



December 11, 2023
File: GE-01104

10919 Longwoods Road Inc.
10689 Denfield Road
London, Ontario N6H 5L2

Attention: Guy Riopelle

**Reference: Nitrate Impact Assessment
10919 Longwoods Road, Delaware**

LDS Consultants Inc. (LDS) has been retained by 10919 Longwoods Road Inc. to prepare a Nitrate Impact Assessment for the project site located at 0919 Longwoods Road, in Delaware. A Key Plan is provided below, for reference.

Figure 1: Key Plan



It is understood that the proposed development at the site (approximately 6.65 ha in size) will include the creation of an industrial subdivision, which will have 18 lots and a stormwater management block. The lots will have municipally supplied water, and are expected to have private septic services. A Nitrate Impact Assessment has been identified as a requirement to support the proposed development.

Background Nitrate Concentrations

A water sample was collected from BH/MW1 on December 4, 2023. The water sample was collected from the monitoring well using a bailer. Prior to sampling, a site visit was conducted on December 1st for well development. This involved purging the equivalent of 3 water columns from the well, and allowing time for the stabilized water table to be re-established.

The water sample was secured for transport in a pre-labelled container, and transported to the analytical lab in a cooler equipped with ice packs, in accordance with standard environmental sampling protocols. The sample

was submitted to the analytical lab (ALS Laboratories) under Chain of Custody #20-1084455, at the Waterloo lab and sample depot.

A background nitrate concentration of 0.119 mg/L was reported for the collected water sample. A copy of the laboratory certificate is appended for reference.

The background nitrate concentration is well below the threshold set by the Ontario Drinking Water Standards (ODWS), which is set at 10 mg/L. For the purposes of this analysis, a background nitrate level of 1.2 mg/L has been incorporated into the calculation (based on average values in precipitation reported by the US EPA National Air Quality and Emissions Trend Report, 1997, and referenced by Environment Canada in the Canada – United States Air Quality Agreement, 2012). This allows for some local and seasonal variation on the background nitrate levels which can vary as a result of site activities and near-by agricultural land-use.

Nitrate Impact Assessment

LDS has carried out a nitrate impact assessment for the proposed lot severance, considering a conventional filter bed, and a level IV treatment system within the proposed lot. Calculations were prepared following the predictive assessment model (calculation) outlined in the MECP D-5-4 Guideline document. The model has been established to demonstrate the theoretical nitrate concentration which would occur at the downstream property boundary (considered to be the worse case boundary condition), and sets a target value of 10 mg/L, based on the applicable ODWS criteria.

The following is a mass balance calculation for the theoretical nitrate concentration which would occur at the downstream property boundary based on a conventional Class IV septic system.

$$C_o = [Q_E (N_E) + D_w (N_B)]/[D_w + Q_E]$$

Where: C_o = Nitrate Concentration at the property boundary (mg/L);
 N_E = Nitrate Concentration of the sewage effluent (from the tank) (mg/L);
 Q_E = Yearly volume of effluent produced (L/year);
 D_w = Dilution Water available (L/yr);
 N_B = Background Nitrate Concentration, (mg/L).

The average daily design sewage load for each lot has been based on a typical building having factory-based operations, with up to 10 employees working a standard 8-hour shift as office staff or operations staff, which results in a design flow in the range of 750 L/day. It is noted that this typical flow rate is considered a realistic and conservative average daily flow rate and should not be confused with the peak design flow used to design the sewage system, (which is often 2 to 3 times this amount).

The site area used in the calculation is based on 18 lots having similar sized operations, over the entirety of the site (6.65 ha) – identified as Scenario 1; and, for the operations of the smallest lot (0.30 ha) with a similarly sized operation (Scenario 2).

Precipitation and infiltration through the soil to groundwater normally provide dilution and provide the basis for the following nitrite loading calculations. The values used in the calculation are based on Environment Canada '30-year average' weather data, established at the London Airport (1991-2020) and through currently accepted MECP Stormwater management guidance materials.

Nitrate (N) concentrations in conventional septic effluent (without treatment) have anecdotally been identified at 40 mg/L. Using the actual values in the technical case studies and science-based analyses, the average nitrate value in pre-treated septic effluent is identified as 37 mg/L. This value has been utilized in the analysis.

Sample calculations are appended for reference, and demonstrate the following:

- Scenario 1: The cumulative effects of the 18 lots, operating with a conventional in-ground septic system with a daily design flow volume in the range of 750 L/day result in a boundary nitrate level of 8.50 mg/L, which is within the target limits.
- Scenario 2A: The effect of the smallest lot (0.30 ha in size) with a conventional in-ground septic system with a daily design flow volume in the range of 750 L/day results in a boundary nitrate level of 9.78 mg/L, which is within the target limits.
- Scenario 2B: The effect of the smallest lot using a Level IV treatment system which reduces the nitrate concentrations in the effluent by at least 25%, results in a boundary nitrate level of 7.62 mg/L.

Although scenario 2B with the Level IV treatment system which reduces the nitrates is not required from a net-impact assessment, consideration may be given to utilizing these types of systems. These types of treatment systems were formerly known as tertiary treatment systems, however, under the recent updates to the building code which require the use of effluent filters in new septic systems, and BNQ standards for effluent quality, these types of systems are becoming more common place. In addition to providing the environmental benefit of reducing nitrate levels in the septic effluent, this type of system offers the added benefit of being able to optimize the area required to accommodate the septic distribution bed, having a smaller impact on disturbed subgrade soils within the lot. This system does not require any washed stone, or require any mechanical or electrical components, and therefore has a smaller carbon footprint compared to traditional septic distribution systems.

Summary Comments

Based on this review and analysis, the parcels can accommodate a conventional septic system. It is noted that a site-specific septic design will be required for each lot, and that if design flows are significantly greater than those used in this analysis, that the use of Level IV treatment systems can be effective as reducing nitrate levels in the effluent.

We trust this meets your current requirements. If you require any clarification or technical support, please don't hesitate to contact our office.

Respectfully,

LOS CONSULTANTS INC.



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Attachments:

Nitrate Loading Sample Calculations
Concept Plan

D-5-4, Nitrate Loading Sample Calculations

Scenario 1 - Max Design Flow, 18 Lots (750 L/day per Lot) Effluent Nitrate @ 37 mg/L

| | | | | | |
|------------|------------|--------|---|--------|----------------|
| Daily Flow | 13,500 | L/day | Area | 66,500 | m ² |
| NE | 37 | mg/L | <i>standard nitrate level</i> | | |
| QE | 4,927,500 | L/year | <i>Effluent Flow Calculated for proposed system</i> | | |
| DW | 19,253,080 | L/year | <i>Dilution water calculated for site Avg value from Env. Canada published data, 2012</i> | | |
| NB | 1.2 | mg/L | | | |
| Co | 9.11 | mg/L | <i>meets ODWQ Guidelines</i> | | |

Scenario 2A - Design Flow, on smallest lot, Effluent N @ 37 mg/L

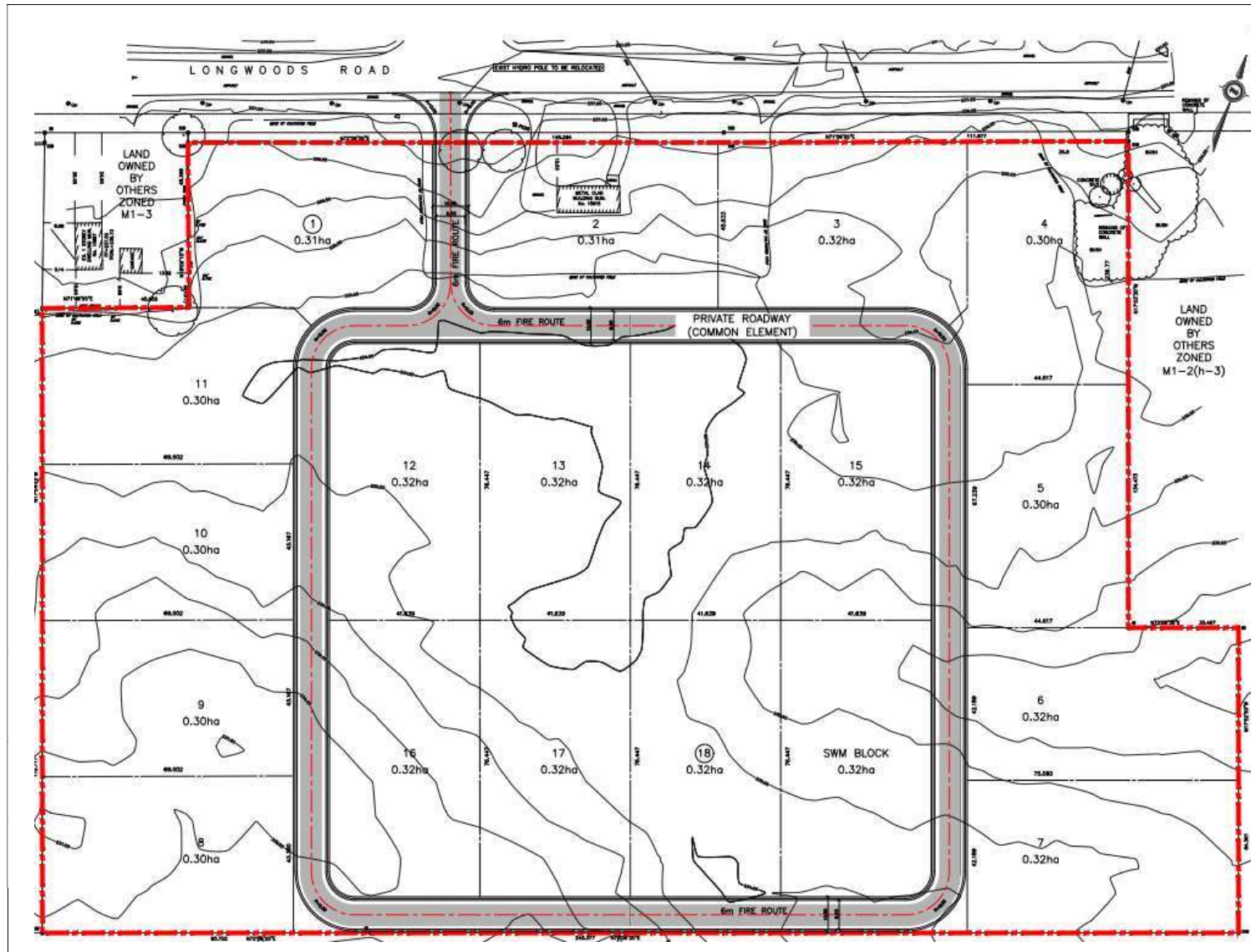
| | | | | | |
|------------|---------|--------|---|-------|----------------|
| Daily Flow | 750 | L/day | Area | 3,000 | m ² |
| NE | 37 | mg/L | <i>standard nitrate level</i> | | |
| QE | 273,750 | L/year | <i>Effluent Flow Calculated for proposed lots</i> | | |
| DW | 868,560 | L/year | <i>Dilution water calculated for site Elevated background nitrate level, for discussion</i> | | |
| NB | 1.20 | mg/L | | | |
| Co | 9.78 | mg/L | <i>meets ODWQ Guidelines</i> | | |

Scenario 2B - Design Flow, on smallest lot, Effluent N @ 28 mg/L (25% nitrate reduction)

| | | | | | |
|------------|---------|--------|---|-------|----------------|
| Daily Flow | 750 | L/day | Area | 3,000 | m ² |
| NE | 28 | mg/L | <i>standard nitrate level</i> | | |
| QE | 273,750 | L/year | <i>Effluent Flow Calculated for proposed lots</i> | | |
| DW | 868,560 | L/year | <i>Dilution water calculated for site Elevated background nitrate level, for discussion</i> | | |
| NB | 1.20 | mg/L | | | |
| Co | 7.62 | mg/L | <i>meets ODWQ Guidelines</i> | | |

Comments and Notes

- 1 LDS has carried out a nitrate impact assessment for the proposed septic system, in accordance with the predictive assessment model (calculation) outlined in the MECP D-5-4 Guideline document. The model has been established to demonstrate the theoretical nitrate concentration which would occur at the downstream property boundary (considered to be the worst case boundary condition), and sets a target value of 10 mg/L, based on the applicable Ontario Drinking Water Objective (ODWO).
- 2 Precipitation and infiltration through the soil to groundwater normally provide dilution water. Precipitation (annual precipitation 961.6 mm/year, 30 year Climate Normal averages for London Weather Station, 1991-2020).
- 3 Infiltration factor of 70% based on topography, soil and vegetative cover) through the soil to groundwater normally provide dilution and provide the basis for the following nitrite loading calculations
- 4 For the purposes of the analyses, a background nitrate concentration of 1.2 mg/L has been used. This is the average value in precipitation reported by the US EPA National Air Quality & Emissions Trend Report, 1997, referenced by Environment Canada in the Canada – United States Air Quality Agreement, 2012.
- 5 Nitrate Loading Rate based on Class IV septic system design, with nitrate concentration at 40 mg/L



SOURCE:
 Produced from "Draft Plan of Vacant Land
 Condominium", sheet A100, prepared by LDS
 Consultants Inc., July 20, 2023



PROJECT NAME
 Proposed Industrial Subdivision

PROJECT LOCATION
 10919 Longwoods Road
 Municipality of Middlesex Centre, ON

DRAWING NAME
 Concept Plan

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|---------------------|--------------------------------|
| SCALE NTS | PROJECT NO. GE-01104 |
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| DATE December 2023 | DRAWING NO. 1 |
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