turn lane

suitable for industrial traffics on Longwoods Road (# 29), and the requirement of a work or entrance permit for any work/construction within the County road allowance (# 30).

Given the above and review by the public, agencies and council, planning staff is satisfied that the subject application is consistent with the PPS, 2020, and in conformity with both the County of Middlesex and Middlesex Centre Official Plans and comprehensive zoning by-law. As such, it is appropriate that Middlesex Centre recommend draft plan approval subject to the attached draft plan conditions. Further, staff recommend that Council direct staff to prepare a zoning by-law amendment to place a Holding symbol (h-2) on the subject property.

This opinion is provided as a result of the public meeting and with the benefit of receiving comments from agencies or members of the public. Should new information arise regarding this proposal prior to or at the meeting, Council is advised to take such information into account when considering the application.

Financial Implications:

None.

Strategic Plan:

This matter aligns with following strategic priorities:

- Vibrant Local Economy

Attachments:

Attachment 1 – Location Map

Attachment 2 – Proposed Plan of Condominium

Attachment 3 – Preliminary Draft Plan Conditions

Attachment 4 – Final Noise Feasibility Assessment Letter

Attachment 5 – Groundwater Sampling Nitrate Loading Assessment

Attachment 6 – Preliminary Stormwater Management Report

Attachment 7 – Stage 1 and 2 Archaeological Assessment

Attachment 8 – Geotechnical Investigation

Attachment 9 – Infiltration Results

Attachment 10 – Preliminary Erosion Plan

Attachment 11 – Preliminary Grading Plan

Attachment 12 – Preliminary Details

Attachment 13 – Letter from area resident 1

Attachment 14 – Letter from area resident 2

LOCATION MAP

Description:
PROPOSED PLAN OF CONDOMINIUM
MUNICIPALITY OF MIDDLESEX CENTRE

File Number:
39T-MC-CDM2002

Prepared by: Planning Department
The County of Middlesex, July 28, 2020.

LEGEND

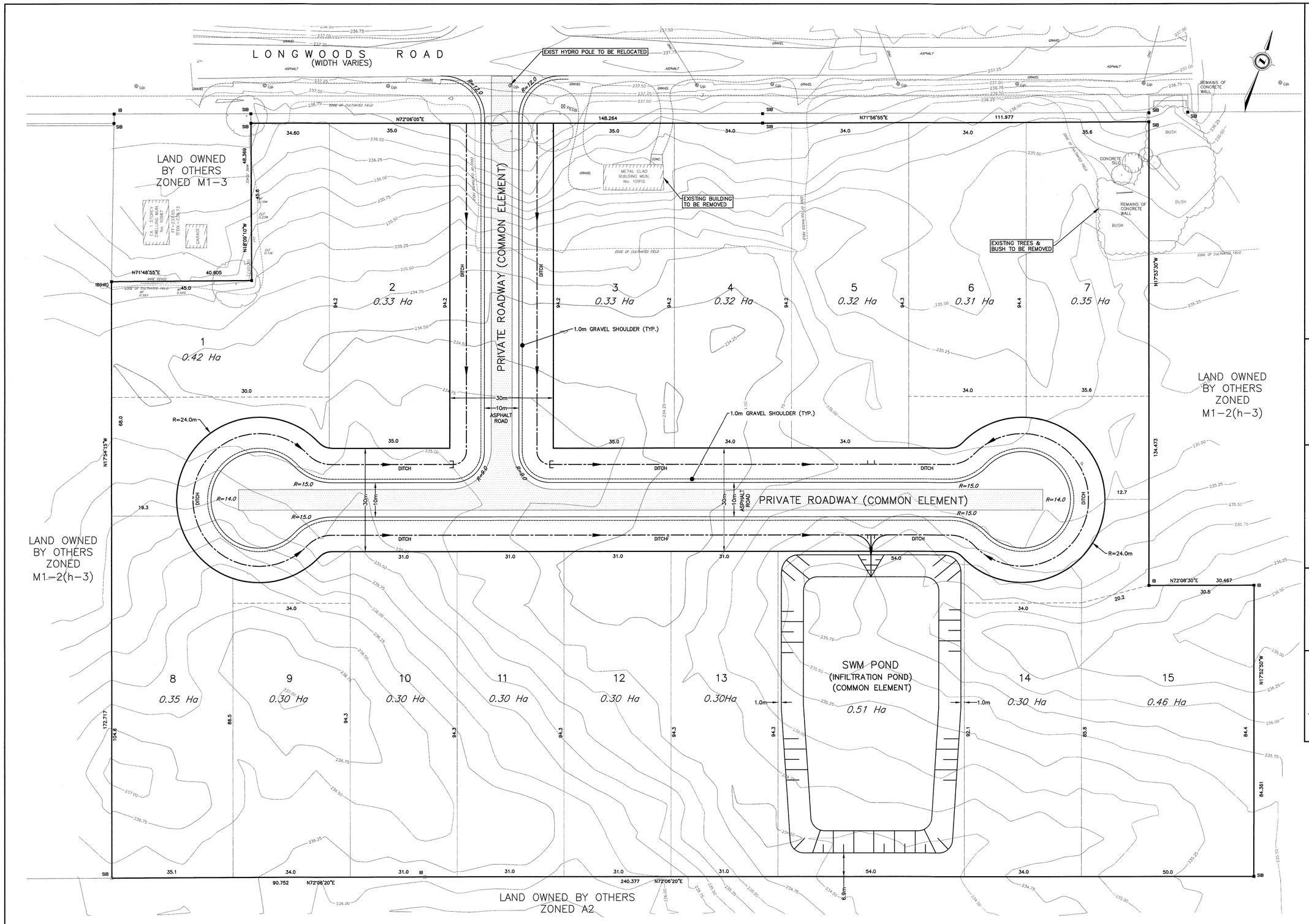
SUBJECT LANDS

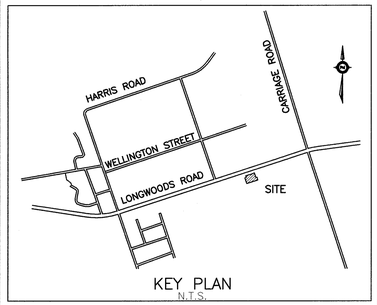
N

1:6,000

0 150 300

Meters





KEY PLAN
N.T.S.

DRAFT PLAN OF VACANT LAND CONDOMINIUM

PART OF

LOT 6, CONCESSION 1

IN THE

MUNICIPALITY OF MIDDLESEX CENTRE

(GEOGRAPHIC TOWNSHIP OF DELAWARE)

COUNTY OF MIDDLESEX

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE THE SUBMISSION OF THIS PLAN IN DRAFT FORM.

July 9 2020
DATE

GUY RIOPELLE
10919 LONGWOODS ROAD INC.
I HAVE AUTHORITY TO BID THE COROPATION

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED, AS SHOWN ON THIS PLAN, AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

July 6/20
DATE

P.R. LEVAC
ONTARIO LAND SURVEYOR

REQUIREMENTS of SECTION 51(17) of the PLANNING ACT

	(E) SEE PLAN	
(A) SEE PLAN	(F) SEE PLAN	(I) SAND, SILT & CLAY
(B) SEE PLAN	(F.1) N/A	(J) SEE PLAN
(C) SEE PLAN	(G) SEE PLAN	(K) MUNICIPAL WATER SERVICE ONLY
(D) SEE PLAN	(H) MUNICIPAL WATER	(L) SEE PLAN

SCHEDULE OF LAND USE (IN Ha)

LIGHT INDUSTRIAL	LOTS 1-15	4.96
ROAD CORRIDOR	COMMON ELEMENT	1.17
SWM POND	COMMON ELEMENT	0.51
TOTAL		6.64 Ha

6.0m WIDE FIRE ROUTE
C\L RADIUS = 12m

FIRE ROUTE SIGNS SHALL BE PLACED ON BOTH SIDES OF ROADWAY WITH 30m SPACINGS

EXISTING ZONING OF LANDS = M1-2(h-3)

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	KAM
DRAWN BY	IRA
CHECKED	KAM
APPROVED	KAM
DATE	JULY/20

No.	REVISIONS	DATE	CONSULTANT

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE - 1 : 500
5m 0 10m

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE
DRAFT PLAN OF
VACANT LAND CONDOMINIUM

PROJECT No. 45013-200
SHEET No. 1
PLAN FILE No.

Applicant:	10919 Longwoods Road Inc.	**Date of Decision:**	DRAFT
File No.:	39T-MC-CDM2002	**Date of Notice:**	DRAFT
Municipality:	Municipality of Middlesex Centre	**Last Date of Appeal:**	DRAFT
Subject Lands:	Delaware Con 1 PT Lot 6 RP 33R17432 Par 9	**Lapsing Date:**	DRAFT

The conditions and amendments to final plan of approval for registration of this Condominium as provided by the County of Middlesex are as follows:

No.	Conditions

1) That this approval applies to the draft plan of condominium prepared and signed by P.R. Levac, OLS dated July 6, 2020 which shows:
   - Units 1 to 15 for light industrial development;
   - Private Road; and
   - Storm water Management Pond.

2)
   a) No development of the Plan of Condominium may begin until all external infrastructure and services required for the development of the Plan of Condominium are in place or there is an executed agreement to complete the external infrastructure and services; including municipal water supply, treatment and conveyance infrastructure and sewage treatment and waste water conveyance infrastructure. For the purpose of these conditions, services being "in place" means that the infrastructure exists and is operational to the satisfaction of the Municipality and that capacity in such infrastructure has been formally allocated by the Municipality for use in connection with the development of the Plan of Condominium. External capacity of any services will be formally allocated through the execution of a Development Agreement for each phase of the development as Municipal capacity allows. Should the Municipal Engineer deem there to be insufficient external capacity for any of the required municipal services, the Municipality has no obligation to provide such capacity within the lapse period, or at any time. The Municipality may include language in each Development Agreement regarding the allocation of external capacity.

   b) that, in connection with all financing proposals and commitments and all offers and agreements of purchase and sale made by or to the Owner involving all or any part of the land covered by the Plan of Condominium that has not been registered, there shall be a written acknowledgement given by the other party or parties of item 2.a. above and of receiving a copy of the draft plan conditions which acknowledgement will be produced by the Owner to the Municipality on request.

3) That the Plan of Condominium shall be developed on municipal water services, and on-site private sewage system and private storm water management practices. Prior to final approval of the development, the Municipality shall confirm that municipal and private services are 'in place' as described in Condition No. 2.

4) That the Owner extend a municipal watermain to service the site and ensure potable water is provided to the entire development. The Municipality will pay a portion of the cost to extend the watermain. A clause shall be included in the development agreement identifying the cost sharing proportions of the developer and the Municipality, and the timing of such payment as required.

5) For the purposes of firefighting, the Owner is required to identify an appropriate flow rate through the extended municipal watermain. If the flow rate is not acceptable for fire suppression, the Owner is required to install individual dry hydrant water tanks within the common areas of the condominium as approved by the Fire Chief.

6) That the Owner install gravity sanitary sewers for a future connection to a sanitary system on external lands.

7) That the Owner provide private stormwater quality and quantity control for the entire development to the satisfaction of the Municipality.

PRELIMINARY

8) That the Owner install groundwater elevation monitoring adjacent to the Stormwater Management Pond block to the satisfaction of the Municipality for a period of up to 3 years after 80% of the units are built upon, and that monthly reads are provided to the Municipality.

9) That the street be named and the units shall be addressed to the satisfaction of the Municipality in consultation with the County of Middlesex. This shall include permanent and temporary road names and municipal address signage during all stages of construction which shall and will be required through the subdivision agreement.

10) That prior to final approval, the County is to be advised by the Municipality that appropriate zoning is in effect for the Plan of Condominium.

11) That the Owner and the Municipality enter into a development agreement ("Development Agreement") pursuant to Section 51 (26) of the Planning Act to be registered on title of the lands to which it applies prior to the Plan of Condominium being registered. Further that the Development Agreement shall include provisions that it will also be registered against the lands to which it applies once the plan of condominium has been registered.

12) That the Development Agreement satisfy all requirements of the Municipality related to financial, legal, planning and engineering matters including but not limited to; grading and drainage, planting of trees, landscaping, provision of community mailboxes, fencing, buffering, street lighting and other amenities, the provision and installation of full municipal water and sanitary services for future use (not to be connected until a future outlet is established through the adjacent lands), the installation of underground electrical services, and other matters which may be required by the Municipality respecting the development of the Plan of Condominium, including the payment of Municipal Development Charges in accordance with the Municipality's Development Charge By-Law.

13) If necessary, that the Owner shall enter into an agreement with Canada Post Corporation for the installation of community mailboxes.

14) The Owner shall enter into an agreement with the appropriate service providers for the installation of underground communication / telecommunication utility services for these lands to enable, at a minimum, the effective delivery of the broadband internet services and communication / telecommunication services for 911 Emergency Services.

15) That the Development Agreement shall ensure that the persons who first purchase the subdivided land after the final approval of the plan of condominium are informed, at the time the land is transferred, of all the development charges related to the development, pursuant to Section 59(4) of the Development Charges Act.

16) That such easements as may be required for utility, servicing, or drainage purposes shall be granted to the appropriate authority, at the expense of the Owner.

17) That prior to final approval, arrangements shall be made to the satisfaction of the Municipality for the relocation of any utilities required for the development of the Plan, which relocation shall be undertaken and provided at the expense of the Owner.

18) That prior to final approval the developer provide the following relevant studies to the satisfaction of the Municipality:

    a) Hydrogeological study

    b) Geotechnical study

PRELIMINARY

c) Stormwater management report

d) Servicing report

e) Sewage Impact Assessment demonstrating compliance with MECP Procedure D-5-4 to the full satisfaction of the Municipality.

f) Archaeological study

g) Noise study

h) Development Assessment Report (DAR)

i) Traffic impact study

19) That prior to final approval, a Licensed Archaeologist shall provide a letter to the Municipality and the County indicating that there are no concerns for impacts to archaeological sites on the subject lands. This is to be accompanied by a Ministry of Tourism, Culture and Sport letter indicating that the licensee has met the Terms and Conditions for Archaeological Licensing and that the report has been entered into the Ontario Public Register of Archaeological Reports.

20) That the Owner install fencing along the shared property boundary of 10987 Longwoods Road to the satisfaction of the Municipality.

21) That the Development Agreement for the condominium acknowledge that individual site plan agreements must be entered into with the Municipality for new development proposed on Units 1 through 15, and that the site plan agreements conform to the Development Agreement for the condominium.

22) That a Hold symbol be placed on Units 1 to 15 until a Noise Study and Servicing Report is completed to the satisfaction of the Municipality prior to new development on each Unit.

23) That the developer construct all municipal servicing (storm, sanitary, and water) to municipal standards and construct all private roads in accordance with the municipal site plan design criteria and all of which shall be to the satisfaction of the Municipality.

24) That the Owner convey up to 2% of the land included in this plan to the Municipality for park purposes. Alternatively, the Municipality will require cash-in-lieu of all or a portion of the conveyance.

25) That prior to final approval, the Owner shall submit for the review and approval of the Upper Thames River Conservation Authority, County of Middlesex (County Engineer) and the Municipality a final storm water management plan, and the sediment and erosion control measures incorporated into the plans to enhance the quality of storm water discharges and to control erosion and sedimentation during and after construction. The final sediment and erosion control plan, and final detailed servicing and grading plans shall identify drainage and sediment and erosion control strategies.

26) The Hydrogeological study shall include a Chloride Impact Assessment and will be completed to the satisfaction of the Ministry of the Environment, Conservation and Parks (MECP) and the Municipality, and shall obtain the necessary approvals from the MECP.

27) The Owner will be required to dedicate lands up to 18 metres from the centerline of construction of County Road 2 (Longwoods Road) for road widening purposes to the County of Middlesex.

PRELIMINARY

28) That any open sides of road allowances along County Road 2 (Longwoods Road) created by this draft plan shall be terminated in 0.3 metre reserves to be conveyed to the County of Middlesex.

29) That the Owner construct a right and left turn lane suitable for industrial traffic including large trucks at the entrance to the site to the satisfaction of the County of Middlesex.

30) That the Owner obtain a work or entrance permit prior to construction or any work completed within the County road allowance.

31) That prior to final approval, the County is to be advised in writing by the Municipality of Middlesex Centre how conditions 1 through 26 have been satisfied.

32) That prior to final approval, the County is to be advised in writing by the Upper Thames River Conservation Authority how condition 25 has been satisfied.

33) That prior to final approval, the County is to be advised in writing by the County Engineer, how conditions 25, and 27 through 30 have been satisfied.

NOTES TO DRAFT APPROVAL

1. Draft approval for this plan of condominium is for a period of three (3) years from the date of decision. Any request made by the Owner to the Approval Authority to extend the lapsing date must be made 60 days prior to the lapsing date and include a written confirmation from the municipality endorsing the extension.

2. It is the applicant's responsibility to fulfill the conditions of draft approval and to ensure that the required clearance letters are forwarded by the appropriate agencies to the approval authority, quoting the file number.

3. It is suggested that the applicant be aware of:

   a) subsection 144 (1) of The Land Titles Act, which requires all new plans be registered in a land titles system;

   b) subsection 144 (2) - allows certain exceptions.

4. Inauguration, or extension of a piped water supply, a communal sewage system or a storm water management system, is subject to the approval of the Ministry of Environment under Section 52 and Section 53 of the Ontario Water Resources Act.

5. The Ministry of Environment must be advised immediately should waste materials or other contaminants be discovered during the development of this plan of condominium.

6. A copy of the Development Agreement must be provided to the County of Middlesex (Planning Department) prior to final plan approval.

7. If the agency's condition concerns a condition in the Development Agreement, a copy of the agreement should be sent to them. This will expedite clearance of the final plan.

8. When the zoning by-law amendment required in Condition 5 is being prepared, reference to this condominium application file number should be included in the explanatory note. This will expedite the County of Middlesex and other agencies' consideration of the by-law.

9. Clearance is required from the following agencies:

PRELIMINARY

Municipality of Middlesex Centre | 10227 Ilderton Road, Coldstream N0M 2A0

Upper Thames River Conservation Authority | 1424 Clarke Road, London, N5V 5B9

County Engineer – County of Middlesex | 399 Ridout Street North, London, ON N6A 2P1

10. All measurements in condominium final plans must be presented in metric units.

11. The final plan approved by the County of Middlesex must include the following paragraph on all copies (3 Mylars and 4 paper) for signature purposes:

    "Approval Authority Certificate
    This Final Plan of Condominium is approved by the County of Middlesex under Section 51(58) of the Planning Act, R.S.O. 1990, on this _____ day of _____, 201____ .

    _____
    Director of Planning"

12. The final plan must be submitted digitally in AutoCAD (DWG) and Portable Document Format (PDF) with the appropriate citation from the Planning Act used. The AutoCAD (DWG) file must be consistent with the following standards:

    - Georeferenced to the NAD83 UTM Zone 17N coordinate system.
    - All classes of features must be separated into different layers.
    - Each layer should be given a descriptive name so that the class of feature it contains is recognizable.

13. The final plan approved by the County of Middlesex must be registered within 30 days or the County may withdraw its approval under Subsection 51(59) of the Planning Act.

PRELIMINARY

600 Southgate Drive
Guelph ON Canada
N1G 4P6

Tel: +1.519.823.1311
Fax: +1.519.823.1316
E-mail: solutions@rwdi.com

February 28, 2020

Steve Saker, Development Consultant
Saker Realty
782 Richmond Street
London, ON N6A 3H5
Steve@sakerrealty.com

Re: Noise Feasibility Study
10915 Longwoods Road, Delaware, Ontario
RWDI Reference No. 2002177

Dear Mr. Saker,

Saker Realty retained RWDI to conduct a noise feasibility study in support of an application to sever the existing lot at 10915 Longwoods Road into eighteen separate lots. It is RWDI's understanding that the proposed uses of the lots include, but are not limited to, contractor's storage area and shops (i.e., plumbers, electricians, cabinet makers, etc.) and retail offices. The intent of the noise feasibility study is to identify where potential incompatible land uses could arise and conceptual recommendations to prevent incompatible land uses.

Figure 1: Site Location

The Site plan drawing dated February 2019 (see Appendix A) was reviewed and serves as the basis for this assessment.

Assessment Criteria

Sound levels from sources at the proposed development were assessed cumulatively at the nearest noise sensitive receptors. The allowable sound level limits at the noise sensitive receptors are established in the Ministry of Environment Conservation Parks (MECP) Publication NPC-300.

BEST MANAGED COMPANIES Platinum member

This document is intended for the sole use of the party to whom it is addressed and may contain information that is privileged and/or confidential. If you have received this in error, please notify us immediately. Accessible document formats provided upon request. ® RWDI name and logo are registered trademarks in Canada and the United States of America.

Noise sensitive receptors include properties that accommodate a dwelling, sensitive commercial buildings, or sensitive institutional buildings. Vacant lots may be considered sensitive if zoned to allow a sensitive use and accessible. There were no accessible vacant lots identified in proximity to the development. Ten residential dwellings identified through aerial photography surround the proposed development to the west, north and east. No noise sensitive receptors were identified to the south of the proposed development.

Impact Assessment

Modelling of proposed development was carried out using the Cadna/A software package, a commercially available implementation of the ISO 9613 noise propagation algorithms. Sound power level data for noise generating equipment associated with the proposed land uses were obtained from measurements of similar equipment on file at RWDI. The expected noise sources associated with the proposed land uses are as follows:

Offices

- General building HVAC

Plumbing or Electrician

- General building HVAC
- Exhaust fans

Cabinetry Makers or Warehouse

- General building HVAC
- Exhaust fans
- Forklift activity
- Dust collectors

Modelling also assessed five transport trucks arriving and departing the development during a worst-case hour in the daytime (07:00-19:00) and two trucks during the evening (19:00-23:00) and night (23:00-07:00). On-site passenger vehicle activity is generally considered to have negligible noise impacts and was not included in the assessment.

Recommendations

Based on the modelling completed, some restrictions will apply to the type of operations and equipment present on some of the lots. These restrictions are presented in Figure 2. Lots for cabinetry maker or warehouses are restricted to the lots coloured in red. Lots for plumbing or electrician are

restricted to the lots coloured in green and red. Lots for offices can be placed in all locations, but only offices can be places in lots 1 and 2.

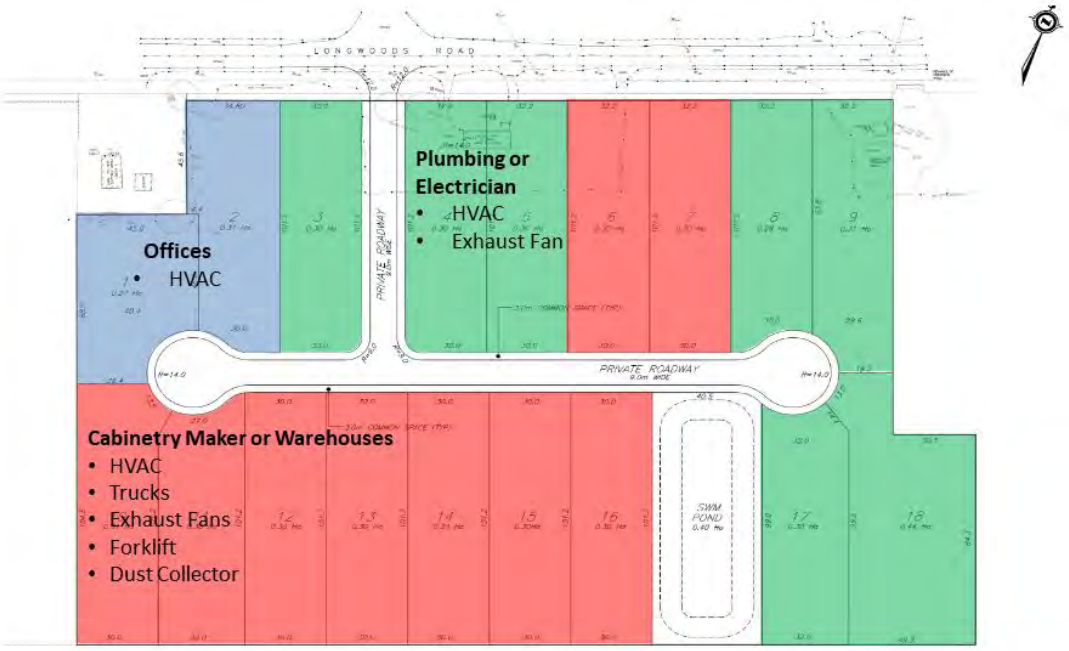


Figure 2: Noise Feasible Configuration

The recommendations listed below are in addition to the restricted uses shown in Figure 2 and will serve as design parameters and should be implemented as detailed design progresses.

1. Noise from forklift activity and the dust collectors should be limited to the southern portions of each lot and behind on-site buildings (where present) to provide adequate screening for northern residential dwellings.
2. Dust collectors, exhausts fans and forklifts are restricted to operate during the daytime period only (07:00 – 19:00).
3. HVAC units for lots 1 and 2 with proposed office uses located on the north western corner of the development are required to meet a maximum allowable sound power level of 82 dBA.
4. Dust collectors are required to meet a maximum allowable sound power level of 103 dBA.

Based on the results of this assessment, the proposed development is considered to be feasible provided that the recommendations outlined are implemented. Detailed assessments for each individual lot should be conducted to ensure that individual impacts do not exceed MECP sound level limits.

Conclusions

RWDI completed a noise feasibility assessment for the severing of 10915 Longwoods Road into eighteen separate lots. Based on the proposed future land uses for the eighteen new lots, a noise feasible configuration was determined and is shown in Figure 2. In addition to this configuration, a number of recommendations are provided. If the configuration and recommendations are implemented, the proposed development is considered feasible.

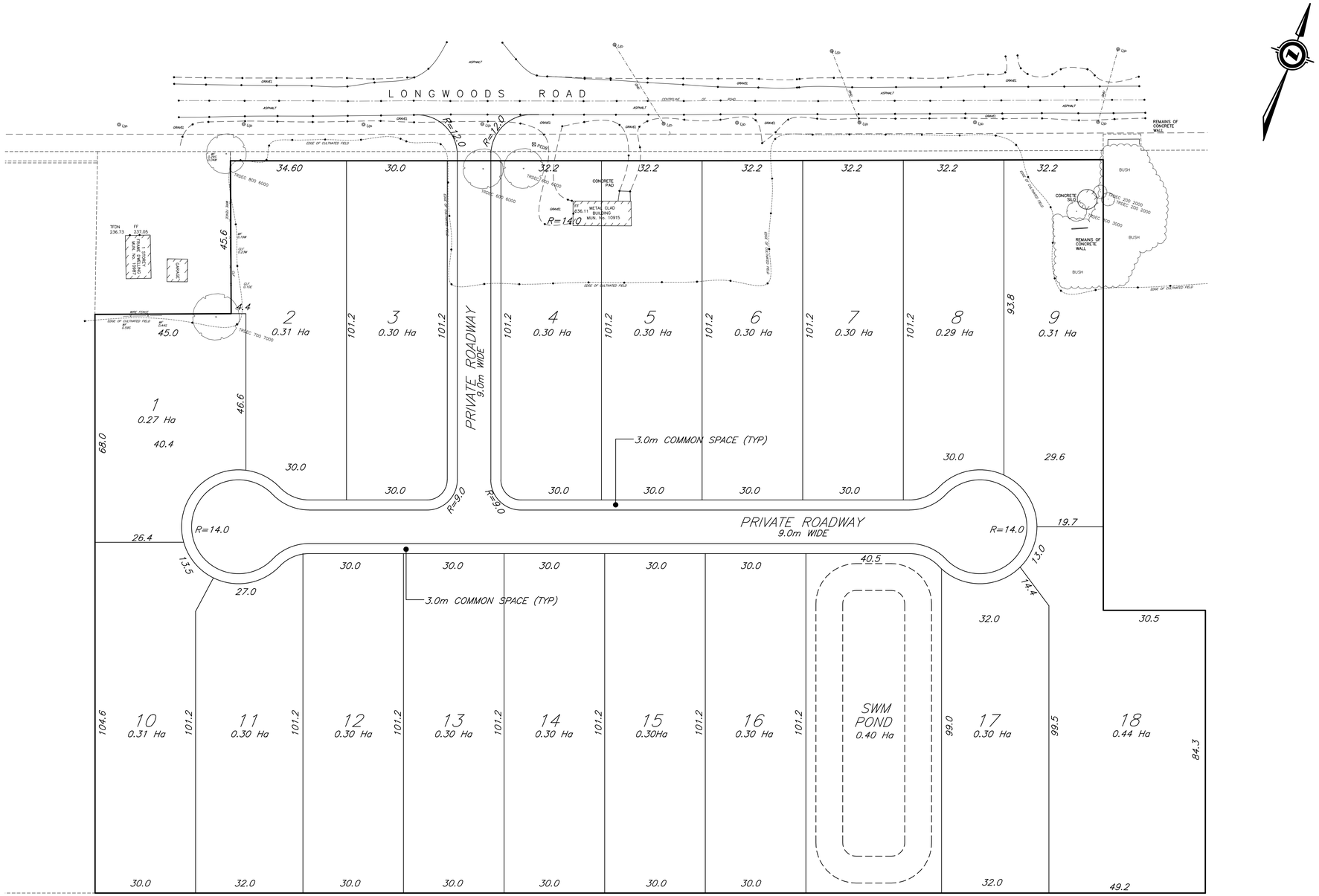
Yours truly,

RWDI

Claire Finoro, P.Eng., B.Sc.
Project Manager

CIF/kta

APPENDIX A



EXISTING SERVICES	DRAWING #, SOURCE	DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS		No.	REVISIONS	DATE	CONSULTANT
					DESIGN	KAM				
					DRAWN BY	KAM				
					CHECKED	KAM				
					APPROVED	KAM				
					DATE	FEB/19				

CONSULTANT OR DIVISION

MTE
Engineers | Scientists | Surveyors

ENGINEER'S STAMP

SCALE

HORIZONTAL SCALE – 1 : 1250
12.5m 0 25m

LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

PRELIMINARY SITE PLAN

PROJECT No. 44559–100

SHEET No. 1

PLAN FILE No.

MTE Consultants
123 St. George St., London, ON N6A 3A1

December 3, 2019

MTE File No.: 45013-300

Mr. Guy Riopeele
10919 Longwoods Road Inc.
10919 Longwoods Road
Middlesex Centre, Ontario

Dear Mr. Riopeele:

RE: Results of Groundwater Sampling and Nitrate Loading Assessment, 10919 Longwoods Road, Proposed Industrial Subdivision

MTE Consultants Inc. (MTE) was retained by 10919 Longwoods Road Inc. to conduct a groundwater sampling program and nitrate loading assessment for a proposed industrial subdivision to be located at 10919 Longwoods Road, Municipality of Middlesex Centre, Ontario ("the Site"). The approximate location of the Site is shown on Figure 1 (attached).

It is our understanding that the proposed industrial subdivision will be developed on approximately 6.65 hectares (ha) of agricultural lands and will include a private roadway, up to eighteen industrial lots and an on-site stormwater management facility. Each proposed lot will be connected to a piped municipal water supply but will be serviced with individual wastewater treatment facilities (septic beds). These wastewater systems are intended for domestic waste disposal only and no commercial/industrial cooling or process wastewater will be directed to these systems. A preliminary site plan concept is shown on Figure 2 (attached).

The purpose of this groundwater sampling program and nitrate loading assessment is to support the site plan design and approval process.

Scope of Work

Our scope of work included the following:

- Collection of groundwater samples from the six on-site monitoring wells;
- Submission of six groundwater samples to an accredited laboratory for analysis of Nitrite-N, Nitrate-N, Ammonia-N, and Total Kjeldahl Nitrogen (TKN);
- Comparison of laboratory results to applicable criteria (Ontario Regulation 169/03 Ontario Drinking Water Quality Standards, Safe Drinking Water Act 2002);
- Completion of a Nitrate Loading Assessment; and
- Data assessment and reporting.

Field Sampling and Observations

On September 13, 2019, and October 4, 2019, MTE collected groundwater samples from the six monitoring wells installed on March 20, 2019 as part of a Geotechnical Investigation (MW101-19, MW102-19, MW103-19, MW104-19, MW105-19, and MW106-19). Refer to Figure 2 for

monitoring well locations. Prior to sample collection, the monitoring wells were purged a minimum of three standing well volumes or until 'dry'. Samples were collected using dedicated Waterra™ inertial pumps; placed into laboratory supplied jars and submitted under chain of custody procedures, in ice packed coolers, to AGAT Laboratories for analysis of Nitrite-N, Nitrate-N, Ammonia-N, and TKN.

The sampling program was conducted in general accordance with the Ministry of Environment, Conservation and Parks (MECP[1]) document *"Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario,"* dated December 1996. All chemical analyses were performed by an accredited analytical laboratory in accordance with the document "*Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act,"* dated July 1, 2011, as amended.

Analytical Results

The analytical results are summarized in Table 1 (attached), which includes a comparison to the Ontario Regulation 169/03 Ontario Drinking Water Quality Standards (ODWQS). Copies of the Certificates of Analysis received from the analytical laboratory are also attached.

Based on the analytical results for the samples collected on September 13, 2019, there was an exceedance of the corresponding ODWQS for Nitrate-N at MW104-19. No other samples collected during this event exceeded the corresponding ODWQS for the parameters analyzed.

In response, MTE collected additional groundwater samples from all six wells on October 4, 2019 to confirm the initial results and assess temporal variability of the groundwater quality. The analytical results for these samples were similar, with a repeated exceedance of the corresponding ODWQS for Nitrate-N at MW104-19. Similar to the previous sample event results, no other samples collected during this event exceeded the corresponding ODWQS for the parameters analyzed.

These analytical results are typical for agricultural properties where chemical fertilizers and/or biosolids are routinely applied. As a result, the nitrate concentration observed in the groundwater sample collected from MW104-19 should decline following the proposed change in land use from agricultural to commercial/industrial.

Nitrate Loading Assessment

To support the site plan design, three scenarios were compared to assess the potential nitrate loading of the proposed industrial subdivision. Details of each scenario are described below.

Scenario 1

- A conventional, anaerobic septic system will be installed on each of the 18 lots;
- Total daily design sanitary sewage flow is 75 litres (L) per employee per 8 hour shift (in general accordance with Section 8.2.1.3 of the Ontario Building Code)[2];

[1] It is noted that the Ontario Ministry of the Environment, Conservation and Parks (MECP) was previously named the Ontario Ministry of the Environment (MOE) and the Ontario Ministry of the Environment and Climate Change (MOECC). For ease of discussion in this document, "MECP" is used to represent this provincial ministry and is inclusive of MOE and MOECC.

[2] https://www.buildingcode.online accessed November 2019.

- Each industrial lot will require wastewater servicing to support up to six employees with one 8 hour shift per day, or equivalent;
- The nitrate concentration in the sewage effluent following conventional treatment will be 40 milligrams per litre (mg/L);
- The development will have no more than 75% impervious surface, or achieve equivalent infiltration using appropriately designed low impact development strategies (LIDs);
- A groundwater recharge rate of 0.25 m/year (in accordance with Section 22.2.8 of the MECP[1] document *Design Guidelines for Sewage Works* (2008); and
- A background nitrate concentration of 1 mg/L was assumed for the infiltration.

Scenario 2

- A conventional, anaerobic septic system will be installed on each of the 13 lots (i.e., a five lot reduction);
- Total daily design sanitary sewage flow is 75 L per employee per 8 hour shift;
- Each industrial lot will require wastewater servicing to support up to six employees with one 8 hour shift per day, or equivalent;
- The nitrate concentration in the sewage effluent following conventional treatment will be 40 mg/L;
- The development will have no more than 50% impervious surface, or achieve equivalent infiltration using appropriately designed LIDs;
- A groundwater recharge rate of 0.25 m/year; and
- A background nitrate concentration of 1 mg/L was assumed for the infiltration.

Scenario 3

- A tertiary treatment system will be installed on each of the 18 lots;
- Total daily design sanitary sewage flow is 75 L per employee per 8 hour shift;
- Each industrial lot will require wastewater servicing to support up to six employees with one 8 hour shift per day, or equivalent;
- The nitrate concentration in the sewage effluent following tertiary treatment will be 20 mg/L;
- The development will have no more than 75% impervious surface, or achieve equivalent infiltration using appropriately designed LIDs;
- A groundwater recharge rate of 0.25 m/year; and
- A background nitrate concentration of 1 mg/L was assumed for the infiltration.

Using the above, the nitrate loading assessment was performed using the following formula:

$$C_B = \frac{SEF \times C_{SEF} + RWI \times C_{RWI}}{SEF + RWI}$$

Where:

C_B = Nitrate concentration at the down-gradient site boundary (mg/L as N)
SEF = Sewage Effluent Flow (L/yr)
C_{SEF} = Nitrate Concentration of sewage effluent (mg/L as N)
RWI = Recharge Water Infiltration (L/yr)
C_{RWI} = Nitrate concentration of infiltration water (mg/L as N)

The results for each of the three scenarios described above are provided in the following table:

Parameter	Units	Scenario 1	Scenario 2	Scenario 3
SEF	L/yr	2,956,500	2,135,250	2,956,500
C_{SEF}	mg/L as N	40	40	20
RWI	L/yr	4,156,250	8,312,500	4,156,250
C_{RWI}	mg/L as N	1	1	1
C_B	mg/L as N	17.2	9.0	8.9
ODWQS Compliance?		**No**	**Yes**	**Yes**

As shown in the table above, the nitrate concentration in groundwater at the down-gradient site boundary (C_B) for Scenario 1 is predicted to be 17.2 mg/L, which exceeds the corresponding ODWQS of 10 mg/L. However, Scenario 2 results in a predicted C_B of 9.0 mg/L by reducing the number of lots to thirteen and using the area of those five lots to increase the total pervious area available for infiltration to approximately 50%. Alternatively, Scenario 3 achieves a predicted C_B of 8.9 mg/L by replacing the conventional septic systems with tertiary treatment systems to reduce the nitrate concentration in the effluent by 50%.

Findings and Recommendations

Based on the above results, the preferred option to achieve a nitrate concentration at the down-gradient site boundary of less than 10 mg/L is to install a tertiary treatment system approved under the Ontario Building Code for each lot. To improve the overall system performance, we suggest implementing LID strategies to promote increased infiltration at the site.

This recommendation assumes that the final site plan design is similar to that shown on Figure 2 and that the design adheres to the assumptions described for Scenario 3. Should the site plan or design assumptions need to be altered in any way, MTE should be requested to review the changes and assess whether the findings and recommendations described herein remain valid.

Limitations

Services performed by MTE were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering and Consulting profession. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This letter is not intended to be exhaustive in scope or to imply a risk-free site. The findings of this report are based on conditions as they existed during the time period of the investigation.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties.

Closure

We trust that this letter provides sufficient information for your current needs. Should you require additional information or have any questions regarding the information provided, please contact this office.

Yours Truly,

MTE Consultants Inc.

Andrew Bingeman, C.E.T.
Manager, Groundwater Resources
519-743-6500 ext. 1309
abingeman@mte85.com

John McNeil, M.Sc., P.Geo.
Senior Hydrogeologist
519-204-6510 ext. 2228
jmcneil@mte85.com

Attachments:

- Figures 1 and 2
- Table 1
- Borehole Logs
- Certificates of Analysis

JDM/ALB:lmb

M:\45013\300\Reports\45013-300 20191203 FINAL LTR N Loading Assessment.docx

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.

FIGURE 1 – LOCATION PLAN Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES.DWG

MTE Engineers | Scientists | Surveyors

LOCATION PLAN

Project Name			
10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION			
Site		Client	
10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON		10919 LONGWOODS ROAD INC.	
Scale. (8.5x11)	MTE Project No.	Date	Figure No.
N.T.S.	45013-300	MARCH 27, 2019	1

LEGEND

BH107–19
MTE BOREHOLE

MW101–19
MTE MONITORING WELL

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.
- BOREHOLE ELEVATIONS SURVEYED BY MTE.

MTE
Engineers | Scientists | Surveyors

SITE PLAN

Project Name	
10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION	
Site: 10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON	Client: 10919 LONGWOODS ROAD INC.

Scale (11x17)	MTE Project No.	Date	Figure No.
1:2000	45013-300	MARCH 27, 2019	2

Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES.DWG FIGURE 2 – SITE PLAN March 27, 2019 – 11:39 a.m. – Plotted By: awilliams

TABLE 1: GROUNDWATER ANALYTICAL RESULTS - O. Reg 169/03: ONTARIO DRINKING WATER QUALITY STANDARDS

Parameter	Unit	RDL	Sample Name	MW101-19		MW102-19		MW103-19		MW104-19		MW105-19		MW106-19	
			Lab Job #	19L517579	19L526675	19L517579	19L526675	19L517579	19L526675	19L517579	19L526675	19L517579	19L526675	19L517579	19L526675
			Laboratory ID	523781	587532	523793	587576	523794	587591	523795	587600	523796	587605	523797	587607
			Sampling Date	2019-09-13	2019-10-04	2019-09-13	2019-10-04	2019-09-13	2019-10-04	2019-09-13	2019-10-04	2019-09-13	2019-10-04	2019-09-13	2019-10-04
			O. Reg. 169/03												
Nitrate as N	mg/L	0.05 or 0.25 or 0.50	10.0	<0.5	<0.5	<0.05	<0.25	<0.05	<0.05	**18.7**	**19.7**	<0.05	<0.05	<0.05	<0.05
Nitrite as N	mg/L	0.05 or 0.25 or 0.50	1.0	<0.5	<0.5	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate + Nitrite) as N (Calculated)	mg/L	0.07	NR	NA	<0.07	NA	<0.07	NA	<0.07	**18.7**	**19.7**	NA	<0.07	NA	<0.07
Ammonia as N	mg/L	0.02	NR	0.75	0.90	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.12	<0.02	<0.02
Total Kjeldahl Nitrogen	mg/L	0.10	NR	1.78	2.49	0.56	6.10	0.45	0.53	<0.10	<0.10	0.86	0.55	0.56	0.33

NOTES:

Bold - Exceeds O.Reg 169/03 Criteria

"<" - Less than the Reporting Detection Limit

RDL - Reported detection limit (varies for N in each Certificate of Analysis for this project)

NR - Not Relevant

NA - Not Applicable (not tested or calculated)

ID Number: MW101-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

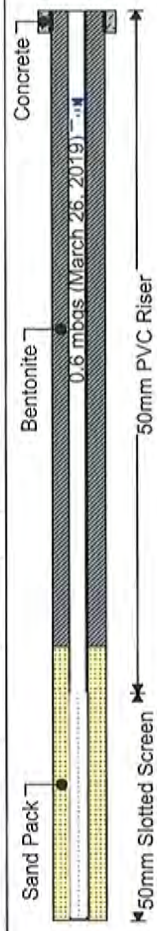
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.0					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 234.7 / 0.3	1	SS	4		24
		SAND AND SILT loose light brown sandy silt, saturated	234.2 / 0.8	2	SS	15		21
		compact light brown silty sand, saturated		3	SS	12		21
				4	SS	11		21
		grey	231.8 / 3.2	5	SS	18		19
		dense	230.4 / 4.6	6	SS	32		18
				7	SS	38		22
		Drilling Terminated	228.4 / 6.6					



Groundwater Observations and Standpipe Details

Initial water level at 0.3mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW102-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

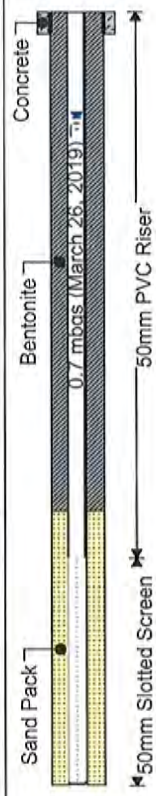
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.6					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 235.3 / 0.3	1	SS	4		24
		SAND AND SILT loose dark brown sandy silt, wet	234.8 / 0.8					
		light brown, trace clay, saturated		2	SS	8		23
		compact	234.1 / 1.5					
				3	SS	10		22
		grey	233.3 / 2.3					
				4	SS	10		25
				5	SS	10		23
		compact grey silt, some sand, trace clay, saturated	231.0 / 4.6					
				6	SS	10		21
		compact grey sandy silt, saturated	229.5 / 6.1					
				7	SS	11		21
		Drilling Terminated	228.9 / 6.7					

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW103-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

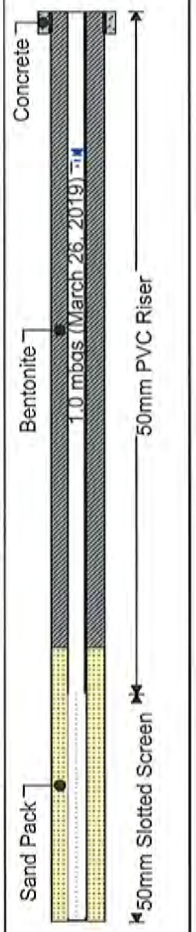
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
0		Ground Surface	235.3					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0	1	SS	5		18
		SAND AND SILT loose dark brown sandy silt, wet	234.5 / 0.8					
		compact, saturated		2	SS	10		24
		compact light brown silty sand, saturated	233.8 / 1.5	3	SS	17		20
				4	SS	16		22
				5	SS	19		19
		compact grey sandy silt, trace clay, saturated	230.7 / 4.6	6	SS	29		19
		dense	229.2 / 6.1	7	SS	32		19
		Drilling Terminated	228.7 / 6.6					

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW104-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

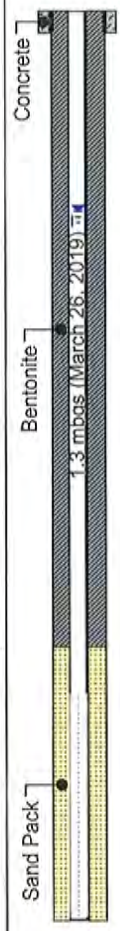
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	236.4					
		TOPSOIL dark brown/black sandy silt, some organics, saturated/frozen	0.0	1	SS	3		16
		SAND AND SILT very loose dark brown silty sand, wet	235.6 / 0.8					
		loose dark brown sand, some silt, trace clay, wet	235.2 / 1.2	2	SS	4		24
		saturated	234.9 / 1.5					
		compact	234.6 / 1.8	3	SS	14		25
		light brown		4	SS	17		21
				5	SS	15		22
		dense, brown	231.8 / 4.6	6	SS	35		21
		grey	231.4 / 5.0					
		dense grey sandy silt, saturated	230.3 / 6.1	7	SS	31		22
		Drilling Terminated	229.8 / 6.6					



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW105-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

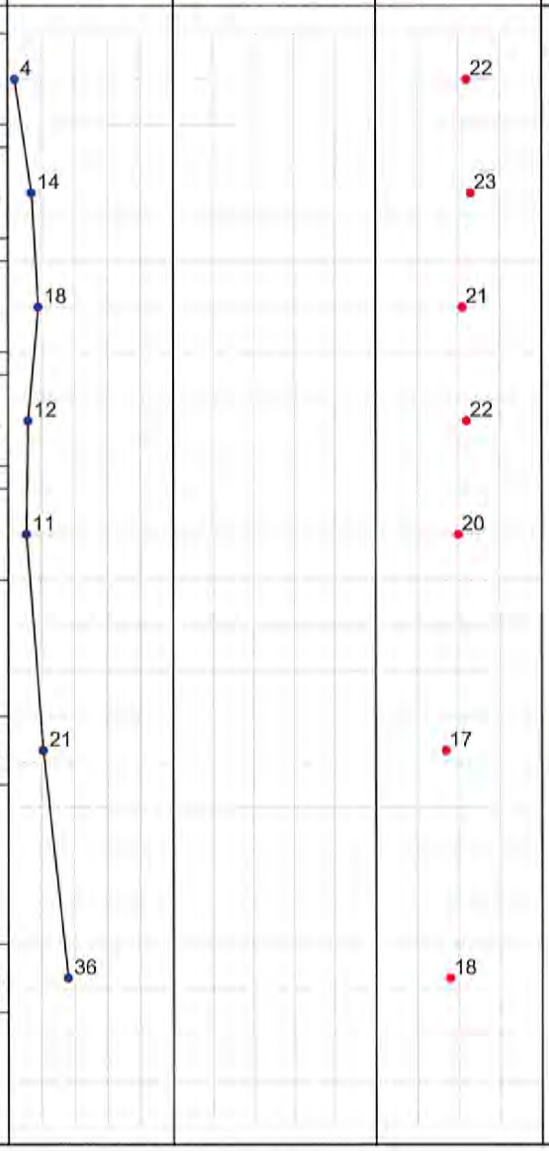
Drilling Contractor: London Soil Test Ltd.

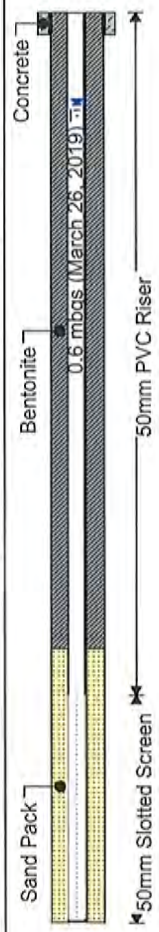
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE	
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type
		Ground Surface	234.2		
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 233.8 / 0.4	1	SS
		SAND AND SILT loose dark brown sandy silt, wet	233.4 / 0.8		
		compact, saturated		2	SS
		light brown	232.7 / 1.5		
		grey		3	SS
				4	SS
				5	SS
		compact grey silt, some sand, trace clay, saturated	229.6 / 4.6	6	SS
		dense grey silty sand, saturated	228.1 / 6.1	7	SS
		Drilling Terminated	227.6 / 6.6		





Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW106-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

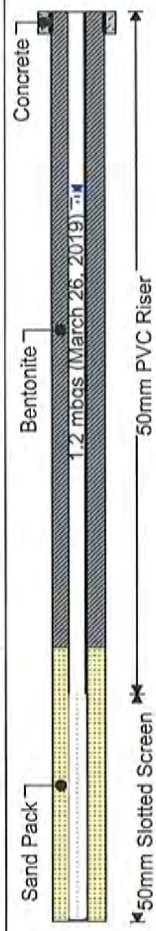
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.5					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 235.2 / 0.3	1	SS	4		18
		SAND AND SILT loose dark brown sandy silt, wet	234.7 / 0.8					
		saturated		2	SS	9		24
		compact, light brown	234.0 / 1.5					
				3	SS	10		21
				4	SS	24		21
		grey	232.5 / 3.0					
				5	SS	13		20
				6	SS	17		22
				7	SS	24		21
		Drilling Terminated	228.9 / 6.6					



Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: BH107-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

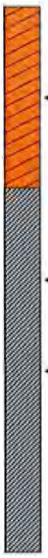
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	234.5					
		TOPSOIL dark brown/black sandy silt, some organics and plastic/glass fragments, saturated	0.0 / 234.2 / 0.3	1	SS	3		25
		SAND AND SILT very loose dark brown/red sandy silt, wet	233.7 / 0.8	2	SS	12		22
		compact, saturated	233.0 / 1.5					
		compact dark brown/red silty sand, saturated		3	SS	22		21
			232.2 / 2.3					
		grey		4	SS	20		21
				5	SS	23		22
			229.9 / 4.6					
		dense grey sandy silt, saturated		6	SS	30		22
			227.9 / 6.6	7	SS	40		25
		Drilling Terminated						

Groundwater Observations and Standpipe Details



Water level at 1.5mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 2.4mbgs

ID Number: BH108-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

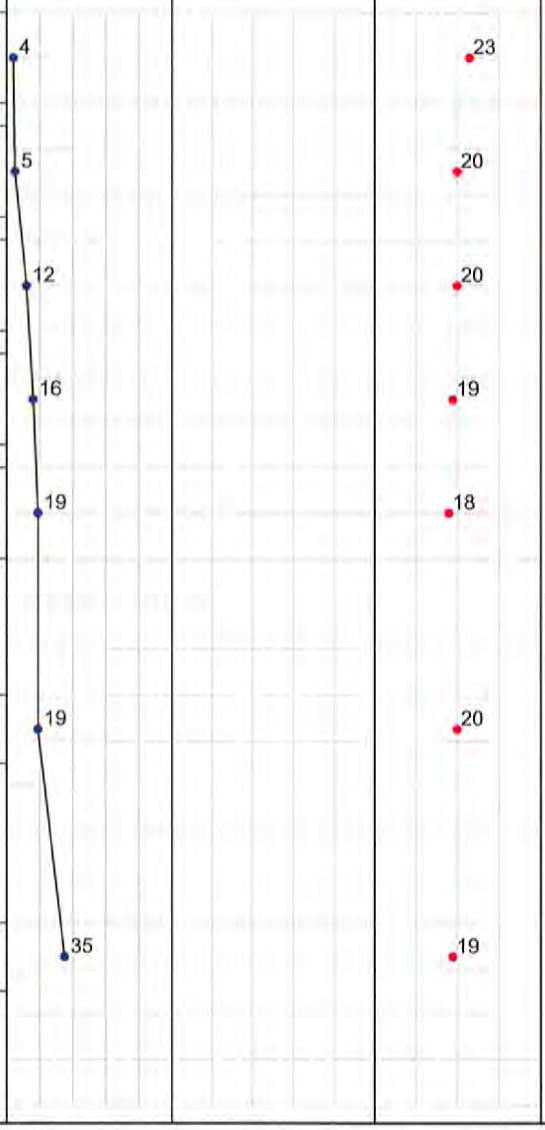
Drilling Contractor: London Soil Test Ltd.

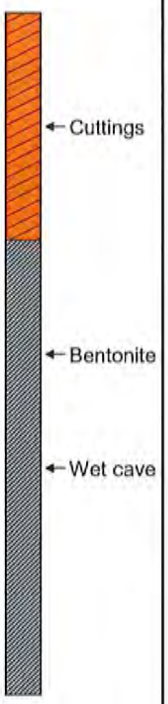
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE	
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type
		Ground Surface	235.1		
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 234.7 / 0.4	1	SS
		SAND AND SILT loose dark brown sandy silt, wet	234.3 / 0.8		
		trace clay, saturated	233.6 / 1.5	2	SS
		compact, light brown	232.8 / 2.3	3	SS
		compact grey silty sand, saturated	230.5 / 4.6	4	SS
		compact grey sandy silt, saturated	229.0 / 6.1	5	SS
		dense	228.5 / 6.6	6	SS
		Drilling Terminated		7	SS





Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 3.1mbgs

ID Number: BH109-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.4					
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 235.0 / 0.4	1	SS	5		27
		SAND AND SILT loose dark brown sandy silt, wet compact, saturated	234.6 / 0.8	2	SS	10		22
				3	SS	15		21
		grey	233.1 / 2.3	4	SS	19		20
				5	SS	17		20
				6	SS	26		18
		dense grey silty sand, saturated	229.3 / 6.1	7	SS	46		20
		Drilling Terminated	228.8 / 6.6					

Groundwater Observations and Standpipe Details:

- Cuttings
- Bentonite
- Wet cave

Water level at 1.5mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: MTE CONSULTANTS Inc.
123ST GEORGE STREET
LONDON, ON N6A 3A1
519-204-6510

ATTENTION TO: John McNeil

PROJECT: 45013-300

AGAT WORK ORDER: 19L517579

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Sep 18, 2019

PAGES (INCLUDING COVER): 4

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

Results relate only to the items tested. Results apply to samples as received.
All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request

AGAT Laboratories

5835 COOPERS AVENUE
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TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19L517579

PROJECT: 45013-300

CLIENT NAME: MTE CONSULTANTS Inc.

ATTENTION TO: John McNeil

SAMPLING SITE:Longwoods

SAMPLED BY:Mackenzie Costello

Various Inorganics (water)

DATE RECEIVED: 2019-09-13 **DATE REPORTED: 2019-09-18**

		SAMPLE DESCRIPTION:		MW101-19		MW102-19	MW103-19	MW104-19	MW105-19	MW106-19
		SAMPLE TYPE:		Water		Water	Water	Water	Water	Water
		DATE SAMPLED:		2019-09-13		2019-09-13	2019-09-13	2019-09-13	2019-09-13	2019-09-13
Parameter	Unit	G / S	RDL	523781	RDL	523793	523794	523795	523796	523797
Nitrate as N	mg/L		0.5	<0.5	0.05	<0.05	<0.05	18.7	<0.05	<0.05
Nitrite as N	mg/L		0.5	<0.5	0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Ammonia as N	mg/L		0.02	0.75	0.02	<0.02	<0.02	<0.02	0.02	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	1.78	0.10	0.56	0.45	<0.10	0.86	0.56

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

523781 Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By: Divine Basily

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
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FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: MTE CONSULTANTS Inc.
PROJECT: 45013-300
SAMPLING SITE:Longwoods

AGAT WORK ORDER: 19L517579
ATTENTION TO: John McNeil
SAMPLED BY:Mackenzie Costello

Water Analysis

RPT Date: Sep 18, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Various Inorganics (water)															
Nitrate as N	533152		0.83	0.87	4.7%	< 0.05	93%	90%	110%	107%	90%	110%	103%	85%	115%
Nitrite as N	533152		<0.25	<0.25	NA	< 0.05	NA	90%	110%	106%	90%	110%	107%	85%	115%
Ammonia as N	520229		0.18	0.17	5.7%	< 0.02	99%	90%	110%	97%	90%	110%	99%	70%	130%
Total Kjeldahl Nitrogen	530411		36.4	36.6	0.5%	< 0.10	98%	80%	120%	97%	80%	120%	94%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Nivine Basily

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Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
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TEL (905)712-5100
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Method Summary

CLIENT NAME: MTE CONSULTANTS Inc.

AGAT WORK ORDER: 19L517579

PROJECT: 45013-300

ATTENTION TO: John McNeil

SAMPLING SITE:Longwoods

SAMPLED BY:Mackenzie Costello

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
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CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: MTE CONSULTANTS Inc.
123ST GEORGE STREET
LONDON, ON N6A 3A1
519-204-6510

ATTENTION TO: John Mcneil

PROJECT: 45013-300

AGAT WORK ORDER: 19L526675

WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganics Report Writer

DATE REPORTED: Oct 10, 2019

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. Measurement Uncertainty is not taken into consideration when stating conformity with a specified requirement.

Results relate only to the items tested. Results apply to samples as received.
All reportable information as specified by ISO 17025:2017 is available from AGAT Laboratories upon request

AGAT Laboratories

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FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 19L526675

PROJECT: 45013-300

CLIENT NAME: MTE CONSULTANTS Inc.

ATTENTION TO: John Mcneil

SAMPLING SITE:

SAMPLED BY:

Inorganic Chemistry (Water)

DATE RECEIVED: 2019-10-04 **DATE REPORTED: 2019-10-10**

		SAMPLE DESCRIPTION:		MW101-19		MW102-19		MW103-19	MW104-19	MW105-19	MW106-19
		SAMPLE TYPE:		Water		Water		Water	Water	Water	Water
		DATE SAMPLED:		2019-10-04 09:05		2019-10-04 12:22		2019-10-04 09:55	2019-10-04 10:35	2019-10-04 11:30	2019-10-04 11:55
Parameter	Unit	G / S	RDL	587532	RDL	587576	RDL	587591	587600	587605	587607
Nitrate as N	mg/L		0.5	<0.5	0.25	<0.25	0.05	<0.05	19.7	<0.05	<0.05
Nitrite as N	mg/L		0.5	<0.5	0.25	<0.25	0.05	<0.05	<0.05	<0.05	<0.05
(Nitrate + Nitrite) as N (Calculated)	mg/L		0.07	<0.07	0.07	<0.07	0.07	<0.07	19.7	<0.07	<0.07
Ammonia as N	mg/L		0.02	0.90	0.02	<0.02	0.02	<0.02	<0.02	0.12	<0.02
Total Kjeldahl Nitrogen	mg/L		0.10	2.49	0.50	6.10	0.10	0.53	<0.10	0.55	0.33

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

587576 Elevated RDL indicates the degree of sample dilution prior to the analysis in order to keep analytes within the calibration range of the instrument and to reduce matrix interference.

Certified By: Vivine Basily

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Quality Assurance

CLIENT NAME: MTE CONSULTANTS Inc.

PROJECT: 45013-300

SAMPLING SITE:

AGAT WORK ORDER: 19L526675

ATTENTION TO: John Mcneil

SAMPLED BY:

Water Analysis

RPT Date: Oct 10, 2019			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Nitrate as N	602152		<0.25	<0.25	NA	< 0.05	92%	90%	110%	104%	90%	110%	99%	85%	115%
Nitrite as N	602152		<0.25	<0.25	NA	< 0.05	NA	90%	110%	104%	90%	110%	109%	85%	115%
Ammonia as N	583935		0.90	0.89	1.1%	< 0.02	104%	90%	110%	103%	90%	110%	94%	70%	130%
Total Kjeldahl Nitrogen	587532	587532	2.49	2.48	0.4%	< 0.10	102%	80%	120%	101%	80%	120%	111%	70%	130%

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Vivine Basily

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation. RPDs calculated using raw data. The RPD may not be reflective of duplicate values shown, due to rounding of final results.

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Method Summary

CLIENT NAME: MTE CONSULTANTS Inc.

AGAT WORK ORDER: 19L526675

PROJECT: 45013-300

ATTENTION TO: John Mcneil

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Nitrate as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
Nitrite as N	INOR-93-6004	SM 4110 B	ION CHROMATOGRAPH
(Nitrate + Nitrite) as N (Calculated)	INOR-93-6004	SM 4110 B	CALCULATION
Ammonia as N	INOR-93-6059	SM 4500-NH3 H	LACHAT FIA
Total Kjeldahl Nitrogen	INOR-93-6048	QuikChem 10-107-06-2-I & SM 4500-Norg D	LACHAT FIA

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

5835 Coopers Avenue
Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water consumed by humans)

Laboratory Use Only

Work Order #: 19L526675

Cooler Quantity:

Arrival Temperatures: 2.6 | 3.0 | 16.0 | 3.6 | 4 | 4.2

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: ice

Report Information:

Company: MTE Consultants

Contact: 123 St. George St, London, ON

Address:

Phone: Fax:

Reports to be sent to:

1. Email: jmcneil@mte85.com
2. Email: mcostello@mte85.com

Regulatory Requirements: ☒ No Regulatory Requirement

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Sewer Use
☐ Sanitary
☐ Storm
Region (Indicate One)
☐ MISA

☐ Regulation 558
☐ CCME
☐ Prov. Water Quality Objectives (PWQO)
☐ Other
(Indicate One)

Is this submission for a Record of Site Condition? ☐ Yes ☒ No

Report Guideline on Certificate of Analysis ☐ Yes ☒ No

Turnaround Time (TAT) Required:

Regular TAT ☒ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT
**TAT is exclusive of weekends and statutory holidays*

For 'Same Day' analysis, please contact your AGAT CPM

Project Information:

Project: 45013-300

Site Location: Longwoods Rd.

Sampled By: Mackenzie Costello

AGAT Quote #: PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information: Bill To Same: Yes ☒ No ☐

Company:

Contact:

Address:

Email:

Sample Matrix Legend

B	Biota
GW	Ground Water
O	Oil
P	Paint
S	Soil
SD	Sediment
SW	Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI (Y/N)	O. Reg 153: Metals and Inorganics (☐ All Metals ☐ 153 Metals (excl. Hydrides) ☐ Hydride Metals ☐ 153 Metals (incl. Hydrides))	ORPs: ☐ B-HWS ☐ Cl⁻ ☐ CN ☐ Cr⁶⁺ ☐ EC ☐ FOC ☐ Hg ☐ pH ☐ SAR	Full Metals Scan	Regulation/Custom Metals	Nutrients: ☐ TP ☒ NH_3 ☒ TKN ☒ NO_2 ☒ NO_3 ☒ NO_2+NO_3	Volatiles: ☐ VOC ☐ BTEX ☐ THM	PHCs F1 - F4	ABNs	PAHs	PCBs: ☐ Total ☐ Aroclors	Organochlorine Pesticides	TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	Sewer Use
MW101-19	Oct 4/19	9:05	2	GW							X								
MW102-19	↓	12:27	2	↓							X								
MW103-19		9:55	2								X								
MW104-19		10:35	2								X								
MW105-19		11:30	2								X								
MW106-19	↓	11:55	2	↓							X								

Samples Relinquished By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time
Mackenzie Costello	19/10/04	13:27	Ainslee-Ann Gibbs	2019/10/04	1:30 PM
Relinquished By (Print Name and Sign): Ann Gibbs	19/10/07	4:00 PM	Samples Received By (Print Name and Sign):	19/10/8	9:11
By (Print Name and Sign):	Date	Time	Samples Received By (Print Name and Sign):	Date	Time

Page 1 of 1

N°: T 086790

Pink Copy - Client | Yellow Copy - AGAT | White Copy- AGAT

MTE Consultants
123 St. George St., London, Ontario N6A 3A1

July 13, 2020

MTE File No.: C45013-200

County of Middlesex
399 Ridout Street North
London, ON N6A 2P1

Attention: Durk Vanderwerff, Director of Planning

RE: Preliminary Stormwater Management Report For Vacant Land Condominium Development (Light Industrial Sites) at 10919 Longwood Road, Delaware

Introduction:

It is proposed to develop the property at 10919 Longwood Road, Delaware in the Municipality of Middlesex Center. The development property is 6.64 Ha in size and is located south of Longwoods Road on the east side of Delaware. The property is zoned for light industrial use. It is proposed to development the property into 15 individual lots for light industrial use. The lots will range from 0.30 to 0.46 Ha in size. The lots will be created through a vacant land condominium which will contain a private internal roadway to provide access to the lots and a private stormwater management (SWM) basin which will provide a stormwater outlet for the lots. The private roadway and SWM basin will be common elements within the condo development.

Please refer to the attached Draft Plan of Vacant Land Condominium (DWG-1) which shows the proposed development. This letter report outlines the proposed storm drainage and stormwater management for the development in support of draft plan approval.

Pre-development Conditions:

The pre-development site is farmland. The pre-development drainage patterns are outlined below:

- The southerly 1.8 Ha of development drains to the south onto the adjacent farm.
- The remainder 4.85 Ha of the development drains to multiple low lying areas throughout the property where the runoff infiltrates into the ground.

MTE Consulting completed a detailed geotechnical investigation for the property. The existing soils are a mixture of sand and silt. (Reference: Geotechnical Investigation for Proposed Industrial Subdivision at 10919 Longwoods Road, MTE Consultants Inc., March 27, 2019).

Proposed Post-Development Site:

Please refer to the attached Draft Plan of Vacant Land Condominium (DWG-1) and the Preliminary Grading Plan (DWG-2). It is proposed to drain the development as follows:

- Each lot will be individually serviced with internal storm sewers and/or ditches which will discharge stormwater runoff to the ditching system located within the private roadway corridor.

- The private roadway corridor will contain roadside ditches on both sides of the asphalt road. The ditches will be approximately 0.80m deep with 4:1 side slopes and a 1m wide flat bottom. The ditches will be grassed with a minimum slope of 0.50% and will drain into the north portion of the proposed SWM basin. Culverts will be installed at the intersection and at future driveways.

- The rear of lots 8-15 will drain into a rear yard swale system, located at the south edge of the development. These swales will be grassed with a 0.50% minimum slope and will drain into the south portion of the proposed SWM basin.

- The roadway ditches and rear yard swales will all outlet a private SWM basin which will be located between lots 13 and 14. The SWM basin will be 0.51 Ha in size and will infiltrate stormwater runoff into the ground in order to match and mimic the pre-development condition.

Infiltration Basin Design:

MTE Consulting completed on-site infiltration testing and determined that the factored infiltration rate of the sandy soils at the infiltration basin location is 18mm/hr. The infiltration rate contains a factor of safety of 3. (Reference: Letter Results of In-situ Infiltration Testing, Proposed Industrial Subdivision, 10919 Longwoods Road, Middlesex Centre, MTE Consultants Inc., July 3, 2020). The following details outline the proposed design of the infiltration basin:

- Drainage Area = 6.65 Ha (including the area of the basin itself)
- Bottom Area of Basin = 0.28 Ha
- Top Area of Basin (to top of slope) = 0.43 Ha
- Block Size = 0.51 Ha
- Side slopes = 4:1 max
- Bottom and sides of infiltration basin will be topsoil and grassed
- Factored infiltration rate = 18mm/hr (contains a factor of safety of 3)
- Total infiltration rate for facility 0.28 Ha x 10,000m2/Ha x 18mm/hr /1000 = 50.4m3/hr = 0.014m3/sec
- Estimated maximum ground water table elevation = 233.60
- Proposed bottom of basin = 234.80
- Estimated clearance (bottom of basin to estimated ground water) = 1.20m

Hydraulic Modelling for Infiltration Basin:

The post-development tributary area to the infiltration basin is outlined below:

- Private Light Industrial Lots = 4.96 Ha (maximum impervious area = 60%)
- Private Roadway Corridor with ditches = 1.17 Ha (impervious area = 45%)
- Private SWM Facility = 0.51 Ha (equivalent impervious area = 50%)
- Total Area = 6.65 Ha, Composite Impervious = 58%
- To be conservative, we have used an overall Composite Impervious Ratio of 60%

As noted on the Preliminary Grading Plan (DWG-2), there appear to be areas from Longwood Road which drain onto the development lands. As shown on the plan, we anticipate and recommend the drainage from the road allowance area be conveyed to the east/west such that the road allowance runoff does not drain onto the private development.

We have completed hydraulic models for the inflow/outflow/ponding of the infiltration basin using SWMHYMO-99. The City of London IDF curves were used to model the following storm events:

- 25mm, 4 hour Chicago Storm
- 1:2 year, 4 hour Chicago Storm
- 1:5 year, 4 hour Chicago Storm
- 1:10 year, 4 hour Chicago Storm
- 1:50 year, 4 hour Chicago Storm
- 1:100 year, 4 hour Chicago Storm

To be conservative, we have used a 4 hour storm duration instead of a 3 hour duration.

As noted previously, the pond infiltration rate (outflow rate) was set at 0.014m3/s which contains a factor of safety of 3.

The attached Table 1 outlines the infiltration basin storage volumes and associated draw down times during each storm event. Detailed SWMHYMO-99 output is also attached.

Infiltration Basin Ponding Depths and Surface Outflow:

Please refer to Table 1 for the estimated ponding depths for each storm event. Please also refer to the attached Pond Cross Section (DWG-3).

The bottom of the basin has been set at 234.80.

1:2 year storm estimated ponding elevation is 235.40 (depth = 0.60m). Small amounts of ponding of 0.30m will occur in isolated areas in the adjacent roadside ditches to an elevation 235.40. To be conservative, storage volumes and infiltration for the roadside ditching has not been factored into this analysis.

The 1:100 year storm estimated ponding elevation is 235.95 (depth = 1.15m). The maximum grade around of the SWM basin is 236.40. As such there is 0.45m freeboard. Ponding of 0.85m will also occur in the roadside ditch to elevation 235.95. However, the majority of the ditch (average elevation of 359.90) will only have 0.05m ponding.

An emergency overflow to the south is provided at elevation 236.20, which is 0.25m higher than the facility storage level for the 1:100 year storm event.

The infiltration basin has been designed to infiltration upto the 1:100 year storm event. As such there should be no surface run-off onto adjacent properties, under normal operating conditions.

Quality Control:

As previously outlined, the development will consist of 15 light industrial lots. The development of each lot will be subject to future Site Plan approvals which will require detailed engineering, grading and stormwater management plans be provided for each lot. Each lot will need to provide an OGS unit such that quality control for the development is provided. The OGS units shall be designed for Level 1 protection. Depending on the end use of each lot, lots with less than 250m2 of total asphalt area may be able to use swales and landscape treatment instead of an oil grit separator. This will be determined and assessed on an individual lot basis during the site plan process for each lot.

Construction Staging for Infiltration Basin:

The infiltration basin should be completed at the initial stages of the development. Active sediment and erosion controls shall be implemented to decrease sediment load into the basin during construction. After the overall site is 85% built out (i.e. 85% of the individual lots are completed including asphalt, vegetation and sodding), the pond will be sub-excavated to remove any accumulated silt. After 85% built-out the following will occur:

- MTE Consulting will inspect the pond bottom and take soil samples.
- The basin bottom including the bottom 2m of each side slope will be sub-excavated to 0.30m minimum depth. The excavated material shall be removed from the site and replaced with 0.30m depth of imported clean sand (no silt/clay). The purpose of this operation is to remove any contaminated sand, silt and sediment that has accumulated in the pond during development construction.
- A 150mm depth of sandy topsoil mix shall be installed on top of the new sand layer.
- The native sand and the imported 0.30m of sand should not be compacted and the top layers of both the native sand and the imported sand shall be scarified prior to the installation of the topsoil mix.

Topsoil and Seeding for Infiltration Basin:

Topsoil and seed shall be installed on the basin bottom and the 4:1 side slopes. It is important that the topsoil is very pervious and a 30/70 sand to topsoil mix shall be used for the topsoil layer within the basin. The topsoil layer will have a maximum thickens of 150mm and shall be seeded (not sodded). The seeding mix shall be Native Prairie Meadow Mix.

Initial Monitoring of the Infiltration Basin:

After the overall development is 85% built out and the basin seeding has been established, MTE Consulting will monitor the basin for a 1 year period. The purpose of the monitoring is to ensure the basin is functioning property and within the design parameters. If the basin is not functioning properly MTE will provide recommendations for any remediation work.

On-going Maintenance of Infiltration Basin:

The infiltration basin will be privately owned and operated by the condo board. The condo board shall complete yearly monitoring and maintenance of the infiltration basin.

The condo board shall undertake the following maintenance and shall allow for the associated costs in the condo board reserve fund:

- The grass areas within the pond shall be cut on a regular basis and pond area shall be kept free of garbage and debris.

- Every five (5) years, the basin bottom and bottom 2m of the side slopes shall be fully excavated by 0.30m. The 0.15m thickens of topsoil and 0.15m thickness of sand below the topsoil shall be removed and replaced with new clean sand and topsoil (with no clay/silt content). The replacement of these materials every 5 years will be required in order to keep the infiltration basin functioning.

Conclusions

This letter report outlines the proposed storm drainage and stormwater management for the development in support of the draft plan approval. We anticipated an updated report will be prepared as a condition of draft plan approval.

In summary, the development consists 15 individual lots for light industrial use which will be development through a vacant land condominium. The stormwater drainage for the development will outlet to a stormwater infiltration basin. The infiltration basin is 0.51 Ha in size and has been designed to accommodate the 1:100 post-development flows from the development. The infiltration basin, private roadway and conveyance ditches will be privately owned and maintained by the condominium board.

Level 1 stromwater quality controls will be provided on the individual lots prior to discharge to the internal roadway ditch system. The development of the individual lots will be subject to future site plan approvals which will require detailed engineering, grading and stormwater management plans be provided for each lot.

Please contact us if you have any comments or questions.

Yours Truly,

MTE Consultants Inc.

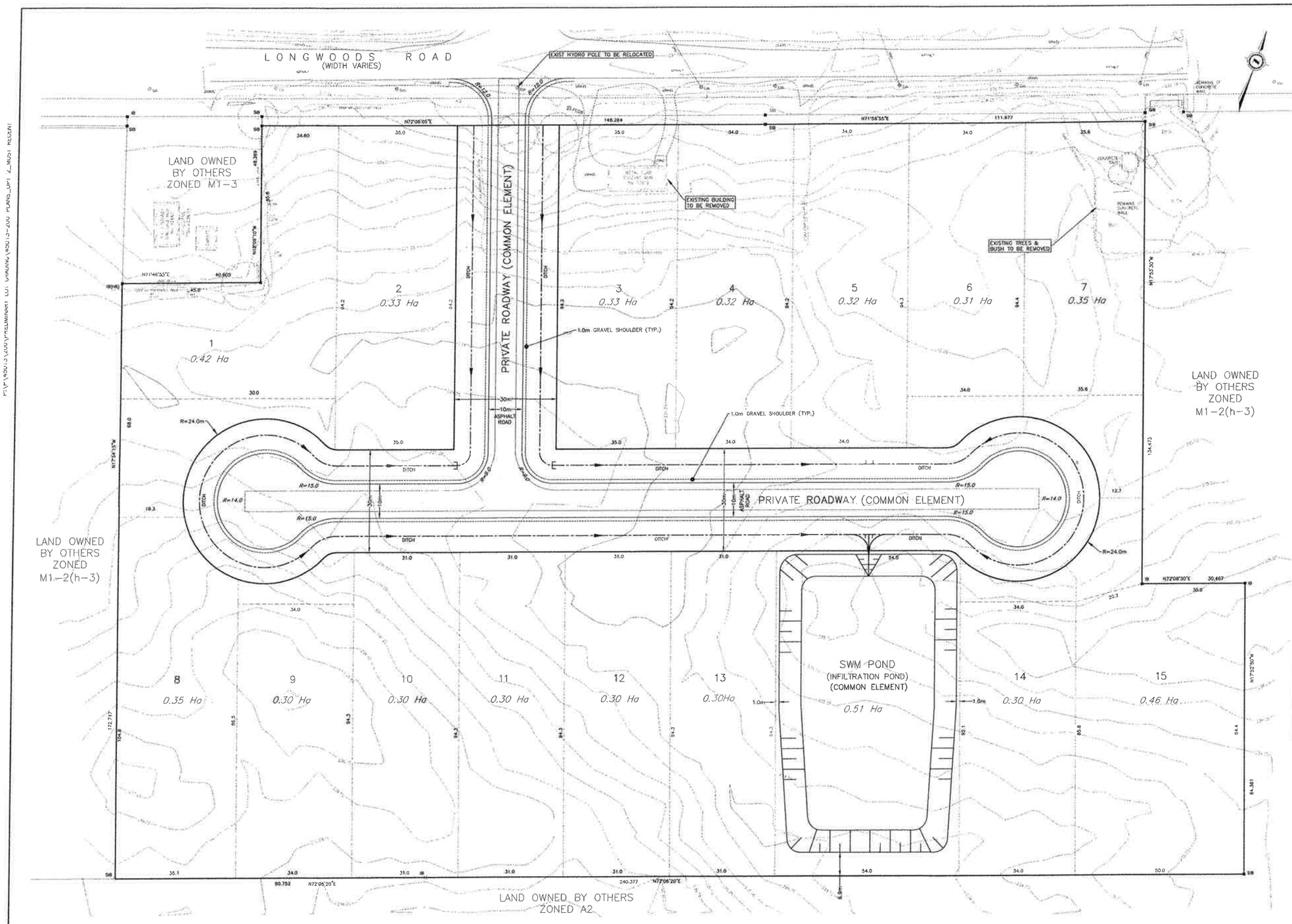
LICENSED PROFESSIONAL ENGINEER
July 13-20
K. A. McINTOSH
PROVINCE OF ONTARIO

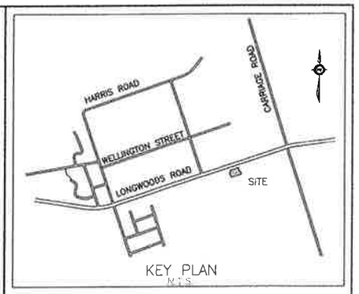
Kyle McIntosh, P. Eng.
Manager, Land Development
519-204-6510 ext. 2203
kmcintosh@mte85.com

M:\45013\200\SWM Report\preliminary stormwater management report.docx

Table 1: Infiltration Basin Calculations

Design Storm	Runoff volume to infiltration basin (m3)	Infiltration Basin Infiltration Rate (m3/hour)	Infiltration Amount During Storm (m3)	Infiltration Basin Total Storage Required (m3)	Drain down time after storm event (hours)	Infiltration Basin Estimated Ponding Depth (m)
25mm, 4 hours	918	50	202	716	14	0.35
1:2 year, 4 hours	1915	50	202	1713	34	0.6
1:5 year, 4 hours	2006	50	202	1804	36	0.7
1:10 year, 4 hours	2447	50	202	2245	45	0.8
1:50 year, 4 hours	3425	50	202	3223	64	0.95
1:100 year, 4 hours	3853	50	202	3651	72	1.15





KEY PLAN
N.T.S.

DRAFT PLAN OF VACANT LAND CONDOMINIUM

PART OF

LOT 6, CONCESSION 1

IN THE

MUNICIPALITY OF MIDDLESEX CENTRE

(GEOGRAPHIC TOWNSHIP OF DELAWARE)

COUNTY OF MIDDLESEX

OWNER'S CERTIFICATE

I HEREBY AUTHORIZE THE SUBMISSION OF THIS PLAN IN DRAFT FORM.

Feb 9 2020
DATE

GUY RIOPELLE
10919 LONGWOODS ROAD INC.
I HAVE AUTHORITY TO BID THE COROPATION

SURVEYOR'S CERTIFICATE

I CERTIFY THAT THE BOUNDARIES OF THE LANDS TO BE SUBDIVIDED, AS SHOWN ON THIS PLAN, AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

P.R. Levac

Jan/6/20
DATE

P.R. LEVAC
ONTARIO LAND SURVEYOR

REQUIREMENTS of SECTION 51(17) of the PLANNING ACT

	(E) SEE PLAN	
(A) SEE PLAN	(F) SEE PLAN	(I) SAND, SILT & CLAY
(B) SEE PLAN	(F.1) N/A	(J) SEE PLAN
(C) SEE PLAN	(G) SEE PLAN	(K) MUNICIPAL WATER SERVICE ONLY
(D) SEE PLAN	(H) MUNICIPAL WATER	(L) SEE PLAN

SCHEDULE OF LAND USE (IN Ha)

LIGHT INDUSTRIAL	LOTS 1-15	4.96
ROAD CORRIDOR	COMMON ELEMENT	1.17
SWM POND	COMMON ELEMENT	0.51
TOTAL		6.64 Ha

6.0m WIDE FIRE ROUTE
C\L RADIUS = 12m

FIRE ROUTE SIGNS SHALL BE PLACED ON BOTH SIDES OF ROADWAY WITH 30m SPACINGS

EXISTING ZONING OF LANDS = M1-2(h-3)

EXISTING SERVICES	DRAWING & SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	KAM
DRAWN BY	HIA
CHECKED	KAM
APPROVED	KAM
DATE	JULY/20

No.	REVISIONS	DATE	CONSULTANT

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE = 1 : 500
5m 0 10m

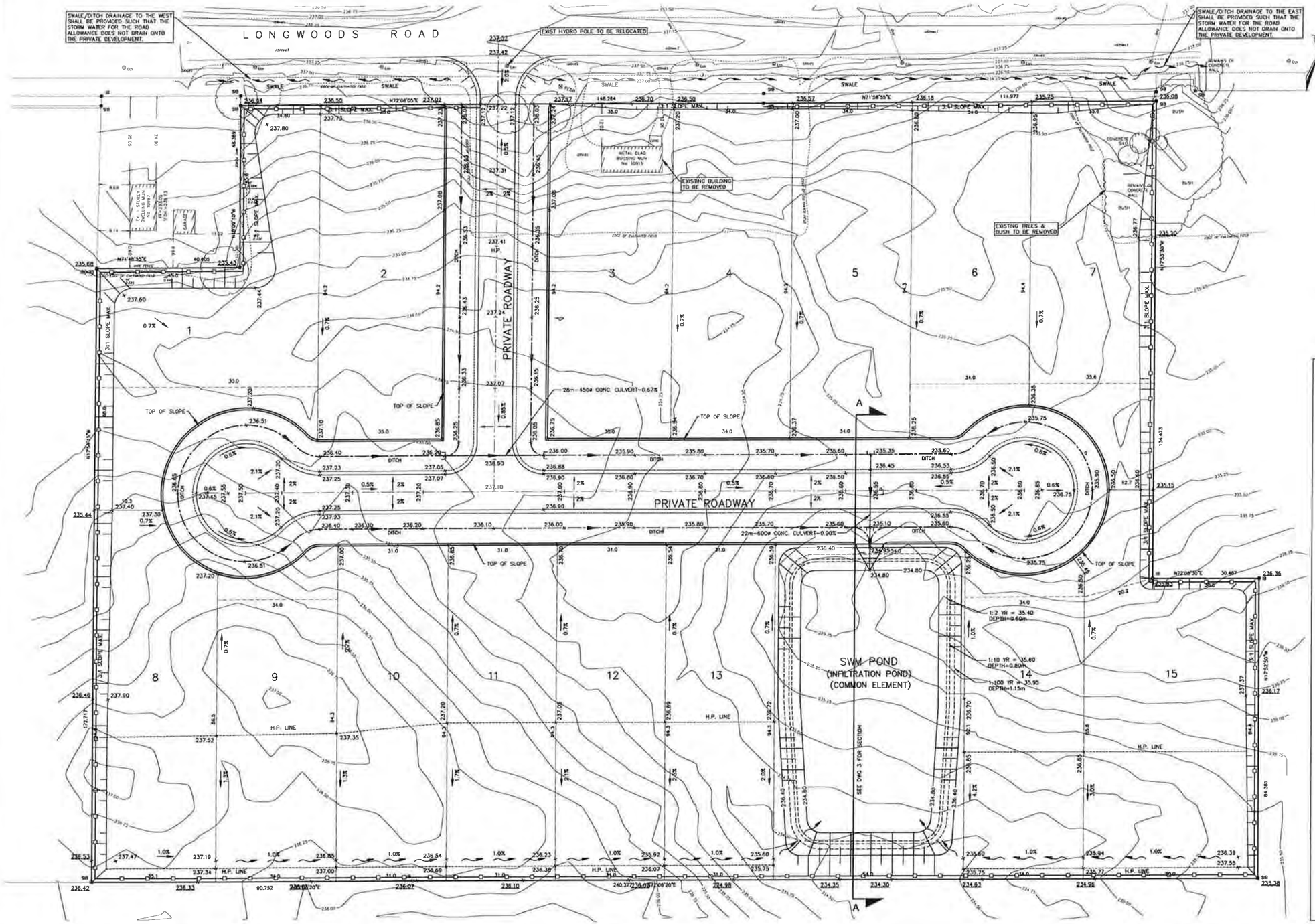
TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

DRAFT PLAN OF
VACANT LAND CONDOMINIUM

PROJECT No. 45013-200

SHEET No. 1

PLAN FILE No.



GENERAL NOTES

1. THIS IS A PRELIMINARY GRADING PLAN TO SUPPORT THE DRAFT PLAN APPLICATION
2. EACH LOT WILL BE SUBJECT TO SEPARATE SITE PLAN APPROVAL. DURING THE SITE PLAN PROCESS FOR EACH LOT, AN INDIVIDUAL LOT GRADING AND DRAINAGE PLAN WILL BE PERPETRATED FOR EACH LOT
3. IT IS ANTICIPATED THAT EACH LOT WILL CONTAIN INTERNAL STORM SEWERS AND/OR INTERNAL DITCHES THAT WILL OUTLET TO THE PRIVATE ROADWAY DITCH
4. THE GRADING STANDARDS TO BE USED FOR THE INDIVIDUAL LOTS IS 1.0% MINIMUM GRADES FOR ASPHALT AREAS AND 2.0% MINIMUM GRADES FOR GRASS AREAS
5. THE SITE PLAN FOR EACH LOT WILL BE REQUIRED TO ADDRESS SWM QUALITY CONTROL. IF THE TOTAL ASPHALT AREA ON EACH LOT IS MORE THAN 800m2, AN OIL GRIT SEPARATOR WILL BE REQUIRED TO BE PROVIDED ON THE INDIVIDUAL LOT. THE OIL GRIT SEPARATOR SHALL BE DESIGNED FOR LEVEL 1 QUALITY CONTROL. FURTHERMORE, IF THE ASPHALT AREA IS LESS THAN 800m2 BUT THERE IS EQUIPMENT WASHING AREAS OR ANY OIL/FUEL STORAGE PROPOSED AN OIL GRIT SEPARATOR SHALL BE PROVIDED

LEGEND

- 200.00 — PROPOSED ELEVATION
- 200.00 — MATCH EXISTING ELEVATION
- 2.0% — PROPOSED SWALE & SLOPE
- 2.0% — PROPOSED SLOPE
- TOP / BOTTOM — PROPOSED BERM (3:1 SLOPE MAXIMUM)
- 200.00 — EXISTING ELEVATION
- 2.0% — EXISTING SWALE & SLOPE
- 2.0% — EXISTING SLOPE
- EXISTING HYDRO POLE
- PROPOSED/EXISTING STREET LIGHT
- EXISTING HYDRO TRANSFORMER ON CONC PAD
- PROPOSED/EXISTING SIGN
- EXISTING FENCE LINE
- PROPOSED FENCE LINE
- PROPOSED CURB CUT
- PROPOSED CURB TRANSITION (CURB TYPE 3.0m MIN.) (TO SUPER-ELEVATED 6.0m MIN.)
- PROPOSED SUPER-ELEVATED CURB
- PROPOSED BUILDING ENTRANCE
- PROPOSED/EXISTING STORM MANHOLE
- PROPOSED/EXISTING CATCH BASIN
- PROPOSED/EXISTING SANITARY MANHOLE
- PROPOSED CATCH BASIN MANHOLE
- PROPOSED 3-WAY FIRE HYDRANT C\W STORZ CONNECTION, WITH WATER VALVE ON 150 LEAD
- PROPOSED WATER VALVE
- PROPOSED RESTORATION AREA (SEE RESTORATION NOTE)
- PROPOSED OVERLAND FLOW ROUTE

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS		No	REVISIONS	DATE	CONSULTANT
					DESIGN	KAM				
					DRAWN BY	IRA				
					CHECKED	KAM				
					APPROVED	KAM				
					DATE	JULY/20				

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE — 1 : 500
5 0 10m

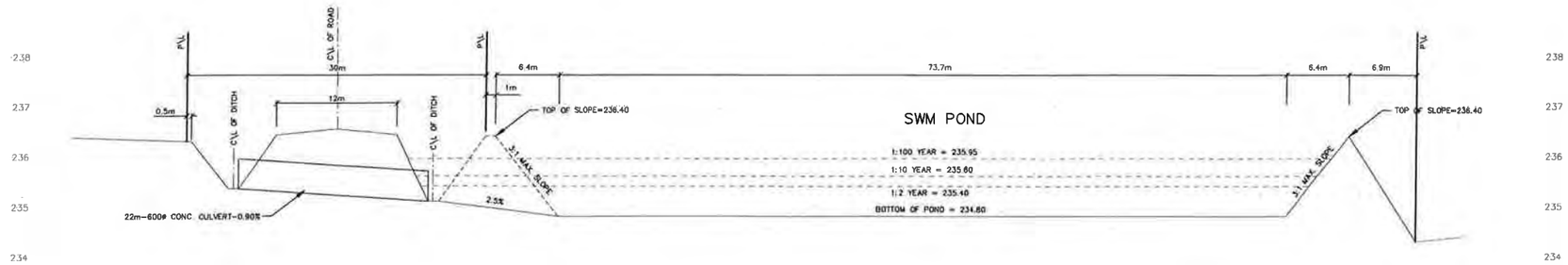
TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

PRELIMINARY GRADING PLAN

PROJECT No. 45013-200

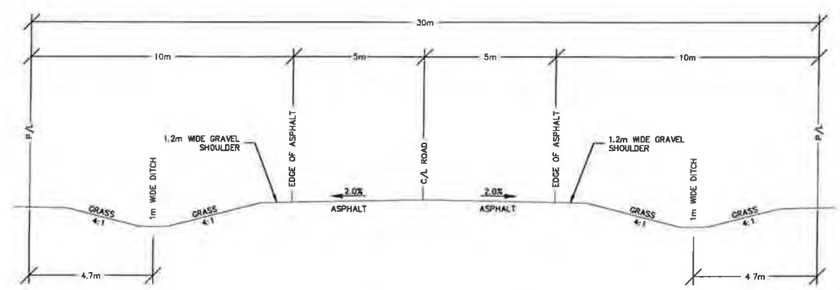
SHEET No. 2

PLAN FILE No.



SECTION A–A
SWM POND

SCALE: HORIZ=1:250
VERT=1:100



TYPICAL PRIVATE ROAD SECTION

SCALE: HORIZ=1:100 VERT=1:100

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
					DESIGN KAM				
					DRAWN BY KSA				
					CHECKED KAM				
					APPROVED KAM				
					DATE JULY/20				

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

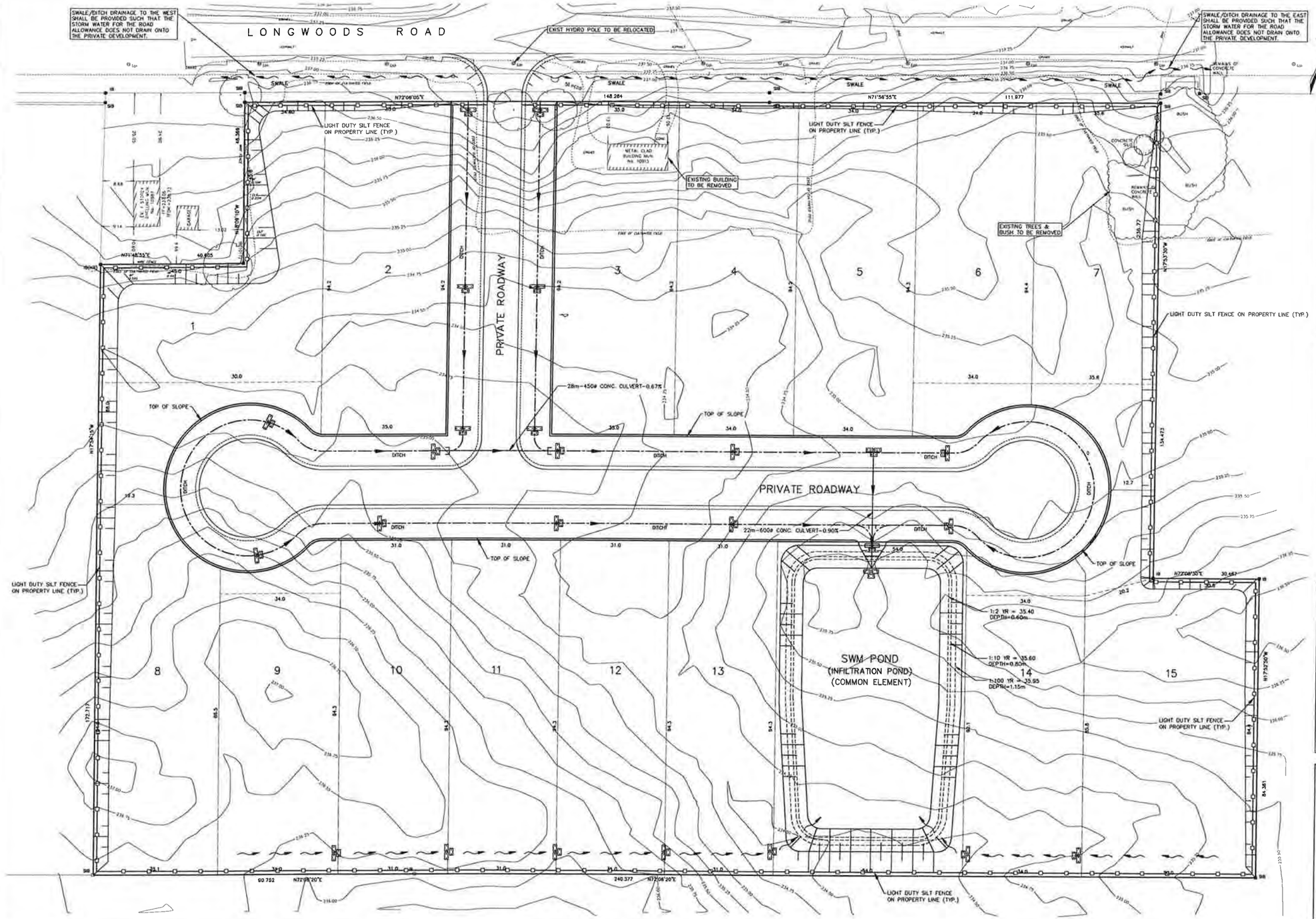
SCALE
SCALE – AS SHOWN

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

DETAILS

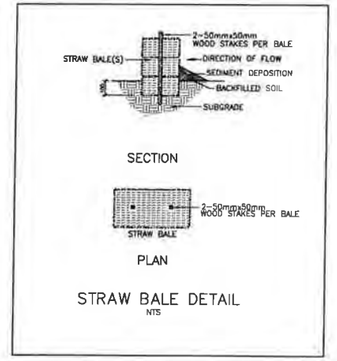
PROJECT No. 45013-200
SHEET No. 3
PLAN FILE No.

C:\USERS\USER\DESKTOP\LONGWOODS\45013-200 PLANS_DP1 (_MOD) MCLEAN



SEDIMENT CONTROL MEASURES

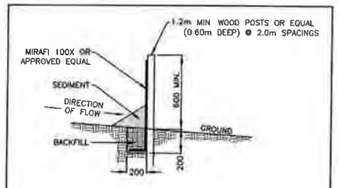
1. INSTALL SILT FENCE AROUND PERIMETER OF ENTIRE SITE INSTALL STRAW BALE CHECK DAMS AT ALL CBs IN GRASS AREAS
2. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION
3. ALL EROSION CONTROL MEASURES ARE TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE
4. MAINTAIN EROSION CONTROL MEASURES DURING ALL PHASES OF CONSTRUCTION
5. ALL COLLECTED SEDIMENT IS TO BE DISPOSED OF AT AN APPROVED LOCATION
6. PROTECT ALL SITE CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R)
7. PREVENT WIND BLOWN DUST.
8. STRAW BALES ARE TO BE USED AT ALL CB/CBMH AND IN LOCALIZED AREAS AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
9. WHEN ALL RESTORATION IS COMPLETED REMOVE SEDIMENT CONTROL MEASURES AND RESTORE IMPACTED AREAS.
10. ALL SILT FENCING AND DETAILS ARE AT THE MINIMUM TO BE CONSTRUCTED IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES
11. ALL OF THE ABOVE NOTES AND ANY SEDIMENT AND EROSION CONTROL MEASURES ARE AT THE MINIMUM TO BE IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES



STRAW BALE DETAIL
NTS

LEGEND

- PROPOSED SWALE
- TOP / BOTTOM — PROPOSED BERM (3:1 SLOPE MAXINUM)
- PROPOSED LIGHT DUTY SILT FENCE
- PROPOSED STRAWBALE CHECKDAM



LIGHT DUTY SILT FENCE DETAIL
NTS:

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS	No.	REVISIONS	DATE	CONSULTANT
					DESIGN KAM				
					DRAWN BY KKA				
					CHECKED KAM				
					APPROVED KAM				
					DATE JULY/20				

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE — 1: 500
5 0 10m

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

PRELIMINARY EROSION CONTROL PLAN

PROJECT No. 45013-200
SHEET No. 4
PLAN FILE No.

```
*******************************************************************************

  SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
  S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
  SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
      S  W W    M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
  SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9   =========
                                                        9   9  9   9   # 3057174
       StormWater Management HYdrologic Model            999    999   =========

*******************************************************************************
***************************** SWMHYMO Ver/4.05 ********************************
*********  A single event and continuous hydrologic simulation model  *********
*********     based on the principles of HYMO and its successors      *********
*********                OTTHYMO-83 and OTTHYMO-89.                   *********
*******************************************************************************
********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
*********                  Ottawa,  Ontario: (613) 836-3884           *********
*********                  Gatineau, Quebec: (819) 243-6858           *********
*********                  E-Mail: swmhymo@jfsa.Com                   *********
*******************************************************************************

+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+++++++++ Licensed user: MTE Consultants Inc.                          +++++++++
++++++++++                                        SERIAL#:3057174      ++++++++++
+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++

*******************************************************************************
*********            ++++++ PROGRAM ARRAY DIMENSIONS ++++++            *********
*********            Maximum value for ID numbers  :     10            *********
*********            Max. number of rainfall points: 105408            *********
*********            Max. number of flow points    : 105408            *********
*******************************************************************************


**********************  D E T A I L E D   O U T P U T  **********************
*******************************************************************************
*          DATE: 2020-06-25     TIME: 20:06:39     RUN COUNTER: 000932        *
*******************************************************************************
* Input   filename: Q:\45013\200\SWMHYMO\60%TIM~1\POST.dat                    *
* Output  filename: Q:\45013\200\SWMHYMO\60%TIM~1\POST.out                    *
* Summary filename: Q:\45013\200\SWMHYMO\60%TIM~1\POST.sum                    *
* User comments:                                                              *
* 1:_____________________________________________________________________     *
* 2:_____________________________________________________________________     *
* 3:_____________________________________________________________________     *
*******************************************************************************

-------------------------------------------------------------------------------
001:0001---------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date        : MARCH 2020
*#  Modeller    : [MFM]
*#  Company     : MTE CONSULTANTS INC.
*#  License #   :
*#*****************************************************************************
--------------------
| START            |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
--------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 001
    NSTORM=   1
          #  1=25mm.HYT
-------------------------------------------------------------------------------
001:0002---------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 25mm Chicago 4-hr duration
| Ptotal=  24.87 mm|    Comments: 25mm Chicago 4-hr duration
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	1.326	1.17	3.776	2.25	5.139	3.33	1.856
.17	1.391	1.25	4.485	2.33	4.485	3.42	1.774

.25	1.462	1.33	5.546	2.42	3.985	3.50	1.701
.33	1.543	1.42	7.297	2.50	3.589	3.58	1.633
.42	1.633	1.50	10.685	2.58	3.268	3.67	1.572
.50	1.737	1.58	19.538	2.67	3.003	3.75	1.515
.58	1.856	1.67	71.316	2.75	2.780	3.83	1.462
.67	1.994	1.75	39.586	2.83	2.590	3.92	1.414
.75	2.157	1.83	19.538	2.92	2.426	4.00	1.368
.83	2.352	1.92	12.622	3.00	2.283	4.08	1.326
.92	2.590	2.00	9.255	3.08	2.157		
1.00	2.887	2.08	7.297	3.17	2.045		
1.08	3.268	2.17	6.026	3.25	1.945		

```
-------------------------------------------------------------------------------
001:0003---------------------------------------------------------------------
*===============================================================================
*
*         PROPOSED SITE
*
*===============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*===============================================================================
---------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
---------------------
                                IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       3.99          2.66
     Dep. Storage      (mm)=       2.00          5.00
     Average Slope      (%)=       1.00          2.50
     Length             (m)=      80.00         80.00
     Mannings n          =         .015          .035

     Max.eff.Inten.(mm/hr)=      71.32         11.74
           over (min)            5.00         10.00
     Storage Coeff.  (min)=       2.79 (ii)    10.03 (ii)
     Unit Hyd. Tpeak (min)=       5.00         10.00
     Unit Hyd. peak  (cms)=        .28           .11
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .58           .05        .594 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.83       1.667
     RUNOFF VOLUME    (mm)=      22.87          4.72      13.798
     TOTAL RAINFALL   (mm)=      24.87         24.87      24.873
     RUNOFF COEFFICIENT   =        .92           .19        .555
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0      Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
001:0004---------------------------------------------------------------------
*===============================================================================
--------------------
| COMPUTE VOLUME   |
| ID:01  (201    ) |                DISCHARGE       TIME
--------------------                  (cms)         (hrs)
          START CONTROLLING AT        .000          1.000
          INFLOW HYD. PEAKS AT        .594          1.667
          STOP  CONTROLLING AT        .017          4.088

          REQUIRED STORAGE VOLUME (ha.m.)=     .0817
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .0918
          % OF HYDROGRAPH TO STORE       =  89.0146

          NOTE:  Storage was computed to reduce the Inflow
                 peak to      .017  (cms).

-------------------------------------------------------------------------------
001:0005---------------------------------------------------------------------
  ** END OF RUN :   1

*******************************************************************************
```

```
----------------------
| START              |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
---------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on         0
    METOUT=    2 (output = METRIC)
    NRUN  = 002
    NSTORM=    1
            #  1=2YR.HYT
-------------------------------------------------------------------------------
002:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date         : MARCH 2020
*#  Modeller     : [MFM]
*#  Company      : MTE CONSULTANTS INC.
*#  License #    :
*#*****************************************************************************
-------------------------------------------------------------------------------
002:0002-----------------------------------------------------------------------
---------------------
| READ STORM        |    Filename: 2YR Chicago 4-hr duration
| Ptotal=  44.77 mm|    Comments: 2YR Chicago 4-hr duration
---------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	1.904	1.17	6.297	2.25	8.958	3.33	2.787
.17	2.008	1.25	7.670	2.33	7.670	3.42	2.649
.25	2.126	1.33	9.770	2.42	6.698	3.50	2.524
.33	2.259	1.42	13.315	2.50	5.940	3.58	2.410
.42	2.410	1.50	20.302	2.58	5.334	3.67	2.307
.50	2.585	1.58	38.522	2.67	4.840	3.75	2.213
.58	2.787	1.67	131.990	2.75	4.430	3.83	2.126
.67	3.026	1.75	77.410	2.83	4.083	3.92	2.046
.75	3.310	1.83	38.522	2.92	3.788	4.00	1.972
.83	3.656	1.92	24.316	3.00	3.533	4.08	1.904
.92	4.083	2.00	17.342	3.08	3.310		
1.00	4.626	2.08	13.315	3.17	3.115		
1.08	5.334	2.17	10.734	3.25	2.942		

```
-------------------------------------------------------------------------------
002:0003-----------------------------------------------------------------------
*****************************************************************************
*
*         PROPOSED SITE
*
*****************************************************************************
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*****************************************************************************
---------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=       3.99          2.66
     Dep. Storage      (mm)=       2.00          5.00
     Average Slope      (%)=       1.00          2.50
     Length             (m)=      80.00         80.00
     Mannings n            =       .015          .035

     Max.eff.Inten.(mm/hr)=     131.99         45.94
            over (min)          5.00          5.00
     Storage Coeff.  (min)=      2.18 (ii)     6.38 (ii)
     Unit Hyd. Tpeak (min)=      5.00          5.00
     Unit Hyd. peak  (cms)=       .31           .18
                                                          *TOTALS*
     PEAK FLOW       (cms)=      1.13           .25        1.330 (iii)
     TIME TO PEAK    (hrs)=      1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=     42.77         14.82       28.792
     TOTAL RAINFALL   (mm)=     44.77         44.77       44.766
     RUNOFF COEFFICIENT   =       .96           .33         .643
```



```
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-------------------------------------------------------------------------------
002:0004-----------------------------------------------------------------------
*****************************************************************************
---------------------
| COMPUTE VOLUME    |
| ID:01  (201    )  |              DISCHARGE      TIME
---------------------                (cms)        (hrs)
          START CONTROLLING AT        .000         .750
          INFLOW HYD. PEAKS AT       1.330        1.667
          STOP  CONTROLLING AT        .017        4.127

          REQUIRED STORAGE VOLUME (ha.m.)=      .1808
          TOTAL HYDROGRAPH VOLUME (ha.m.)=      .1915
          % OF HYDROGRAPH TO STORE       =    94.4373

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .017  (cms).

-------------------------------------------------------------------------------
002:0005-----------------------------------------------------------------------
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
002:0002-----------------------------------------------------------------------
  ** END OF RUN :   2

*****************************************************************************
```

```
---------------------
| START              |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
---------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on         0
    METOUT=    2 (output = METRIC)
    NRUN  = 003
    NSTORM=    1
            #  1=5YR.HYT
-------------------------------------------------------------------------------
003:0002-----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date         : MARCH 2020
*#  Modeller     : [MFM]
*#  Company      : MTE CONSULTANTS INC.
*#  License #    :
*#*****************************************************************************
-------------------------------------------------------------------------------
003:0002-----------------------------------------------------------------------
---------------------
| READ STORM        |    Filename: 5YR Chicago 4-hr duration
| Ptotal=  46.48 mm|    Comments: 5YR Chicago 4-hr duration
---------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	2.193	1.17	6.775	2.25	9.452	3.33	3.145
.17	2.307	1.25	8.162	2.33	8.162	3.42	2.997
.25	2.435	1.33	10.261	2.42	7.181	3.50	2.863
.33	2.578	1.42	13.772	2.50	6.413	3.58	2.742
.42	2.742	1.50	20.639	2.58	5.795	3.67	2.631
.50	2.928	1.58	38.551	2.67	5.288	3.75	2.529
.58	3.145	1.67	134.791	2.75	4.865	3.83	2.435
.67	3.398	1.75	77.604	2.83	4.506	3.92	2.348
.75	3.698	1.83	38.551	2.92	4.199	4.00	2.268
.83	4.061	1.92	24.575	3.00	3.932	4.08	2.193
.92	4.506	2.00	17.735	3.08	3.698		

```
             1.00   5.068 |   2.08  13.772 |   3.17   3.492 |
             1.08   5.795 |   2.17  11.219 |   3.25   3.309 |

-----------------------------------------------------------------------------
003:0003-------------------------------------------------------------------------
*============================================================================
*
*         PROPOSED SITE
*
*============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*============================================================================
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.99          2.66
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          2.50
     Length            (m)=      80.00         80.00
     Mannings n          =        .015          .035

     Max.eff.Inten.(mm/hr)=     134.79         48.90
                over (min)        5.00          5.00
     Storage Coeff.  (min)=       2.16 (ii)     6.26 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .31           .19
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.16           .26        1.371 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=      44.48         15.84       30.160
     TOTAL RAINFALL   (mm)=      46.48         46.48       46.475
     RUNOFF COEFFICIENT   =        .96           .34         .649
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
003:0004-------------------------------------------------------------------------
*============================================================================
----------------------
| COMPUTE VOLUME     |
| ID:01  (201    )   |              DISCHARGE      TIME
----------------------                (cms)        (hrs)
          START CONTROLLING AT        .000         .667
          INFLOW HYD. PEAKS AT       1.371        1.667
          STOP  CONTROLLING AT        .017        4.136

          REQUIRED STORAGE VOLUME (ha.m.)=     .1896
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .2006
          % OF HYDROGRAPH TO STORE       =   94.5531

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .017  (cms).

-----------------------------------------------------------------------------
003:0005-------------------------------------------------------------------------
-----------------------------------------------------------------------------
003:0002-------------------------------------------------------------------------
-----------------------------------------------------------------------------
003:0002-------------------------------------------------------------------------
  ** END OF RUN :   3

****************************************************************************
```



```
----------------------
| START              |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
----------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on        0
    METOUT=    2 (output = METRIC)
    NRUN  = 004
    NSTORM=    1
           #  1=10YR.HYT
-----------------------------------------------------------------------------
004:0002-------------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date        : MARCH 2020
*#  Modeller    : [MFM]
*#  Company     : MTE CONSULTANTS INC.
*#  License #   :
*#***************************************************************************
-----------------------------------------------------------------------------
004:0002-------------------------------------------------------------------------
----------------------
| READ STORM         |    Filename: 10YR Chicago 4-hr duration
| Ptotal=  54.60 mm|    Comments: 10YR Chicago 4-hr duration
----------------------
             TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
              hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
              .08   2.343 |  1.17   7.804 |  2.25  11.115 |  3.33   3.439
              .17   2.473 |  1.25   9.514 |  2.33   9.514 |  3.42   3.267
              .25   2.618 |  1.33  12.124 |  2.42   8.304 |  3.50   3.112
              .33   2.783 |  1.42  16.521 |  2.50   7.361 |  3.58   2.971
              .42   2.971 |  1.50  25.144 |  2.58   6.607 |  3.67   2.843
              .50   3.187 |  1.58  47.356 |  2.67   5.991 |  3.75   2.726
              .58   3.439 |  1.67 156.469 |  2.75   5.481 |  3.83   2.618
              .67   3.735 |  1.75  93.617 |  2.83   5.050 |  3.92   2.519
              .75   4.089 |  1.83  47.356 |  2.92   4.682 |  4.00   2.428
              .83   4.518 |  1.92  30.071 |  3.00   4.365 |  4.08   2.343
              .92   5.050 |  2.00  21.499 |  3.08   4.089 |
             1.00   5.725 |  2.08  16.521 |  3.17   3.846 |
             1.08   6.607 |  2.17  13.321 |  3.25   3.631 |

-----------------------------------------------------------------------------
004:0003-------------------------------------------------------------------------
*============================================================================
*
*         PROPOSED SITE
*
*============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*============================================================================
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.99          2.66
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          2.50
     Length            (m)=      80.00         80.00
     Mannings n          =        .015          .035

     Max.eff.Inten.(mm/hr)=     156.47         65.88
                over (min)        5.00          5.00
     Storage Coeff.  (min)=       2.04 (ii)     5.67 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .31           .20
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.36           .37        1.666 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=      52.60         20.98       36.791
     TOTAL RAINFALL   (mm)=      54.60         54.60       54.596
     RUNOFF COEFFICIENT   =        .96           .38         .674
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
```

```
     (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
          THAN THE STORAGE COEFFICIENT.
    (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
004:0004-------------------------------------------------------------------------
*============================================================================
--------------------
| COMPUTE VOLUME   |
| ID:01  (201    ) |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
          START CONTROLLING AT      .000        .667
          INFLOW HYD. PEAKS AT     1.666       1.667
          STOP  CONTROLLING AT      .017       4.140

          REQUIRED STORAGE VOLUME (ha.m.)=     .2338
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .2447
          % OF HYDROGRAPH TO STORE       =   95.5422

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .017  (cms).

------------------------------------------------------------------------------
004:0005-------------------------------------------------------------------------
------------------------------------------------------------------------------
004:0002-------------------------------------------------------------------------
------------------------------------------------------------------------------
004:0002-------------------------------------------------------------------------
------------------------------------------------------------------------------
004:0002-------------------------------------------------------------------------
  ** END OF RUN :   4

*****************************************************************************



--------------------
| START            |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
--------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 005
    NSTORM=   1
          #  1=25YR.HYT
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date        : MARCH 2020
*#  Modeller    : [MFM]
*#  Company     : MTE CONSULTANTS INC.
*#  License #   :
*#***************************************************************************
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
--------------------
| READ STORM       |     Filename: 25YR Chicago 4-hr duration
| Ptotal=  64.33 mm|     Comments: 25YR Chicago 4-hr duration
--------------------
              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
               hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
               .08   2.569 |   1.17   9.034 |   2.25  13.050 |   3.33   3.836
               .17   2.718 |   1.25  11.103 |   2.33  11.103 |   3.42   3.636
               .25   2.885 |   1.33  14.280 |   2.42   9.637 |   3.50   3.456
               .33   3.075 |   1.42  19.656 |   2.50   8.499 |   3.58   3.292
               .42   3.292 |   1.50  30.223 |   2.58   7.593 |   3.67   3.144
               .50   3.543 |   1.58  57.277 |   2.67   6.856 |   3.75   3.009
               .58   3.836 |   1.67 184.478 |   2.75   6.246 |   3.83   2.885
               .67   4.183 |   1.75 112.342 |   2.83   5.734 |   3.92   2.771
               .75   4.598 |   1.83  57.277 |   2.92   5.298 |   4.00   2.666
               .83   5.104 |   1.92  36.251 |   3.00   4.923 |   4.08   2.569
               .92   5.734 |   2.00  25.756 |   3.08   4.598 |
              1.00   6.537 |   2.08  19.656 |   3.17   4.312 |
```



```
              1.08   7.593 |   2.17  15.741 |   3.25   4.060 |

------------------------------------------------------------------------------
005:0003-------------------------------------------------------------------------
*============================================================================
*
*         PROPOSED SITE
*
*============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*============================================================================
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      3.99          2.66
     Dep. Storage      (mm)=      2.00          5.00
     Average Slope      (%)=      1.00          2.50
     Length             (m)=     80.00         80.00
     Mannings n            =      .015          .035

     Max.eff.Inten.(mm/hr)=    184.48         89.26
                over (min)       5.00          5.00
     Storage Coeff.  (min)=      1.91 (ii)     5.12 (ii)
     Unit Hyd. Tpeak (min)=      5.00          5.00
     Unit Hyd. peak  (cms)=       .32           .21
                                                          *TOTALS*
     PEAK FLOW       (cms)=      1.62           .51        2.062 (iii)
     TIME TO PEAK    (hrs)=      1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=     62.33         27.63       44.977
     TOTAL RAINFALL   (mm)=     64.33         64.33       64.326
     RUNOFF COEFFICIENT   =      .97           .43         .699
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

------------------------------------------------------------------------------
005:0004-------------------------------------------------------------------------
*============================================================================
--------------------
| COMPUTE VOLUME   |
| ID:01  (201    ) |              DISCHARGE      TIME
--------------------                (cms)       (hrs)
          START CONTROLLING AT      .000        .583
          INFLOW HYD. PEAKS AT     2.062       1.667
          STOP  CONTROLLING AT      .017       4.144

          REQUIRED STORAGE VOLUME (ha.m.)=     .2880
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .2991
          % OF HYDROGRAPH TO STORE       =   96.2738

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .017  (cms).

------------------------------------------------------------------------------
005:0005-------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
------------------------------------------------------------------------------
005:0002-------------------------------------------------------------------------
  ** END OF RUN :   5

*****************************************************************************
```

```
--------------------
| START            |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
--------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on        0
    METOUT=    2 (output = METRIC)
    NRUN  = 006
    NSTORM=    1
          #  1=50YR.HYT
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date         : MARCH 2020
*#  Modeller     : [MFM]
*#  Company      : MTE CONSULTANTS INC.
*#  License #    :
*#*****************************************************************************
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 50YR Chicago 4-hr duration
| Ptotal=  71.91 mm|    Comments: 50YR Chicago 4-hr duration
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	2.864	1.17	10.121	2.25	14.636	3.33	4.283
.17	3.030	1.25	12.446	2.33	12.446	3.42	4.059
.25	3.218	1.33	16.018	2.42	10.799	3.50	3.856
.33	3.430	1.42	22.060	2.50	9.519	3.58	3.674
.42	3.674	1.50	33.926	2.58	8.501	3.67	3.508
.50	3.955	1.58	64.215	2.67	7.673	3.75	3.356
.58	4.283	1.67	205.106	2.75	6.988	3.83	3.218
.67	4.672	1.75	125.487	2.83	6.413	3.92	3.090
.75	5.137	1.83	64.215	2.92	5.924	4.00	2.973
.83	5.706	1.92	40.686	3.00	5.503	4.08	2.864
.92	6.413	2.00	28.913	3.08	5.137		
1.00	7.315	2.08	22.060	3.17	4.817		
1.08	8.501	2.17	17.661	3.25	4.535		

```
--------------------------------------------------------------------------------
006:0003----------------------------------------------------------------------
*==============================================================================
*
*         PROPOSED SITE
*
*==============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*==============================================================================
----------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
----------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.99          2.66
     Dep. Storage     (mm)=       2.00          5.00
     Average Slope     (%)=       1.00          2.50
     Length            (m)=      80.00         80.00
     Mannings n          =        .015          .035

     Max.eff.Inten.(mm/hr)=     205.11        108.38
                over (min)        5.00          5.00
     Storage Coeff.  (min)=       1.83 (ii)     4.80 (ii)
     Unit Hyd. Tpeak (min)=       5.00          5.00
     Unit Hyd. peak  (cms)=        .32           .22
                                                          *TOTALS*
     PEAK FLOW       (cms)=       1.81           .62       2.368 (iii)
     TIME TO PEAK    (hrs)=       1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=      69.91         33.10       51.505
     TOTAL RAINFALL   (mm)=      71.91         71.91       71.907
     RUNOFF COEFFICIENT   =        .97           .46         .716
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
```



```
        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN* =  74.0     Ia = Dep. Storage  (Above)
       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
            THAN THE STORAGE COEFFICIENT.
      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
006:0004----------------------------------------------------------------------
*==============================================================================
--------------------
| COMPUTE VOLUME   |
| ID:01  (201    ) |                DISCHARGE      TIME
--------------------                  (cms)        (hrs)
            START CONTROLLING AT      .000         .500
            INFLOW HYD. PEAKS AT     2.368        1.667
            STOP  CONTROLLING AT      .017        4.148

            REQUIRED STORAGE VOLUME (ha.m.)=     .3311
            TOTAL HYDROGRAPH VOLUME (ha.m.)=     .3425
            % OF HYDROGRAPH TO STORE       =   96.6711

            NOTE:  Storage was computed to reduce the Inflow
                   peak to     .017  (cms).

--------------------------------------------------------------------------------
006:0005----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
--------------------------------------------------------------------------------
006:0002----------------------------------------------------------------------
  ** END OF RUN :   6

*****************************************************************************


--------------------
| START            |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
--------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =    .00 hrs on        0
    METOUT=    2 (output = METRIC)
    NRUN  = 007
    NSTORM=    1
          #  1=100YR.HYT
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
*#*****************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date         : MARCH 2020
*#  Modeller     : [MFM]
*#  Company      : MTE CONSULTANTS INC.
*#  License #    :
*#*****************************************************************************
--------------------------------------------------------------------------------
007:0002----------------------------------------------------------------------
--------------------
| READ STORM       |    Filename: 100YR Chicago 4-hr duration
| Ptotal=  79.25 mm|    Comments: 100YR Chicago 4-hr duration
--------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	3.037	1.17	11.082	2.25	16.149	3.33	4.590
.17	3.218	1.25	13.689	2.33	13.689	3.42	4.344
.25	3.423	1.33	17.705	2.42	11.841	3.50	4.122
.33	3.655	1.42	24.509	2.50	10.408	3.58	3.921
.42	3.921	1.50	37.869	2.58	9.270	3.67	3.740

```
 .50   4.230 |  1.58  71.789 |  2.67   8.347 |  3.75   3.574
 .58   4.590 |  1.67 225.189 |  2.75   7.584 |  3.83   3.423
 .67   5.018 |  1.75 139.348 |  2.83   6.945 |  3.92   3.284
 .75   5.532 |  1.83  71.789 |  2.92   6.402 |  4.00   3.156
 .83   6.160 |  1.92  45.468 |  3.00   5.936 |  4.08   3.037
 .92   6.945 |  2.00  32.227 |  3.08   5.532 |
1.00   7.948 |  2.08  24.509 |  3.17   5.179 |
1.08   9.270 |  2.17  19.554 |  3.25   4.867 |

-----------------------------------------------------------------------------
007:0003-----------------------------------------------------------------------
*============================================================================
*
*        PROPOSED SITE
*
*============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*============================================================================
---------------------
| CALIB STANDHYD     |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
---------------------
                              IMPERVIOUS    PERVIOUS (i)
     Surface Area      (ha)=      3.99          2.66
     Dep. Storage      (mm)=      2.00          5.00
     Average Slope      (%)=      1.00          2.50
     Length             (m)=     80.00         80.00
     Mannings n            =      .015          .035

     Max.eff.Inten.(mm/hr)=    225.19        127.80
                over (min)       5.00          5.00
     Storage Coeff.  (min)=      1.76 (ii)     4.55 (ii)
     Unit Hyd. Tpeak (min)=      5.00          5.00
     Unit Hyd. peak  (cms)=       .32           .23
                                                          *TOTALS*
     PEAK FLOW       (cms)=      2.00           .74        2.675 (iii)
     TIME TO PEAK    (hrs)=      1.67          1.75        1.667
     RUNOFF VOLUME    (mm)=     77.25         38.61       57.933
     TOTAL RAINFALL   (mm)=     79.25         79.25       79.251
     RUNOFF COEFFICIENT   =      .97           .49         .731
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

-----------------------------------------------------------------------------
007:0004-----------------------------------------------------------------------
*============================================================================
---------------------
| COMPUTE VOLUME    |
| ID:01  (201    )  |              DISCHARGE      TIME
---------------------                (cms)        (hrs)
          START CONTROLLING AT       .000         .500
          INFLOW HYD. PEAKS AT      2.675        1.667
          STOP  CONTROLLING AT       .017        4.150

          REQUIRED STORAGE VOLUME (ha.m.)=     .3739
          TOTAL HYDROGRAPH VOLUME (ha.m.)=     .3853
          % OF HYDROGRAPH TO STORE       =   97.0423

          NOTE:  Storage was computed to reduce the Inflow
                 peak to      .017  (cms).

-----------------------------------------------------------------------------
007:0005-----------------------------------------------------------------------
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
```



```
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
-----------------------------------------------------------------------------
007:0002-----------------------------------------------------------------------
  ** END OF RUN :   7

*****************************************************************************
```

```
---------------------
| START              |  Project  dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
---------------------  Rainfall dir.: Q:\45013\200\SWMHYMO\60%TIM~1\
    TZERO =   .00 hrs on        0
    METOUT=   2 (output = METRIC)
    NRUN  = 008
    NSTORM=   1
           #  1=250YR.HYT
-----------------------------------------------------------------------------
008:0002-----------------------------------------------------------------------
*#***************************************************************************
*#  Project Name: [10919 LONGWOODS ROAD INDUSTRIAL SUBDIVISION]    Project Numbe
*#  Date        : MARCH 2020
*#  Modeller    : [MFM]
*#  Company     : MTE CONSULTANTS INC.
*#  License #   :
*#***************************************************************************
-----------------------------------------------------------------------------
008:0002-----------------------------------------------------------------------
---------------------
| READ STORM         |    Filename: 250YR Chicago 24-hr duration
| Ptotal= 113.56 mm|    Comments: 250YR Chicago 24-hr duration
---------------------
```

TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr	TIME hrs	RAIN mm/hr
.08	.561	6.17	1.474	12.25	3.107	18.33	.909
.17	.566	6.25	1.510	12.33	3.002	18.42	.901
.25	.571	6.33	1.548	12.42	2.904	18.50	.892
.33	.575	6.42	1.587	12.50	2.813	18.58	.884
.42	.580	6.50	1.629	12.58	2.727	18.67	.877
.50	.585	6.58	1.673	12.67	2.646	18.75	.869
.58	.590	6.67	1.720	12.75	2.570	18.83	.861
.67	.595	6.75	1.770	12.83	2.499	18.92	.854
.75	.600	6.83	1.822	12.92	2.431	19.00	.846
.83	.606	6.92	1.878	13.00	2.367	19.08	.839
.92	.611	7.00	1.938	13.08	2.307	19.17	.832
1.00	.617	7.08	2.001	13.17	2.249	19.25	.825
1.08	.622	7.17	2.070	13.25	2.195	19.33	.819
1.17	.628	7.25	2.143	13.33	2.143	19.42	.812
1.25	.634	7.33	2.222	13.42	2.093	19.50	.805
1.33	.640	7.42	2.307	13.50	2.046	19.58	.799
1.42	.646	7.50	2.399	13.58	2.001	19.67	.793
1.50	.652	7.58	2.499	13.67	1.959	19.75	.786
1.58	.658	7.67	2.608	13.75	1.917	19.83	.780
1.67	.665	7.75	2.727	13.83	1.878	19.92	.774
1.75	.671	7.83	2.858	13.92	1.840	20.00	.768
1.83	.678	7.92	3.002	14.00	1.804	20.08	.762
1.92	.685	8.00	3.162	14.08	1.770	20.17	.757
2.00	.692	8.08	3.340	14.17	1.736	20.25	.751
2.08	.699	8.17	3.540	14.25	1.704	20.33	.745
2.17	.706	8.25	3.766	14.33	1.673	20.42	.740
2.25	.714	8.33	4.023	14.42	1.643	20.50	.734
2.33	.721	8.42	4.318	14.50	1.615	20.58	.729
2.42	.729	8.50	4.659	14.58	1.587	20.67	.724
2.50	.737	8.58	5.059	14.67	1.561	20.75	.719
2.58	.745	8.67	5.533	14.75	1.535	20.83	.714
2.67	.754	8.75	6.103	14.83	1.510	20.92	.709
2.75	.762	8.83	6.800	14.92	1.486	21.00	.704
2.83	.771	8.92	7.672	15.00	1.463	21.08	.699
2.92	.780	9.00	8.788	15.08	1.440	21.17	.694
3.00	.789	9.08	10.262	15.17	1.418	21.25	.689

3.08	.799	9.17	12.284	15.25	1.397	21.33	.685
3.17	.809	9.25	15.202	15.33	1.377	21.42	.680
3.25	.819	9.33	19.711	15.42	1.357	21.50	.676
3.33	.829	9.42	27.388	15.50	1.338	21.58	.671
3.42	.839	9.50	42.582	15.58	1.319	21.67	.667
3.50	.850	9.58	81.716	15.67	1.301	21.75	.662
3.58	.861	9.67	265.689	15.75	1.283	21.83	.658
3.67	.873	9.75	161.512	15.83	1.266	21.92	.654
3.75	.884	9.83	81.716	15.92	1.250	22.00	.650
3.83	.896	9.92	51.283	16.00	1.233	22.08	.646
3.92	.909	10.00	36.148	16.08	1.218	22.17	.642
4.00	.922	10.08	27.388	16.17	1.202	22.25	.638
4.08	.935	10.17	21.793	16.25	1.187	22.33	.634
4.17	.948	10.25	17.962	16.33	1.173	22.42	.630
4.25	.962	10.33	15.202	16.42	1.158	22.50	.626
4.33	.977	10.42	13.133	16.50	1.145	22.58	.622
4.42	.992	10.50	11.532	16.58	1.131	22.67	.618
4.50	1.007	10.58	10.262	16.67	1.118	22.75	.615
4.58	1.023	10.67	9.232	16.75	1.105	22.83	.611
4.67	1.040	10.75	8.383	16.83	1.093	22.92	.607
4.75	1.057	10.83	7.672	16.92	1.080	23.00	.604
4.83	1.074	10.92	7.069	17.00	1.068	23.08	.600
4.92	1.093	11.00	6.551	17.08	1.057	23.17	.597
5.00	1.112	11.08	6.103	17.17	1.045	23.25	.593
5.08	1.131	11.17	5.711	17.25	1.034	23.33	.590
5.17	1.152	11.25	5.365	17.33	1.023	23.42	.587
5.25	1.173	11.33	5.059	17.42	1.013	23.50	.583
5.33	1.195	11.42	4.785	17.50	1.002	23.58	.580
5.42	1.218	11.50	4.540	17.58	.992	23.67	.577
5.50	1.241	11.58	4.318	17.67	.982	23.75	.574
5.58	1.266	11.67	4.117	17.75	.972	23.83	.571
5.67	1.292	11.75	3.934	17.83	.962	23.92	.567
5.75	1.319	11.83	3.766	17.92	.953	24.00	.564
5.83	1.347	11.92	3.613	18.00	.944	24.08	.561
5.92	1.377	12.00	3.471	18.08	.935		
6.00	1.408	12.08	3.340	18.17	.926		
6.08	1.440	12.17	3.219	18.25	.917		

```
008:0003----------------------------------------------------------------------------
*============================================================================
*
*         PROPOSED SITE
*
*============================================================================
*AREA 201 -> PROPOSED LONGWOODS ROAD INDUSTRIAL SUBDIVISION
*============================================================================
---------------------
| CALIB STANDHYD      |   Area    (ha)=    6.65
| 01:201    DT= 5.00 |   Total Imp(%)=   60.00   Dir. Conn.(%)=   50.00
---------------------
                          IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       3.99         2.66
     Dep. Storage     (mm)=       2.00         5.00
     Average Slope     (%)=       1.00         2.50
     Length            (m)=      80.00        80.00
     Mannings n          =        .015         .035

     Max.eff.Inten.(mm/hr)=     265.69       192.02
                over (min)        5.00         5.00
     Storage Coeff.  (min)=       1.65 (ii)    4.02 (ii)
     Unit Hyd. Tpeak (min)=       5.00         5.00
     Unit Hyd. peak  (cms)=        .32          .24
                                                          *TOTALS*
     PEAK FLOW       (cms)=       2.37         1.09         3.461 (iii)
     TIME TO PEAK    (hrs)=       9.67         9.67         9.667
     RUNOFF VOLUME    (mm)=     111.56        66.33        88.945
     TOTAL RAINFALL   (mm)=     113.56       113.56       113.558
     RUNOFF COEFFICIENT   =        .98          .58          .783
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN* =  74.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
```



```
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
008:0004--------------------------------------------------------------------------
*================================================================================
--------------------
| COMPUTE VOLUME   |
| ID:01  (201   )  |              DISCHARGE      TIME
--------------------                (cms)        (hrs)
          START CONTROLLING AT       .000        3.000
          INFLOW HYD. PEAKS AT      3.461        9.667
          STOP  CONTROLLING AT       .017       17.513

          REQUIRED STORAGE VOLUME (ha.m.)=      .5172
          TOTAL HYDROGRAPH VOLUME (ha.m.)=      .5915
          % OF HYDROGRAPH TO STORE       =    87.4426

          NOTE:  Storage was computed to reduce the Inflow
                 peak to     .017  (cms).

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     WARNINGS / ERRORS / NOTES
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 001:0003 CALIB STANDHYD
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
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                   Use a smaller DT or a larger area.
      *** WARNING: Storage Coefficient is smaller than DT!
                   Use a smaller DT or a larger area.
   Simulation ended on 2020-06-25     at 20:06:41
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Original Report:
Stage 1 & 2 Archaeological Assessment

Proposed Commercial Development, 10919 Longwoods Road, Delaware, Part of Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County, Ontario
Project # SWW181495

Archaeological Consulting License # P066 (O'Neal)
P.I.F. # P066-0302-2018 (Stage 1 & 2)

Prepared for:
10919 Longwood Road Inc.
10919 Longwoods Road, Delaware, Ontario, N0L 1E0

7-Jan-18

Stage 1 & 2 Archaeological Assessment

Proposed Commercial Development, 10919 Longwoods Road, Delaware, Part of Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County, Ontario

Project # SWW181495

Prepared for:

10919 Longwood Road Inc.
10919 Longwoods Road, Delaware, Ontario, N0L 1E0

Prepared by:

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7-Jan-18

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Executive Summary

Wood Environment & Infrastructure ("Wood") was retained by 10919 Longwood Road Inc. (the CLIENT) to conduct a Stage 1 and Stage 2 archaeological assessment in support of a commercial development. This assessment was triggered under the Planning Act and was conducted prior to development. The study area encompasses approximately 5.8 hectares (14.3 acres) and is located at 10919 Longwoods Road, in the town of Delaware. The property is legally described as Part of Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County, Ontario (Appendix A: Figures 1, 2 and 3).

The Stage 1 & 2 archaeological assessment was carried out in accordance with the Ontario Ministry of Tourism, Culture and Sport's ("MTCS") *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P066) held by Kristy O'Neal, Senior Archaeologist at Wood. The project information was acknowledged by the MTCS on 20 November 2018 with the approval of PIF number P066-0302-2018 (Stage 1 & 2). Permission to enter for the purposes of the assessment was granted to Wood by the CLIENT on 12 November 2018. This permission extended to all required fieldwork activities, including the recovery and removal of artifacts.

The Stage 1 property inspection was conducted by Kristy O'Neal (P066) of Wood on 04 December 2018. The Stage 2 pedestrian survey was also conducted on 04 December 2018 under the direction of Kristy O'Neal (P066), with the assistance of Luke Fischer (P219) and Chelsea Dickinson (R1194). The weather on 04 December 2018 was a mix of sun and clouds with an approximate temperature of 2 degrees Celsius, which did not impede the inspection or survey in any way.

The Stage 1 background study indicated that the subject property has archaeological potential and warrants Stage 2 property assessment for four principal reasons: 1) the close proximity of a natural water source, Sharon Creek, 300 m to the south; 2) the known presence of six archaeological sites within a 1-km radius (two of which are within 250 m), providing direct evidence that this general area had been exploited by both pre-contact Aboriginal and historic period Euro-Canadian peoples; 3) the presence of an historical transportation route, Longwoods Road, within 100 m; and 4) the proximity of a 1-½ storey brick house as listed in the 1861 historical census.

Based on the Stage 1 property inspection and a review of recent land-use history, Wood has identified that 100% (5.8 hectares) of the study area has archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 7). Because the study area is an agricultural field, it is recommended that Stage 2 assessment be carried out by means of pedestrian survey at five-metre intervals.

No artifacts or other archaeological resources were identified as a result of the Stage 2 property assessment. According to the *Standards and Guidelines for Consultant Archaeologists*, the property has now been completely assessed and does not require any additional fieldwork.

In light of the results presented above, the following recommendations are made, subject to the conditions outlined below and in Section 5.0:

The Study Area requires no further archaeological assessment.

The above recommendation is subject to Ministry of Tourism, Culture and Sport approval, and it is an offence to alter any of the Study Area without Ministry of Tourism, Culture, and Sport concurrence.

No grading or other activities that may result in the destruction or disturbance of the Study Area is permitted until notice of Ministry of Tourism, Culture, and Sport approval has been received.

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Project Personnel

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Report Reviewer:	Barbara Slim, M.A.

1.0 Project Context

1.1 Development Context

Wood Environment & Infrastructure ("Wood") was retained by 10919 Longwood Road Inc. (the CLIENT) to conduct a Stage 1 and Stage 2 archaeological assessment in support of a commercial development. This assessment was triggered under the Planning Act and was conducted prior to development. The study area encompasses approximately 5.8 hectares (14.3 acres) and is located at 10919 Longwoods Road, in the town of Delaware. The property is legally described as Part of Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County, Ontario (Appendix A: Figures 1, 2 and 3).

The Stage 1 & 2 archaeological assessment was carried out in accordance with the Ontario Ministry of Tourism, Culture and Sport's ("MTCS") *Standards and Guidelines for Consultant Archaeologists* (2011), under an Ontario Professional Licence to Conduct Archaeological Fieldwork (P066) held by Kristy O'Neal, Senior Archaeologist at Wood. The project information was acknowledged by the MTCS on 20 November 2018 with the approval of PIF number P066-0302-2018 (Stage 1 & 2). Permission to enter for the purposes of the assessment was granted to Wood by the CLIENT on 12 November 2018. This permission extended to all required fieldwork activities, including the recovery and removal of artifacts.

The Stage 1 property inspection was conducted by Kristy O'Neal (P066) of Wood on 04 December 2018. The Stage 2 pedestrian survey was also conducted on 04 December 2018 under the direction of Kristy O'Neal (P066), with the assistance of Luke Fischer (P219) and Chelsea Dickinson (R1194). The weather on 04 December 2018 was a mix of sun and clouds with an approximate temperature of 2 degrees Celsius, which did not impede the inspection or survey in any way.

This report presents the results of the Stage 1 background study and Stage 2 property assessment and makes pertinent recommendations.

1.2 Scope of Work

This Stage 1 and 2 archaeological assessment was carried out in accordance with the Terms of Reference provided in Wood's work agreement dated 11 October 2018.

A Stage 1 archaeological assessment is a systematic qualitative process executed in order to assess the archaeological potential of a property based on its historical use and its potential for early Euro-Canadian (early settler) and pre-contact Aboriginal occupation. The objectives of a Stage 1 background study are: 1) to provide information about the property's geography, history, previous archaeological fieldwork and current land condition; 2) to evaluate in detail the property's archaeological potential which will support recommendations for Stage 2 property assessment for all or parts of the property if warranted; and, 3) to recommend appropriate strategies for Stage 2 property assessment if warranted.

The Stage 1 background study was conducted in accordance with the *Standards and Guidelines for Consultant Archaeologists, 2011,* set out by the MTCS, and with the Ontario Heritage Act, R.S.O. 1990, c.0.18.

The scope of work for the Stage 1 background study consisted of the following tasks:

- Contacting the MTCS to determine if recorded archaeological sites exist in the vicinity (one-kilometre ["km"] radius) of the property, through a search of the Ontario Archaeological Sites Database maintained by that Ministry;
- Contacting the MTCS to determine if there are any known reports of previous archaeological field work within a radius of 50 metres ("m") around the study area;
- A desktop review of the study area's physical setting to determine its potential for both historic and pre-contact human occupation, including its topography, hydrology, soils, vegetation, and proximity to important resources and historic transportation routes;
- A review of the potential for historic occupation as documented in historical atlases and other archival sources;
- A visual inspection of the study area in order to gather first-hand and current evidence of the property's physical setting, and to aid in delineating areas where archaeological potential may have been impacted or removed by previous land-use practices.

The scope of work for the Stage 2 archaeological assessment consisted of the following tasks:

- A pedestrian survey conducted at five-m intervals for any ploughable land employing strategies that adhere to the technical standards for Stage 2 archaeological assessments as prescribed by the MTCS (2011);
- Mapping, photographing and other relevant graphics;
- Artifact processing and analysis; and,
- Preparing a report of findings with recommendations regarding the need for further archaeological work if deemed necessary.

Sites discovered during a Stage 2 assessment that are determined to have cultural value or interest may be recommended for a Stage 3 site-specific assessment.

2.0 Stage 1 Background Study

As part of the Stage 1 archaeological assessment, Wood searched MTCS's PastPort system to determine if archaeological sites have been registered within 1 km of the property (Section 2.1.1), and if previous archaeological assessments have been carried out within a 50-m radius (Section 2.1.2). Secondly, the principal determinants of archaeological potential–proximity to water, topography, drainage, soils, vegetation, and proximity to important resources and historically significant transportation routes–were examined in order to evaluate the property's overall archaeological potential (Sections 2.1, 2.1.3, 2.2, and 2.2.1). Thirdly, the specific potential for historic archaeological resources was assessed through an examination of available historical maps and other archival sources (Section 2.2).

2.1 Archaeological Context

2.1.1 Registered Archaeological Sites

Wood conducted the requisite Stage 1 background research. First, Wood searched MTCS's PastPort system in order to ascertain if previously registered archaeological sites have been identified in close proximity to the study area.

In Ontario, information concerning archaeology sites is stored in the Ontario Archaeological Sites Database (OASD) maintained by the MTCS. This database contains archaeological registered sites within the Borden system. Under the Borden system, Canada has been divided into grid blocks based on longitude and latitude. A Borden block is approximately 13 km east to west, and approximately 18.5 km north to south. Each Borden block is referred to by a four-letter designation and sites located within the block are numbered sequentially as they are found. The subject property is located within the *AfHi* Borden Block. On the basis of a search of the OASD through PastPort on 19 November 2018, there are no registered sites within the study area and six registered archaeological sites located within a 1-km radius.

Table 1 provides a summary of these sites.

Table 1: Registered Archaeological Sites within a 1-km Radius

Borden Number	Site Name	Cultural Affiliation	Site Type	Researcher	Distance to Study Area	Status
AfHi-148	Alison	Pre-contact Aboriginal	Unknown	Wilson (1993) Martelle (2003)	185 m	No further Cultural Heritage Value or Interest (CHVI)
AfHi-149	Nursary	Early Woodland	Findspot	Wilson (1993) Martelle (2003)	265 m	No further CHVI
AfHi-153	Raccoon	Pre-contact Aboriginal	Unknown	Wilson (1993) Martelle (2003)	450 m	No further CHVI
AfHi-253		Pre-contact Aboriginal	Lithic Scatter	Wilson (2000)	835 m	No further CHVI
AfHi-323	Dairy	Pre-contact Aboriginal	Findspot	Martelle (2003)	235 m	No further CHVI

Table 1: Registered Archaeological Sites within a 1-km Radius						
Borden Number	**Site Name**	**Cultural Affiliation**	**Site Type**	**Researcher**	**Distance to Study Area**	**Status**
AfHi-334		Euro-Canadian	Midden	Wilson (1993)	460 m	Unknown

2.1.2 History of Archaeological Investigations

Wood completed a search for reports directly on PastPort on 27 November 2018. Based on this search (by address, lot and concession and above mentioned archaeological sites), two archaeological assessments have been conducted within 50 m of the subject lands. A request was made to the MTCS to obtain copies of these reports on 27 November 2018. At the time of the writing of this report, copies of the requested reports had still not been made available.

Based on site information available in PastPort, an assessment was completed on lands to the north by Jim Wilson in 1993 (MTCS 2019). As the report was not available for review, the size of the study area and the results of the assessment are unknown. An additional Stage 1 to 3 assessment was completed on lands to the north by Timmins Martelle Heritage Consultants (TMHC) in 2003 (MTCS 2019). Again, because the report was not available for review the study area limits and results of the assessment are unknown.

Information available in PastPort indicates that there are two sites located within 250 m of the current study area, and a third site located 265 m away. Site AfHi-149, the Alison site, is located 185 m from the current study area. According to the site information available in PastPort, the site was investigated by Jim Wilson in 1993 and again in 2003 by TMHC. The site consists of six flakes, four fire-cracked rocks, a core and a biface (MTCS 2019). The site has no further cultural heritage value or interest (CHVI).

The Dairy Site, AfHi-323 is single artifact findspot investigated by TMHC (MTCS 2019). The site consists of an isolated projectile point of indeterminate type, found 235 m from the current study area. The site has no further CHVI.

The Nursary Site, AfHi-149 is located 265 m from the current study area. PastPort indicates the site was investigated by Jim Wilson in 1993 and by TMHC in 2003. The site measures 40 m by 30 m and consists of four flakes, one biface, one scraper, and ten fire-cracked rocks. The site was subjected to Stage 2 pedestrian survey and Stage 3 test unit excavation (MTCS 2019). The site has no further CHVI.

2.1.3 Environmental Context

The study area (Appendix A: Figures 1–3) is situated in the Caradoc Sand Plain physiographic region (Chapman and Putnam 1984: 113). This area is a basin that formed one of the earliest glacial spillways, which left beds of silt and fine sand. There are two dominant surface soils within the study area. The northern portion consists of Watford very fine sandy loam. The southern portion consists of Brookston fine sandy loam. Both of these soil types are characterized by well to imperfect drainage and very gently sloping topography (Hagerty and Kingston 1992).

It is crucial to consider the proximity of water sources in any evaluation of archaeological potential because the availability of water is arguably the single most important determinant of human land use, past and present. The 2011 MTCS *Standards and Guidelines for Consultant Archaeologists* (S&G) lists proximity to water as one of the prime indicators of potential for the presence of archaeological sites. Distance from potable water has been one of the most commonly used variables for predictive modeling of site location. Water, both potable and non-potable, also facilitated the transportation of people and goods and served to focus animal and vegetable resources. According to the S&G, lands within 300 m of an extant or formerly mapped river or creek have potential for the presence of early Aboriginal or Euro-Canadian archaeological sites. The nearest water source is Sharon Creek, a tributary of the Thames River, which is situated 300 m to the south. The Thames River itself is located 1.2 km to the west.

In summary, a review of the archaeological context supports a conclusion of overall archaeological potential and the need for a Stage 2 assessment. Natural water sources are located within 300 m of the study area, including Sharon Creek. Moreover, we have direct evidence that the immediate vicinity of the study area had been intensively exploited by both pre-contact Aboriginal and historic Euro-Canadian peoples in that six sites have previously been registered within a 1-km radius, and two of these sites–AfHi-148 and AfHi-323–were found less than 250 m away.

2.2 Historical Context

2.2.1 Cultural History of Southwestern Ontario

The majority of interpretations of pre-contact Aboriginal adaptations in Ontario derive from the analysis and interpretation of stone tools. Stone tools are made from specific types of rocks that fracture in ways that can be controlled, so that they are easily shaped into useful forms. These rocks include chert, chalcedony, quartzite, petrified wood, and volcanic glass, known as obsidian. Most stone tools found in southern Ontario are formed from types of chert that outcrop in local limestone formations, such as: Onondaga and Haldimand cherts, found near the north shore of Lake Erie; Kettle Point chert, which outcrops near Lake Huron; and Collingwood chert, which outcrops along the Niagara Escarpment near Georgian Bay.

Stone tools used as spear tips and arrowheads are the most commonly studied tool type. These are referred to as projectile points. As projectile point technology changed over time, styles and shapes of points changed also. Studying these changing point types has resulted in the development of a chronological framework for pre-contact times prior to 3,000 years ago, when First Nations groups began to make clay pottery. Later periods are defined both by point types and pottery characteristics. Radiocarbon dating of archaeological sites can only be done when organic materials are collected from those sites, so the dating of most sites is done by comparing the artifacts from dated sites to those from undated sites. The following is an overview of the pre-contact history of southern Ontario as understood by archaeologists.

The cultural history of southern Ontario began approximately 11,000 years ago when the glaciers had melted, and the land was re-exposed. The land was quickly settled by bands of hunters and gatherers who are thought to have been large game hunters. These people used large spear points that are distinctively shaped with long central grooves, called “flutes”. Archaeologists have defined a number of point types that date to this time, including Gainey, Barnes, Crowfield, and

Hi-Lo types. This period is referred to as the Paleo-Indian Period and it is thought to have lasted until approximately 9,000 years ago.

After 9,500 years ago, there was a long period when the climate was variable, and the bare lands left by the glaciers were becoming re-forested, resulting in patchier, more diverse ecozones. During this time, which lasted until 3,000 years ago, people were adapting to diverse environmental settings. There appears to have been more reliance on local stone for making tools and more variable tool manufacturing technologies. The adoption of a spear-throwing board, known as an atlatl, was an important innovation, resulting in the ability to throw smaller darts with more force. Projectile points from this period, called the Archaic Period, are commonly side or corner-notched and are smaller than those of the preceding period. The Archaic adaptation is generally thought to have centred on localized resources, often forest resources, and groups of people are thought to have been less mobile, an adaptation that continued to develop until the arrival of Europeans.

In southern Ontario, the Archaic Period is divided into the Early, Middle and Late Archaic. Early point types include serrated Nettling and Bifurcate Base points. Middle types include Brewerton Corner Notched and Otter Creek, and Late types include Lamoka, Genesee, Crawford Knoll, and Innes. Most of these are named after sites where they were first identified.

The Archaic Period is followed by the Woodland Period. The major technological change in the Early Woodland Period is the introduction of pottery. During this time, people are thought to have developed more community organization and the manufacture of clay pottery is thought to indicate less residential mobility. Burial sites dating to this time often display evidence of ceremonial activities. Projectile points made at this time include much smaller types, probably used as arrow tips. Point types include Meadowood and Kramer and early ceramics were crudely-made vessels with conoidal (pointed) bases. The Early Woodland Period transitioned into the Middle Woodland Period approximately 2,400 years ago.

During the Middle Woodland Period in southern Ontario community and kin identity became more deeply entrenched, and more sedentary communities developed. Point types made at this time include Saugeen, Vanport, and Snyders. Ceramic vessels were conoidal in shape but were decorated with stamped designs in the soft clay. The Middle Woodland Period transitioned into the Late Woodland Period A.D. 500–900 with the earliest direct evidence for agriculture.

The Late Woodland Period saw the development of recognizable Iroquoian and Algonkian cultures in southern Ontario, characterized by the intensification of agriculture and the increased utilization of corn. Greater sedentism led to increasing settlement populations and greater complexity of settlement organization. Sites dating to this time are often found on terraces overlooking the floodplains of large rivers. Iroquoian villages tended to be small, palisaded compounds with longhouses occupied by families. As the Late Woodland Period progressed, more intercommunity communication and integration became necessary to maintain the sedentary agricultural way of life. Later Iroquoian villages were larger and more heavily palisaded, and longhouses were larger also.

When European explorers and missionaries arrived in southern Ontario in the early seventeenth century, they described the local Iroquoian social organization as being under the direction of

elected chiefs. Tribal confederacies and allegiances resulted in intertribal warfare, which was only made worse by the European presence. Three Ontario Iroquoian confederacies, the Huron, Petun, and Neutral, were driven from their traditional territories before the middle of the seventeenth century.

Archaeologists tend to describe a period of transition from Late Woodland to Historic times as "proto-historic". The dating of this period is variable and may be different from site to site within a region as it describes a time when local First Nations were acquiring European trade goods indirectly through other Aboriginal middlemen rather than directly from European traders. This period was generally very short and is often difficult to differentiate archaeologically from later historic times, when trade goods were widely available, but it usually is identified by evidence of an intact traditional cultural adaptation with occasional European items used in traditional ways.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario

Period	Complexes/Cultures, Some Diagnostic Artifacts
Early Paleo-Indian (9000–8500 B.C.)	Small nomadic hunter-gatherer bands. Early Paleo-Indian (EPI) rarely found in Eastern Ontario. Gainey, Barnes, Crowfield fluted points.
Late Paleo-Indian (8500–7500 B.C.)	Small nomadic hunter-gatherer bands. Hi-Lo, Holcombe points, Lanceolate Bifaces.
Early Archaic (7500–6000/4500 B.C.)	Small nomadic hunter-gatherer bands. Nettling, Stanley/Neville points.
Middle Archaic (6000/4500–2500 B.C.)	Transition to territorial settlements. Seasonal round of subsistence introduced. Thebes (6000–5000 B.C.), Otter Creek points (4500–3000 B.C.). **Brewerton Complex (3000–2500 B.C.).** Brewerton points. **Laurentian Complex (6000 B.C.–2500 B.C.)** (Eastern Ontario)
Late Archaic (2500–1000 B.C.)	More numerous territorial hunter- gatherer bands, increasing use of exotic materials and artistic items for grave offerings, regional trade networks. **Narrowpoint Complex (2500–1850 B.C.).** Lamoka points. **Broadpoint Complex (1850–1650 B.C.).** Adder Orchard, Genesee points. **Smallpoint Complex (1650–1000 B.C.).** Crawford Knoll, Innes points. **Terminal Archaic (1100–1000 B.C.) Glacial Kame Complex.** Hind points.
Early Woodland (1000–400 B.C.)	Pottery introduced. Meadowood Notched points, Meadowood Cache Blades, Kramer, Adena points. **Meadowood Complex (1000–400 B.C.).** **Middlesex Complex (650–400 B.C.).** Introduction of true cemeteries.
Middle Woodland (400 B.C.–A.D. 500/900)	Saugeen, Snyders, Vanport, Port Maitland points. **Point Peninsula Complex** (Southcentral and Eastern Ontario) **Saugeen Complex** (southeast of Lake Huron and the Bruce Peninsula, London area, and possibly as far east as the Grand River) **Couture Complex** (Lake St. Clair and the western end of Lake Erie). Burial ceremonialism.

Table 2: Simplified Cultural Chronology of Southern and Eastern Ontario	
Period	**Complexes/Cultures, Some Diagnostic Artifacts**
Transitional Woodland (A.D. 500–900)	Agriculture introduced. Levanna, Jacks Reef points. **Princess Point Complex** (Eastern end of Lake Erie and the western end of Lake Ontario). **Rivière au Vase Phase of the Younge / Western Basin Tradition** (Lake St. Clair and western end of Lake Erie) **Sandbanks Complex** (Kingston area).
Late Woodland (A.D. 900–1650)	Tribal differentiation. Transition to settled village life. Dewaele, Glen Meyer Tanged, Triangular Nanticoke, Notched Nanticoke, Triangular Daniels/Madison points. **Ontario Iroquoian and St. Lawrence Iroquoian Traditions** (Southcentral and Eastern Ontario, respectively). **Algonkian Western Basin Tradition** (Lake St. Clair and the western end of Lake Erie).
Early Post-Contact (A.D. 1650–1763)	Iroquoian, Algonkian migrations and resettlement. French exploration and colonization
Late Post-Contact (A.D. 1763–1867)	Iroquoian, Algonkian migrations and resettlement. British and other European immigration increases.

Archaeologically, the years since the arrival of Europeans are referred to as the Historic Period. In southern Ontario, significant Historic sites are those that have an affiliation with an important historic event, figure, or family, but can also be anything dating to the original European settlement of a region. Often, these sites date to before A.D. 1830.

2.2.2 Review of Historical Records

The study area is located within the Township of Delaware. Middlesex County. Middlesex County was first settled in 1793 after Lieutenant Governor of Upper Canada, John Graves Simcoe passed through the area (Page 1878). Simcoe determined that the landscape along the Thames River made a suitable location for the future capital of Upper Canada. This plan was not realized; however, London, located at the forks of the Thames River, did become an important city (Mika and Mika, 1981). Much of Middlesex County is comprised of rich agricultural lands, which are drained by the Thames River and its tributaries (Page 1878).

The first permanent settlement of Middlesex County was established in the Township of Delaware in 1801 (Page, 1878). The first settlement was near the Thames River, specifically in the village of Delaware (Mika & Mika, 1977). The township of Delaware thrived because of the early construction of Longwoods Road which connected the township to Chatham (Page, 1878:5). During the War of 1812, Longwoods Road was an important route for transportation of artillery and other war supplies (Page, 1878: 6).

The study area is located approximately 1.2 km east of the historic community of Delaware. Delaware was named after the township and is one of the oldest settlements in Middlesex County. The earliest settler was Ebenezer Allen, who arrived in 1794 and was granted 2,000 acres of land. Allen was originally from New Jersey and had served with Butler's Rangers during the American

Revolution (Goodspeed 1889). He built a grist mill around which early settlement grew (Mika & Mika 1977). A fire destroyed much the settlement and the present village of Delaware was laid out nearby by Henry Rawlings. In 1842, Delaware was chosen as the early township centre and the village grew considerably in the mid-nineteenth century due to construction of plank roads to nearby Port Stanley and London. Once the Great Western and London and Port Stanley Railways were completed, trade was diverted from Delaware and the village's prosperity declined (Mika & Mika 1977). Delaware had a population of 300 in 1886 (Carter 1984: 300).

Historical records and mapping were examined for evidence of early Euro-Canadian use of the study area. The study area was located on Part of Lot 6, Concession 1, in the Geographic Township of Delaware, Middlesex County.

The 1862 *Tremaine's Map of the County of Middlesex* (Tremaine 1862) was examined in an effort to determine the potential for historic archaeological evidence within the study area, which at that time appears to be under the ownership of Mr. Weld (Appendix A: Figure 5). The study area is located directly south of Longwoods Road, an historic transportation route. No historical features shown on the lot, but the study area is just over 1 km from the town of Delaware at that time.

A William Weld, aged 36, appears in only the 1861 Canada census records. He is listed as a farmer married to Agnes Weld, age 34. At the time they had six children between the ages of 2 and 14, and the family belonged to the Church of England. William was born in England, Agnes was born in Scotland, and all six children were born in Upper Canada. A brick 1-½ storey house is listed on the lot (Library and Archives Canada 2018).

In addition, the *1878 Illustrated Historical Atlas of Middlesex County* (Page 1878; Appendix A: Figure 6) was examined. In 1878, the subject property was under the ownership of S.J. Merrill. Historical features are not illustrated within the study area. However, the study area is once again depicted directly south of Longwoods Road, and east of the historical limits of Delaware. A number of homesteads are illustrated in Lot 5, to the north of Longwoods Road.

A Sylvester Merrill, aged 30, first appears in the 1881 Canada census records. He is listed as a farmer married to Hannah Merrill, age 26. Both Sylvester and Hannah were Methodists who were born in England (Library and Archives Canada 2018).

In summary, a review of the historical context supports a conclusion of overall archaeological potential and the need for a Stage 2 assessment since the study area is located adjacent to historical roadways as illustrated in the 1862 and 1878 historical maps consulted. Moreover, a brick 1-½ storey house is listed in the 1861 census. As per the MTCS's *Standards and Guidelines for Consultant Archaeologists*, any areas within 100 m of early historic transportation routes and 300 m of early Euro-Canadian settlement warrant the need for a Stage 2 property assessment.

2.2.3 Historical Plaques

There are no historical plaques located within 1-km of the study area.

2.3 Stage 1 Property Inspection

2.3.1 Methodology

The Stage 1 property inspection was conducted by Kristy O'Neal (P066) of Wood on 04 December 2018 to confirm archaeological site potential and to determine the degree to which development and landscape alteration have affected that potential. The weather that day was sunny to cloudy and cool (2°C) and did not impede the inspection in any way.

The Stage 1 property inspection included a walk-through of the entire property, which measures approximately 5.8 ha and is made up entirely of ploughed agricultural field. The property inspection was thoroughly photo-documented. Field observations were recorded on aerial maps and field forms. All land conditions were recorded as shown in Appendix A: Figure 7 and Appendix B: Photographs 1–4.

2.3.2 Results

The study area consists of a 5.8-ha ploughed agricultural field. The entire property exhibits archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 7; Appendix B: Photographs 1–4).

2.4 Stage 1 Analysis and Conclusions

The Stage 1 background study indicated that the subject property has archaeological potential and warrants Stage 2 property assessment for four principal reasons: 1) the close proximity of a natural water source, Sharon Creek, 300 m to the south; 2) the known presence of six archaeological sites within a 1-km radius (two of which are within 250 m), providing direct evidence that this general area had been exploited by both pre-contact Aboriginal and historic period Euro-Canadian peoples; 3) the presence of an historical transportation route, Longwoods Road, within 100 m; and 4) the proximity of a 1-½ storey brick house as listed in the 1861 historical census.

Based on the Stage 1 property inspection and a review of recent land-use history, Wood has identified that 100% (5.8 hectares) of the study area has archaeological potential and warrants Stage 2 assessment (Appendix A: Figure 7). Because the study area is an agricultural field, it is recommended that Stage 2 assessment be carried out by means of pedestrian survey at five-metre intervals.

3.0 Stage 2 Property Assessment

3.1 Methodology

The Stage 2 assessment was conducted under the direction of Kristy O'Neal (P066), with the assistance of Luke Fischer (P219) and Chelsea Dickinson (R1194), on 04 December 2018. The weather was sunny to cloudy and cool with a temperature of 2°C and did not impede the assessment in any way.

Stage 2 pedestrian survey was conducted at 5-m intervals on 100% of the property (5.8 hectares). The land had earlier been prepared by being ploughed to the depth of previous ploughing and allowed to weather through several rainfalls. At least 90% of the ground surface was visible at the time of the Stage 2 assessment.

The Wood field crew photo-documented the assessment (Appendix A: Figure 8; and Appendix B: Photographs 1–6).

3.2 Record of Finds

The study area was subjected to comprehensive pedestrian survey at 5-m intervals (Appendix A: Figure 8; Appendix B: Photograph 5).

No artifacts or other archaeological resources were identified during the Stage 2 assessment.

The following table provides the inventory of documentary records accumulated as part of this assessment.

Table 3: Inventory of Documentary Record

Study Area	Map and Photo(s)	Field Notes
10919 Longwoods Road, Delaware, Part Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County	Copies of 2 historical maps, 6 Stage 1 & 2 photographs and 1 aerial photograph	Stage 1 & 2 photo logs and field notes

Documentation related to the archaeological assessment of this project will be curated by Wood until such time that arrangements for their ultimate transfer to Her Majesty the Queen in right of Ontario, or other public institution, can be made to the satisfaction of the project owner, the MTCS and any other legitimate interest groups.

3.3 Stage 2 Analysis and Conclusions

The Stage 1 archaeological assessment determined that entire property had archaeological potential and required Stage 2 archaeological assessment (Appendix A: Figure 7). Because the study area was an actively cultivated agricultural field, it was assessed by means of pedestrian survey (Appendix A: Figure 8).

No artifacts or other archaeological resources were identified as a result of the Stage 2 assessment. According to the *Standards and Guidelines for Consultant Archaeologists*, the property has now been completely assessed and does not require any additional fieldwork.

4.0 Recommendations

In light of the results presented above, the following recommendations are made, subject to the conditions outlined below and in Section 5.0:

1) The study area requires no further archaeological assessment.

The above recommendation is subject to Ministry of Tourism, Culture and Sport approval, and it is an offence to alter any of the Study Area without Ministry of Tourism, Culture, and Sport concurrence.

No grading or other activities that may result in the destruction or disturbance of the Study Area is permitted until notice of Ministry of Tourism, Culture, and Sport approval has been received.

5.0 Advice on Compliance with Legislation

a) This report is submitted to the Minister of Tourism, Culture and Sport as a condition of licensing in accordance with Part IV of the *Ontario Heritage Act, R.S.O. 1990, c 0.18*. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the Ministry of Tourism, Culture and Sport, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.

b) It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such a time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeological Reports referred to in Section 65.1 of the *Ontario Heritage Act*.

c) Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.

d) The *Funeral, Burial and Cremation Services Act,* 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or corner and the Registrar of Cemeteries at the Ministry of Consumer Services.

6.0 Assessor Qualifications

This report was prepared and reviewed by the undersigned, employees of Wood. Wood is one of North America's leading engineering firms, with more than 50 years of experience in the earth and environmental consulting industry. The qualifications of the assessors involved in the preparation of this report are provided in Appendix C.

7.0 Closure

This report was prepared for the exclusive use of 10919 Longwood Road Inc. and is intended to provide a Stage 1 & 2 archaeological assessment of the Study Area. The property is located at 10919 Longwoods Road in the town of Delaware. The property is legally described as Part of Lot 6, Concession 1, Geographic Township of Delaware, Middlesex County, Ontario.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Wood will be required. With respect to third parties, Wood has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs.

The report is based on data and information collected during the Stage 1 background study and Stage 2 property inspection conducted by Wood. It is based solely a review of historical information, a property reconnaissance conducted on 04 December 2018 and data obtained by Wood as described in this report. Except as otherwise maybe specified, Wood disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Wood after the time during which Wood conducted the archaeological assessment. In evaluating the property, Wood has relied in good faith on information provided by other individuals noted in this report. Wood has assumed that the information provided is factual and accurate. In addition, the findings in this report are based, to a large degree, upon information provided by the current owner/occupant. Wood accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Wood makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This report is also subject to the further Standard Limitations contained in Appendix E.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Respectfully Submitted,

Wood Environment & Infrastructure,
a Division of Wood Canada Limited

Prepared by,

Kristy O'Neal, M.A. (P066)

Senior Archaeologist

Reviewed by,

Barbara Slim, M.A. (P348)

Senior Archaeologist

8.0 Bibliography

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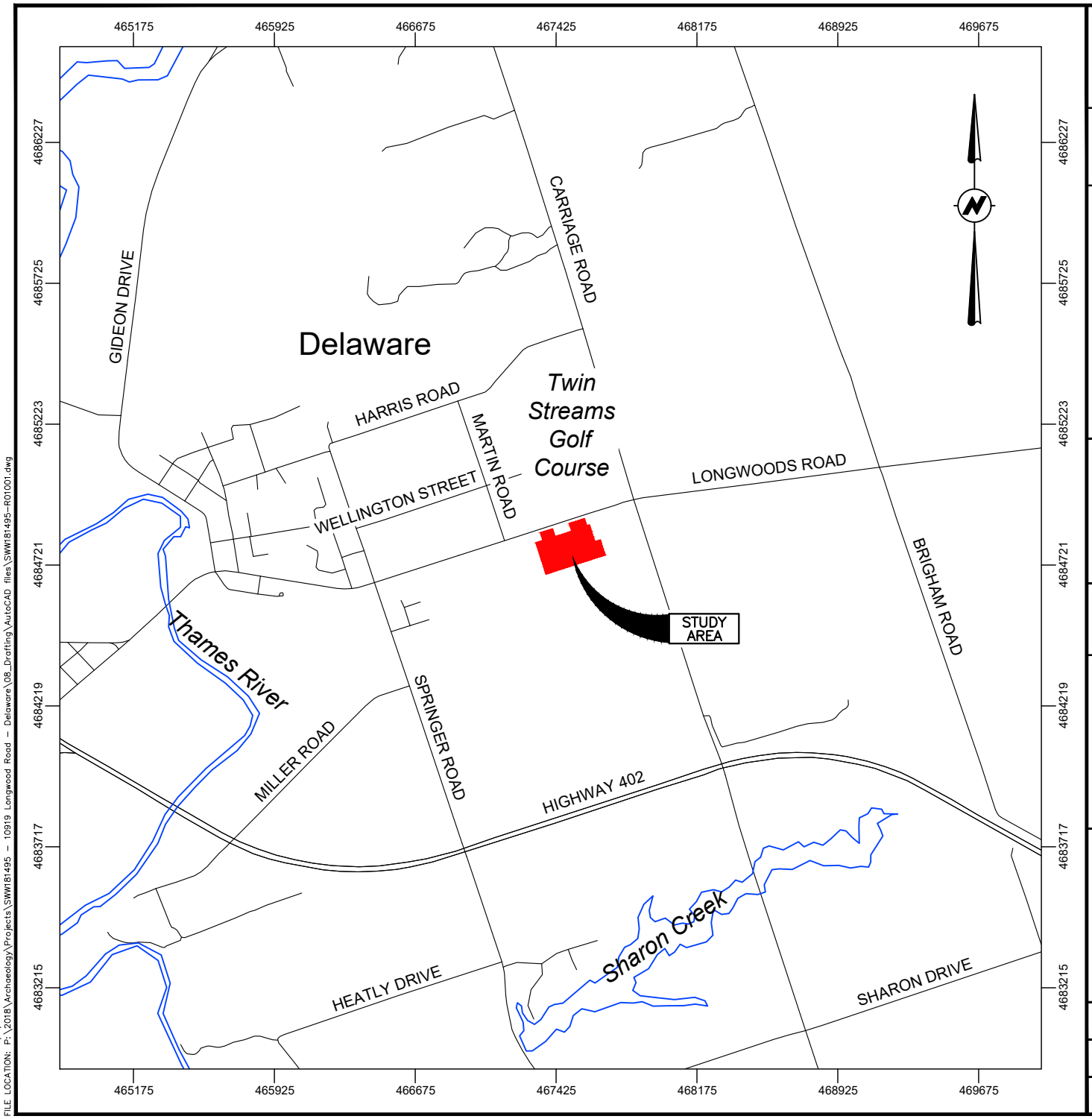
Tremaine, George C.
1862 *Tremaine's Map of the County of Middlesex, Canada West.*

Appendix A

Figures



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STAGE 1 & 2
ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
LOCATION OF STUDY AREA

LEGEND:
STUDY AREA

NOTES:
THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH THE WOOD ENVIRONMENT & INFRASTRUCTURE SOLUTIONS REPORT No. SWW181495.
ALL LOCATIONS ARE APPROXIMATE.
ORIGINAL PAPER SIZE: 8½ x 11.
REFERENCES:
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ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
AERIAL PHOTOGRAPH SHOWING
LOCATION OF STUDY AREA

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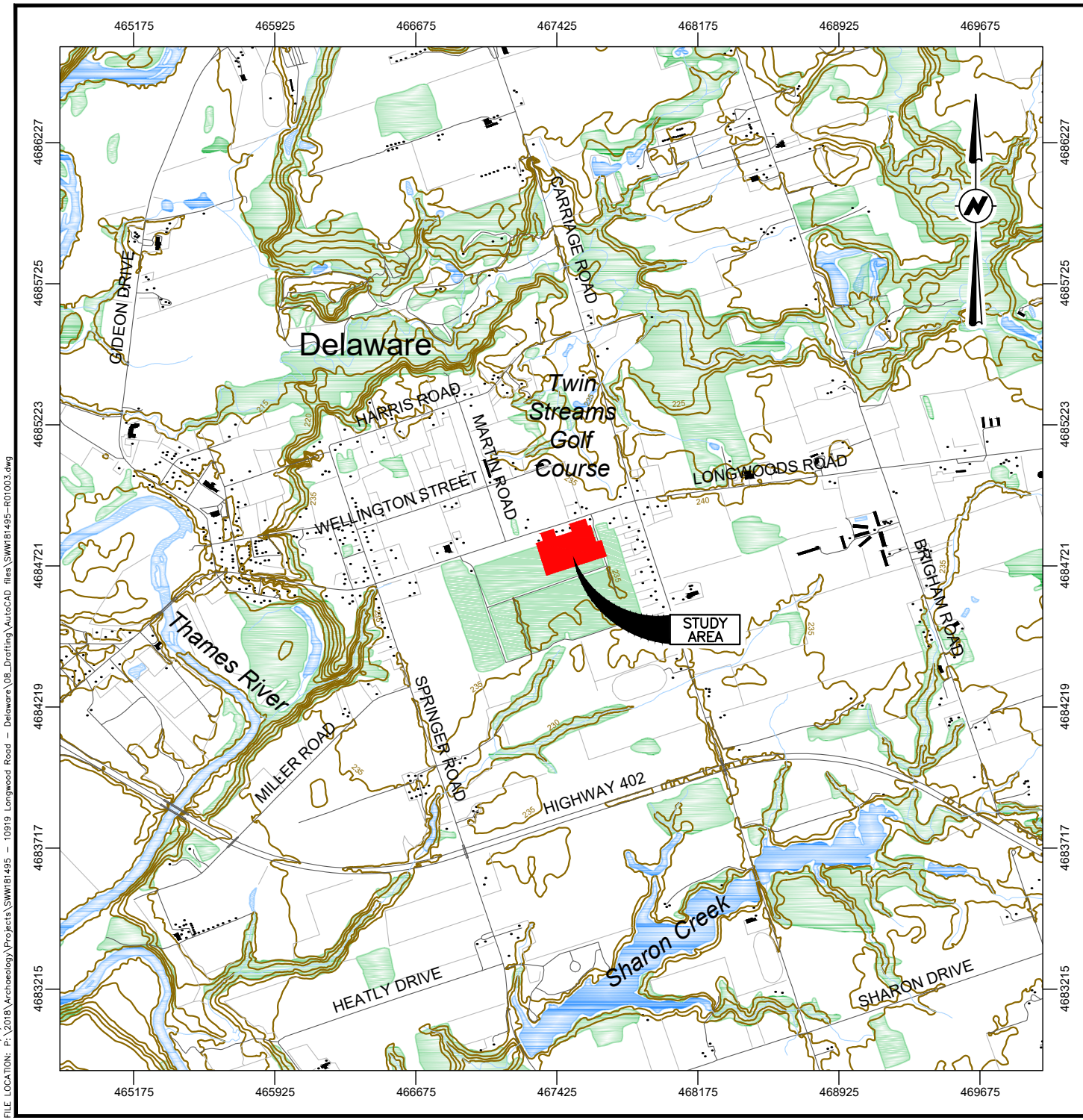

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STAGE 1 & 2
ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
TOPOGRAPHIC MAP SHOWING
LOCATION OF STUDY AREA

LEGEND:
STUDY AREA

NOTES:
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ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
DEVELOPMENT PLAN

LEGEND:
STUDY AREA

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PROJECT:
STAGE 1 & 2
ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
1862 TREMAINE MAP OF THE TOWNSHIP OF DELAWARE SHOWING LOCATION OF STUDY AREA

LEGEND:
STUDY AREA

NOTES:
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ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
1877 HISTORICAL ATLAS OF THE TOWNSHIP OF DELAWARE SHOWING LOCATION OF STUDY AREA

LEGEND:
STUDY AREA

NOTES:
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STAGE 1 & 2
ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
STAGE 1 RESULTS WITH
PHOTOGRAPH LOCATIONS & DIRECTIONS

LEGEND:

STUDY AREA

AREA OF ARCHAEOLOGICAL POTENTIAL:

PEDESTRIAN SURVEY AT 5m INTERVALS RECOMMENDED

1 PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND PLATE NUMBER

NOTES:

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STAGE 1 & 2
ARCHAEOLOGICAL ASSESSMENT
PART OF LOT 6, CONCESSION 1,
10919 LONGWOODS ROAD
GEOGRAPHIC TOWNSHIP OF DELAWARE
MIDDLESEX COUNTY, ONTARIO

TITLE:
STAGE 2 RESULTS WITH
PHOTOGRAPH LOCATIONS & DIRECTIONS

LEGEND:

STUDY AREA

AREA OF ARCHAEOLOGICAL POTENTIAL:

SUBJECT TO PEDESTRIAN SURVEY AT 5m INTERVALS

1 PHOTOGRAPH LOCATION, VIEWING DIRECTION, AND PLATE NUMBER

NOTES:

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Appendix B

Photographs

APPENDIX B - PHOTOGRAPHIC RECORD

PROJECT NO. SWW181495

PROJECT Stage 1 & 2 Archaeological Assessment

LOCATION 10919 Longwoods Road, Delaware
Part Lot 6, Concession 1, Delaware Township, Middlesex County, Ontario

PHOTOGRAPH	1

Description
View of study area, from northwest corner, facing southeast.

PHOTOGRAPH	2

Description
View of study area, from southwest corner, facing northeast.

APPENDIX B - PHOTOGRAPHIC RECORD

PROJECT NO. SWW181495

PROJECT Stage 1 & 2 Archaeological Assessment

LOCATION 10919 Longwoods Road, Delaware
Part Lot 6, Concession 1, Delaware Township, Middlesex County, Ontario

PHOTOGRAPH	3

Description
View of study area, from northeast corner, facing southwest.

PHOTOGRAPH	4

Description
View of study area, from southeast corner, facing northwest.

APPENDIX B - PHOTOGRAPHIC RECORD

PROJECT NO. SWW181495

PROJECT Stage 1 & 2 Archaeological Assessment

LOCATION 10919 Longwoods Road, Delaware
Part Lot 6, Concession 1, Delaware Township, Middlesex County, Ontario

PHOTOGRAPH	5

Description
Crew at work, pedestrian survey at 5m intervals, facing northwest.

PHOTOGRAPH	6

Description
Ground visibility conditions.

Appendix C

Assessor Qualifications

Assessor Qualifications

Dr. Shaun Austin, Ph.D. – Associate Archaeologist

Dr. Austin is the Senior Archaeology Advisor of Wood's cultural heritage resources group and is based in the Wood's Hamilton Office. He has been working in Canadian archaeology and heritage since 1976 and as an archaeological and heritage consultant in Ontario since 1987. He is a dedicated cultural heritage consultant with repeated success guiding projects through to completion to the satisfaction of the development proponent, the cultural heritage community and all other stakeholder groups. His areas of interest and expertise include pre-contact Aboriginal lithics and ceramics. Dr. Austin holds a Professional Archaeology License (P141) issued by the Ontario Ministry of Tourism, Culture and Sport, is MTO RAQs certified in Archaeology/Heritage and is a member of the Ontario Association of Professional Archaeologists.

Barbara Slim, M.A. – Senior Archaeologist

Ms. Slim is a Senior Archaeologist with more than 13 years of experience in the archaeological field and has participated in and directed numerous Stage 1 to 4 archaeological assessments in Ontario. As a founding member of the Wood's archaeology team, Ms. Slim has performed every aspect of project execution, from client relations, project design and First Nation's engagement to MTCS clearance. The majority of the above-mentioned projects have included First Nations involvement. In addition to her archaeological experience, Ms. Slim has several years of experience in conducting environmental investigations and occupational hygiene assessments. Furthermore, she currently serves as Health & Safety Coordinator for her office. Her diverse background with multidisciplinary projects has highlighted her abilities as an effective team member and innovator. Ms. Slim holds a Professional Archaeology License (P348) issued by the Ontario MTCS, is a member of the Ontario Association of Professional Archaeologists and Ontario Archaeological Association.

Kristy O'Neal, M.A. - Senior Archaeologist

Ms. O'Neal is a Senior Archaeologist at Wood with over 20 years of archaeology consulting experience in Ontario. Ms. O'Neal has supervised a wide variety of Stage 1 through 4 archaeological assessments throughout Ontario, with a focus on both pre-contact and Euro-Canadian settlements. Pre-Contact projects have involved First Nations consultation. Ms. O'Neal has a strong background in cultural material analysis and has extensive experience with large complex stratified Aboriginal sites situated within often compromised urban context. She holds a Master's Degree in Bioarchaeology and a Bachelor of Arts Degree in Anthropology from the University of Western Ontario, where she received a Gold Medal Award. Ms. O'Neal's areas of interest and expertise include the archaeological prehistory and history of southwestern Ontario, with focus on the Middle Woodland period and changes in Aboriginal weapon technology. Ms. O'Neal holds a **Professional Archaeology Licence** (**P066**) issued by the Ontario Ministry of Tourism, Culture and Sport, and is a member of the Ontario Archaeology Society.

Appendix D

Limitations

Limitations

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:

   (a) The Standard Terms and Conditions which form a part of our Professional Services Contract;

   (b) The Scope of Services;

   (c) Time and Budgetary limitations as described in our Contract; and,

   (d) The Limitations stated herein.

2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.

3. The conclusions presented in this report were based, in part, on visual observations of the Study Area. Our conclusions cannot and are not extended to include those portions of the Study Area which were not reasonably available, in Wood Environment & Infrastructure's opinion, for direct observation.

4. The potential for archaeological resources, and any actual archaeological resources encountered, at the Study Area were assessed, within the limitations set out above, having due regard for applicable heritage regulations as of the date of the inspection.

5. Services including a background study and fieldwork were performed. Wood Environment & Infrastructure's work, including archival studies and fieldwork, were completed in a professional manner and in accordance with the Ministry of Tourism, Culture and Sport's guidelines. It is possible that unforeseen and undiscovered archaeological resources may be present at the Study Area.

6. The utilization of Wood Environment & Infrastructure's services during the implementation of any further archaeological work recommended will allow Wood Environment & Infrastructure to observe compliance with the conclusions and recommendations contained in the report. Wood Environment & Infrastructure's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.

7. This report is for the sole use of the parties to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or in part, or any reliance thereon, or decisions made based on any information of conclusions in the report, is the sole responsibility of such third party. Wood Environment & Infrastructure accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.

8. This report is not to be given over to any third-party other than a governmental entity, for any purpose whatsoever without the written permission of Wood Environment & Infrastructure, which shall not be unreasonably withheld.

10919 LONGWOODS ROAD
PROPOSED INDUSTRIAL SUBDIVISION

Geotechnical Investigation

Project Location:
10919 Longwoods Road
Municipality of Middlesex Centre, ON

Prepared for:
10919 Longwoods Road Inc.
10919 Longwoods Road
Municipality of Middlesex Centre, ON

Prepared by:
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365 Home Street
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March 27, 2019

MTE File No.: 45013-300

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1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was retained by 10919 Longwoods Road Inc. to conduct a geotechnical investigation for a proposed industrial subdivision at 10919 Longwoods Road in the Municipality of Middlesex, Ontario, as shown on **Figure 1 in Appendix A**. The site is currently agricultural fields with a metal clad building located at the north end of the site along Longwoods Road. It is also understood that there were two houses at the north end of the site that have been demolished.

The site comprises approximately 2.5 hectares and will include eighteen (18) industrial lots. A Stormwater Management (SWM) block is proposed at the southwest corner of the site between lots 16 and 17. It is understood that each lot will be provided with individual wastewater treatment facilities (septic beds), wells and heating sources. No municipal services are proposed for the development. Two roadways are proposed within the subdivision to access the industrial lots. The proposed subdivision layout is referenced to MTE's Preliminary Site Plan, File No. 45013-100, dated February 2019.

The property is bordered to the south and west by agricultural fields; to the east by agricultural fields and residential buildings; and to the north by Longwoods Road and residential buildings. The ground surface is generally level at the site with a grade difference of approximately 1.5 to 2.0 m between the borehole locations.

The purpose of this geotechnical investigation is to determine the soil and groundwater conditions in the area of the proposed subdivision and provide geotechnical engineering recommendations for site grading, excavations and dewatering, foundations, slab-on-grade construction, pavement design, subdrainage requirements, and stormwater infiltration.

2.0 FIELD AND LABORATORY PROGRAM

The fieldwork for this investigation was carried out on March 20th and 21st, 2019 and involved the drilling of nine boreholes (Boreholes MW101-19 to MW106-19 and BH107-19 to BH109-19) to depths ranging from 6.6 to 6.7 m. The locations of the boreholes are shown on the Site Plan, **Figure 2 in Appendix A**.

Private and public utility companies were contacted prior to the start of drilling activities in order to isolate underground utilities near the boring locations.

The boreholes were advanced with a D50T track mounted drill rig equipped with continuous flight hollow stem augers, supplied and operated by London Soil Test Ltd.

Representative soil samples were recovered throughout the depths explored. Standard Penetration Tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. The SPT N-values recorded are plotted on the borehole logs in **Appendix B.**

Six 50 mm diameter monitoring wells were installed in Boreholes MW101-19 to MW106-19 to allow measurement of stabilized groundwater levels and groundwater sampling and testing. The installations comprised 1.5 m filtered screens and bentonite seals above the screens. Stabilized water level measurements were taken by MTE on March 26, 2019. Details of the installation and groundwater observations and measurements are provided on the appended borehole logs.

The monitoring wells were installed in accordance to Ontario Regulation 468/10. A licensed well technician must properly decommission all wells before construction. The construction, maintenance and abandonment of the wells are regulated under the province's Water Resources Act.

Upon completion of drilling, the remaining boreholes were backfilled with soil cuttings and bentonite in accordance with Ontario Regulation 468/10 (formerly O. Reg. 903) under the provinces Water Resources Act.

The fieldwork was monitored throughout by a member of our geotechnical engineering staff, who directed the drilling procedures; documented SPT tests; documented the soil stratigraphies; monitored the groundwater conditions; observed the monitoring well installation; and transported the recovered soil samples to our office for further classification.

The geodetic ground surface elevations at the borehole locations were surveyed by MTE.

All of the soil samples collected were submitted for moisture content testing with the results provided on the borehole logs in **Appendix B**. Additionally, seven soil samples were submitted for particle size distribution analyses and the results are provided in **Appendix C**. The remaining soil samples will be stored for a period of 3 months and will be discarded of at that time without prior request from the client to extend storage time.

3.0 SOIL CONDITIONS

Reference is provided to the appended borehole logs for soil stratigraphy details, SPT N-values, moisture content profiles, and groundwater observations and measurements. Soil conditions encountered at the site typically include topsoil overlying native deposits of sand and silt.

3.1 Topsoil

Topsoil was encountered surficially in all of the boreholes and was 205 to 355 mm thick (average thickness = 310 mm). The topsoil typically comprises dark brown/black sandy silt with some organics and was wet to saturated with some frozen portions at the time of the fieldwork. It is noted that plastic and glass fragments were observed within the topsoil in Borehole BH107-19.

3.2 Sand and Silt

Sand and silt was encountered beneath the topsoil in all of the boreholes and extends to the termination depth of each borehole. The sand and silt typically ranges in composition from light brown sand with some silt and trace clay to grey silt with some sand and trace clay. The results of seven particle size distribution analyses conducted on the sand and silt are provided in **Appendix C** and summarized in the following table;

TABLE 1 - RESULTS OF SAND AND SILT PARTICLE SIZE DISTRIBUTION ANALYSES

Borehole Number	Sample Depth (m)	Sand (%)	Silt (%)	Clay (%)
MW101-19	0.76 - 1.37	68	30	2
MW102-19	0.76 - 1.37	31	67	2
MW102-19	4.57 - 5.18	19	79	2
MW103-19	4.57 - 5.03	23	74	3
MW104-19	0.76 - 1.37	81	10	9
MW105-19	4.57 - 5.03	16	80	4
BH108-19	0.76 - 1.37	25	69	6

SPT N-values measured in the sand and silt typically increase with depth and range from 3 to 46 blows per 300 mm penetration of the split spoon sampler indicating very loose to dense conditions. It is noted the very loose to loose conditions extended to a maximum depth of 1.5 m.

Insitu moisture contents in the sand and silt range from 16 to 27% indicating wet to saturated conditions.

4.0 GROUNDWATER CONDITIONS

Groundwater observations and measurements were carried out in the open boreholes at the time of drilling and are summarized on the borehole logs. Saturated conditions were noted within the native soil deposits in each borehole at depths of 0.3 to 1.2 m (Elevation 233.4 to 235.2 m).

Upon completion of drilling activities, free groundwater was measured in all of the boreholes at depths of 0.3 to 1.5 m below the ground surface (Elevation 233.0 to 235.6 m). The stabilized groundwater level measurements completed in the six monitoring wells are summarized in the following table;

TABLE 2 - GROUNDWATER LEVEL MEASUREMENTS

Borehole Number	Borehole Elevation (masl)	Water Level Measured March 26, 2019 (mbgs)	Groundwater Level Elevation March 26, 2019 (masl)
MW101-19	235.0	0.6	234.4
MW102-19	235.6	0.7	234.9
MW103-19	235.3	1.0	234.3
MW104-19	236.4	1.3	235.1
MW105-19	234.2	0.6	233.6
MW106-19	235.5	1.2	234.3

The grey colour of the soil at depths of 1.5 to 5.0 m below ground surface (Elevation 230.7 to 233.3 m) is indicative of permanent saturated conditions and groundwater is not expected to drop below these levels.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations and local variations.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 General

The project involves the design of a proposed industrial subdivision at 10919 Longwoods Road in the Municipality of Middlesex, Ontario. The site comprises approximately 2.5 hectares of agricultural fields with a metal clad building located at the north end. It is understood that there were two houses at the north end of the site that have been demolished. The proposed subdivision will include eighteen (18) industrial lots with a SWM block at the southwest corner of the site between lots 16 and 17. It is understood that each lot will be provided with individual wastewater treatment facilities (septic beds), wells and heating sources. No municipal services are proposed for the development. Two roadways are proposed within the subdivision to access the industrial lots.

The subsurface stratigraphy at the site generally comprises topsoil overlying native deposits of sand and silt. The stabilized groundwater level was measured at depths of 0.6 to 1.3 m (Elevation 233.6 to 235.1 m).

Based on the results of this geotechnical investigation, the site is suitable for the proposed development; however, the groundwater table and upper loose native soils will affect design and construction. The following subsections of this report contain geotechnical recommendations pertaining to development of the property; including, site grading, excavations and dewatering, foundations, slab-on-grade construction, pavement design, subdrainage requirements, and stormwater infiltration.

5.2 Site Preparation

The first construction activity that will be required for the proposed development will be grading. A metal clad building located at the north end of the site and it is understood that there were two houses at the north end of the site that have been demolished. All buildings should be removed including old foundations and slabs.

Prior to carrying out any cutting and engineering fill operations, the surficial topsoil must be removed and stockpiled. The average topsoil thickness measured in the boreholes was 310 mm. It is recommended that the average topsoil thickness across the site be increased by 50 mm for removal/stripping calculations to account for variations at the site and over stripping. The upper loose deposits of sand and silt ranging from depths of 0.8 to 1.5 m are also not suitable to remain below the industrial buildings and must be removed. The topsoil and upper loose sand and silt could be used in landscaping areas.

Due to high moisture contents and the depth of the groundwater table, the native soils are not considered suitable for reuse as engineered fill. All engineered fill should be imported and placed in maximum 300 mm thick lifts and compacted to the following percentages;

TABLE 3 - ENGINEERED FILL REQUIREMENTS

Fill Use	Minimum Compaction Required
Structural fill to support buildings	100% SPMDD
Subgrade fill beneath pavements or services	95% SPMDD
Bulk fill in landscape areas	90% SPMDD

The subgrade soils are susceptible to disturbance due to the silt content, and it is recommended that construction traffic on the subgrade be minimized.

Structural fill used for raising grades beneath the industrial buildings should comprise granular material such as OPSS 1010 Granular ‘A’. Subgrade fill material beneath the proposed pavement areas should meet the requirements of OPSS Select Subgrade Material. Any imported fill should be tested and verified by a geotechnical engineer prior to placement.

Structural fill pads should extend a minimum 0.3 m beyond the edge of the footing envelope of any building and down to subgrade at an angle of 45 degrees to the horizontal. Full time testing by geotechnical personnel is required during fill placement and compaction to monitor material quality, lift thickness, and verify the compaction by in-situ density testing (as per the 2012 Ontario Building Code).

In order to minimize the effects of weather and groundwater, fill operations onsite should be carried out in the dry summer months.

5.3 Excavations and Dewatering

All excavations at the site should be carried out in conformance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects. The predominate soils encountered in the boreholes would be classified as Type 3 soils, and temporary side slopes through this material must be cut at an inclination of 1.0 horizontal to 1.0 vertical or less from the base of the excavation, exclusive of groundwater effects. Where wet to saturated conditions are encountered, excavation side slopes should be expected to slough to flatter inclinations, potentially 3.0 horizontal to 1.0 vertical or flatter.

Trench side slopes must be continuously inspected especially after periods of heavy rainfall or snow melt to identify areas of instability. Surface water should be directed away from entering the trench.

Moderate to significant groundwater inflow should be expected where the excavations extend into the groundwater table encountered between Elevation 233.6 to 235.1 m. It is envisioned that groundwater inflow from the excavations extending up to 0.3 m below the groundwater regime can be controlled using a gravity dewatering system with properly constructed sumps and perimeter interceptor ditches and filtered pumps. It is our opinion that extensive pumping will be required to handle the groundwater infiltration. Well points or an equivalent system may be required for any excavation work extending more than 0.3 m below the groundwater regime.

It will be necessary to flatten the excavation side slopes where groundwater seepage is occurring to ensure stability. Every excavation that a worker may be required to enter shall be kept reasonably free of water (O. Reg. 213/91, s. 230).

It should be noted that an Environmental Activity and Sector Registry (EASR) or Permit to Take Water (PTTW), issued by the Ministry of Environment, Conservation and Parks, will be required if the dewatering system/sumps result in a water taking of more than 50,000 L/day to 400,000 L/day, respectively. The design of the dewatering system should be left to the contractor’s discretion to control groundwater at least 0.5 m below the deepest excavation level in order to provide stable excavation base. The contractor should notify the prime consultant in the event that he feels that an EASR/PTTW will be needed.

It is recommended test pits be excavated during the tendering stage of the project to familiarize potential contractors of the soil and groundwater conditions at the site.

5.4 Pavements

It is understood pavements will be constructed for the proposed roadways at the site. The pavement subgrade soils will comprise native inorganic soils or imported structural fill. Based on the results of the particle size distribution analyses and the shallow groundwater table at the site, the native soils would be considered highly frost-susceptible.

The pavement component thicknesses in the following table are recommended based on the proposed pavement usage and the frost-susceptibility and strength of the subgrade soils;

TABLE 4 - PAVEMENT DESIGN

Pavement Component	Industrial Streets
Asphalt Hot Mix	140 mm
OPSS 1010 Granular ‘A’ Base	150 mm
OPSS 1010 Granular ‘B’ Subbase	500 mm

Samples of aggregates should be checked for conformance to OPSS 1010 prior to utilization on site and during construction. The Granular 'B' subbase and Granular 'A' base courses must be compacted to 100% SPMDD, as verified by insitu density testing.

The asphaltic concrete paving materials should conform to the requirements of OPSS 1150. The asphalt should be placed and compacted in accordance with OPSS 310. The Performance Graded Asphalt Cement designation for the asphaltic concrete is 58-28.

The asphaltic concrete should comprise 40 mm of HL4 surface over 100 mm of HL8 binder placed in two lifts for the industrial roadways.

The pavement design is based on the assumption that construction will be carried out during the drier time of the year and that the subgrade soil is stable as determined by proof-rolling inspected by a geotechnical engineer. If the subgrade is wet and unstable, additional granular subbase will be required.

All materials and construction services required for the work should be in accordance with the relevant sections of the Ontario Provincial Standard Specifications.

It is **strongly recommended** to install continuous subdrains beneath the pavement and connected to catchbasins. The purpose of the subdrains is to remove excess subsurface water in order to improve overall pavement serviceability and increase the pavement life. At a minimum subdrains should be provided in the low areas of pavement.

The work of subdrain installation shall be in accordance with OPSS 405 and OPSD 216.021. The subdrain shall be 100 or 150 mm diameter perforated pipe conforming to OPSS 1801 or 1840, and wrapped with geotextile conforming to OPSS 1860.

5.5 Curbs and Gutter and Sidewalks

The concrete for curbs, gutters and sidewalks should be proportioned, mixed, placed and cured in accordance with the requirements of OPSS 353, and OPSS 1350 and shall meet the following specific requirements (OPSS 353.05.01):

- Minimum compressive strength = 30 MPa at 28 days
- Coarse aggregate = 19.0 mm nominal max. size
- Maximum slump = 60 mm for curb and gutter, 70 mm for sidewalks
- Air entrainment = 7.0 ± 1.5%

During cold weather any freshly placed concrete must be covered with insulating blankets to protect against freezing as per OPSS 904. Three cylinders from each days pour should be taken for compressive strength testing. Air entrainment, temperature and slump tests should be conducted on the same batch of concrete from the test cylinders made.

5.6 Foundation Design

It is anticipated that the proposed industrial buildings will be constructed using conventional strip footings and slab-on-grade floors. In general, the undisturbed compact native soils or approved structural fill is considered suitable to support the industrial buildings. The upper 0.8 to 1.5 m of loose sand and silt encountered in the boreholes is not suitable to support foundations due to low internal strength.

Conventional spread footings founded on the undisturbed compact native soils or approved structural fill may be designed for a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 225 kPa, and soil bearing resistance for 25 mm of settlement at Serviceability Limit States (SLS) of 150 kPa.

The founding materials are susceptible to disturbance by construction activity, especially during wet weather and care should be taken to preserve the integrity of the material as bearing strata.

The footing areas must be inspected by a geotechnical engineer to ensure that the soil conditions encountered at the time of construction are suitable to support the design resistances prior to pouring concrete. Any loose, disturbed, organic and deleterious material identified during the inspection should be removed from the footing areas and replaced with structural fill or concrete.

All exterior floor slabs and footings in unheated areas must be provided with a minimum 1.2 m of earth cover after final grading in order to minimize the potential of damage due to frost action, as per Ontario Provincial Standard Drawing, OPSD 3090.101, dated November 2010. If construction is undertaken during the winter, the subgrade soil and concrete should be protected from freezing.

Where spread footings are constructed at different elevations, the difference in elevation in the individual footing should not be greater than one half of the clear distance between the footings. The lower footing should be constructed first so that if it is necessary to construct the lower footings at a greater depth than anticipated, the elevation of the upper footings can be adjusted accordingly. Stepped strip footings should be constructed in accordance with OBC Section 9.15.3.8.

A Site Classification ‘D’ should be used for earthquake load and effects in accordance with Table 4.1.8.4.A. of the 2012 Ontario Building Code.

In general, the native soils excavated from the foundation trench areas will not be suitable for reuse as foundation wall backfill due to high moisture content. Imported OPSS 1010 Granular ‘B’ material may be used as foundation wall backfill. The backfill should be placed in 300 mm thick lifts and compacted to at least 95% Standard Proctor Maximum Dry Density (SPMDD) on the outside of the proposed buildings; and 100% SPMDD on the inside of the proposed buildings. The backfill must be brought up evenly on both sides of walls not designed to resist lateral earth pressure.

5.7 Concrete Slab-on-Grade Floors

It is understood that the floor slabs for the proposed buildings will be constructed using conventional concrete slab-on-grade techniques, following removal of any topsoil, and organic soils, and inspecting the subgrade soils.

Any additional material required to raise grades below the floor slabs should be compacted to 100% SPMDD. A minimum 150 mm thick layer of Granular 'A' material uniformly compacted to 100% SPMDD should be provided directly beneath the slab for leveling and support purposes.

A modulus of subgrade reaction of 25 to 30 MPa/m should be used in the design of the floor slabs.

No special underfloor drains are required, provided the exterior grades are lower than the floor slabs and positively sloped away from the buildings.

If a moisture-sensitive floor finish is to be applied to the slab, then we recommend that a 15 mil polyethylene moisture vapour barrier be installed directly beneath the slabs as per Article 9.13.2.7 of the Ontario Building Code. The purpose of the vapour barrier is to reduce moisture transfer by diffusion as per Article 5.5.1.2 of the Ontario Building Code. Joints in the vapour barrier should be lapped not less than 100 mm.

The water to cement ratio and slump of the concrete utilized in the floor slabs should be strictly controlled to minimize shrinkage of the slabs. Control joints should be sawed into the slabs at regular intervals within 12 hours of initial concrete placement in order to prelocate shrinkage cracks.

Concrete testing should be performed onsite to determine the slump, temperature, and air entrainment; and concrete cylinders should be cast for compressive strength testing.

5.8 Stormwater Management Block

It is understood that a SWM block is proposed for the development at the southwest corner of the site between lots 16 and 17. Boreholes MW105-19, MW106-19 and BH108-19 were advanced in the vicinity of the proposed SWM block. The stabilized groundwater level in Boreholes MW105-19 and MW106-19 was measured at 0.6 m and 1.2 m (Elevation 233.6 m and 234.3 m), respectively.

SWM inlet/outlet structures footing constructed on the compact undisturbed native soils encountered at depths of 0.8 to 1.5 m (Elevation 233.4 to 234.0 m) may be designed for a factored geotechnical bearing resistance at Ultimate Limit States (ULS) of 225 kPa, and soil bearing resistance for 25 mm of settlement at Serviceability Limit States (SLS) of 150 kPa.

The footing areas must be inspected by a geotechnical engineer to ensure that the soil conditions encountered at the time of construction are suitable to support the design resistances prior to pouring concrete. Any loose, disturbed, organic and deleterious material identified during the inspection should be removed from the footing areas and replaced with structural fill or concrete.

Moderate groundwater inflow is anticipated in the excavations for the SWM block. Please refer to Section 5.3 for dewatering details.

Embankments for the SWM blocks should be at an inclination of 3.0 horizontal to 1.0 vertical or less from the base of the excavation and can be constructed with onsite native soils. If the native soils are wet or saturated then imported engineered fill is recommended. The native soils or imported engineered fill should be placed in 300 mm thick lifts and compacted to at least 95% SPMDD. The embankment surfaces should be topsoiled and sodded to prevent surface erosion. Further recommendations should be provided once final SWM block design details are known.

5.9 Stormwater Infiltration

It is understood that at-source infiltration of stormwater runoff from the development may also be considered for this site. Soak-away pits generally require soils with a minimum percolation rate of 15 mm/hr and a minimum separation between the bottom of the pit and the seasonally high water table of 1 m (MOE, 2003). Seven particle size distribution analyses were carried out on the sand and silt deposits encountered at the site. They are plotted on **Tables 1 and 2 in Appendix C**.

The vertical hydraulic conductivity (k) is derived from an empirical formulae by Kaubisch. The estimated design infiltration rate is based on recommendations found in the *Low Impact Development Stormwater Management Planning and Design Guide, Appendix C*, Version 1.0, 2011, published by the Toronto and Region (TRCA) and the Credit Valley (CVC) Conservation Authority, and the approximate relationship between hydraulic conductivity and infiltration rate. A Factor of Safety of 2.5 has been applied to the calculated infiltration rates.

TABLE 5 - INFILTRATION RATES FOR NATIVE SOILS

Borehole Number	Sample Depth (mbgs)	Borehole Elevation (masl)	Soil Type	Geometric Mean K-Value (m/sec)	Infiltration Rate (mm/hr)
MW101-19	0.76 - 1.37	235.0	Silty Sand	1.3E-06	20
MW102-19	0.76 - 1.37	235.6	Sandy Silt	1.3E-06	20
MW102-19	4.57 - 5.18	235.6	Silt	7.8E-10	3
MW103-19	4.57 - 5.03	235.3	Sandy Silt	1.0E-09	3
MW104-19	0.76 - 1.37	236.4	Sand	3.3E-06	25
MW105-19	4.57 - 5.03	234.2	Silt	2.9E-10	2
BH108-19	0.76 - 1.37	235.1	Sandy Silt	8.9E-10	3

The relatively shallow groundwater table encountered at the site will significantly reduce the infiltration capacity of the native soils and design infiltration rates should be confirmed with insitu testing.

Any infiltration gallery must be constructed at least 5 m from any structure and the base of the gallery at least 1 m below any foundation.

5.10 Construction Inspection and Testing

MTE recommends that geotechnical inspection and testing procedures be conducted throughout the various phases of the project.

Engineer site visits should be conducted to confirm geotechnical bearing resistances for footings. Soil compaction testing should be carried out on structural fill beneath the industrial buildings, foundation wall backfill and subslab granular fill. Laboratory and field testing of the pavement structure components (granulars and asphaltic concrete) should be conducted, as well as concrete testing for foundations, curbs and sidewalks.

MTE offers soil compaction, concrete, and asphalt testing as well as soil inspection services through our Stratford office.

6.0 LIMITATIONS OF REPORT

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Geotechnical Engineering & Consulting profession practicing under similar conditions in the same geographic area were the services are provided. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of the Client. This report is not intended to be exhaustive in scope or to imply a risk-free site. As such, this report may not deal with all issues potentially applicable to the site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a soil sample result represents one distinct portion of a site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation. The material in the report reflects our best judgment using the information available at the time the report was written. The soil and groundwater conditions between and beyond the test holes may differ from those encountered in the test holes. Should subsurface conditions arise that are different from those in the test holes MTE should be notified to determine whether or not changes should be made as a result of these conditions.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because groundwater conditions of a property can change, along with regulatory requirements. All design details were not known at the time of submission of this report and it is recommended MTE should be retained to review the final design documents prior to construction to confirm they are consistent with our report recommendations. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans. The contractors bidding on this project or undertaking the construction should make their own interpretation of the factual information and draw their own conclusions as to how subsurface conditions may affect their work.

The benchmark and elevations provided in this report are primarily established to identify differences between the test hole locations and should not be used for other purposes such as, planning, development, grading, and excavation.

Respectfully submitted,

MTE CONSULTANTS INC.

Ben Heinbuch, EIT
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MXW:dld

APPENDIX A

FIGURES

Figure 1- Location Plan
Figure 2 - Site Plan

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.

Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES.DWG

FIGURE 1 - LOCATION PLAN

MTE Engineers | Scientists | Surveyors

LOCATION PLAN

Project Name

10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION

Site	Client
10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON	10919 LONGWOODS ROAD INC.

Scale. (8.5x11)	MTE Project No.	Date	Figure No.
N.T.S.	45013-300	MARCH 27, 2019	1

LEGEND

BH107–19
MTE BOREHOLE

MW101–19
MTE MONITORING WELL

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.
- BOREHOLE ELEVATIONS SURVEYED BY MTE.

MTE
Engineers | Scientists | Surveyors

SITE PLAN

Project Name
10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION

Site	Client
10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON	10919 LONGWOODS ROAD INC.

Scale (11x17)	MTE Project No.	Date	Figure No.
1:2000	45013-300	MARCH 27, 2019	2

Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES.DWG
FIGURE 2 – SITE PLAN
March 27, 2019 – 11:39 a.m. – Plotted By: awilliams

APPENDIX B

BOREHOLE LOGS

Boreholes MW101-19 to MW106-19 &
BH107-19 to BH109-19

ID Number: MW101-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

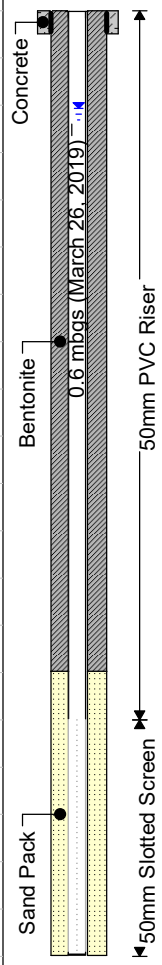
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.0					
0		**TOPSOIL** dark brown/black sandy silt, some organics, wet	0.0 / 234.7 / 0.3	1	SS	4		24
2		**SAND AND SILT** loose light brown sandy silt, saturated	234.2 / 0.8	2	SS	15		21
4		compact light brown silty sand, saturated		3	SS	12		21
6				4	SS	11		21
8								
10		grey	231.8 / 3.2	5	SS	18		19
12								
14		dense	230.4 / 4.6	6	SS	32		18
16								
18								
20				7	SS	38		22
22		Drilling Terminated	228.4 / 6.6					
24								

Groundwater Observations and Standpipe Details



Initial water level at 0.3mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW102-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

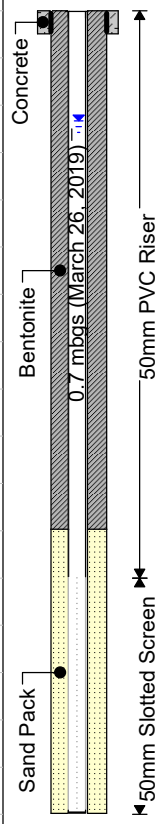
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.6					
0		**TOPSOIL** dark brown/black sandy silt, some organics, wet	0.0 / 235.3 / 0.3	1	SS	4		24
2		**SAND AND SILT** loose dark brown sandy silt, wet	234.8 / 0.8					
		light brown, trace clay, saturated		2	SS	8		23
4			234.1 / 1.5					
		compact		3	SS	10		22
6 (2 m)			233.3 / 2.3					
		grey		4	SS	10		25
10				5	SS	10		23
12 (4 m)								
14			231.0 / 4.6					
		compact grey silt, some sand, trace clay, saturated		6	SS	10		21
18								
20 (6 m)			229.5 / 6.1					
		compact grey sandy silt, saturated		7	SS	11		21
22			228.9 / 6.7					
		Drilling Terminated						
24								

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW103-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

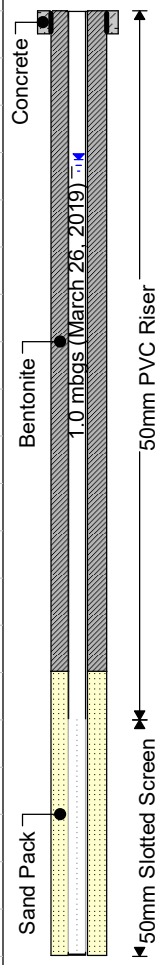
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.3					
0		**TOPSOIL** dark brown/black sandy silt, some organics, wet	0.0	1	SS	5		18
2		**SAND AND SILT** loose dark brown sandy silt, wet	234.5 / 0.8					
		compact, saturated		2	SS	10		24
4			233.8 / 1.5					
		compact light brown silty sand, saturated		3	SS	17		20
6 / 2								
8				4	SS	16		22
10				5	SS	19		19
12 / 4								
14			230.7 / 4.6					
		compact grey sandy silt, trace clay, saturated		6	SS	29		19
16								
18								
20 / 6			229.2 / 6.1					
		dense		7	SS	32		19
			228.7 / 6.6					
22		Drilling Terminated						
24								

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW104-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

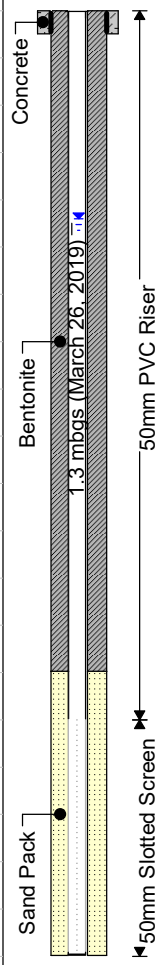
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	236.4					
0		**TOPSOIL** dark brown/black sandy silt, some organics, saturated/frozen	0.0	1	SS	3		16
2		**SAND AND SILT** very loose dark brown silty sand, wet	235.6 / 0.8	2	SS	4		24
4		loose dark brown sand, some silt, trace clay, wet	235.2 / 1.2					
		saturated	234.9 / 1.5					
6		compact	234.6 / 1.8	3	SS	14		25
		light brown		4	SS	17		21
10				5	SS	15		22
14			231.8					
16		dense, brown	4.6 / 231.4	6	SS	35		21
		grey	5.0					
20		dense grey sandy silt, saturated	230.3 / 6.1	7	SS	31		22
22		Drilling Terminated	229.8 / 6.6					

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW105-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

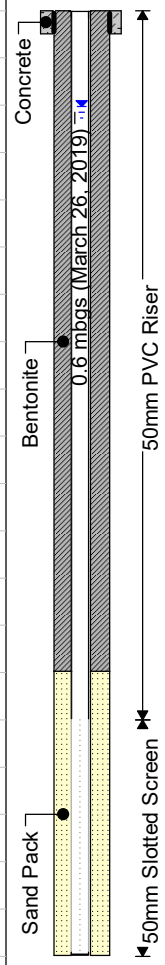
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	234.2					
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 233.8 / 0.4	1	SS	4		22
		SAND AND SILT loose dark brown sandy silt, wet	233.4 / 0.8					
		compact, saturated light brown		2	SS	14		23
		grey	232.7 / 1.5	3	SS	18		21
				4	SS	12		22
				5	SS	11		20
		compact grey silt, some sand, trace clay, saturated	229.6 / 4.6	6	SS	21		17
		dense grey silty sand, saturated	228.1 / 6.1	7	SS	36		18
		Drilling Terminated	227.6 / 6.6					



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW106-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

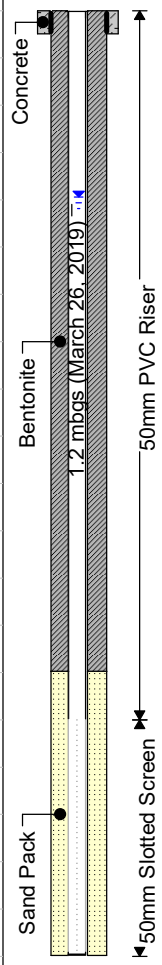
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.5					
0		**TOPSOIL** dark brown/black sandy silt, some organics, wet	0.0 / 235.2 / 0.3	1	SS	4		18
2		**SAND AND SILT** loose dark brown sandy silt, wet	234.7 / 0.8					
		saturated		2	SS	9		24
4			234.0 / 1.5					
		compact, light brown		3	SS	10		21
6								
8				4	SS	24		21
10			232.5 / 3.0					
		grey		5	SS	13		20
12								
14								
16				6	SS	17		22
18								
20				7	SS	24		21
			228.9					
22		Drilling Terminated	6.6					
24								

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: BH107-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE					
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
		Ground Surface	234.5						
		TOPSOIL dark brown/black sandy silt, some organics and plastic/glass fragments, saturated	0.0 / 234.2 / 0.3	1	SS	3		25	Cuttings
		SAND AND SILT very loose dark brown/red sandy silt, wet	233.7 / 0.8	2	SS	12		22	
		compact, saturated	233.0						
		compact dark brown/red silty sand, saturated	1.5	3	SS	22		21	Bentonite
			232.2						
		grey	2.3	4	SS	20		21	Wet cave
				5	SS	23		22	
			229.9						Water level at 1.5mbgs upon drilling completion
		dense grey sandy silt, saturated	4.6	6	SS	30		22	
				7	SS	40		25	
			227.9						
		Drilling Terminated	6.6						

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 2.4mbgs

ID Number: BH108-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE					
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
		Ground Surface	235.1						
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 234.7 / 0.4	1	SS	4		23	
		SAND AND SILT loose dark brown sandy silt, wet	234.3 / 0.8						← Cuttings
		trace clay, saturated		2	SS	5		20	
			233.6						
		compact, light brown	1.5	3	SS	12		20	
			232.8						← Bentonite
		compact grey silty sand, saturated	2.3	4	SS	16		19	
				5	SS	19		18	← Wet cave
			230.5						
		compact grey sandy silt, saturated	4.6	6	SS	19		20	
			229.0						
		dense	6.1	7	SS	35		19	
			228.5						
		Drilling Terminated	6.6						

Water level at 1.5mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 3.1mbgs

ID Number: BH109-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE					
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)	Groundwater Observations and Standpipe Details
		Ground Surface	235.4						
0		**TOPSOIL** dark brown/black sandy silt, some organics, saturated	0.0 / 235.0 / 0.4	1	SS	5		27	
2		**SAND AND SILT** loose dark brown sandy silt, wet	234.6 / 0.8						Cuttings
4		compact, saturated		2	SS	10		22	
6				3	SS	15		21	
			233.1						
8		grey	2.3	4	SS	19		20	
10				5	SS	17		20	Bentonite
12									
14									
16				6	SS	26		18	Wet cave
18									Water level at 1.5mbgs upon drilling completion
20			229.3						
		dense grey silty sand, saturated	6.1 / 228.8	7	SS	46		20	
22		Drilling Terminated	6.6						
24									

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

APPENDIX C

LABORATORY TEST RESULTS

Tables 1 & 2

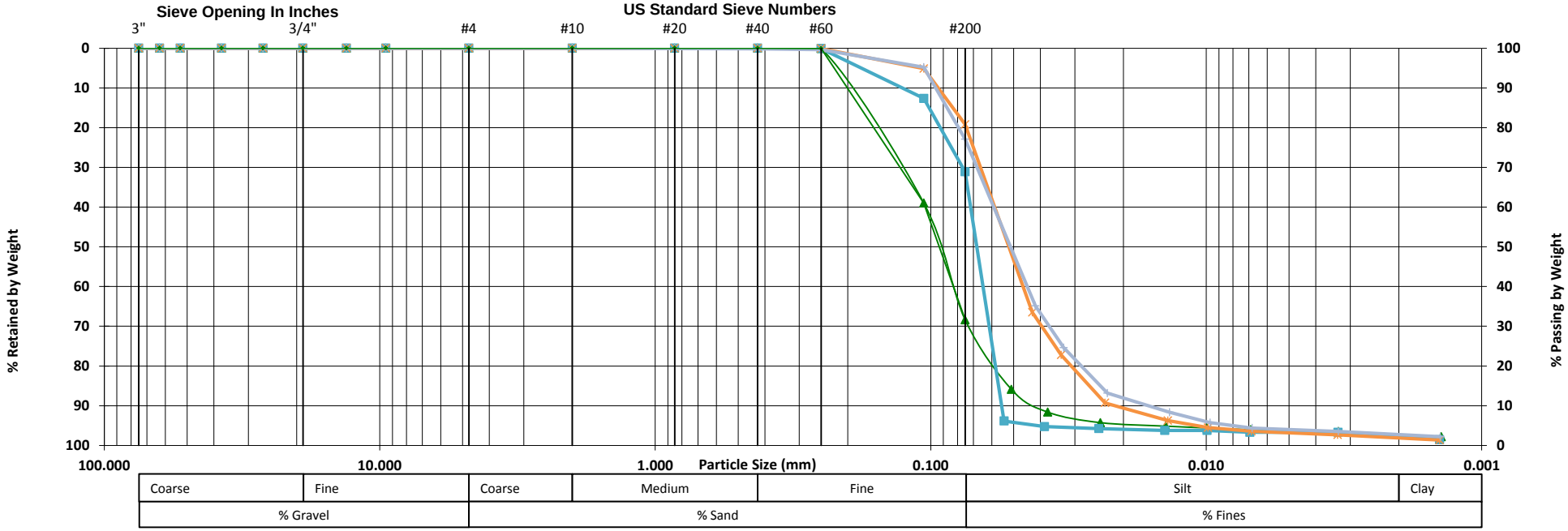
Particle Size Distribution Analysis Test Results

PROJECT NAME: Proposed Industrial Subdivision
CLIENT: 10919 Longwoods Road Inc.
LOCATION: 10919 Longwoods Road, Municipality of Middlesex Centre, ON

DATE SAMPLED: Mar. 20, 2019
DATE TESTED: Mar. 22-26, 2019

FILE No.: 45013-300
TABLE #: 1

Unified Soil Classification



Symbol	Borehole ID	Sample #	*Sample Depth*	Description
▲	MW101-19	SS-2	0.76-1.37 mbgs	Silty SAND, trace Clay
■	MW102-19	SS-2	0.76-1.37 mbgs	Sandy SILT, trace Clay
✳	MW102-19	SS-6	4.57-5.18 mbgs	SILT, some Sand, trace Clay
+	MW103-19	SS-6	4.57-5.03 mbgs	Sandy SILT, trace Clay

CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

NOTES:

MTE Consultants Inc.
365 Home Street
Stratford, Ontario N5A 2A5
Phone: 519-271-7952
Fax: 519-271-3545

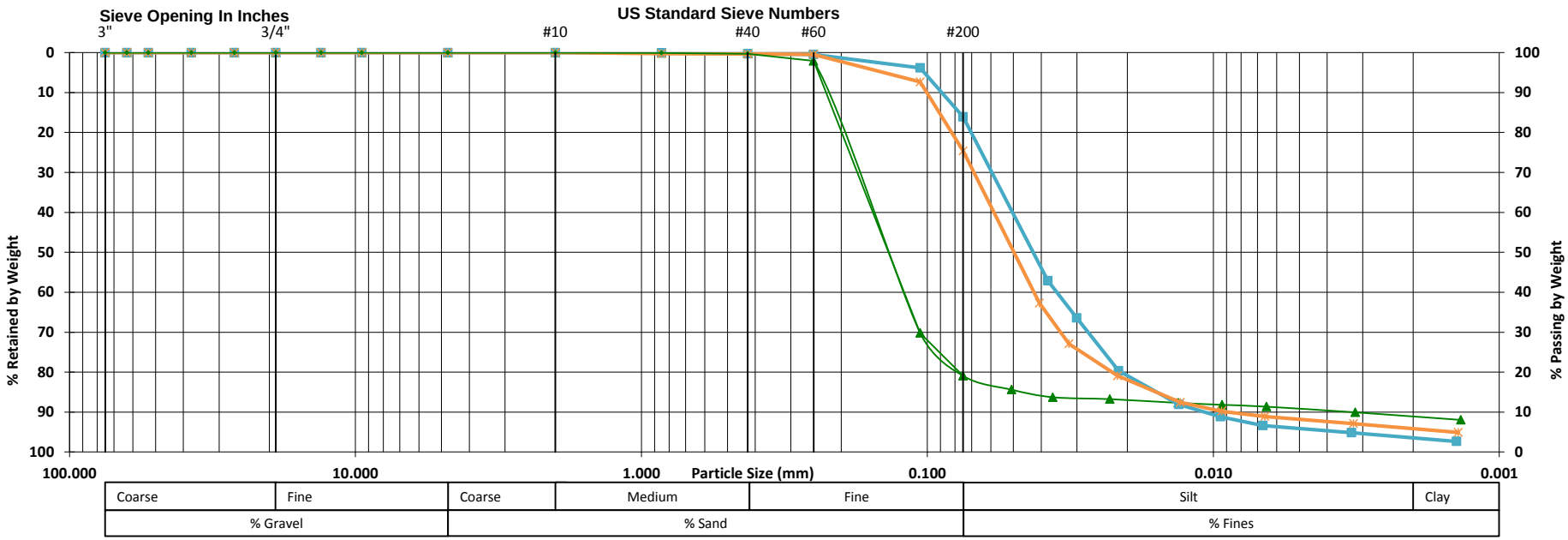
Particle Size Distribution Analysis Test Results

PROJECT NAME: Proposed Industrial Subdivision
CLIENT: 10919 Longwoods Road Inc.
LOCATION: 10919 Longwoods Road, Municipality of Middlesex Centre, ON

DATE SAMPLED: Mar. 20, 2019
DATE TESTED: Mar. 22-26, 2019

FILE No.: 45013-300
TABLE #: 2

Unified Soil Classification



Symbol	Borehole ID	Sample #	*Sample Depth*	Description
▲	MW104-19	SS-2	0.76-1.37 mbgs	SAND, some Silt, trace Clay
■	MW105-19	SS-6	4.57-5.03 mbgs	SILT, some Sand, trace Clay
✳	BH108-19	SS-2	0.76-1.37 mbgs	Sandy SILT, trace Clay

NOTES:

CERTIFIED BY CCIL
Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

MTE Consultants Inc.
365 Home Street
Stratford, Ontario N5A 2A5
Phone: 519-271-7952
Fax: 519-271-3545
www.mte85.com

"MTE is a trusted advisor to our clients and enhances their projects by providing the right solution in a personal, cost effective and timely manner."

MTE Consultants Inc. www.mte85.com

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Burlington, Ontario L7L 6B8
Phone: 905-639-2552
Fax: 905-639-7727

520 Bingemans Centre Drive
Kitchener, Ontario N2B 3X9
Phone: 519-743-6500
Fax: 519-743-6513

560 Wellington Street, Fourth Floor
London, Ontario N6A 3R4
Phone: 519-204-6510
Fax: 519-204-6511

365 Home Street
Stratford, Ontario N5A 2A5
Phone: 519-271-7952
Fax: 519-271-3545

MTE Consultants
123 St. George St., London, ON N6A 3A1

July 3, 2020

MTE File No.: 45013-300

Mr. Guy Riopeele
10919 Longwoods Road Inc.
10919 Longwoods Road
Middlesex Centre, Ontario

Dear Mr. Riopeele:

RE: Results of In-situ Infiltration Testing, Proposed Industrial Subdivision, 10919 Longwoods Road, Middlesex Centre, ON

This letter presents the results of in-situ infiltration testing carried out to support the design of at-source stormwater infiltration facilities for a proposed industrial subdivision to be located at 10919 Longwoods Road in the Municipality of Middlesex Centre, Ontario (herein referred to as the "Site"). The approximate location of the Site is shown on **Figure 1**.

Field Methodology

On April 15 and 16, 2020 in-situ infiltration testing of the native surficial soils was carried out using a constant head well permeameter (Guelph Permeameter Model 2800K1) supplied by Hoskins Scientific. Test methods followed the manufacturer's operating instructions[1]. Infiltration tests were carried out at three locations identified as corresponding to the proposed footprint of the at-source stormwater infiltration facilities. The approximate test locations are shown on **Figure 2.**

At each test location, two infiltration tests were performed, each in a unique auger hole that was manually advanced to a depth of 0.5 meters below the existing ground surface. It is our understanding that the grade will be raised for this development and that the tested elevations correspond to the approximate base of the proposed infiltration facilities.

Each of the auger holes extended through the topsoil, which was noted to range in thickness from 0.3 to 0.4 meters, into the underlying native sand and silt deposits. A description of the shallow soils encountered in the auger holes at the test depth is provided in **Table 1**.

Based on a review of nearby borehole logs prepared as part of the geotechnical investigation[2], the stratigraphy is relatively consistent beneath the tested depth. As a result, additional tests were not completed to assess infiltration of the soils underlying the infiltration facility. Copies of the borehole logs are attached.

---

[1] Soilmoisture Equipment Corp. December 2012. *Operating Instructions, Guelph Permeameter, Model 2800.*

[2] MTE Consultants, March 2019. *Geotechnical Investigation, 10919 Longwoods Road, Proposed Industrial Subdivision.* MTE File No.: 45013-300.

Table 1: Summary of Infiltration Test Locations

Test ID	Location	UTMs (Zone 17T)	Ground Elevation (m AMSL)[2]	Test Elevation (m AMSL)[2]	Soil Description for Test Elevation
IT-1	Lot #7	467573m E, 4750768m N	235.65	235.15	Sand, some silt to sandy silt with trace clay
IT-2	SWM Block	467536m E, 4750857m N	235.37	234.87	Sand, some silt to sandy silt
IT-3	Lot #12	467426m E, 4750717m N	236.29	235.79	Silty sand to silt, some sand with trace to some clay

NOTES:
1. All values approximate.
2. "m AMSL" refers to meters above mean sea level.

Analysis and Results

Field saturated hydraulic conductivity (K_{fs}) was estimated following the single-head method described by Reynolds and Elrick (1986)[3] and a calculation spreadsheet available online from Soilmoisture Equipment Corp.[4] Copies of the calculation sheets for each of the six tests are attached.

The results of the infiltration tests on native soils are summarized in **Table 2**. The recommended design infiltration rate is based on guidance provided by the Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation (CVC)[5] and the approximate relationship between hydraulic conductivity and infiltration rate. It is noted that hydraulic conductivity and infiltration rate are different concepts and unit conversion does not apply. A factor of safety of 3 was applied to the recommended design infiltration rates.

Table 2: Results of Infiltration Testing

Test ID	Location	K_{fs} (m/sec)	Geometric Mean, K_{fs} (m/sec)	Recommended Design Infiltration Rate (mm/hr)
IT-1	Lot #7	9.5E-06	1.0E-05	29
		1.1E-05		
IT-2		1.6E-06	1.7E-06	18

[3] Reynolds, W.D. and Elrick, D.E. 1986. *A Method for Simultaneous In-Situ Measurement in the Vadose Zone of Field Saturated Hydraulic Conductivity, Sorptivity and the Conductivity-Pressure Head Relationship.* Ground Water Monitoring Review Vol 6, No. 4.
[4] https://www.soilmoisture.com/Calculators/Guelph-Permeameter-Ksat-Calculator-ver-3.xls
[5] TRCA and CVC. 2011. *Low Impact Development Stormwater Management Planning Design Guide*. Appendix C, Version 1.0.

Test ID	Location	K_{fs} (m/sec)	Geometric Mean, K_{fs} (m/sec)	Recommended Design Infiltration Rate (mm/hr)
	SWM Block	1.9E-06		
IT-3	Lot #12	5.3E-08	2.9E-08	6
		1.5E-08		

NOTES:
1. All values are approximate.

Recommendations

The following recommendations are provided:

- If the footprint or proposed depth of the at-source infiltration facilities is altered from the tested locations, additional in-situ infiltration testing should be carried out at new locations and/or depths;
- A groundwater monitoring program should be implemented to establish the seasonal high groundwater elevation and confirm that there is sufficient separation from the base of the infiltration facility to the seasonal high groundwater table; and
- Following determination of the seasonal high groundwater level, if there is less than 2 m of separation between the proposed based of the infiltration facility and the seasonal high groundwater level, a groundwater mounding analysis should be completed as part of the detailed design.

Limitations

This letter was prepared for 10919 Longwoods Road Inc. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, are the sole responsibility of such third parties.

Our findings are based on limited data and information collected during the identified field testing and are based solely on-site conditions encountered at the time of investigation. The site conditions were inferred based on observations and tests at a limited number of locations and the conditions may vary between and beyond these locations.

Services performed by MTE were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering and Consulting profession. No other warranty is expressed or implied.

Closure

We trust that this letter provides sufficient information for your current needs. Should you require additional information or have any questions regarding the information provided, please contact the undersigned.

Yours Truly,

MTE Consultants Inc.

PROFESSIONAL GEOSCIENTIST
JOHN D. McNEIL
PRACTISING MEMBER
2014
ONTARIO

John McNeil, M.Sc., P.Geo.
Senior Hydrogeologist
519-204-6510 ext. 2228
jmcneil@mte85.com

Attachments:

Figures 1 and 2
Borehole Logs
K_{fs} Calculations

MBC/JDM/jdm

M:\45013\300\Deliverables\Infiltration Testing\Final\45013-300L02 20200703 Infiltration Results.docx

Attachment A

Figures

MTE

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.

FIGURE 1 – LOCATION PLAN Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES.DWG

MTE Engineers | Scientists | Surveyors

LOCATION PLAN

Project Name			
10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION			
Site		Client	
10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON		10919 LONGWOODS ROAD INC.	
Scale. (8.5x11)	MTE Project No.	Date	Figure No.
N.T.S.	45013-300	MARCH 27, 2019	1

LEGEND

BH107–19
MTE BOREHOLE

MW101–19
MTE MONITORING WELL

IT–1
MTE INFILTRATION TEST LOCATION

REFERENCES:

- AERIAL IMAGE FROM GOOGLE EARTH PRO.
- BOREHOLE ELEVATIONS SURVEYED BY MTE.

MTE
Engineers, Scientists, Surveyors

SITE PLAN

Project Name
10919 LONGWOODS ROAD PROPOSED INDUSTRIAL SUBDIVISION

Site	Client
10919 LONGWOODS ROAD, MUNICIPALITY OF MIDDLESEX, ON	10919 LONGWOODS ROAD INC.

Scale (11x17)	MTE Project No.	Date	Figure No.
1:2000	45013-300	MARCH 27, 2019	2

Project: 45013-300 CAD: P:\P\45013\300\BH FIGURES\45013-300 BH FIGURES_3.DWG
FIGURE 2 – SITE PLAN
March 27, 2019 – 11:39 a.m. – Plotted By: awilliams

Attachment B

Borehole Logs

MTE

The following are abbreviations and symbols commonly used on borehole logs, figures and reports.

Sample Types

AS	Auger Sample
CS	Chunk Sample
BS	Bulk Sample
GS	Grab Sample
WS	Wash Sample
SS	Split Spoon
RC	Rock Core
SC	Soil Core
TW	Thinwall, Open
TP	Thinwall, Piston

Soil Tests

PP	Pocket Penetrometer
FV	Field Vane
SPT	Standard Penetration Test
CPT	Cone Penetration Test
WC	Water Content
WL	Water Level

Penetration Resistance

Standard Penetration Test, N (ASTM D1586)	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.) open spilt spoon sampler for a distance of 300 mm (12 in.).
Dynamic Cone Penetration Resistance	The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive an uncased 50 mm (2 in.) diameter, 60o cone attached to “A” size drill rods for a distance of 300 mm (12 in.).

Soil Description

Cohesive Soils	Undrained Shear Strength (Cu)	
Consistency	kPa	psf
Very Soft	0 to 12	0 to 250
Soft	12 to 25	250 to 500
Firm	25 to 50	500 to 1,000
Stiff	50 to 100	1,000 to 2,000
Very Stiff	100 to 200	2,000 to 4,000
Hard	Above 200	Above 4,000

Cohesionless Soils	
Relative Density	SPT N Value
Very Loose	0 to 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Above 50

WH	Sampler advanced by static weight of hammer
WR	Sampler advanced by static weight of drilling rods
PH	Sampler advanced by hydraulic force
PM	Sampler advanced by manual force

DTPL	Drier than Plastic Limit
APL	About Plastic Limit
WTPL	Wetter than Plastic Limit
mbgs	Metres below Ground Surface

ID Number: MW101-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

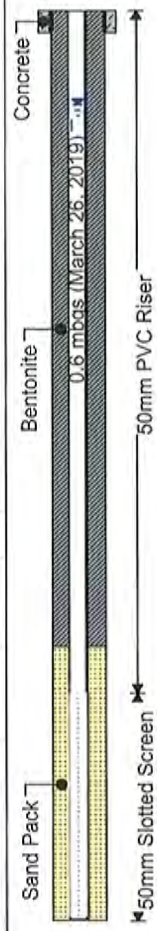
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.0					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 234.7 / 0.3	1	SS	4		24
		SAND AND SILT loose light brown sandy silt, saturated	234.2 / 0.8	2	SS	15		21
		compact light brown silty sand, saturated		3	SS	12		21
				4	SS	11		21
		grey	231.8 / 3.2	5	SS	18		19
		dense	230.4 / 4.6	6	SS	32		18
				7	SS	38		22
		Drilling Terminated	228.4 / 6.6					



Groundwater Observations and Standpipe Details

Initial water level at 0.3mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW102-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

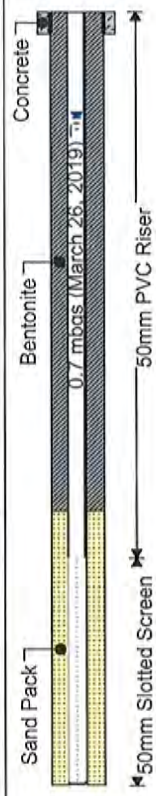
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.6					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 235.3 / 0.3	1	SS	4		24
		SAND AND SILT loose dark brown sandy silt, wet	234.8 / 0.8					
		light brown, trace clay, saturated		2	SS	8		23
		compact	234.1 / 1.5					
				3	SS	10		22
		grey	233.3 / 2.3					
				4	SS	10		25
				5	SS	10		23
		compact grey silt, some sand, trace clay, saturated	231.0 / 4.6					
				6	SS	10		21
		compact grey sandy silt, saturated	229.5 / 6.1					
				7	SS	11		21
		Drilling Terminated	228.9 / 6.7					

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW103-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

Drilling Contractor: London Soil Test Ltd.

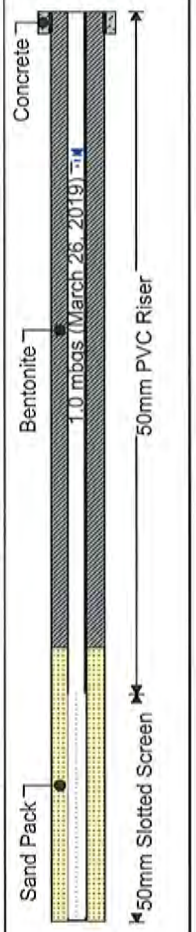
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
0		Ground Surface	235.3					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0	1	SS	5		18
		SAND AND SILT loose dark brown sandy silt, wet	234.5 / 0.8					
		compact, saturated		2	SS	10		24
		compact light brown silty sand, saturated	233.8 / 1.5	3	SS	17		20
				4	SS	16		22
				5	SS	19		19
		compact grey sandy silt, trace clay, saturated	230.7 / 4.6	6	SS	29		19
		dense	229.2 / 6.1	7	SS	32		19
		Drilling Terminated	228.7 / 6.6					

Groundwater Observations and Standpipe Details



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW104-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

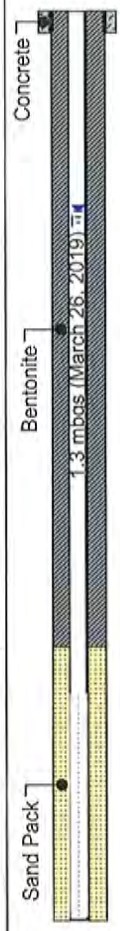
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	236.4					
		TOPSOIL dark brown/black sandy silt, some organics, saturated/frozen	0.0	1	SS	3		16
		SAND AND SILT very loose dark brown silty sand, wet	235.6 / 0.8					
		loose dark brown sand, some silt, trace clay, wet	235.2 / 1.2	2	SS	4		24
		saturated	234.9 / 1.5					
		compact	234.6 / 1.8	3	SS	14		25
		light brown		4	SS	17		21
				5	SS	15		22
		dense, brown	231.8 / 4.6	6	SS	35		21
		grey	231.4 / 5.0					
		dense grey sandy silt, saturated	230.3 / 6.1	7	SS	31		22
		Drilling Terminated	229.8 / 6.6					



Initial water level at 0.8mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW105-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

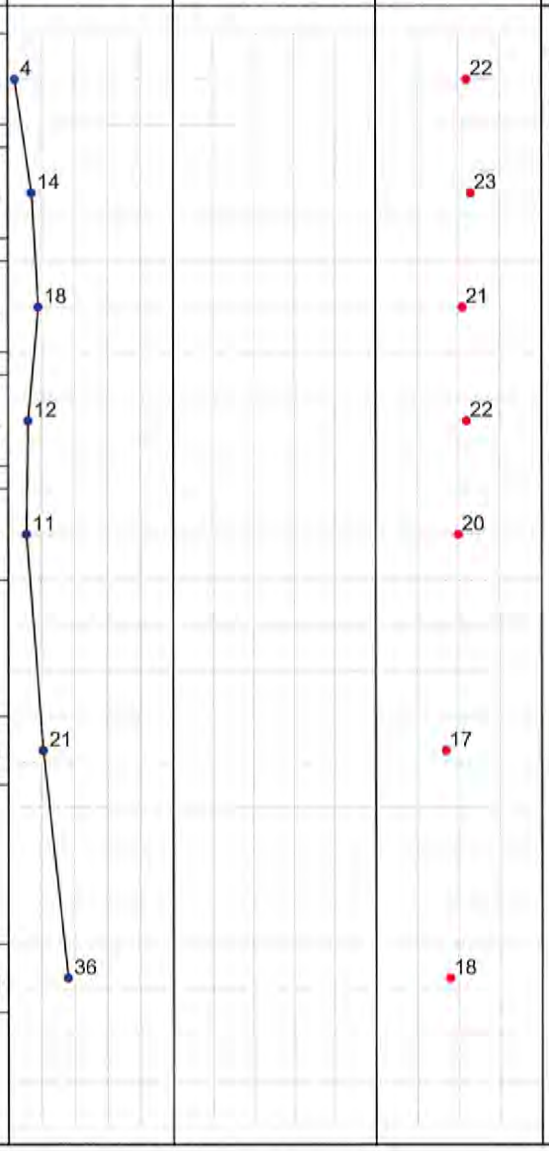
Drilling Contractor: London Soil Test Ltd.

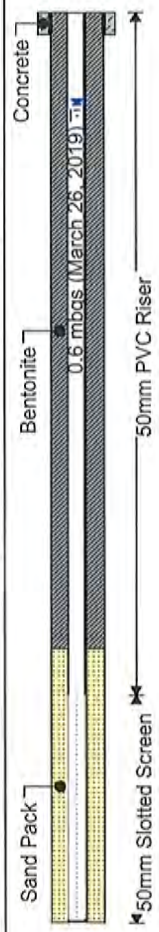
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE	
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type
		Ground Surface	234.2		
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 233.8 / 0.4	1	SS
		SAND AND SILT loose dark brown sandy silt, wet	233.4 / 0.8		
		compact, saturated		2	SS
		light brown	232.7 / 1.5		
		grey		3	SS
				4	SS
				5	SS
		compact grey silt, some sand, trace clay, saturated	229.6 / 4.6	6	SS
		dense grey silty sand, saturated	228.1 / 6.1	7	SS
		Drilling Terminated	227.6 / 6.6		





Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: MW106-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/20/2019

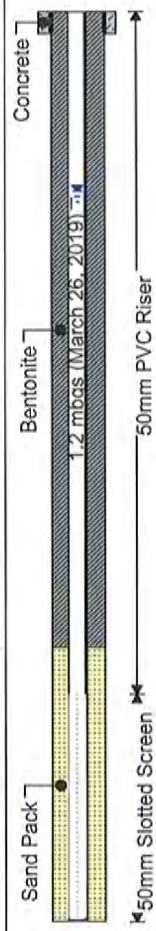
Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.5					
		TOPSOIL dark brown/black sandy silt, some organics, wet	0.0 / 235.2 / 0.3	1	SS	4		18
		SAND AND SILT loose dark brown sandy silt, wet	234.7 / 0.8					
		saturated		2	SS	9		24
		compact, light brown	234.0 / 1.5					
				3	SS	10		21
				4	SS	24		21
		grey	232.5 / 3.0					
				5	SS	13		20
				6	SS	17		22
				7	SS	24		21
		Drilling Terminated	228.9 / 6.6					



Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

ID Number: BH107-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

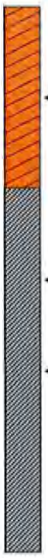
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) kPa / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	234.5					
		TOPSOIL dark brown/black sandy silt, some organics and plastic/glass fragments, saturated	0.0 / 234.2 / 0.3	1	SS	3		25
		SAND AND SILT very loose dark brown/red sandy silt, wet	233.7 / 0.8	2	SS	12		22
		compact, saturated	233.0 / 1.5					
		compact dark brown/red silty sand, saturated		3	SS	22		21
			232.2 / 2.3					
		grey		4	SS	20		21
				5	SS	23		22
			229.9 / 4.6					
		dense grey sandy silt, saturated		6	SS	30		22
			227.9 / 6.6	7	SS	40		25
		Drilling Terminated						

Groundwater Observations and Standpipe Details



Water level at 1.5mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 2.4mbgs

ID Number: BH108-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

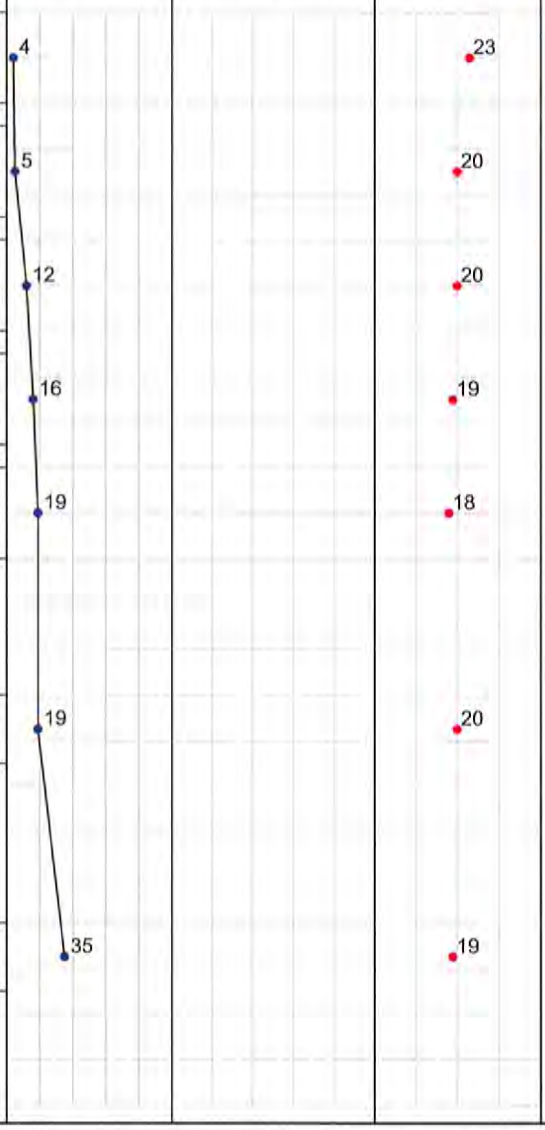
Drilling Contractor: London Soil Test Ltd.

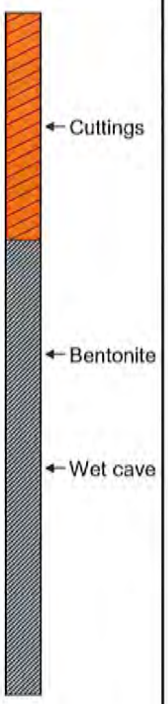
Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE	
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type
		Ground Surface	235.1		
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 234.7 / 0.4	1	SS
		SAND AND SILT loose dark brown sandy silt, wet	234.3 / 0.8		
		trace clay, saturated	233.6 / 1.5	2	SS
		compact, light brown	232.8 / 2.3	3	SS
		compact grey silty sand, saturated	230.5 / 4.6	4	SS
		compact grey sandy silt, saturated	229.0 / 6.1	5	SS
		dense	228.5 / 6.6	6	SS
		Drilling Terminated		7	SS





Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Notes:
Bentonite forced into wet cave at 3.1mbgs

ID Number: BH109-19

Project: 10919 Longwoods Road Proposed Industrial Subdivision

Project No: 45013-300

Client: 10919 Longwoods Road Inc.

Site Location: 10919 Longwoods Road, Middlesex Centre, ON

Drill Date: 3/21/2019

Drilling Contractor: London Soil Test Ltd.

Drill Rig: D50T Track

Drill Method: Hollow Stem Auger

Protective Cover: Monument Casing

SUBSURFACE PROFILE				SAMPLE				
Depth (ft / m)	Symbol	Soil Description	Elevation (masl) / Depth (m)	Number	Type	Dynamic Cone / Standard Penetration (20 40 60 80)	Shear Strength (PP) / Shear Strength (FV) kPa (50 100 150 200)	Water Content % (10 20 30)
		Ground Surface	235.4					
		TOPSOIL dark brown/black sandy silt, some organics, saturated	0.0 / 235.0 / 0.4	1	SS	5		27
		SAND AND SILT loose dark brown sandy silt, wet compact, saturated	234.6 / 0.8	2	SS	10		22
				3	SS	15		21
		grey	233.1 / 2.3	4	SS	19		20
				5	SS	17		20
				6	SS	26		18
		dense grey silty sand, saturated	229.3 / 6.1	7	SS	46		20
		Drilling Terminated	228.8 / 6.6					

Groundwater Observations and Standpipe Details:

- Cuttings
- Bentonite
- Wet cave

Water level at 1.5mbgs upon drilling completion

Field Technician: M. Dalgliesh

Drafted by: B. Heinbuch

Reviewed by: D. Gonser

MTE

Sheet: 1 of 1

Attachment C

K_{fs} Calculations

Guelph Permeameter Calculations

Input
Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.5000

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	1.500
Q	0.881
pi	3.142

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.8805

K_{fs} = 9.54E-04 *cm/sec*
5.72E-02 *cm/min*
9.54E-06 *m/sec*
2.25E-02 *inch/min*
3.76E-04 *inch/sec*

Φ_m = 7.95E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.5000

Res Type	35.22
H	10
a	3
H/a	3.33333
a*	0.12
C0.01	1.21841
C0.04	1.29023
C0.12	1.28754
C0.36	1.28754
C	1.28754
R	1.500
Q	0.8805
pi	3.1415

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.8805

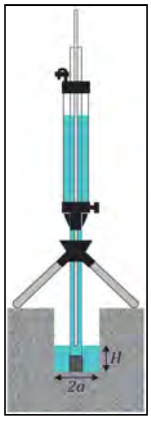
K_{fs} = 9.54E-04 *cm/sec*
5.72E-02 *cm/min*
9.54E-06 *m/ses*
2.25E-02 *inch/min*
3.76E-04 *inch/sec*

Φ_m = 7.95E-03 cm^2/min

Average

K_{fs} = 9.54E-04 *cm/sec*
5.72E-02 *cm/min*
9.54E-06 *m/s*
2.25E-02 *inch/min*
3.76E-04 *inch/sec*

Φ_m = 7.95E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), a^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Guelph Permeameter Calculations

Input
Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.7000

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	1.700
Q	0.998
pi	3.142

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.9979

K_{fs} = 1.08E-03 *cm/sec*
6.49E-02 *cm/min*
1.08E-05 *m/sec*
2.55E-02 *inch/min*
4.26E-04 *inch/sec*

Φ_m = 9.01E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 1.7000

Res Type	35.22
H	10
a	3
H/a	3.33333
a*	0.12
C0.01	1.21841
C0.04	1.29023
C0.12	1.28754
C0.36	1.28754
C	1.28754
R	1.700
Q	0.9979
pi	3.1415

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.9979

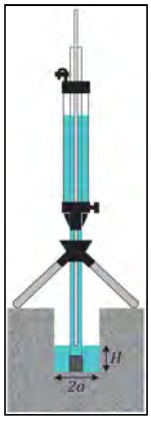
K_{fs} = 1.08E-03 *cm/sec*
6.49E-02 *cm/min*
1.08E-05 *m/ses*
2.55E-02 *inch/min*
4.26E-04 *inch/sec*

Φ_m = 9.01E-03 cm^2/min

Average

K_{fs} = 1.08E-03 *cm/sec*
6.49E-02 *cm/min*
1.08E-05 *m/s*
2.55E-02 *inch/min*
4.26E-04 *inch/sec*

Φ_m = 9.01E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), a^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Guelph Permeameter Calculations

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2 (enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.2500

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	0.250
Q	0.147
pi	3.142

$\alpha^* =$ 0.12 cm^{-1}

C = 1.287543

Q = 0.14675

$K_{fs} =$ 1.59E-04 *cm/sec*
9.54E-03 *cm/min*
1.59E-06 *m/sec*
3.76E-03 *inch/min*
6.26E-05 *inch/sec*

$\Phi_m =$ 1.33E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2 (enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22

Enter water Head Height ("H" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.2500

Res Type	35.22
H	10
a	3
H/a	3.33333
a*	0.12
C0.01	1.21841
C0.04	1.29023
C0.12	1.28754
C0.36	1.28754
C	1.28754
R	0.250
Q	0.14675
pi	3.1415

$\alpha^* =$ 0.12 cm^{-1}

C = 1.287543

Q = 0.14675

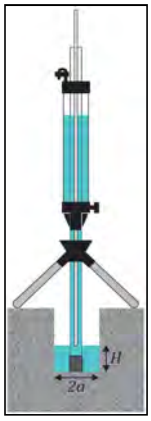
$K_{fs} =$ 1.59E-04 *cm/sec*
9.54E-03 *cm/min*
1.59E-06 *m/ses*
3.76E-03 *inch/min*
6.26E-05 *inch/sec*

$\Phi_m =$ 1.33E-03 cm^2/min

Average

$K_{fs} =$ 1.59E-04 *cm/sec*
9.54E-03 *cm/min*
1.59E-06 *m/s*
3.76E-03 *inch/min*
6.26E-05 *inch/sec*

$\Phi_m =$ 1.33E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), a^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{a^*}\right)}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	$\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Guelph Permeameter Calculations

Input

Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.3000

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	0.300
Q	0.176
pi	3.142

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.1761

K_{fs} = 1.91E-04 cm/sec
1.14E-02 cm/min
1.91E-06 m/sec
4.51E-03 inch/min
7.51E-05 inch/sec

Φ_m = 1.59E-03 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 35.22
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.3000

Res Type	35.22
H	10
a	3
H/a	3.33333
a*	0.12
C0.01	1.21841
C0.04	1.29023
C0.12	1.28754
C0.36	1.28754
C	1.28754
R	0.300
Q	0.1761
pi	3.1415

α^* = 0.12 cm^{-1}

C = 1.287543
Q = 0.1761

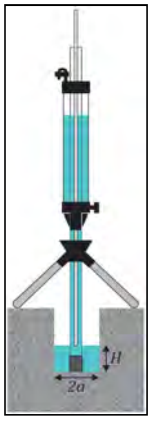
K_{fs} = 1.91E-04 cm/sec
1.14E-02 cm/min
1.91E-06 m/ses
4.51E-03 inch/min
7.51E-05 inch/sec

Φ_m = 1.59E-03 cm^2/min

Average

K_{fs} = 1.91E-04 cm/sec
1.14E-02 cm/min
1.91E-06 m/s
4.51E-03 inch/min
7.51E-05 inch/sec

Φ_m = 1.59E-03 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_2/a}{2.081 + 0.121\left(H_2/a\right)}\right)^{0.672}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), a^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{a^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)a^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Guelph Permeameter Calculations

Input
Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 2.16
Enter water Head Height ("H" in cm): 25
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 0.3500

Res Type	2.16
H	25
a	3
H/a	8.333
a*	0.12
C0.01	1.948
C0.04	2.132
C0.12	2.246
C0.36	2.246
C	2.246
R	0.350
Q	0.013
pi	3.142

α*= 0.12 cm^{-1}

C = 2.246256
Q = 0.0126

K_{fs} = 5.34E-06 cm/sec
3.20E-04 cm/min
5.34E-08 m/sec
1.26E-04 inch/min
2.10E-06 inch/sec

Φ_m = 4.45E-05 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 2.16
Enter water Head Height ("H" in cm): 25
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
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C0.04	2.13216
C0.12	2.24626
C0.36	2.24626
C	2.24626
R	0.350
Q	0.0126
pi	3.1415

α*= 0.12 cm^{-1}

C = 2.246256
Q = 0.0126

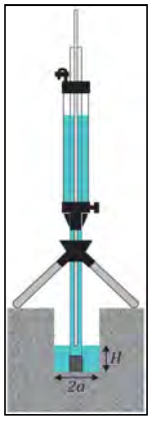
K_{fs} = 5.34E-06 cm/sec
3.20E-04 cm/min
5.34E-08 m/ses
1.26E-04 inch/min
2.10E-06 inch/sec

Φ_m = 4.45E-05 cm^2/min

Average

K_{fs} = 5.34E-06 cm/sec
3.20E-04 cm/min
5.34E-08 m/s
1.26E-04 inch/min
2.10E-06 inch/sec

Φ_m = 4.45E-05 cm^2/min



Calculation formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is microscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

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Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), a^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

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One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter Calculations

Input
Result

Single Head Method (1)

Reservoir Cross-sectional area in cm^2
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Steady State Rate of Water Level Change ("R" in cm/min): 0.1000

Res Type	2.16
H	25
a	3
H/a	8.333
a*	0.12
C0.01	1.948
C0.04	2.132
C0.12	2.246
C0.36	2.246
C	2.246
R	0.100
Q	0.004
pi	3.142

α^* = 0.12 cm^{-1}
C = 2.246256
Q = 0.0036

K_{fs} = 1.53E-06 cm/sec
9.16E-05 cm/min
1.53E-08 m/sec
3.60E-05 inch/min
6.01E-07 inch/sec

Φ_m = 1.27E-05 cm^2/min

Single Head Method (2)

Reservoir Cross-sectional area in cm^2
(enter "35.22" for Combined and "2.16" for Inner reservoir): 2.16
Enter water Head Height ("H" in cm): 25
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
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K_{fs} = 1.53E-06 cm/sec
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3.60E-05 inch/min
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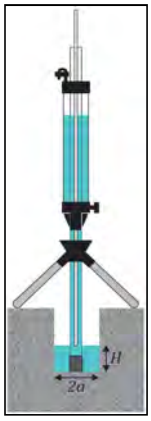

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One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

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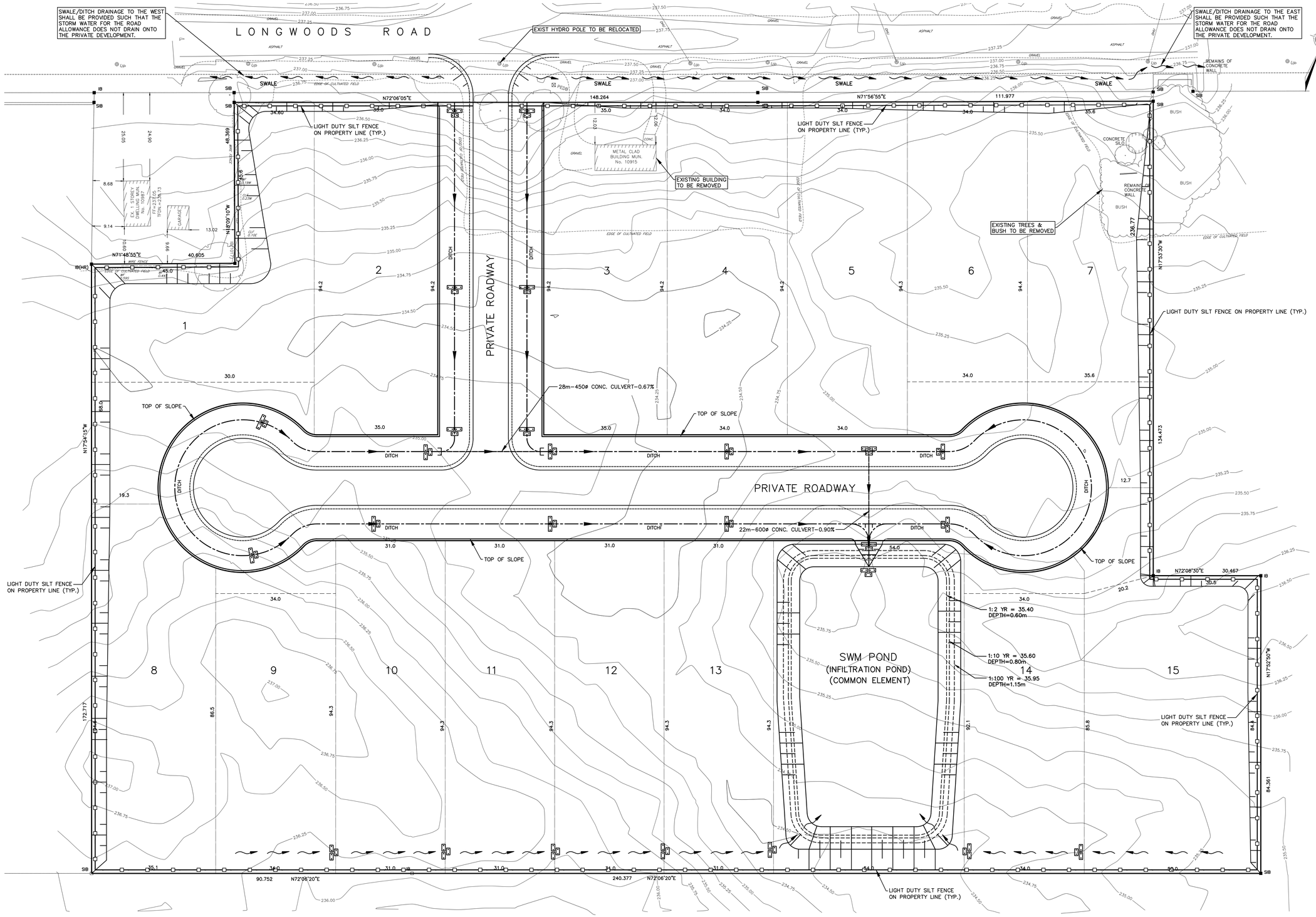
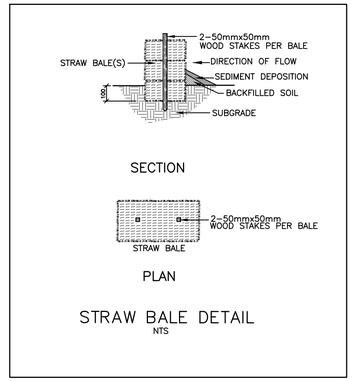


SEDIMENT CONTROL MEASURES

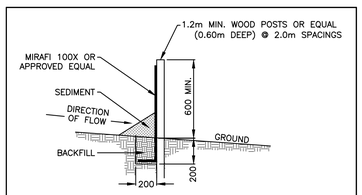
1. INSTALL SILT FENCE AROUND PERIMETER OF ENTIRE SITE INSTALL STRAW BALE CHECK DAMS AT ALL CBs IN GRASS AREAS.
2. PROTECT ALL EXPOSED SURFACES AND CONTROL ALL RUNOFF DURING CONSTRUCTION.
3. ALL EROSION CONTROL MEASURES ARE TO BE IN PLACE BEFORE STARTING CONSTRUCTION AND REMAIN IN PLACE UNTIL RESTORATION IS COMPLETE.
4. MAINTAIN EROSION CONTROL MEASURES DURING ALL PHASES OF CONSTRUCTION.
5. ALL COLLECTED SEDIMENT IS TO BE DISPOSED OF AT AN APPROVED LOCATION.
6. PROTECT ALL SITE CATCHBASINS, MANHOLES AND PIPE ENDS FROM SEDIMENT INTRUSION WITH GEOTEXTILE (TERRAFIX 270R).
7. PREVENT WIND BLOWN DUST.
8. STRAW BALES ARE TO BE USED AT ALL CB/CBMH AND IN LOCALIZED AREAS AS DIRECTED BY THE ENGINEER DURING CONSTRUCTION.
9. WHEN ALL RESTORATION IS COMPLETED REMOVE SEDIMENT CONTROL MEASURES AND RESTORE IMPACTED AREAS.
10. ALL SILT FENCING AND DETAILS ARE AT THE MINIMUM TO BE CONSTRUCTED IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES.
11. ALL OF THE ABOVE NOTES AND ANY SEDIMENT AND EROSION CONTROL MEASURES ARE AT THE MINIMUM TO BE IN ACCORDANCE WITH THE MINISTRY OF NATURAL RESOURCES GUIDELINES ON EROSION AND SEDIMENT CONTROL FOR URBAN CONSTRUCTION SITES.



STRAW BALE DETAIL
NTS

LEGEND

- PROPOSED SWALE
- PROPOSED BERM (3:1 SLOPE MAXIMUM) (TOP / BOTTOM)
- PROPOSED LIGHT DUTY SILT FENCE
- PROPOSED STRAWBALE CHECKDAM



LIGHT DUTY SILT FENCE DETAIL
NTS:

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS		No.	REVISIONS	DATE	CONSULTANT
					DESIGN	KAM				
					DRAWN BY	IRA				
					CHECKED	KAM				
					APPROVED	KAM				
					DATE	JULY/20				

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

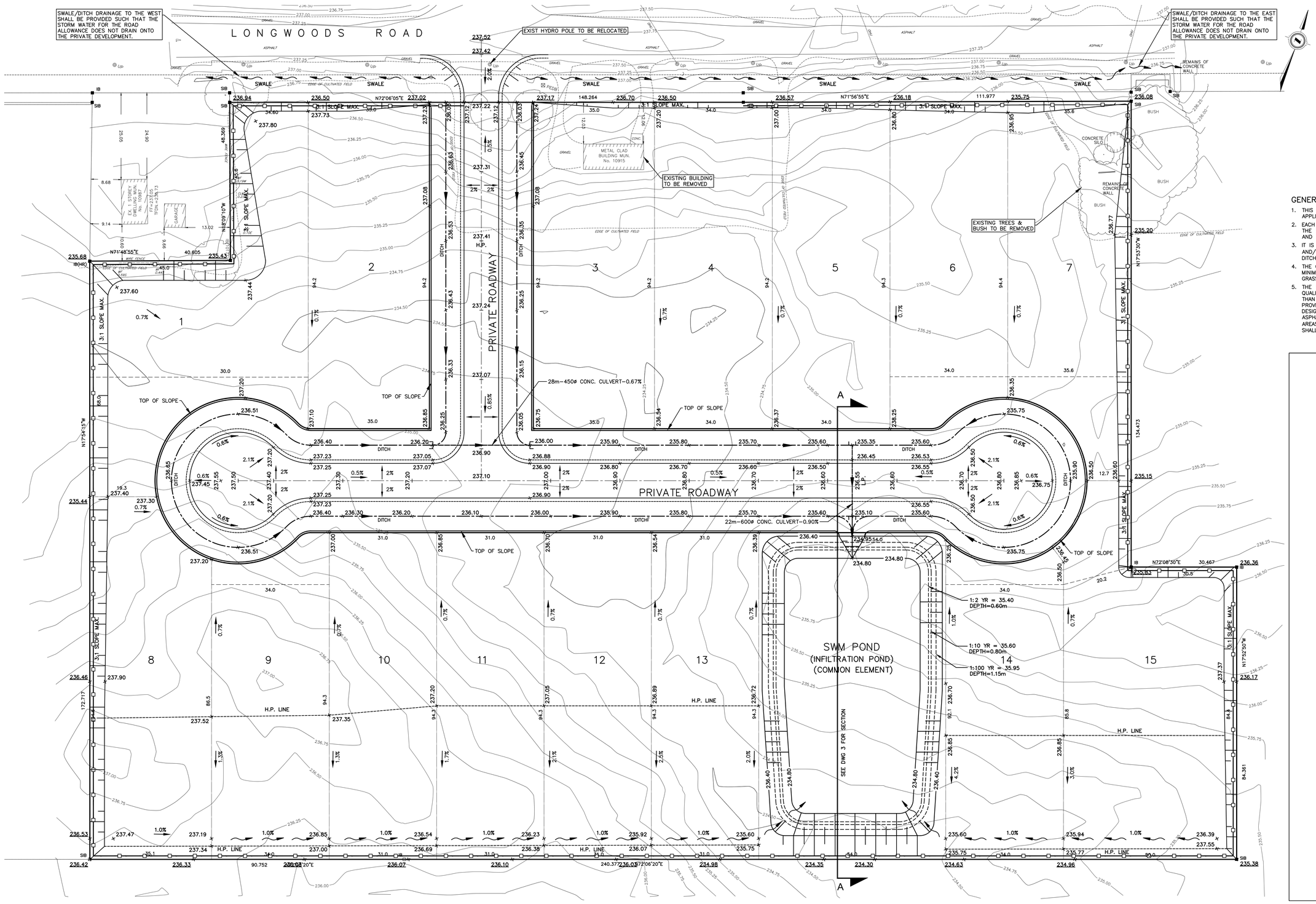
ENGINEER'S STAMP

SCALE
SCALE – 1 : 500
5 0 10m

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

PRELIMINARY EROSION CONTROL PLAN

PROJECT No. 45013-200
SHEET No. 4
PLAN FILE No.



GENERAL NOTES

1. THIS IS A PRELIMINARY GRADING PLAN TO SUPPORT THE DRAFT PLAN APPLICATION.
2. EACH LOT WILL BE SUBJECT TO SEPARATE SITE PLAN APPROVAL. DURING THE SITE PLAN PROCESS FOR EACH LOT, AN INDIVIDUAL LOT GRADING AND DRAINAGE PLAN WILL BE PERPETRATED FOR EACH LOT
3. IT IS ANTICIPATED THAT EACH LOT WILL CONTAIN INTERNAL STORM SEWERS AND/OR INTERNAL DITCHES THAT WILL OUTLET TO THE PRIVATE ROADWAY DITCH
4. THE GRADING STANDARDS TO BE USED FOR THE INDIVIDUAL LOTS IS 1.0% MINIMUM GRADES FOR ASPHALT AREAS AND 2.0% MINIMUM GRADES FOR GRASS AREAS
5. THE SITE PLAN FOR EACH LOT WILL BE REQUIRED TO ADDRESS SWM QUALITY CONTROL. IF THE TOTAL ASPHALT AREA ON EACH LOT IS MORE THAN 800m2, AN OIL GRIT SEPARATOR WILL BE REQUIRED TO BE PROVIDED ON THE INDIVIDUAL LOT. THE OIL GRIT SEPARATOR SHALL BE DESIGNED FOR LEVEL 1 QUALITY CONTROL. FURTHERMORE, IF THE ASPHALT AREA IS LESS THAN 800m2 BUT THERE IS EQUIPMENT WASHING AREAS OR ANY OIL/FUEL STORAGE PROPOSED AN OIL GRIT SEPARATOR SHALL BE PROVIDED.

LEGEND

200.00	PROPOSED ELEVATION
200.00	MATCH EXISTING ELEVATION
2.0%	PROPOSED SWALE & SLOPE
2.0%	PROPOSED SLOPE
TOP / BOTTOM	PROPOSED BERM (3:1 SLOPE MAXIMUM)
200.00	EXISTING ELEVATION
2.0%	EXISTING SWALE & SLOPE
2.0%	EXISTING SLOPE
	EXISTING HYDRO POLE
	PROPOSED/EXISTING STREET LIGHT
	EXISTING HYDRO TRANSFORMER ON CONC. PAD
	PROPOSED/EXISTING SIGN
	EXISTING FENCE LINE
	PROPOSED FENCE LINE
	PROPOSED CURB CUT
	PROPOSED CURB TRANSITION (CURB TYPE 3.0m MIN.) (TO SUPER-ELEVATED 6.0m MIN.)
	PROPOSED SUPER-ELEVATED CURB
	PROPOSED BUILDING ENTRANCE
	PROPOSED/EXISTING STORM MANHOLE
	PROPOSED/EXISTING CATCH BASIN
	PROPOSED/EXISTING SANITARY MANHOLE
	PROPOSED CATCH BASIN MANHOLE
	PROPOSED 3-WAY FIRE HYDRANT C\W STORZ CONNECTION, WITH WATER VALVE ON 150 LEAD
	PROPOSED WATER VALVE
	PROPOSED RESTORATION AREA (SEE RESTORATION NOTE)
	PROPOSED OVERLAND FLOW ROUTE

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION

DETAILS	
DESIGN	KAM
DRAWN BY	IRA
CHECKED	KAM
APPROVED	KAM
DATE	JULY/20

No.	REVISIONS	DATE	CONSULTANT

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE

SCALE - 1 : 500
5 0 10m

TITLE

LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

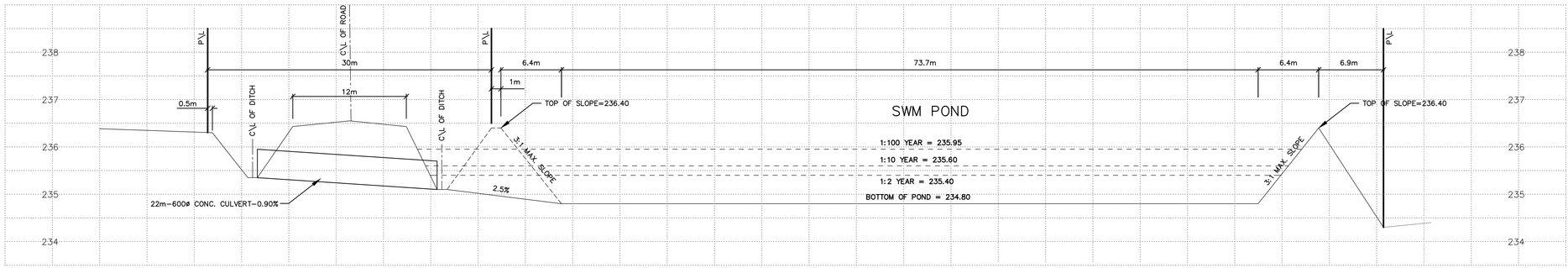
PRELIMINARY GRADING PLAN

PROJECT No. 45013-200

SHEET No. 2

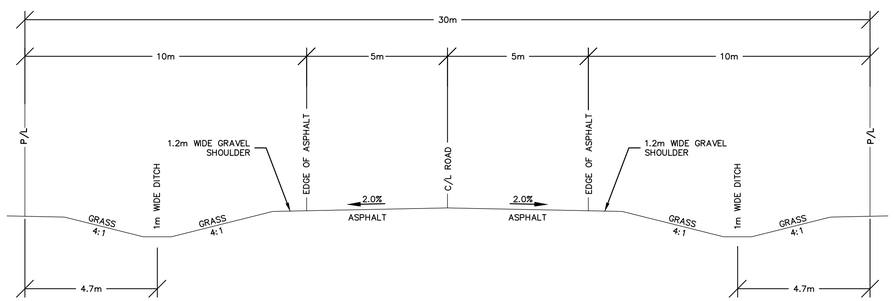
PLAN FILE No.

C:\USERS\USER\DESKTOP\LONGWOODS\45013-200 PLANS_DP1 Z_MUST RECENT



SECTION A–A
SWM POND

SCALE: HORIZ=1:250
VERT=1:100



TYPICAL PRIVATE ROAD SECTION

SCALE: HORIZ=1:100 VERT=1:100

EXISTING SERVICES	DRAWING #, SOURCE	CONSTRUCTION DATE	CONSTRUCTED SERVICES	COMPLETION	DETAILS		No.	REVISIONS	DATE	CONSULTANT
					DESIGN	KAM				
					DRAWN BY	IRA				
					CHECKED	KAM				
					APPROVED	KAM				
					DATE	JULY/20				

CONSULTANT OR DIVISION

MTE
Engineers, Scientists, Surveyors

ENGINEER'S STAMP

SCALE
SCALE – AS SHOWN

TITLE
LOT 6, CONCESSION 1
MUNICIPALITY OF MIDDLESEX CENTRE

DETAILS

PROJECT No. 45013–200

SHEET No. 3

PLAN FILE No.

Municipality of Middlesex Centre
10227 Ilderton Road
Ilderton, ON
N0M 2A0

November 20, 2020

Attention Planning Department
Re: Condominium Application on 10915, 10929 and 11157 Longwoods Road

Dear Sirs:

The information provided in the Middlesex Centre Notice of Public Meeting regarding 10919 Longwoods Road includes an Infiltration Stormwater Pond. I am quite concerned about this method of dealing with the stormwater runoff as this is in a groundwater source protection area and we have a shallow dug water well for our domestic water supply.

I'd like to know what studies and analysis have been completed to ensure that the quality and quantity of the water supply to our shallow well will not be affected by this proposal.

Sincerely,

3603 Carriage Road
Delaware, ON
N0L 1E0

Municipality of Middlesex Centre
10227 Ilderton Road
Ilderton, ON
N0M 2A0

November 20, 2020

Attention Planning Department
Re: Condominium Application on 10915, 10929 and 11157 Longwoods Road

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Sincerely,

Bernie Demmery
3603 Carriage Road
Delaware, ON
N0L 1E0

Monteith◆Brown
planning consultants

610 PRINCESS AVENUE
LONDON, ON N6B 2B9

TEL: (519) 686-1300
FAX: (519) 681-1690
E-MAIL: mbpc@mbpc.ca

November 20, 2020

File No.: 19-1900

Mayor and Members of Council
Municipality of Middlesex Centre
10227 Ilderton Road
Ilderton, Ontario,
N0M 2A0

Reference: Application for Draft Plan of Condominium (39T-MC-CDM2002)
Proposed Industrial Condominium
Municipality of Middlesex Centre
10915, 10929 & 11157 Longwoods Road, Delaware
Owner: 10919 Longwoods Road Inc.
Agent: Kyle McIntosh, MTE Consultants Inc.

Monteith Brown Planning Consultants ("MBPC"), on behalf of our client, Cirrus Developments, is pleased to submit the following comments regarding the above noted application for Draft Plan of Condominium on Longwoods Road in Delaware.

Cirrus Developments owns the lands, known legally as DELAWARE CON 1 PT LOT 6 RP 33R17432 PARTS 4 AND 10, which abuts the southern and eastern boundaries of the subject lands for the proposed industrial condominium.

We are excited by and supportive of appropriate growth and development in Delaware. Our client is encouraged to see the development interest on these lands as it shows that there is a demand for growth in Delaware. We do, however, share some of the concerns expressed by the Municipality's Public Works and Engineering Department regarding the servicing of the proposed development.

After review of the Preliminary Stormwater Management (SWM) Report and Geotechnical Investigation completed by MTE Consultants, we have some minor concerns with the proposed stormwater management plan. As observed in the geotechnical report, the groundwater levels are in close proximity to the existing top of ground. The proposed SWM block has no SWM outlet and instead plans to use infiltration as a means of handling the excess stormwater flows which requires the grade be brought up substantially from existing conditions. We are concerned that when the ground is frozen the SWM block, with no proposed outlet, will overflow over onto our subject property and hinder our client's ability to farm his land. Furthermore, with the infiltration pond raised above our subject property, there is a high probability that stormwater will filter through the proposed embankment and onto our lands adjacent to the pond. We propose that the submitted SWM pond be interim, or resubmitted with a physical outlet controlling the release of stormwater. We believe there is an opportunity for the stormwater to be handled in line with the stormwater master area plan, or through our preliminary proposal for our lands which outlets to the Elviage drain to the south.

We have also reviewed the Noise Feasibility Study included as part of the submission package for the proposed condominium and have concerns with the lack of proposed noise attenuation measures along the southern boundary of the subject lands. The Noise Feasibility Study recommends that the uses and activities which generate the most noise are to be located along the southern property line. Additionally, the subject property's zoning allows for open storage, however, the noise study does not address this possibility, and the effects it will have on surrounding areas. We request that the Noise Feasibility Study be revised to address the potential open storage uses on the subject lands. The impact of noise generated by these uses will be amplified due the proposed grading of the subject land which proposes the use to fill to raise the ground level approximately 2.0m above our client's lands. This will make future efforts to provide noise attenuation more challenging, costly, and hinder the efficient use of land as adjacent berms will need to be constructed to match the elevation on the subject lands.

While our client's lands are currently not designated or zoned for residential development, there is significant demand for residential development within communities near the 400 series highways, like Delaware, as seen by the recent explosive growth of Komoka-Kilworth, Mount Brydges, and Strathroy. The Municipality is currently undertaking a Comprehensive Review of its Official Plan, and our client has submitted a proposal to the municipality to expand the settlement area boundary to include our client's lands and designate them for residential purposes. Due to the continued demand for residential growth in the area, it is reasonable to assume that during either this comprehensive review, or a future one, that these lands will be added to the Settlement Area for Delaware. We are concerned that a decision to permit industrial development with no noise attenuation along the southern and eastern edges of the subject lands will encumber future opportunities to expand the settlement area in an efficient and logical manner. We request that a noise berm or wall be included on the subject lands along the southern and eastern property lines to mitigate potential future impacts on residential development in the area to the south and east.

We also have concerns regarding the proposed use of private sanitary services within the industrial condominium. Section 5.5.1 of the Municipality of Middlesex Centre Official Plan encourages "the development of industrial and business uses within settlement areas *on full municipal services wherever possible*" (emphasis added). Our client's proposal to expand the settlement area for Delaware includes the development of a package sewage treatment plan with the capacity to provide municipal services to Delaware, including the lands subject to these applications. We recommend that consideration be given to the ability to connect in to municipal services which may be provided to Delaware in the future.

Thank you for your consideration of our comments. We will be in attendance at the public meeting on November 25th to present this letter and discuss our comments with the applicant, staff, and Council.

We also request that we are notified of all reports, meetings and decisions relating to the Application for Draft Plan of Condominium (39T-MC-CDM2002).

Respectfully submitted,

MONTEITH BROWN PLANNING CONSULTANTS

Jay McGuffin, MCIP, RPP
Vice-President and Principal Planner

JMc:mc

cc: Marion-Frances Cabral, Planner, Middlesex County
Cirrus Developments Ltd.
Dillon Consulting Ltd.

Meeting Date: **November 25, 2020**

Submitted by: **Marion-Frances Cabral, Planner**

Report No: **PLA-71-2020**

Subject: **Application for Draft Plan of Condominium (39T-MC-CDM2002); Filed by 10919 Longwoods Road Inc.**

Recommendation:

THAT Report PLA-71-2020 be RECEIVED FOR INFORMATION.

Purpose:

The purpose of this report is to provide Council with information for a draft plan of condominium proposal for the property known municipally as 10915, 10929 and 11157 Longwoods Road and legally described as Concession 1 Part Lot 6 RP 33R17432 Part 9 in Delaware. The plan proposes to create 15 lots

A location map is included as Attachment 1 and proposed plan of condominium as Attachment 2.

Background:

The subject property is located within the Delaware Settlement Area is located on the south side of Longwoods Road (County Road 2) east of Martin Road and west of Carriage Road.

The subject property is irregularly shaped and is 6.64 ha (16.4 ac) in area. There is an existing metal shed that will be removed and the remnant of the parcel is actively farmed. Previously there were residential uses on the land. The subject property is surrounded by actively farmed land to the east, west and south. Residential uses exist immediately to the west and to the east along Carriage Road, and industrial, commercial and residential uses exist on the north side of Longwoods Road.

The complete application for the plan of subdivision was received on September 15, 2020. A Notice of Complete Application was circulated to area residents and agencies.

The plan proposes to create 15 lots for light industrial uses and a lot for stormwater management. The lots are proposed to front onto private roadway within 2 turning circles on each end. This roadway will be a common element within the plan of condominium and will be the only access permitted off Longwoods Road. A ditch will be located on each side of the roadway and will direct water runoff to the stormwater pond. Each lot will be serviced by municipal water and will contain an individual septic system. A berm is proposed along the perimeter of the property boundary.

Seven (7) lots will back onto Longwoods Road on the northern portion of the property, and the remaining 8 lots and block will be located on the southern portion of the property. The 15 lots will vary in size from 0.30 ha (0.74 ac) to 0.46 ha (1.14 ac). The lot containing the stormwater management pond is 0.51 ha (1.26 ac) in area.

The proposed plan of condominium is included as Attachment 2.

Policy Regulation:

The Middlesex County Official Plan identifies Delaware as a settlement area and defers to municipal official plans to delineate the boundaries of the settlement area. The subject property is within the Delaware Settlement Area and is designated as 'Settlement Employment' within Middlesex Centre's Official Plan. Additionally, the property is subject to Special Policy Area (SPA) #5. The subject property is currently zoned 'Light Industrial exception 2 with Hold (M1-2)(h-3)' within the Middlesex Centre's Comprehensive Zoning By-law.

As such, the policies and provisions below are applicable to the lands.

Provincial Policy Statement, 2020:

The Planning Act states that all decisions made by planning authorities/municipalities "shall be consistent with the policy statements issued" under subsection 3. The Provincial Policy Statement, 2020 (PPS) document is comprised of several policy statements and those that are applicable to the proposed development are noted below:

Generally, the PPS promotes healthy, liveable and safe communities by supporting efficient land use patterns that facilitate economic growth, create liveable communities, and protect the environment and public health and safety.

Section 1.1 – Managing and Directing Land Use to Achieve Efficient and Resilient Development and Land Use Patterns identifies that healthy communities are sustained by accommodating an appropriate range and mix of uses, avoiding development patterns that cause environmental concerns, and promoting cost-effective development patterns that optimize the use of planned and future infrastructure.

Section 1.1.3 – Settlement Areas establishes that settlement areas shall be based on densities and mix of land uses, including employment uses, that efficiently use land, are appropriate for infrastructure and avoid the need for uneconomical expansion, and are freight-supportive.

Section 1.3 – Employment requires municipalities to promote economic development and competitiveness by providing for a mix of employment uses and diversified economic base to meet long-term needs. This includes maintaining a range and choice of suitable sites for employment uses that consider existing and future businesses. Municipalities must also facilitate conditions for economic investment including monitoring the availability and suitability of employment sites including market-ready sites and addressing barriers to investment. Municipalities are to encourage compact, mixed-use development that incorporate compatible employment uses to support liveable resilient communities in consideration of section 1.4 – Housing.

Section 1.3.2 – Employment Areas contain a variety of policies for the protection and preservation of employment areas for current and future uses, and to ensure the necessary infrastructure is provided to supports its need. Section 1.3.2.3 states that within employment areas planned for industrial or manufacturing uses, municipalities shall prohibit residential uses and prohibit or limit other sensitive land uses that are not ancillary to the primary employment uses in order to maintain land use compatibility. Employment areas planned for industrial or manufacturing uses should include an appropriate transition to adjacent non-employment areas. Section 1.3.2.6 requires planning authorities to protect employment areas in proximity to major goods movement facilities and corridors, such as primary transportation routes, for employment uses that require those locations.

Sections 1.6 – Infrastructure and Public Service Facilities directs that infrastructure and be provided in an efficient manner that also prepares for the impacts of a changing climate. Section 1.6.3 directs municipalities to consider optimizing the use of existing infrastructure before consideration is given to developing new infrastructure. Infrastructure should be strategically located to support the effective and efficient delivery of services.

Section 1.6.6 – Sewage, Water and Stormwater directs future growth and development to efficiently use and optimize existing services such as municipal sewage and water services, when available. Municipal sewage and water services are the preferred form of servicing for settlement areas. However, private services can be supported where it is suitable for the long-term provision of such services with no negative impacts.

In settlement areas, individual on-site sewage services may be used for infilling and minor rounding out of existing development. At the time of the official plan review or update, planning authorities should assess the long-term impacts of individual on-site sewage services and water services on the environmental health of the settlement area.

Section 1.6.6.7 promotes planning for stormwater management that minimizes or prevents an increase in negative impacts on the environment and water system; does not increase risks to human health and safety and property damage; and uses best practices, vegetation, and pervious surfaces as part of an effective stormwater management system. Stormwater management best practices shall be promoted including stormwater attenuation and re-use, water conservation and efficiency, and low impact development.

Section 1.6.7 – Transportation Systems directs transportation and land use coordination to be considered at all stages of the planning process. Transportation networks should be safe, energy efficient and facilitate the movement of people and goods. Efficient development patterns, and a mix of uses and densities should also be promoted to minimize the number of vehicle trips and support active transportation.

Middlesex County's Official Plan:

The County of Middlesex Official Plan (County Plan) identifies the subject property as within the Delaware 'Settlement Area'.

Section 2.3.4 – Policy Framework-Economic Development identified that economic development is an important component of the County's Growth Management policy framework. Diversifying the economic base is an important factor to foster new opportunities within the County. The County encourages local municipalities to monitor the supply of employment land to ensure there is sufficient supply and particularly in those municipalities with access to provincial highways and major arterials roads.

Section 2.3.8 – Policy Framework-Settlement Areas of the County Plan recognizes that Settlement Areas will be the focus for future growth including commercial and industrial uses. These areas are intended to have a wide range of land uses and full municipal servicing in conjunction with 2.4.5 of the County Plan. Additionally, section 2.3.8.1 – Urban Areas permit new development fully serviced by municipal or communal water and sewage disposal systems.

Where there is substantial vacant land between the built-up area and the Urban Area boundary, the local municipality shall ensure the development proceeds in a logical, phased manner.

Section 2.4.2 – Transportation Network recognizes the importance of roads, highways, and railways within the network. The County Road system provide inter-municipal service moving people and goods throughout the County, and functions as an arterial or collector road. For high-volume arterial roads, access shall be strictly controlled. Agricultural, industrial, commercial and open space land uses are considered to be appropriate land use adjacent to arterial County Roads.

With regard to municipal sanitary sewers and water services, section 2.4.5 – Sanitary Sewers and Water of the County Plan promotes efficient and environmentally responsible development that can be supported by full municipal systems servicing. Where partial municipal services are considered the supporting studies of new development shall address all servicing options. Additionally, municipalities are also encouraged to implement suitable and economically viable methods of reducing urban storm water runoff and to improve its quality.

Section 3.2 – Detailed Land Use Policies-Settlement Areas provides additional development policies for lands within Settlement Areas. The County Plan further supports that Settlement Areas, including Urban Areas, permit a variety of uses including commercial and industrial uses.

Middlesex Centre's Official Plan:

The Middlesex Centre Official Plan (Official Plan) designates the subject lands as 'Settlement Employment' within the Delaware Community Settlement Area on Schedule A-4. Additionally, the property is located within Special Policy Area (SPA) #5.

Section 5.5 – Settlement Employment Areas pertains to lands designated 'Settlement Employment Area' within Urban and Community Settlement Areas. The Official Plan encourages the development of industrial and business uses within settlement areas on full municipal services wherever possible. Within Urban and Community Settlement Areas industrial land uses shall have access to public roads of reasonable construction and year-round maintenance. Development is encouraged on hard-surface, dust-free roads. Within Community Settlement Areas, industrial land uses shall be dry in nature.

Industrial uses shall be adequately buffered where adjacent to residential uses or other sensitive land uses. New industrial operations that product significant amounts of noise, dust, odours, particulate emissions, or heavy truck movements shall not be permitted to locate in proximity to existing residential areas or in locations within settlement areas that would negatively affect the quality of life or character of the settlement area. Proposed industrial uses not meeting this policy are encouraged to locate within existing Rural Industrial designations outside of settlement areas where they are not located in proximity to sensitive agricultural uses. Additionally, new development shall be subject to the policies of Section 6.0 – Municipal Design Policies and Section 10.5 – Site Plan Control, and shall have regard for the Municipality's site plan manual and urban design guidelines.

Permitted uses within the Settlement Employment designation include industrial uses (e.g. manufacturing, processing, wholesaling, repair and servicing and storage of goods and materials). Within Community Settlement Areas, where municipal water supply is not provided, such uses must be dry in nature. Other uses include office park and limited retail and personal service uses that are compatible with industrial uses and located within an office building or industrial use.

Section 5.6 – Protection of Employment Lands directs council to support the protection of designated Settlement Employment areas within the municipality including lands that are designated for clusters of business and economic activities including, but not limited to, manufacturing, warehousing, offices and secondary uses.

Section 9.3 – Municipal Infrastructure and Services Policies states that the Delaware Settlement Area has full municipal water, and that municipal sanitary sewer infrastructure is Delaware is possible within the planning period of the Official Plan. Development within settlement areas are to proceed on the basis of full municipal services with partial services potentially permitted on an interim basis where proper justification is provided. Additionally, all lots affected by an application for a plan of subdivision/condominium shall be sized such that there is sufficient space for a building envelope, sewage envelope, sewage system contingency area, and potable water supply if municipal water is not available.

Section 9.4 – Transportation and Utilities Policies supports the efficient movement of people and goods to and from the Municipality, and within the Municipality. This can be supported by limiting direct access to County Roads where access is available by a local road.

Section 10.4 – Plan of Subdivision Policies details policies for draft plans of subdivision and draft plans of condominium applications and are as follows:

a) Plans of subdivision/condominium will not be required where three or fewer new lots are proposed to be created or where circumstances exist where a plan of subdivision is not considered by the Municipality to be necessary. Where more than three new lots are to be created, the Municipality may exercise flexibility in determining whether a plan of subdivision process is required. Notwithstanding the above, in all cases where the creation or extension of municipal streets and/or services is proposed, a plan of subdivision process will be required.

b) When considering plans of subdivision/condominium applications, the review is to consider whether the proposed development is premature. One key consideration of this review relates to the availability of appropriate services and capacity. Other relevant factors may also be considered.

c) The review of plans of subdivision/condominium within the Municipality will be based in part on consideration of design policies included in Section 6.0 of this Plan and the Municipality's Urban Design Guidelines.

d) Where possible, plans of subdivision/condominium within the Municipality will incorporate a mixture of housing types and levels of affordability in keeping with policies included in Residential policies included in Section 5.2 of this Plan.

e) All lots within a proposed plan of subdivision must have frontage on a public road which is or will be opened and maintained on a year round basis, and constructed to an acceptable Municipal standard.

f) Plans of subdivision/condominium that respect natural contours and topography will be encouraged. All unique natural features and assets, as well as heritage features, should be preserved and integrated into the subdivision design.

g) For large plans of subdivision/condominium, consideration of appropriate staging or phasing will be included.

h) It is the policy of this Plan that all new plans of subdivision/condominium be subject to a subdivision agreement between the Municipality and the owner / developer. This agreement shall address various matters pertaining to the plan of subdivision/condominium, as determined by the Municipality.

i) Park land dedication provided to the Municipality in keeping with Section 9.5 of this Plan, must be considered suitable for park land purposes and acceptable to the Municipality. Under no circumstances shall Municipal Council be obligated to accept park land which is being offered by an applicant for a proposed plan of subdivision. Park land dedications shall be reviewed in the context of public realm policies included in Section 6.0 of this Plan.

j) The extent to which the plan's design optimizes the available supply, means of supplying, efficient use and conservation of energy.

k) The interrelationship between the design of the proposed plan of subdivision and site plan control matters relating to any development on the land, if the land is also located within a site plan control area.

l) That highways, including pedestrian pathways, bicycle pathways and public transit rights of way, be dedicated as the approval authority considers necessary.

The subject property is also subject to Special Policy Area (SPA) #5 and subject to the following policy: Notwithstanding the Settlement Employment designation of the subject lands, prior to the consideration of enactment of an implementing zoning by-law amendment, a noise impact assessment is required to be prepared by a qualified consultant and approved by the Municipality which determines the appropriate uses that are to be permitted on the land; and provides recommendations for appropriate mitigation measures to be incorporated into subdivision design and site plan design.

Middlesex Centre Zoning By-law:

The subject property is currently zoned 'Light Industrial exception 2 with Hold (M1-2)(h-3)' within Middlesex Centre's Comprehensive Zoning By-law.

The site-specific zone permits all the uses within the 'Light Industrial (M1)' zone and a *contractor's yard or shop*, *machine shop* and *service shop*. The minimum lot area for the zone is 3, 000 m^2 (0.75 ac) and minimum lot frontage is 0.0 m (0.0 ft).

Further, the precondition for removal of the holding symbol (h-3) shall be that a Noise Impact Analysis be prepared by a qualified professional in association with the site plan approval process for any proposed development on the lands to which the holding symbol applies and that any recommendations for noise mitigation arising from the Noise Impact Analysis have been incorporated into the site plan such that the proposed development will meet the Ministry of Environment (MOE) noise criteria.

Consultation:

Notice of the application has been circulated to agencies, as well as property owners in accordance with the *Planning Act* and Ontario Regulation 544/06.

Public Comments:

At the time of writing this report staff received the following comments from a neighbouring property owner:

- The proposed plan of condominium abuts the neighbouring property to the north and west. In preparation of the public meeting on November 25, 2020 the landowner requested to review supporting materials (e.g. hydrogeological, geotechnical, etc.) that was submitted with the application. Further, the landowner would like to know if noise impact assessments would be conducted on current or future surrounding residential areas, and if so, what measures are being proposed. Lastly, the landowner would like to know what fencing, berms or buffers are required around the site.

Agency Comments:

At the time of writing the subject report the following comments were received:

The Municipality's Chief Building Official has not concerns with the condominium proposal and will provide additional comments at the time of site plan review.

The Municipality's Public Works and Engineering Department has reviewed the applications and provide the following comments:

- The property is assessed into a municipal drain. Further discussion is needed to establish how the assessment will be split.

- Surface water should be contained internally where possible, especially around the existing residential property.

- The applicant should consider the use of storm sewers instead of road side ditches.

- A greater slope within the roadside ditches is preferred. The same applies to the swale located in the rear of lots 8-15. The minimum slope in a swale is 2% per the municipality's infrastructure design standards.

- There appears to be an error in the average ditch depth mentioned in the SWM letter report

- The emergency overflow is not shown on the grading plan, further details should be provided on where the overflow would go on the adjoining property. The pond should be sized for the 100 year, 24 hour storm as a minimum before overflow. Please confirm the impact of the 250 year, 24 hour storm.

- Servicing drawings will need to be provided during the detailed design stage. These drawings should include the watermain extension along Longwoods Road.

- PWE would prefer to see the grade breaks on lots 8-15 shifted so that a minimum side yard slope of 1% can be achieved where possible.

- The 100 year water level in the pond is 235.95 which is higher than the berm at the rear of lots 12-15. The rear yard swales would have some flooding. The flooding limit should be shown in the ditches and the swales.

- With no SWM outlet the pond should have sufficient freeboard (ideally containing the 250 year)

- Based on the findings of the nitrate loading study, using a conventional septic system on all the proposed lots would not meet the 10 mg/L requirement. The Municipality's practice is that lot sizes shall be based on conventional septic system in order to meet nitrate loading requirements. Staff would like to have a further conversation with the applicant's consultant (MTE) on this matter to ensure the lots are sized appropriately. Some modification to the lot sizes may be needed based on the discussions.

- In addition to the already submitted materials, PWE would like to review:

    - Site plan, showing concept for driveways, septic layout, etc.

    - Servicing brief

    - Servicing plans, with plan and profile drawings of the watermain extension along Longwoods Road

    - Detailed grading plans

    - Lighting plan with photometrics

    - Landscape plan

The Lower Thames Valley Conservation Authority (LTVCA) has not provided comments at the time of writing this report.

Canada Post reviewed the proposal and advised the applicant to consult with Canada Post to determine a suitable permanent location for a community mailbox and that the applicant agrees to provide a walkway, curb and base pad for the community mailbox. Canada Post requests to be notified of any changes or approval to the plan of condominium.

Financial Implications:

None.

Strategic Plan:

This matter aligns with following strategic priorities:

- 2b. Economic Development: Capitalizing on Middlesex Centre's location advantage.
- 2a. Economic Development: Realizing economic development opportunities.
- 2e.Economic Development: Expanding local employment options.

Attachments:

Attachment 1 – Location Map

Attachment 2 – Proposed Plan of Condominium