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# MEMO

| | | | |
|---|---|---|---|
| **DATE** | October 25, 2023 | **PROJECT NO.** | 2395-6588 |
| **RE** | Onsite Sewage Servicing Assessment for Draft Plan of Subdivision<br>Proposed Residential Development<br>6640 Seventh Line in the Village of Belwood, Township of Centre Wellington | | |

| | |
|---|---|
| **TO** | Steve Schiedel, BelCal Inc. |
| **FROM** | Katherine Rentsch, P.Eng. - C.F. Crozier & Associates Inc. |
| **CC** | Rob Stovel Sr., Stovel and Associates Inc. |

## 1.0 Introduction

C.F. Crozier & Associates Inc. (Crozier) was retained by BelCal Inc. (BelCal) to prepare a preliminary onsite sewage servicing assessment for the proposed residential development of the property located at 6640 Seventh Line in Village of Belwood, Township of Centre Wellington (Site). The opinions in this memo are based on the information available to date and the following key documents and correspondence:

- Conceptual Site Plan prepared by Stovel and Associates Inc., July 28, 2023
- Preliminary Geotechnical Characterization Report prepared by Chung & Vander Doelen Engineering Ltd., September 21, 2022
- Preliminary Nitrate Loading Calculations prepared by Groundwater Science Corp., November 29, 2022
- Email correspondence with Rob Stovel Sr. regarding the proposed residential dwellings on November 2, 2022
- Main Floor A and B Floor Plans prepared by Mike Fuller, dated April 10, 2021

## 2.0 Site Description

The Site covers an area of approximately 39 ha and currently consists of agricultural lands with cultivated crops and tree clusters. The Site is bounded by agricultural lands to the north, south, and west, and residential lands to the east (Village of Belwood).

Based on the Conceptual Site Plan prepared for BelCal Inc., the proposed residential development will include:

- 107 lots with single detached residential dwellings. The average lot size ranges from 2,111 $m^2$ to 3,117 $m^2$
- Associated internal roads
- Stormwater Management (SWM) area
- Open space/parkland and path trail areas

According to the Conceptual Site Plan, a Grand River Conservation Authority (GRCA) regulated wetland extends onto the northeast corner of the Site and part of the eastern portion of the Site contains a watercourse that is also regulated by the GRCA. In addition, there is a woodland located on the northwest corner of the Site with an associated 30 m environmental buffer.

There is no municipal servicing infrastructure available in the Site. Therefore, the proposed development will be serviced by individual onsite sewage systems and individual drilled wells.

## 3.0 Soil Conditions

Chung & Vander Doelen Engineering Ltd. (CVD) was retained to complete a preliminary geotechnical characterization for the proposed development. The twenty-seven (27) test pits were advanced across the Site in June 2022. The test pits were advanced to depths between 2.4 m and 5.2 m below ground surface (mbgs).

As reported by CVD, the soils encountered consisted of topsoil (150 mm to 500 mm thick) underlain by sand or silt mixtures (silty sand to gravelly sand, sandy silt to silt, clayey silt). At twenty (20) of the twenty-seven (27) test pits, the sand or silt mixtures were underlain by a glacial till deposit, described as sandy silt till to clayey silt till with varying percentages of sand, silt, clay, and gravel. The glacial till deposit was encountered between 0.25 mbgs (Test Pit 2/10) and 4.6 mbgs (Test Pit 21) and extended to the depth of the test pit (between 2.4 and 5.2 mbgs). Due to the varying soil conditions observed across the Site, a conservative percolation time of 50 min/cm was assigned for design purposes.

CVD indicated that groundwater was encountered in five (5) of the test pits (Test Pits 3, 4, 7, 8, and 21) at depths between 1.8 mbgs and 4.5 mbgs. CVD noted that the other test pits remained dry; however, it was likely that groundwater seepage would have been observed had the test pits remained open for longer. For preliminary design purposes, it is assumed that most of the systems will be raised above grade.

## 4.0 Sewage Flows

It is Crozier's understanding that the proposed residential dwellings will range from approximately 2,000 $ft^2$ (186 $m^2$) to 3,500 $ft^2$ (325 $m^2$) in size. For the purposes of this assessment, preliminary sewage system design flows were calculated for the smallest and largest proposed residential dwellings. The preliminary sewage system design flows were calculated in accordance with the Ontario Building Code (OBC), Part 8 and are presented below in Table 1. Detailed calculations are enclosed.

**Table 1: Preliminary Sewage System Design Flows**

| Unit Type | Number of Bedrooms | Floor Area ($m^2$) | Number of Fixture Units | Base Flow (L/day) | Additional Flow – Floor Area (L/day) | Additional Flow – Fixture Units (L/day) | Total Flow Per Unit (L/day) |
|---|---|---|---|---|---|---|---|
| 186 $m^2$ Residential Dwelling | 2 | 186 | 32 | 1,100 | 0 | 600 | **1,700** |
| 325 $m^2$ Residential Dwelling | 4 | 325 | 45 | 2,000 | 1,300 | 1,250 | **3,300** |

As shown, the preliminary sewage system design flows range from 1,700 L/day to 3,300 L/day. These flows were calculated based on the information available at the time of this memo. If details of the proposed dwellings change (e.g., number of bedrooms, fixtures, and floor area) during detailed design, the sewage system design flows may change, which may affect the size of the onsite sewage systems and the serviceability of the development.

Properties with a total daily design sanitary sewage flow exceeding 10,000 L/day are subject to Section 53 of the Ontario Water Resources Act and require an Environmental Compliance Approval (ECA) issued by the Ministry of Environment, Conservation and Parks (MECP). Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA is not required. Building permits will be required for each sewage system prior to construction.

## 5.0 Proposed Individual Sanitary Servicing Strategy

Sanitary servicing for the proposed development will be provided through individual Class 4 onsite sewage systems. Due to the limited space available per lot, the onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed. Further details on the proposed advanced treatment system and leaching bed are presented in the subsections below.

### 5.1 Advanced Treatment System

The advanced treatment system will consist of a Level IV treatment unit meeting the CAN/BNQ 3680-600 standard, sized based on the sewage system design flow. The treatment unit proposed is a Waterloo Biofilter recirculating basket system. Sewage will flow from the dwelling to a Waterloo Biofilter anaerobic digester tank. Effluent from the digester tank is pumped to the Waterloo Biofilter basket tank, which is equipped with a patented foam media that effectively treats wastewater prior to discharge to the leaching bed.

Table 2 summarizes the treatment unit sizing for the smallest and largest proposed residential dwelling.

**Table 2: Preliminary Advanced Treatment Unit Sizing**

| Unit Type | Total Flow Per Unit (L/day) | Waterloo Biofilter Treatment Model | Treatment Capacity (L/day) | Anaerobic Digester Tank Size (L)[1] | Basket Biofilter Tank Size (L)[1] |
|---|---|---|---|---|---|
| 186 $m^2$ Residential Dwelling | 1,700 | AD-BA20 | 2,000 | 5,400 | 5,400 |
| 325 $m^2$ Residential Dwelling | 3,300 | AD-BA35 | 3,500 | 9,000 | 9,000 |

1. Or approved equivalent. This sizing is based on Waterloo Biofilters 2022 Design & Installation Guide and Orangeville Precast Concrete tank sizes. May be subject to change.

Nitrate loading calculations were prepared by Groundwater Science Corp. to determine the effluent concentration of nitrate-nitrogen each advanced treatment system must achieve for the proposed development to meet MECP Guideline D-5-4. A typical conventional onsite sewage system produces an effluent concentration of nitrate nitrogen of approximately 40 mg/L, and Groundwater Science Corp. determined that at least a 50% reduction of nitrate-nitrogen (effluent concentration of 20 mg/L) is required.

Waterloo Biofilter recirculating basket systems can achieve between 50% and 65% nitrogen reduction and can therefore meet the denitrification (e.g., removal of nitrogen) requirements. Two (2) cold weather third-party verification studies were completed on the Waterloo Biofilter recirculating basket systems, which indicated total nitrogen removals of 59% and 65% depending on the testing protocol. The third-party verification studies are enclosed.

Note the Waterloo Biofilter configuration is shown for conceptual purposes only, any Level IV CAN/BNQ certified system may be considered if the system can meet the denitrification requirements (at least 50% reduction).

### 5.2 Leaching Bed

A leaching bed constructed as a Type A dispersal bed is proposed for the disposal of the treated effluent. Treated effluent from the Waterloo Biofilter basket tank will be pumped to the Type A dispersal bed.

The Type A dispersal bed will include a sand and stone layer as sized in accordance with Section 8.7.7. Table 3 summarizes the preliminary sizing of the Type A Dispersal beds for the smallest and largest proposed residential dwellings. Detailed calculations are enclosed.

**Table 3: Preliminary Type A Dispersal Bed Sizing**

| Unit Type | Total Flow Per Unit (L/day) | Minimum Stone Area ($m^2$) | Minimum Sand Area ($m^2$) | Proposed Footprint ($m^2$) |
|---|---|---|---|---|
| 186 $m^2$ Residential Dwelling | 1,700 | 23 | 213 | 220 |
| 325 $m^2$ Residential Dwelling | 3,300 | 66 | 413 | 432 |

A preliminary schematic demonstrating onsite sewage servicing for the proposed development is enclosed. Where adequate space was available, the larger proposed residential dwelling (325 $m^2$) and onsite sewage system was sized for the lot (Lots 1-86, 92, 93, 97-102, and Lots 106-107). Conversely, for the smaller lots (Lots 87-91, 95 & 96 and103-105) the smaller proposed residential dwelling (186 $m^2$) and onsite sewage system was sized. As detailed design of the subdivision and the lots progress there may be some opportunity to optimize lot layouts to accommodate more amenity space while meeting minimum building code requirements for onsite sewage systems.

## 6.0 Operation and Maintenance

The sewage systems proposed must be operated within the parameters for which they are designed and must be maintained according to Section 8.9 of the OBC. Proper use and maintenance of the system is necessary to minimize the potential of failure and to maximize the life of the system. The property owner is responsible for ensuring that the sewage systems are operated in accordance with the building code and the specific requirements of the treatment equipment specified.

The owner must enter into an agreement with a service provider who is authorized by the manufacturer to service and maintain the specified treatment system. The service provider will visit the site at least once a year to complete a maintenance inspection of the components of the treatment system and obtain an effluent sample. The person authorized to carry out the service work must notify the Chief Building Official if their agreement has been terminated or if the owner of the system denies access.

As effluent objectives and limits for the proposed subdivision have not been set at this time, it is assumed that the sampling procedures will follow Section 8.9.2.4 of the OBC. A grab sample of the treated effluent will be obtained and analyzed for $CBOD_5$, suspended solids, and nitrate-nitrogen, if required. The concentration of $CBOD_5$ and suspended solids is deemed to comply with Table 8.6.2.2 when the concentrations do not exceed 20 mg/L for each of these parameters. The effluent limit for nitrate-nitrogen is based on the requirements of the nitrate loading calculations by the hydrogeologist (20 mg/L). Effluent monitoring for nitrate-nitrogen, if required, should be completed in accordance with the requirements and conditions of the Draft Plan of Subdivision.

The area of the leaching bed must be landscaped (preferably as a grassed/lawn area) and cannot consist of any hard surfaces such as pavement, asphalt, gravel, etc. The property owner should avoid operating heavy machinery in the vicinity of the leaching bed to mitigate the risk of damaging the distribution pipes or trenches of the leaching bed.

## 7.0 Conclusions

Based on the foregoing, Crozier is prepared to make the following conclusions:

- The proposed development of the Site consists of 107 lots with single detached residential dwellings, internal roadways, a stormwater management area, and open space/parkland/trail areas. No municipal servicing infrastructure is available in the Site and therefore the proposed development will be serviced by individual onsite sewage systems and drilled wells.

- The residential dwellings will range from approximately 186 $m^2$ to 325 $m^2$ in size. Preliminary sewage system design flows for the smallest and largest residential dwellings are 1,700 L/day and 3,300 L/day, respectively. Given the preliminary sewage system design flow is less than 10,000 L/day per individual lot, an ECA with the MECP is not required.

- Each onsite sewage system will consist of an advanced treatment unit discharging to a leaching bed constructed as a Type A dispersal bed. The proposed leaching bed footprints range from approximately 220 $m^2$ (186 $m^2$ residential dwelling) to 432 $m^2$ (325 $m^2$ residential dwelling).

- A building permit will be required to permit the installation of each sewage system.

- The proposed development can be adequately serviced with an onsite sewage system and private well meeting the requirements of the Ontario Building Code.

Should you have any questions or require any further information, please do not hesitate to contact the undersigned.

Respectfully submitted,

**C.F. CROZIER & ASSOCIATES INC.**

Jessica Doherty, P.Eng.
Project Manager

**C.F. CROZIER & ASSOCIATES INC**

Katherine Rentsch, P.Eng.
Senior Project Manager

JD/cj:tc

Enclosures:
- Onsite Sewage System Residential Design Calculation Sheet (Smallest Residential Dwelling)
- Onsite Sewage System Residential Design Calculation Sheet (Largest Residential Dwelling)
- Waterloo Biofilter Third-party Verification Studies
- Drawing OSS101 - Onsite Sewage Servicing Schematic
- Drawing OSS102 - Onsite Sewage System Design Notes

J:\2300\2395 - BelCal Inc\6588 - Belwood Estate Subdivision Private Service\Memos\2023.09.01_Final Belwood Memo\2023.10.25_Onsite Sewage Servicing Assessment.docx

# ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

**Project Name:** Belwood Development
**Project Number:** 2395-6588
**Date:** 11/10/2022
**Designed By:** AL
**Checked By:** KR

#### input required

House Details: 2 bedroom
158.52 m2

References

| Description | | Number of Units | Additional Flow per Unit (L) | Total Flow (L/day) |
|---|---|---|---|---|
| | | | | |
| Base Flow | | | | 1100 |
| | | | | |
| Additional Flow | | | | |
| i) Each bedroom over 5 | | 0 | 500 | 0 |
| | | | | |
| ii) Area over 200m$^2$, | | | | |
| A) Each 10m$^2$ over 200m$^2$ to 400m$^2$ | | 0 | 100 | 0 |
| B) Each 10m$^2$ over 400m$^2$ to 600m$^2$ | | 0 | 75 | 0 |
| C) Each 10m$^2$ over 600m$^2$ | | 0 | 50 | 0 |
| | | | | |
| | Total Additional Sewage Flow from Area | | | 0 |
| | | | | |
| iii) Fixture Units over 20 | | 12 | 50 | 600 |
| | | | | |
| | | | **Addition flow (greatest of i,ii,iii)** | **600** |
| | | | | |
| | | | **Total Daily Design Sanitary Sewage Flow (L/day):** | **1700** |
| | | | | |

**Pre-Treatment Options**

Required septic tank size = 3600 L minimum

Propose Level IV Treatment (Y/N): Y

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

Treatment: **WBP Model AD20**, 2000 L/d
Treatment: **ADIPC-5400**
Basket Biofilter Tank: **BT-5400**

**Orangeville Precast Concrete Ltd.**
2 compartment tank, 5,400 **L**

T-time from Geo-tech report

**Option #1 - Type A Dispersal Bed**

| | Required | | | Provided | | |
|---|---|---|---|---|---|---|
| Stone area = | 23 | m$^2$ | (Q/75) | 28 | m$^2$ | 4m x 7m |
| Sand area = | 213 | m$^2$ | (QT/400) | 220 | m$^2$ | 11m x 20 m |

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# ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

**Project Name:** Belwood Development
**Project Number:** 2395-6588
**Date:** 11/10/2022
**Designed By:** AL
**Checked By:** KR

#### input required

| Fixtures | Number of Fixtures | Fixture Units per Fixture | Total Fixture Units |
|---|---|---|---|
| | | | |
| Bathroom Group (flush tank) | 2 | 6 | 12.0 |
| 2 Piece Bathroom | 1 | 5.5 | 5.5 |
| Basement Rough-in | 0 | 6 | 0.0 |
| Sinks (Domestic Lavatory w. 1/2" trap, kitchen sink, single compartment laundry tray) | 4 | 1.5 | 6.0 |
| Clothes Washer | 1 | 1.5 | 1.5 |
| Dishwasher (if not connected to kitchen sink) | 1 | 1 | 1.0 |
| Shower (from 1 head) | 1 | 1.5 | 2 |
| Floor drain | 1 | 3 | 3 |
| Laundry Tub | 1 | 1.5 | 2 |
| | | **Total Fixture Units** | **32.0** |
| | | | |

# ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

**Project Name:** Belwood Development
**Project Number:** 2395-6588
**Date:** 11/10/2022
**Designed By:** AL
**Checked By:** KR

#### input required

House Details: 4 bedroom
325.15 m2

References

| Description | | Number of Units | Additional Flow per Unit (L) | Total Flow (L/day) |
|---|---|---|---|---|
| | | | | |
| Base Flow | | | | 2000 |
| | | | | |
| Additional Flow | | | | |
| i) Each bedroom over 5 | | 0 | 500 | 0 |
| | | | | |
| ii) Area over 200m$^2$. | | | | |
| A) Each 10m$^2$ over 200m$^2$ to 400m$^2$ | | 13 | 100 | 1300 |
| B) Each 10m$^2$ over 400m$^2$ to 600m$^2$ | | 0 | 75 | 0 |
| C) Each 10m$^2$ over 600m$^2$ | | 0 | 50 | 0 |
| | | | | |
| | Total Additional Sewage Flow from Area | | | 1300 |
| | | | | |
| iii) Fixture Units over 20 | | 25 | 50 | 1250 |
| | | | | |
| | | | **Addition flow (greatest of i,ii,iii)** | **1300** |
| | | | | |
| | | | **Total Daily Design Sanitary Sewage Flow (L/day):** | **3300** |
| | | | | |

**Pre-Treatment Options**

Treatment: **WBP Model AD35**, 3500 L/d
Treatment: **ADIPC-9000**
Basket Biofilter Tank: **BT-9000**

**Orangeville Precast Concrete Ltd.**
2 compartment tank, 5,400 **L**

Required septic tank size = 6600 L minimum

Propose Level IV Treatment (Y/N): Y

Native Percolation time, T = 50 min/cm

Imported Sand Percolation time = 10 min/cm

T-time from Geo-tech report

**Option #4 - Type A Dispersal Bed**

| | Required | | | Provided | | |
|---|---|---|---|---|---|---|
| Stone area = | 66 | m$^2$ | (Q/50) | 70 | m$^2$ | 10m x 7m |
| Sand area = | 413 | m$^2$ | (QT/400) | 432 | m$^2$ | 16m x 27 m |

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# ONSITE SEWAGE SYSTEM RESIDENTIAL CALCULATION SHEET

**Project Name:** Belwood Development
**Project Number:** 2395-6588
**Date:** 11/10/2022
**Designed By:** AL
**Checked By:** KR

#### input required

| Fixtures | Number of Fixtures | Fixture Units per Fixture | Total Fixture Units |
|---|---|---|---|
| | | | |
| Bathroom Group (flush tank) | 3 | 6 | 18.0 |
| 2 Piece Bathroom | 2 | 5.5 | 11.0 |
| Basement Rough-in | 0 | 6 | 0.0 |
| Sinks (Domestic Lavatory w. 1/2" trap, kitchen sink, single compartment laundry tray) | 5 | 1.5 | 7.5 |
| Clothes Washer | 1 | 1.5 | 1.5 |
| Dishwasher (if not connected to kitchen sink) | 1 | 1 | 1.0 |
| Shower (from 1 head) | 1 | 1.5 | 2 |
| Floor drain | 1 | 3 | 3 |
| Laundry Tub | 1 | 1.5 | 2 |
| | | **Total Fixture Units** | **45.0** |
| | | | |

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Ann Arbor, MI · Sacramento, CA · Washington, D.C. · Brussels, Belgium

# Data Summary for Waterloo Biofilter® Model 4 Bedroom Under the EPA ETV Water Quality Protection Center

The following is a preliminary summary of the test results obtained for the Waterloo Biofilter® Model 4 Bedroom for nutrient reduction under the ETV Water Quality Protection Center. These results have been QA reviewed, but will not be considered final until all EPA reviews have been completed. The testing was completed at the Massachusetts Septic Systems Test Center during the period of March 2001 through April 2002. A full report for this testing will be completed soon and posted on the EPA (www.epa.gov/etv) and NSF (www.nsf.org/etv) web sites.

Table 1. $BOD_5$/$CBOD_5$ and TSS Data Summary

| | $BOD_5$ | $CBOD_5$ | | TSS | | |
|---|---|---|---|---|---|---|
| | Influent (mg/L) | Effluent (mg/L) | Removal Percent | Influent (mg/L) | Effluent (mg/L) | Removal Percent |
| Samples | 53 | 53 | 53 | 53 | 53 | 52 |
| Average | 210 | 10 | 95 | 150 | 7 | 95 |
| Median | 200 | 7.4 | 96 | 130 | 5 | 97 |
| Max | 370 | 43 | 99 | 340 | 55 | >99 |
| Min | 67 | 1.0 | 71 | 61 | <1 | 51 |
| Std. Dev. | 73 | 9.0 | 6.0 | 66 | 8 | 8 |

Table 2. Nitrogen Data Summary

| | TKN (mg/L) | | NH4 (mg/L) | | Total Nitrogen (mg/L) | | Nitrate (mg/L) | Nitrite (mg/L) | Temperature (C) |
|---|---|---|---|---|---|---|---|---|---|
| | Influent | Effluent | Influent | Effluent | Influent | Effluent | Effluent | Effluent | Effluent |
| Samples | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 53 | 51 |
| Average | 37 | 3.7 | 23 | 2.4 | 37 | 14 | 10 | 0.19 | 15 |
| Median | 37 | 1.6 | 23 | 0.7 | 37 | 13 | 10 | 0.14 | 14 |
| Maximum | 45 | 31 | 29 | 24 | 45 | 45 | 33 | 0.84 | 24 |
| Minimum | 24 | <0.5 | 18 | <0.2 | 24 | 6.8 | 0.6 | <0.05 | 5.2 |
| Std. Dev. | 4.2 | 5.5 | 2.4 | 4.0 | 4.2 | 6.0 | 5.0 | 0.20 | 5.9 |

NSF Contact: Thomas Stevens
(734) 769-5347
stevenst@nsf.org

# ETI Independent Testing

## Buzzard's Bay Test Facility, MA

### 24-Month Waterloo Biofilter Testing with 50% Recirculation in Triplicate for the Period of June 1999-June 2001

#### Results

- The Waterloo Biofilter can be loaded at very high rates
- Tertiary quality effluent
- ~60% total nitrogen removal
- Fecal coliforms are reduced by 99% in the Waterloo Biofilter and 99.99% with an additional foot of coarse sand or >99.999% with 10" of fine sand
- 10" of soil or fine sand after the Biofilter is equivalent to an under-drained 60" thick Title 5 sand filter system, but with much better nitrogen removal
- Very low power consumption; less than a re-circulating sand filter and 1/3 of a standard ATU producing secondary effluent (www.buzzardsbay.org/etiresults.htm)

#### Biofilter organic results including start-up period (124-133 samples)

| | $_{c+n}BOD_5$ mg/L | TSS mg/L | Fecals cfu/100 mL | $NH_4$-N mg/L | TN mg/L |
|---|---|---|---|---|---|
| Influent Median | 162 | 161 | 3100K | 24.2 | 34.6 |
| Effluent Median | 9 | 6 | 32K | 0.5 | 13.9 |
| **% Removal** | **94.4** | **96.3** | **99.0** | **97.9** | **59.8** |

#### Fecal coliform results for 12" and 10" lysimeter testing (25-31 samples)

| | Lysimeter A1 May '00 — Jul '01 cfu/100 mL | Lysimeter A2 June '00 — July '01 cfu/100 mL | Lysimeter A3 June '00 — July '01 cfu/100 mL |
|---|---|---|---|
| Influent Sewage | 3 700 000 | 3 800 000 | 3 700 000 |
| Effluent After Waterloo + 12" of T = 0.8 min/cm Sand | 400 | 295 | 100 |
| **% Removal** | **99.989** | **99.992** | **99.997** |
| Effluent After Waterloo + 10" of T = 5 min/cm Sand | - | - | <1 |
| **% Removal** | **-** | **-** | **>99.999** |

### 21-Month Single-Pass Waterloo Biofilter Testing (No Recirculation)

#### Results

- A single pass through the Waterloo Biofilter is very effective at removing dissolved organics and solids
- ~40% total nitrogen removal
- Very low power consumption; about half that of a re-circulating sand filter and 1/6 of a standard ATU producing secondary effluent

#### Biofilter single pass organic results from September 2001 - June 2002

| | # of Samples | $_cBOD$ mg/L | TSS mg/L | DO mg/L | TN mg/L |
|---|---|---|---|---|---|
| Influent Median | 37 | 214 | 130 | 0 | 37 |
| Effluent Median | 19 | 6.4 | 3.0 | 5.6 | 23.1 |
| **% Removal** | **-** | **97.0** | **97.7** | **-** | **42.4** |


**Buzzard's Bay Site Manager**
George Heufelder
Buzzard's Bay Project
2870 Cranberry Highway
East Wareham, MA
02538
Phone: 508-291-3625
Site: 508-563-6757


**Project Overseers**
USEPA
MDEP
USDOD
BCDHE
NEIWPCC


Waterloo Biofilter Systems Inc.
143 Dennis Street
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Canada N0B 2K0
Phone: 519-856-0757
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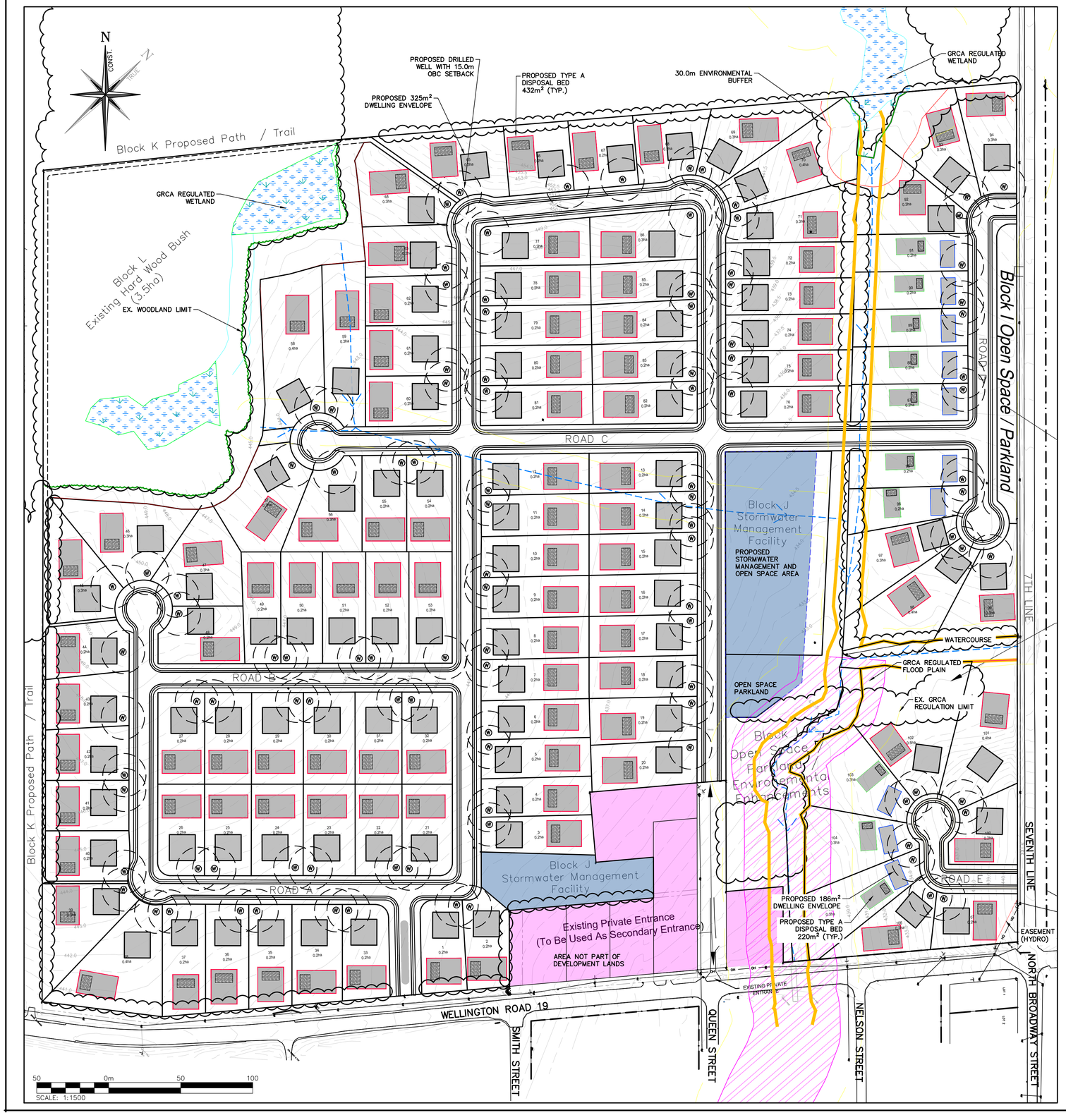
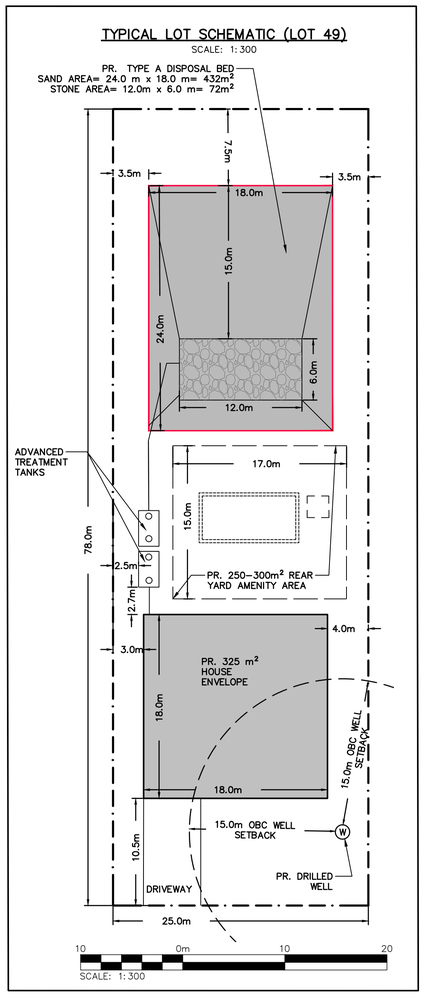



## ONSITE SEWAGE SYSTEM DESIGN TYPICAL LOT NOTES

| | |
|---|---|
| PROPOSED 4 BEDROOM, 325 $m^2$ HOME WITH FIRTY-FIVE (45) FIXTURE UNITS | BASE FLOW (4 BEDROOMS)= 2,000 L/DAY<br>ADDITIONAL FLOOR AREA (125 m2)= 1,300 L/DAY<br>ADDITIONAL FIXTURE UNITS (25)= 1,300 L/DAY<br>Q TOTAL (2,000+1,300)= 3,300 L/DAY |
| SOIL PERCOLATION RATE | T = 50 min/cm (ESTIMATED BY C.F. CROZIER) |
| PROPOSED TREATMENT UNIT | WATERLOO BIOFILTER AD-BA35 |
| TYPE A DISPERSAL BED STONE AREA | MINIMUM SIZE=Q/50=3,300/50 = 66 $m^2$<br>PROVIDED 12m x 6m = 72 $m^2$ |
| TYPE A DISPERSAL BED SAND AREA | MINIMUM SIZE=QT/400= 3,300*50/400 = 413 $m^2$<br>PROVIDED 24m x 18m = 432 $m^2$ |

## TYPICAL LOT SCHEMATIC (LOT 49)

SCALE: 1:300





## LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOURS (0.5m)
- EXISTING WATER COURSE
- 73 LOT NUMBER
- MEANDER BELT (GSP)
- EXISTING WOODED AREA LIMIT
- GRCA REGULATED WETLANDS
- GRCA REGULATED FLOODPLAIN
- PROPOSED STORMWATER MANAGEMENT POND
- AREA NOT PART OF DEVELOPMENT LANDS
- CONCEPTUAL 186 $m^2$ BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 220 $m^2$
- CONCEPTUAL 325 $m^2$ BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 432 $m^2$
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK

| No. | ISSUE / REVISION | YYYY/MMM/DD |
|---|---|---|
| A | ISSUED FOR COORDINATION | 2022/DEC/09 |
| B | ISSUED FOR COORDINATION | 2023/JAN/10 |
| C | ISSUED FOR DRAFT PLAN OF SUBDIVISION | 2023/SEP/01 |
| D | RE-ISSUED PER REVISED DRAFT PLAN OF SUBDIVISION | 2023/SEP/28 |
| E | RE-ISSUED IN RESPONSE TO COMMENTS | 2023/OCT/02 |
| F | ISSUED FOR DRAFT PLAN OF SUBDIVISION (1st Submission) | 2023/OCT/25 |

**ONSITE SEWAGE SYSTEM OBC SETBACKS:**

5m SETBACK TO BUILDING
1.5m SETBACK TO BUILDING
3m SETBACK TO PROPERTY LINE
15m SETBACK TO DRILLED WELL

**SURVEY NOTES:**

SURVEY COMPLETED BY VAN HARTEN (2022/JUL/29)
REFERENCE No.: 61R-20623
BEARINGS ARE UTM GRID, DERIVED FROM RTN OBSERVATIONS
UTM ZONE 17, NAD83 (CSRS) (2010.0)
BM#1 1003 436.00 SPIKE IN HP ON EAST SIDE OF SITE NEAR SEVENTH LINE
BM#1 1002 450.66

**CONCEPT PLAN NOTES:**

DESIGN ELEMENTS ARE BASED ON CONCEPTUAL PLAN 107 LOTS BY STOVEL AND ASSOCIATES INC. (2023/JUL/28)

**DRAWING NOTES:**



THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LEVELS, AND DATUMS ON SITE AND REPORT ANY DISCREPANCIES OR OMISSIONS TO THIS OFFICE PRIOR TO CONSTRUCTION.

THIS DRAWING IS TO BE READ AND UNDERSTOOD IN CONJUNCTION WITH ALL OTHER PLANS AND DOCUMENTS APPLICABLE TO THIS PROJECT. DO NOT SCALE THIS DRAWING.

ALL EXISTING UNDERGROUND UTILITIES TO BE VERIFIED IN THE FIELD BY THE CONTRACTOR PRIOR TO CONSTRUCTION.

Project

6640 SEVENTH LINE
BELWOOD, ONTARIO
LOT 12, CONCESSION 7

Drawing

ONSITE SEWAGE SERVICING SCHEMATIC

NOT FOR CONSTRUCTION

Stamp

LICENSED PROFESSIONAL ENGINEER
J. M. DOHERTY
100526262
OCT 25, 2023
PROVINCE OF ONTARIO

Stamp

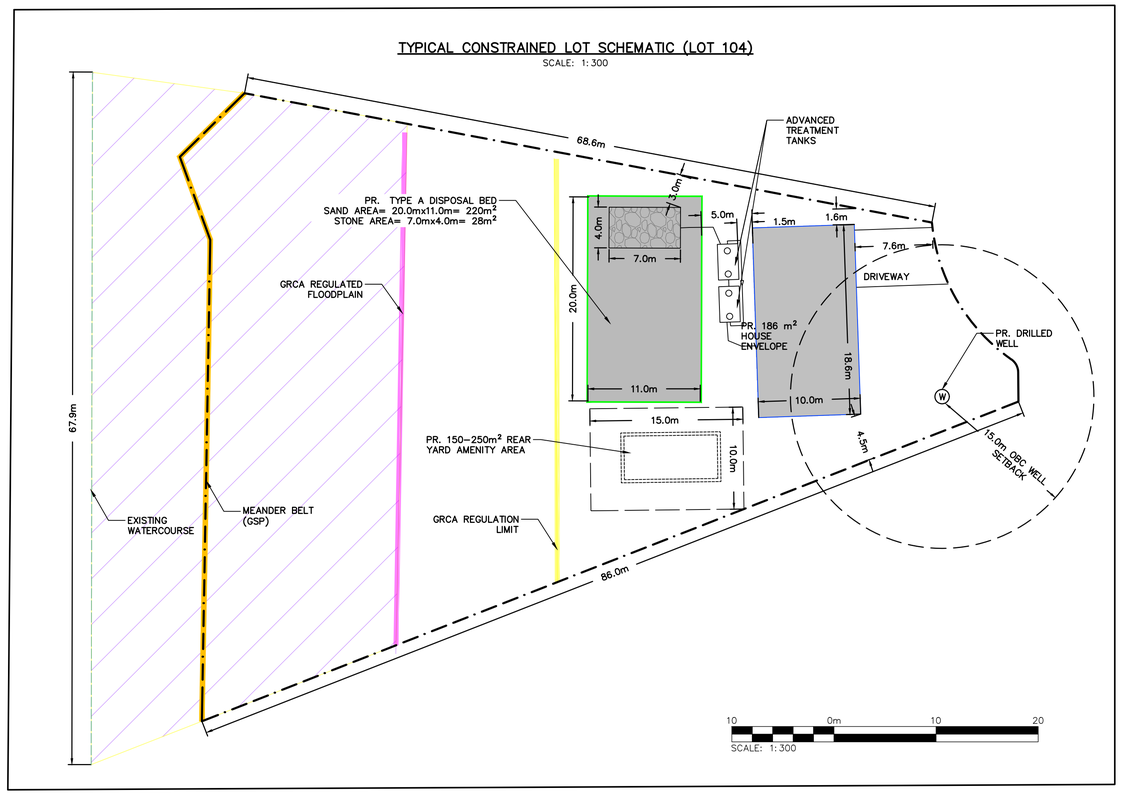
LICENSED PROFESSIONAL ENGINEER
K. RENTSCH
100105133
OCT 25, 2023
PROVINCE OF ONTARIO

CROZIER
CONSULTING ENGINEERS
2800 HIGH POINT DRIVE
SUITE 100
MILTON, ON L9T 6P4
905-875-0026 T
905-875-4915 F
WWW.CFCROZIER.CA

| Drawn | Design | Project No. | |
|---|---|---|---|
| A.L. | A.L. | | 2395-6588 |
| Check | Check | Scale | Dwg. |
| K.R. | K.R. | 1:1500 | OSS101 |

## TYPICAL CONSTRAINED LOT SCHEMATIC (LOT 104)

SCALE: 1:300




## ONSITE SEWAGE SYSTEM DESIGN CONSTRAINED LOT NOTES

| | |
|---|---|
| PROPOSED 2 BEDROOM, 186 $m^2$ HOME WITH THIRTY-TWO (32) FIXTURE UNITS | BASE FLOW (2 BEDROOMS)= 1,100 L/DAY<br>ADDITIONAL FIXTURE UNITS (12)= 600 L/DAY<br>Q TOTAL (2,000+1,300)= 1,700 L/DAY |
| SOIL PERCOLATION RATE | T = 50 min/cm (ESTIMATED BY C.F. CROZIER) |
| PROPOSED TREATMENT UNIT | WATERLOO BIOFILTER AD-BA20 |
| TYPE A DISPERSAL BED STONE AREA | MINIMUM SIZE=Q/75= 1,700/75 = 23 $m^2$<br>PROVIDED 7m x 4m = 28 $m^2$ |
| TYPE A DISPERSAL BED SAND AREA | MINIMUM SIZE=QT/400= 1,700*50/400 = 213 $m^2$<br>PROVIDED 20m x 11m = 220 $m^2$ |


LEGEND

- PROPERTY LINE
- EXISTING CONTOUR (1.0m)
- EXISTING CONTOURS (0.5m)
- EXISTING WATER COURSE
- 73 LOT NUMBER
- GRCA REGULATION LIMIT
- MEANDER BELT (GSP)
- GRCA REGULATED FLOODPLAIN LIMIT
- GRCA REGULATED WETLANDS
- GRCA REGULATED FLOODPLAIN
- PROPOSED STORMWATER MANAGEMENT POND
- AREA NOT PART OF DEVELOPMENT LANDS
- CONCEPTUAL 186 $m^2$ BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 220 $m^2$
- CONCEPTUAL 325 $m^2$ BUILDING ENVELOPE
- PROPOSED TYPE A DISPERSAL BED 432 $m^2$
- (W) CONCEPTUAL PROPOSED DRILLED WELL LOCATION C/W 15.0m OBC SETBACK

| No. | ISSUE / REVISION | YYYY/MMM/DD |
|---|---|---|
| A | ISSUED FOR COORDINATION | 2022/DEC/09 |
| B | ISSUED FOR COORDINATION | 2023/JAN/10 |
| C | ISSUED FOR DRAFT PLAN OF SUBDIVISION | 2023/SEP/01 |
| D | RE-ISSUED PER REVISED DRAFT PLAN OF SUBDIVISION | 2023/SEP/28 |
| E | RE-ISSUED IN RESPONSE TO COMMENTS | 2023/OCT/02 |
| F | ISSUED FOR DRAFT PLAN OF SUBDIVISION (1st Submission) | 2023/OCT/25 |

### SEWAGE SYSTEM NOTES

1. PROPOSED SEWAGE SYSTEM CONSTRUCTION TO BE UNDERTAKEN IN ACCORDANCE WITH THE ONTARIO BUILDING CODE, ONTARIO MINISTRY OF ENVIRONMENT, AND THE MANUFACTURER'S RECOMMENDATIONS.
2. INSTALLATION OF ALL COMPONENTS OF THE SEWAGE SYSTEM TO BE COMPLETED BY A LICENSED AND REGISTERED ONSITE SEWAGE SYSTEM INSTALLER IN THE PROVINCE OF ONTARIO.
3. THE CONTRACTOR SHALL COORDINATE AND PAY FOR ALL NECESSARY INSPECTIONS WITH THE TOWN AND OTHER AUTHORITIES PERTAINING TO THE INSTALLATION OF THEIR WORK.
4. CONTRACTOR TO LOCATE ALL UNDERGROUND UTILITIES AND EXISTING SEWAGE WORKS PRIOR TO CONSTRUCTION.
5. ALL COMPONENT LOCATIONS SHALL BE FIELD VERIFIED WITH THE ENGINEER PRIOR TO INSTALLATION.
6. ALL EARTHWORKS, INCLUDING PLACEMENT OF FILL ARE TO BE UNDERTAKEN WITH TRACK MOUNTED EQUIPMENT TO KEEP COMPACTION TO A MINIMUM. KEEP ALL TRAFFIC IN THE AREA OF THE PROPOSED LEACHING BED TO A MINIMUM.
7. ALL TOPSOIL AND ORGANICS TO BE REMOVED FROM LEACHING BED AREA.
8. IF HIGH GROUNDWATER CONDITIONS ARE EVIDENT AT THE TIME OF CONSTRUCTION, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY. ALL VERTICAL CLEARANCE DISTANCES AS REQUIRED BY THE ONTARIO BUILDING CODE MUST BE MAINTAINED.
9. GRAVITY SEWERS TO HAVE MINIMUM 0.6 M COVER AND SHALL BE INSULATED WHERE LESS THAN 1.0M COVER IS PROVIDED. FORCEMAIN SHALL BE INSULATED WHERE LESS THAN 1.5 M COVER IS PROVIDED. BEDDING, COVER AND BACKFILL TO BE IN ACCORDANCE WITH OPSS.
10. UNLESS OTHERWISE NOTED PE FORCEMAIN TO BE HDPE SERIES 100 OR DR 13.5 PE AND PVC FORCEMAIN TO BE SCHEDULE 40. GRAVITY SEWERS TO BE SDR-35. FORCE MAIN TO BE PROVIDED WITH TRACER WIRE, SECURED TO THE TOP OF THE PIPE WITH WATER PROOF TAPE OR ZIP TIES.
11. ALL PIPES SUBJECT TO VEHICULAR TRAFFIC SHALL BE ADEQUATELY PROTECTED.
12. ALL METAL IN TANKS OR PUMP CHAMBERS TO BE GLAVANIZED OR STAINLESS STEEL
13. ALL JOINTS BELOW THE HIGH WATER LEVEL IN PRECAST TANKS TO BE SEALED WITH MASTIC SEALANT IN ACCORDANCE WITH MANUFACTURERS INSTRUCTIONS FOR WATERTIGHT SEAL. ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH CAST IN RUBBER BOOT FOR WATER TIGHT SEAL. UNLESS OTHERWISE NOTED ALL TANK INLETS AND OUTLETS TO BE EQUIPPED WITH TEES.
14. ALL TANKS TO BE PROVIDED WITH PRECAST CONCRETE OR PVC ACCESS RISERS TO GRADE. HATCHES TO BE BOLTED AND GASKETED AND ACCESSIBLE AT GRADE. ALL CIRCULAR HATCHES TO BE 600 MM DIAMETER POLYLOK RISER WITH CAST IN ADAPTOR. ALL SQUARE ACCESS OPENINGS TO BE EQUIPPED WITH CONCRETE RISERS. VENTED HATCHES TO BE PROVIDED ON TANKS CONTAINING PUMPS.
15. EXISTING SOILS SHALL BE SCARIFIED AT A RIGHT ANGLE TO THE DIRECTION OF LATERAL SEWAGE FLOW IN THE LEACHING BED PRIOR TO IMPORTING FILL OR INSTALLING DISTRIBUTION PIPE STONE LAYER.
16. WHEN THE IMPORTATION OF FILL IS REQUIRED, FILL SHOULD BE END-DUMPED AND GRADED PROGRESSIVELY OVER THE PREPARED SITE AREA WITH TRACK MOUNTED EQUIPMENT.
17. ALL ELEVATIONS TO BE VERIFIED PRIOR TO BACKFILL
18. ALL FILL MATERIAL PLACED BENEATH TANKS TO BE COMPACTED TO 95%
19. ALL DISTURBED AREAS TO BE TOPSOILED (100MM MINIMUM) AND SEEDED COMPLETE WITH FERTILIZER AND MULCH IN ACCORDANCE WITH OPSS
20. THE INSTALLING CONTRACTOR SHALL INSTALL THE SEWAGE SYSTEM USING A TRANSIT/LEVEL AND SHALL PROVIDE SAME FOR INSPECTION OF ANY COMPONENT.
21. MAXIMUM BURIAL DEPTH OF TANKS NOT TO EXCEED TO MANUFACTURERS RECOMMENDATIONS
22. CLEARANCE DISTANCES FROM PROPERTY LINES, STRUCTURES, WELLS, AND SURFACE WATER WILL ADHERE TO THE REQUIREMENTS OF OBC 8.2.1.6.A
23. A LEACHING BED SHALL NOT BE LOCATED ON AN AREA WITH A SLOPE OF GREATER THAN 4 UNITS HORIZONTALLY TO 1 UNIT VERTICALLY.
24. THE HEADER LINE, DISTRIBUTION PIPES AND LEACHING BED SHALL BE EQUIPPED WITH MEANS OF DETECTION AS REQUIRED BY OBC 8.7.2.2. (2). LIGHT COLOURED PLASTIC COATED 14 GAUGE TRACER WIRE OR EPOXY COATED, 10m REBAR LAID HORIZONTALLY AT EACH CORNER OF THE BED IS ACCEPTABLE.
25. STONE TRENCH OR LAYER TO BE COVERED WITH PERMEABLE GEOTEXTILE PRIOR TO BACKFILL.
26. STONE TO CONFORM WITH OBC 8.7.3.3.
27. ALL IMPORTED SAND FILL TO HAVE A T-TIME OF 6 TO 10 MIN/CM AND A SILT/CLAY CONTENT OF NO MORE THAN 5% AND SHALL BE VERIFIED IN WRITING BY A SOIL TESTING FIRM AND APPROVED BY THE ENGINEER PRIOR TO PLACEMENT.
28. ANAEROBIC DIGESTER AND BIOFILTER BASKET PUMPS AS DESIGNED AND SUPPLIED BY WATERLOO BIOFILTER.
29. PUMP CHAMBER TO BE VENTED AND EQUIPPED WITH AUDIBLE AND VISUAL HIGH LEVEL ALARM
30. ALL VALVES TO PROVIDE NO OBSTRUCTION TO FLOW WHEN FULLY OPENED. ALL VALVES AND COUPLINGS TO BE ACCESSIBLE AT GRADE.
31. ALL PUMP FLOATS TO BE SECURED TO A REMOVABLE PVC FLOAT TREE
32. ALL PUMP CONTROL PANELS TO BE EQUIPPED WITH SEPARATE CIRCUIT BREAKERS FOR PUMP CIRCUIT
33. NO JUNCTION BOXES IN RISERS
34. ALL BURIED ELECTRICAL WIRING TO BE IN PVC CONDUIT
35. PRIOR TO ACCEPTANCE CONTRACTOR TO PROVIDE DOCUMENTATION THAT ALL ELECTRICAL WORK HAS BEEN INPSECTED AND APPROVED BY THE ELECTRICAL AUTHORITY HAVING JURISDICTION

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Project

6640 SEVENTH LINE
BELWOOD, ONTARIO
LOT 12, CONCESSION 7

Drawing

ONSITE SEWAGE DESIGN NOTES

NOT FOR CONSTRUCTION

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100526262
OCT 25, 2023
PROVINCE OF ONTARIO

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| Drawn | Design | Project No. | |
|---|---|---|---|
| A.L. | A.L. | | 2395-6588 |
| Check | Check | Scale | Dwg. |
| K.R. | K.R. | N.T.S. | OSS102 |