

# FUNCTIONAL SERVICING REPORT CAMPFIRE CIRCLE

August 19, 2026



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***Revision Summary***

***August 19, 2026***

Fourth submission for Site Plan approval.

***June 1, 2026***

Third submission for Site Plan approval.

***February 3, 2026***

Second submission for Site Plan approval.

***August 15, 2025***

Initial submission for Site Plan approval.

***November 7, 2024***

Second submission for rezoning.

***April 29, 2024***

Initial submission for rezoning.

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## 1 Background

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Jewell Engineering Inc. (Jewell) was retained by Campfire Circle (the Client) to provide servicing requirements and capacity to support site plan application of the property at 565 Wesley Acres Road in Bloomfield, Ontario (the site) to permit a proposed Overnight Campground Development.

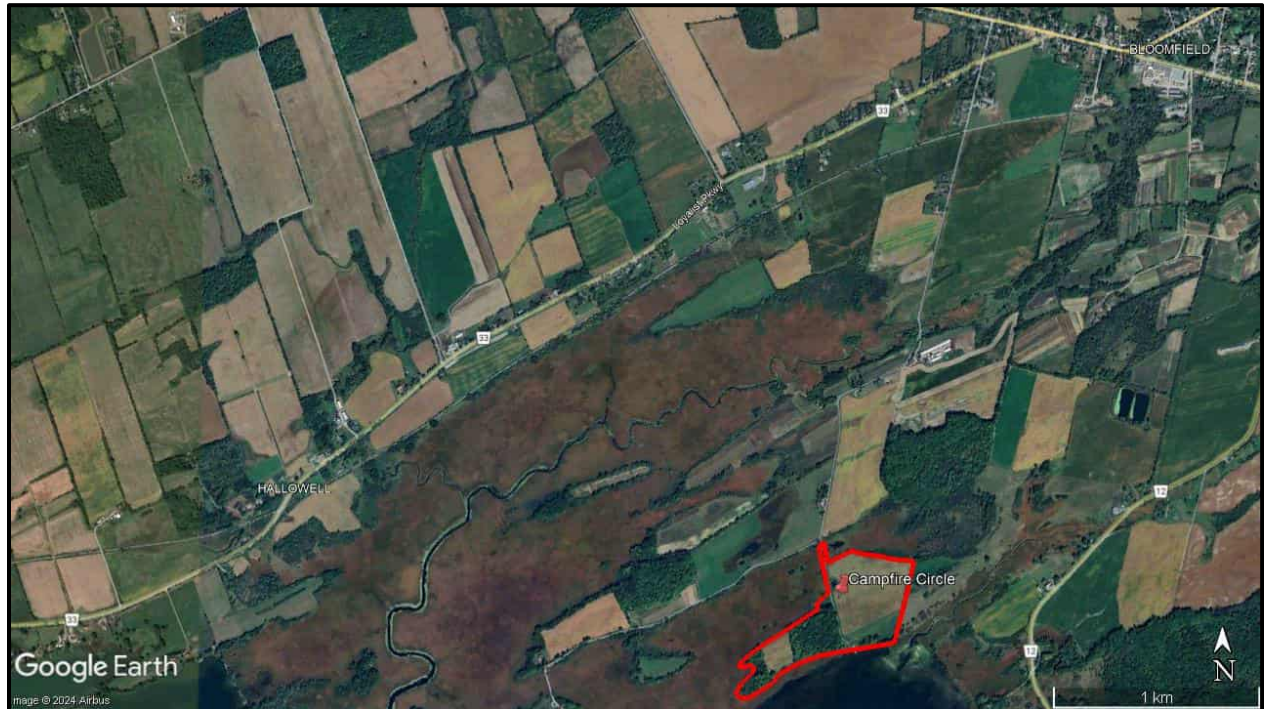


Figure 1: Site Location

The following services have been reviewed as part of this Functional Servicing Report:

- Water Supply – Fire, Domestic and Irrigation
- Private Septic Servicing
- Stormwater Management (under separate cover)
- Electrical (under separate cover)

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### 1.1 Site Description

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The site is approximately 33.7 hectares with frontage on Wesley Acres Road and waterfront access from West Lake along the south property limit. The past land use of the site is a mix of cultivated fields, forest, and rural recreational cabins.

The topography of the site can be described as rolling hills. There is a high point along the approximate centre of the property that has a height difference of 10 – 15 metres to the surface of the surrounding wetland and shoreline.



## **1.2 Proposed Development**

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The proposed development will include the following, but not limited to:

- Camper residences
- Lodge
- Indoor activity area
- Equine therapy arena (day use only)
- Flexible residence
- Staff/Director residences
- Medical facility
- Pool area & building
- Garden/Greenhouse
- Utility/Maintenance buildings

A site plan can be found in Appendix A.

## 2 Water Supply - Fire Protection

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Municipal water is not available in the area of the site, and therefore a private supply of water will be required for fire suppression. Required flows and volumes were calculated according to the Ontario Building Code (OBC) for the proposed building sizes, uses and construction types. Fire protection is to be supplied from a shore well through a series of pressurized hydrants. See Appendix B for plan.

The building classification is either A-2 (lodge, Pool Building, Athletic Centre, Riding Arena, Greenhouse), B-2 (Medical Clinic), C (staff and camper residences), or F-3 (Maintenance) with combustible construction. The required fire volume ranges from 42 m<sup>3</sup> (Maintenance building) to 357 m<sup>3</sup> (the lodge), see Appendix C for the full calculations. This represents a maximum required fire flow of 9,000 L/min in accordance with OBC A-3.2.5.7 for a duration of 2 hours.

The water source will be West Lake indirectly through a shore well constructed according to O.Reg. 903. Upon construction the well will be tested to ensure that a minimum supply rate of 9,000 L/min is attainable, as well as a volume of 357 m<sup>3</sup> extraction within 120 minutes. Should this not prove possible, an alternative is to install a dry hydrant directly into the lake. The shore well is preferable as it provides filtration and protection of the intake.

Pumping will be via an electric pump with propane backup capable of flowing up to 9,000 L/min located in a dedicated maintenance shed adjacent to the shore well.

Distribution will be via a pressurized 200 mm watermain to eight dry hydrants distributed throughout the site. Hydrants are located adjacent to the local road network to ensure efficient access by PEC fire. They are also located within 90 m of the entrance of all buildings in accordance with the OBC.

The system will be installed below the frost line to avoid freeze damage and activated on demand. Hydrants will be self-draining. This system is separate and distinct from the domestic water supply system.

### **3 Water Supply - Domestic**

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ASC Environmental was engaged to complete a Hydrogeological Study and Servicing Options report for the site as proposed (Appendix D). As municipal water is not available in the area, domestic water will also be provided by a private well on site and distributed by a private network.

Jewell Engineering has calculated an average daily demand of 87,470 L/day according to the guidelines in the OBC. This represents a demand of 200 L/day per resident at a maximum capacity of 411 campers and staff. Additional demand was allowed for watering horses and operating the pool. See Appendix E for detailed calculations.

The well is drilled to a depth of 18 m to access the local limestone aquifer. The water bearing limestone bedrock aquifer is moderately vulnerable to surface water influence due to overburden thickness consisting of sands and clays and potential fracturing of the bedrock. ASC Environmental conducted a 24-hour pump test at a rate of 75 L/min (108,000 L/day), which is 123% of the expected required average daily demand of the development. At the test rate, the drawdown in the test well stabilized at 0.8 m, with rebound within 30 minutes. The calculated impact to the aquifer at the nearest adjacent property was calculated to be 0.26 m on a 20-year time horizon. The actual will be less, as demand for the development is less than the test flow rate. The required volume of water to support the expected domestic demands of the development may be reliably extracted with minimal impact to the local aquifer.

As stated in the ASC report, water storage is anticipated to manage daily supply requirements. In accordance with MOECC design guidelines, storage of 104 m<sup>3</sup> should be provided.

While water quality as tested was acceptable for domestic use, O.Reg 170/03 requires both primary and secondary disinfection. Primary disinfection exists to sterilize the water as it comes from the well. This will be accomplished with ultraviolet (UV) equipment. Secondary disinfection exists to keep the water sterile in storage and as it flows through underground piping among the buildings. This will be accomplished with chlorination. Details of the treatment and storage system are included in the report completed by MacLellan Water Treatment and Pumps in Appendix F. Consideration should be made for immunocompromised individuals.

Domestic supply will be distributed via a 50 mm watermain separate from the 200 mm fire main as shown in the Site Servicing Plan in Appendix B.

As the expected daily water demand exceeds 50,000 L/day, a Permit to Take Water will be required from the Ministry of the Environment, Conservation and Parks.

## **4 Water Supply – Irrigation**

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The development is proposed to contain a 650 m<sup>2</sup> greenhouse, large garden (~1 ha) and several landscaped gardens and grassed fields with combined area of approximately 2 ha. Typical potential evapotranspiration in the Quinte area in July is approximately 4.3 mm/day, while greenhouses typically have a peak daily water use of 5.0 mm/day. Total peak water use for irrigation is therefore expected to be 132,000 L/day during the month of July.

Water for irrigation will be sourced from West Lake via the shore well and distributed via the 200 mm fire main. A separate low-flow pump with capacity of 275 L/min will be used in parallel with the larger 9000 L/min fire pump for purposes of irrigation.

## 5 Sanitary Septic

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Similar to water supply, municipal sewer services are not available in the area of the site. A private system will be required to manage the domestic sewage generated by campers and associated activities on the site. Groundwork Engineering Ltd. was engaged to complete a Wastewater Servicing Brief (Appendix G) for the proposed development.

Jewell Engineering has confirmed that the estimated load of 83,300 L/day is consistent with the proposed development and the provisions of the OBC. Similar to the domestic water calculation, Groundwork reduced the demand for the residence buildings by an equivalent load as will be generated by ancillary buildings, as it is anticipated that the same individuals will be staying and utilizing the property. The total demand represents 200 L/day per resident plus the Director's cabin, which was modelled as a 2 bedroom house. Average sanitary flows are less than domestic water demand as the horses and pool evaporation do not contribute to sanitary flows.

Groundwork has recommended the use of advanced treatment systems to minimize the area of the dispersal bed, allow for medications discharged from campers being treated for cancer, and to remove nitrates and phosphorus to acceptable levels. While not included in the Area of Concern for the Bay of Quinte Remedial Action Plan, Groundwork has conservatively used the guidelines for the Bay of Quinte in calculating the nitrate and phosphorous removal requirements. This reflects the shallow depth and low flow in West Lake. Removal requirements are calculated to be 90.3% for nitrate and 98.0% for phosphorous. The Wastewater Servicing Brief details the treatment system and resulting effluent concentrations.

Recommendation for the location of the wastewater treatment system is suitable for the site conditions and respects environmental and zoning setbacks. Separation of greater than 15 m is maintained between the dispersal bed and the drilled well, as required. Separation of greater than 30 m is maintained for the proposed shore well for fire protection, as required.

Waste will be collected by 100 mm gravity sewers to local pump chambers and pumped via 50 mm forcemain to the advanced treatment system. All 100 mm diameter gravity sanitary pipes have slopes of 1.0% or greater, ensuring that flow rates are at minimum 0.6 m/s in accordance with MOE 2008 guidelines, and with maintenance holes spaced at not more than 90 m according to the OBC. Cleanouts are required within 30 m of the connection to each building.

## **6 Stormwater Management**

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A separate Stormwater Management Report was prepared by Jewell Engineering. The plan maintains existing drainage patterns to West Lake and the surrounding wetlands.

Increases in imperviousness will increase peak flows discharging from the site. West Lake and the surrounding wetlands are connected to Lake Ontario, and the increases in flow will have no impact on water levels. The development will not result in an increase in peak flows to adjacent private lands, and therefore, quantity controls are not required.

Quality controls have been established to achieve an Enhanced level of protection (80% TSS removal) according to the 2003 MOE Stormwater Planning and Design Manual. A diffuse approach was taken, utilizing vegetated swales and filter strips throughout the site.

## 7 Swimming Pool Discharge

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The proposed development includes a swimming pool in the vicinity of West Lake. The pool has an estimated volume of 900 m<sup>3</sup> based on preliminary site plan design. The *Natural Heritage Impact Assessment (EIS)* for the proposed development (Ecological Services, 2024) noted that if there is a need to drain the pool, there are potential impacts to the adjacent fish habitat that will need to be considered such as with chlorine, bromine, copper, pH, and temperature.

Specific contaminants generally present in pool water that can have a negative impact on aquatic life include Chlorine/Bromine used as a disinfectant, Copper-based Algaecides, and Phenolic Compounds present in some algaecides, cleaning products and personal care products including some sunscreens.

Best management practices from both the City of Toronto (Toronto Water Division) and Pool & Hot Tub Council of Canada (Pool & Hot Tub Council of Canada, 2013) recommend discharging of pools onto the owner's property where possible. This avoids releasing contaminants into the environment. For this development, it is recommended that discharge water from backwashing filters and draining the pool be pumped to the on-site private storm sewer system. Water from this system discharges into a grassed swale on the property, and then to a low area surrounding the existing pond. The flowing water in the swale will permit residual chlorine to dissipate, reducing the primary potential contaminant. Discharge should not occur during or after a heavy rainfall and should be monitored to ensure that it is being absorbed rather than flowing off the property.

The Pool & Hot Tub Council of Canada recommends the following limits for discharge water into a municipal storm sewer. The recommendations assume that water entering a municipal storm sewer system will be discharged directly into a waterbody. While water from the on-site storm sewer system is not discharged into a waterbody, it is recommended that the limits be applied to avoid potential for contamination.

|                                          |                   |
|------------------------------------------|-------------------|
| Chlorine                                 | 0.01 mg/L or less |
| Bromine                                  | 0.01 mg/L or less |
| Copper                                   | 0.04 mg/L or less |
| pH                                       | 6.0 to 9.5        |
| Sodium Chloride (salt)                   | 0.00 mg/L         |
| Algaecide / Fungicides                   | 0.00 mg/L         |
| Nonylphenols and Nonylphenol Ethoxylates | 0.00 mg/L         |

Both references listed above may be consulted regarding methods for reducing the concentrations of contaminants to acceptable levels. An in-line dechlorinator is recommended for filter backwash water. Allowing the water to sit in the pool untreated for at least 2 weeks prior to discharge will aid in reducing contaminant levels. It is not recommended to discharge any pool water into the sanitary system.



## **8 Electrical Servicing**

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Electrical servicing of the property is by Hydro One. Three-phase power is available at the property. Smith and Anderson Consulting Engineering have been engaged to provide electrical servicing design for the site. Underground servicing ducts and transformer locations have been included in the attached Site Servicing Plan in Appendix B.

## 9 Conclusion

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Adequate services are available to support the proposed development at 565 Wesley Acres Road. Fire suppression water, domestic water and sanitary septic will all be managed by private systems on site.

### 9.1 Water Service

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Domestic water will be supplied from the existing well located centrally on the site. ASC Environmental prepared a hydrogeological report concluding that the well could reliably supply up to 108,000 L/day of potable water. This supply is in excess of the projected average daily demand of 87,470 L/day. Primary treatment will be via ultraviolet disinfection. Secondary will be via chlorination. Vertical tank cisterns within the Utility Building will provide water storage on site, which will be distributed to the various buildings via a 50 mm main. A permit to take water from MECP will be required.

Fire suppression water will be supplied from a shore well on West Lake. A 9,000 L/min electric pump with diesel backup will distribute water to eight hydrants via 200 mm main.

Irrigation water will also be distributed from the shore well via the 200 mm main. A secondary 275 L/min pump will be utilized for irrigation flows.

### 9.2 Sanitary

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The daily design sanitary flow rate was calculated to be 83,300 L/day. Flows from the various buildings will be collected by 100 mm gravity sewers to six pump chambers and pumped via 50 mm forcemain to a single advanced treatment system located in the northwest section of the development. The advanced treatment system and dispersal bed will provide adequate treatment. The Site Servicing Plan shows the location of the system and that there is sufficient space to situate the facility. The system will require an ECA from the MECP.

Prepared by:



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Jewell Engineering Inc.

Submitted by:



Graham Potter, P.Eng.  
Jewell Engineering Inc.

## 10 References

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- Burger, M. (August 12, 2026). *Revised Wastewater Servicing Brief Campfire Circle - Prince Edward County - GW 23003-16*. Groundwork Engineering Ltd.
- Ecological Services. (2024). *Natrual Heritage Impact Assessment (EIS), 565 Wesley Acres Road, Bloomfield, ON K0K 1G0*.
- Johnston, P. (March 22, 2024). *Hydrogeological Study and Servicing Options, Overnight Campground Development, 565 Wesley Acres Road, Bloomfield, Ontario*. ASC Environmental.
- Ministry of Municipal Affairs and Housing. (2024, May 29). *Ontario Building Code*.
- Ministry of the Environment. (2008). *Design Guidelines for Drinking-Water Systems*.
- Ministry of the Environment. (2008). *Design Guidelines for Sewage Works*.
- Ontario Ministry of Agriculture, Food and Rural Affairs. (February, 2025). *Publication 836B: Guide to Production of Greenhouse Fruits and Vegetables*.
- Pool & Hot Tub Council of Canada. (2013). *Recommended Guidelines - Water Discharge Best Management Practices [G-0613]*.
- Quinte Conservation. (October, 2019). *Quinte Region Drought Management Project Water Budget*.
- Toronto Water Division. (n.d.). *Environmental Best Management Practies for Private Swimming Pools. Hot Tubs/Spas in the City of Toronto*. Toronto, Ontario: City of Toronto.
- Vander Wilp, W. (August 12, 2025). *Report for Campfire Circle*. MacLellan Water Treatment and Pumps.
- Ward, D., & McKague, K. (February 2023). *Factsheet #23-023 Water Requirements of Livestock*. Ontario Ministry of Agriculture, Food and Rural Affairs.

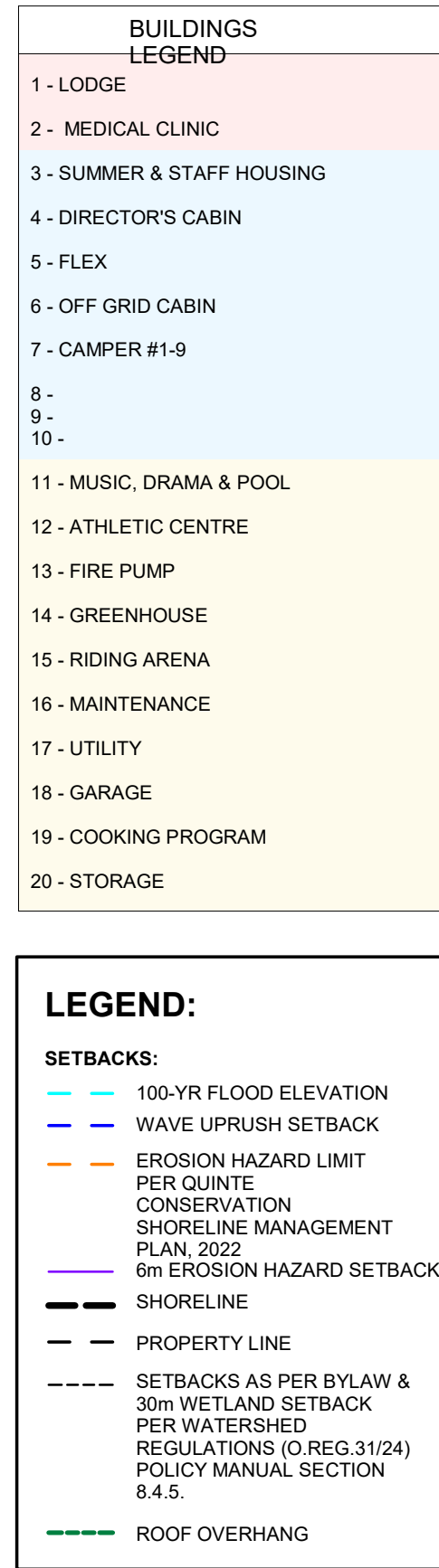
**APPENDIX A:**  
**SITE PLAN**



This drawing, as an instrument of service, is provided by and is the property of Teeple Architects Inc., and shall be used only for the project named on this drawing and solely for reference purposes only. The contractor is responsible for the coordination and verification of all dimensions contained herein and all measurements and conditions on site as they pertain to these documents. The contractor shall report any discrepancies to the consultant in writing prior to the commencement of construction work.

DO NOT SCALE THIS DRAWING

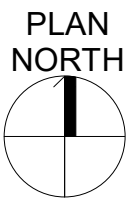
This drawing shall not be used for construction purposes  
unless countersigned

[illegible]

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565 Wesley Acres Rd  
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ONTARIO ASSOCIATION  
OF  
ARCHITECTS  
EDWARD P. HANDY  
LICENSE  
3854  
SEAL

DRAWN BY **JM** CHECKED BY **RK**

|             |              |        |           |
|-------------|--------------|--------|-----------|
| PROJ NO     | SCALE        | FORMAT | PLOT DATE |
| TAI: 23-105 | As indicated | ARCH D | 09/10/15  |

**CAMPFIRE CIRCLE**

**BUILDINGS**

**LAYOUT**

**A014**



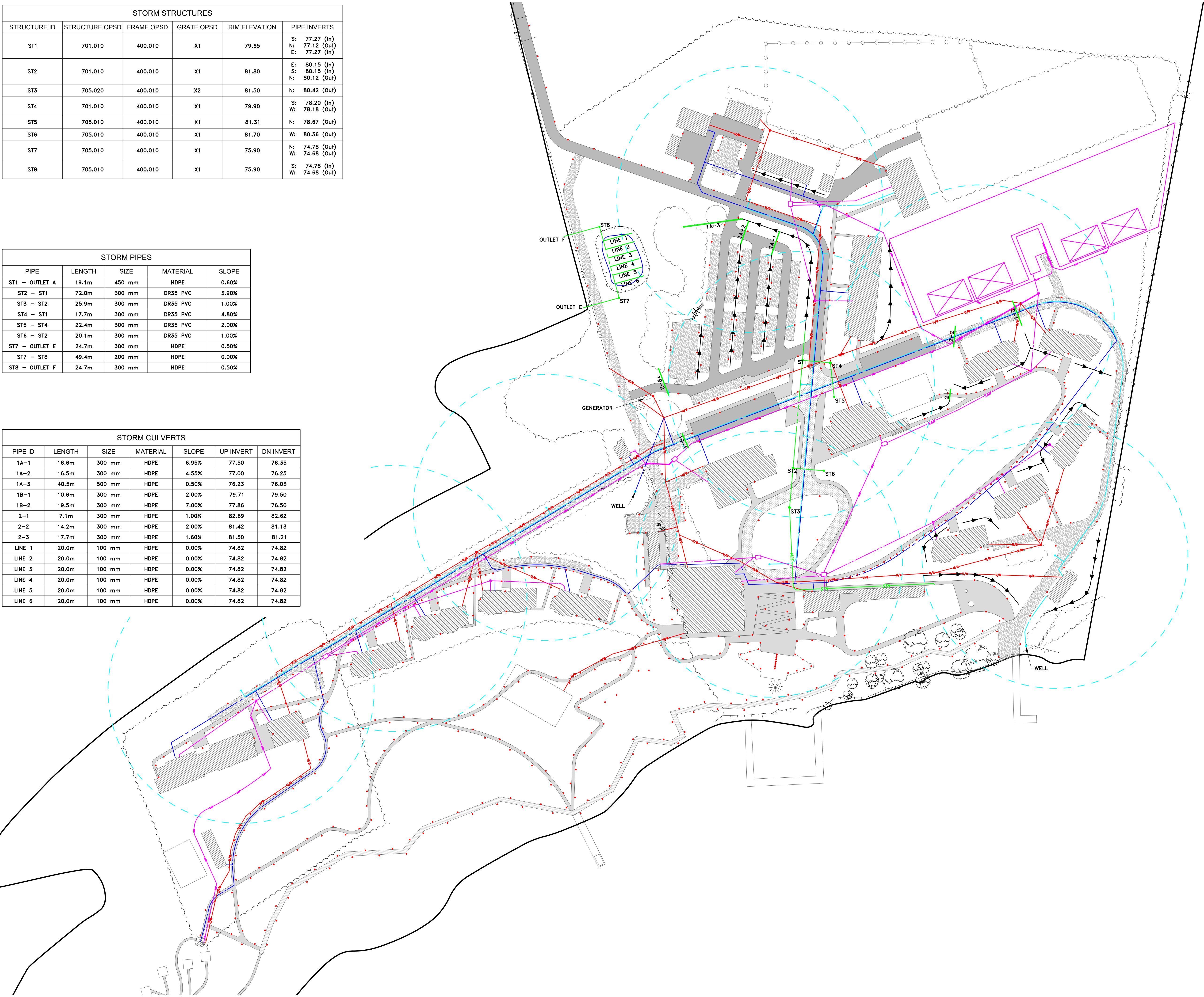
## **APPENDIX B: SITE SERVICING PLANS**



| STORM STRUCTURES |                |            |            |               |                                                  |
|------------------|----------------|------------|------------|---------------|--------------------------------------------------|
| STRUCTURE ID     | STRUCTURE OPSD | FRAME OPSD | GRATE OPSD | RIM ELEVATION | PIPE INVERTS                                     |
| ST1              | 701.010        | 400.010    | X1         | 79.65         | S: 77.27 (In)<br>N: 77.12 (Out)<br>E: 77.27 (In) |
| ST2              | 701.010        | 400.010    | X1         | 81.80         | E: 80.15 (In)<br>S: 80.15 (In)<br>N: 80.12 (Out) |
| ST3              | 705.020        | 400.010    | X2         | 81.50         | N: 80.42 (Out)                                   |
| ST4              | 701.010        | 400.010    | X1         | 79.90         | S: 78.20 (In)<br>W: 78.18 (Out)                  |
| ST5              | 705.010        | 400.010    | X1         | 81.31         | N: 78.67 (Out)                                   |
| ST6              | 705.010        | 400.010    | X1         | 81.70         | W: 80.36 (Out)                                   |
| ST7              | 705.010        | 400.010    | X1         | 75.90         | N: 74.78 (Out)<br>W: 74.68 (Out)                 |
| ST8              | 705.010        | 400.010    | X1         | 75.90         | S: 74.78 (In)<br>W: 74.68 (Out)                  |

| STORM PIPES    |        |        |          |       |
|----------------|--------|--------|----------|-------|
| PIPE           | LENGTH | SIZE   | MATERIAL | SLOPE |
| ST1 - OUTLET A | 19.1m  | 450 mm | HDPE     | 0.60% |
| ST2 - ST1      | 72.0m  | 300 mm | DR35 PVC | 3.90% |
| ST3 - ST2      | 25.9m  | 300 mm | DR35 PVC | 1.00% |
| ST4 - ST1      | 17.7m  | 300 mm | DR35 PVC | 4.80% |
| ST5 - ST4      | 22.4m  | 300 mm | DR35 PVC | 2.00% |
| ST6 - ST2      | 20.1m  | 300 mm | DR35 PVC | 1.00% |
| ST7 - OUTLET E | 24.7m  | 300 mm | HDPE     | 0.50% |
| ST7 - ST8      | 49.4m  | 200 mm | HDPE     | 0.00% |
| ST8 - OUTLET F | 24.7m  | 300 mm | HDPE     | 0.50% |

| STORM CULVERTS |        |        |          |       |           |           |
|----------------|--------|--------|----------|-------|-----------|-----------|
| PIPE ID        | LENGTH | SIZE   | MATERIAL | SLOPE | UP INVERT | DN INVERT |
| 1A-1           | 16.6m  | 300 mm | HDPE     | 6.95% | 77.50     | 76.35     |
| 1A-2           | 16.5m  | 300 mm | HDPE     | 4.55% | 77.00     | 76.25     |
| 1A-3           | 40.5m  | 500 mm | HDPE     | 0.50% | 76.23     | 76.03     |
| 1B-1           | 10.6m  | 300 mm | HDPE     | 2.00% | 79.71     | 79.50     |
| 1B-2           | 19.5m  | 300 mm | HDPE     | 7.00% | 77.86     | 76.50     |
| 2-1            | 7.1m   | 300 mm | HDPE     | 1.00% | 82.69     | 82.62     |
| 2-2            | 14.2m  | 300 mm | HDPE     | 2.00% | 81.42     | 81.13     |
| 2-3            | 17.7m  | 300 mm | HDPE     | 1.60% | 81.50     | 81.21     |
| LINE 1         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |
| LINE 2         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |
| LINE 3         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |
| LINE 4         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |
| LINE 5         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |
| LINE 6         | 20.0m  | 100 mm | HDPE     | 0.00% | 74.82     | 74.82     |



GENERAL NOTES:

- ALL INFORMATION TO BE VERIFIED ON SITE PRIOR TO COMMENCING ANY WORK. ANY DISCREPANCIES ARE TO BE REPORTED TO THE CONSULTANT IMMEDIATELY.
- ALL UTILITY LOCATIONS SHOWN ON THE DRAWINGS ARE APPROXIMATE. THE CONTRACTOR SHALL CONFIRM THE LOCATION ON SITE AND ASSUME ALL LIABILITY FOR DAMAGE TO ALL UTILITIES.
- EXCLUDING THE BENCHMARK AND DESCRIPTION PROVIDED FOR THIS PROJECT, NO OTHER ELEVATIONS ARE TO BE USED AS A REFERENCE ELEVATION FOR ANY PURPOSE.

METRIC NOTE:

- ALL DIMENSIONS SHOWN ARE IN METRES OR MILLIMETRES, UNLESS OTHERWISE NOTED.

GEOMETRIC NOTE:

- ALL SURVEY DATA SHOWN ON THIS DRAWING WAS RECORDED USING REAL-TIME KINETIC (RTK) GPS OBSERVATIONS IN REFERENCE TO UTM 18 NORTH COORDINATE SYSTEM.
- ALL ELEVATIONS ARE IN REFERENCE TO LOCAL DATUM NAD83 - GEODETIC MODEL HTF.2, UNLESS DESCRIBED OTHERWISE.

\*\* DRAWINGS ARE NOT TO BE SCALED \*\*

| REVISIONS |            |                               |    |
|-----------|------------|-------------------------------|----|
| NO.       | DATE       | DESCRIPTION                   | BY |
| 0         | 08/15/2025 | ISSUED FOR SITE PLAN APPROVAL | JH |
| 1         | 02/02/2026 | ISSUED FOR SITE PLAN APPROVAL | JH |
| 2         | 06/01/2026 | ISSUED FOR SITE PLAN APPROVAL | JH |
| 3         | 06/18/2026 | REVISED SITE PLAN             | JH |
| 4         | 07/06/2026 | REVISED SITE PLAN             | JH |
| 5         | 08/18/2026 | REVISED SITE PLAN             | JH |

| LEGEND |                                 |
|--------|---------------------------------|
|        | FIRE WATER SUPPLY               |
|        | DOMESTIC WATER SUPPLY           |
|        | SANITARY FORCEMAIN              |
|        | SANITARY GRAVITY MAIN           |
|        | SANITARY SERVICE                |
|        | SANITARY MANHOLE                |
|        | SANITARY PUMP CHAMBER           |
|        | STORM CULVERT                   |
|        | STORM SEWER                     |
|        | POOL DRAIN (DESIGNED BY OTHERS) |
|        | STORM STRUCTURES                |
|        | JOINT UTILITY TRENCH            |

PIPE SEPARATION NOTES:

- WHEN WATERMAIN CROSS A SEWER, A VERTICAL SEPARATION OF 0.5m SHALL BE MAINTAINED.
- WHEN A WATERMAIN PASSES SEWER STRUCTURES, A MINIMUM 0.5m HORIZONTAL SEPARATION SHALL BE MAINTAINED.
- HORIZONTAL SEPARATION BETWEEN WATERMAIN AND SEWER TO BE 3.0m (CENTRE-TO-CENTRE).



COPE GROUP  
CAMPFIRE CIRCLE  
  
THE COUNTY OF PRINCE EDWARD

SITE SERVICING PLAN  
1 of 1

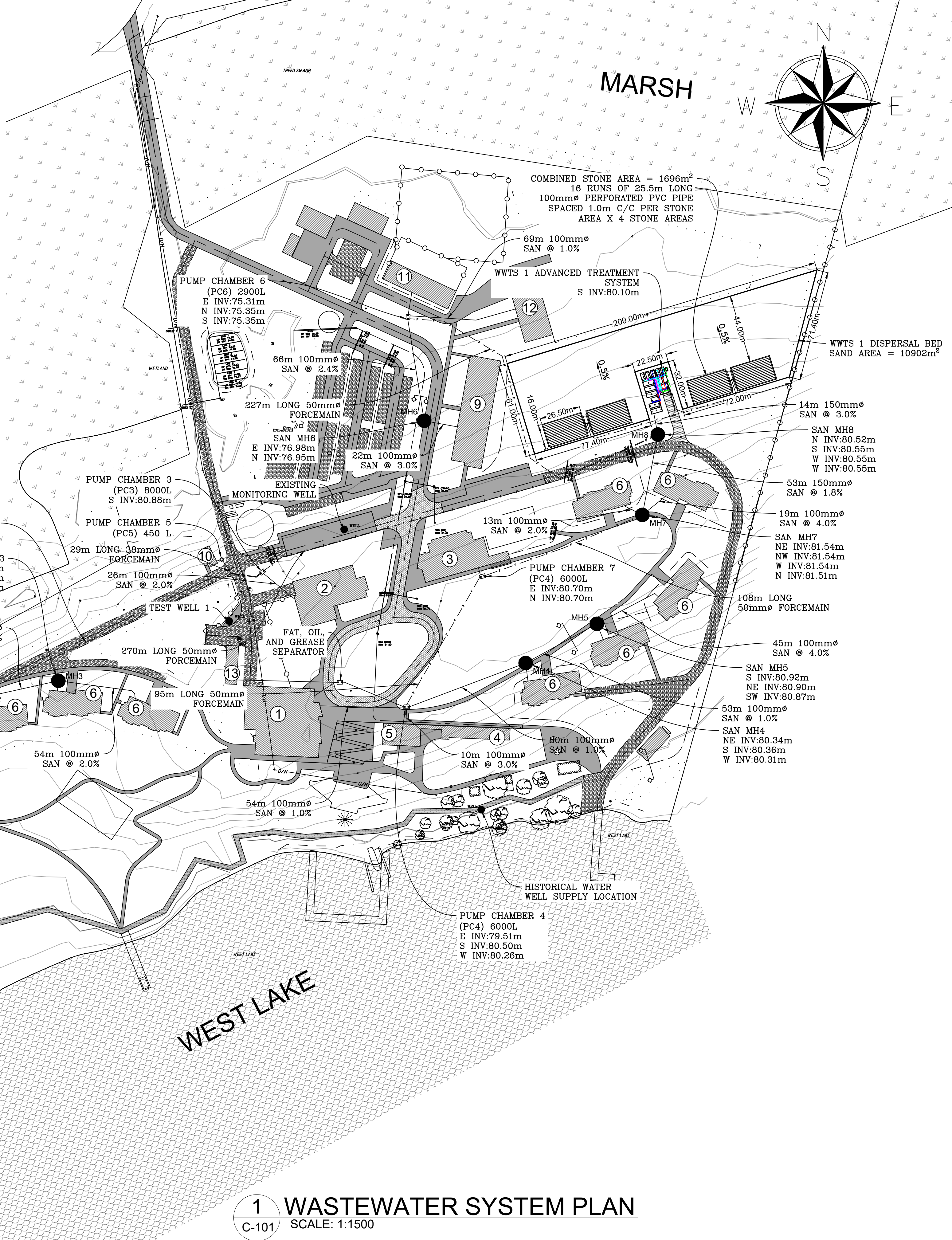
|                   |                                                 |
|-------------------|-------------------------------------------------|
| DRAWN BY:<br>JH   | PROJECT NO:<br>230-5322                         |
| DESIGNED BY:      | DATE:<br>July 2026                              |
| CHECKED BY:<br>GP | SCALE:<br>HORIZONTAL - 1:1200<br>VERTICAL - N/A |
| APPROVED BY:      | CONTRACT NO:<br>DRAWING NO:<br>SS-1             |



| STRUCTURES TABLE |        |                                                |                                           |               |                |
|------------------|--------|------------------------------------------------|-------------------------------------------|---------------|----------------|
| STRUCTURE        | TOG    | INV IN                                         | SIZE IN                                   | INV OUT       | SIZE OUT       |
| MH1              | 79.59m | W INV:77.55m<br>S INV:77.55m<br>SW INV:77.55m  | 100mm<br>100mm                            | E INV:77.53m  | 100mm          |
| MH2              | 81.40m | E INV:78.81m<br>S INV:78.81m                   | 100mm<br>100mm                            | W INV:78.78m  | 100mm          |
| MH3              | 82.14m | E INV:79.92m<br>S INV:79.92m                   | 100mm<br>100mm                            | W INV:79.89m  | 100mm          |
| MH4              | 83.50m | E INV:80.34m<br>S INV:80.36m                   | 100mm<br>100mm                            | W INV:80.31m  | 100mm          |
| MH5              | 83.32m | NE INV:80.90m<br>S INV:80.92m                  | 100mm<br>100mm                            | SW INV:80.87m | 100mm          |
| MH6              | 77.94m | E INV:76.98m                                   | 100mm                                     | N INV:76.95m  | 100mm          |
| MH7              | 84.75m | NE INV:81.54m<br>NW INV:81.54m<br>W INV:81.51m | 100mm<br>100mm<br>100mm                   | N INV:81.51m  | 150mm          |
| MH8              | 81.50m | W INV:80.55m<br>W INV:80.55m<br>S INV:80.55m   | 50mm FORCEMAIN<br>50mm FORCEMAIN<br>150mm | N INV:80.52m  | 150mm          |
| PC1              | 76.79m | S INV:76.10m                                   | 100mm                                     | N INV:76.10m  | 50mm FORCEMAIN |
| PC2              | 80.38m | E INV:77.44m<br>W INV:76.98m                   | 100mm<br>100mm                            | E INV:76.98m  | 50mm FORCEMAIN |
| PC3              | 81.80m | W INV:80.80m<br>W INV:80.80m<br>S INV:80.88m   | 38mm FORCEMAIN<br>50mm FORCEMAIN<br>100mm | E INV:80.80m  | 50mm FORCEMAIN |
| PC4              | 83.60m | E INV:79.51m<br>W INV:80.26m<br>S INV:80.50m   | 100mm<br>100mm<br>100mm                   | N INV:80.65m  | 50mm FORCEMAIN |
| PC5              | 80.97m | W INV:79.97m                                   | 100mm                                     | S INV:79.97m  | 38mm FORCEMAIN |
| PC6              | 76.60m | E INV:75.31m<br>N INV:75.35m<br>S INV:75.35m   | 100mm<br>100mm<br>100mm                   | E INV:75.35m  | 50mm FORCEMAIN |
| PC7              | 84.10m | N INV:80.70m<br>W INV:80.70m                   | 100mm<br>50mm FORCEMAIN                   | E INV:80.80m  | 50mm FORCEMAIN |

NOTES:

- TOG ELEVATIONS BASED ON EXISTING GROUND SURFACE.
- TOG ELEVATIONS TO BE UPDATED TO USE PROPOSED SURFACE ONCE PROPOSED GRADING PLAN IS COMPLETED.



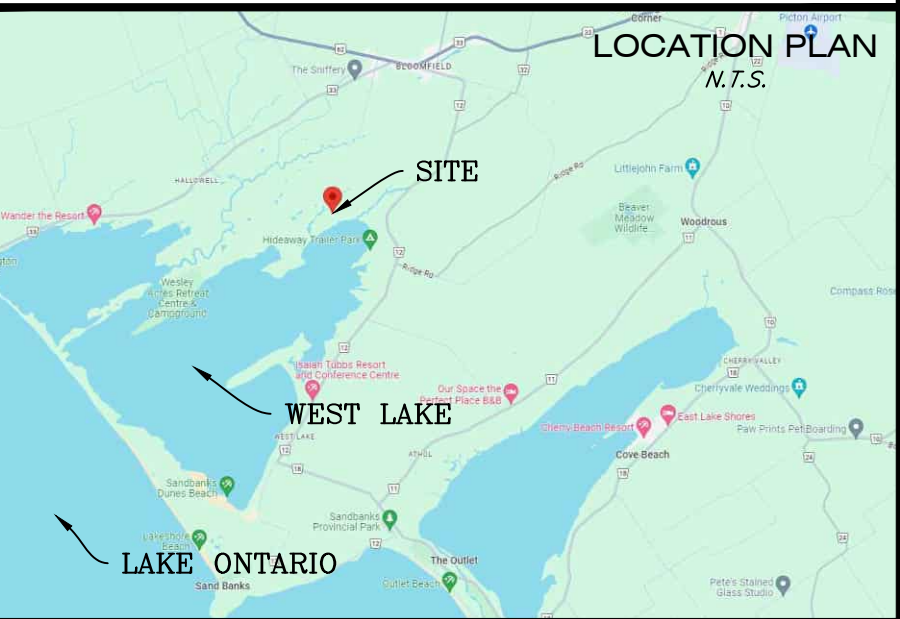


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| LEGEND                 |                        |
|------------------------|------------------------|
| --- NEW 50mm FORCEMAIN |                        |
| BUILDING NUMBER        | BUILDING NAME          |
| 1                      | LODGE                  |
| 2                      | HOSPITAL               |
| 3                      | INDOOR ACTIVITY SPACE  |
| 4                      | POOL BUILDING          |
| 5                      | DRAMA BUILDING         |
| 6                      | CAMPER RESIDENCE       |
| 7                      | SUMMER STAFF RESIDENCE |
| 8                      | MATURE STAFF RESIDENCE |
| 9                      | FLEX                   |
| 10                     | DIRECTOR'S CABIN       |
| 11                     | EQUESTRIAN STABLES     |
| 12                     | GREENHOUSE             |
| 13                     | COOKING PROGRAM        |

| REVISIONS |                                   |            |
|-----------|-----------------------------------|------------|
| No.       | Description                       | Date       |
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| 06        | REVISED PER DECEMBER 2025 DRAWING | 2026/01/23 |
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| 08        | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09        | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| BENCHMARK: |             |           |
|------------|-------------|-----------|
| No.        | DESCRIPTION | ELEVATION |
| ##.        | XXX         | XXX.XX    |
|            |             |           |
|            |             |           |
|            |             |           |



Client / Land Owner:  
**CAMPFIRE CIRCLE**

Project:  
**565 WESLEY ACRES ROAD**  
BLOOMFIELD ONTARIO

Drawing Title:  
**SANITARY WASTEWATER PLAN**

Drawn by: LM  
Checked By: MB  
Scale: 24"x36" 1:1500  
Date: AUG 12, 2026

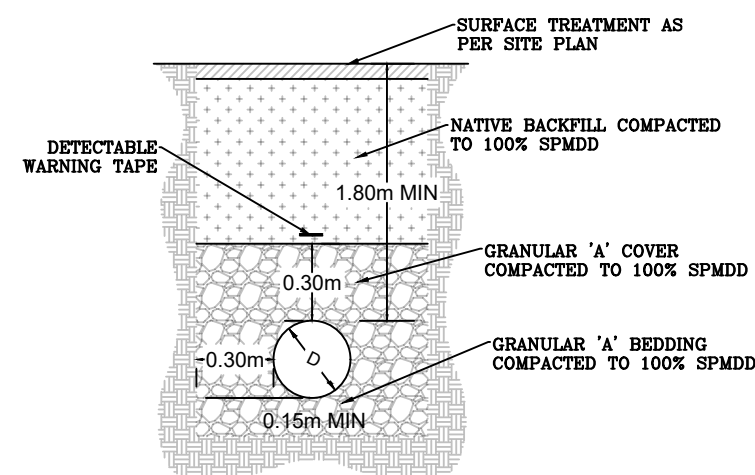
Project Number:  
**GW-23003-16**

Drawing Number:  
**C-101**

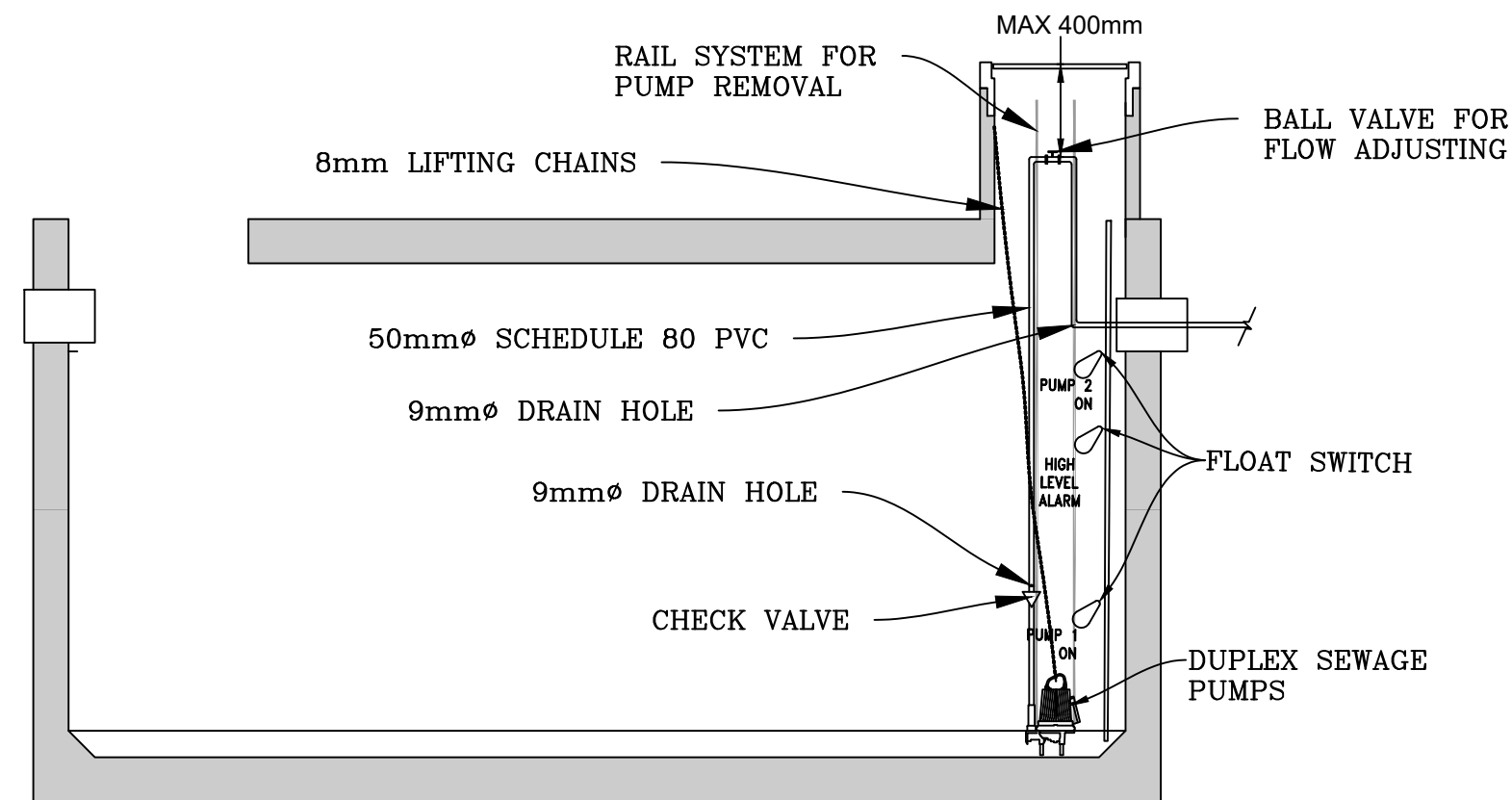
SHEET 1 of 3



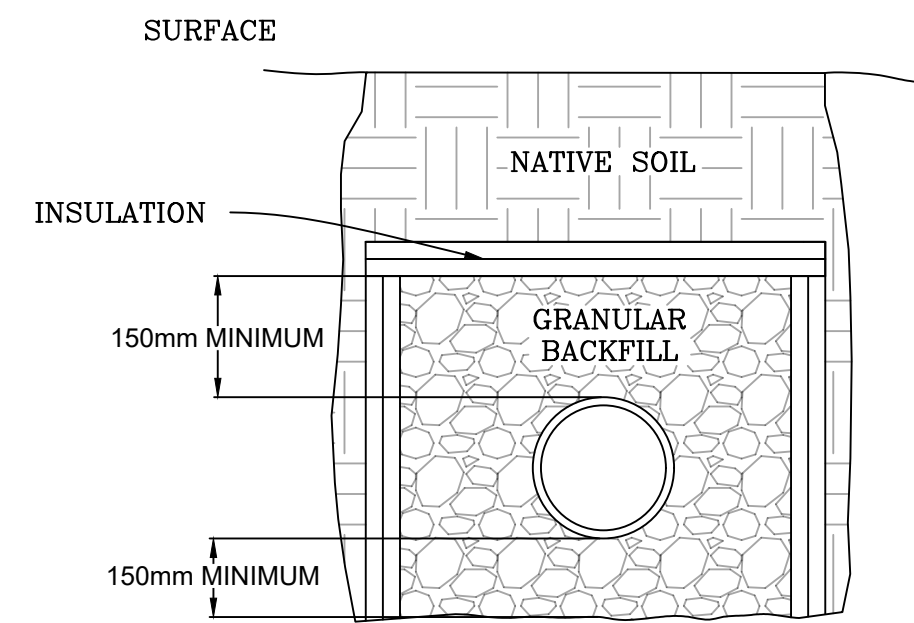
- NOTES:
- SANITARY OUTLET INVERT IS ASSUMED TO BE 1.0m BELOW FINISHED FLOOR ELEVATION (FFE)
  - SANITARY OUTLET FROM 2-STORY BUILDINGS IS ASSUMED TO BE 1.0m BELOW UPPER FLOOR FFE.
  - MANHOLES TO BE AS PER OPSD 701.010.
  - ALL GRAVITY SEWER MAIN PIPE TO BE PVC SDR35.
  - ALL FORCEMAINS TO BE 150 PSI POLYETHYLENE.
  - ALL FORCEMAINS UNLESS OTHERWISE NOTED ARE 50mmØ.
  - ALL FORCEMAINS IF NOT SELF DRAINING TO BE BURIED 1.5m DEEP, INSULATED, OR HEAT TRACED TO PREVENT STANDING WATER FROM FREEZING.



SANITARY TYPICAL TRENCH



TYPICAL PUMP CHAMBER  
SCALE: NTS



- NOTES:
- INCREMENTS OF THICKNESS SHALL BE 50MM.
  - INSULATION TO BE STYROFOAM SM HI-40 OR EQUIVALENT.
  - TO BE USED WHEN GROUND COVER IS LESS THAN 1.2m FOR STORM SEWER, 1.5m FOR SANITARY SEWER AND 1.7m FOR WATERMAIN.

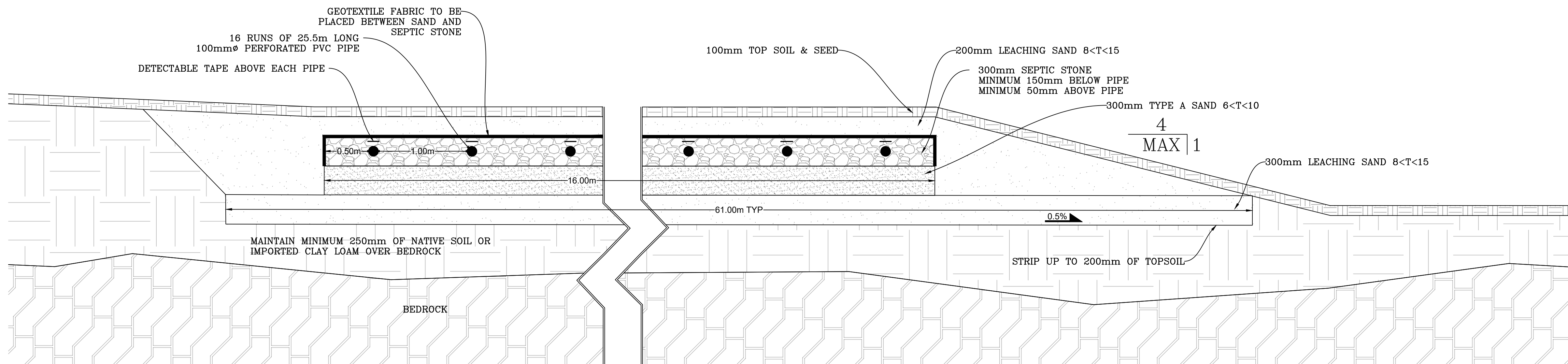
PIPE INSULATION TABLE

| GROUND COVER    | INSULATION THICKNESS (mm) |
|-----------------|---------------------------|
| 500 to 1500mm   | 100                       |
| 1500mm and over | 50                        |

PIPE INSULATION DETAIL

## 1 WASTEWATER TREATMENT SYSTEM DETAILS

C-102 SCALE: 1:75



## 2 DISPERSAL BED PROFILE

C-102 SCALE: 1:25



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### LEGEND

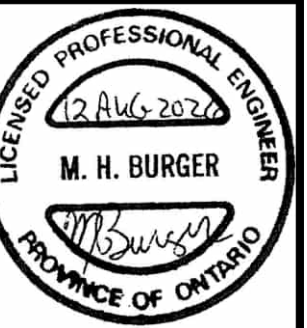
- NEW 50mm FORCEMAIN
- NEW 50mm FORCEMAIN
- NEW 6mm CARBON LINE
- NEW 50mm AERATION
- NEW 6mm COAGULANT LINE

### REVISIONS

| No. | Description                       | Date       |
|-----|-----------------------------------|------------|
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| 09  | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

### BENCHMARK:

| No. | DESCRIPTION | ELEVATION |
|-----|-------------|-----------|
| ##  | XXX         | XXX.XX    |



Client / Land Owner:

CAMPFIRE CIRCLE

Project:

565 WESLEY ACRES ROAD

BLOOMFIELD

ONTARIO

Drawing Title:

NOTES AND DETAILS

Drawn by: LM

Project Number:

GW-23003-16

Checked By: MB

Scale: 24"x36" AS NOTED

Drawing Number:

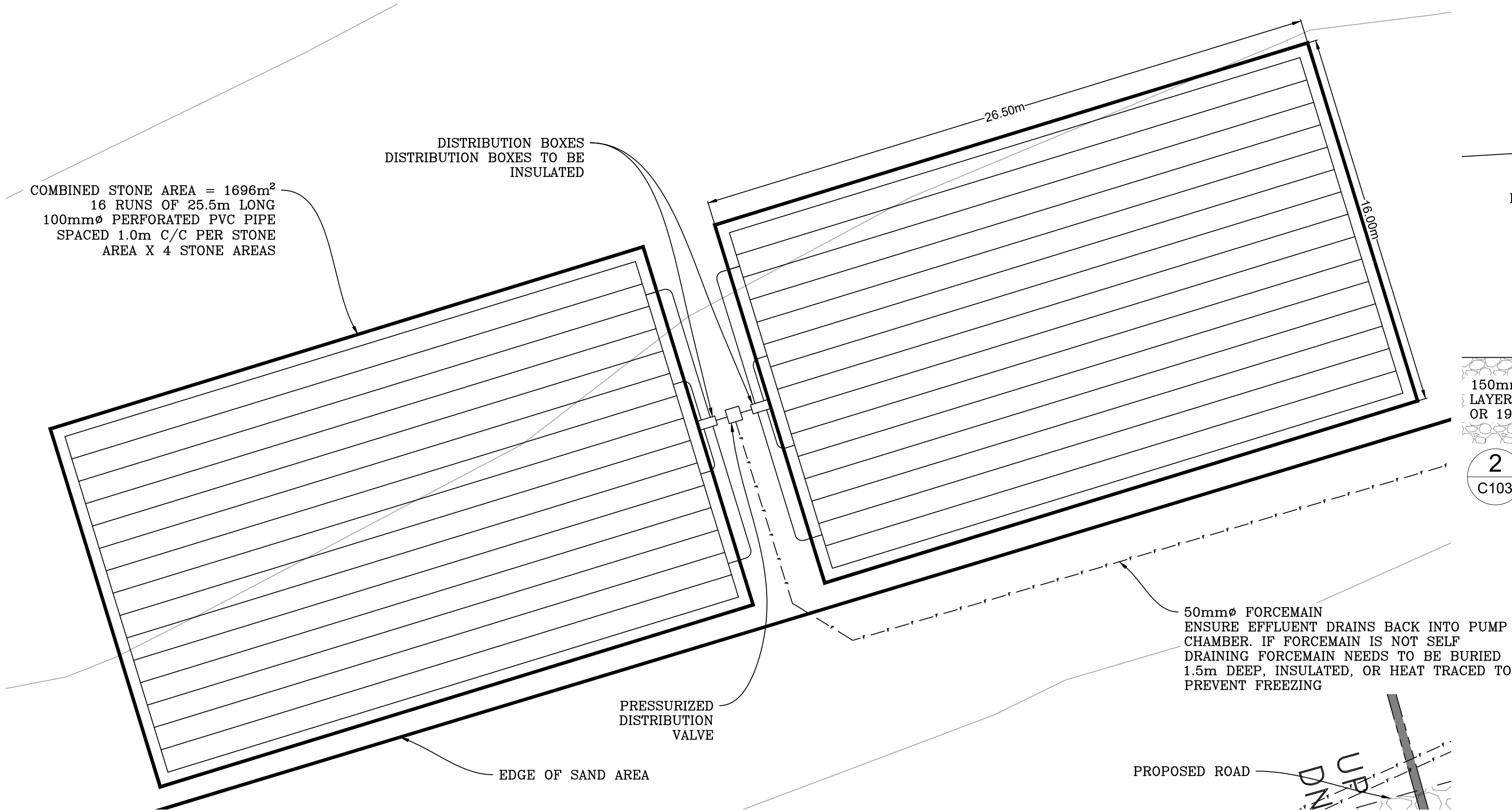
C-102

Date:

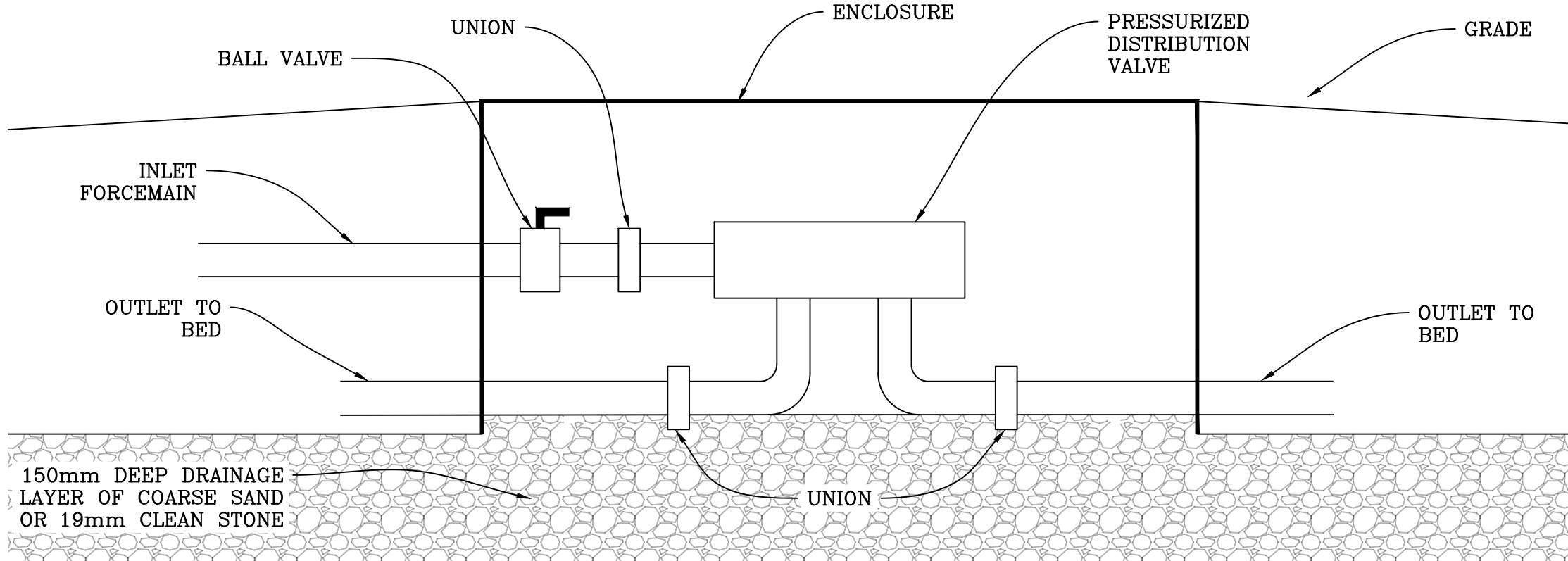
AUG 12, 2026

SHEET 2 of 3





1 DISPERSAL BED STONE AREA AND PIPE DETAIL  
C-103 SCALE: 1:150



2 DISTRIBUTING VALVE DETAIL  
C103 NTS

Pump Chambers and Pumps

| Pump Chamber | Working Volume (L) | Maximum Combined Head (m) | Pump Required         | Flow (L/s) |
|--------------|--------------------|---------------------------|-----------------------|------------|
| PC1          | 1200               | 11.58                     | LIBERTY LEH100 Series | 3          |
| PC2          | 7200               | 17.51                     | LIBERTY LEH200 Series | 3          |
| PC3          | 8000               | 13.44                     | LIBERTY LEH100 Series | 3          |
| PC4          | 6000               | 6.78                      | LIBERTY LE100 Series  | 3          |
| PC5          | 450                | 6.13                      | LIBERTY LE50 Series   | 3          |
| PC6          | 2900               | 16.94                     | LIBERTY LEH200 Series | 3          |
| PC7          | 7200               | 7.04                      | LIBERTY LE100 Series  | 3          |

GENERAL NOTES:

- THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY DATA SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THESE PLANS. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION. IF THERE IS ANY DISCREPANCY THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY.
- ALL ELEVATIONS PROVIDED ARE GEODETIC AND UTILIZE METRIC UNITS UNLESS OTHERWISE NOTED.
- THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME ALL RESPONSIBILITY FOR EXISTING UTILITIES WHETHER OR NOT SHOWN ON THE DRAWINGS. IF THERE ARE ANY DISCREPANCIES THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY. GAS, HYDRO, CABLE, TELEPHONE, OR ANY OTHER UTILITY THAT MAY EXIST ON SITE MUST BE LOCATED BY ITS OWN UTILITIES AND VERIFIED.
- ALL UNDERGROUND SERVICES, MATERIALS AND INSTALLATIONS TO BE IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE STATED (OPSS).
- ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION OR BETTER UNLESS OTHERWISE SPECIFIED. ANY GRASSED AREAS DISTURBED ARE TO BE REINSTATED WITH MINIMUM 100mm TOP SOIL AND SEED. ROAD CUTS TO BE REINSTATED WITH TOPSOIL AND SEED.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
- TREES DESIGNATED BY THE ENGINEER MUST BE PROTECTED AND MAINTAINED DURING CONSTRUCTION AS PER OPSD 220.010
- CONTRACTOR TO OBTAIN AND PAY FOR ALL NECESSARY PERMITS FROM THE COUNTY, MUNICIPALITY AND/OR CONSERVATION AUTHORITY PRIOR TO COMMENCING CONSTRUCTION.
- EXCAVATE AND DISPOSE OF ALL EXCESS EXCAVATED MATERIAL, SUCH AS ASPHALT, CURBING AND DEBRIS, OFF SITE TO THE SATISFACTION OF THE ENGINEER OR THE COUNTY, MUNICIPALITY OR CONSERVATION AUTHORITY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING THE SUPPLY, INSTALLATION, AND REMOVAL OF ALL NECESSARY SIGNAGE AND SPECIFICATIONS.
- ALL DIMENSIONS AND INVERTS MUST BE VERIFIED BEFORE CONSTRUCTION, IF THERE IS ANY DISCREPANCY THE CONTRACTOR MUST NOTIFY THE ENGINEER PROMPTLY.
- CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR ALL PROPOSED MATERIALS FOR REVIEW AND APPROVAL BY THE STAMPING ENGINEER OR THEIR REPRESENTATIVE.
- TOPSOIL TO BE STRIPPED.
- GRANULAR 'A' AND GRANULAR 'B' TO BE COMPACTED TO 98% SPD UNLESS OTHERWISE STATED.
- REINSTATE TRENCHES IN GRANULAR AREA WITH 150mm GRANULAR 'A' & 300mm GRANULAR 'B'.
- BACKFILL TO AT LEAST 300mm ABOVE TOP OF PIPE WITH GRANULAR 'A'

ENVIRONMENTAL

- EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO CONSTRUCTION AND MONITORED AND MAINTAINED BY THE CONTRACTOR UNTIL COMPLETION. THE TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED ONCE THE SITE HAS BEEN STABILIZED AND SITE WORKS COMPLETED.
- REGARDLESS OF SITE SPECIFIC ITEMS DETAILED ON THE PLANS, THE CONTRACTOR SHALL INSTALL EROSION CONTROL MEASURES TO SUIT THE PROPOSED WORK METHODS TO CONTROL SEDIMENT FROM RUNNING OFF THE SITE OR INTO WATER BEARING FEATURES PRIOR TO ANY DISTURBANCE. FOLLOWING CONSTRUCTION, DISTURBED AREAS, AS WELL AS PROPOSED GRASSED AND VEGETATED SURFACES SHALL BE REINSTATED..

- IN THE EVENT THAT HUMAN REMAINS ARE ENCOUNTERED DURING CONSTRUCTION, THE MINISTRY OF CITIZENSHIP, CULTURE AND RECREATION SHALL BE NOTIFIED IMMEDIATELY AND THE REGISTRAR OR DEPUTY REGISTRAR OF THE CEMETARIES REGULATION UNIT OF THE MINISTRY OF CONSUMER AND COMMERCIAL RELATIONS (416) 362-8392, SHALL BE NOTIFIED IMMEDIATELY.
- IN THE EVENT THAT BURIED ARCHEOLOGICAL REMAINS ARE FOUND DURING CONSTRUCTION ACTIVITIES, THE MINISTRY OF CITIZENSHIP, CULTURE AND RECREATION SHALL BE NOTIFIED IMMEDIATELY.
- WHILE UNDERTAKING CLEARING, DEMOLITION, EXCAVATION OR CONSTRUCTION THE OWNER AND THEIR CONTRACTORS SHALL BE VIGILANT FOR THE POTENTIAL PRESENCE OF UNDERGROUND FUEL TANKS, CONTAMINATED SOIL OR GROUNDWATER, BURIED WASTE OR ABANDONED WATER WELLS. IF ANY OF THE ABOVE ARE ENCOUNTERED OR SUSPECTED, THE OWNER SHALL ENSURE THAT:
  - ANY SOIL OR GROUNDWATER CONTAMINATION ENCOUNTERED IS REMEDIATED TO APPLICABLE STANDARDS AS DEFINED WITHIN O.REG OR AS REVISED;
  - ANY WASTES GENERATED BY SITE CLEAN-UPS ARE MANAGED IN ACCORDANCE WITH APPLICABLE LAWS AND STANDARDS;
  - ANY ABANDONED FUEL TANKS ENCOUNTERED ARE DECOMMISSIONED IN ACCORDANCE WITH APPLICABLE LAWS AND STANDARDS;
  - ANY UNUSED WATER WELLS (DRILLED OR DUG) ARE PROPERLY ABANDONED IN ACCORDANCE WITH ONTARIO REGULATIONS 903 WELLS OR AS ADVISED;
  - IF IT APPEARS LIKELY THAT CONTAMINATION EXTENDS BEYOND THE BOUNDARIES OF THE SUBJECT PROPERTY, THE OWNER NOTIFIES THE LOCAL OFFICE OF THE MINISTRY OF ENVIRONMENT.
  - CONSTRUCTION WASTES ARE NOT TO BE BURIED WITHIN THE PROPERTY THAT IS THE SUBJECT OF THIS AGREEMENT, AND THE OWNER AND THEIR CONTRACTORS REPORT ALL SPILLS TO THE MINISTRY OF THE ENVIRONMENT'S SPILLS ACTION CENTRE (1-800-268-6060) AND TO THE MUNICIPALITY FORTHWITH.

SANITARY

- EACH DISTRIBUTION BED TO BE SPLIT INTO TWO (2) CELLS. FLOW TO BE SPLIT AND ALTERNATE BETWEEN CELLS USING AN AUTOMATIC DISTRIBUTING VALVE ASSEMBLY. AUTOMATIC DISTRIBUTING VALVE TO BE ORENCO MODEL: V6402A OR APPROVED EQUIVALENT.
- DISTRIBUTING VALVE TO BE LOCATED NOT MORE THAN 600mm BELOW DISTRIBUTION LINES.
- DISTRIBUTING VALVE TO BE INSTALLED AS PER MANUFACTURERS INSTALLATION INSTRUCTIONS AND GUIDELINES.
- CONTRACTOR IS RESPONSIBLE FOR COMMISSIONING THE DUPLEX EFFLUENT PUMP SYSTEM.
- TYPE A DISPERSAL BED TO BE CONSTRUCTED AS PER OBC 8.7.7.1. SEPTIC STONE GRADATIONS AS PER OBC 8.7.3.3.
- TYPE A SAND TO BE 6<T<10 WITH A MAXIMUM 5% OF PARTICLES WITH A DIAMETER OF 75µm OR LESS, PASSING THROUGH A 0.074mm (No. 200) SIEVE. AS PER OBC 8.7.7.1.(4)(a).
- SEPTIC STONE AS PER OBC 8.7.7.1.(6), 8.7.3.3.(2) AND TABLE 8.7.3.3
- THE HEADER AND DISTRIBUTION LINES SHALL BE INSTALLED AS PER OBC 8.7.2.2.
- DISTRIBUTION BOXES TO BE RAISED, INSULATED AND LEVELED ON A COMPACTED BASE.
- PUMP CHAMBERS AND PUMPS AS PER TABLE.
- SEWAGE PUMP CONTROL PANELS TO BE TO BE SJE RHOMBUS IFS SERIES DUPLEX CONTROLLER 240V, 15 AMP, OR APPROVED EQUIVALENT.
- NEW DUPLEX DEMAND CONTROLLERS WITH AUDIBLE & VISUAL ALARMS TO BE INSTALLED ON 100mm X 100mm X 1.5m PRESSURE TREATED WOOD POST ADJACENT TO SEWAGE PUMP CHAMBERS OR ON WALL OF BUILDING FOR EASE OF MAINTENANCE. IF MOUNTED IN MECHANICAL ROOM SEAL ALL DUCTS ENTERING BUILDING WITH EYS FITTING TO PREVENT GAS TRANSFER.
- ALL ELECTRICAL WORK MUST BE COMPLETED IN ACCORDANCE WITH ELECTRICAL CODE & BE PREFORMED BY A LICENCED ELECTRICIAN IN GOOD STANDING WITH THE ESA.
- FORCEMAIN IF NOT SELF DRAINING TO BE BURIED 1.5m DEEP, INSULATED OR HEAT TRACED TO PREVENT STANDING WATER FROM FREEZING.

- SEWER TRENCHING AND BEDDING SHALL CONFORM TO OPSD 802.010 AND 802.013 UNLESS NOTED OTHERWISE.
- ALL PIPE ELBOWS TO BE LONG SWEEP RADIUS.
- ANY AREAS WHERE TRAFFIC IS EXPECTED TO CROSS OVER FORCEMAINS INSTALL FORCEMAINS INSIDE 100mmØ SDR 35 PVC PIPE.
- BNA-MBBR PUMP CHAMBER TO BE EQUIPPED WITH ON/OFF FLOAT SWITCH. PUMP CHAMBER TO BE EQUIPPED WITH HIGH LEVEL ALARM FLOAT. REDUNDANT LAG FLOAT CONTROL SWITCH TO BE INSTALLED ABOVE HIGH LEVEL ALARM FLOAT CONTROL SWITCH.
- HIGH LEVEL ALARM CONTROL WIRE AND PUMP CONTROL WIRE TO BE INSTALLED IN SEPARATE CONDUIT, FROM ELECTRICAL SUPPLY TO PUMP CHAMBER
- TANKS TO BE BACKFILLED WITH 300mm OF GRANULAR 'A' OR SAND FILL.
- TANKS TO BE PLACED ON 300mm OF GRANULAR 'A' COMPACTED TO 98% SPD.
- TANKS TO BE EQUIPPED WITH RISERS. TANKS TO HAVE MINIMUM 300mm COVER.
- ALL TANKS TO BE INSTALLED AS PER MANUFACTURERS SPECIFICATIONS AND INSTALLATION INSTRUCTIONS.
- BNA-MBBR TREATMENT PLANT TANKS AND PRE-TREATMENTS TANK TO BE INSTALLED AS PER MANUFACTURERS SPECIFICATIONS.

ELECTRICAL

- ALL ELECTRICAL WORK TO BE COMPLETED IN ACCORDANCE WITH ESA STANDARDS.
- ELECTRICAL CONDUIT FOR CONTROLLER TO BE 50mmØ RIGID PVC AND 25mmØ RIGID PVC FOR ALARM UNLESS SPECIFIED OTHERWISE.
- ELECTRICAL CONDUIT TO BE INSTALLED WITH SWEEPS ON EACH CORNER.
- EXTERNAL ELECTRICAL PANEL TO BE IN NEMA 4 CERTIFIED OUTDOOR LOCKABLE ENCLOSURE MOUNTED ON TWO (2) 4X4 PRESSURE TREATED POSTS AND 20mm PLYWOOD.
- PANEL TO BE SIZED TO ACCOMMODATE BREAKERS AND CIRCUITRY FOR CONTROLLERS, PUMP CHAMBER CONTROLLER, AND TWO (2) SPARES.



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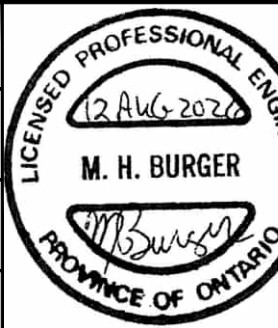


CALCULATIONS AS PER ONTARIO BUILDING CODE PART 8  
DAILY DESIGN SEWAGE FLOW DETERMINATION (Q)

- RESIDENTIAL UNITS (CAMPER AND STAFF RESIDENCES)  
- 411 BEDS @ 200L/DAY PER BED = 82,200 L/DAY  
NOTE: ACCESSORY AND COMMUNAL BUILDING INCLUDED IN RESIDENTIAL FLOWS  
- 2 DIRECTORS CABIN  
- 2 BEDROOMS = 1,100 L/DAY  
**TOTAL (Q) = 83,300 L/DAY**  
LOADING  
EXISTING SOIL:  
T=TIME > 50 (CLAY)  
TYPE A DISPERSAL BED:  
FLOW RATE > 3000L/DAY  
THEREFORE RATE IS 50L/m²  
STONE AREA= 1696m² → Q/50 → 83,300/50 = 1666m² (REQ'D)  
SAND AREA= 10902m² → QxT/400 → 83,300x50 = 10412.5m² (REQ'D)

| No. | Description                       | Date       |
|-----|-----------------------------------|------------|
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| 08  | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09  | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| No. | DESCRIPTION | ELEVATION |
|-----|-------------|-----------|
| ##. | XXX         | XXX.XX    |
|     |             |           |
|     |             |           |
|     |             |           |

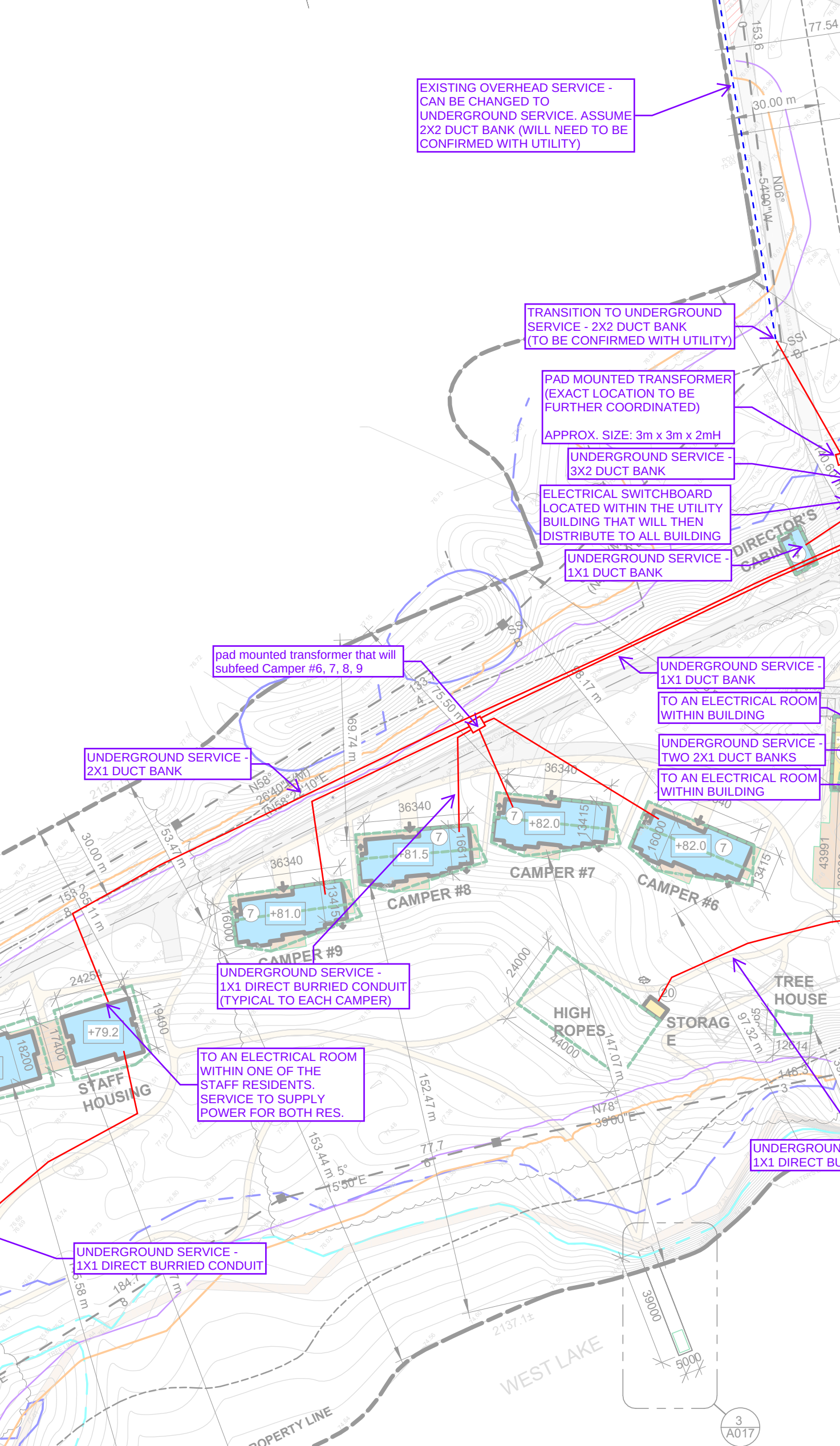
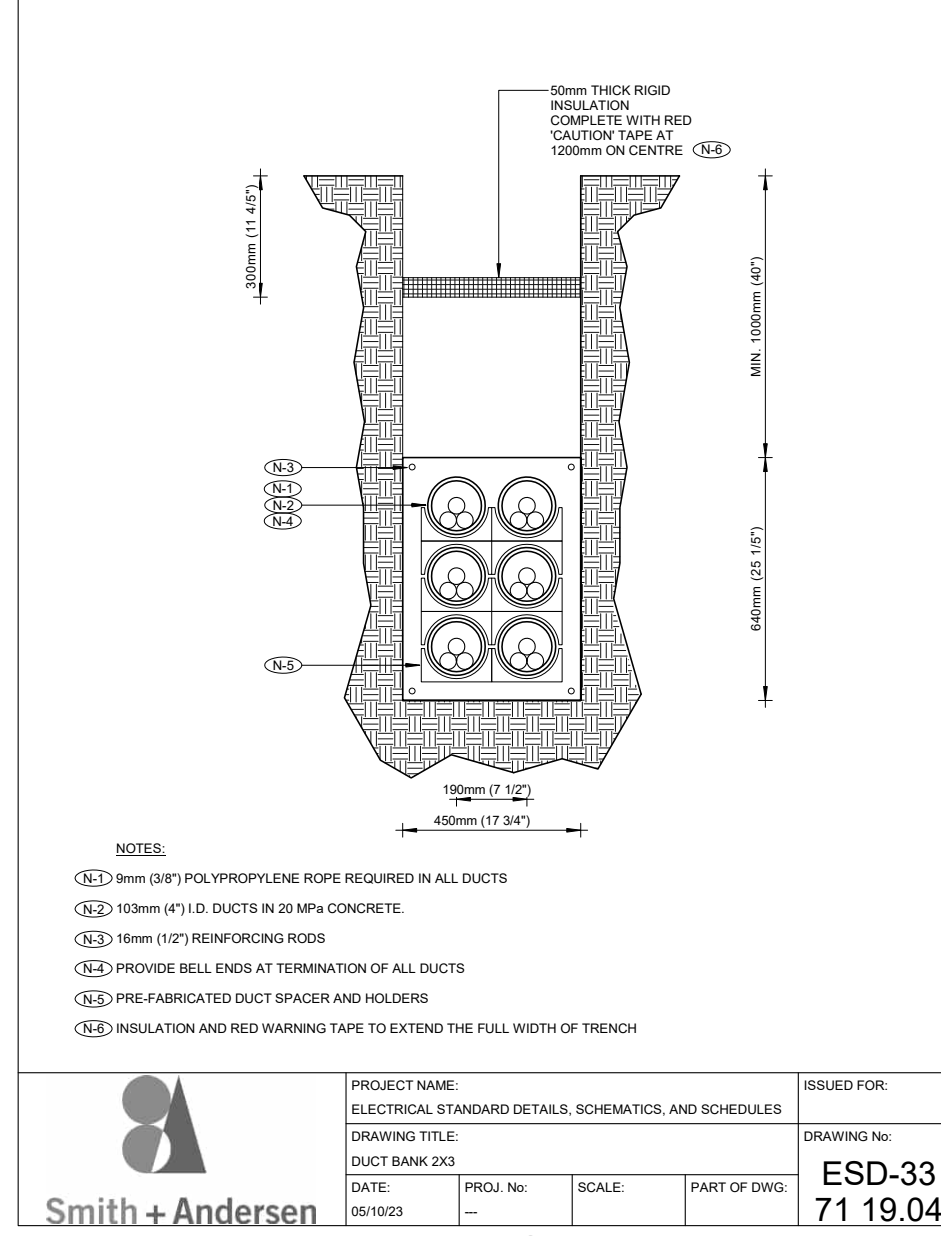
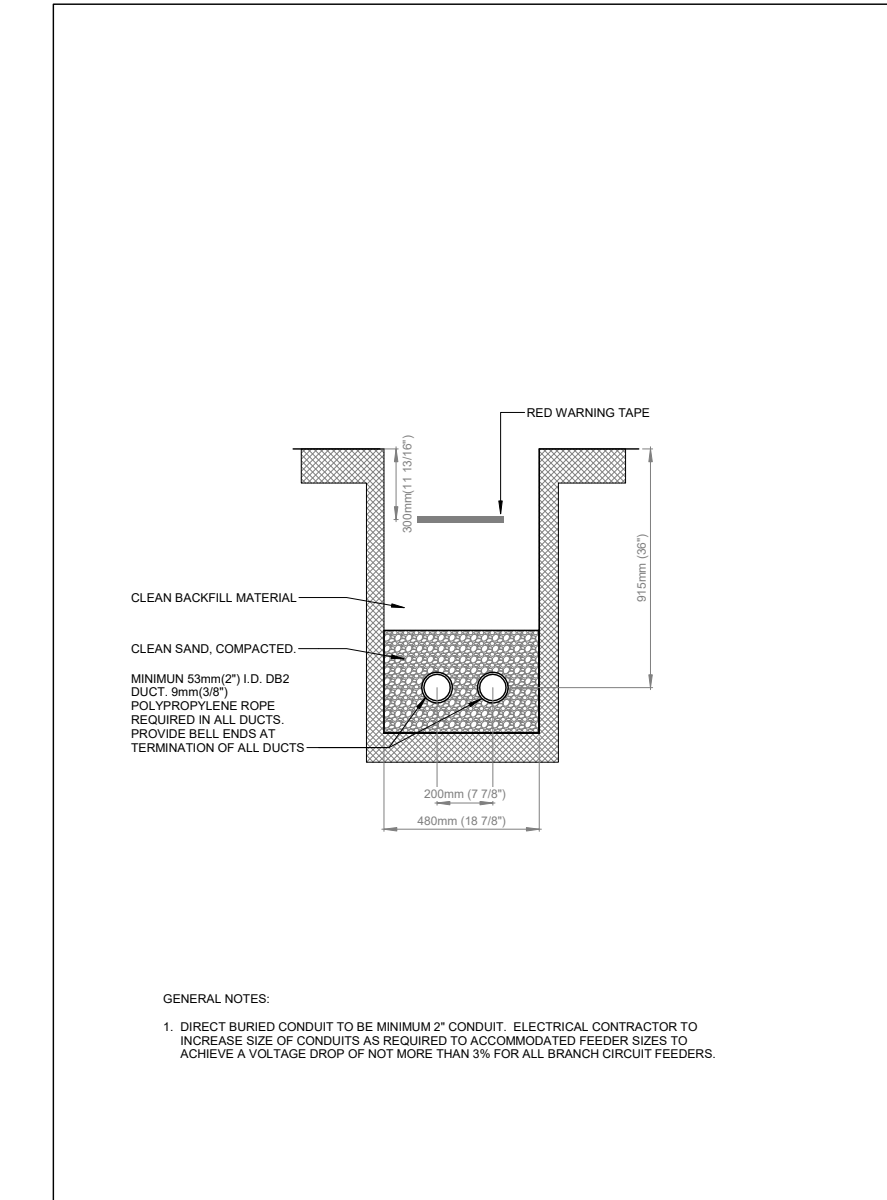


Client / Land Owner:  
**CAMPFIRE CIRCLE**

Project:  
**565 WESLEY ACRES ROAD**  
BLOOMFIELD ONTARIO  
Drawing Title:  
**NOTES AND DETAILS 2**

|                         |                    |
|-------------------------|--------------------|
| Drawn by: LM            | Project Number:    |
| Checked By: MB          | <b>GW-23003-16</b> |
| Scale: 24"x36" AS NOTED | Drawing Number:    |
| Date: AUG 12, 2026      | <b>C-103</b>       |
|                         | SHEET 3 of 3       |





**General Comments:**

- 1) Location of pad mounted transformers can be shifted and coordinated further based on best location for the program space.
- 2) Assumed electrical rooms in some building. If this is not possible, then alternative distribution may need to be determined. This may have an impact on the proposed mechanical system for these buildings.
- 3) Routing can be adjusted to avoid interferences, clashes, etc.
- 4) Duct banks are being proposed for all main services to building. For cost savings, alternative method can be explored.

[illegible]

|                                                                                                                       |                                       |                                                                                                                                                                                                     |                                       |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|
| <p>CLIENT<br/> <b>Campfire Circle</b><br/>         464 Bathurst St.<br/>         Toronto, ON<br/>         M5T 2S6</p> |                                       |  <p>HEALING THROUGH HAPPINESS</p>                                                                              |                                       |
| <p>565 Wesley Acres Rd<br/>         Bloomfield, Ontario K0K 1G0</p>                                                   |                                       | <p>ONTARIO ASSOCIATION<br/>         OF<br/>         ARCHITECTS<br/> <i>Handwritten signature: David</i><br/>         EDWARD P. HANDY<br/>         ARCHITECT<br/>         5764<br/>         SEAL</p> |                                       |
| <p>DRAWN BY<br/> <b>JM</b></p>                                                                                        |                                       | <p>CHECKED BY<br/> <b>RK</b></p>                                                                                                                                                                    |                                       |
| <p>PROJ NO<br/> <b>TAI: 23-105</b></p>                                                                                | <p>SCALE<br/> <b>As indicated</b></p> | <p>FORMAT<br/> <b>ARCH D</b></p>                                                                                                                                                                    | <p>PLOT DATE<br/> <b>09/10/15</b></p> |



## **APPENDIX C: OBC FIRE FLOW CALCULATIONS**



Functional Servicing Report  
Campfire Circle

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

| Building                                 | Lodge                | Staff Residences     | Camper Residence        | Medical Clinic       | Flex                 | Music, Drama & Pool  | Athletic Centre      | Maintenance             | Riding Arena         | Greenhouse              |
|------------------------------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|----------------------|----------------------|-------------------------|----------------------|-------------------------|
| Classification                           | A-2                  | C                    | C                       | B-2                  | C                    | A-2                  | A-2                  | F-3                     | A-2                  | A-2                     |
| Level 1 Area                             | 2030                 | 1740                 | 580                     | 1200                 | 1400                 | 720                  | 1200                 | 301                     | 1282                 | 690                     |
| Level 2 Area                             | 2030                 | 0                    | 580                     | 0                    | 0                    | 271                  | 0                    | 0                       | 0                    | 0                       |
| 2 - Number of Storeys                    | 2                    | 1                    | 1                       | 1                    | 1                    | 2                    | 1                    | 1                       | 1                    | 1                       |
| Level 1 Height                           | 4                    | 6.4                  | 4.8                     | 5.3                  | 4.45                 | 6.5                  | 8.4                  | 5                       | 6.1                  | 3.6                     |
| Level 2 Height                           | 7.8                  | 0                    | 0                       | 0                    | 0                    | 4.4                  | 0                    | 0                       | 0                    | 0                       |
| 4 - Firewall Separation?                 | No                   | No                   | No                      | No                   | No                   | No                   | No                   | No                      | No                   | No                      |
| 5 - Sprinkler System?                    | Yes                  | No                   | No                      | Yes                  | No                   | No                   | Yes                  | No                      | No                   | No                      |
| 6 - Construction Type                    | Combustible (rating) | Combustible (rating) | Combustible (no rating) | Combustible (rating) | Combustible (rating) | Combustible (rating) | Combustible (rating) | Combustible (no rating) | Combustible (rating) | Combustible (no rating) |
| Water Supply Coeff, K                    | 18                   | 18                   | 23                      | 18                   | 18                   | 18                   | 18                   | 28                      | 23                   | 23                      |
| Building Volume, V (m <sup>3</sup> )     | 23,954               | 11,136               | 4,524                   | 6,360                | 6,230                | 5,872                | 10,080               | 1,505                   | 7,820                | 2,484                   |
| Spatial Coefficient, S <sub>tot</sub>    | 1                    | 1                    | 1                       | 1                    | 1                    | 1                    | 1                    | 1                       | 1                    | 1                       |
| Min Supply of Water, Q (m <sup>3</sup> ) | 431,000              | 200,000              | 104,000                 | 114,000              | 112,000              | 106,000              | 181,000              | 42,000                  | 180,000              | 57,000                  |
| Minimum Fire Flow (L/min)                | 9,000                | 6,300                | 2,700                   | 3,600                | 3,600                | 2,700                | 5,400                | 2,700                   | 5,400                | 2,700                   |

# Functional Servicing Report

## Campfire Circle

### Lodge

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |               |
|---|---------------------------|--------------------------|----------------------|---------------|
| 1 | Building to be Assessed   |                          | Lodge                |               |
| 2 | Building Classification   |                          | A-2                  | A-3.1.2.1.(1) |
| 3 | Building Specific Details | 1 - First Floor Area     | 2030                 | sq.m          |
|   |                           | 2 - Second Floor Area    | 2030                 | sq.m          |
|   |                           | 3 - Number of Storeys    | 2                    |               |
|   |                           | 3 - First Floor Height   | 4                    | m             |
|   |                           | 4 - Second Floor Height  | 7.8                  | m             |
|   |                           | 5 - Firewall Separation? | No                   |               |
|   |                           | 6 - Sprinkler System?    | Yes                  |               |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |               |
|   |                           | K                        | 18                   | Table 1       |
|   |                           | V                        | 23,954               | cu.m          |
|   |                           | S <sub>tot</sub>         | 1.0                  |               |
|   |                           | Q                        | 431,000              | L             |
| 5 | Minimum Fire Flow         | Table 2                  | 9000                 | L/min         |
|   |                           |                          | 150                  | L/s           |

| 2 - Building Classification | Table 1                      |                                              |     |     |     |     | Table 2                                                      |                                |       |
|-----------------------------|------------------------------|----------------------------------------------|-----|-----|-----|-----|--------------------------------------------------------------|--------------------------------|-------|
| A-1                         | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load                                                    | Minimum Water Supply Flow Rate |       |
| A-2                         | Type of Construction         | Building Classification by Group or Division |     |     |     |     |                                                              | (L/min)                        | (L/s) |
| A-3                         |                              |                                              |     |     |     |     |                                                              |                                |       |
| A-4                         |                              | A-2                                          | A-4 | A-1 | E   | F-1 |                                                              |                                |       |
| B-1                         |                              | B-1                                          | F-3 | A-3 | F-2 |     | Q < 108000                                                   | 2700                           | 45    |
| B-2                         |                              | B-2                                          |     |     |     |     | 108000 < Q < 135000                                          | 3600                           | 60    |
| B-3                         |                              | B-3                                          |     |     |     |     | 135000 < Q < 162000                                          | 4500                           | 75    |
| C                           |                              | C                                            |     |     |     |     | 162000 < Q < 190000                                          | 5400                           | 90    |
| D                           |                              | D                                            |     |     |     |     | 190000 < Q < 270000                                          | 6300                           | 105   |
| E                           |                              |                                              |     |     |     |     | 270000 < Q                                                   | 9000                           | 150   |
| F-1                         |                              |                                              |     |     |     |     |                                                              |                                |       |
| F-2                         | Non-combustible (rating)     | 10                                           | 12  | 14  | 17  | 23  |                                                              |                                |       |
| F-3                         | Non-combustible (no rating)  | 16                                           | 19  | 22  | 27  | 37  |                                                              |                                |       |
|                             | Combustible (rating)         | 18                                           | 22  | 25  | 31  | 41  |                                                              |                                |       |
|                             | Combustible (no rating)      | 23                                           | 28  | 32  | 39  | 53  |                                                              |                                |       |
| 3.4 - Firewall Separation   | Exposure - Figure 1          |                                              |     |     |     |     | <p>Figure 1<br/>Spatial Coefficient vs Exposure Distance</p> |                                |       |
| Yes                         | North (Sback)                | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| No                          | East (Sside)                 | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| 3.5 - Sprinkler System      | South (Sfront)               | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| Yes                         | West (Sside)                 | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| No                          | Total                        |                                              |     |     |     | 1.0 |                                                              |                                |       |



# Functional Servicing Report

## Campfire Circle

### Staff Residences

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |               |
|---|---------------------------|--------------------------|----------------------|---------------|
| 1 | Building to be Assessed   |                          | Staff Residences     |               |
| 2 | Building Classification   |                          | C                    | A-3.1.2.1.(1) |
| 3 | Building Specific Details | 1 - First Floor Area     | 1740                 | sq.m          |
|   |                           | 2 - Second Floor Area    | 0                    | sq.m          |
|   |                           | 3 - Number of Storeys    | 1                    |               |
|   |                           | 3 - First Floor Height   | 6.4                  | m             |
|   |                           | 4 - Second Floor Height  | 0                    | m             |
|   |                           | 5 - Firewall Separation? | No                   |               |
|   |                           | 6 - Sprinkler System?    | No                   |               |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |               |
|   |                           | K                        | 18                   | Table 1       |
|   |                           | V                        | 11,136               | cu.m          |
|   |                           | S <sub>tot</sub>         | 1.0                  |               |
| 5 | Minimum Fire Flow         | Table 2                  | 6300                 | L/min         |
|   |                           |                          | 105                  | L/s           |

| 2 - Building Classification |                              | Table 1                                      |       |     |     |     |                     | Table 2                                                                                                                                           |                                |       |  |  |
|-----------------------------|------------------------------|----------------------------------------------|-------|-----|-----|-----|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|--|--|
| A-1                         | Water Supply Coefficient - K |                                              |       |     |     |     | Fire Load           |                                                                                                                                                   | Minimum Water Supply Flow Rate |       |  |  |
| A-2                         | Type of Construction         | Building Classification by Group or Division |       |     |     |     |                     |                                                                                                                                                   | (L/min)                        | (L/s) |  |  |
| A-3                         |                              | A-2                                          | A-4   | A-1 | E   | F-1 | Q < 108000          | 2700                                                                                                                                              | 45                             |       |  |  |
| A-4                         |                              | B-1                                          | F-3   | A-3 | F-2 |     | 108000 < Q < 135000 | 3600                                                                                                                                              | 60                             |       |  |  |
| B-1                         |                              | B-2                                          |       |     |     |     | 135000 < Q < 162000 | 4500                                                                                                                                              | 75                             |       |  |  |
| B-2                         |                              | B-3                                          |       |     |     |     | 162000 < Q < 190000 | 5400                                                                                                                                              | 90                             |       |  |  |
| B-3                         |                              | C                                            |       |     |     |     | 190000 < Q < 270000 | 6300                                                                                                                                              | 105                            |       |  |  |
| C                           |                              | D                                            |       |     |     |     | 270000 < Q          | 9000                                                                                                                                              | 150                            |       |  |  |
| D                           |                              |                                              |       |     |     |     |                     |                                                                                                                                                   |                                |       |  |  |
| E                           | Non-combustible (rating)     | 10                                           | 12    | 14  | 17  | 23  |                     |                                                                                                                                                   |                                |       |  |  |
| F-1                         | Non-combustible (no rating)  | 16                                           | 19    | 22  | 27  | 37  |                     |                                                                                                                                                   |                                |       |  |  |
| F-2                         | Combustible (rating)         | 18                                           | 22    | 25  | 31  | 41  |                     |                                                                                                                                                   |                                |       |  |  |
| F-3                         | Combustible (no rating)      | 23                                           | 28    | 32  | 39  | 53  |                     |                                                                                                                                                   |                                |       |  |  |
| 3.4 - Firewall Separation   |                              | Exposure - Figure 1                          |       |     |     |     |                     | <div>Figure 1</div> <div>Spatial Coefficient vs Exposure Distance</div> <div><div>New buildings (ex. F-1)</div><div>New F-1 buildings</div></div> |                                |       |  |  |
| Yes                         | North (Sback)                | >15 m                                        |       | 0.0 |     |     |                     |                                                                                                                                                   |                                |       |  |  |
| No                          | East (Sside)                 | >15 m                                        |       | 0.0 |     |     |                     |                                                                                                                                                   |                                |       |  |  |
| 3.5 - Sprinkler System      |                              | South (Sfront)                               | >15 m |     | 0.0 |     |                     |                                                                                                                                                   |                                |       |  |  |
| Yes                         | West (Sside)                 | >15 m                                        |       | 0.0 |     |     |                     |                                                                                                                                                   |                                |       |  |  |
| No                          | Total                        |                                              |       | 1.0 |     |     |                     |                                                                                                                                                   |                                |       |  |  |

# Functional Servicing Report

## Campfire Circle

### Camper Residences

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                         |               |
|---|---------------------------|--------------------------|-------------------------|---------------|
| 1 | Building to be Assessed   |                          | Camper Residences       |               |
| 2 | Building Classification   |                          | C                       | A-3.1.2.1.(1) |
| 3 | Building Specific Details | 1 - First Floor Area     | 580                     | sq.m          |
|   |                           | 2 - Second Floor Area    | 580                     | sq.m          |
|   |                           | 3 - Number of Storeys    | 2                       |               |
|   |                           | 3 - First Floor Height   | 3                       | m             |
|   |                           | 4 - Second Floor Height  | 4.8                     | m             |
|   |                           | 5 - Firewall Separation? | No                      |               |
|   |                           | 6 - Sprinkler System?    | No                      |               |
|   |                           | 7 - Construction Type    | Combustible (no rating) |               |
| 4 | Minimum Supply of Water   | K                        | 23                      | Table 1       |
|   |                           | V                        | 4,524                   | cu.m          |
|   |                           | S <sub>tot</sub>         | 1.0                     |               |
|   |                           | Q                        | 104,000                 | L             |
|   |                           |                          |                         |               |
| 5 | Minimum Fire Flow         | Table 2                  | 2700                    | L/min         |
|   |                           |                          | 45                      | L/s           |

| 2 - Building Classification | Table 1                      |                                              |     |     |     |     | Table 2                                                                                                                                                                                                         |                                |       |
|-----------------------------|------------------------------|----------------------------------------------|-----|-----|-----|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------|
| A-1                         | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load                                                                                                                                                                                                       | Minimum Water Supply Flow Rate |       |
| A-2                         | Type of Construction         | Building Classification by Group or Division |     |     |     |     |                                                                                                                                                                                                                 | (L/min)                        | (L/s) |
| A-3                         |                              | A-2                                          | A-4 | A-1 | E   | F-1 | Q < 108000                                                                                                                                                                                                      | 2700                           | 45    |
| A-4                         |                              | B-1                                          | F-3 | A-3 | F-2 |     | 108000 < Q < 135000                                                                                                                                                                                             | 3600                           | 60    |
| B-1                         |                              | B-2                                          |     |     |     |     | 135000 < Q < 162000                                                                                                                                                                                             | 4500                           | 75    |
| B-2                         |                              | B-3                                          |     |     |     |     | 162000 < Q < 190000                                                                                                                                                                                             | 5400                           | 90    |
| B-3                         |                              | C                                            |     |     |     |     | 190000 < Q < 270000                                                                                                                                                                                             | 6300                           | 105   |
| C                           |                              | D                                            |     |     |     |     | 270000 < Q                                                                                                                                                                                                      | 9000                           | 150   |
| D                           |                              |                                              |     |     |     |     |                                                                                                                                                                                                                 |                                |       |
| E                           |                              | Non-combustible (rating)                     | 10  | 12  | 14  | 17  | 23                                                                                                                                                                                                              |                                |       |
| F-1                         |                              | Non-combustible (no rating)                  | 16  | 19  | 22  | 27  | 37                                                                                                                                                                                                              |                                |       |
| F-2                         | Combustible (rating)         | 18                                           | 22  | 25  | 31  | 41  |                                                                                                                                                                                                                 |                                |       |
| F-3                         | Combustible (no rating)      | 23                                           | 28  | 32  | 39  | 53  |                                                                                                                                                                                                                 |                                |       |
| 3.4 - Firewall Separation   | Exposure - Figure 1          |                                              |     |     |     |     | <div>Figure 1</div> <div>Spatial Coefficient vs Exposure Distance</div> <div><div>Spatial Coefficient</div><div>Exposure Distance (m)</div><div>New buildings (ex. F-1)</div><div>New F-1 buildings</div></div> |                                |       |
| Yes                         | North (Sback)                | >15 m                                        |     | 0.0 |     |     |                                                                                                                                                                                                                 |                                |       |
| No                          | East (Sside)                 | 12 m                                         |     | 0.0 |     |     |                                                                                                                                                                                                                 |                                |       |
| 3.5 - Sprinkler System      | South (Sfront)               | 11 m                                         |     | 0.0 |     |     |                                                                                                                                                                                                                 |                                |       |
| Yes                         | West (Sside)                 | 12 m                                         |     | 0.0 |     |     |                                                                                                                                                                                                                 |                                |       |
| No                          | Total                        |                                              |     | 1.0 |     |     |                                                                                                                                                                                                                 |                                |       |



# Functional Servicing Report

## Campfire Circle

### Medical Clinic

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |
|---|---------------------------|--------------------------|----------------------|
| 1 | Building to be Assessed   | Medical Clinic           |                      |
| 2 | Building Classification   | B-2                      | A-3.1.2.1.(1)        |
| 3 | Building Specific Details | 1 - First Floor Area     | 1200 sq.m            |
|   |                           | 2 - Second Floor Area    | 0 sq.m               |
|   |                           | 3 - Number of Storeys    | 1                    |
|   |                           | 3 - First Floor Height   | 5.3 m                |
|   |                           | 4 - Second Floor Height  | 0 m                  |
|   |                           | 5 - Firewall Separation? | No                   |
|   |                           | 6 - Sprinkler System?    | Yes                  |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |
|   |                           | K                        | 18 Table 1           |
|   |                           | V                        | 6,360 cu.m           |
|   |                           | S <sub>tot</sub>         | 1.0                  |
| 5 | Minimum Fire Flow         | Q                        | 114,000 L            |
|   |                           | Table 2                  | 3600 L/min           |
|   |                           |                          | 60 L/s               |

| 2 - Building Classification |  | Table 1                      |                                              |     |     |     |     | Table 2             |         |                                |  |
|-----------------------------|--|------------------------------|----------------------------------------------|-----|-----|-----|-----|---------------------|---------|--------------------------------|--|
| A-1                         |  | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load           |         | Minimum Water Supply Flow Rate |  |
| A-2                         |  | Type of Construction         | Building Classification by Group or Division |     |     |     |     | Q < 108000          | (L/min) | (L/s)                          |  |
| A-3                         |  |                              |                                              |     |     |     |     |                     | 2700    | 45                             |  |
| A-4                         |  |                              | A-2                                          | A-4 | A-1 | E   | F-1 | 108000 < Q < 135000 | 3600    | 60                             |  |
| B-1                         |  |                              | B-1                                          | F-3 | A-3 | F-2 |     | 135000 < Q < 162000 | 4500    | 75                             |  |
| B-2                         |  |                              | B-2                                          |     |     |     |     | 162000 < Q < 190000 | 5400    | 90                             |  |
| B-3                         |  |                              | B-3                                          |     |     |     |     | 190000 < Q < 270000 | 6300    | 105                            |  |
| C                           |  |                              | C                                            |     |     |     |     | 270000 < Q          | 9000    | 150                            |  |
| D                           |  |                              | D                                            |     |     |     |     |                     |         |                                |  |
| E                           |  | Non-combustible (rating)     | 10                                           | 12  | 14  | 17  | 23  |                     |         |                                |  |
| F-1                         |  | Non-combustible (no rating)  | 16                                           | 19  | 22  | 27  | 37  |                     |         |                                |  |
| F-2                         |  | Combustible (rating)         | 18                                           | 22  | 25  | 31  | 41  |                     |         |                                |  |
| F-3                         |  | Combustible (no rating)      | 23                                           | 28  | 32  | 39  | 53  |                     |         |                                |  |
| 3.4 - Firewall Separation   |  | Exposure - Figure 1          |                                              |     |     |     |     |                     |         |                                |  |
| Yes                         |  | North (Sback)                | >15 m                                        |     |     |     | 0.0 |                     |         |                                |  |
| No                          |  | East (Sside)                 | >15 m                                        |     |     |     | 0.0 |                     |         |                                |  |
| 3.5 - Sprinkler System      |  | South (Sfront)               | >15 m                                        |     |     |     | 0.0 |                     |         |                                |  |
| Yes                         |  | West (Sside)                 | >15 m                                        |     |     |     | 0.0 |                     |         |                                |  |
| No                          |  | Total                        |                                              |     |     |     | 1.0 |                     |         |                                |  |

Figure 1

Spatial Coefficient vs Exposure Distance

| Exposure Distance (m) | Spatial Coefficient (New buildings ex. F-1) | Spatial Coefficient (New F-1 buildings) |
|-----------------------|---------------------------------------------|-----------------------------------------|
| 0                     | 0.5                                         | 0.5                                     |
| 2                     | 0.5                                         | 0.5                                     |
| 4                     | 0.5                                         | 0.5                                     |
| 6                     | 0.4                                         | 0.5                                     |
| 8                     | 0.3                                         | 0.5                                     |
| 10                    | 0.0                                         | 0.5                                     |
| 12                    | 0.0                                         | 0.375                                   |
| 14                    | 0.0                                         | 0.0                                     |

# Functional Servicing Report

## Campfire Circle

### Flex

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |
|---|---------------------------|--------------------------|----------------------|
| 1 | Building to be Assessed   | Flex                     |                      |
| 2 | Building Classification   | C                        | A-3.1.2.1.(1)        |
| 3 | Building Specific Details | 1 - First Floor Area     | 1400 sq.m            |
|   |                           | 2 - Second Floor Area    | 0 sq.m               |
|   |                           | 3 - Number of Storeys    | 1                    |
|   |                           | 3 - First Floor Height   | 4.45 m               |
|   |                           | 4 - Second Floor Height  | 0 m                  |
|   |                           | 5 - Firewall Separation? | No                   |
|   |                           | 6 - Sprinkler System?    | No                   |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |
|   |                           | K                        | 18 Table 1           |
|   |                           | V                        | 6,230 cu.m           |
|   |                           | S <sub>tot</sub>         | 1.0                  |
| 5 | Minimum Fire Flow         | Q                        | 112,000 L            |
|   |                           | Table 2                  | 3600 L/min           |
|   |                           |                          | 60 L/s               |

| 2 - Building Classification |  | Table 1                      |  |       |    |     |    | Table 2    |     |                                              |       |     |                     |      |     |
|-----------------------------|--|------------------------------|--|-------|----|-----|----|------------|-----|----------------------------------------------|-------|-----|---------------------|------|-----|
| A-1                         |  | Water Supply Coefficient - K |  |       |    |     |    | Fire Load  |     | Minimum Water Supply Flow Rate               |       |     |                     |      |     |
| A-2                         |  | Type of Construction         |  |       |    |     |    | Q < 108000 |     | (L/min)                                      | (L/s) |     |                     |      |     |
| A-3                         |  |                              |  |       |    |     |    |            |     | Building Classification by Group or Division |       |     |                     |      |     |
| A-4                         |  |                              |  |       |    |     |    | A-2        | A-4 | A-1                                          | E     | F-1 | 2700                | 45   |     |
| B-1                         |  |                              |  |       |    |     |    | B-1        | F-3 | A-3                                          | F-2   |     | 108000 < Q < 135000 | 3600 | 60  |
| B-2                         |  |                              |  |       |    |     |    | B-2        |     |                                              |       |     | 135000 < Q < 162000 | 4500 | 75  |
| B-3                         |  |                              |  |       |    |     |    | B-3        |     |                                              |       |     | 162000 < Q < 190000 | 5400 | 90  |
| C                           |  |                              |  |       |    |     |    | C          |     |                                              |       |     | 190000 < Q < 270000 | 6300 | 105 |
| D                           |  |                              |  |       |    |     |    | D          |     |                                              |       |     | 270000 < Q          | 9000 | 150 |
| E                           |  | Non-combustible (rating)     |  | 10    | 12 | 14  | 17 | 23         |     |                                              |       |     |                     |      |     |
| F-1                         |  | Non-combustible (no rating)  |  | 16    | 19 | 22  | 27 | 37         |     |                                              |       |     |                     |      |     |
| F-2                         |  | Combustible (rating)         |  | 18    | 22 | 25  | 31 | 41         |     |                                              |       |     |                     |      |     |
| F-3                         |  | Combustible (no rating)      |  | 23    | 28 | 32  | 39 | 53         |     |                                              |       |     |                     |      |     |
| 3.4 - Firewall Separation   |  | Exposure - Figure 1          |  |       |    |     |    |            |     |                                              |       |     |                     |      |     |
| Yes                         |  | North (Sback)                |  | >15 m |    | 0.0 |    |            |     |                                              |       |     |                     |      |     |
| No                          |  | East (Sside)                 |  | >15 m |    | 0.0 |    |            |     |                                              |       |     |                     |      |     |
| 3.5 - Sprinkler System      |  | South (Sfront)               |  | >15 m |    | 0.0 |    |            |     |                                              |       |     |                     |      |     |
| Yes                         |  | West (Sside)                 |  | >15 m |    | 0.0 |    |            |     |                                              |       |     |                     |      |     |
| No                          |  | Total                        |  |       |    | 1.0 |    |            |     |                                              |       |     |                     |      |     |

Figure 1

Spatial Coefficient vs Exposure Distance

| Exposure Distance (m) | New buildings (ex. F-1) | New F-1 buildings |
|-----------------------|-------------------------|-------------------|
| 0                     | 0.5                     | 0.5               |
| 2                     | 0.5                     | 0.5               |
| 4                     | 0.5                     | 0.5               |
| 6                     | 0.5                     | 0.5               |
| 8                     | 0.5                     | 0.5               |
| 10                    | 0                       | 0.5               |
| 12                    |                         | 0.25              |
| 14                    |                         | 0                 |



# Functional Servicing Report

## Campfire Circle

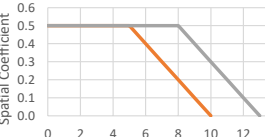
### Music, Drama & Pool Building

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |
|---|---------------------------|--------------------------|----------------------|
| 1 | Building to be Assessed   | Music, Drama & Pool      |                      |
| 2 | Building Classification   | A-2                      |                      |
| 3 | Building Specific Details | 1 - First Floor Area     | 720 sq.m             |
|   |                           | 2 - Second Floor Area    | 271 sq.m             |
|   |                           | 3 - Number of Storeys    | 2                    |
|   |                           | 3 - First Floor Height   | 6.5 m                |
|   |                           | 4 - Second Floor Height  | 4.4 m                |
|   |                           | 5 - Firewall Separation? | No                   |
|   |                           | 6 - Sprinkler System?    | No                   |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |
|   |                           | K                        | 18                   |
|   |                           | V                        | 5,872                |
|   |                           | S <sub>tot</sub>         | 1.0                  |
| 5 | Minimum Fire Flow         | Q                        | 106,000 L            |
|   |                           | Table 2                  | 2700 L/min           |
|   |                           |                          | 45 L/s               |

| 2 - Building Classification |  | Table 1                      |                                              |       |     |     |     | Table 2   |                                                                                                                                                               |                                |  |
|-----------------------------|--|------------------------------|----------------------------------------------|-------|-----|-----|-----|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--|
| A-1                         |  | Water Supply Coefficient - K |                                              |       |     |     |     | Fire Load |                                                                                                                                                               | Minimum Water Supply Flow Rate |  |
| A-2                         |  | Type of Construction         | Building Classification by Group or Division |       |     |     |     | (L/min)   | (L/s)                                                                                                                                                         |                                |  |
| A-3                         |  |                              |                                              |       |     |     |     |           |                                                                                                                                                               |                                |  |
| A-4                         |  |                              | A-2                                          | A-4   | A-1 | E   | F-1 |           |                                                                                                                                                               |                                |  |
| B-1                         |  |                              | B-1                                          | F-3   | A-3 | F-2 |     |           |                                                                                                                                                               |                                |  |
| B-2                         |  |                              | B-2                                          |       |     |     |     |           |                                                                                                                                                               |                                |  |
| B-3                         |  |                              | B-3                                          |       |     |     |     |           |                                                                                                                                                               |                                |  |
| C                           |  |                              | C                                            |       |     |     |     |           |                                                                                                                                                               |                                |  |
| D                           |  |                              | D                                            |       |     |     |     |           |                                                                                                                                                               |                                |  |
| E                           |  | Non-combustible (rating)     |                                              | 10    | 12  | 14  | 17  | 23        |                                                                                                                                                               |                                |  |
| F-1                         |  | Non-combustible (no rating)  |                                              | 16    | 19  | 22  | 27  | 37        |                                                                                                                                                               |                                |  |
| F-2                         |  | Combustible (rating)         |                                              | 18    | 22  | 25  | 31  | 41        |                                                                                                                                                               |                                |  |
| F-3                         |  | Combustible (no rating)      |                                              | 23    | 28  | 32  | 39  | 53        |                                                                                                                                                               |                                |  |
| 3.4 - Firewall Separation   |  | Exposure - Figure 1          |                                              |       |     |     |     |           | <div><p>Figure 1</p><p>Spatial Coefficient vs Exposure Distance</p></div> |                                |  |
| Yes                         |  | North (Sback)                |                                              | 11 m  |     | 0.0 |     |           |                                                                                                                                                               |                                |  |
| No                          |  | East (Sside)                 |                                              | >15 m |     | 0.0 |     |           |                                                                                                                                                               |                                |  |
| 3.5 - Sprinkler System      |  | South (Sfront)               |                                              | >15 m |     | 0.0 |     |           |                                                                                                                                                               |                                |  |
| Yes                         |  | West (Sside)                 |                                              | >15 m |     | 0.0 |     |           |                                                                                                                                                               |                                |  |
| No                          |  | Total                        |                                              |       |     | 1.0 |     |           |                                                                                                                                                               |                                |  |

# Functional Servicing Report

## Campfire Circle

### Athletic Centre

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                      |
|---|---------------------------|--------------------------|----------------------|
| 1 | Building to be Assessed   | Athletic Centre          |                      |
| 2 | Building Classification   | A-2                      |                      |
| 3 | Building Specific Details | 1 - First Floor Area     | 1200                 |
|   |                           | 2 - Second Floor Area    | 0                    |
|   |                           | 3 - Number of Storeys    | 1                    |
|   |                           | 3 - First Floor Height   | 8.4                  |
|   |                           | 4 - Second Floor Height  | 0                    |
|   |                           | 5 - Firewall Separation? | No                   |
|   |                           | 6 - Sprinkler System?    | Yes                  |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (rating) |
|   |                           | K                        | 18                   |
|   |                           | V                        | 10,080               |
|   |                           | S <sub>tot</sub>         | 1.0                  |
| 5 | Minimum Fire Flow         | Table 2                  | 5400                 |
|   |                           |                          | 90                   |

A-3.1.2.1.(1)

sq.m

sq.m

m

m

Table 1

cu.m

L

L/min

L/s

| 2 - Building Classification | Table 1                      |                                              |     |     |     |     | Table 2                                                                                                              |                                              |                                    |
|-----------------------------|------------------------------|----------------------------------------------|-----|-----|-----|-----|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------|
| A-1                         | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load                                                                                                            | Minimum Water Supply Flow Rate               |                                    |
| A-2                         | Type of Construction         | Building Classification by Group or Division |     |     |     |     | Q < 108000<br>108000 < Q < 135000<br>135000 < Q < 162000<br>162000 < Q < 190000<br>190000 < Q < 270000<br>270000 < Q | (L/min)                                      | (L/s)                              |
| A-3                         |                              | A-2                                          | A-4 | A-1 | E   | F-1 |                                                                                                                      | 2700<br>3600<br>4500<br>5400<br>6300<br>9000 | 45<br>60<br>75<br>90<br>105<br>150 |
| A-4                         |                              | B-1                                          | F-3 | A-3 | F-2 |     |                                                                                                                      |                                              |                                    |
| B-1                         |                              | B-2                                          |     |     |     |     |                                                                                                                      |                                              |                                    |
| B-2                         |                              | B-3                                          |     |     |     |     |                                                                                                                      |                                              |                                    |
| B-3                         |                              | C                                            |     |     |     |     |                                                                                                                      |                                              |                                    |
| C                           |                              | D                                            |     |     |     |     |                                                                                                                      |                                              |                                    |
| D                           |                              |                                              |     |     |     |     |                                                                                                                      |                                              |                                    |
| E                           | Non-combustible (rating)     | 10                                           | 12  | 14  | 17  | 23  |                                                                                                                      |                                              |                                    |
| F-1                         | Non-combustible (no rating)  | 16                                           | 19  | 22  | 27  | 37  |                                                                                                                      |                                              |                                    |
| F-2                         | Combustible (rating)         | 18                                           | 22  | 25  | 31  | 41  |                                                                                                                      |                                              |                                    |
| F-3                         | Combustible (no rating)      | 23                                           | 28  | 32  | 39  | 53  |                                                                                                                      |                                              |                                    |
| 3.4 - Firewall Separation   | Exposure - Figure 1          |                                              |     |     |     |     | <p>Figure 1<br/>Spatial Coefficient vs Exposure Distance</p>                                                         |                                              |                                    |
| Yes                         | North (Sback)                | >15 m                                        |     |     |     | 0.0 |                                                                                                                      |                                              |                                    |
| No                          | East (Sside)                 | >15 m                                        |     |     |     | 0.0 |                                                                                                                      |                                              |                                    |
| 3.5 - Sprinkler System      | South (Sfront)               | >15 m                                        |     |     |     | 0.0 |                                                                                                                      |                                              |                                    |
| Yes                         | West (Sside)                 | >15 m                                        |     |     |     | 0.0 |                                                                                                                      |                                              |                                    |
| No                          | Total                        |                                              |     |     |     | 1.0 |                                                                                                                      |                                              |                                    |



# Functional Servicing Report

## Campfire Circle

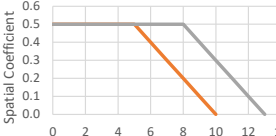
### Maintenance

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                         |               |
|---|---------------------------|--------------------------|-------------------------|---------------|
| 1 | Building to be Assessed   |                          | Maintenance             |               |
| 2 | Building Classification   |                          | F-3                     | A-3.1.2.1.(1) |
| 3 | Building Specific Details | 1 - First Floor Area     | 301                     | sq.m          |
|   |                           | 2 - Second Floor Area    | 0                       | sq.m          |
|   |                           | 3 - Number of Storeys    | 1                       |               |
|   |                           | 3 - First Floor Height   | 5                       | m             |
|   |                           | 4 - Second Floor Height  | 0                       | m             |
|   |                           | 5 - Firewall Separation? | No                      |               |
|   |                           | 6 - Sprinkler System?    | No                      |               |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (no rating) |               |
|   |                           | K                        | 28                      | Table 1       |
|   |                           | V                        | 1,505                   | cu.m          |
|   |                           | S <sub>tot</sub>         | 1.0                     |               |
| 5 | Minimum Fire Flow         | Table 2                  | 42,000                  | L             |
|   |                           |                          | 2700                    | L/min         |
|   |                           |                          | 45                      | L/s           |

| 2 - Building Classification | Table 1                      |                                              |     |     |     |     | Table 2                                                                                                                                                                                                                                |                                |     |
|-----------------------------|------------------------------|----------------------------------------------|-----|-----|-----|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----|
| A-1                         | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load                                                                                                                                                                                                                              | Minimum Water Supply Flow Rate |     |
| A-2                         |                              |                                              |     |     |     |     |                                                                                                                                                                                                                                        | (L/min)                        |     |
| A-3                         | Type of Construction         | Building Classification by Group or Division |     |     |     |     | Q < 108000                                                                                                                                                                                                                             | 2700                           | 45  |
| A-4                         |                              | A-2                                          | A-4 | A-1 | E   | F-1 | 108000 < Q < 135000                                                                                                                                                                                                                    | 3600                           | 60  |
| B-1                         |                              | B-1                                          | F-3 | A-3 | F-2 |     | 135000 < Q < 162000                                                                                                                                                                                                                    | 4500                           | 75  |
| B-2                         |                              | B-2                                          |     |     |     |     | 162000 < Q < 190000                                                                                                                                                                                                                    | 5400                           | 90  |
| B-3                         |                              | B-3                                          |     |     |     |     | 190000 < Q < 270000                                                                                                                                                                                                                    | 6300                           | 105 |
| C                           |                              | C                                            |     |     |     |     | 270000 < Q                                                                                                                                                                                                                             | 9000                           | 150 |
| D                           |                              | D                                            |     |     |     |     |                                                                                                                                                                                                                                        |                                |     |
| E                           |                              | Non-combustible (rating)                     | 10  | 12  | 14  | 17  | 23                                                                                                                                                                                                                                     |                                |     |
| F-1                         |                              | Non-combustible (no rating)                  | 16  | 19  | 22  | 27  | 37                                                                                                                                                                                                                                     |                                |     |
| F-2                         |                              | Combustible (rating)                         | 18  | 22  | 25  | 31  | 41                                                                                                                                                                                                                                     |                                |     |
| F-3                         | Combustible (no rating)      | 23                                           | 28  | 32  | 39  | 53  |                                                                                                                                                                                                                                        |                                |     |
| 3.4 - Firewall Separation   | Exposure - Figure 1          |                                              |     |     |     |     | <div>Figure 1</div> <div>Spatial Coefficient vs Exposure Distance</div>  <div><div>New buildings (ex. F-1)</div><div>New F-1 buildings</div></div> |                                |     |
| Yes                         | North (Sback)                | >15 m                                        |     | 0.0 |     |     |                                                                                                                                                                                                                                        |                                |     |
| No                          | East (Sside)                 | >15 m                                        |     | 0.0 |     |     |                                                                                                                                                                                                                                        |                                |     |
| 3.5 - Sprinkler System      | South (Sfront)               | >15 m                                        |     | 0.0 |     |     |                                                                                                                                                                                                                                        |                                |     |
| Yes                         | West (Sside)                 | >15 m                                        |     | 0.0 |     |     |                                                                                                                                                                                                                                        |                                |     |
| No                          | Total                        |                                              |     | 1.0 |     |     |                                                                                                                                                                                                                                        |                                |     |

# Functional Servicing Report

## Campfire Circle

### Riding Arena

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                         |
|---|---------------------------|--------------------------|-------------------------|
| 1 | Building to be Assessed   | Riding Arena             |                         |
| 2 | Building Classification   | A-2                      |                         |
| 3 | Building Specific Details | 1 - First Floor Area     | 1282 sq.m               |
|   |                           | 2 - Second Floor Area    | 0 sq.m                  |
|   |                           | 3 - Number of Storeys    | 1                       |
|   |                           | 3 - First Floor Height   | 6.1 m                   |
|   |                           | 4 - Second Floor Height  | 0 m                     |
|   |                           | 5 - Firewall Separation? | No                      |
|   |                           | 6 - Sprinkler System?    | No                      |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (no rating) |
|   |                           | K                        | 23                      |
|   |                           | V                        | 7,820                   |
|   |                           | S <sub>tot</sub>         | 1.0                     |
| 5 | Minimum Fire Flow         | Q                        | 180,000 L               |
|   |                           | Table 2                  | 5400 L/min              |
|   |                           |                          | 90 L/s                  |

| 2 - Building Classification |  | Table 1                      |                                              |       |     |     |     | Table 2    |         |                                |  |
|-----------------------------|--|------------------------------|----------------------------------------------|-------|-----|-----|-----|------------|---------|--------------------------------|--|
| A-1                         |  | Water Supply Coefficient - K |                                              |       |     |     |     | Fire Load  |         | Minimum Water Supply Flow Rate |  |
| A-2                         |  | Type of Construction         | Building Classification by Group or Division |       |     |     |     | Q < 108000 | (L/min) | (L/s)                          |  |
| A-3                         |  |                              |                                              |       |     |     |     |            |         |                                |  |
| A-4                         |  |                              | A-2                                          | A-4   | A-1 | E   | F-1 |            |         |                                |  |
| B-1                         |  |                              | B-1                                          | F-3   | A-3 | F-2 |     |            |         |                                |  |
| B-2                         |  |                              | B-2                                          |       |     |     |     |            |         |                                |  |
| B-3                         |  |                              | B-3                                          |       |     |     |     |            |         |                                |  |
| C                           |  |                              | C                                            |       |     |     |     |            |         |                                |  |
| D                           |  |                              | D                                            |       |     |     |     |            |         |                                |  |
| E                           |  | Non-combustible (rating)     |                                              | 10    | 12  | 14  | 17  | 23         |         |                                |  |
| F-1                         |  | Non-combustible (no rating)  |                                              | 16    | 19  | 22  | 27  | 37         |         |                                |  |
| F-2                         |  | Combustible (rating)         |                                              | 18    | 22  | 25  | 31  | 41         |         |                                |  |
| F-3                         |  | Combustible (no rating)      |                                              | 23    | 28  | 32  | 39  | 53         |         |                                |  |
| 3.4 - Firewall Separation   |  | Exposure - Figure 1          |                                              |       |     |     |     |            |         |                                |  |
| Yes                         |  | North (Sback)                |                                              | >15 m |     |     | 0.0 |            |         |                                |  |
| No                          |  | East (Sside)                 |                                              | 10 m  |     |     | 0.0 |            |         |                                |  |
| 3.5 - Sprinkler System      |  | South (Sfront)               |                                              | >15 m |     |     | 0.0 |            |         |                                |  |
| Yes                         |  | West (Sside)                 |                                              | >15 m |     |     | 0.0 |            |         |                                |  |
| No                          |  | Total                        |                                              |       |     |     | 1.0 |            |         |                                |  |

| Fire Load           |  | Minimum Water Supply Flow Rate |       |
|---------------------|--|--------------------------------|-------|
|                     |  | (L/min)                        | (L/s) |
| Q < 108000          |  | 2700                           | 45    |
| 108000 < Q < 135000 |  | 3600                           | 60    |
| 135000 < Q < 162000 |  | 4500                           | 75    |
| 162000 < Q < 190000 |  | 5400                           | 90    |
| 190000 < Q < 270000 |  | 6300                           | 105   |
| 270000 < Q          |  | 9000                           | 150   |

Figure 1

Spatial Coefficient vs Exposure Distance

| Exposure Distance (m) | New buildings (ex. F-1) | New F-1 buildings |
|-----------------------|-------------------------|-------------------|
| 0                     | 0.5                     | 0.5               |
| 6                     | 0.5                     | 0.5               |
| 8                     | 0.375                   | 0.5               |
| 10                    | 0.25                    | 0.375             |
| 12                    | 0.125                   | 0.25              |
| 14                    | 0                       | 0.125             |



# Functional Servicing Report

## Campfire Circle

### Greenhouse

Fire Flow Requirements as per the Ontario Building Code (OBC)

\*A-3.2.5.7. Water Supply for Fire-Fighting

#### Procedure

|   |                           |                          |                         |               |
|---|---------------------------|--------------------------|-------------------------|---------------|
| 1 | Building to be Assessed   |                          | Greenhouse              |               |
| 2 | Building Classification   |                          | A-2                     | A-3.1.2.1.(1) |
| 3 | Building Specific Details | 1 - First Floor Area     | 690                     | sq.m          |
|   |                           | 2 - Second Floor Area    | 0                       | sq.m          |
|   |                           | 3 - Number of Storeys    | 1                       |               |
|   |                           | 3 - First Floor Height   | 3.6                     | m             |
|   |                           | 4 - Second Floor Height  | 0                       | m             |
|   |                           | 5 - Firewall Separation? | No                      |               |
|   |                           | 6 - Sprinkler System?    | No                      |               |
| 4 | Minimum Supply of Water   | 7 - Construction Type    | Combustible (no rating) |               |
|   |                           | K                        | 23                      | Table 1       |
|   |                           | V                        | 2,484                   | cu.m          |
|   |                           | S <sub>tot</sub>         | 1.0                     |               |
| 5 | Minimum Fire Flow         | Table 2                  | 2700                    | L/min         |
|   |                           |                          | 45                      | L/s           |

| 2 - Building Classification | Table 1                      |                                              |     |     |     |     | Table 2                                                      |                                |       |
|-----------------------------|------------------------------|----------------------------------------------|-----|-----|-----|-----|--------------------------------------------------------------|--------------------------------|-------|
| A-1                         | Water Supply Coefficient - K |                                              |     |     |     |     | Fire Load                                                    | Minimum Water Supply Flow Rate |       |
| A-2                         | Type of Construction         | Building Classification by Group or Division |     |     |     |     |                                                              | (L/min)                        | (L/s) |
| A-3                         |                              |                                              |     |     |     |     |                                                              |                                |       |
| A-4                         |                              | A-2                                          | A-4 | A-1 | E   | F-1 | Q < 108000                                                   | 2700                           | 45    |
| B-1                         |                              | B-1                                          | F-3 | A-3 | F-2 |     | 108000 < Q < 135000                                          | 3600                           | 60    |
| B-2                         |                              | B-2                                          |     |     |     |     | 135000 < Q < 162000                                          | 4500                           | 75    |
| B-3                         |                              | B-3                                          |     |     |     |     | 162000 < Q < 190000                                          | 5400                           | 90    |
| C                           |                              | C                                            |     |     |     |     | 190000 < Q < 270000                                          | 6300                           | 105   |
| D                           |                              | D                                            |     |     |     |     | 270000 < Q                                                   | 9000                           | 150   |
| E                           |                              | Non-combustible (rating)                     | 10  | 12  | 14  | 17  | 23                                                           |                                |       |
| F-1                         |                              | Non-combustible (no rating)                  | 16  | 19  | 22  | 27  | 37                                                           |                                |       |
| F-2                         |                              | Combustible (rating)                         | 18  | 22  | 25  | 31  | 41                                                           |                                |       |
| F-3                         |                              | Combustible (no rating)                      | 23  | 28  | 32  | 39  | 53                                                           |                                |       |
| 3.4 - Firewall Separation   | Exposure - Figure 1          |                                              |     |     |     |     | <p>Figure 1<br/>Spatial Coefficient vs Exposure Distance</p> |                                |       |
| Yes                         | North (Sback)                | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| No                          | East (Sside)                 | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| 3.5 - Sprinkler System      | South (Sfront)               | >15 m                                        |     |     |     | 0.0 |                                                              |                                |       |
| Yes                         | West (Sside)                 | 10 m                                         |     |     |     | 0.0 |                                                              |                                |       |
| No                          | Total                        |                                              |     |     |     | 1.0 |                                                              |                                |       |

**APPENDIX D:**  
**HYDROGEOLOGICAL STUDY, AND SERVICING OPTIONS REPORT**





## **Hydrogeological Study, and Servicing Options**

Overnight Campground Development

565 Wesley Acres Road, Bloomfield, Ontario



### **Prepared for:**

Campfire Circle  
464 Bathurst Street  
Toronto, ON M5T 2S6

### **Prepared by:**

ASC Environmental Inc.  
1305 Princess St,  
Kingston, ON K7M 3E3

**File: ASC-870 102r**  
**March 22, 2024**

ASC Environmental Inc.  
1305 Princess St,  
Kingston, ON K7M 3E3  
Tel: (613) 634-5596  
[asc-environmental.com](http://asc-environmental.com)

## **Hydrogeological Study, and Servicing Options**

565 Wesley Acres, Bloomfield, Ontario

**Prepared for:**

Campfire Circle  
464 Bathurst Street  
Toronto, ON M5T 2S6

**Prepared by:**

ASC Environmental Inc.  
1305 Princess St,  
Kingston, ON K7M 3E3

Respectfully submitted on behalf of

***ASC Environmental Inc.***



---

Thomas Asma, B.ASc.  
E.I.T

Reviewed by:



Paul Johnston, M.Sc., P.Eng., QP<sub>ESA</sub>  
Project Manager



**ASC Environmental Inc.**  
**1305 Princess Street,**  
**Kingston, ON K7M 3E3**  
**Tel: (613) 634- 5596**

## EXECUTIVE SUMMARY

ASC Environmental Inc. (ASC) was retained by **Groundwork Engineering** (herein after referred to as 'Groundwork') on behalf of **Campfire Circle** (herein after referred to as the 'Client') to undertake a Hydrogeological Study for a proposed Overnight Campground Development, located at 565 Wesley Acres Road, Bloomfield, Ontario (the "Site"). The legal description of the property is Part Lot 2 and Part of Point M or Gibsons Point, Concession 1, Military Tract, Hallowell Ward, Prince Edward County (Part 1 on 47R7639). The property PIN is 55051-0178.

The proposed development will be consisting of approximately nine (9) camper residencies, a lodge, hospital, director's cabin, indoor activity area, and flex area, for the 33.6 hectare property.

- The development is proposed to be serviced with private on-site well water supply (with supplemental storage) and two (2) private on-site sewage works treatment systems. Based on the maximum occupancy, resulting net daily water taking of approximately 106,750 L/day is anticipated for the proposed development.
- Land use within 500 m of the Site consists of rural residential, commercial (short term rentals, campgrounds, etc.), and agricultural activity.
- Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) radially towards the surrounding wetlands and surface water bodies. Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man-made pond present on the east side of the site access drive in the northern portion of the subject property.
- Existing residential, commercial and agricultural developments in this area of Prince Edward County currently utilize individual on-site private services. Existing services in the local area (minimum 500 m radius), consist of private well water supply and individual private septic systems.
- Prince Edward County is lacking full municipal or communal services in the area of the site and based on the above conditions and our evaluation of existing development in Prince Edward County, we believe that the proposed development would be consistent with the Provincial Policy Statement and recommend the use of communal on-site sewage and water services.
- Six (6) water well records were available for review (MECP database) within 1000 m of the Site. The majority of these wells were drilled for domestic water supply purposes, four (4) wells were reported as being completed in the limestone bedrock aquifer, while one (1) well was completed in an overburden gravel lens, and one (1) well was reported as being dry. Based on review of the





MECP well records, it is apparent that the majority of the local residents utilize the limestone bedrock aquifer for domestic water supply.

- The on-site hydrogeological investigation was conducted to assess site groundwater supply conditions from one recently drilled well to determine support for the proposed development. One pumping test of 24-hour duration was conducted at test well TW1 to evaluate long term well yield.
- Water quantity was assessed on the basis of the 24-hour pumping test; and water quality was assessed on the basis of chemical and bacteriological sample collection and analyses for water samples collected near the beginning and in the final hour of the pumping test; and potential interference was investigated through monitoring neighbouring and on-site wells.
- The pumping test for test well TW1 was conducted on February 21 and 22, 2024. Referencing local weather data (Point Petre weather station), the region received approximately 14.7 mm of precipitation from February 1 to February 21. Based on the precipitation data, the location of the test well (highest point on the subject property topographically), the thickness of the overburden in the vicinity of the test well, and the composition of the overburden (two clay lenses), the pumping test was not conducted during a period of high groundwater recharge to the test well.
- Reviewing the drawdown and recovery curves for the pumping test, the data indicate that TW1 showed a maximum drawdown of approximately 0.83 m following 24 hours of pumping reaching equilibrium after approximately 60 minutes (1 hour) of continuous pumping at a rate of 75 liters per minutes (~ 20 gallons per minute); and over 11 metres (approximately 93%) of well water supply was available in the well following the 24-hour pumping test. Recovery of the well to 95% was attained within 30 minutes (half an hour).
- Results of interference monitoring of neighbouring wells generally did not show a positive response (interference drawdown) to pumping during the 24-hour pumping test. Neighbouring wells showed sufficient water supply storage remaining following the pumping test.

The measured interference during pumping is an appropriate estimation of the anticipated influence from the proposed development.

- Results of the pumping tests confirm that the limestone bedrock aquifer is able to support a sustained pumping rate of 75 liters per minute. Based on the pumping test results and favourable recovery time following prolonged continuous pumping of 24 hours, sufficient aquifer storage and demonstrated yield is available to supply the well to meet the demand for the proposed development; without adversely impacting upon neighbouring resident water supply.
- Measured groundwater levels from test well show hydraulic gradient of approximately 0.5% radially from the test well towards adjacent water bodies.
- Calculated long-term drawdown at 20 years of continuous pumping at 106,750 L/day shows approximately 0.26 m at a radial distance of 250 m from test well TW1. Therefore, based on the



predicted drawdown analyses, adverse impact to existing neighbouring well water supply is not expected.

- Water quality tests did not identify bacteriological concerns in the two (2) water samples collected from test well TW1 (after 6 hours and in the last hour of the test).

We recommend disinfection (UV treatment or similar) to ensure a bacteriological free water supply.

- Nitrate and Nitrite concentrations were below laboratory detection in the two (2) water samples from test well TW1.
- Field turbidity results showed turbidity at 0 NTU at the time of collection for each sample, respectively. Laboratory test well turbidity results for Test Well TW1 showed a turbidity of 0.4 NTU after 6 hours, and 1.4 NTU in the final hour of pumping. We are of the opinion that the laboratory result may have been subject to precipitate in the sample water during transport or handling to/by the laboratory, and the field result is likely representative of well water conditions. Where persistent turbidity levels are encountered installing a pre-filter and ultra violet light system to the drinking water system would be effective in managing turbidity.
- Sodium concentrations ranging from 6.2 mg/L to 6.4 mg/L were detected in water samples from test well TW1. Sodium concentrations were therefore interpreted to meet both health-related (20 mg/L) and aesthetic objectives (200 mg/L).
- The operational guideline for hardness is 80-100 mg/L and the ODWO level is 500 mg/L. Sample analyses for TW1 identified hardness of 274 mg/L to 283 mg/L. Total Dissolved Solids (TDS) were measured at 282 mg/L to 287 mg/L. Hardness and TDS in water usually occur when elevated concentrations of calcium, magnesium, and chlorides are present in water. Elevated concentrations of hardness and TDS may result in scale build-up and mineral deposits on hot water heaters and plumbing fixtures. Hard water can be readily treated through ion exchange water softening.

To ensure safe drinking water is provided to the site users, we recommend disinfection to ensure a long-term source of good quality groundwater for consumption purposes. We recommend contracting a water quality professional to confirm treatment options.

- A pre-survey and post-pumping survey was taken from the sole neighboring participant in the study, Mr. Tim Bucknell at 528 Wesley Acres Road. Mr. Tim Bucknell was identified as the closest neighboring water user, located approximately 600 metres from the test well; and was monitored for due diligence purposes despite being considered of low potential for impact based on the distance from the test well and the properties being separated by a surface water body. Results of the survey indicated 528 Wesley Acres Road had an approximately 13.4 metre deep drilled well, presumed to be completed in limestone bedrock. Mr. Bucknell indicated he has never had an issue with water quantity, and the well has produced sufficient water to support individual domestic requirements as well as his commercial farming operations (rose



nursery, cattle, etc.). Mr. Bucknell indicated that he regularly tests the quality of his water, and with the exception of the water being slightly hard, no other health or aesthetic related water concerns were noted. Mr. Bucknell indicated that he uses a reverse osmosis system to treat hardness.

- Based on the depth of the wells, the depth of the overburden, the water quality, and results of the drawdown data; results of the study do not suggest potential connectivity with the down gradient adjacent water body
- Based on an evaluation of the hydrogeological investigative work, it is evident that the down gradient reasonable use of groundwater is primarily for individual domestic consumption; and sewage management is through raised or in ground private leaching bed septic systems for the neighbouring properties. This is not anticipated to change based on existing local site development and the Township of Stone Mills Official Plan.

The scale of the proposed development makes it more challenging to support in ground/raised leaching beds for conventional large private services. Based on the proposed daily loading, the site will require a large treatment system designed in accordance with MECP regulations, guidelines and Section 53 of the *Ontario Water Resources Act* (OWRA). Preliminary sewage treatment plans for this site are being prepared by Groundwork Engineering Inc. We understand the proposed treatment systems would likely include the following:

1. In ground balancing and/or pre-treatment tanks
2. Treatment system with in ground and above ground components (extended aeration or membrane bio-reactor)
3. Nutrient removal system (recirculation and chemical ad-mixture)



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## APPENDICIES

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**Appendix B: Concept Plan**

**Appendix C: Test Week Record**

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**Appendix G: Groundwater Quality Results**



## LIST OF ACRONYMS

|                |                                                           |
|----------------|-----------------------------------------------------------|
| ASC            | ASC Environmental                                         |
| BH             | Borehole                                                  |
| CALA           | Canadian Association of Laboratory Accreditation          |
| ha             | hectare                                                   |
| m              | Metre                                                     |
| m <sup>2</sup> | Square metre                                              |
| m <sup>3</sup> | Cubic metre                                               |
| MDL            | Minimum detection limit                                   |
| MECP           | Ministry of Environment, Conservation and Parks (Ontario) |
| MW             | Monitoring well                                           |
| NTU            | Nephelometric Turbidity Units                             |
| OW             | Observation Well                                          |
| TW             | Test Well                                                 |





## 1.0 INTRODUCTION

### 1.1 Initiation, Objective and Planning Context

ASC Environmental Inc. (ASC) was retained by **Groundwork Engineering** (herein after referred to as 'Groundwork') on behalf of **Campfire Circle** (herein after referred to as the 'Client') to undertake a Hydrogeological Study for a proposed Overnight Campground Development, located at 565 Wesley Acres Road, Bloomfield, Ontario (the "Site"). A site location plan is shown on Figure 1 in Appendix A.

The proposed development will include, but not be limited, to nine (9) camper residencies, a lodge, hospital, director's cabin, indoor activity area, and flex area.

A conceptual plan showing the approximate location and layout is shown in Appendix B.

Proposed construction activities will include minor forestry and site grubbing, two (2) septic systems, stormwater management landscaping, building construction, and other minor property alterations.

The property proposed for development is zoned a mixture of 'EP-W' (Environmental Protection – Provincially Significant Wetland) and 'RU2' (Rural 2 Zone). The proposed development will require a new zoning change necessary for site redevelopment from Rural Land to Tourist/Commercial zoning.

The objective of this Hydrogeological Study was to assess potential groundwater quantity, quality, and the potential for interference with existing water resources in the area to support the proposed development. A terrain analyses was not conducted under our mandate. Groundwork Engineering was retained by the Client to determine the suitability of the site for septic services. The extent of research to identify and assess potential sources of concern was limited by the scope of services.

### 1.2 Site Description and Current Land Use

The site currently encompasses approximately 33.7 hectares. The site is located on the south side of Wesley Acres Road approximately 2.5 kilometres south/southwest of the intersection of Wesley Acres Road and Loyalist Parkway, Bloomfield, Ontario. UTM NAD 18 coordinates for centroid of the property are 319441 E and 4869978 N. The past land use for the subject property was considered to be vacant/agricultural, with cultivated fields occupying the eastern portion, a mix of cultivated fields and forests occupying the western peninsula, and rural recreational cabins located in the southern portion of the property along the West Lake shoreline. A site layout plan showing current property is presented on Figure 2 in Appendix A.

Property development is presently being undertaken by the Client, including general property surface reworking/grubbing and minor logging activities in the forested areas.

Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) radially towards the surrounding wetlands and surface water bodies. Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject



property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man made pond present on the east side of the site access drive in the northern portion of the subject property. A site topographic map is shown in Appendix A.

The legal description of the property is Part Lot 2 and Part of Point M or Gibsons Point, Concession 1, Military Tract, Hallowell Ward, Prince Edward County (Part 1 on 47R7639). The property PIN is 55051-0178. The portion of the property slated for development is approximately 33.6 hectares. A concept plan is shown in Appendix B.

A regional map is shown on Figure 3 in Appendix A; showing the site, major/minor roads, environmental protection areas, wetland and watercourse features within 500 metres of the site.

### **1.3 Neighbouring Property Land Use**

Adjacent land use consists of predominantly vacant wetlands and surface water bodies. North of the Site (across Wesley Acres Road) is Rambling Rose Nursey (agricultural use). Land use within 500 m of the Site consists of rural residential, commercial (short term rentals, campgrounds, etc.), and agricultural activity.

Based on existing adjacent upgradient and cross gradient land use, the downgradient land use (West Lake), and no significant historical development on the subject property, potential hydrogeological sources of groundwater contaminants are not expected.

No existing groundwater users were identified downgradient of the subject property. Potential hydrogeological sources down gradient from the Site that may be susceptible to groundwater impacts would be West Lake. Impact to West Lake is not anticipated as a result of the proposed development. A neighbouring land use plan (within 500 m) is shown on Figure 3 in Appendix A.

### **1.4 Planning Context**

As indicated above, the proposed development will consist of an Overnight Campground Development consisting of nine (9) camper residencies, a lodge, hospital, director's cabin, indoor activity area, and flex area. A net water taking of approximately 106,750 L/day (approximately 500 beds plus services) will be required to support the proposed Overnight Campground Development. The development is proposed to be serviced with communal well water supply (with potential storage) and two (2) large on-site sewage works treatment system.

### **1.5 Provincial Policy Statement - Servicing Options Statement**

Referencing MECP Guideline D-5 Planning for Sewage and Water Services, the legislative authority for this guideline and associated procedures is mandated by the Ontario Environmental Protection Act, Ontario Water Resources Act and the Planning Act. It is consistent with the Provincial goal to manage growth and change to foster communities that are socially, economically, environmentally, and culturally healthy, and that make efficient use of land, new and existing infrastructure and public service facilities.



## **MECP Hydrogeological Technical Information Requirements for Land Development Applications (April 1995).**

The MECP 'Policy on Planning for Sewage and Water Services' and Implementation Guideline for Policy Statement B7, 'Planning for Sewage and Water Services'. These documents support the Comprehensive Set of Policy Statements under Section 3 of the Planning Act, 1995. Municipalities or their equivalents are expected to investigate servicing options by means of a 'servicing options statement' in the absence of municipal wide sewage and water servicing plans that have been adopted in approved official plans.

The Provincial Policy Statement indicates the requirements for servicing new developable areas, specifically Sections 1.6.4.2 to 1.6.4.4, which identify the preferred methods of servicing new developments.

Included in Policy Statement B7 is a hierarchy of servicing preferences in the following order:

- a) Municipal services; development on full municipal services be the preferred mode of servicing where there is sufficient uncommitted reserve capacity or where there is the capability for full municipal services to be expanded.
- b) Communal services; and in areas lacking full municipal services, communal sewage and water services be the preferred mode of servicing multiunit/lot development.
- c) Individual on-site private services. in areas lacking full municipal or communal services where development can be justified consistent with the Provincial Policy Statement, the use of individual on-site sewage and water services, may be considered subject to meeting environmental and public health requirements.

Although, the preferred option would be to service the proposed lands by municipal sewage and water services via sanitary sewers and water mains, unfortunately, no municipal services are present in the area of the proposed development. Existing services in the local area (minimum 500 m radius), consist of private well water supply and individual private septic systems. We offer the following supporting information for on-site private services (communal).

- The potential for future connection to full municipal services is unlikely given the capital costs. Reviewing available documents, the Corporation of the County of Prince Edward has no future plans for municipal services in the study area.
- Based on our understanding and review of potential development applications for the area which typically include land severance applications for single family residential development or residential campground/subdivision development, these typically require a hydrogeological assessment to address the requirements for individual on-site private services. Referencing the distance to the nearest known services (over 2km) and the low population density surrounding the Site, it is unlikely that the Site will be part of a long-term municipal servicing plan or growth management objective.
- The subject property was previously considered to be vacant/agricultural, with cultivated fields occupying the eastern portion, a mix of cultivated fields and forests occupying the western peninsula, and rural recreational cabins located in the southern portion of the property along the West Lake shoreline. Looking at the property from an environmental perspective, Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to





the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man made pond present on the east side of the site access drive in the northern portion of the subject property. No significant Environmental Concerns or sources of potential contamination were identified during document review.

- Groundwater is the major source of drinking water and individual onsite septic services for neighbouring properties, the groundwater is primarily sourced from the semi-confined limestone aquifer. The limestone bedrock is generally overlain by clay overburden ranging from 7.0 m to 13.7 m in depth, with an average overburden thickness of approximately 9.7 m. The limestone bedrock in the area of the site typically ranges from 7 – 13 m below grade, and topography at the subject property slope is rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) in all directions towards the surrounding wetlands and surface water bodies.
- Other residential, multitenant residential, and commercial developments in the rural portion of the Corporation of the County of Prince Edward are facilitated with individual services or communal services.
- Overnight Campground Development consisting of to nine (9) camper residencies, a lodge, hospital, director's cabin, indoor activity area, and flex area. The proposed development will encompass an area of approximately 33.6 hectares.
- Municipal Services Option - The proposed overnight campground development would be an ideal candidate for municipal services. Municipal services would provide a continuous water supply. Unfortunately, no municipal services are offered in the area of the subject property.

Communal Services Option – A communal well and communal wastewater system is identified within the Provincial Policy Statement as an alternative to municipal servicing. At present no known communal services are present in the vicinity of the proposed development or surrounding area (500 metres). The proposed development is a standalone overnight campground complex development (residential land use). It is not part of a proposed subdivision or multi-lot development. Based on the proposed development it is a candidate for communal water supply.

- Existing residential, agricultural and commercial development in this particular area of Prince Edward County is currently utilized through individual on-site private services. The Corporation of the County of Prince Edward is lacking full municipal or communal services in the area of the subject property and based on the above conditions and our evaluation of available information, we believe that the proposed development is consistent with the Provincial Policy Statement and recommend the use of a communal on-site sewage and water services.



The Provincial Policy Statement allows for individual onsite sewage services and onsite water services for uses permitted in Section 1.1.4.1 provided that the onsite activities are suited for the long-term provision of such services. Water service, from groundwater well(s) must be shown to be safe and sustainable. On this basis, the following hydrogeological study was undertaken with reference to the MECP technical guideline in support of the proposed development. The following sections outline our study, field investigation work, and recommendations.



## **2.0 SPECIFIC HYDROGEOLOGICAL ISSUES RELATED TO THE PROPOSED DEVELOPMENT AND PROPOSED HYDROGEOLOGICAL SCOPE OF ASSESSMENT**

Based on review and evaluation of the existing services in the local area, development services options, and hydrogeological conditions, servicing to support the proposed development will be via a communal water well and communal septic services.

### **2.1 Main Elements of the Proposed Development**

The main elements of the proposed development include:

- Nine (9) Camper Residencies,
- One (1) Lodge,
- One (1) Hospital,
- One (1) Director's Cabin,
- One (1) Indoor Activity Area, and
- One (1) Flex Area.
- Two (2) Staff Residences.

The total anticipated site capacity for the development proposal is 106,750 L/day (approximately 500 beds plus services). A Site Conceptual Plan rendering is shown in Appendix B.

Section 8.2 Design Standards of the Ontario Building Code was referenced to determine the total required daily water taking for the proposed development including each proposed use. The resulting maximum water use is expected to be 106,750 litres/day. On this basis a Permit to Take Water would be required for the proposed development.

### **2.2 Specific Hydrogeological Issues**

The specific hydrogeological issues identified and anticipated for the proposed development are as follows:

- Address change in land use and zoning to support proposed development.
- Address existing land use within a 500 m radius (upgradient and down gradient) from property boundary to determine whether there are potential off-site sources of impact present that may adversely impact upon the proposed development.
- Address whether the proposed development will adversely impact upon groundwater recharge to the area.
- Address whether adequate long term groundwater supply is available to support the proposed development without adversely impacting the existing neighbouring properties, local and regional groundwater supply, and local surface water courses.
- Address whether the existing on site soils and groundwater quality is suitable to support private sewage system design for the proposed development without adversely impacting the groundwater and risk to existing and/or potential downgradient users and receptors. (Conduct a Water Quality Impact Assessment).
- Address whether the Site is suitable for sewage effluent disposal.





- Address the requirement regarding potential application for Permit To Take Water with the MECP.

The MECP has the legislative responsibility for the management and protection of ground water and surface water resources in the Province of Ontario. This authority is provided under the Ontario Water Resources Act R.S.O. 1990, the Environmental Protection Act R.S.O. 1990 and the Environmental Assessment Act R.S.O. 1990.

### **2.3 Proposed Scope of the Hydrogeological Assessment**

The proposed scope of work to address the specific issues identified in Section 2.2 above include the following tasks in support of the proposed development.

- Initial meeting(s) with the proponent to understand the development proposal, potential concerns and discuss potential impacts to existing neighbouring receptors.
- Conduct a desktop survey of existing available documentation regarding surficial and hydrogeological conditions in the local and regional area to consider whether the proposed development may be hydrogeologically suitable and whether local soil conditions are favourable for attenuation of sewage.
- Conduct an initial pre-survey of neighbouring upgradient and downgradient properties to assess water taking aquifer(s), treatment systems in place, and address potential future water supply concerns potentially from the proposed development and also general communication with neighbours regarding the details of the proposed development.
- Reviewing local geological and hydrogeological conditions within a 500 m radius of the property,
- Review existing land use within 500 m radius to assess for potential impacts to the groundwater supply and whether these may adversely impact the proposed development.
- Advance one (1) drilled well using a licensed well water contractor to facilitate water supply.
- Conduct a 24-hour duration pumping test on the newly advanced test well to determine potential long-term yield of the water supply aquifer, assess potential water quality through sampling and analyses, potential for on-site and off-site interference of wells during pumping, future use and treatment purposes, and monitor existing neighbouring wells for potential positive response to determine whether the development may adversely impact existing neighbouring water supply wells.

The on-site hydrogeological investigation was assessed through a 24-hour pumping test on one (1) recently drilled well. Water quantity was assessed on the basis of the pumping tests; water quality was assessed on the basis of chemical and bacteriological sample collection and analyses for water samples collected near the beginning and near the end of the 24-hour pumping test; and assessing potential interference through monitoring neighbouring and on-site wells.

Based on the information obtained, groundwater data is presented regarding recommendations for the proposed development from a groundwater supply and sustainability perspective.



### **3.0 CONCEPTUAL SITE MODEL DEVELOPMENT - REGIONAL AND SITE PHYSIOGRAPHY AND GEOLOGICAL SETTING**

#### **3.1 Topography, Surface Water and Drainage**

The Site is located along the northern slope of the West Lake watershed, a subsidiary of the larger Northeast Lake Ontario Shoreline watershed. West Lake is located south adjacent to the Site and Lake Ontario is located approximately 4 kilometers west/southwest of the Site.

Topography of the site was assessed using online digital mapping, and site visits conducted in the winter of 2024. Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) radially towards the surrounding wetlands and surface water bodies. Surface water at the site based on site topography would be likely be directed overland in all direction towards the neighbouring wetlands and surface water bodies.

Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man made pond present on the east side of the site access drive in the northern portion of the subject property. A copy of the topographic map is shown on Figure 5 in Appendix A.

Attached in Appendix B is a concept drawing showing the proposed site alterations. Site drainage is not anticipated to be significantly altered based on the proposed development.

#### **3.2 Geology and Soils**

##### *3.2.1 Surficial Geology - Physiography*

The Ontario Department of Mines and Northern Affairs (MRD228), Physiography of the Eastern Portion of Southern Ontario, shows the subject property as being located in an area described as a mix of Sand Plains, Peat and Muck, and Drumlins. The Ontario Department of Mines and Northern Affairs (MRD128), Surficial geology of southern Ontario, shows the subject property as being in an area of mixed Coarse-textured glaciolacustrine deposits, Coarse-textured glaciolacustrine deposits, and tills with organic deposits present in wetland areas.

Overburden thickness recorded in the on-site well records identified clay to approximately 2.4 mbgs, underlain by sand to approximately 7.0 mbgs, underlain by another clay lens to approximately 11.9 mbgs. Limestone bedrock was encountered at approximately 11.9 mbgs and the final thickness of the limestone bedrock was not encountered during well drilling to a depth of 18.3 mbgs.

##### *3.2.2 Bedrock Geology*

Referencing the Ministry of Northern Development and Mines (Map 2544), Bedrock Geology of Ontario (Southern Sheet), bedrock geology in the study area consists of a stratigraphic sequence of Paleozoic,



Middle Ordovician age predominantly limestone bedrock, of the Ottawa Group, Simcoe Group and Shadow Lake Formation.

According to Ontario Geological Survey Aggregate Resources inventory for prince Edward county, excluding two small inliers, a Precambrian (granitic) inlier and an Ordovician aged Bobcaygeon Formation inlier, the oldest Paleozoic unit in the area is the Verulam Formation. The Verulam Formation consists of interbedded limestones and shales and has an upper and lower member. The lower member, ranging from 23 to 68 m in thickness, consists of interbedded dark grey to grey, fossiliferous, fine- to coarse-grained limestone and green shale. The upper member is a medium- to coarse-grained, buff to tan coloured, cross-bedded, bioclastic limestone, ranging from 2 to 9 m in thickness. The upper member is not widely present in the study area.

Well records did not indicate the thickness of the limestone sedimentary sequence in the area in wells extending to approximately 21 metres deep. Well records indicate that groundwater is present in the limestone bedrock formations with the limestone bedrock utilized as the predominant water supply aquifer in the study area.

### **3.3 MECP Water Well Records – 1000 m radius**

ASC Environmental reviewed water well records obtained from MECP Water Well Records database. Six (6) water well records were available for review within 1000 m of the Site. The majority of the wells were drilled for domestic water supply purposes, four (4) wells were reported as being completed in the limestone bedrock aquifer, while one (1) well was completed in an overburden gravel lens, and one (1) well was reported as being dry. Based on review of the MECP well records, conclusions can be drawn regarding subsurface conditions in the local area.

Reviewing the well logs from the local area, the limestone bedrock is generally overlain by clay overburden ranging from 7.0 m to 13.7 m in depth, with an average overburden thickness of approximately 9.7 m. The limestone bedrock in the area of the site typically ranges from 7 – 13 m below grade. The reviewed well records did not indicate the thickness of the limestone unit, nor did they encounter an underlying unit to a maximum investigated depth of approximately 20.7 metres below grade.

The pumping tests conducted on local drilled wells showed pumping rates ranging from a minimum of 13.7 litres/minute to 114 litres/minute. Clear/fresh water was reported in the majority of wells. Fresh water was encountered at depths ranging from approximately 12.8 metres to approximately 20.4 metres below the ground surface in the limestone bedrock; the overburden well record encountered a water bearing gravel lens at 4.6 metres below the ground surface. Based on the well record information; water bearing zones are present in the middle Ordovician limestone bedrock. Static water levels typically varied from approximately 1 metre to approximately 8 metres below ground surface.

Based on the site drilling well records, the leaky-confined Ordovician limestone is the predominant source for drinking water in the area. The majority of the wells are utilizing the upper limestone bedrock for domestic water supply source.

Groundwater is stored and transmitted by the openings present along horizontal bedding planes (limestone bedrock) and vertical fractures or joints. The spacing of these openings, the size and the





interconnection between them is crucial to an adequate supply.

The water well completed at the Site and finished in the limestone is expected to obtain water from fracture systems in the upper leaky-confined limestone aquifer. The water bearing limestone bedrock aquifer is moderately vulnerable to surface water influence due to overburden thickness consisting of sands and clays and potential fracturing of the bedrock.

Recharge to the shallow unconfined limestone bedrock groundwater aquifer probably occurs with the vertical infiltration of water from near surface seasonal sources and precipitation. Recharge at the subject property would be in the form of precipitation. A potential permanent surface water supply source is West Lake, located south adjacent to the Site. The nearest discharge source is the West Lake as well as surrounding creeks and wetlands, located adjacent to the site and bordering the majority of the Site boundary. This West Lake watershed system flows into the Northeast Lake Ontario Shoreline watershed system, located approximately 4 kilometres west/southwest of the Site.

In the bedrock environment, water flow within the aquifer(s) occurs through a complex network of fractures, joints or other discontinuities within the rock matrix. The bedrock system receives recharge where these fractures intersect the ground surface or shallow overburden flow system.

The location of domestic water supply wells near the site are shown on Figure 2, and the MECP water well records are included in Appendix D.

## 4.0 HYDROGEOLOGICAL ASSESSMENT

Groundwater is part of the hydrologic cycle. It is dynamic, moving naturally through the subsurface environment and ultimately discharging at the surface. An understanding of the natural movement of groundwater is important in undertaking an assessment of the potential effects of a proposed development.

### 4.1 Water Balance Methodology

The MECP Stormwater Planning and Design Manual (2003 – updated 2015) is used as a baseline reference document in the review of stormwater management applications for approval under Section 53 of the *Ontario Water Resources Act* as administered by the MECP.

The manual offers a method to estimate the infiltration on the Site, based on a local infiltration factor “i”, which is applied to the available water surplus to determine the groundwater recharge for a given area with pervious cover. The methodology considers factors such as the soil type, topography, and vegetation to arrive at the amount of water infiltrating into the ground. The remaining water surplus is considered runoff.

Under the post-development conditions, the infiltration factor is recalculated to account for changes in soil types, vegetation, and topography after development, and the infiltration and runoff at the pervious land areas are recalculated.

ASC understands from correspondence with the Client that, as of the preliminary designs available at the time of this report, the proposed stormwater management system will consist of drainage swales to direct stormwater away from high traffic areas of the Site, but will not have a stormwater collection system (i.e. all stormwater will reach the Site ground surface). On this basis, land after development is not anticipated to have any impermeable surfaces at this time. As the stormwater design has not yet been finalized, ASC assumed 10% of the property area will be impermeable post development (i.e. 3.36 Ha) to be conservative.

The proposed maximum water taking has been determined to be 106,750 litres/day (see Section 1.4) for the development proposal. Reference Canadian Historical Weather Data from the Point Petre weather station between 2013 and 2023, the local area receives on average 914 mm of precipitation per year. The amount of infiltrating water available (minus evapotranspiration etc.) to the aquifer has been estimated at 250 mm/yr.



Therefore, the total amount of recharge water available to the proposed development, considering impervious structures is determined as follows:

**Table 1 - Water Balance**

| Site Area<br>(A) | Impervious<br>Area (A1) | Annual<br>Precipitation | Annual<br>Infiltrating<br>Water<br>Available (i) | Recharge<br>Water<br>Available to<br>Aquifer | Maximum<br>Water<br>Taking | Net Water Balance    |
|------------------|-------------------------|-------------------------|--------------------------------------------------|----------------------------------------------|----------------------------|----------------------|
| (hectares)       | (hectares)              | (mm/yr)                 | (mm)                                             | (m <sup>3</sup> /yr)                         | (m <sup>3</sup> /yr)       | (m <sup>3</sup> /yr) |
| 33.6             | 3.6                     | 914                     | 250                                              | 75,000                                       | 38,964                     | + 36,036             |

Total Area (A) – 33.6 ha

Impervious Area (A1) – 3.6 ha

Infiltrating water (i) = 250 mm/yr

Recharge Water Available to Aquifer =

$(A - A1) * i * 10,000 \text{ m}^2/\text{ha} * 1000 \text{ litres/m}^3 = 75,000,000 \text{ litres/yr.}$

The water taking demand based on the proposed development has been established at 106,750 litres/day (38,963,750 litres/yr).

Therefore, the net total average annual recharge to the shallow limestone aquifer within the site under probable post development conditions is 36,310 m<sup>3</sup>/year, resulting in a net positive water balance available for recharge and sufficient groundwater supply available in the aquifer to meet seasonal variability, peak demand and long-term water taking for the proposed development.

On this basis, the net reduction in water balance from the proposed water taking would not adversely impact upon recharge. It is recommended that stormwater management techniques including beneficial reuse be designed to enhance the estimated average annual rate of groundwater recharge for the site to maintain support of local groundwater levels. Stormwater management systems should also be designed to protect groundwater quality.

## 4.2 Determination of Present and Future Water Taking Demand

Based on the anticipated daily water requirements per person using the facilities, as per the Ontario Building Code Table 8.2.1.3. B, the long term maximum daily requirement is anticipated to be 106,750 litres/day for the proposed development of the site.

The quantity of groundwater available at the Site was investigated through a 24-hour pumping test (with recovery). One well was advanced on the subject property in February 2024 by Jack Knox Well Drilling Ltd. (MECP Licensed Well Drillers - 3202) to assess water supply quantity, quality and potential interference with existing neighbouring water supply wells. The locations of the well was determined by the Client. The test well location is shown on Figure 2 in Appendix A.

The Ministry of Environment Conservation and Parks (MECP) Hydrogeological Technical Information Requirements for Land Development Applications (1995) was used for reference purposes to support



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developing the water supply assessment program. Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment (August 1996) was also referenced for guidance purposes.

### **4.3 Construction and Development of New and Existing On-Site Water Wells**

One well was recently advanced by Knox Well Drilling (Licence #) in February 2024 for purposes of water supply assessment. The drilled well is proposed to be used as the water supply source for the proposed development. Well locations are shown on Figure 2 in Appendix A.

Test well TW1 was drilled to approximately 18.3 metres depth, completed February 2, 2024. Well drillers reported encountering native clay to approximately 2.4 mbgs, underlain by sand to approximately 7.0 mbgs, underlain by another clay lens to approximately 11.9 mbgs and terminating in limestone bedrock at a depth of approximately 18.3 mbgs. Water was reportedly encountered at 12.2 mbgs and 16.2 mbgs in the limestone bedrock.

Test well TW1 was constructed according to O. Reg. 903, under the Ontario Water Resources Act, with 0.159 m (6.25") diameter steel casing extending to approximately 12.8 mbgs and the annular space sealed with cement grout. The height of the casing was approximately 0.6 metres above grade and therefore meets the requirements of O. Reg 903. Visual observations during field work indicated that test well was constructed and maintained to prevent surface water and other foreign materials from entering the wells.

No sources of potential contamination were evident during the site work on the subject property. We understand that water will be supplied using submersible pumps. Pump installation shall be undertaken in accordance with RRO 903 (Section 17). ASC understands based on Jack Knox Well Drilling and the information indicated on the well record that the pump be set at a depth of approximately 13.7 mbgs. ASC further understands that, should the intake be set at a depth greater than 13.7 mbgs, Jack Knox Well Drilling recommends the installation of a steel screen be installed from the bottom of the casing to the bottom of the well in order to protect the submersible pump and prevent cave in over the open hole portion of well construction.

A one-hour pumping test (and recovery) was conducted by the well driller at a pumping rate of 37.9 lpm (10 gpm), indicating 0.49 metres of drawdown after 1 hour and achieving 100% recovery after 30 minutes. The well is identified with MECP tag # A383968.

The test well record is attached in Appendix C.

### **4.4 Neighbouring Wells**

Adjacent land use consists of predominantly vacant wetlands and surface water bodies. North of the Site (across Wesley Acres Road) is Rambling Rose Nursey (agricultural use). Land use within 500 m of the Site consists of rural residential, commercial (short term rentals, campgrounds, etc.), and agricultural activity. A pre-survey and post-pumping survey was taken from the sole neighboring participant in the study, Mr. Tim Bucknell at 528 Wesley Acres Road. Mr. Tim Bucknell was identified as the closest neighboring water user, located approximately 600 metres from the test well; and was monitored for due diligence purposes despite being considered of low potential for impact based on the distance from the test well and the properties being separated by a surface water body.



The purpose of the survey was to establish water taking aquifer(s), treatment systems in place, address potential future water supply concerns from the proposed development and, also general communication with neighbours regarding the details of the proposed development. Figure 2 in Appendix A shows the location of the participating neighbour.

Results of the survey indicated 528 Wesley Acres Road had an approximately 13.4 metre deep drilled well, presumed to be completed in limestone bedrock. Mr. Bucknell indicated he has never had an issue with water quantity, and the well has produced sufficient water to support individual domestic requirements as well as his commercial farming operations (rose nursery, cattle, etc.). Mr. Bucknell indicated that he regularly tests the quality of his water, and with the exception of the water being slightly hard, no other health or aesthetic related water concerns were noted. Mr. Bucknell indicated that he uses a reverse osmosis system to treat hardness.

In addition to Mr. Bucknell's well, ASC utilized two (2) on-site wells for monitoring locations. These included the historical drilled well servicing the recreational cabins, and a monitoring well which was recently installed for the purposes of a geotechnical study to support the proposed development.

Neighbouring wells were monitored to assess potential interference impact during pumping tests for TW1 (February 2024). Results are discussed in Section 4.5 below and a tabular summary of neighbouring drawdown and recovery results are presented in Appendix E.

#### **4.5 Pumping Tests and Recovery Data**

One pumping test (TW1) was designed to assess groundwater supply and interference potential at the Site. The 24-hour pumping test (with recovery) was determined to be reasonable to assess the site hydrogeological conditions regarding long term water supply and potential adverse impacts to existing neighbouring stakeholders.

Following completion of well construction by Jack Knox Well Drilling, and prior to conducting pumping tests, the test well was not disturbed for a period of approximately two weeks to allow the wells to recover from drilling activities. Submersible test well pumping equipment was supplied by Jack Knox Well Drilling and site access by the Client.

The pumping test for test well TW1 was conducted on February 21 and 22, 2024. Referencing local weather data (Point Petre weather station), the region received approximately 14.7 mm of precipitation from February 1 to February 21. Based on the precipitation data, the location of the test well (highest point on the subject property topographically), the thickness of the overburden in the vicinity of the test well, and the composition of the overburden (two clay lenses), the pumping test was not conducted during a period of high groundwater recharge to the test well. Three (3) neighbouring wells, including two (2) water supply wells and one (1) monitoring well (See Section 4.4), were utilized for observation purposes during pumping tests to assess potential positive interference.

The well was fully developed prior to the pumping test (see Section 4.2 above). Prior to pumping, static water levels were measured and recorded, and a Solinst Levellogger was installed in the pumping test well; pre-set to record data at 1-minute intervals over the duration of the 24-hour pumping test, including



recovery. Test pumping rate was set at a p runout rate of 75 lpm for a period of 24 continuous hours to assess aquifer capacity and confirm potential long term water supply where storage may be required, resulting in maximum water taking of 106,000 litres per day; therefore, a Permit to Take Water was not required for the test however the filing of an EASR within the MECP Registry was required. The EASR was filed on February 20, 2024 and the registration number for the EASR was R-011-5270688883. In accordance with the requirements of the EASR, a Pumping Test Design Report can be made available by the Client upon request. Potential off-site impacts to adjacent water bodies or water users in the area as a result of the proposed taking were considered to be unlikely.

Water was discharged during the pumping tests downgradient from the test well to eliminate potential artificial recharge. Water level recovery was measured following pump shut down for a period of 24 hours or when 95% recovery was achieved. The specific capacity of the well was calculated near the end of the pumping test.

Neighbouring water supply wells were monitored prior to pumping tests, and during the pumping tests and recovery. No high yield well takings were identified within 500 metres of the site.

No sources of current or past potential contamination were evident on site during the hydrogeological study.

## **TW1**

The pumping test on test well TW1 was initiated on February 21, 2024 with a measured pumping rate of 75 lpm. Water levels were recorded at 1-minute intervals using the down well levellogger during pumping and recovery. Water levels were also measured manually during the pumping test. Pumping was undertaken continuously for 24 hours resulting in a measured drawdown of 0.83 metres, approximately 108,000 litres of water yielded from the limestone aquifer, and 95% recovery was attained approximately 30 minutes (0.5 hours) following pump shutdown. During pumping, steady state was identified after approximately 60 minutes indicating the limestone water supply aquifer is able to support the designed pumping rate. Approximately ninety-three percent (93%) of initial water supply was available in the well following pump shutdown. Specific capacity calculated over the final 420 minutes (7 hours)- of pumping showed 7500 l/min/m.

Reviewing the drawdown curves for the pumping test, the data indicate that TW1 pumping well reached equilibrium, with a maximum drawdown of approximately 0.83 meters, and approximately 11.5 m of well water supply available in the well following the pumping test.

Drawdown and recovery data, and field analysis results are shown in Appendix E.

Results of the pumping tests confirm that the limestone bedrock aquifer is able to support pumping rates in the order of 75 lpm. Based on the pumping test results and favourable recovery time following prolonged continuous pumping of 24 hours, sufficient aquifer storage and demonstrated yield is available to supply the well to meet the demand for the proposed development; without adversely impacting upon neighbouring resident water supply.

On the basis of the pumping test, the probable well yield determined is representative of the yields which the development are likely to obtain from the well in the long term.





We understand that water supply to the proposed development will be using submersible pumps. Please refer to pump installations recommendations outlined in Section 4.3 above. Pump installation should be undertaken by a licensed well contractor in accordance with O. Reg 903.

#### **4.6 Neighbouring and On-site Observation Well Response to Pumping Tests**

The effects of interference were monitored during well development and pumping of existing nearby on-site and neighbouring wells extending outward from the proposed development well a distance of approximately 100 m to 600 m.

Neighbouring wells were monitored to assess potential interference impact from pumping tests for TW1 (February 2024), to determine whether local well supply would be negatively impacted from the proposed development.

Prior to initiating pumping tests, neighbouring wells were monitored to measure initial static water levels. Some domestic wells were noted to have been in use prior to and during the pumping tests, as evidenced by periodic measured well recovery during the pumping test, this is to be expected considering the 24-hour duration of pumping and necessary water use by residents especially during early morning and evening (see results of individual neighbouring well water response in Appendix E).

#### **Test Well TW1 – February 21 and 22, 2024**

Positive response (interference drawdown) to pumping was not significant in neighbouring wells during the 24-hour pumping test for test well TW1. The neighboring well at 528 Wesley Acres Road was shown to have periods of drawdown and recovery prior to the completion of the pumping test, indicating sustained domestic use and no mutual well interference. Minor fluctuations were noted in on-site wells throughout the 24-hour pumping test for test well TW1. These fluctuations were less than 10 centimeters and were attributed to changes in barometric pressure and daily fluctuations, not mutual well interference.

The measured interference during pumping is an appropriate estimation of the influence.

#### **4.7 Potentiometric Data**

Referencing available site plans received from the Client, the ground surface elevation in the area of test well TW1 is approximately 82 masl, and the ground surface elevation in the area of observation well OW1 is approximately 77 masl. Referencing initial static levels from the pumping test of TW1, the groundwater elevations for TW1 and OW1 were estimated to be approximately 75.79 masl and 74.75 masl, respectively. The groundwater gradient between TW1 and OW1 was calculated to be approximately 0.005 (0.5%) to the southeast in the direction of West Lake. Note that Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property (proximal to TW1) and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) in all directions towards the surrounding wetlands and surface water bodies. On this basis, regional groundwater flow direction is expected to be radial relative to test well TW1.

Referencing the geotechnical investigation for the property, the monitoring well proximal to TW1 has a ground surface elevation of 81.13 masl. The static water level on the day of the pumping test was



measured to be 0.59 mbgs, yielding a groundwater elevation of approximately 80.54 masl. The monitoring well was noted as being approximately 6.1 mbgs in depth, screened within the overburden material, and therefore not representative of the underlying semi-confined limestone bedrock aquifer.

#### **4.8 Determination of Aquifer Supply – Pumping Test Analyses**

At completion of the 24-hour pumping test, total water taking from the limestone bedrock aquifer at a rate of 75 lpm, approached 108,000 litres. The pumping test completed (TW1) represents approximately 101% of the maximum daily design requirement, without observing significant drawdown of well supply, and favourable recovery within 30 minutes of pump shutdown, indicating a low potential for aquifer mining.

Test well pumping indicated the well reaching equilibrium conditions after approximately 60 minutes (1 hour) of continuous pumping at a rate of 75 liters per minutes (~ 20 gallons per minute);

Drawdown and recovery measurements obtained during the pumping test are presented in Appendix E.

Values of transmissivity were calculated from the pumping data by the Theis method which assumes the bedrock aquifer is analogous to a homogeneous, confined, porous media aquifer of infinite horizontal extent<sup>1</sup>. Local water supply wells are predominantly located in the upper limestone bedrock formation and are likely to vary in drawdown due to the wells varying ability to interface with water bearing fractures.

Recharge to the shallow unconfined limestone bedrock groundwater aquifer probably occurs with the vertical infiltration of water from near surface seasonal sources and precipitation. Recharge at the subject property would be in the form of precipitation. Recognizing that the limestone bedrock water bearing unit is not totally “confined” the Theis method sufficiently estimates aquifer parameters to assess site hydrogeological conditions.

##### *4.8.1 Pumping Test Analyses*

Bedrock hydrogeological values of transmissivity were calculated from the pumping data by the Jacob method, which assumes the heterogeneous limestone bedrock aquifer is analogous to a homogeneous, confined, porous media aquifer of infinite horizontal extent. Recognizing that the limestone bedrock water bearing unit is likely to exhibit semi-confining conditions, the Jacob method sufficiently estimates the aquifer parameters to assess well hydrogeological conditions.

Hydraulic Conductivity (K) values calculated from the Jacob method ranged from  $6.4 \times 10^{-5}$  m/s to  $1.9 \times 10^{-0}$  m/s and Transmissivity (T) values ranged from  $4.09 \times 10^{-4}$  m<sup>2</sup>/s to  $1.2 \times 10^1$  m<sup>2</sup>/s. The Theis method data are summarized on Table 1 in Appendix F. The storativity (S) values shown on Table 1 in Appendix F were obtained from the Jacob method and ranged from  $5.6 \times 10^{-1}$  to  $1.8 \times 10^{-5}$ . Based on a typical storativity of 0.005 to 0.00005 for a fully confined aquifer, calculated storability values are indicative of the expected semi-confined condition.

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<sup>1</sup> Applied Hydrogeology, Second Edition, Fetter C.W. 1980.

#### 4.8.2 Predicted Potential Well Interference

The Theis and Jacob solution (using test well data) was utilized to assess the effects on a “residential” well located  $r = 250$  m radial distance (approximate minimum distance to subject property boundary from test well) from the pumping well TW1 when pumping at the expected daily design demand of  $Q = 106,750$  litres/day. For purposes of evaluating the water supply at the site average  $K$ ,  $S$  and  $T$  (see Table 1 in Appendix F) were utilized and are summarized as follows:

**Hydraulic Conductivity ( $K$ ) =  $3.9 \times 10^{-1}$  m/sec**

**Storage Coefficient ( $S$ ) =  $1.6 \times 10^{-1}$**

**Transmissivity ( $T$ ) =  $2.5 \times 10^0$  m<sup>2</sup>/sec**

Using the Theis solution, one can estimate the drawdown at a distance “ $r$ ” for a specified time period. We have chosen,  $t = 20$  years.

$$\text{Drawdown (s)} = \frac{Q}{4\pi T} * W(u)$$

Where the well function,  $W(u)$ , can be estimated from known values, based on the following relationship:

$$u = \frac{r^2 S}{4Tt}$$

$r$  = distance from pumping well to neighbouring well

Solving for  $u$ , after  $t = 20$  years, and a radial distance  $r = 250$  m (approximate minimum distance to subject property boundary from test well) and using the average aquifer parameters for  $T$  and  $S$ , results in a  $u = 1.62 \times 10^{-6}$  and a corresponding well function  $W(u) = 12.75$ . Applying these results to the Theis solution as shown above, the calculation predicts that a drawdown of approximately 0.26 m would occur in the well of interest at a distance of 250 m, after pumping continuously for 20 years. The Theis solution analyses, and input values are presented in Appendix F.

The Jacob method was also utilized for comparison purposes and the data showed similar results following pumping for 20 years at a radial distance –  $r = 250$  m. The solution analyses, and input values are presented in Appendix F.

#### 4.8.3 Potential Long-Term Well Interference

Based on the results from the drawdown curves of the 24-hour pumping test, showing drawdown of approximately 0.8 m during pumping; resulting available well supply drawdown remaining following pumping in the order of 11.5 m, and test well TW1 attaining equilibrium after approximately 60 minutes of pumping, demonstrates sufficient available drawdown in the test wells to support the proposed pumping conditions.

Neighbouring observation wells showed no response during the pumping test, confirming a sustained yield sufficient to supply the proposed development without interference to neighbouring properties.



Furthermore, a favourable recovery rate was measured following the pumping test showing the hydrogeological ability of the supply aquifers to recover and meet the anticipated daily demand.

Comparing the calculated and predicted drawdown of approximately 0.26 m at a radial distance of 250 m, there is sufficient available drawdown in the site wells to support the proposed pumping conditions without creating adverse effects to neighbouring wells.

Based on the calculated and predicted drawdown, existing neighbouring water supply wells accessing the limestone aquifer would not likely experience drawdown resulting from the proposed development, given the calculated assessment was for continuous pumping and clearly conservative; and the actual peak demand required by a neighbour accessing the same aquifer would be considerably less on a daily basis.

The measured interference during pumping is an appropriate estimation of the potential influence.





## 5.0 GROUNDWATER QUALITY

The test well was chlorinated prior to pumping. Residual chlorine was measured from the pump discharge during the pumping tests prior to sample collection using a Hach DR 900 Colorimeter (see Appendix F). Samples were collected following confirmation of chlorine residual (no longer present in groundwater).

Water samples were collected from pumping test well TW1 after approximately 6 hours of pumping (in reference to D-5-5 criteria based on a typical 6-hour test), and in the last hour (23) near completion of the pumping test (in accordance with D-5-5). This frequency was determined when developing the pumping test program to be reasonable for assessment of potential variations in water quality with continued long-term use.

During pumping tests, hourly field readings for conductivity, total dissolved solids, and pH. These were measured from the discharge pipe using a Hanna HI 98130 Meter as a field screening quality control measure.

Hourly field readings for turbidity were measured from the discharge pipe at the test well using a Hach DR 900 Colorimeter also. Field turbidity readings prior to groundwater sample collection is exercised as turbidity may be influenced by changes in conditions (i.e. temperature, pressure etc.) between the point of collection on site and sample receipt and analyses at the laboratory.

Sterile sample vessels were numbered and recorded prior to sampling. Samples were collected by filling laboratory supplied bottles from the discharge pipe using sterile sampling practices. Samples were recorded on chain of custody records, stored in a cooler with ice and transported directly to a CALA certified laboratory for chemical analyses with comparison to MECP Procedure D-5-5 and the Ontario Drinking Water Standards (ODWS).

Following receipt of laboratory analyses results, field readings were compared to laboratory results; percent difference between laboratory results and field readings were generally +/- 7%.

Results of analyses are presented in the following sections.

### 5.1 On-Site Groundwater Quality

Samples were collected following confirmation of chlorine residual no longer present in groundwater. Test well water samples were collected from pumping test well TW1 after approximately 6 hours of pumping (in reference to D-5-5 criteria based on a typical 6-hour test), and in the last hour (23) near completion of the pumping test (in accordance with D-5-5).

Tabulated results with comparison to referenced criteria and laboratory analytical certificates are presented in Appendix G.

#### 5.1.1 Health Related Bacteriological Parameters

Bacteriological chemical results from the test well did not detect E coli, total coliform or fecal coliform in the analyzed groundwater samples.



We recommend disinfection of test wells supplying drinking water to the development and installation of UV treatment (or similar) to ensure a bacteriological free water supply. Laboratory analytical certificates are attached in Appendix G.

#### *5.1.2 Health Related Chemical and Physical Parameters*

Nitrate and Nitrite concentrations were below laboratory detection in the samples from the test well.

Sodium concentrations ranging from 6.2 mg/L to 6.4 mg/L were detected in water samples from test well TW1. Sodium concentrations were therefore interpreted to meet both health-related (20 mg/L) and aesthetic objectives (200 mg/L).

Field turbidity results showed turbidity at 0 NTU at the time of collection for each sample, respectively. Laboratory test well turbidity results for Test Well TW1 showed a turbidity of 0.4 NTU after 6 hours, and 1.4 NTU in the final hour of pumping. We are of the opinion that the laboratory result may have been subject to precipitate in the sample water during transport or handling to/by the laboratory, and the field result is likely representative of well water conditions. Where persistent turbidity levels are encountered installing a pre-filter and ultra violet light system to the drinking water system would be effective in managing turbidity.

#### *5.1.3 Common Aesthetic, Analytical and Indicator Parameters*

The operational guideline for hardness is 80-100 mg/L and the ODWO level is 500 mg/L. Sample analyses for TW1 identified hardness of 274 mg/L to 283 mg/L. Total Dissolved Solids (TDS) were measured at 282 mg/L to 287 mg/L. Hardness and TDS in water usually occur when elevated concentrations of calcium, magnesium, and chlorides are present in water. Elevated concentrations of hardness and TDS may result in scale build-up and mineral deposits on hot water heaters and plumbing fixtures. Hard water can be readily treated through ion exchange water softening.

Results of chemical analysis from the test well showed concentrations of the remaining tested parameters which met their respective aesthetic, analytical, or indicator parameters in groundwater samples collected from the test well.

To ensure safe drinking water is provided to the site users, we recommend disinfection to ensure a long-term source of good quality groundwater for consumption purposes. We recommend contracting a water quality professional to confirm treatment options.



## **6.0 GROUNDWATER UNDER DIRECT INFLUENCE OF SURFACE WATER (GUDI)**

When drinking water wells are constructed in close proximity to permanent surface water bodies (i.e. ponds, lakes, rivers, creeks etc.), the bedrock aquifer(s) may be vulnerable to surface water influence due to shallow overburden and fracturing of the bedrock providing connectivity between the surface water and the groundwater source.

To determine whether the test well may be under direct influence from the adjacent Bloomfield Creek Wetlands and West Lake we reviewed the following data:

1. On-site water well record
2. The pumping test drawdown data,
3. The water quality parameters measured in the field during pumping and;
4. The laboratory bacteriological results.

Referencing the well record, approximately 11.9 metres of overburden, including clay lenses, are present at the subject property which are likely capable of providing adequate protection to prevent potential infiltration of surface water influences to groundwater.

Referencing well seating, the test well is located at approximately the highest point topographically on the property, and as a result radial flow is expected away from the well towards the wetlands, further protecting it from surface water influence.

Field indicator parameters: temperature, turbidity, conductivity, and total dissolved solids, measured with a Hanna HI 98130 Meter, were observed to be consistent during the pumping test for test well TW1 and field indicator parameters generally varied less than 10% between hourly readings.

E. Coli, Fecal Coliform, and TC were not detected in the groundwater samples collected from TW1. Nitrate and Nitrite concentrations were below the detectible limit in the groundwater samples collected from TW1.

Drawdown data, based on an approximate well elevation of 82 masl and a static level of 7.75 metres below top of pipe at equilibrium, would indicate equilibrium was reached at a groundwater level of approximately 75 masl. Referencing the water level of West Lake (74 masl), the distance to the nearest surface water (200 metres depending in the direction of OW1), and the 0.5% gradient calculated in Section 4.7; drawdown data would be consistent with radial flow from the test well towards the lake at a 0.5% gradient.

Based on the depth of the wells, the depth of the overburden, the water quality, and results of the drawdown data; results of the study do not suggest potential connectivity with the down gradient adjacent water body.



## **7.0 SEWAGE SYSTEM ASSESSMENT**

### **7.1 Terrain Analyses**

Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) in all directions towards the surrounding wetlands and surface water bodies.

The past land use for the subject property was considered to be vacant/agricultural, with cultivated fields occupying the eastern portion, a mix of cultivated fields and forests occupying the western peninsula, and rural recreational cabins located in the southern portion of the property along the West Lake shoreline. Limestone bedrock outcropping was not observed at the subject property, or within the general study area. Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man made pond present on the east side of the site access drive in the northern portion of the subject property. Figure 2 shows the property layout. A topographic plan is shown on Figure 5 in Appendix A. A concept drawing is shown in Appendix B.

We understand that Groundwork Engineering is conducting a terrain and sewage assessment for the subject property and therefore a rigorous nitrate assessment is outside the scope of this hydrogeological study.

Based on the results of groundwater sample analyses for nitrate and nitrite parameters we do not anticipate elevated concentrations at the downgradient boundary due to existing site groundwater quality.





## 8.0 CONCLUSIONS AND RECOMMENDATIONS

The following summarizes the characterization of the hydrogeological conditions for the proposed development site located 565 Wesley Acres Road, Ontario:

- The proposed development will include, but not be limited, to nine (9) camper residencies, a lodge, hospital, director's cabin, indoor activity area, and flex area; occupying 33.6 hectares of the property.
- The development is proposed to be serviced with private on-site well water supply (with supplemental storage) and two (2) large private on-site sewage works treatment systems. Based on the maximum occupancy, resulting net daily water taking of approximately 106,750 L/day is anticipated for the proposed development.
- Well water storage is anticipated to manage daily supply requirements.
- Land use within 500 m of the Site consists of rural residential, commercial (short term rentals, campgrounds, etc.), and agricultural activity.
- Existing residential, commercial and agricultural developments in this area of Prince Edward County currently utilize individual on-site private services. Existing services in the local area (minimum 500 m radius), consist of private well water supply and individual private septic systems. The Corporation of the County of Prince Edward is lacking municipal services and based on the above conditions and our evaluation of existing development in the local area, we believe that the proposed development is consistent with the Provincial Policy Statement and recommend the use of communal well water services and on-site sewage services.
- Site topography can be generally described as rolling hills, with the high point of the property being at approximately the centroid of the property and sloping downwards 10 – 15 metres (Elevation generally 85 to 75 masl) in all directions towards the surrounding wetlands and surface water bodies. Bloomfield Creek Wetlands (a provincially significant wetland area) are present northwest/west adjacent to the subject property, unnamed creeks and associated wetlands are present northeast/east adjacent to the subject property, and the southern boundary of the subject property is the shoreline of West Lake. West Lake feeds into Lake Ontario, located approximately 4 kilometers west/southwest of the subject property. In addition to these surface water features, there is a man-made pond present on the east side of the site access drive in the northern portion of the subject property.
- The on-site hydrogeological investigation was conducted to assess site groundwater supply conditions through a 24-hour pumping test on test well TW1. Water quantity was assessed on the basis of the pumping test; water quality was assessed on the basis of chemical and bacteriological sample collection and analyses for water samples after approximately 6 hours of pumping and in the final hour of the pumping test; and potential interference was investigated through monitoring neighbouring and on-site wells.



- The pumping test for test well TW1 was conducted on February 21 and 22, 2024. Referencing local weather data (Point Petre weather station), the region received approximately 14.7 mm of precipitation from February 1 to February 21. Based on the precipitation data, the location of the test well (highest point on the subject property topographically), the thickness of the overburden in the vicinity of the test well, and the composition of the overburden (two clay lenses), the pumping test was not conducted during a period of high groundwater recharge to the test well.
- Reviewing the drawdown and recovery curves for the pumping test, the data indicate that TW1 showed a maximum drawdown of approximately 0.83 m following 24 hours of pumping reaching equilibrium after approximately 60 minutes (1 hour) of continuous pumping at a rate of 75 liters per minutes (~ 20 gallons per minute); and over 11 metres (approximately 93%) of well water supply was available in the well following the 24-hour pumping test. Recovery of the well to 95% was attained within 30 minutes (half an hour).
- Results of the pumping tests confirm that the limestone bedrock aquifer is able to support a sustained pumping rate of 75 liters per minute. Based on the pumping test results and favourable recovery time following prolonged continuous pumping of 24 hours, sufficient aquifer storage and demonstrated yield is available to supply the well to meet the demand for the proposed development; without adversely impacting upon neighbouring resident water supply.
- Results of interference monitoring of neighbouring wells generally did not show a positive response (interference drawdown) to pumping during the 24-hour pumping test. Neighbouring wells showed sufficient water supply storage remaining following the pumping test.

The measured interference during pumping is an appropriate estimation of the anticipated influence for the proposed development.

- Calculated long-term drawdown at 20 years of continuous pumping at 106,750 L/day shows approximately 0.26 m at a radial distance of 250 m from test well TW1. Therefore, based on the predicted drawdown analyses, adverse impact to existing neighbouring well water supply is not expected.
- Water quality tests did not identify bacteriological concerns in the two (2) water samples collected from test well TW1 (after 6 hours and in the last hour of the test).

We recommend disinfection (UV treatment or similar) to ensure a bacteriological free water supply.

- Nitrate and Nitrite concentrations were below laboratory detection in the two (2) water samples from test well TW1.
- Field turbidity results showed turbidity at 0 NTU at the time of collection for each sample, respectively. Laboratory test well turbidity results for Test Well TW1 showed a turbidity of 0.4



March 22, 2024

NTU after 6 hours, and 1.4 NTU in the final hour of pumping. We are of the opinion that the laboratory result may have been subject to precipitate in the sample water during transport or handling to/by the laboratory, and the field result is likely representative of well water conditions. Where persistent turbidity levels are encountered installing a pre-filter and ultra violet light system to the drinking water system would be effective in managing turbidity.

- Sodium concentrations ranging from 6.2 mg/L to 6.4 mg/L were detected in water samples from test well TW1. Sodium concentrations were therefore interpreted to meet both health-related (20 mg/L) and aesthetic objectives (200 mg/L).
- The operational guideline for hardness is 80-100 mg/L and the ODWO level is 500 mg/L. Sample analyses for TW1 identified hardness of 274 mg/L to 283 mg/L. Total Dissolved Solids (TDS) were measured at 282 mg/L to 287 mg/L. Hardness and TDS in water usually occur when elevated concentrations of calcium, magnesium, and chlorides are present in water. Elevated concentrations of hardness and TDS may result in scale build-up and mineral deposits on hot water heaters and plumbing fixtures. Hard water can be readily treated through ion exchange water softening.

To ensure safe drinking water is provided to the site users, we recommend disinfection to ensure a long-term source of good quality groundwater for consumption purposes. We recommend contracting a water quality professional to confirm treatment options.

- A pre-survey and post-pumping survey was taken from the sole neighboring participant in the study, Mr. Tim Bucknell at 528 Wesley Acres Road. Mr. Tim Bucknell was identified as the closest neighboring water user, located approximately 600 metres from the test well; and was monitored for due diligence purposes despite being considered of low potential for impact based on the distance from the test well and the properties being separated by a surface water body. Results of the survey indicated 528 Wesley Acres Road had an approximately 13.4 metre deep drilled well, presumed to be completed in limestone bedrock. Mr. Bucknell indicated he has never had an issue with water quantity, and the well has produced sufficient water to support individual domestic requirements as well as his commercial farming operations (rose nursery, cattle, etc.). Mr. Bucknell indicated that he regularly tests the quality of his water, and with the exception of the water being slightly hard, no other health or aesthetic related water concerns were noted. Mr. Bucknell indicated that he uses a reverse osmosis system to treat hardness.
- Based on an evaluation of the hydrogeological investigative work, it is evident that the down gradient reasonable use of groundwater is primarily for individual domestic consumption; and sewage management is through raised or in ground private leaching bed septic systems for the neighbouring properties. This is not anticipated to change based on existing local site development and the Township of Stone Mills Official Plan.

The scale of the proposed development makes it more challenging to support in ground/raised leaching beds for conventional large private services. Based on the proposed daily loading, the



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site will require a large treatment system designed in accordance with MECP regulations, guidelines and Section 53 of the *Ontario Water Resources Act* (OWRA). Preliminary sewage treatment plans for this site are being prepared by Groundwork Engineering Inc. We understand the proposed treatment systems would likely include the following:

4. In ground balancing and/or pre-treatment tanks
5. Treatment system with in ground and above ground components (extended aeration or membrane bio-reactor)
6. Nutrient removal system (recirculation and chemical ad-mixture)





## 9.0 STUDY LIMITATIONS

*ASC Environmental Inc.* was retained by *Groundwork Engineering* (herein after referred to as 'Groundwork') on behalf of *Campfire Circle* (herein after referred to as the 'Client') to undertake a hydrogeological investigation for the development proposal located at 565 Wesley Acres Road, Bloomfield, Ontario.

The findings reported in this document are based on the tasks completed by *ASC Environmental Inc.* under the mutually agreed scope of work. Professional judgment, experience with similar investigations, and available data collected within the scope of work form the basis for this report. *ASC Environmental Inc.* has prepared this report using information understood to be factual and correct and shall not be responsible for conditions arising from information or facts that were inaccurate, concealed, or not fully disclosed at the time of investigation. Therefore, ASC cannot be held responsible for environmental conditions at the Property that were not apparent from the available information. No investigation method can completely eliminate the possibility of obtaining partially imprecise or incomplete information; it can only reduce the possibility to an acceptable level.

*ASC Environmental Inc.* 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 these interpretations may change over time.

*ASC Environmental Inc.* is not able to represent that the site or adjoining lands contain no hazardous waste, oil, or other latent condition beyond that detected or observed. The possibility exists for hazardous substances to migrate through surface water, air, soil, or groundwater. The ability to accurately address the environmental risk associated with these media is beyond the scope of this assessment.

This document has been prepared by *ASC Environmental Inc.* for the sole use of *Groundwork Engineering* and *assignees* to assess hydrogeological site conditions at the time of the study related to the subject site. Unauthorized reuse of this document for other purposes, or by any other party, or any reliance on or decisions to be made based on it, are the responsibility of the third parties. If additional parties require reliance on this report, written authorization from *ASC Environmental Inc.* will be required. Such reliance will only be provided by *ASC Environmental Inc.* following written authorization from the Client. *ASC Environmental Inc.* disclaims responsibility of consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. No other warranties are implied or expressed.

*ASC Environmental Inc.* will not be responsible for any consequential or indirect damages. *ASC Environmental Inc.* will only be liable for damages resulting from negligence of *ASC Environmental Inc.* *ASC Environmental Inc.* will not be liable for any losses or damage if the Client has failed, within a period of two years following the date upon which the claim is discovered (Claim Period), to commence legal proceedings against *ASC Environmental Inc.* to recover such losses or damage unless the laws of the jurisdiction which govern the Claim Period which is applicable to such claim provides that the application Claim Period is greater than two years and cannot be abridged by the contract between the Client and *ASC Environmental Inc.*, in which case the Claim Period shall be deemed to be extended by the shortest



additional period which results in this provision being legally enforceable.

We thank you for the opportunity to work with you on this project, and trust that this report meets your satisfaction.



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## 10.0 REFERENCES

- (1) Ministry of Environment, Conservation and Parks (MECP) 2004. Protocol for Analytical Methods Used in the Assessment of Properties. Ministry of Environment.
- (2) RRO 1990; Reg 903: Wells
- (3) The Ontario Department of Mines and Northern Affairs (Map 2227), Physiography of the Eastern Portion of Southern Ontario . L. J. Chapman and D. F. Putnam. 1972.
- (4) The Ministry of Northern Development and Mines,(Map 2544), Bedrock Geology of Ontario (Southern Sheet). L. J. Chapman and D. F. Putnam. 1972.
- (5) MECP Hydrogeological Technical Information Requirements for Land Development Applications (April 1995).
- (6) MECP Water Well Records Database
- (7) MECP Procedure D-5-5 Technical Guideline for Private Wells: Water Supply Assessment (August 1996)
- (8) Ontario Building Code - Section 8.2 Design Standards
- (9) O.Reg. 169/03. Ontario Drinking Water Standards (ODWS)
- (10) Jagger Hims Limited and the Ontario Geological Survey 1999. Aggregate resources inventory of Prince Edward County; Ontario Geological Survey, Aggregate Resources Inventory Paper 172, 46p.
- (11) Applied Hydrogeology (2<sup>nd</sup> Edition), C.W. Fetter, 1988.
- (12) AQTESOLVE – Aquifer Test Analysis Software
- (13) Google Maps. (2016). Internet: <https://www.google.ca/maps>
- (14) MECP Guideline D-5 Planning for Sewage and Water Services
- (15) Implementation Guideline for Policy Statement B7, 'Planning for Sewage and Water Services'
- (16) MECP Stormwater Planning and Design Manual (2003 – updated 2015)
- (17) Ontario Water Resources Act R.S.O. 1990,
- (18) Environmental Protection Act R.S.O. 1990
- (19) Environmental Assessment Act R.S.O. 1990.
- (20) The Planning Act.
- (21) The Provincial Policy Statement. 2014
- (22) Ministry of Environment Conservation and Parks (MECP) Hydrogeological Technical Information Requirements for Land Development Applications (1995)
- (23) Guideline B-1 Water Management Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of the Environment
- (24) Guideline B-7 Incorporation of the Reasonable Use Concept into MECP Groundwater Management Activities
- (25) Procedure B-7-1 Determination of Contaminant Limits and Attenuation Zones
- (26) Authorship of Water Resource Impact Assessment
- (27) MECP Procedure D-5-4 “Technical Guideline for Individual On-Site Sewage Systems – Water Quality Impact Risk Assessment” and MECP “Design Guidelines for Sewage Works 2008”



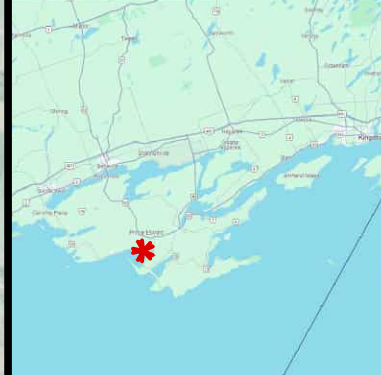
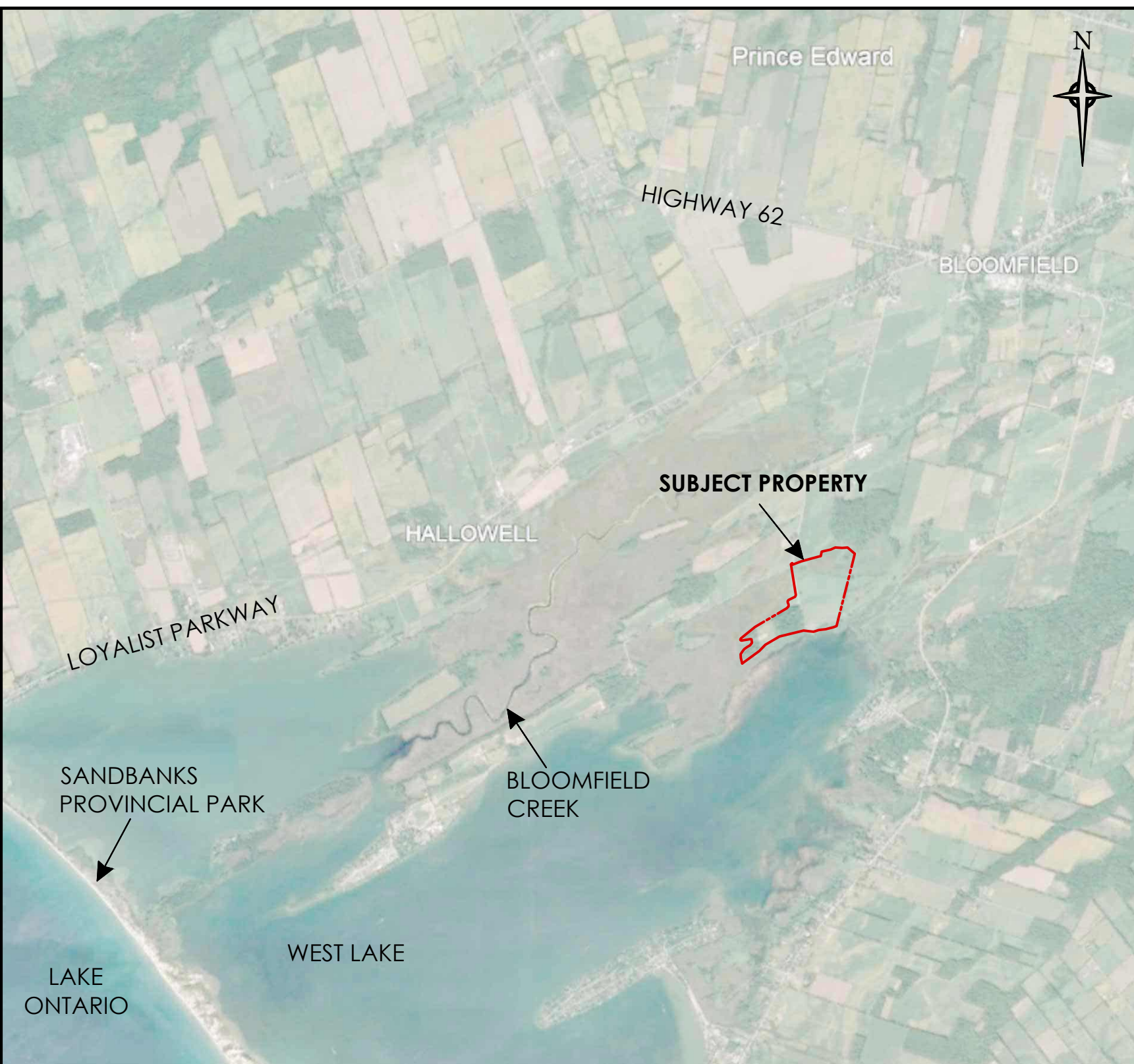
## **APPENDIX A**

### **Figures**



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| LEGEND |                                       |
|--------|---------------------------------------|
|        | SUBJECT PROPERTY LOCATION             |
|        | APPROXIMATE SUBJECT PROPERTY BOUNDARY |

| DRAWING TITLE      |  |
|--------------------|--|
| Site Location Plan |  |

| FIGURE NO. | DRAWN BY |
|------------|----------|
| 01         | T. Asma  |

| PROJECT               |
|-----------------------|
| Hydrogeological Study |

| CLIENT          |
|-----------------|
| Campfire Circle |

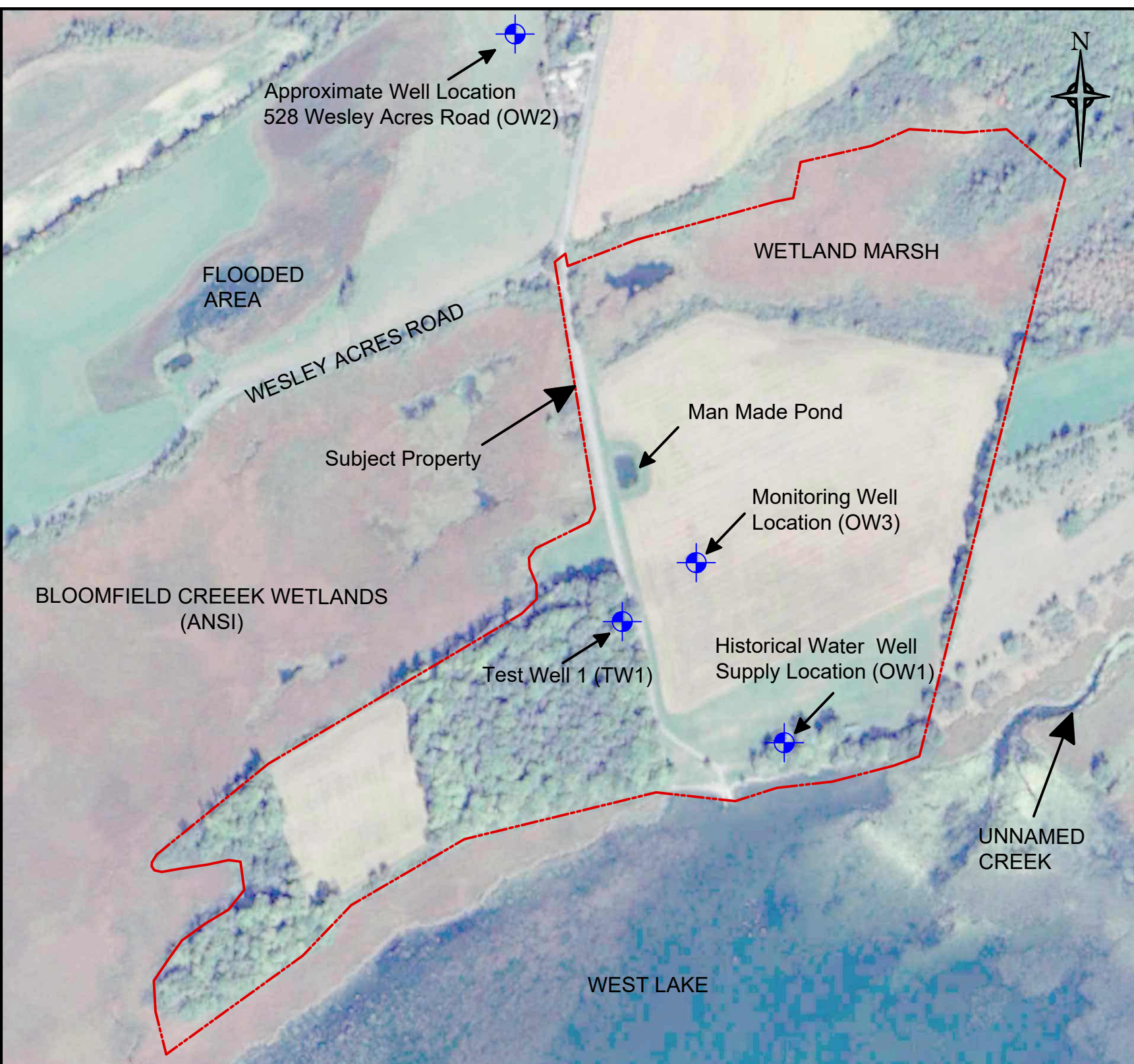
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| <b>PROJECT NO.</b><br>ASC-870 | <b>SCALE:</b><br> |
| <b>DATE</b><br>22-Mar-2024    |                                                                                                        |



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**LEGEND**  

APPROXIMATE SUBJECT PROPERTY BOUNDARY

APPROXIMATE WELL LOCATION

**DRAWING TITLE**  
Site Layout Plan

**FIGURE NO.**  
02

**DRAWN BY**  
T. Asma

**PROJECT**  
Hydrogeological Study

**CLIENT**  
Campfire Circle

**LOCATION**  
565 Wesley Acres Road,  
Bloomfield, ON

**PROJECT NO.**  
ASC-870

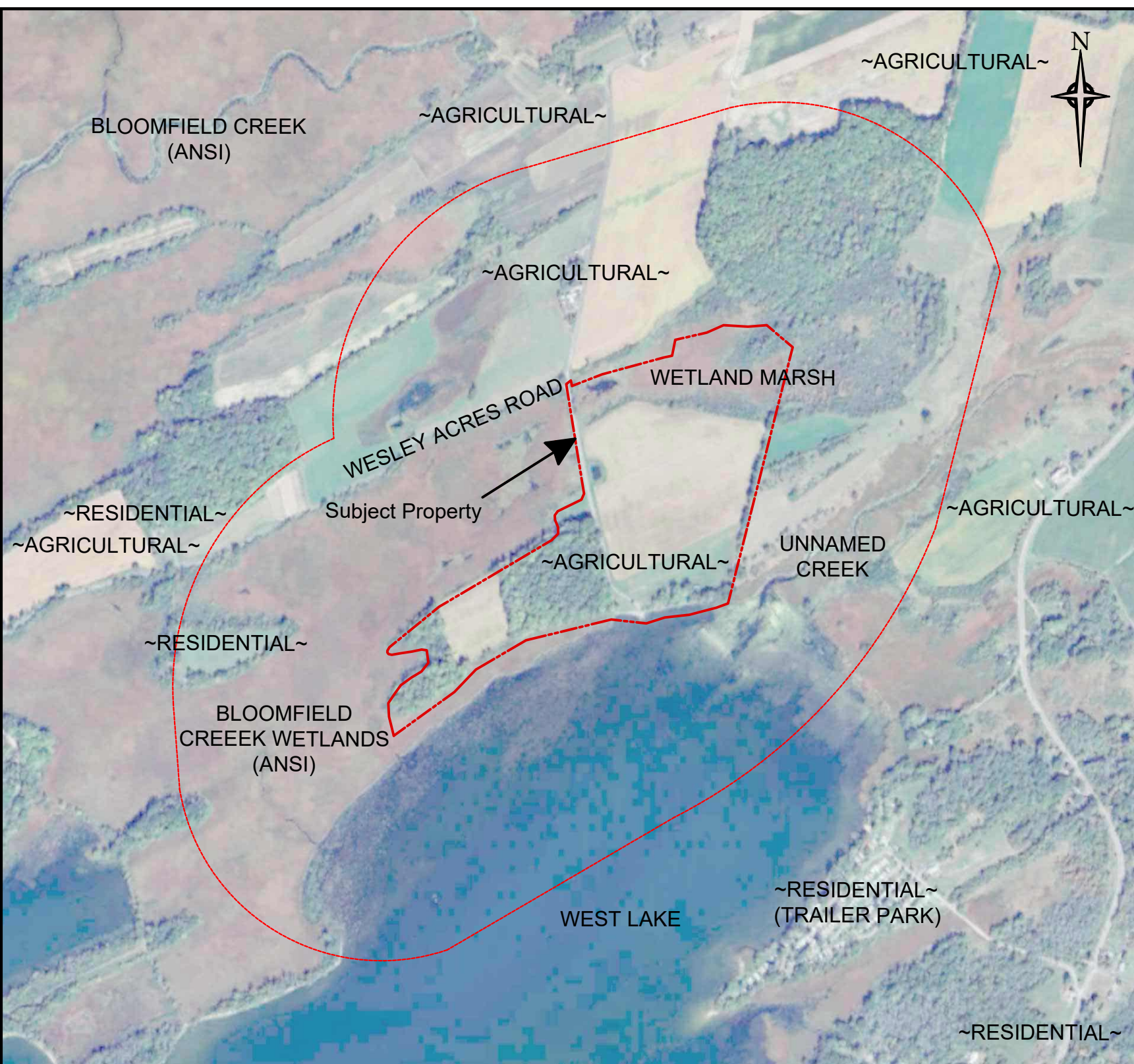
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0 METRES 106

**DATE**  
22-Mar-2024

  
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**LEGEND**  
--- APPROXIMATE SUBJECT PROPERTY BOUNDARY

**DRAWING TITLE**  
500 Metre Layout

**FIGURE NO.**  
03

**DRAWN BY**  
T. Asma

**PROJECT**  
Hydrogeological Study

**CLIENT**  
Campfire Circle

**LOCATION**  
565 Wesley Acres Road,  
Bloomfield, ON

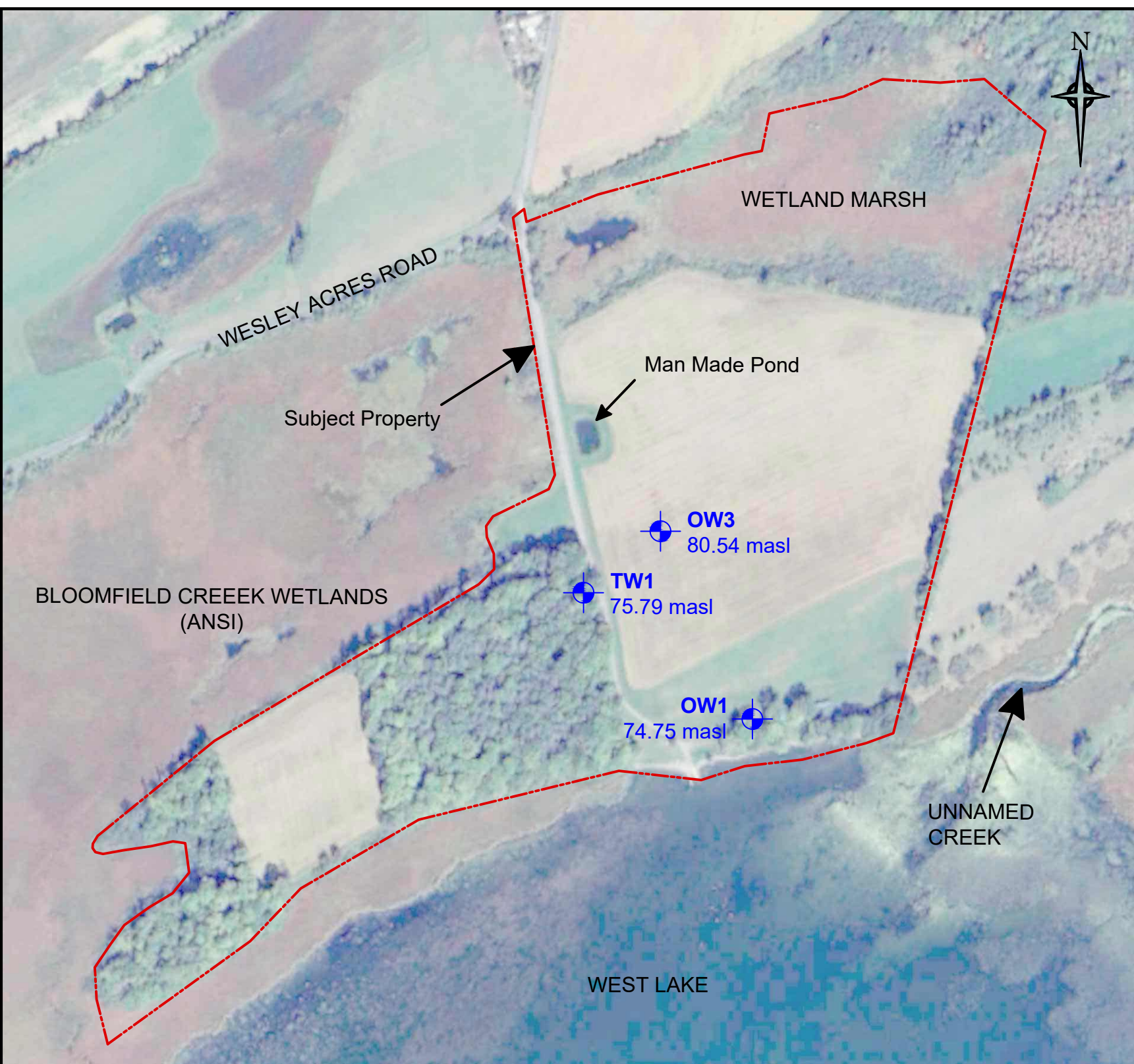
**PROJECT NO.**  
ASC-870

**SCALE:**  
0 240 METRES

**DATE**  
22-Mar-2024

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**LEGEND**  
 APPROXIMATE SUBJECT PROPERTY BOUNDARY  
 APPROXIMATE WELL LOCATION

**DRAWING TITLE**  
Groundwater Elevation Layout

|                         |                            |
|-------------------------|----------------------------|
| <b>FIGURE NO.</b><br>04 | <b>DRAWN BY</b><br>T. Asma |
|-------------------------|----------------------------|

**PROJECT**  
Hydrogeological Study

**CLIENT**  
Campfire Circle

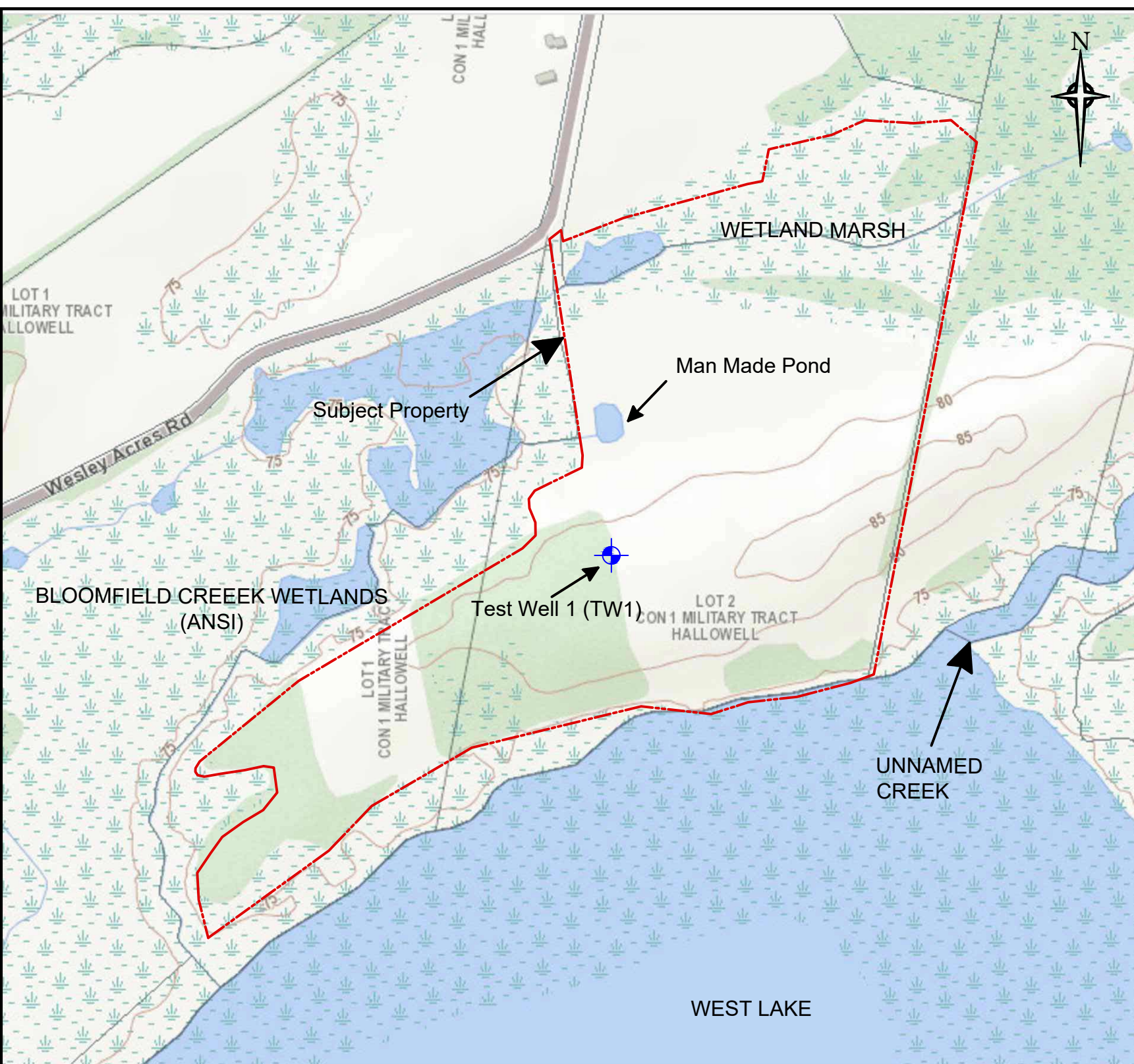
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Bloomfield, ON

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| <b>PROJECT NO.</b><br>ASC-870 | <b>SCALE:</b><br> |
|-------------------------------|-------------------|

|                            |
|----------------------------|
| <b>DATE</b><br>22-Mar-2024 |
|----------------------------|

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**LEGEND**  
--- APPROXIMATE SUBJECT PROPERTY BOUNDARY

**DRAWING TITLE**  
Topographic Map

|                         |                            |
|-------------------------|----------------------------|
| <b>FIGURE NO.</b><br>05 | <b>DRAWN BY</b><br>T. Asma |
|-------------------------|----------------------------|

**PROJECT**  
Hydrogeological Study

**CLIENT**  
Campfire Circle

**LOCATION**  
565 Wesley Acres Road,  
Bloomfield, ON

|                               |                               |
|-------------------------------|-------------------------------|
| <b>PROJECT NO.</b><br>ASC-870 | <b>SCALE:</b><br>0 METRES 120 |
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| <b>DATE</b><br>22-Mar-2024 |
|----------------------------|

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## **APPENDIX B**

### **Concept Plan**



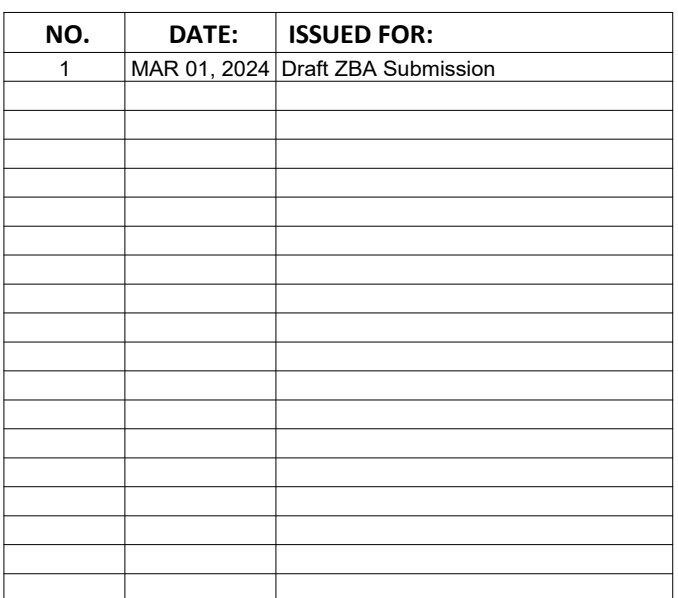
***ASC Environmental Inc.***  
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This drawing, as an instrument of service, is provided by and is the property of Teeple Architects Inc., and shall be used only for the project named on this drawing and solely for reference purposes only. The contractor is responsible for the coordination and verification of all dimensions contained herein and all measurements and conditions on site as they pertain to these documents. The contractor shall report any discrepancies to the consultant in writing prior to the commencement of any affected work.

This drawing, as an instrument of service, is provided by and is the property of Teeple Architects Inc., and shall be used only for the project named on this drawing and solely for reference purposes only. The contractor is responsible for the coordination and verification of all dimensions contained herein and all measurements and conditions on site as they pertain to these documents. The contractor shall report any discrepancies to the consultant in writing prior to the commencement of any affected work.

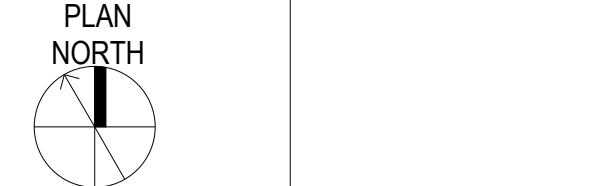
This drawing shall not be used for construction purposes  
unless countersigned



**CAMPFIRE  
CIRCLE**  
HEALING THROUGH HAPPINESS

## CAMPFIRE CIRCLE

565 Wesley Acres Rd  
Bloomfield, Ontario K0K 1G0



SEAL

## SITE PLAN

|               |                |
|---------------|----------------|
| DRAWN BY      | CHECKED BY     |
| <b>Author</b> | <b>Checker</b> |

|                |              |        |           |
|----------------|--------------|--------|-----------|
| PROJ NO        | SCALE        | FORMAT | PLOT DATE |
| TAI:<br>23-105 | As indicated | ARCH D | 09/10/15  |

# A011



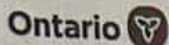
## **APPENDIX C**

### **Test Well Record**



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Ministry of the Environment,  
Conservation and Parks

Well Tag No. (Place sticker next to row)

Tag#: A383968

Well Record  
Regulation 903 Ontario Water Resources Act

Measurements recorded in: ☐ Metric ☒ Imperial

Page of

### Well Owner's Information

First Name: CAMPFIRE CIRCLE  
Last Name/Organization: Mailing Address (Street Number/Name): 464 BATHURST ST  
Municipality: TORONTO Province: ONT Postal Code: M5T 2S6 Telephone No. (inc. area code): 416 060 0025

Well Location  
Address of Well Location (Street Number/Name):  
Township: HALLOWELL Lot: 2 Concession: 1 MT  
County/District/Municipality: PRINCE EDWARD  
City/Town/Village: Ontario  
UTM Coordinates: Zone: 18 Easting: 319348 Northing: 4869942 Municipal Plan and Sublot Number: 47R7638 PT 1

| Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) |                      |                 | Depth (m/ft) |     |
|---------------------------------------------------------------------------------------------------------|----------------------|-----------------|--------------|-----|
| General Colour                                                                                          | Most Common Material | Other Materials | From         | To  |
| BROWN                                                                                                   | CLAY                 |                 | 0'           | 8'  |
| BROWN                                                                                                   | SAND                 |                 | 8'           | 23' |
| BLUE                                                                                                    | CLAY                 |                 | 23'          | 39' |
| BLUE                                                                                                    | LIMESTONE            |                 | 39'          | 56' |
| BLACK                                                                                                   | LIMESTONE            |                 | 56'          | 60' |

| Annular Space       |                                          |                                                  | Results of Well Yield Testing                                                                                                              |                    |            |                    |
|---------------------|------------------------------------------|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|--------------------|------------|--------------------|
| Depth Set at (m/ft) | Type of Sealant Used (Material and Type) | Volume Placed (m <sup>3</sup> /ft <sup>3</sup> ) | Draw Down                                                                                                                                  |                    | Recovery   |                    |
|                     |                                          |                                                  | Time (min)                                                                                                                                 | Water Level (m/ft) | Time (min) | Water Level (m/ft) |
| 42                  | CEMENT                                   | 8 ft <sup>3</sup>                                |                                                                                                                                            |                    |            |                    |
|                     |                                          |                                                  | After test of well yield, water was:<br><input checked="" type="checkbox"/> Clear and sand free<br><input type="checkbox"/> Other, specify |                    |            |                    |
|                     |                                          |                                                  | If pumping discontinued, give reason:                                                                                                      |                    |            |                    |
|                     |                                          |                                                  | Static Level                                                                                                                               | 22.6               |            |                    |
|                     |                                          |                                                  | 1                                                                                                                                          | 23.3               | 1          | 23.8               |
|                     |                                          |                                                  | Pump intake set at (m/ft)                                                                                                                  | 45'                | 2          | 23.6               |
|                     |                                          |                                                  | Pumping rate (l/min / GPM)                                                                                                                 | 10 GPM             | 3          | 23.4               |
|                     |                                          |                                                  | Duration of pumping                                                                                                                        | 1 hrs + 0 min      | 4          | 23.2               |
|                     |                                          |                                                  | Final water level end of pumping (m/ft)                                                                                                    | 24.2               | 5          | 23.1               |
|                     |                                          |                                                  | If flowing give rate (l/min/GPM)                                                                                                           |                    | 10         | 22.9               |
|                     |                                          |                                                  |                                                                                                                                            |                    | 15         | 22.8               |
|                     |                                          |                                                  |                                                                                                                                            |                    | 20         | 22.7               |
|                     |                                          |                                                  | Recommended pump depth (m/ft)                                                                                                              | 45'                | 25         | 22.7               |
|                     |                                          |                                                  | Recommended pump rate (l/min/GPM)                                                                                                          | 10 + GPM           | 30         | 22.6               |
|                     |                                          |                                                  | Well production (l/min/GPM)                                                                                                                | 15 + GPM           | 40         | 22.6               |
|                     |                                          |                                                  | Discontinued?                                                                                                                              |                    | 50         | 22.6               |
|                     |                                          |                                                  | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No PPM 110                                                                |                    | 60         | 22.6               |

| Construction Record - Casing |                                                                          |                        |                      | Status of Well                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|------------------------------|--------------------------------------------------------------------------|------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Inside Diameter (cm/in)      | Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) | Well Thickness (cm/in) | Depth (m/ft) From To |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
| 6 1/4"                       | STEEL                                                                    | 188 cm                 | 42' 60'              | <input checked="" type="checkbox"/> Water Supply<br><input type="checkbox"/> Replacement Well<br><input type="checkbox"/> Test Hole<br><input type="checkbox"/> Recharge Well<br><input type="checkbox"/> Dewatering Well<br><input type="checkbox"/> Observation and/or Monitoring Hole<br><input type="checkbox"/> Alteration (Construction)<br><input type="checkbox"/> Abandoned, Insufficient Supply<br><input type="checkbox"/> Abandoned, Poor Water Quality<br><input type="checkbox"/> Abandoned, other, specify<br><input type="checkbox"/> Other, specify |  |
| 6"                           | OPEN HOLE                                                                |                        |                      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |

| Construction Record - Screen |                                       |          |                      | Map of Well Location                                                                                                               |  |
|------------------------------|---------------------------------------|----------|----------------------|------------------------------------------------------------------------------------------------------------------------------------|--|
| Outside Diameter (cm/in)     | Material (Plastic, Galvanized, Steel) | Slot No. | Depth (m/ft) From To |                                                                                                                                    |  |
|                              |                                       |          |                      | Please provide a map below following instructions on the back:<br>N 565 WESLEY ACRES ROAD<br>WESLEY ACRES RD<br>PRIVATE DR<br>WELL |  |

| Water Details               |               |                                                                             | Hole Diameter        |                  |     |
|-----------------------------|---------------|-----------------------------------------------------------------------------|----------------------|------------------|-----|
| Water found at Depth (m/ft) | Kind of Water | <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested | Depth (m/ft) From To | Diameter (cm/in) |     |
| 46'                         | Gas           | <input type="checkbox"/> Other, specify                                     | 0'                   | 44'              | 10" |
| 53'                         | Gas           | <input type="checkbox"/> Other, specify                                     | 44'                  | 60'              | 6"  |

| Well Contractor and Well Technician Information                                 |                     |                                                            |  | Ministry Use Only                                        |  |
|---------------------------------------------------------------------------------|---------------------|------------------------------------------------------------|--|----------------------------------------------------------|--|
| Business Name of Well Contractor: JACK KNOX WELL DRILLING LTD                   |                     | Well Contractor's Licence No: 3202                         |  | Audit No: 2425229                                        |  |
| Business Address (Street Number/Name): 2580 PEPPI ROAD                          |                     | Municipality: GLENBURNE                                    |  | Date Package Delivered: 20240206                         |  |
| Province: ONT                                                                   | Postal Code: K0H1S0 | Business E-mail Address:                                   |  | Date Work Completed:                                     |  |
| Business Telephone No. (inc. area code): 613 546 6164                           |                     | Name of Well Technician (Last Name, First Name): KNOX JOHN |  | <input type="checkbox"/> Yes <input type="checkbox"/> No |  |
| Well Technician's Licence No. (Signature of Technician and/or Contractor): 2879 |                     | Date Submitted: YYY YYY M M D D                            |  | Received:                                                |  |

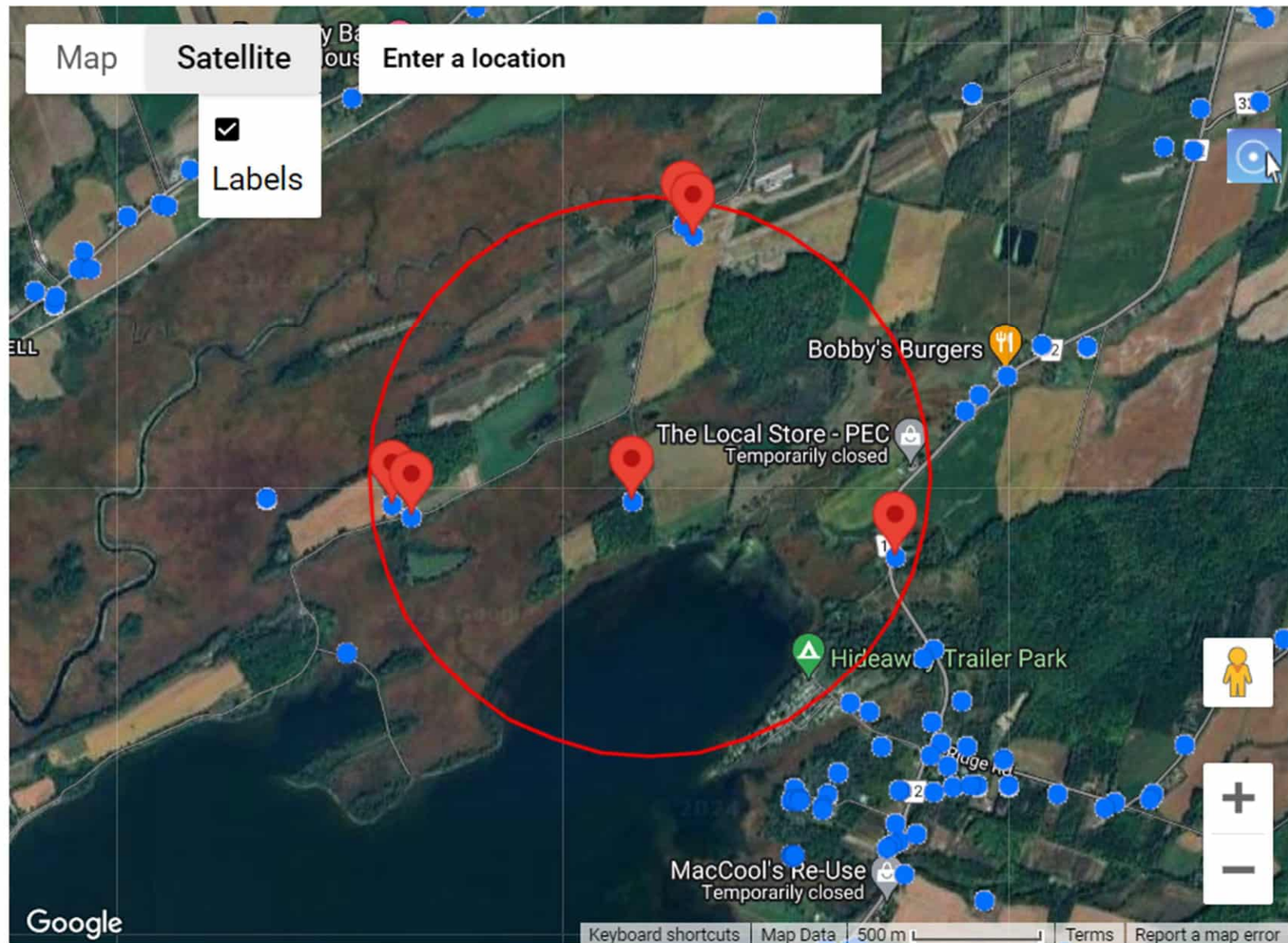
## **APPENDIX D**

### **Neighbouring Water Wells – 1000 M Radius**



***ASC Environmental Inc.***  
***1305 Princess Street,***  
***Kingston, ON K7M 3E3***  
***Tel: (613) 634- 5596***





Latitude:43.97543, Longitude:-77.26782 (UTM Zone:18, Easting:318103, Northing:4871644)





# WATER WELL RECORD

30N / 14G

[illegible]

| 41 WATER RECORD       |  | 51 CASING & OPEN HOLE RECORD                                                   |  |              |  | 61 PLUGGING & SEALING RECORD                |  |       |  |                               |  |                |  |              |  |
|-----------------------|--|--------------------------------------------------------------------------------|--|--------------|--|---------------------------------------------|--|-------|--|-------------------------------|--|----------------|--|--------------|--|
| WATER FOUND AT - FEET |  | KIND OF WATER                                                                  |  | DEPTH - FEET |  |                                             |  |       |  | SIZE(S) OF OPENING (SLOT NO.) |  | DIAMETER 31-33 |  | LENGTH 39-40 |  |
|                       |  |                                                                                |  |              |  |                                             |  |       |  |                               |  |                |  |              |  |
| 10-13                 |  | 1 <input checked="" type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR |  | 10-11        |  | 1 <input checked="" type="checkbox"/> STEEL |  | 17-18 |  | 20-23                         |  |                |  |              |  |
| 15-25                 |  | 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL            |  | 12           |  | 2 <input type="checkbox"/> GALVANIZED       |  | 24-25 |  | 26-30                         |  |                |  |              |  |
| 15-18                 |  | 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR            |  | 19           |  | 3 <input type="checkbox"/> CONCRETE         |  | 29    |  | 34-40                         |  |                |  |              |  |
| 20-23                 |  | 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL            |  | 20-23        |  | 4 <input type="checkbox"/> OPEN HOLE        |  | 25    |  | 30-33                         |  |                |  |              |  |
| 25-28                 |  | 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR            |  | 24-25        |  | 1 <input type="checkbox"/> STEEL            |  | 26    |  | 27-30                         |  |                |  |              |  |
| 30-33                 |  | 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL            |  | 26           |  | 2 <input type="checkbox"/> GALVANIZED       |  | 27-30 |  | 31-33                         |  |                |  |              |  |
| 34-40                 |  | 1 <input type="checkbox"/> FRESH 3 <input type="checkbox"/> SULPHUR            |  | 27-30        |  | 3 <input type="checkbox"/> CONCRETE         |  | 31-33 |  | 34-40                         |  |                |  |              |  |
| 35-40                 |  | 2 <input type="checkbox"/> SALTY 4 <input type="checkbox"/> MINERAL            |  | 31-33        |  | 4 <input type="checkbox"/> OPEN HOLE        |  | 34-40 |  | 35-40                         |  |                |  |              |  |

LOCATION OF WELL 2069

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.

Com 1 mT

Lot 2

Lot 3

991

0.5 mi

Small maroon Tulacant.

DRILLERS REMARKS:

|                 |                    |   |           |            |      |       |               |        |       |    |
|-----------------|--------------------|---|-----------|------------|------|-------|---------------|--------|-------|----|
| OFFICE USE ONLY | DATA SOURCE        | 1 | 58        | CONTRACTOR | 3516 | 59-62 | DATE RECEIVED | 140274 | 63-68 | 60 |
|                 | DATE OF INSPECTION |   | INSPECTOR |            |      |       |               |        |       |    |
|                 | REMARKS:           |   | APL       |            |      |       |               |        |       |    |

# WATER WELL RECORD

30 N / 14 f'

Ontario

1. PRINT ONLY IN SPACES PROVIDED

2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

COUNTY OR ~~SUBDIVISION~~ Prince Edward TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE Hallowell 3

MUNICIP. 53003 CON. MT 11 15 22 23 24

CON., BLOCK, TRACT, SURVEY, ETC. 1 MT LOT 25-27 001

Bloomfield Ont DATE COMPLETED 48-53 DAY 25 MO 11 75

THING 869760 RC 4 ELEVATION 0.250 RC 4 BASIN CODE 24 II III IV

## LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

[illegible]

|    |             |           |  |  |  |  |  |
|----|-------------|-----------|--|--|--|--|--|
| 31 | 00236051179 | 004521574 |  |  |  |  |  |
| 32 |             |           |  |  |  |  |  |

| 41                    |                                             | WATER RECORD                       |    |
|-----------------------|---------------------------------------------|------------------------------------|----|
| WATER FOUND AT - FEET |                                             | KIND OF WATER                      |    |
| 10-13                 | 1 <input checked="" type="checkbox"/> FRESH | 3 <input type="checkbox"/> SULPHUR | 14 |
|                       | 2 <input type="checkbox"/> SALTY            | 4 <input type="checkbox"/> MINERAL |    |
| 15-18                 | 1 <input type="checkbox"/> FRESH            | 3 <input type="checkbox"/> SULPHUR | 19 |
|                       | 2 <input type="checkbox"/> SALTY            | 4 <input type="checkbox"/> MINERAL |    |
| 20-23                 | 1 <input type="checkbox"/> FRESH            | 3 <input type="checkbox"/> SULPHUR | 24 |
|                       | 2 <input type="checkbox"/> SALTY            | 4 <input type="checkbox"/> MINERAL |    |
| 25-28                 | 1 <input type="checkbox"/> FRESH            | 3 <input type="checkbox"/> SULPHUR | 29 |
|                       | 2 <input type="checkbox"/> SALTY            | 4 <input type="checkbox"/> MINERAL |    |
| 30-33                 | 1 <input type="checkbox"/> FRESH            | 3 <input type="checkbox"/> SULPHUR | 34 |
|                       | 2 <input type="checkbox"/> SALTY            | 4 <input type="checkbox"/> MINERAL |    |

| 51                         |                                                 | CASING & OPEN HOLE RECORD   |              |       |
|----------------------------|-------------------------------------------------|-----------------------------|--------------|-------|
| INSIDE<br>DIAM<br>- INCHES | MATERIAL                                        | WALL<br>THICKNESS<br>INCHES | DEPTH - FEET |       |
|                            |                                                 |                             | FROM         | TO    |
| 10-11                      | 1 <input checked="" type="checkbox"/> STEEL     | 12                          |              | 13-16 |
| 08 1/2                     | 2 <input type="checkbox"/> GALVANIZED           | 2 1/8                       | 0            | 0023  |
|                            | 3 <input type="checkbox"/> CONCRETE             |                             |              |       |
|                            | 4 <input type="checkbox"/> OPEN HOLE            |                             |              |       |
| 17-18                      | 1 <input type="checkbox"/> STEEL                | 19                          |              | 20-23 |
| 08 1/2                     | 2 <input type="checkbox"/> GALVANIZED           |                             | 23           | 0045  |
|                            | 3 <input type="checkbox"/> CONCRETE             |                             |              |       |
|                            | 4 <input checked="" type="checkbox"/> OPEN HOLE |                             |              |       |
| 24-25                      | 1 <input type="checkbox"/> STEEL                | 26                          |              | 27-30 |
|                            | 2 <input type="checkbox"/> GALVANIZED           |                             |              |       |
|                            | 3 <input type="checkbox"/> CONCRETE             |                             |              |       |
|                            | 4 <input type="checkbox"/> OPEN HOLE            |                             |              |       |
|                            |                                                 |                             |              |       |

|        |                                  |       |                           |        |        |       |
|--------|----------------------------------|-------|---------------------------|--------|--------|-------|
| SCREEN | SIZE(S) OF OPENING<br>(SLOT NO.) | 31-33 | DIAMETER                  | 34-38  | LENGTH | 39-40 |
|        |                                  |       |                           | INCHES |        | FEET  |
|        | MATERIAL AND TYPE                |       | DEPTH TO TOP<br>OF SCREEN |        | 41-44  | 80    |
|        |                                  |       |                           |        | FEET   |       |

| 61 PLUGGING & SEALING RECORD |       |                   |                                     |
|------------------------------|-------|-------------------|-------------------------------------|
| DEPTH SET AT - FEET          |       | MATERIAL AND TYPE | (CEMENT GROUT<br>LEAD PACKER, ETC.) |
| FROM                         | TO    |                   |                                     |
| 10-13                        | 14-17 |                   |                                     |
| 18-21                        | 22-25 |                   |                                     |
| 26-29                        | 30-33 | 80                |                                     |

|                                                                           |                                                                                       |                             |                            |      |                    |                                                                               |                          |       |                     |            |            |  |
|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------|-----------------------------|----------------------------|------|--------------------|-------------------------------------------------------------------------------|--------------------------|-------|---------------------|------------|------------|--|
| PUMPING TEST                                                              | 71                                                                                    |                             | PUMPING TEST METHOD        |      | 10                 | PUMPING RATE                                                                  |                          | 11-14 | DURATION OF PUMPING |            | 15-18      |  |
|                                                                           | 1 <input checked="" type="checkbox"/> PUMP <input checked="" type="checkbox"/> BAILER |                             | 0010                       |      | GPM                | 01                                                                            | 15-16 HOURS              |       | 00                  | 17-18 MINS |            |  |
|                                                                           | STATIC LEVEL                                                                          |                             | WATER LEVEL END OF PUMPING |      | 25                 | WATER LEVELS DURING                                                           |                          |       |                     |            |            |  |
|                                                                           | 19-21                                                                                 |                             | 22-24                      |      | 15 MINUTES         |                                                                               | 30 MINUTES               |       | 45 MINUTES          |            | 60 MINUTES |  |
|                                                                           | 012 FEET                                                                              |                             | 045 FEET                   |      | 26-28              |                                                                               | 29-31                    |       | 32-34               |            | 35-37      |  |
|                                                                           | IF FLOWING, GIVE RATE                                                                 |                             | 38-41                      |      | PUMP INTAKE SET AT |                                                                               | WATER AT END OF TEST     |       | 42                  |            |            |  |
|                                                                           | RECOMMENDED PUMP TYPE                                                                 |                             | RECOMMENDED PUMP SETTING   |      | 43-45              |                                                                               | RECOMMENDED PUMPING RATE |       | 46-49               |            |            |  |
| <input type="checkbox"/> SHALLOW <input checked="" type="checkbox"/> DEEP |                                                                                       | 042                         |                            | FEET |                    | 1 <input checked="" type="checkbox"/> CLEAR 2 <input type="checkbox"/> CLOUDY |                          | 0010  |                     | GPM        |            |  |
| 50-53                                                                     |                                                                                       | GPM / FT. SPECIFIC CAPACITY |                            |      |                    |                                                                               |                          |       |                     |            |            |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| <div>54</div> <div>FINAL STATUS OF WELL</div> <div>1 <input checked="" type="checkbox"/> WATER SUPPLY</div> <div>2 <input checked="" type="checkbox"/> OBSERVATION WELL</div> <div>3 <input type="checkbox"/> TEST HOLE</div> <div>4 <input type="checkbox"/> RECHARGE WELL</div> <div>5 <input type="checkbox"/> ABANDONED, INSUFFICIENT SUPPLY</div> <div>6 <input type="checkbox"/> ABANDONED, POOR QUALITY</div> <div>7 <input type="checkbox"/> UNFINISHED</div>                                                                                                    |  |
| <div>55-56</div> <div>WATER USE</div> <div>1 <input checked="" type="checkbox"/> DOMESTIC</div> <div>2 <input checked="" type="checkbox"/> STOCK</div> <div>3 <input type="checkbox"/> IRRIGATION</div> <div>4 <input type="checkbox"/> INDUSTRIAL</div> <div><input type="checkbox"/> OTHER</div> <div>5 <input type="checkbox"/> COMMERCIAL</div> <div>6 <input type="checkbox"/> MUNICIPAL</div> <div>7 <input type="checkbox"/> PUBLIC SUPPLY</div> <div>8 <input type="checkbox"/> COOLING OR AIR CONDITIONING</div> <div>9 <input type="checkbox"/> NOT USED</div> |  |
| <div>57</div> <div>METHOD OF DRILLING</div> <div>1 <input type="checkbox"/> CABLE TOOL</div> <div>2 <input type="checkbox"/> ROTARY (CONVENTIONAL)</div> <div>3 <input type="checkbox"/> ROTARY (REVERSE)</div> <div>4 <input checked="" type="checkbox"/> ROTARY (AIR)</div> <div>5 <input type="checkbox"/> AIR PERCUSSION</div> <div>6 <input type="checkbox"/> BORING</div> <div>7 <input type="checkbox"/> DIAMOND</div> <div>8 <input type="checkbox"/> JETTING</div> <div>9 <input type="checkbox"/> DRIVING</div>                                                |  |

**LOCATION OF WELL** 1969

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.

Lot 1

Lot 2

Creek

100m

250'

N

DRILLERS REMARKS

|            |                          |                               |                |
|------------|--------------------------|-------------------------------|----------------|
| CONTRACTOR | NAME OF WELL CONTRACTOR  |                               | LICENCE NUMBER |
|            | M'Clennan Drilling Ltd   |                               | 3516           |
|            | ADDRESS                  |                               |                |
|            | Wellington Ont.          |                               |                |
|            | NAME OF DRILLER OR BORER |                               | LICENCE NUMBER |
|            | Ken M'Clennan            |                               |                |
|            | SIGNATURE OF CONTRACTOR  | SUBMISSION DATE               |                |
|            | Ken M'Clennan            | DAY _____ MO. _____ YR. _____ |                |

|                 |                    |    |            |       |               |       |       |
|-----------------|--------------------|----|------------|-------|---------------|-------|-------|
| OFFICE USE ONLY | DATA SOURCE        | 58 | CONTRACTOR | 59-62 | DATE RECEIVED | 63-68 | 69-72 |
|                 | 1                  |    | 3516       |       | 230476        |       |       |
|                 | DATE OF INSPECTION |    | INSPECTOR  |       |               |       |       |
| REMARKS:        |                    |    |            |       |               |       | WI    |
|                 |                    |    |            |       |               |       |       |











|                                                                       |  |            |                   |                                    |                                                           |                     |                 |                        |  |
|-----------------------------------------------------------------------|--|------------|-------------------|------------------------------------|-----------------------------------------------------------|---------------------|-----------------|------------------------|--|
| Address of Well Location (Street Number/Name)<br>772 Wesley Acres Rd. |  |            |                   | Township<br>Hallowell              |                                                           | Lot                 |                 | Concession<br>I M.T.   |  |
| County/District/Municipality<br>Prince Edward                         |  |            |                   | City/Town/Village<br>Prince Edward |                                                           | Province<br>Ontario |                 | Postal Code<br>K0K 1G0 |  |
| UTM Coordinates<br>NAD 83                                             |  | Zone<br>18 | Easting<br>318343 | Northings<br>4869994               | Municipal Plan and Sublot Number<br>Pt. Point M RP47R5318 |                     | Other<br>Part 1 |                        |  |

| Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) |                      |                 |                     |              |    |
|---------------------------------------------------------------------------------------------------------|----------------------|-----------------|---------------------|--------------|----|
| General Colour                                                                                          | Most Common Material | Other Materials | General Description | Depth (m/ft) |    |
| From                                                                                                    | To                   |                 |                     |              |    |
| Brown                                                                                                   | Clay                 | Small Stone     | Packed              | 0            | 20 |
| Grey                                                                                                    | Sand                 | Clay            | Loose               | 20           | 30 |
| Grey                                                                                                    | Clay                 | Small Stone     | Packed              | 30           | 45 |
| Grey                                                                                                    | Limestone            |                 | Hard                | 45           | 69 |
|                                                                                                         |                      |                 |                     |              |    |
|                                                                                                         |                      |                 |                     |              |    |
|                                                                                                         |                      |                 |                     |              |    |
|                                                                                                         |                      |                 |                     |              |    |
|                                                                                                         |                      |                 |                     |              |    |
|                                                                                                         |                      |                 |                     |              |    |

| Annular Space       |                                          |                        |
|---------------------|------------------------------------------|------------------------|
| Depth Set at (m/ft) | Type of Sealant Used (Material and Type) | Volume Placed (m³/ft³) |
| From                | To                                       |                        |
| 20                  | 0                                        | Bentonite              |
|                     |                                          |                        |
|                     |                                          |                        |
|                     |                                          |                        |

| Method of Construction                                                                                                                                                                                                                                                       | Well Use                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <input checked="" type="checkbox"/> Cable Tool<br><input type="checkbox"/> Rotary (Conventional)<br><input type="checkbox"/> Rotary (Reverse)<br><input type="checkbox"/> Boring<br><input type="checkbox"/> Air percussion<br><input type="checkbox"/> Other, specify _____ | <input type="checkbox"/> Diamond<br><input type="checkbox"/> Jetting<br><input type="checkbox"/> Driving<br><input type="checkbox"/> Digging<br><input type="checkbox"/> Public<br><input type="checkbox"/> Commercial<br><input type="checkbox"/> Not used<br><input checked="" type="checkbox"/> Domestic<br><input type="checkbox"/> Municipal<br><input type="checkbox"/> Dewatering<br><input type="checkbox"/> Livestock<br><input type="checkbox"/> Test Hole<br><input type="checkbox"/> Monitoring<br><input type="checkbox"/> Irrigation<br><input type="checkbox"/> Cooling & Air Conditioning<br><input type="checkbox"/> Industrial<br><input type="checkbox"/> Other, specify _____ |

| Construction Record - Casing |                                                                          |                        |              | Status of Well |    |
|------------------------------|--------------------------------------------------------------------------|------------------------|--------------|----------------|----|
| Inside Diameter (cm/in)      | Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) | Wall Thickness (cm/in) | Depth (m/ft) | From           | To |
| 6.25                         | steel                                                                    | .188                   | +1.5         | 45             |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |
|                              |                                                                          |                        |              |                |    |

| Construction Record - Screen |                                       |          |              | Status of Well |    |
|------------------------------|---------------------------------------|----------|--------------|----------------|----|
| Outside Diameter (cm/in)     | Material (Plastic, Galvanized, Steel) | Slot No. | Depth (m/ft) | From           | To |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |
|                              |                                       |          |              |                |    |

| Water Details                                                                        |                                                                                            | Hole Diameter |                  |   |
|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|---------------|------------------|---|
| Water found at Depth                                                                 | Kind of Water: <input type="checkbox"/> Fresh <input checked="" type="checkbox"/> Untested | Depth (m/ft)  | Diameter (cm/in) |   |
| 50 (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____ |                                                                                            | From          | To               |   |
| Water found at Depth                                                                 | Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested            | 0             | 20               | 8 |
| (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____    |                                                                                            | 20            | 69               | 6 |
| Water found at Depth                                                                 | Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested            |               |                  |   |
| (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify _____    |                                                                                            |               |                  |   |

| Well Contractor and Well Technician Information               |                        |                                                               |  |
|---------------------------------------------------------------|------------------------|---------------------------------------------------------------|--|
| Business Name of Well Contractor<br>Chalk Well Drilling Ltd.  |                        | Well Contractor's Licence No.<br>1507                         |  |
| Business Address (Street Number/Name)<br>31 Johnsons Side Rd. |                        | Municipality<br>Napanee                                       |  |
| Province<br>Ontario                                           | Postal Code<br>K7R 3L1 | Business E-mail Address<br>chalkwel kos.net                   |  |
| Bus. Telephone No. (inc. area code)<br>613-388-2809           |                        | Name of Well Technician (Last Name, First Name)<br>Chalk, Ben |  |
| Well Technician's Licence No.<br>T-3624                       |                        | Signature of Technician and/or Contractor<br>Ben Chalk        |  |
|                                                               |                        | Date Submitted<br>2015 09 03                                  |  |

| Results of Well Yield Testing                                                                                                                    |              |                    |                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|--------------------|
| After test of well yield, water was:<br><input checked="" type="checkbox"/> Clear and sand free<br><input type="checkbox"/> Other, specify _____ | Draw Down    |                    | Recovery           |
|                                                                                                                                                  | Time (min)   | Water Level (m/ft) | Time (min)         |
|                                                                                                                                                  |              |                    | Water Level (m/ft) |
| If pumping discontinued, give reason:                                                                                                            | Static Level | 28.3               | 42.1               |
|                                                                                                                                                  | 1            | 35.0               | 38.1               |
| Pump intake set at (m/ft)<br>66                                                                                                                  | 2            | 36.7               | 34.0               |
| Pumping rate (l/min / GPM)<br>3 gpm                                                                                                              | 3            | 38.1               | 33.0               |
| Duration of pumping<br>1 hrs + 0 min                                                                                                             | 4            | 38.7               | 32.4               |
| Final water level end of pumping (m/ft)<br>42.1                                                                                                  | 5            | 39.2               | 31.9               |
| If flowing give rate (l/min / GPM)                                                                                                               | 10           | 40.6               | 30.3               |
|                                                                                                                                                  | 15           | 41.3               | 29.4               |
| Recommended pump depth (m/ft)<br>66                                                                                                              | 20           | 41.6               | 28.9               |
| Recommended pump rate (l/min / GPM)<br>3.5 gpm                                                                                                   | 25           | 41.8               | 28.6               |
| Well production (l/min / GPM)<br>3.5 gpm                                                                                                         | 30           | 41.8               | 28.5               |
| Disinfected?<br><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No                                                              | 40           | 42.0               | 28.4               |
|                                                                                                                                                  | 50           | 42.1               | 28.4               |
|                                                                                                                                                  | 60           | 42.1               | 28.4               |

| Map of Well Location                                           |  |
|----------------------------------------------------------------|--|
| Please provide a map below following instructions on the back. |  |
|                                                                |  |

|                                                                                                                      |                                                                    |
|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Comments:                                                                                                            |                                                                    |
| Well owner's information package delivered<br><input checked="" type="checkbox"/> Yes<br><input type="checkbox"/> No | Date Package Delivered<br>Y Y Y Y M M D D<br>2015 09 03            |
| Date Work Completed<br>2015 09 03                                                                                    | Ministry Use Only<br>Audit No. 2215974<br>OCT 8 7 2015<br>Received |





|                                                                       |  |            |  |                                    |  |                     |  |                                                           |  |                        |  |
|-----------------------------------------------------------------------|--|------------|--|------------------------------------|--|---------------------|--|-----------------------------------------------------------|--|------------------------|--|
| Address of Well Location (Street Number/Name)<br>772 Wesley Acres Rd. |  |            |  | Township<br>Hallowell              |  | Lot                 |  | Concession<br>I M.T.                                      |  |                        |  |
| County/District/Municipality<br>Prince Edward                         |  |            |  | City/Town/Village<br>Prince Edward |  |                     |  | Province<br>Ontario                                       |  | Postal Code<br>K0K 1G0 |  |
| UTM Coordinates<br>NAD 83                                             |  | Zone<br>18 |  | Easting<br>318415                  |  | Northing<br>4869944 |  | Municipal Plan and Sublot Number<br>Pt. Point M RP47R5318 |  |                        |  |
|                                                                       |  |            |  |                                    |  |                     |  | Other<br>Part 1                                           |  |                        |  |

| Overburden and Bedrock Materials/Abandonment Sealing Record (see instructions on the back of this form) |                      |  |                 |  |                         |
|---------------------------------------------------------------------------------------------------------|----------------------|--|-----------------|--|-------------------------|
| General Colour                                                                                          | Most Common Material |  | Other Materials |  | Depth (m/ft)<br>From To |
| Brown Clay                                                                                              | Clay                 |  |                 |  | 0 11                    |
| Brown                                                                                                   | Sand                 |  | Gravel          |  | 11 18                   |
| Grey                                                                                                    | Clay                 |  |                 |  | 18 25                   |
| Grey                                                                                                    | Limestone            |  |                 |  | 25 51                   |
|                                                                                                         |                      |  |                 |  |                         |
|                                                                                                         |                      |  |                 |  |                         |
|                                                                                                         |                      |  |                 |  |                         |
|                                                                                                         |                      |  |                 |  |                         |
|                                                                                                         |                      |  |                 |  |                         |
|                                                                                                         |                      |  |                 |  |                         |

| Abandonment                    |  |                                             |                           | Results of Well Yield Testing                                                                                                   |              |                    |            |
|--------------------------------|--|---------------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------|------------|
| Depth Set at (m/ft)<br>From To |  | Type of Sealant Used<br>(Material and Type) | Volume Placed<br>(m³/ft³) | After test of well yield, water was:<br><input type="checkbox"/> Clear and sand free<br><input type="checkbox"/> Other, specify | Draw Down    |                    | Recovery   |
| 51 0                           |  | Bentonite                                   | 14.8                      |                                                                                                                                 | Time (min)   | Water Level (m/ft) | Time (min) |
|                                |  |                                             |                           | If pumping discontinued, give reason:                                                                                           | Static Level |                    |            |
|                                |  |                                             |                           |                                                                                                                                 | 1            |                    | 1          |
|                                |  |                                             |                           | Pump intake set at (m/ft)                                                                                                       | 2            |                    | 2          |
|                                |  |                                             |                           | Pumping rate (l/min / GPM)                                                                                                      | 3            |                    | 3          |
|                                |  |                                             |                           | Duration of pumping<br>hrs + min                                                                                                | 4            |                    | 4          |
|                                |  |                                             |                           | Final water level end of pumping (m/ft)                                                                                         | 5            |                    | 5          |
|                                |  |                                             |                           | If flowing give rate (l/min / GPM)                                                                                              | 10           |                    | 10         |
|                                |  |                                             |                           |                                                                                                                                 | 15           |                    | 15         |
|                                |  |                                             |                           |                                                                                                                                 | 20           |                    | 20         |
|                                |  |                                             |                           | Recommended pump depth (m/ft)                                                                                                   | 25           |                    | 25         |
|                                |  |                                             |                           | Recommended pump rate (l/min / GPM)                                                                                             | 30           |                    | 30         |
|                                |  |                                             |                           | Well production (l/min / GPM)                                                                                                   | 40           |                    | 40         |
|                                |  |                                             |                           | Disinfected?<br><input type="checkbox"/> Yes <input type="checkbox"/> No                                                        | 50           |                    | 50         |
|                                |  |                                             |                           |                                                                                                                                 | 60           |                    | 60         |

| Method of Construction                         |                                  | Well Use                                |                                                     |
|------------------------------------------------|----------------------------------|-----------------------------------------|-----------------------------------------------------|
| <input checked="" type="checkbox"/> Cable Tool | <input type="checkbox"/> Diamond | <input type="checkbox"/> Public         | <input type="checkbox"/> Commercial                 |
| <input type="checkbox"/> Rotary (Conventional) | <input type="checkbox"/> Jetting | <input type="checkbox"/> Domestic       | <input type="checkbox"/> Municipal                  |
| <input type="checkbox"/> Rotary (Reverse)      | <input type="checkbox"/> Driving | <input type="checkbox"/> Livestock      | <input type="checkbox"/> Test Hole                  |
| <input type="checkbox"/> Boring                | <input type="checkbox"/> Digging | <input type="checkbox"/> Irrigation     | <input type="checkbox"/> Cooling & Air Conditioning |
| <input type="checkbox"/> Air percussion        |                                  | <input type="checkbox"/> Industrial     |                                                     |
| <input type="checkbox"/> Other, specify        |                                  | <input type="checkbox"/> Other, specify |                                                     |

| Construction Record - Casing |                                                                          |                        |                         | Status of Well                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |
|------------------------------|--------------------------------------------------------------------------|------------------------|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Inside Diameter (cm/in)      | Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel) | Wall Thickness (cm/in) | Depth (m/ft)<br>From To | <input type="checkbox"/> Water Supply<br><input type="checkbox"/> Replacement Well<br><input type="checkbox"/> Test Hole<br><input type="checkbox"/> Recharge Well<br><input type="checkbox"/> Dewatering Well<br><input type="checkbox"/> Observation and/or Monitoring Hole<br><input type="checkbox"/> Alteration (Construction)<br><input checked="" type="checkbox"/> Abandoned, Insufficient Supply<br><input type="checkbox"/> Abandoned, Poor Water Quality<br><input type="checkbox"/> Abandoned, other, specify<br><input type="checkbox"/> Other, specify |  |
|                              | Casing removed                                                           |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |
|                              |                                                                          |                        |                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |

| Construction Record - Screen |                                       |          |                         | Status of Well                                                                                                                                          |  |
|------------------------------|---------------------------------------|----------|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Outside Diameter (cm/in)     | Material (Plastic, Galvanized, Steel) | Slot No. | Depth (m/ft)<br>From To | <input type="checkbox"/> Abandoned, Poor Water Quality<br><input type="checkbox"/> Abandoned, other, specify<br><input type="checkbox"/> Other, specify |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |
|                              |                                       |          |                         |                                                                                                                                                         |  |

| Water Details                                                                                           |                                                                                 | Hole Diameter           |                  |  |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------|------------------|--|
| Water found at Depth<br>Dry (m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify | Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested | Depth (m/ft)<br>From To | Diameter (cm/in) |  |
| Water found at Depth<br>(m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify     | Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested | 0 18                    | 10               |  |
| Water found at Depth<br>(m/ft) <input type="checkbox"/> Gas <input type="checkbox"/> Other, specify     | Kind of Water: <input type="checkbox"/> Fresh <input type="checkbox"/> Untested | 18 51                   | 6                |  |
|                                                                                                         |                                                                                 |                         |                  |  |

| Well Contractor and Well Technician Information               |                        |                                                               |  |
|---------------------------------------------------------------|------------------------|---------------------------------------------------------------|--|
| Business Name of Well Contractor<br>Chalk Well Drilling Ltd.  |                        | Well Contractor's Licence No.<br>1507                         |  |
| Business Address (Street Number/Name)<br>31 Johnsons Side Rd. |                        | Municipality<br>Napanee                                       |  |
| Province<br>Ontario                                           | Postal Code<br>K7R 3L1 | Business E-mail Address<br>chalkwel kos.net                   |  |
| Bus. Telephone No. (inc. area code)<br>613-388-2809           |                        | Name of Well Technician (Last Name, First Name)<br>Chalk, Dan |  |
| Well Technician's Licence No.<br>T-3304                       |                        | Signature of Technician and/or Contractor<br>Dan Chalk        |  |
|                                                               |                        | Date Submitted<br>2015 08 31                                  |  |

| Map of Well Location                                                                                      |                                                             |
|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------|
| Please provide a map below following instructions on the back.                                            |                                                             |
|                                                                                                           |                                                             |
| Comments:                                                                                                 |                                                             |
| Well owner's information package delivered<br><input type="checkbox"/> Yes<br><input type="checkbox"/> No | Date Package Delivered<br>Y Y Y Y M M D D<br>2015 Y M 08 32 |
| Date Work Completed<br>2015 Y M 08 32                                                                     |                                                             |
| Ministry Use Only<br>Audit No. 2215981<br>Received OCT 07 2015                                            |                                                             |



**APPENDIX E**  
**On Site Test Well Drawdown And Recovery Data And**  
**Neighbouring Well Response**



***ASC Environmental Inc.***  
***1305 Princess Street,***  
***Kingston, ON K7M 3E3***  
***Tel: (613) 634- 5596***

**Table E1. Water Quality Field Measurements.**

|                                                                                   |                                                    |                                  |                                       |                   |                                    |               |                         |
|-----------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------|---------------------------------------|-------------------|------------------------------------|---------------|-------------------------|
|  |                                                    | Field Water Quality Analysis     |                                       |                   | Test Well:                         | TW1           |                         |
|                                                                                   |                                                    | Project No.:                     | ASC-870                               |                   | Date:                              | 21-Feb-24     |                         |
|                                                                                   |                                                    | Client:                          | Campfire Circle                       |                   | Recorded By: T.C / T.A / J.B / J.K |               |                         |
|                                                                                   |                                                    | Location:                        | 565 Wesley Acres Road, Bloomfield, ON |                   |                                    |               |                         |
|                                                                                   |                                                    | Started pumping 75 L/min at 9:00 |                                       |                   |                                    |               |                         |
| Pumping Test Elapsed Time (min)                                                   | Odour                                              | Temperature (°C)                 | pH                                    | Conductivity (µS) | Total Dissolved Solids (ppm)       | Turbidity NTU | Chlorine (Total) (mg/L) |
| 1                                                                                 | Chlorine Odour                                     | -                                | -                                     | -                 | -                                  | -             | 750                     |
| 3                                                                                 | Chlorine Odour                                     | -                                | -                                     | -                 | -                                  | -             | -                       |
| 5                                                                                 | Chlorine Odour                                     | 9.60                             | 8.64                                  | 534               | 266                                | 0             | <25                     |
| 10                                                                                | Chlorine Odour                                     | -                                | -                                     | -                 | -                                  | -             | -                       |
| 20                                                                                | Chlorine Odour                                     | -                                | -                                     | -                 | -                                  | -             | -                       |
| 30                                                                                | No Odour                                           | 9.70                             | 8.56                                  | 532               | 266                                | 0             | >2.2                    |
| 60                                                                                | No Odour                                           | 9.40                             | 8.49                                  | 525               | 261                                | 0             | 1.0                     |
| 90                                                                                | No Odour                                           | 9.40                             | 8.55                                  | 53                | 265                                | 0             | 1.5                     |
| 120                                                                               | No Odour                                           | 9.40                             | 8.53                                  | 519               | 256                                | 0             | 0.2                     |
| 150                                                                               | No Odour                                           | 9.40                             | 8.51                                  | 505               | 252                                | 0             | 0.2                     |
| 180                                                                               | No Odour                                           | 9.60                             | 8.50                                  | 516               | 256                                | 0             | 0.3                     |
| 210                                                                               | No Odour                                           | 9.50                             | 8.45                                  | 509               | 254                                | 0             | 0.1                     |
| 240                                                                               | No Odour                                           | 9.60                             | 8.47                                  | 507               | 253                                | 0             | 0.0                     |
| 270                                                                               | No Odour                                           | 9.60                             | 8.47                                  | 510               | 254                                | 0             | 0.0                     |
| 300                                                                               | No Odour                                           | 9.50                             | 8.46                                  | 504               | 252                                | 0             | 0.0                     |
| 330                                                                               | No Odour                                           | 9.70                             | 8.47                                  | 510               | 253                                | 0             | -                       |
| 340                                                                               | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | 0.0                     |
| 360                                                                               | No Odour                                           | 9.40                             | 8.43                                  | 510               | 254                                | 0             | -                       |
| 390                                                                               | No Odour                                           | 9.50                             | 8.44                                  | 506               | 253                                | 0             | -                       |
| Notes                                                                             | Pump intake set at 14.02 metres below top of pipe. |                                  |                                       |                   |                                    |               |                         |
| Field Analysis Equipment                                                          |                                                    |                                  |                                       |                   |                                    |               |                         |
| Chlorine :                                                                        |                                                    | Hach DR 900 Colorimeter          |                                       |                   |                                    |               |                         |
| Temp./pH/Cond./TDS :                                                              |                                                    | Hanna HI 98130 Meter             |                                       |                   |                                    |               |                         |
| Turbidity :                                                                       |                                                    | Hach DR 900 Colorimeter          |                                       |                   |                                    |               |                         |

**Table E1. Water Quality Field Measurements. (continued)**

|                                                                                   |          |                                                    |                                       |                   |                   |                                    |                         |  |
|-----------------------------------------------------------------------------------|----------|----------------------------------------------------|---------------------------------------|-------------------|-------------------|------------------------------------|-------------------------|--|
|  |          | <b>Field Water Quality Analysis</b>                |                                       |                   | <b>Test Well:</b> | <b>TW1</b>                         |                         |  |
|                                                                                   |          | Project No.:                                       | ASC-870                               |                   |                   | Date:                              | 21-Feb-24 & 22-Feb-24   |  |
|                                                                                   |          | Client:                                            | Groundwork Engineering                |                   |                   | Recorded By: T.C / T.A / J.B / J.K |                         |  |
|                                                                                   |          | Location:                                          | 565 Wesley Acres Road, Bloomfield, ON |                   |                   |                                    |                         |  |
|                                                                                   |          | Started pumping 75 L/min at 9:00                   |                                       |                   |                   |                                    |                         |  |
| Pumping Test (min)                                                                | Odour    | Temperature (°C)                                   | pH                                    | Conductivity (µS) | Total (ppm)       | Turbidity NTU                      | Chlorine (Total) (mg/L) |  |
| 420                                                                               | No Odour | 9.70                                               | 8.49                                  | 503.00            | 252.00            | 0                                  | -                       |  |
| 450                                                                               | No Odour | 9.70                                               | 8.40                                  | 508.00            | 254.00            | 0                                  | -                       |  |
| 480                                                                               | No Odour | 9.70                                               | 8.42                                  | 506               | 253               | 0                                  | -                       |  |
| 510                                                                               | No Odour | 9.40                                               | 8.57                                  | 497               | 249               | 0                                  | -                       |  |
| 540                                                                               | No Odour | 9.50                                               | 8.50                                  | 505               | 252               | 0                                  | -                       |  |
| 570                                                                               | No Odour | 9.40                                               | 8.49                                  | 504               | 253               | 0                                  | -                       |  |
| 600                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 630                                                                               | No Odour | 9.30                                               | 8.45                                  | 511               | 255               | 0                                  | -                       |  |
| 660                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 690                                                                               | No Odour | 9.50                                               | 8.38                                  | 518               | 258               | 0                                  | -                       |  |
| 720                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 750                                                                               | No Odour | 9.40                                               | 8.44                                  | 512               | 257               | 0                                  | -                       |  |
| 780                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 810                                                                               | No Odour | 9.40                                               | 8.40                                  | 512               | 257               | 0                                  | -                       |  |
| 840                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 870                                                                               | No Odour | 9.40                                               | 8.39                                  | 509               | 255               | 0                                  | -                       |  |
| 900                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| 930                                                                               | No Odour | 9.40                                               | 8.35                                  | 514               | 257               | 0                                  | -                       |  |
| 960                                                                               | No Odour | -                                                  | -                                     | -                 | -                 | -                                  | -                       |  |
| Notes                                                                             |          | Pump intake set at 14.02 metres below top of pipe. |                                       |                   |                   |                                    |                         |  |
| Field Analysis Equipment                                                          |          |                                                    |                                       |                   |                   |                                    |                         |  |
| Chlorine :                                                                        |          | Hach DR 900 Colorimeter                            |                                       |                   |                   |                                    |                         |  |
| Temp./pH/Cond./TDS :                                                              |          | Hanna HI 98130 Meter                               |                                       |                   |                   |                                    |                         |  |
| Turbidity :                                                                       |          | Hach DR 900 Colorimeter                            |                                       |                   |                   |                                    |                         |  |



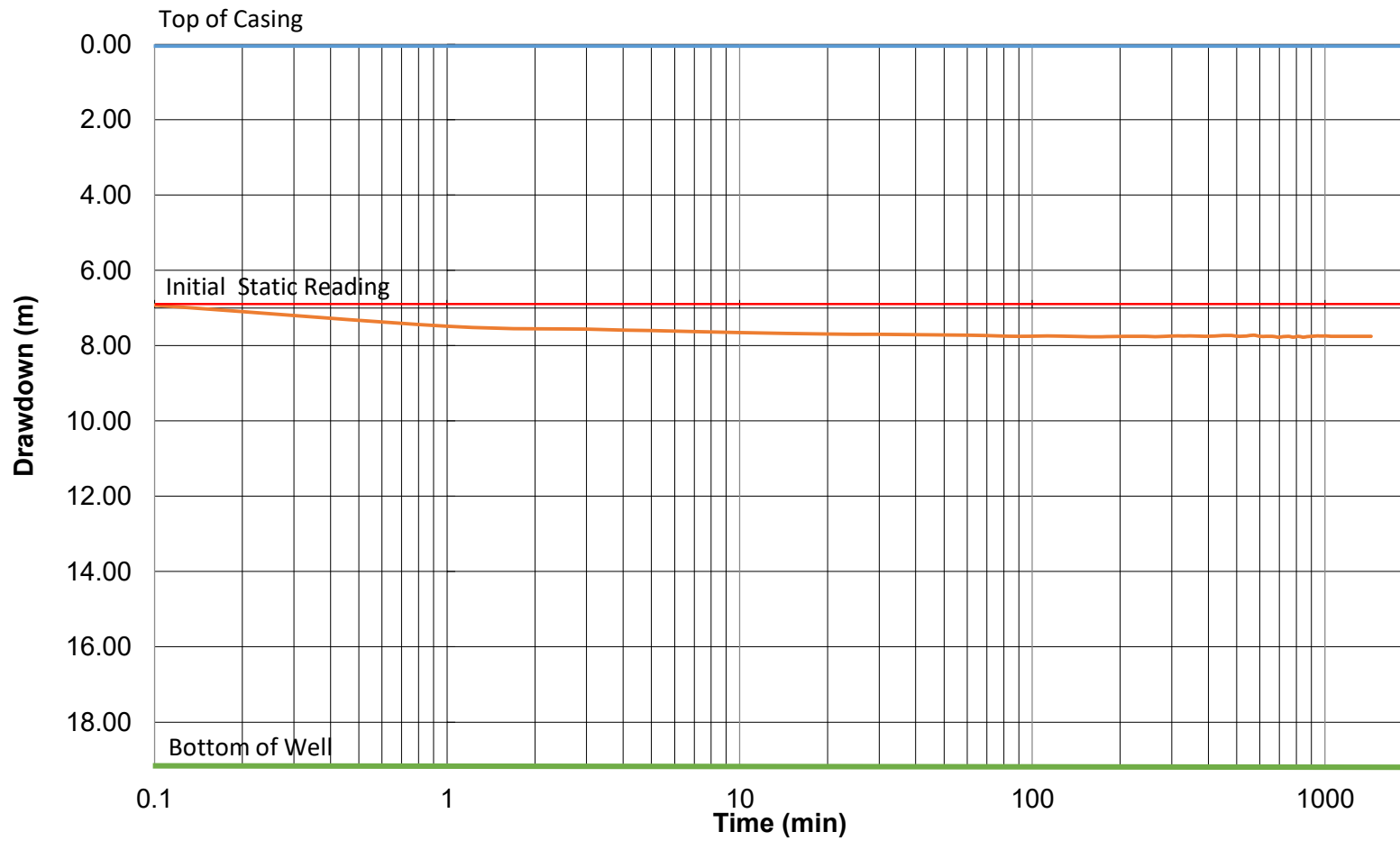
**Table E1. Water Quality Field Measurements. (continued)**

|                                                                                   |                                                    |                                  |                                       |                   |                                    |               |                         |
|-----------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------|---------------------------------------|-------------------|------------------------------------|---------------|-------------------------|
|  |                                                    | Field Water Quality Analysis     |                                       |                   | Test Well:                         | TW1           |                         |
|                                                                                   |                                                    | Project No.:                     | ASC-870                               |                   | Date:                              | 22-Feb-24     |                         |
|                                                                                   |                                                    | Client:                          | Groundwork Engineering                |                   | Recorded By: T.C / T.A / J.B / J.K |               |                         |
|                                                                                   |                                                    | Location:                        | 565 Wesley Acres Road, Bloomfield, ON |                   |                                    |               |                         |
|                                                                                   |                                                    | Started pumping 75 L/min at 9:00 |                                       |                   |                                    |               |                         |
| Pumping Test Elapsed Time (min)                                                   | Odour                                              | Temperature (°C)                 | pH                                    | Conductivity (µS) | Total Dissolved Solids (ppm)       | Turbidity NTU | Chlorine (Total) (mg/L) |
| 990                                                                               | No Odour                                           | 9.30                             | 8.34                                  | 514.00            | 257.00                             | 0             | -                       |
| 1020                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1050                                                                              | No Odour                                           | 9.30                             | 8.34                                  | 515               | 258                                | 0             | -                       |
| 1080                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1110                                                                              | No Odour                                           | 9.40                             | 8.33                                  | 515               | 258                                | 0             | -                       |
| 1140                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1170                                                                              | No Odour                                           | 9.40                             | 8.33                                  | 516               | 257                                | 0             | -                       |
| 1200                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1230                                                                              | No Odour                                           | 9.40                             | 8.36                                  | 518               | 259                                | 0             | -                       |
| 1260                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1290                                                                              | No Odour                                           | 9.40                             | 8.41                                  | 513               | 257                                | 0             | -                       |
| 1320                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1350                                                                              | No Odour                                           | 9.50                             | 8.34                                  | 518               | 259                                | 0             | -                       |
| 1380                                                                              | No Odour                                           | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1410                                                                              | No Odour                                           | 9.70                             | 8.30                                  | 518               | 259                                | 0             | -                       |
| 1420                                                                              | -                                                  | -                                | -                                     | -                 | -                                  | -             | -                       |
| 1440                                                                              | -                                                  | -                                | -                                     | -                 | -                                  | -             | -                       |
|                                                                                   |                                                    |                                  |                                       |                   |                                    |               |                         |
|                                                                                   |                                                    |                                  |                                       |                   |                                    |               |                         |
| Notes                                                                             | Pump intake set at 14.02 metres below top of pipe. |                                  |                                       |                   |                                    |               |                         |
| Field Analysis Equipment                                                          |                                                    |                                  |                                       |                   |                                    |               |                         |
| Chlorine :                                                                        |                                                    | Hach DR 900 Colorimeter          |                                       |                   |                                    |               |                         |
| Temp./pH/Cond./TDS :                                                              |                                                    | Hanna HI 98130 Meter             |                                       |                   |                                    |               |                         |
| Turbidity :                                                                       |                                                    | Hach DR 900 Colorimeter          |                                       |                   |                                    |               |                         |

**Table E2. Test Well drawdown during pumping test.**

|  | Pumping Test - Drawdown       |                                       |                      | Test Well: TW1                                  |                          |
|-----------------------------------------------------------------------------------|-------------------------------|---------------------------------------|----------------------|-------------------------------------------------|--------------------------|
|                                                                                   | Project No.:                  | ASC-870                               |                      | Date:                                           | 2024-02-21 to 2024-02-22 |
|                                                                                   | Client:                       | Campfire Circle                       |                      | Recorded By: T.C / T.A / J.B / J.K              |                          |
|                                                                                   | Location:                     | 565 Wesley Acres Road, Bloomfield, ON |                      |                                                 |                          |
| Pumping Rate (Q)<br>(L/min)                                                       | Elapsed Time (ET)<br>(min)    | Well Level (WL)<br>(m)                | Drawdown (DD)<br>(m) |                                                 |                          |
| 75                                                                                | 0                             | 6.92                                  | 0.00                 |                                                 |                          |
| 75                                                                                | 1                             | 7.48                                  | 0.56                 |                                                 |                          |
| 75                                                                                | 3                             | 7.56                                  | 0.64                 |                                                 |                          |
| 75                                                                                | 5                             | 7.60                                  | 0.68                 |                                                 |                          |
| 75                                                                                | 10                            | 7.65                                  | 0.73                 |                                                 |                          |
| 75                                                                                | 20                            | 7.69                                  | 0.77                 |                                                 |                          |
| 75                                                                                | 30                            | 7.70                                  | 0.78                 |                                                 |                          |
| 75                                                                                | 60                            | 7.72                                  | 0.80                 |                                                 |                          |
| 75                                                                                | 90                            | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 120                           | 7.74                                  | 0.82                 |                                                 |                          |
| 75                                                                                | 240                           | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 480                           | 7.73                                  | 0.81                 |                                                 |                          |
| 75                                                                                | 720                           | 7.76                                  | 0.84                 |                                                 |                          |
| 75                                                                                | 840                           | 7.77                                  | 0.85                 |                                                 |                          |
| 75                                                                                | 1020                          | 7.74                                  | 0.82                 |                                                 |                          |
| 75                                                                                | 1140                          | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 1260                          | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 1380                          | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 1410                          | 7.75                                  | 0.83                 |                                                 |                          |
| 75                                                                                | 1440                          | 7.75                                  | 0.83                 |                                                 |                          |
|                                                                                   |                               |                                       |                      |                                                 |                          |
| TW1                                                                               | (m)                           |                                       |                      | m³/day                                          |                          |
| $\Delta s_{0-1min}$                                                               | 0.56                          | $Q_{0-1min}$                          | 75.00                | 108.0                                           |                          |
| $\Delta s_{1-10min}$                                                              | 0.17                          | $Q_{1-10min}$                         | 75.00                | 108.0                                           |                          |
| $\Delta s_{10-100min}$                                                            | 0.09                          | $Q_{10-100min}$                       | 75.00                | 108.0                                           |                          |
| $\Delta s_{100-1000min}$                                                          | 0.003                         | $Q_{100-1000min}$                     | 75.00                | 108.0                                           |                          |
| $\Delta s_{1000-10000min}$                                                        | 0.00002                       | $Q_{1000-10000min}$                   | 75.00                | 108.0                                           |                          |
|                                                                                   | m²/day                        | m²/s                                  |                      |                                                 |                          |
| $T_{0-1min}$                                                                      | 35.36                         | 4.09E-04                              |                      |                                                 |                          |
| $T_{1-10min}$                                                                     | 115.99                        | 1.34E-03                              |                      |                                                 |                          |
| $T_{10-100min}$                                                                   | 228.89                        | 2.65E-03                              |                      |                                                 |                          |
| $T_{100-1000min}$                                                                 | 7152.83                       | 8.28E-02                              |                      |                                                 |                          |
| $T_{1000-10000min}$                                                               | 1072924.52                    | 1.24E+01                              |                      |                                                 |                          |
| Notes                                                                             |                               |                                       |                      |                                                 |                          |
| 1                                                                                 |                               |                                       |                      | Drawdown over one Log Cycle based on Trend Line |                          |
| Q                                                                                 | Volumetric Flow Rate          |                                       |                      | Litres per Minute                               |                          |
| T                                                                                 | Coefficient of Transmissivity |                                       |                      | Gallon per Minute                               |                          |

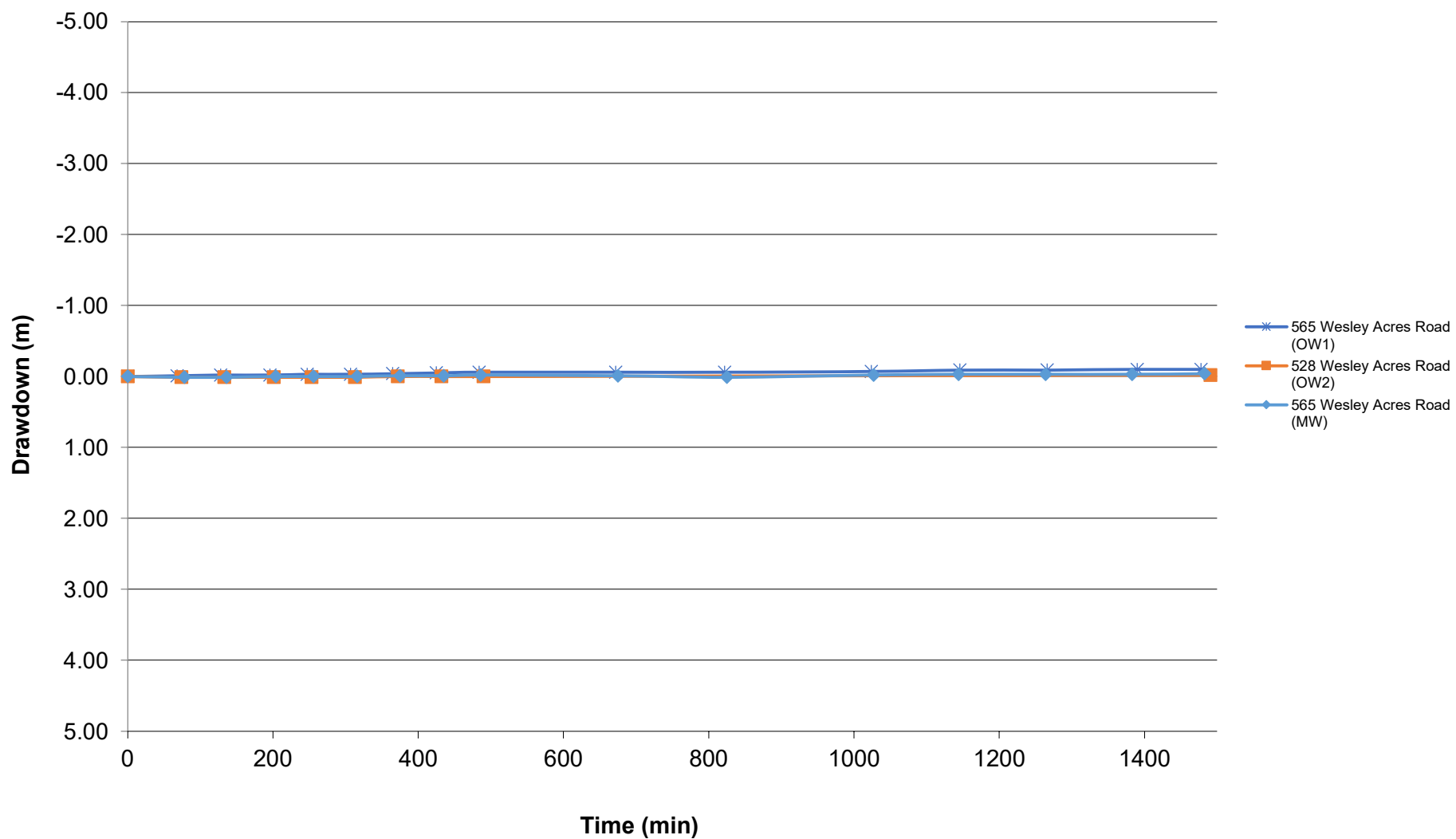
ASC Environmental Inc.  
ASC-870, Campfire Circle, 565 Wesley Acres Road, Bloomfield, ON  
Figure E1. TW1 Pumping Test Drawdown





| Table E3. Observation well drawdown during pumping test.                          |       |        |                         |                                       |                             |       |        |                    |       |                          |  |
|-----------------------------------------------------------------------------------|-------|--------|-------------------------|---------------------------------------|-----------------------------|-------|--------|--------------------|-------|--------------------------|--|
|  |       |        | Pumping Test - Drawdown |                                       |                             |       |        | Test Well:         |       | TW1                      |  |
|                                                                                   |       |        | Project No.:            | ASC-870                               |                             |       |        | Date:              |       | 2024-02-21 to 2024-02-22 |  |
|                                                                                   |       |        | Client:                 | Campfire Circle                       |                             |       |        | Pumping start time |       |                          |  |
|                                                                                   |       |        | Location:               | 565 Wesley Acres Road, Bloomfield, ON |                             |       |        | 9 0                | AM    |                          |  |
| 565 Wesley Acres Road (OW1)                                                       |       |        |                         |                                       | 565 Wesley Acres Road (MW)  |       |        |                    |       |                          |  |
| WL                                                                                | WL    | DD     | Time                    | ET                                    | WL                          | WL    | DD     | Time               | ET    |                          |  |
| (ft)                                                                              | (m)   | (m)    | H:Min                   | (min)                                 | (ft)                        | (m)   | (m)    | H:Min              | (min) |                          |  |
| 7.382                                                                             | 2.250 | 0.000  | 8 30                    | 0                                     | 6.234                       | 1.900 | 0.000  | 8 57               | 0     |                          |  |
| 7.349                                                                             | 2.240 | -0.010 | 10 8                    | 68                                    | 6.267                       | 1.910 | 0.010  | 10 18              | 78    |                          |  |
| 7.317                                                                             | 2.230 | -0.020 | 11 8                    | 128                                   | 6.267                       | 1.910 | 0.010  | 11 16              | 136   |                          |  |
| 7.317                                                                             | 2.230 | -0.020 | 12 16                   | 196                                   | 6.234                       | 1.900 | 0.000  | 12 24              | 204   |                          |  |
| 7.284                                                                             | 2.220 | -0.030 | 13 7                    | 247                                   | 6.234                       | 1.900 | 0.000  | 13 16              | 256   |                          |  |
| 7.284                                                                             | 2.220 | -0.030 | 14 7                    | 307                                   | 6.234                       | 1.900 | 0.000  | 14 16              | 316   |                          |  |
| 7.251                                                                             | 2.210 | -0.040 | 15 5                    | 365                                   | 6.201                       | 1.890 | -0.010 | 15 15              | 375   |                          |  |
| 7.2182                                                                            | 2.2   | -0.05  | 16 5                    | 425                                   | 6.20109                     | 1.89  | -0.01  | 16 15              | 435   |                          |  |
| 7.18539                                                                           | 2.19  | -0.06  | 17 4                    | 484                                   | 6.16828                     | 1.88  | -0.02  | 17 6               | 486   |                          |  |
| 7.185                                                                             | 2.190 | -0.060 | 20 12                   | 672                                   | 6.201                       | 1.890 | -0.010 | 20 15              | 675   |                          |  |
| 7.185                                                                             | 2.190 | -0.060 | 22 42                   | 822                                   | 6.267                       | 1.910 | 0.010  | 22 45              | 825   |                          |  |
| 7.153                                                                             | 2.180 | -0.070 | 2 4                     | 1024                                  | 6.168                       | 1.880 | -0.020 | 2 7                | 1027  |                          |  |
| 7.087                                                                             | 2.160 | -0.090 | 4 6                     | 1146                                  | 6.135                       | 1.870 | -0.030 | 4 4                | 1144  |                          |  |
| 7.087                                                                             | 2.160 | -0.090 | 6 6                     | 1266                                  | 6.135                       | 1.870 | -0.030 | 6 4                | 1264  |                          |  |
| 7.054                                                                             | 2.150 | -0.100 | 8 10                    | 1390                                  | 6.135                       | 1.870 | -0.030 | 8 3                | 1383  |                          |  |
| 7.054                                                                             | 2.150 | -0.100 | 9 38                    | 1478                                  | 6.103                       | 1.860 | -0.040 | 9 43               | 1483  |                          |  |
| 528 Wesley Acres Road (OW2)                                                       |       |        |                         |                                       |                             |       |        |                    |       |                          |  |
| WL                                                                                | WL    | DD     | Time                    | ET                                    |                             |       |        |                    |       |                          |  |
| (ft)                                                                              | (m)   | (m)    | H:Min                   | (min)                                 |                             |       |        |                    |       |                          |  |
| 5.381                                                                             | 1.640 | 0.000  | 8 50                    | 0                                     | 565 Wesley Acres Road (OW1) |       |        |                    |       | 200                      |  |
| 5.414                                                                             | 1.650 | 0.010  | 10 14                   | 74                                    | 528 Wesley Acres Road (OW2) |       |        |                    |       | 600                      |  |
| 5.414                                                                             | 1.650 | 0.010  | 11 13                   | 133                                   | 565 Wesley Acres Road (MW)  |       |        |                    |       | 95                       |  |
| 5.414                                                                             | 1.650 | 0.010  | 12 21                   | 201                                   |                             |       |        |                    |       |                          |  |
| 5.414                                                                             | 1.650 | 0.010  | 13 13                   | 253                                   |                             |       |        |                    |       |                          |  |
| 5.414                                                                             | 1.650 | 0.010  | 14 13                   | 313                                   |                             |       |        |                    |       |                          |  |
| 5.381                                                                             | 1.640 | 0.000  | 15 12                   | 372                                   |                             |       |        |                    |       |                          |  |
| 5.381                                                                             | 1.640 | 0.000  | 16 12                   | 432                                   |                             |       |        |                    |       |                          |  |
| 5.381                                                                             | 1.640 | 0.000  | 17 10                   | 490                                   |                             |       |        |                    |       |                          |  |
| 5.315                                                                             | 1.620 | -0.020 | 9 51                    | 1491                                  |                             |       |        |                    |       |                          |  |

ASC Environmental Inc.  
ASC-870, Campfire Circle, 565 Wesley Acres Road, Bloomfield, ON  
Figure E2. Pumping Test Influence on Neighbouring Wells  
TW1 Pumping Test Zone of Influence

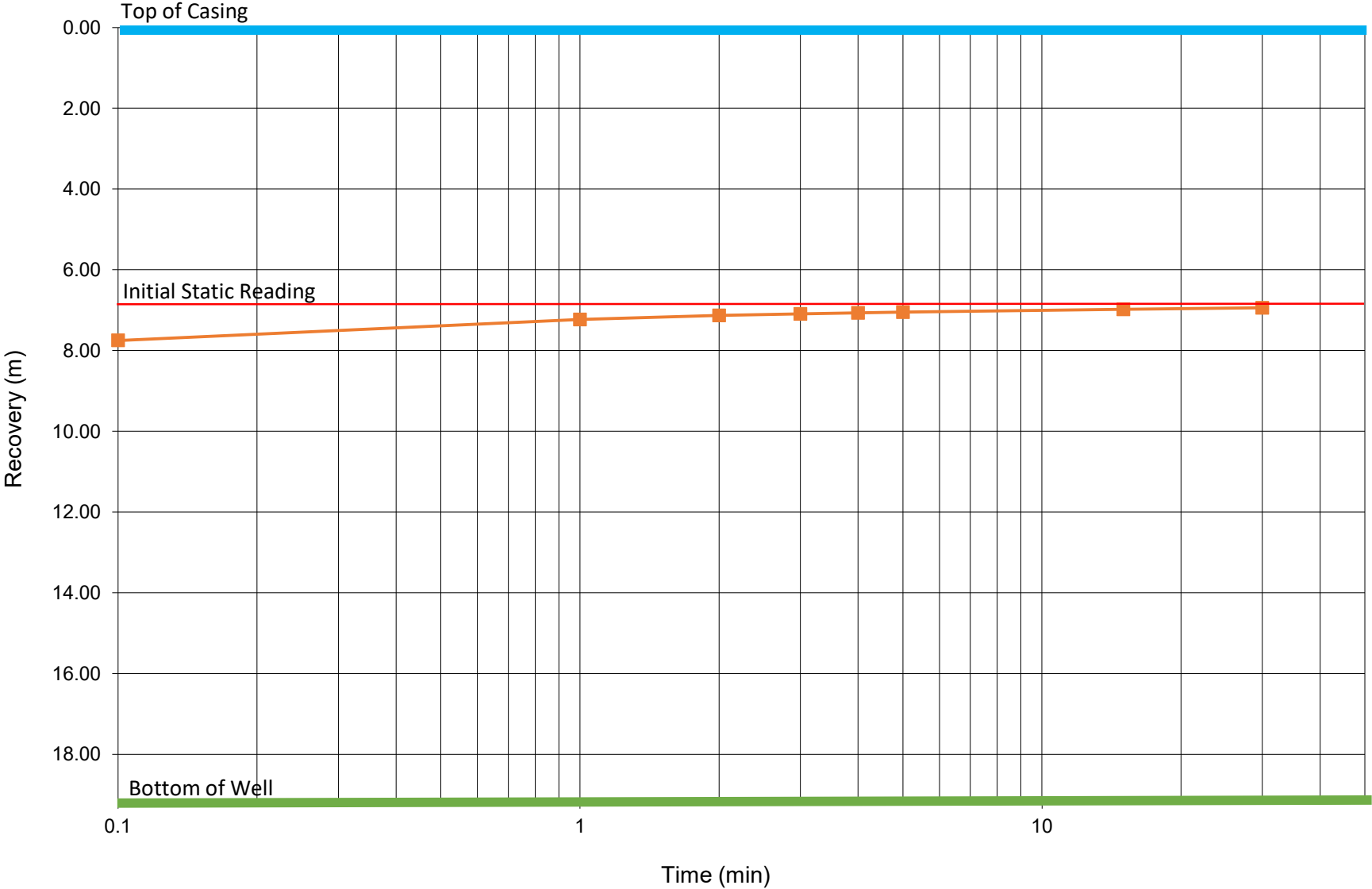


**Table E4. Test well recovery after pumping test.**

|                                                                                   |                    |                         |              |                                       |            |       |                                    |
|-----------------------------------------------------------------------------------|--------------------|-------------------------|--------------|---------------------------------------|------------|-------|------------------------------------|
|  |                    | Pumping Test - Recovery |              |                                       | Test Well: | TW1   |                                    |
|                                                                                   |                    | Project No.:            |              | ASC-870                               |            | Date: | 22-Feb-24                          |
|                                                                                   |                    | Client:                 |              | Campfire Circle                       |            |       | Recorded By: T.C / T.A / J.B / J.K |
|                                                                                   |                    | Location:               |              | 565 Wesley Acres Road, Bloomfield, ON |            |       |                                    |
|                                                                                   |                    | Test Well               |              |                                       |            |       |                                    |
| Pumping                                                                           | Elapsed Time (min) | Well Level (WL) (m)     | Drawdown (m) |                                       |            |       |                                    |
| 0                                                                                 | 0                  | 7.75                    | 0.83         |                                       |            |       |                                    |
| 0                                                                                 | 1                  | 7.23                    | 0.31         |                                       |            |       |                                    |
| 0                                                                                 | 2                  | 7.13                    | 0.21         |                                       |            |       |                                    |
| 0                                                                                 | 3                  | 7.09                    | 0.17         |                                       |            |       |                                    |
| 0                                                                                 | 4                  | 7.07                    | 0.15         |                                       |            |       |                                    |
| 0                                                                                 | 5                  | 7.05                    | 0.13         |                                       |            |       |                                    |
| 0                                                                                 | 15                 | 6.98                    | 0.06         |                                       |            |       |                                    |
| 0                                                                                 | 30                 | 6.94                    | 0.02         |                                       |            |       |                                    |
| WL at 95% Recovery =                                                              |                    | 6.96 m                  |              |                                       |            |       |                                    |



ASC Environmental Inc.  
ASC-870, Campfire Circle, 565 Wesley Acres Road, Bloomfield, ON  
Figure E3. TW1 Recovery



## **APPENDIX F**

### **Pumping Test Analyses**



***ASC Environmental Inc.***  
***1305 Princess Street,***  
***Kingston, ON K7M 3E3***  
***Tel: (613) 634- 5596***

[illegible]



## **APPENDIX G**

### **Groundwater Quality Results**



***ASC Environmental Inc.***  
***1305 Princess Street,***  
***Kingston, ON K7M 3E3***  
***Tel: (613) 634- 5596***

| <div></div> |           |        |                                                                               | Project:<br>Client:<br>Location:            | ASC-870<br>Campfire Circle<br>565 Wesley Acres Road, Bloomfield, ON |                    |
|----------------------------------------------------------------------------------------------|-----------|--------|-------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------|--------------------|
|                                                                                              |           |        |                                                                               |                                             | Test Well Water Chemistry                                           |                    |
| Parameter                                                                                    | Units     | M.D.L. | Reference Method                                                              | Ontario Drinking Water<br>Quality Standards | TW1-1<br>21-Feb-24                                                  | TW1-4<br>22-Feb-24 |
| Total Coliform                                                                               | cfu/100mL | 1      | MOE E3407                                                                     | 0                                           | 0                                                                   | 0                  |
| E coli                                                                                       | cfu/100mL | 1      | MOE E3407                                                                     | 0                                           | 0                                                                   | 0                  |
| Fecal Coliforms                                                                              | cfu/100mL | 1      | SM9222D                                                                       | 0                                           | 0                                                                   | 0                  |
| Background                                                                                   | cfu/100mL | 1      | SM9222B                                                                       |                                             | <10                                                                 | 10                 |
| Heterotrophic Plate Count                                                                    | cfu/mL    | 10     | SM9215D                                                                       |                                             | -                                                                   | -                  |
| Alkalinity(CaCO3) to pH4.5                                                                   | mg/L      | 5      | SM 2320B                                                                      |                                             | 205                                                                 | 218                |
| pH @25°C                                                                                     | pH Units  |        | SM 4500H                                                                      | 6.5-8.5                                     | 8.09                                                                | 8.03               |
| Conductivity @25°C                                                                           | µmho/cm   | 1      | SM 2510B                                                                      |                                             | 545                                                                 | 554                |
| TDS (Calc. from Cond.)                                                                       | mg/L      |        | Calc.                                                                         | 500                                         | 282                                                                 | 287                |
| Colour                                                                                       | TCU       | 2      | SM2120C                                                                       | 5                                           | <2                                                                  | <2                 |
| Turbidity                                                                                    | NTU       | 0.1    | SM2130B                                                                       | 5 (1)                                       | 0.4                                                                 | 1.6                |
| Fluoride                                                                                     | mg/L      | 0.1    | SM4110C                                                                       | 1.5                                         | <0.1                                                                | <0.1               |
| Chloride                                                                                     | mg/L      | 0.5    | SM4110C                                                                       | 250                                         | 18.5                                                                | 15.3               |
| Nitrite (N)                                                                                  | mg/L      | 0.1    | SM4110C                                                                       | 1                                           | <0.05                                                               | <0.05              |
| Nitrate (N)                                                                                  | mg/L      | 0.1    | SM4110C                                                                       | 10                                          | <0.05                                                               | <0.05              |
| Sulphate                                                                                     | mg/L      | 1      | SM4110C                                                                       | 500                                         | 61                                                                  | 58                 |
| Dissolved Organic Carbon                                                                     | mg/L      | 0.2    | EPA 415.1                                                                     | 5                                           | 1.7                                                                 | 2.4                |
| Total Organic Carbon                                                                         | mg/L      | 0.2    | EPA 415.1                                                                     |                                             | -                                                                   | -                  |
| Total Kjeldahl Nitrogen                                                                      | mg/L      | 0.1    | E3199A.1                                                                      |                                             | 0.3                                                                 | 0.1                |
| Ammonia (N)-Total                                                                            | mg/L      | 0.01   | SM4500-NH3-H                                                                  |                                             | 0.06                                                                | 0.05               |
| Ammonia (N)-unionized                                                                        | mg/L      | 0.01   | CALC                                                                          |                                             | -                                                                   | -                  |
| Phophorus (Total)                                                                            | mg/L      | 0.01   | PE4500-S                                                                      |                                             | 0.02                                                                | 0.01               |
| Sulphide                                                                                     | mg/L      | 0.01   | SM4500-S2                                                                     |                                             | <0.01                                                               | 0.03               |
| Phenolics                                                                                    | mg/L      | 0.001  | MOEE 3179                                                                     |                                             | <0.001                                                              | <0.001             |
| Tannins and Lignins                                                                          | mg/L      | 0.5    | SM5500B                                                                       |                                             | <0.5                                                                | <0.5               |
| Hardness (as CaCO3)                                                                          | mg/L      | 1      | SM 3120                                                                       | 500                                         | 274                                                                 | 283                |
| Calcium                                                                                      | mg/L      | 0.02   | SM 3120                                                                       | See hardness                                | 54.0                                                                | 56.8               |
| Iron                                                                                         | mg/L      | 0.005  | SM 3120                                                                       | 0.3                                         | 0.119                                                               | 0.135              |
| Magnesium                                                                                    | mg/L      | 0.02   | SM 3120                                                                       | see hardness                                | 33.7                                                                | 34.3               |
| Manganese                                                                                    | mg/L      | 0.001  | SM 3120                                                                       | 0.5                                         | 0.005                                                               | 0.005              |
| Potassium                                                                                    | mg/L      | 0.1    | SM 3120                                                                       |                                             | 1.6                                                                 | 1.6                |
| Sodium                                                                                       | mg/L      | 0.2    | SM 3120                                                                       | 200 (20)                                    | 6.4                                                                 | 6.2                |
| Notes                                                                                        | 1         |        | Indicates Ontario Drinking Water Quality Standard Exceedance (Health Related) |                                             |                                                                     |                    |
|                                                                                              | 2         | -      | Not analyzed                                                                  |                                             |                                                                     |                    |

**C.O.C.: G106891**

**REPORT No: 24-005015 - Rev. 0**

**Report To:**

ASC Environmental  
 1305 Princess St.  
 Kingston, ON K7M 3E3

**CADUCEON Environmental Laboratories**

285 Dalton Ave  
 Kingston, ON K7K 6Z1

**Attention: Tanner Cook**

DATE RECEIVED: 2024-Feb-22  
 DATE REPORTED: 2024-Feb-28  
 SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: ASC-870  
 P.O. NUMBER:

| Analyses                       | Qty | Site Analyzed | Authorized | Date Analyzed | Lab Method               | Reference Method         |
|--------------------------------|-----|---------------|------------|---------------|--------------------------|--------------------------|
| Anions (Liquid)                | 2   | OTTAWA        | PCURIEL    | 2024-Feb-24   | A-IC-01                  | SM 4110B                 |
| Colour (Liquid)                | 2   | OTTAWA        | AWILSON    | 2024-Feb-23   | A-COL-01                 | SM 2120C                 |
| Cond/pH/Alk Auto (Liquid)      | 2   | OTTAWA        | SBOUDREAU  | 2024-Feb-23   | COND-02/PH-02/A<br>LK-02 | SM 2510B/4500H/<br>2320B |
| Coliforms - DC Media (Liquid)  | 2   | KINGSTON      | BBURTCH    | 2024-Feb-22   | ECTC-001                 | MECP E3407               |
| DOC/DIC (Liquid)               | 2   | OTTAWA        | VKASYAN    | 2024-Feb-26   | C-OC-01                  | EPA 415.2                |
| Fecal Coliforms (Liquid)       | 2   | KINGSTON      | BBURTCH    | 2024-Feb-22   | FC-001                   | SM 9222D                 |
| HPC MF (Liquid)                | 2   | KINGSTON      | BBURTCH    | 2024-Feb-22   | HPC-001                  | SM 9215D                 |
| ICP/OES (Liquid)               | 2   | OTTAWA        | NHOGAN     | 2024-Feb-27   | D-ICP-01                 | SM 3120B                 |
| Ammonia & o-Phosphate (Liquid) | 2   | KINGSTON      | JYEARWOOD  | 2024-Feb-28   | NH3-001                  | SM 4500NH3               |
| Phenols (Liquid)               | 2   | KINGSTON      | JMACINNES  | 2024-Feb-23   | PHEN-01                  | MECP E3179               |
| Sulphide (Liquid)              | 2   | KINGSTON      | EHINCH     | 2024-Feb-23   | H2S-001                  | SM 4500-S2               |
| Tannins (Liquid)               | 2   | KINGSTON      | EHINCH     | 2024-Feb-23   | TAN-001                  | SM 5550                  |
| TP & TKN (Liquid)              | 2   | KINGSTON      | KDIBBITS   | 2024-Feb-27   | TPTKN-001                | MECP E3516.2             |
| Turbidity (Liquid)             | 2   | OTTAWA        | AWILSON    | 2024-Feb-23   | A-TURB-01                | SM 2130B                 |

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an \*



**Michelle Dubien**  
**Data Specialist**



**CADUCEON Environmental Laboratories Certificate of Analysis**

**Final Report**  
**REPORT No: 24-005015 - Rev. 0**

|                             |           |      | Client I.D.    | TW1-1       | TW1-4       |
|-----------------------------|-----------|------|----------------|-------------|-------------|
|                             |           |      | Sample I.D.    | 24-005015-1 | 24-005015-2 |
|                             |           |      | Date Collected | 2024-02-21  | 2024-02-22  |
| Parameter                   | Units     | R.L. |                | -           | -           |
| Total Coliform (DC Media)   | CFU/100mL | 1    |                | 0           | 0           |
| E coli (DC Media)           | CFU/100mL | 1    |                | 0           | 0           |
| Heterotrophic Plate Count   | CFU/1mL   | 10   |                | <10         | 10          |
| Fecal Coliform              | CFU/100mL | 1    |                | 0           | 0           |
| Alkalinity(CaCO3) to pH4.5  | mg/L      | 5    |                | 205         | 218         |
| TDS (Calc. from Cond.)      | mg/L      | 3    |                | 282         | 287         |
| Conductivity @25°C          | uS/cm     | 1    |                | 545         | 554         |
| pH @25°C                    | pH units  | -    |                | 8.09        | 8.03        |
| Colour                      | TCU       | 2    |                | <2          | <2          |
| Turbidity                   | NTU       | 0.1  |                | 0.4         | 1.6         |
| Fluoride                    | mg/L      | 0.1  |                | <0.1        | <0.1        |
| Chloride                    | mg/L      | 0.5  |                | 18.5        | 15.3        |
| Nitrate (N)                 | mg/L      | 0.05 |                | <0.05       | <0.05       |
| Nitrite (N)                 | mg/L      | 0.05 |                | <0.05       | <0.05       |
| Sulphate                    | mg/L      | 1    |                | 61          | 58          |
| Phosphorus (Total)          | mg/L      | 0.01 |                | 0.02        | 0.01        |
| Total Kjeldahl Nitrogen     | mg/L      | 0.1  |                | 0.3         | 0.1         |
| Ammonia (N)-Total (NH3+NH4) | mg/L      | 0.05 |                | 0.06        | 0.05        |
| Dissolved Organic Carbon    | mg/L      | 0.2  |                | 1.7         | 2.4         |
| Tannin & Lignin             | mg/L      | 0.5  |                | <0.5        | <0.5        |
| Sulphide                    | mg/L      | 0.01 |                | <0.01       | 0.03        |



**Michelle Dubien**  
**Data Specialist**

The analytical results reported herein refer to the samples as received and relate only to the items tested. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

|                     |               |       | Client I.D.    | TW1-1       | TW1-4       |
|---------------------|---------------|-------|----------------|-------------|-------------|
|                     |               |       | Sample I.D.    | 24-005015-1 | 24-005015-2 |
|                     |               |       | Date Collected | 2024-02-21  | 2024-02-22  |
| Parameter           | Units         | R.L.  |                | -           | -           |
| Phenolics           | mg/L          | 0.001 |                | <0.001      | <0.001      |
| Hardness (as CaCO3) | mg/L as CaCO3 | 0.02  |                | 274         | 283         |
| Calcium             | mg/L          | 0.02  |                | 54.0        | 56.8        |
| Iron                | mg/L          | 0.005 |                | 0.119       | 0.135       |
| Magnesium           | mg/L          | 0.02  |                | 33.7        | 34.3        |
| Manganese           | mg/L          | 0.001 |                | 0.005       | 0.005       |
| Potassium           | mg/L          | 0.1   |                | 1.6         | 1.6         |
| Sodium              | mg/L          | 0.2   |                | 6.4         | 6.2         |



Michelle Dubien  
Data Specialist

## **APPENDIX E: WATER DEMAND AND SEWER FLOW CALCULATIONS**



*Functional Servicing Report*  
*Campfire Circle*

| Building                    | OBC                       | Units          | Rate<br>(L/Unit/day) | Qty    | Domestic<br>Demand<br>(L/day) | Sanitary<br>Flow<br>(L/day) | Irrigation<br>(L/day) |
|-----------------------------|---------------------------|----------------|----------------------|--------|-------------------------------|-----------------------------|-----------------------|
| Camper Residence 1          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 2          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 3          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 4          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 5          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 6          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 7          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 8          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Camper Residence 9          | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 32     | 4,921                         | 4,921                       |                       |
| Summer Staff Res.           | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 66     | 10,149                        | 10,149                      |                       |
| Mature Staff Residence      | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 10     | 1,538                         | 1,538                       |                       |
| Flex                        | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 39     | 5,997                         | 5,997                       |                       |
| Hospital - Staff            | OBC 8.2.1.3.-A.(2)(a)(i)* | Beds           | 153.77               | 8      | 1,230                         | 1,230                       |                       |
| Director's Cabin            | OBC 8.2.1.3.-A.(4)(b)     | Dwelling       | 1100                 | 1      | 1,100                         | 1,100                       |                       |
|                             |                           |                |                      |        |                               |                             |                       |
| Lodge (360 seats x 3 meals) | OBC 8.2.1.3.-B.(11)(i)    | Meals          | 12                   | 1080   | 12,960                        | 12,960                      |                       |
| Indoor Activity Centre      | OBC 8.2.1.3.-B.(2)(a)     | Cap            | 8                    | 200    | 1,600                         | 1,600                       |                       |
| Pool - Building             | OBC 8.2.1.3.-B.(22)(a)    | Cap            | 40                   | 75     | 3,000                         | 3,000                       |                       |
| Pool - Make-Up Water        | O.Reg. 494/17 7.(13)      | Cap            | 15                   | 75     | 1,125                         |                             |                       |
| Pool - Operating Water      |                           | Cap            | 35                   | 75     | 2,625                         |                             |                       |
| Arts & Music (Drama)        | OBC 8.2.1.3.-B.(2)(a)     | Cap            | 8                    | 75     | 600                           | 600                         |                       |
| Greenhouse - Gardeners      | OBC 8.2.1.3.-B.(2)(a)     | Cap            | 8                    | 75     | 600                           | 600                         |                       |
| Equestrian Centre - Riders  | OBC 8.2.1.3.-B.(2)(a)     | Cap            | 8                    | 30     | 240                           | 240                         |                       |
|                             |                           |                |                      |        |                               |                             |                       |
| Equestreian Centre - Horses | OMAFRA Factsheet #07-023  | Horse          | 42                   | 10     | 420                           |                             |                       |
|                             |                           |                |                      |        |                               |                             |                       |
| Greenhouse - Irrigation     | OMAFRA Publication 836    | m <sup>2</sup> | 5.0                  | 650    |                               |                             | 3,250                 |
| Garden                      | Quinte Conservation       | m <sup>2</sup> | 4.3                  | 10,000 |                               |                             | 43,000                |
| Landscaping                 | Quinte Conservation       | m <sup>2</sup> | 4.3                  | 20,000 |                               |                             | 86,000                |
|                             |                           |                |                      |        |                               |                             |                       |
| <b>Total</b>                |                           |                |                      |        | <b>87,470</b>                 | <b>83,300</b>               | <b>132,250</b>        |

## **APPENDIX F: WATER TREATMENT SYSTEM REPORT**



**Telephone:** (613) 386-0550  
**Toll-Free:** 1-800-200-0865  
**Fax:** 613-386-9889  
**Website:** [www.mwater.ca](http://www.mwater.ca)  
**Email:** [info@mwater.ca](mailto:info@mwater.ca)

**Address:** 388 Millhaven Road  
P.O. Box 392  
Odessa, ON K0H 2H0

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## Report for Campfire Circle Camp

*August 12, 2025*

### Introduction

This report has been prepared based on information submitted by email regarding a new children's camp to be located at 565 Wesley Acres Road. The water system for this camp will fall under Ontario Regulation 170/03. The purpose of this report is to give a high level design for a regulation-compliant water treatment system.

### Site Information

Water will be supplied from a drilled well bearing well tag A383968. The well record indicates a well depth of 60 feet (~19 m) and a well yield of 10 gpm (~38 L/min). The engineering study of the well, however, indicates that it can support a pumping rate of 75 L/min which is the number we will assume for well yield in this report.

Calculations done by others anticipate a daily water demand of about 82 000 L.

As this exceeds 50 000 L/day, the camp will require a permit to take water. This is not included in the scope of our work to design the water pumping and treatment system, but we do want to remind people of the fact.

The initial engineering report for the project done by ASC Environmental indicates that the well is not under the influence of surface water. We are therefore designing the treatment system for a true groundwater well, not a GUDI well.

### Water Quality

The report from ASC Environmental also included water quality information. From that report, the following parameters returned noteworthy values:

#### *Turbidity*

Turbidity is a measure of the "cloudiness" of the water. Turbidity is a concern because the materials that cause turbidity can interfere with disinfection efforts. The operational limit for turbidity is 1 NTU. The turbidity of this water was measured at 1.4 NTU.

#### *Hardness*



Water is considered hard when the hardness exceeds 100 mg/L. This water was tested with a hardness of 283 mg/L. A hardness of 300 to 400 mg/L is typical for the area.

## **Treatment System Discussion**

For a facility like the camp, which has multiple buildings, Regulation 170/03 requires both primary and secondary disinfection.

Primary disinfection exists to sterilize the water as it comes from the well. This will be accomplished with ultra violet (UV) equipment.

Secondary disinfection exists to keep the water sterile as it flows through underground piping among the buildings. This will be accomplished with chlorination.

The daily water use at the camp is estimated at about 82 000 L. If water was used evenly over 24 hours, this would equate to a continuous flow of 57 L/min. In reality, of course, water will not be used evenly and peak demand will sometimes exceed the 75 L/min production rate of the well. For this reason water will be treated ahead of time, stored in a cistern, and then distributed to the camp. The cistern will provide a buffer capacity against times of high water use.

## **Water System**

1. A submersible pump will need to be installed in the well, connected to the treatment building with pipe and wire, and provided with an appropriate pressure system. A 1 hp, 230 V, 3 wire pump should be suitable for this purpose given the yield of the well and the required pumping rate to supply the system. The pump will also be provided with run dry protection.

2. Primary disinfection will be provided by a pair of UV units that will be plumbed in parallel. Each UV unit will have a capacity of 20 gpm (~75 L/min) so that the camp could operate on a single UV unit if necessary. Under ordinary circumstances, each unit will treat half the water.

The units will be NSF-certified and equipped with alarms, UV intensity sensors, and emergency solenoid shut off valves as required by the regulation. Each unit will also be preceded by a pair of parallel 5 µm cartridge filters to exclude particles large enough to shelter bacteria from the UV light. Each unit will be equipped with a surge protector as recommended by the manufacturer and will have a timer-activated blow off valve to periodically vent the UV chamber to help prevent overheating.

3. Secondary disinfection will be provided by chlorination. Dosing will be triggered by a flow meter so that it will be proportional to the water flow. Two chlorine pumps with an alternator panel will be used to provide redundancy. A chlorine injection manifold will be employed so that the chlorine injection points can be cleaned easily and without having to shut down the entire water system.

4. The only aspect of the water chemistry that might interfere with disinfection efforts is the water hardness. Over time, hard water scale can coat the inside of UV units and block the UV light as well as plug up chlorine injection points and block the injection of chlorine.

It would be possible to install water softeners to remove the hardness. Softening water on the scale of the camp would require sizeable softeners, however, which would increase the cost of the installation and space required. The use of softener salt would also increase the ongoing operational costs.

More importantly, however, softeners work on an ion-exchange principle. Sodium is added to the water in proportion to the amount of hardness being removed. Using water softeners at this site would result in the treated water having a sodium content above the limit permitted for regulated facilities like the camp. Additional efforts, such as sign posting and/or the installation of reverse osmosis equipment, would then be needed to deal with the sodium.

The easiest approach to dealing with hardness at this site would be to accept a slightly higher maintenance requirement where the licensed operators running the water system manually clean the UV units and chlorine injection points from time to time. (We do this successfully at a large number of other regulated sites.)

5. After treatment, the water will be deposited in a cistern. The cistern tank will be buried outside the water treatment building to prevent freezing. Controls will be put in place so that the treatment system will automatically work to keep the cistern full.

As mentioned previously, the purpose of the cistern is to provide a buffer supply of treated water against times of high water demand. In the unlikely event of a problem with the treatment system, trucked municipal water could also be delivered to the cistern to keep the camp going until repairs could be made.

Cisterns are available in many sizes. We would recommend a cistern that represents about half the estimated daily water use for the camp.

6. Water will be supplied to the camp from the cistern by a pair of submersible pumps. The pumps will have variable speed controllers. Pumps with these controllers maintain more even water pressure and use less electricity. The pumps can also be set to alternate duty and to both come on to maintain water pressure during times of particularly high use. Two smaller pumps are preferred to one larger pump to provide redundancy (and because a pump large enough to meet peak demand can struggle to go low enough when demand is minimal).

7. An engineering company will need to produce an engineering evaluation report (EER) when the system is complete. The EER certifies that the system meets the requirements of the regulation and sets out a maintenance schedule for the equipment.

## **Physical Requirements of the Water System**

The following are the physical requirements for the water system:

### Electrical

Each of the three pumps (one well and two cistern) will require a dedicated 230 V circuit with a disconnect.

The UV and chlorine equipment runs off a regular 120 V circuit. Theoretically, the two UV units and the two chlorine pumps could all run off a single circuit. In practice, it would be better to have more so that the entire treatment doesn't shut down if a single breaker trips.

### Space

With the exception of the pressure tank for the well pump, which sits on the floor, all the rest of the equipment mounts on the wall. Most of it does not stick out very far off the wall, but it would be best to allow for at least one metre back from the wall so that a person could stand in front of the equipment to service it.

In terms of linear wall space, the well pressure tank and controls will need about 1 m. Each UV unit (including prefilters) will need about 1.5 m. The chlorination equipment will need about 2 m. The cistern pump pressure systems and controls will also need about 2m. In total, then, there is the requirement for about 6 or 7 m of linear wall space.

### Drainage

The automatic blow offs for the UV units require a drain to receive the water being vented.

## **Ongoing Operations Work**

In addition to setting out requirements for treatment equipment, Regulation 170/03 sets out requirements for ongoing maintenance and testing to ensure the system remains in proper working order. This work must generally be done by a licensed drinking water operator. The main components of this work are:

- A. Verification that the water treatment equipment is working along with routine physical maintenance of the equipment. Typically this must be done at least monthly.
- B. Regular sampling and testing for microbiological and chemical parameters on set schedules. Bacteria testing is normally required monthly while different chemical parameters are sampled on quarterly, annual, and five year schedules.

C. Record keeping and paperwork associated with items A and B as well as with an annual report and dealing with routine inspections by the Ministry of the Environment every few years.

D. Responding as required by the regulation if any sort of adverse event occurs. An adverse event could be a bad sample result or an equipment failure. (Obviously strenuous efforts are made to avoid adverse events.)

E. The items discussed above typically require the presence of a licensed operator only once per month. An exception to this is the requirement to test the chlorine residual in the drinking water. This is normally required at least every three days and, in practice, is often done daily.

It is not economical to have a licensed operator come to the site very frequently just to do chlorine residual testing. Automatic equipment does exist for this purpose but it can also be expensive to install and maintain. Most facilities like the camp make use of the "supervised person" clause in the regulation for chlorine residual testing.

Under this clause, a licensed operator can train one or (ideally) more people on how to do the simple chlorine test using an inexpensive hand held chlorine meter. These supervised persons then do the tests and send (normally email) the results back to the licensed operator.

### **MacLellan Water Treatment**

MacLellan Water is fully capable of doing a detailed design of the water system, including price estimates, and then installing the system. We also have licensed operators who already do operations work for more than 200 sites including some close to the camp. We would be very happy to design, install, and operate this water system for you.

### **Conclusion**

We hope that this report contains all the information you require. Please do not hesitate to contact me with any questions.

Sincerely,

William Vander Wilp  
MacLellan Water Treatment and Pumps  
1-800-200-0865 x 24



## **APPENDIX G: WASTEWATER SERVICING BRIEF**



12 August, 2026

Graham Potter, MASc, MBA, P.Eng., PMP  
Vice President  
Jewell Engineering Inc.  
1-71 Millenium Pkwy.  
Belleville, ON K8N 4Z5

**RE: Revised Wastewater Servicing Brief Campfire Circle – Prince Edward County – GW-23003-16**

Dear Graham,

Pursuant to your request, Groundwork Engineering Limited (GEL) has completed a wastewater review of the revised design for the proposed camp, Campfire Circle – Prince Edward County, at 565 Wesley Acres Road, Bloomfield Ontario.

The theoretical daily design sewage flow was determined using the building occupancy and type as defined in Part 8 of the Ontario Building Code. Our assessment has been completed using the drawing - Concept Site Plan – A014 – Revised February 4, 2026 by Teeple Architects Inc. Please see the attached Wastewater Servicing Brief.

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

Sincerely,

A handwritten signature in black ink, appearing to read "MBurger".

Martin Burger  
MEng., P.Eng.

cc. via email Sean McGregor, Cope Group Inc.

Attachments:  
Wastewater Servicing Brief  
ECA Application Preliminary Design Brief

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Unit 640, 654 Norris Court Kingston, ON K7P 2R9  
613-634-1789

[www.groundengineer.ca](http://www.groundengineer.ca)

## **CFC-PEC Wastewater Servicing Brief - Revised**

This Wastewater Servicing Brief is provided as an overview of the wastewater design flows and treatment options for the proposed development at 565 Wesley Acres Road, Bloomfield ON, K0K 1G0. The assessment has been completed using the drawing - Concept Site Plan – A012 – Revised January 15, 2026 by Teeple Architects Inc. The proposed development Campfire Circle – PEC, is for a year-round children's camp. It will include thirteen (13) boarding house style residences with sleeping space for 180 campers and 223 staff, a lodge that will serve as the Site's restaurant/cafeteria with three-hundred and sixty (360) seats, several indoor activity spaces, a 2-bedroom director's cabin, and a small hospital with eight (8) staff and five (5) patient beds. There is a combined total of five-hundred (415) bed spaces at the camp including the director's cabin.

The total theoretical daily design sewage flows (Q) for the proposed buildings at the site are calculated using the building use and occupancy type as per Part 8 of the Ontario Building Code (OBC). Occupancy of the facility will vary throughout the year with full or nearly full capacity anticipated in the summer period and half capacity or less anticipated in the winter months.

The thirteen (13) residences are most accurately represented as Boarding Houses with meals and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i). The lodge is most accurately described as a Cafeteria with serving three-hundred and sixty (360) meals three (3) times per day per seat as per OBC 8.2.1.3.B.(11)(i). The hospital is most accurately described as a Hospital Including Laundry Facilities as per OBC Table 8.2.1.3.B.(12)(a). The indoor activity spaces are most accurately described as an Assembly Hall with no food service as per OBC Table 8.2.1.3.B.(2)(a). The director's cabin is most accurately described as a 2-bedroom residence as per OBC Table 8.2.1.3.A(2)(4)(b). The pool is most accurately described as a Swimming and Bathing Facility as per OBC Table 8.2.1.3.B.(23).

Determination of total daily theoretical sewage flows for each of the buildings are outlined below. It is proposed that one (1) wastewater treatment system (WWTS) be utilized for the development.

The flows generated by the lodge, indoor activity spaces, pool, and hospital are included in the residential flow as they will not serve non campers. Most of the facility's food preparation and dining space are located within the lodge with the exception of a kitchen in the director's cabin and kitchenets containing microwaves in the staff residences. As such 19 000 L has been subtracted from the flows associated with the residential buildings and added to the lodge, activity spaces, and pool.

## Buildings serviced by WWTS 1

|                                                                                        |                |
|----------------------------------------------------------------------------------------|----------------|
| Camper Residence #1: 32 beds at 153.77L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)     | = 4 921 L/day  |
| Camper Residence #2: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #3: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #4: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #5: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #6: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #7: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #8: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Camper Residence #9: 32 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)    | = 4 921 L/day  |
| Summer Staff Residence: 66 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i) | = 10 149 L/day |
| Mature Staff Residence: 10 beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i) | = 1 518 L/day  |
| Hospital: 8 staff beds at 153.77 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)          | = 1 230 L/day  |
| Flex: 39 beds at 151.8 L/day per bed as per OBC 8.2.1.3.A.(2)(a)(i)                    | = 5 997 L/day  |
| Directors Cabin: 2-bedroom residence 1100 L/day as per Table 8.2.1.3.A(2)(4)(b)        | = 1 100 L/day  |
| Indoor Activity Space: 200 seats at 8 L/day per seat as per OBC 8.2.1.3.B.(2)(a)       | = 1 600 L/day  |
| Drama Building: 75 seats at 8 L/day per seat as per OBC 8.2.1.3.B.(2)(a)               | = 600 L/day    |
| Greenhouse: 75 seats at 8 L/day per seat as per OBC 8.2.1.3.B.(2)(a)                   | = 600 L/day    |
| Equestrian Stables: 30 seats at 8 L/day per seat as per OBC 8.2.1.3.B.(2)(a)           | = 240 L/day    |
| Pool: 75 people at 40 L/day per person as per Table 8.2.1.3.B.(23)                     | = 3 000 L/day  |
| Lodge: 1080 meals per day at 12 L per meal as per OBC 8.2.1.3.B.(2)(a)                 | = 12 960 L/day |
| <b>Total: = 83 300 L/day</b>                                                           |                |

One (1) wastewater treatment system is proposed to treat the total theoretical daily design sewage flow of 83 300 L. Wastewater treatment system 1 (WWTS 1) will treat all flows from the site. The lodge will require a grease separator to prevent cooking oils and greases from entering the treatment system.

On November 14, 2023 Groundwork Engineering Limited (GEL) conducted a geotechnical investigation of the Site. A total of six (6) boreholes were completed and two percolation tests were performed as part of the geotechnical investigation. Percolation Test Site #2 (PTS 2) is located near the location of Proposed WWTS 1. The native soil at PTS 2 has an estimated T-time greater than 50 min/cm. The borehole depths ranged from 3.0 m to 6.1 m. None of the six (6) boreholes encountered bedrock. Given the depth to bedrock it is recommended that gravity sewers be used where possible to convey wastewater to limit the use of sanitary force mains.

Sewage flows to WWTS 1 would be considered commercial in nature due to the lodge, indoor activity spaces, pool, and hospital.

## GEOTECHNICAL • CIVIL • STORMWATER • ONSITE WASTEWATER



An advanced treatment system consisting of a Moving Bed Bioreactor (MBBR) provided by Bergmann North America (BNA) and a Type A dispersal bed is proposed to maximize nutrient reduction and minimize the effluent dispersal bed area. The system has been designed to accommodate medications that will be present in the sewage from those campers being treated for cancer.

To aid in the removal of residual medications from the wastewater the proposed treatment system is designed to have a combined tank capacity for the balancing and primary treatment phases of 191,500 L. This will provide 2.3 days of retention time based on the theoretical daily sewage flow rate of 83,300 L. Most oral cancer drugs have half life of less than 24 hours with some drugs having a half life of less than an hour. Based on a half life of 24 hours the balancing and primary treatment tanks will allow for a 79.7% reduction in residual medication.

Given the land area available we recommend the use of a large subsurface dispersal bed over direct discharge of the effluent to West Lake. The operation and maintenance cost of a direct discharge system would be more than for a subsurface dispersal system. Due to existing soil conditions, the bed will need to be fully raised or fit to the topography to ensure the dispersal bed can function as required. The required sand area is 10 413 m<sup>2</sup> for WWTS 1. The attached drawing Proposed Wastewater Treatment Systems C-101 identifies the proposed dispersal bed and treatment system location.

West Lake is a shallow body of water with limited flushing capability. It is located adjacent to the Area of Concern of the Great Lakes that is affected by the Bay of Quinte Remedial Action Plan (BQRAP). This plan identifies that nutrient concentrations in the affected waters are elevated and imposes nutrient limits of 2.5 mg/L for nitrates (N) and 0.1 mg/L for total phosphorous (P) for effluent discharged to the affected water bodies. However, West Lake is not part of the BQRAP.

Further study has been completed to review effluent nutrient attenuation and groundwater mounding to determine concentration levels at property boundaries. Attenuation calculations are provided in Appendix C. This analysis will use the more restrictive criteria of the BQRAP as a conservative approach. To meet the nutrient limits outlined in the BQRAP, nitrate removal of 90.5% and phosphorous removal of 98.2% will need to be provided by the wastewater treatment system.

As the total theoretical daily design sewage flow is greater than 10 000 L the Ministry of Environment, Conservation and Parks (MECP) will be the regulatory approval authority for the wastewater system design. An application will be made to MECP for an Environmental Compliance Approval for private sewage works. Pre-consultation with District Staff has been completed. A preliminary design brief is attached.

Should there be any questions on any aspect of this submission, please do not hesitate to contact the undersigned.

Sincerely,



Martin Burger  
MEng., P.Eng.

## Appendix A

### ECA Application Preliminary Design Brief

# Design Brief

## Campfire Circle – Prince Edward County

565 Wesley Acres Road  
Bloomfield, ON, K0K 1G0

Prepared for: **Campfire Circle**

Project No: **GW-23003-16**

Date: **January 23, 2026**

Revised: **August 12, 2026**



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## **Executive Summary**

This design brief is in support of an application for a new Environmental Compliance Approval (ECA) for the proposed Campfire Circle – Prince Edward County (Site) for sewage works for the collection, treatment and subsurface disposal of up to 83.30 cubic meters (m<sup>3</sup>) of combined domestic/commercial sewage flow per day.

Campfire Circle – Prince Edward County (CFC-PEC) is a proposed 33.7-hectare (ha) year-round children's camp consisting of thirteen (13) boarding house style residences with sleeping space for one-hundred and eighty (180) campers and two-hundred and twenty-three (223) staff, a lodge that will serve as the Site's restaurant/cafeteria with three-hundred and sixty (360) seats, several indoor activity spaces, a 2-bedroom director's cabin, and a small hospital with eight (8) staff and five (5) patient beds. There are a combined total of four-hundred and fifteen (415) bed spaces at the camp including the director's cabin.

The Site is currently unserviced. The proposed wastewater treatment system (WWTS) will consist of an advanced treatment system consisting of a Moving Bed Bioreactor (MBBR) provided by Bergmann North America (BNA) and a Type A dispersal bed. The MBBR treatment system is designed to provide direct discharge quality effluent that will be discharged via subsurface dispersal to reduce impacts on West Lake.

The Site does not currently have an Environmental Compliance Approval (ECA) for sewage works.

## **1.0 Introduction**

Groundwork Engineering Limited (GEL) was retained by Campfire Circle (CFC) to provide engineering services in order to support an Environmental Compliance Approval (ECA) Application for a new onsite wastewater treatment system.

This brief, prepared by GEL on behalf of CFC, details the proposed wastewater treatment system. The proposed design will consist of a sanitary sewage network, an advanced treatment system consisting of a Moving Bed Bioreactor (MBBR) provided by Bergmann North America (BNA), and a Type A dispersal bed. The MBBR treatment system is designed to provide direct discharge quality effluent that will be discharged via subsurface dispersal to reduce impacts on West Lake.

## **2.0 Site Overview**

CFC-PEC is a 33.7 ha proposed year-round children's camp that will operate at full capacity from May to October and at a reduced capacity for the remainder of the year. It is located at 565 Wesley Acres Road, Bloomfield, Ontario and can be legally described as Part Lot 2 Concession 1 Military Tract Part Point M or Gibsons Point Part 1 47R7639; Ward 2 (Bloomfield/Hallowell), Prince Edward County.

The site is bordered by Wesley Acres Road and the Bloomfield Creek Wetland to the north, the Bloomfield Creek Wetland to the west, agricultural lands to the east, and West Lake to the south. There are no existing structures on the property. There are three (3) drilled wells on the property.

The site does not currently have an Environmental Compliance Approval (ECA). A detailed description of the proposed wastewater treatment system components is provided in Section 4 of this brief.

### **3.0 Theoretical Sewage Flows**

Theoretical sewage flows were calculated for the Lodge, Summer Staff Residence, Mature Staff Residence, nine (9) Camper Residences, Hospital, Pool Building, Drama Building, Indoor Activity Building, Equestrian Stables, Greenhouse, Directors Cabin, and Flex Building. The daily design sewage flow was calculated using Ontario Building Code (OBC) Table 8.2.1.3.A and OBC Table 8.2.1.3.B.

The only people using the non-residential buildings will be staying in the residential buildings on site. Therefore, to avoid duplication of wastewater flows and to more accurately determine the required pump chamber sizing the flow from the residential buildings is reduced from 200 L/day per bed to 153.77 L/day per bed. This reduction in residential flow is equivalent to subtracting 19,000 L/day from the flows associated with the residential buildings and added 19,000 L/day to the lodge, activity spaces, and pool.

#### **3.1. Lodge**

The lodge is most accurately described as a Cafeteria with three-hundred and sixty (360) seats that serve three (3) meals per day per seat as per OBC 8.2.1.3.B.(11)(i).

1080 meals @ 12 L/day per meal per day OBC 8.2.1.3.B.(11)(i). **= 12,960 L/day**

#### **3.2. Summer Staff Residence**

The Summer Staff Residence is most accurately represented as a Boarding House with meal and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i).

66 beds @ 153.77 L/day per bed OBC 8.2.1.3.B.(11)(i). **= 10,149 L/day**

#### **3.3. Mature Staff Residence**

The Mature Staff Residence is most accurately represented as a Boarding House with meal and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i).

10 beds @ 153.77 L/day per bed OBC 8.2.1.3.B.(11)(i). **= 1,538 L/day**

### **3.4. Camper Residences**

The nine (9) Camper Residences are most accurately represented as Boarding Houses with meal and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i).

9 Residences @ 32 beds each @ 153.77 L/day per bed OBC 8.2.1.3.B.(11)(i). **= 44,286 L/day**

### **3.5. Hospital**

The Hospital is most accurately represented as Boarding House with meal and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i) for the eight (8) staff bedrooms. The hospital also contains five (5) patient beds. However, the patient beds will only be used for campers that are receiving medication and as such will not contribute any additional flow to the site.

8 beds @ 153.77 L/day per bed OBC 8.2.1.3.B.(11)(i). **= 1,230 L/day**

### **3.6. Pool Building**

The Pool Building is most accurately represented as a Swimming and Bathing Facility as per OBC Table 8.2.1.3.B.(23).

75 people @ 40 L/day per person OBC 8.2.1.3.B.(23). **= 3,000 L/day**

### **3.7. Drama Building**

The Drama Building is most accurately represented as an Assembly Hall with no food service as per OBC Table 8.2.1.3.B.(2)(a).

75 people @ 8 L/day per person OBC 8.2.1.3.B.(2)(a). **= 600 L/day**

### **3.8. Indoor Activity Building**

The Indoor Activity Building is most accurately represented as an Assembly Hall with no food service as per OBC Table 8.2.1.3.B.(2)(a).

200 people @ 8 L/day per person OBC 8.2.1.3.B.(2)(a). **= 1,600 L/day**



### 3.9. Equestrian Stables

The Equestrian Stables are most accurately represented as an Assembly Hall with no food service as per OBC Table 8.2.1.3.B.(2)(a).

30 people @ 8 L/day per person OBC 8.2.1.3.B.(2)(a). **= 240 L/day**

### 3.9. Greenhouse

The Greenhouse is most accurately represented as an Assembly Hall with no food service as per OBC Table 8.2.1.3.B.(2)(a).

75 people @ 8 L/day per person OBC 8.2.1.3.B.(2)(a). **= 600 L/day**

### 3.10. Director's Cabin

The Director's Cabin is most accurately described as a 2-bedroom residence as per OBC Table 8.2.1.3.A(2)(4)(b).

2-bedroom residence OBC 8.2.1.3.A(2)(4)(b). **= 1,100 L/day**

### 3.11. Flex Building

The Flex Building is most accurately represented as a Boarding House with meal and laundry facilities as per OBC 8.2.1.3.A.(2)(a)(i).

39 beds @ 153.77 L/day per bed OBC 8.2.1.3.B.(11)(i). **= 5,997 L/day**

|                                                      |
|------------------------------------------------------|
| <b>Total Daily Design Sewage Flow = 83,300 L/day</b> |
|------------------------------------------------------|

*\*Volume is over 10,000 L/day and falls under the authority of Ministry of Environment, Conservation and Parks (MECP). This system shall be operated under an Environmental Compliance Approval (ECA) for Private Sewage Works.*

## **4.0 Proposed Sewage Works**

A new Advanced Wastewater Treatment System is being proposed to service the entire site. The new sewage system will utilize new wastewater infrastructure as described in Section 4.1. The new wastewater infrastructure includes a gravity sanitary sewer pipe network, seven (7) pump chambers, forcemains, and a wastewater treatment system consisting of a Moving Bed Bioreactor (MBBR) provided by Bergmann North America (BNA), and a Type A dispersal bed. Proposed site plan drawings can be found in Appendix A.

The proposed treatment system has a combined tank capacity for the balancing and primary treatment phases of 191,500 L. This will provide 2.3 days of retention time based on the theoretical daily sewage flow rate of 83,300 L. Most oral cancer drugs have half life of less than 24 hours with some drugs having a half life of less than an hour. Based on a half life of 24 hours the balancing and primary treatment tanks will provide for a 79.7% reduction in active medication.

### **4.1. Pump Chambers (PC1 to PC7)**

Seven (7) pump chambers of volumes ranging from 450 L to 8,000 L and a sanitary sewer network are proposed to convey wastewater to the advanced treatment system.

Pump Chamber 1 (PC1) services a washroom building located in the southwest part of the property. PC1 has a working volume of 1,200 L and conveys wastewater via a 193 m long 50 mm diameter forcemain to Maintenance Hole 1 (MH1). MH1 discharges to Pump Chamber 2 (PC2).

PC2 services the Summer Staff Residence, Mature Staff Residence, and four (4) Camper Residences and also receives flow from PC1. PC2 has a working volume of 7,200 L and conveys wastewater via a 270 m long 50 mm diameter forcemain to Pump Chamber 3 (PC3).

PC3 services the Hospital and also receives flow from PC2 and Pump Chamber 5 (PC5). PC3 has a working volume of 8,000 L and conveys wastewater via a 270 m long 50 mm diameter forcemain to Maintenance Hole 8 (MH8).

Pump Chamber 4 (PC4) services the Lodge, Drama Building, Pool Building, and three (3) Camper Residences. PC4 has a working volume of 6,000 L and conveys wastewater via a 95 m long 50 mm diameter forcemain to Pump Chamber 7 (PC7).

PC5 services the Director's Cabin. PC5 has a working volume of 450 L and conveys wastewater via a 29 m long 50 mm diameter forcemain to PC3.

Pump Chamber 6 (PC6) services the Flex Building, Greenhouse, and Equestrian Stables. PC6 has a working volume of 2,900 L and conveys wastewater via a 227 m long 50 mm diameter forcemain to MH8.

PC7 services the indoor activity building and also receives flow from PC4. PC2 has a working volume of 7,200 L and conveys wastewater via a 108 m long 50 mm diameter forcemain to Maintenance Hole 7 (MH7).

Pump chamber volume calculations, pump sizing calculations, and sanitary sewer calculations can be found in Appendix B.

*\*All forcemains unless otherwise noted have a diameter of 50 mm. All pump chambers will be equipped with audible and visual warning alarms.*

## **4.2. Moving Bed Bioreactor (MBBR)**

Wastewater treatment will be provided by a BNA MBBR treatment system with the unit processes and tank specifications as follows;

- An Influent Equalization unit consisting of two (2) single chamber precast concrete tanks with a total working volume of approximately 78,300 L with wastewater to flow via forcemain to the Primary Treatment and Sludge Storage Unit;
- A Sludge Storage unit consisting of two (2) single chamber precast concrete tanks with a combined total working volume of approximately 76,900 L with wastewater to flow via gravity through the unit to the Primary Treatment Unit Primary Clarifier;
- A Primary Clarifier consisting of one (1) single chamber precast tank with an approximate working volume of 36,300 L with primary effluent to flow via gravity through the clarifier to Secondary Treatment Unit- Bioreactor 1;
- Bioreactor 1 MBBR consisting of one (1) single chamber precast tank with an approximate working volume of 30,200 L, equipped with fine bubble aeration diffusers and carrier media, with process water to flow via gravity to the Secondary Treatment Unit- Bioreactor 2;
- Bioreactor 2 MBBR consisting of one (1) single chamber precast tank with an approximate working volume of 29,400 L, equipped with fine bubble aeration diffusers and carrier media, with some wastewater (process effluent recirculation) to be recirculated via forcemain to the Sludge Storage unit with supplemental carbon (primary) dosed into the recirculation line to ensure mixing in the primary treatment tanks; remainder of the process water to flow via gravity to the Secondary Treatment Unit- Secondary Clarifier;
- A Secondary Clarifier consisting of one (1) single chamber precast tank with an approximate working volume of 14,100L equipped with three (3) specialized hoppers, scum skimmer system and three (3) sludge return pumps, such that scum and sludge (process effluent sludge return) are returned to the Sludge Storage unit and the secondary effluent to flow to the Tertiary Treatment Unit- Anoxic Bioreactor;
- Anoxic Bioreactor consisting of one (1) single chamber precast tank with an approximate working volume of 17,100 L, equipped with carrier media, supplemental carbon (tertiary) dosing is flow paced based on the influent equalization pump operation and proportioned to limit residual nitrate; the carbon supplement is intermittently mixed in the reactor via (3) mixing pumps; with process water to flow via gravity to the Tertiary Treatment Unit- Bioreactor 3;
- Bioreactor 3 MBBR consisting of the first chamber of one (1) precast dual chamber tank with an approximate working volume of 9,800 L; with fine bubble aeration diffusers and carrier media, with process water to flow via gravity to the Tertiary Treatment Unit- Floc Reactor;

- Floc Reactor phosphorous reduction system consisting of one (1) single chamber precast tank with an approximate working volume of 1,800L which eliminates phosphorous by chemical precipitation with Clariphos® rare earth coagulant, stored and dosed via pump from a vessel in the control shed, with process water to flow via gravity to the Tertiary Treatment Unit- Tertiary Clarifier;
- Tertiary Clarifier consisting of the second chamber of Bioreactor 3 MBBR tank with a working capacity of 12,600 L; equipped with two (2) specialized hoppers, scum skimmer system and two (2) sludge return pumps, such that scum and sludge (process effluent sludge return) are returned to the Secondary Sludge Storage tank and the tertiary effluent to flow to the Intermediate Pump Tank;
- Intermediate Pump Tank consisting of one (1) single chamber precast tank with an approximate working volume of 23,300L equipped with duplex effluent pumps and high-level audio/visual alarm system discharging via forcemain to a Tertiary Filtration system;
- A Tertiary Filtration system housed in a control shed consisting of an Enhanced (tertiary) phosphorus reduction and filtration system which further reduces phosphorus by chemical precipitation with Clariphos® rare earth coagulant, stored and dosed via pump from a vessel in the control shed which will discharge treated effluent to the Effluent Pump Tank; and
- An Effluent Pump Tank consisting of one (1) precast single chamber tank with an approximate working volume of 23,300 L equipped with duplex effluent pumps and high-level audio/visual alarm system discharging via forcemain to the Type A Dispersal Bed.

Detailed design and specifications for the MBBR can be found in Appendix C.

### 4.3. Type A Dispersal Bed (DB1)

The proposed dispersal bed will consist of four (4) identical cells that will each treat 25% of the effluent. Each of the four (4) cells in the dispersal bed will consist of 16 runs of 25.5 m long 100 mm diameter perforated PVC pipe in a 424 m<sup>2</sup> stone area (the combined stone area is 1,696 m<sup>2</sup>). The sand area will be combined for the bed and will have a total area of 10,902 m<sup>2</sup>.

The main variables in the determination of the capacity of a dispersal bed are the percolation rate of the soils in which the pipes are laid and the daily sewage flow. The daily sewage flows are calculated using OBC tables 8.2.1.3.A. & 8.2.1.3.B. Two soil samples were tested for estimated percolation rate (T- time) with the T-time of the sample from the proposed dispersal bed location having a T-time of over 50 min/cm.

The capacity of each dispersal bed is based on the size of the stone area and the sand area. The size of the stone area is determined as:

$$A = Q/B \text{ (OBC 8.7.7.1. (6)(e))}$$

A = Area of stone in Type A dispersal bed

Q = Daily flow capacity

B = 50 if Q > 3,000 L/day or 75 if Q < 3,000 L/day

When the percolation time of the native soils is more than 15 minutes the size of the sand area is determined as:



$$A = (QT)/400 \text{ (OBC 8.7.7.1.(5)(b))}$$

A = Area of sand in Type A dispersal bed

Q = Daily flow capacity

T = Percolation time of native soil

#### **PROPOSED DISPERSAL BED (TYPICAL)**

##### **LOADING - NATIVE SOIL:**

T-TIME >50 \*Silty sand, trace clay

A = AREA OF STONE OR SAND

Q = DAILY DESIGN SEWAGE FLOW

T = PERCOLATION TIME OF NATIVE SOIL

B = 50 if Q>3,000 L/day or 75 if Q<3,000 L/day

##### **STONE AREA**

$$A = 1,696 \text{ m}^2 \rightarrow Q/B \rightarrow 83,300/50 = 1,666 \text{ m}^2 \text{ (REQ'D)}$$

##### **SAND AREA**

$$A = 10,902 \text{ m}^2 \rightarrow QT/400 \rightarrow (83,300*50)/400 = 10,412.5 \text{ m}^2 \text{ (REQ'D)}$$

Figure 1: Daily rated subsurface Type A dispersal bed capacities.

Infiltration rates for the sanitary gravity pipe network were calculated based on 1.8 L/day/m of public sewer (Stevens-Schutzbach Method).

There are 450 m of 100 mm diameter sanitary sewers and 67 m of 150 mm diameter sanitary sewers on the site which results in a total maximum infiltration rate of 931 L/day for the site during periods of high groundwater.

Design details for the proposed wastewater treatment system can be found in the design drawings in Appendix A. Infiltration calculations can be found in the sanitary sewer calculation sheet in Appendix B.

## **5.0 Effluent Attenuation**

Attenuation is used to reduce the concentration of Phosphorus and Nitrogen in effluent. Under O. Reg. 169/03: Ontario Drinking Water Quality Standards Nitrate (as nitrogen) in potable water should be less than 10 mg/L and under the Bay of Quinte Remedial Action Plan (BQRAP) the Nitrate (as nitrogen) concentration should be less than 2.5 mg/L and the Phosphorus concentration should be less than 0.1 mg/L.

## 5.1. Phosphorus

Prediction of Contaminant Attenuation (Ministry of Environment Design Guidelines for Sewage Works 2008, Chapter 22 – Section 22.5.8)

$$V_A = A_D \times k$$

$$V_T = V_A + V_S$$

$$C_{PB} = \frac{C_S \times V_S}{V_T}$$

$V_A$  = Annual attenuation volume [ $m^3$ ]

$A_D$  = Attenuation Area 1 [ $m^2$ ]

$V_T$  = Total volume of water [ $m^3$ ]

$V_S$  = Annual sewage Volume [ $m^3$ ]

$C_{PB}$  = Concentration at property boundary or water course [mg/L]

$C_S$  = Concentration in sewage [mg/L]

$k$  = 0.25m [SI]

Type A dispersal bed servicing a maximum theoretical daily design sewage flow of 83,300 L/day in the summer and 41,650 L/day in the winter.

Calculation:

$V_A = 11,380m^3$

Attenuation Volume.

$A_D = 45,520m^2$

Attenuation Area WWTS 1 (See attached drawing)

$V_T = 33,579m^3$

Total Volume of water based on 168-day summer and 197-day winter operational season.

$V_S = 22,199m^3$

Annual sewage volume based on 168-day summer and 197-day winter operational season.

$CPB = 5.42mg/L$

Concentration after attenuation.

$C_S = 8.2mg/L$

Typical Concentration of Phosphorus in Septic Tank Effluent as per Table 1.2 Sharaf, Ahmed, On-Site Sewage Systems Ministry of Municipal Affairs and Housing. 2013.

$k = 0.25m$  [SI]

Assumes 250 mm annual attenuation precipitation rate.

$$V_A = 45,520m^2 \times 0.25m$$

$$V_A = 11,380m^3$$

$$V_T = 11,380m^3 + 22,199m^3$$

$$V_T = 33,579m^3$$

$$C_{PB} = \frac{8.2\text{mg/L} \times 22,199\text{m}^3}{33,579\text{m}^3}$$

$$C_{PB} = 5.42\text{mg/L}$$

This assumes worst case with no phosphorus retention in sand and soils around the dispersal bed

The annual phosphorus loading into wetland based is on a 168-day summer and 197-day winter operational season.

Summer:

$$P_{\text{loading}} = C_{PB} \times \text{Daily Sewage Flow} = 5.42 \text{ mg/L} \times 83,300 \text{ L/day} = 0.451 \text{ Kg/day}$$

Winter:

$$P_{\text{loading}} = C_{PB} \times \text{Daily Sewage Flow} = 5.42 \text{ mg/L} \times 41,650 \text{ L/day} = 0.226 \text{ Kg/day}$$

$$0.451 \text{ Kg/day} \times 168 \text{ days/year} + 0.226 \text{ Kg/day} \times 197 \text{ days/year} = 120.29 \text{ Kg/year}$$

West Lake is not part of the Bay of Quinte Remedial Action Plan (BQRAP) but due to low flow turnover in West Lake it is assumed that concentration limits similar to the BQRAP would be required by MECP.

A phosphorus concentration of 5.42 mg/L exceeds the maximum allowable phosphorus concentration in effluent entering a surface water body. Phosphorus concentration limits vary by water body; however, for water bodies affected by the BQRAP they are 0.1 mg/L or less. Achieving a phosphorus concentration after attenuation of 0.1 mg/L would require a pre-attenuation concentration of 0.15 mg/L or less. This would require a phosphorus reduction of 98.2% during treatment.

## 5.2. Nitrate (as nitrogen)

Prediction of Contaminant Attenuation (Ministry of Environment Design Guidelines for Sewage Works 2008, Chapter 22 – Section 22.5.8)

$$V_A = A_D \times k$$

$$V_T = V_A + V_S$$

$$C_{PB} = \frac{C_S \times V_S}{V_T}$$

$V_A$  = Annual attenuation volume [ $\text{m}^3$ ]

$A_D$  = Attenuation Area 1 [ $\text{m}^2$ ]

$V_T$  = Total volume of water [ $\text{m}^3$ ]

$V_S$  = Annual sewage Volume [ $\text{m}^3$ ]

$C_{PB}$  = Concentration at property boundary or water course [ $\text{mg/L}$ ]

$C_s$  = Concentration in sewage [mg/L]  
 $k = 0.25m$  [SI]

Type A dispersal bed servicing a maximum theoretical daily design sewage flow of 83,300 L/day in the summer and 41,650 L/day in the winter.

Calculation:

|                      |                                                                                      |
|----------------------|--------------------------------------------------------------------------------------|
| $V_A = 11,380m^3$    | Attenuation Volume.                                                                  |
| $A_D = 45,520m^2$    | Attenuation Area WWTS 1 (See attached drawing)                                       |
| $V_T = 33,579m^3$    | Total Volume of water based on 168-day summer and 197-day winter operational season. |
| $V_S = 22,199m^3$    | Annual sewage volume based on 168-day summer and 197-day winter operational season.  |
| $C_{PB} = 26.44mg/L$ | Concentration after attenuation.                                                     |
| $C_s = 40mg/L$       | Typical Concentration of Nitrate in Septic Tank Effluent.                            |
| $k = 0.25m$ [SI]     | Assumes 250mm annual attenuation precipitation rate.                                 |

$$V_A = 45,520m^2 \times 0.25m$$

$$V_A = 11,380m^3$$

$$V_T = 11,380m^3 + 22,199m^3$$

$$V_T = 33,579m^3$$

$$C_{PB} = \frac{40mg/L \times 22,199m^3}{33,579m^3}$$

$$C_{PB} = 26.44mg/L$$

This assumes worst case with no nitrogen retention in the sand and soils around the dispersal bed

The annual nitrate loading into wetland based on a 168-day summer and 197-day winter operational season.

Summer:

$$N_{loading} = C_{PB} \times \text{Daily Sewage Flow} = 26.44 \text{ mg/L} \times 83,300 \text{ L/day} = 2.20 \text{ Kg/day}$$

Winter:

$$N_{loading} = C_{PB} \times \text{Daily Sewage Flow} = 26.44 \text{ mg/L} \times 41,650 \text{ L/day} = 1.10 \text{ Kg/day}$$

$$2.20 \text{ Kg/day} \times 168 \text{ days/year} + 1.10 \text{ Kg/day} \times 197 \text{ days/year} = 586.3 \text{ Kg/year}$$

West Lake is not part of the BQRAP but due to low flow turnover in West Lake we are assuming that concentration limits similar to the BQRAP would be required by MECP.

A nitrate concentration of 26.44 mg/L exceeds the BQRAP and MECP B7 Reasonable Use Guidelines limit of 2.5 mg/L or less for surface water. Achieving a nitrate concentration after



attenuation of 2.5 mg/L would require a pre-attenuation concentration of 3.78 mg/L or less. This would require a nitrate reduction of 90.5% during treatment.

The attenuation area map can be found in Appendix D.

## **6.0 Recommendations**

The proposed wastewater treatment system is designed to provide nitrate (as nitrogen) reduction of 90.5% and phosphorus reduction of 98.2%. This nutrient reduction combined with attenuation will result in a nitrate concentration of 2.5 mg/L or less and a phosphorus concentration of 0.1 mg/L or less at the wetland boundary meeting the effluent objectives outlined in the BQRAP and the MECP B7 Reasonable Use Guidelines.

The proposed wastewater treatment system will also provide Total Suspended Solids (TSS) reduction and Biochemical Oxygen Demand (BOD<sub>5</sub>) reduction resulting in TSS concentrations of 10 mg/L and BOD<sub>5</sub> concentrations of 10 mg/L in the effluent as per MECP requirements.

The proposed monitoring locations are the balancing/equalization tanks, the effluent pump tank, and three (3) monitoring wells installed below the dispersal between the garden and the wetland.

It is recommended that Campfire Circle – Prince Edward County have an operation and maintenance manual produced for the proposed sewage works. This manual should include start up and shut down procedures. Maintenance procedures should include annual inspection of pump chambers, holding tanks, treatment units and system controls. Maintenance should also include cleaning of effluent filters, grease tank and measurement of the sludge depth in tanks. Pump out/removal of sludge is required when this depth reaches approximately 1/3 the total working height of the tanks. It is necessary to have an active maintenance agreement to service the Moving Bed Bioractor (MBBR) treatment units annually.

The report recommendations are applicable only to the project described in the report. Any changes to the project will require review by Groundwork Engineering Limited to ensure compatibility with the recommendations contained in this brief.

We trust this brief provides sufficient information for your present purposes. If you have any questions concerning this report or if we may be of further service to you, please do not hesitate to contact the undersigned.

**Report Prepared by:**

*Lucas McCallum*

\_\_\_\_\_  
Lucas McCallum, B. Eng., C. Tech.



**Report Reviewed by:**

\_\_\_\_\_  
Martin Burger, M.Eng., P.Eng.

## Statement of Qualifications and Limitations

The attached Report has been prepared by Groundwork Engineering Limited (the Consultant) for the benefit of the Client in accordance with their Agreement.

The information, data, recommendations and conclusions contained in the Report:

1. is subject to the scope, schedule, and other constraints and limitations in the Agreement and the qualifications contained in the Report;
2. represents the Consultant's judgement in light of the limitations and industry standards for the preparation of similar reports;
3. may be based on information provided to Consultant which has not been independently verified;
4. has not been updated since the date of issuance of the Report and its accuracy is limited to the time and circumstances in which it was prepared; and
5. must be read as a whole and sections should not be read out of context.

The Consultant shall be entitled to rely upon the accuracy and completeness of information that was provided to it and has no obligation to update such information. Consultant accepts no responsibility for any events or circumstances that may have occurred since the date on which the Report was prepared.

Any estimates or opinions regarding expected construction costs or construction schedule provided by Consultant represent Consultant's judgement in light of its experience and the knowledge and information available to it at the time of preparation. The Consultant does not make any representations, with respect to such estimates or opinions, and accepts no responsibility for any loss or damage arising from them. Persons relying on such estimates or opinions do so at their own risk.

Except as agreed to in writing by the Consultant and the Client; as required by-law; or to the extent used by governmental reviewing agencies for the purpose of obtaining permits or approvals, the Report and the Information may be used and relied upon only by the Client.

The Consultant accepts no responsibility, to parties other than the Client who may obtain access to the Report or the information for any injury, loss or damage suffered by such parties arising from their use of, reliance upon, or decisions or actions based on the Report, except to the extent those parties have obtained the prior written consent of the Consultant to use and rely upon the Report and the information. Any injury, loss or damages arising from improper use of the Report shall be borne by the party making such use.

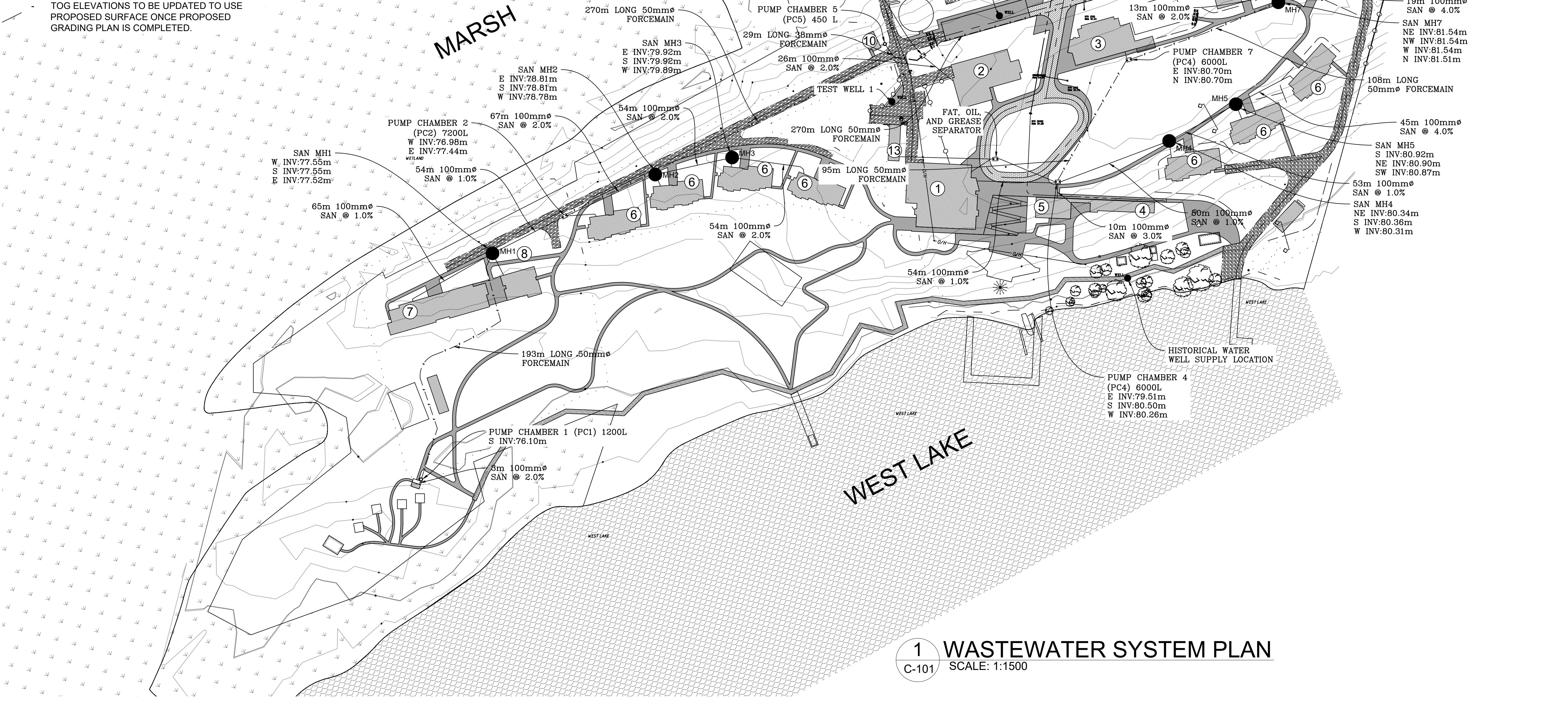
## Appendix A

### Drawings



| STRUCTURES TABLE |        |                                                |                                           |               |                |
|------------------|--------|------------------------------------------------|-------------------------------------------|---------------|----------------|
| STRUCTURE        | TOG    | INV IN                                         | SIZE IN                                   | INV OUT       | SIZE OUT       |
| MH1              | 79.59m | W INV:77.55m<br>S INV:77.55m<br>SW INV:77.55m  | 100mm<br>100mm                            | E INV:77.53m  | 100mm          |
| MH2              | 81.40m | E INV:78.81m<br>S INV:78.81m                   | 100mm<br>100mm                            | W INV:78.78m  | 100mm          |
| MH3              | 82.14m | E INV:79.92m<br>S INV:79.92m                   | 100mm<br>100mm                            | W INV:79.89m  | 100mm          |
| MH4              | 83.50m | E INV:80.34m<br>S INV:80.36m                   | 100mm<br>100mm                            | W INV:80.31m  | 100mm          |
| MH5              | 83.32m | NE INV:80.90m<br>S INV:80.92m                  | 100mm<br>100mm                            | SW INV:80.87m | 100mm          |
| MH6              | 77.94m | E INV:76.98m                                   | 100mm                                     | N INV:76.95m  | 100mm          |
| MH7              | 84.75m | NE INV:81.54m<br>NW INV:81.54m<br>W INV:81.51m | 100mm<br>100mm<br>100mm                   | N INV:81.51m  | 150mm          |
| MH8              | 81.50m | W INV:80.55m<br>W INV:80.55m<br>S INV:80.55m   | 50mm FORCEMAIN<br>50mm FORCEMAIN<br>150mm | N INV:80.52m  | 150mm          |
| PC1              | 76.79m | S INV:76.10m                                   | 100mm                                     | N INV:76.10m  | 50mm FORCEMAIN |
| PC2              | 80.38m | E INV:77.44m<br>W INV:76.98m                   | 100mm<br>100mm                            | E INV:76.98m  | 50mm FORCEMAIN |
| PC3              | 81.80m | W INV:80.80m<br>W INV:80.80m<br>S INV:80.88m   | 38mm FORCEMAIN<br>50mm FORCEMAIN<br>100mm | E INV:80.80m  | 50mm FORCEMAIN |
| PC4              | 83.60m | E INV:79.51m<br>W INV:80.26m<br>S INV:80.50m   | 100mm<br>100mm<br>100mm                   | N INV:80.65m  | 50mm FORCEMAIN |
| PC5              | 80.97m | W INV:79.97m                                   | 100mm                                     | S INV:79.97m  | 38mm FORCEMAIN |
| PC6              | 76.60m | E INV:75.31m<br>N INV:75.35m<br>S INV:75.35m   | 100mm<br>100mm<br>100mm                   | E INV:75.35m  | 50mm FORCEMAIN |
| PC7              | 84.10m | N INV:80.70m<br>W INV:80.70m                   | 100mm<br>50mm FORCEMAIN                   | E INV:80.80m  | 50mm FORCEMAIN |

NOTES:  
- TOG ELEVATIONS BASED ON EXISTING GROUND SURFACE.  
- TOG ELEVATIONS TO BE UPDATED TO USE PROPOSED SURFACE ONCE PROPOSED GRADING PLAN IS COMPLETED.



1 WASTEWATER SYSTEM PLAN  
C-101 SCALE: 1:1500



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| LEGEND          |                        |
|-----------------|------------------------|
| ---             | NEW 50mm FORCEMAIN     |
| BUILDING NUMBER | BUILDING NAME          |
| 1               | LODGE                  |
| 2               | HOSPITAL               |
| 3               | INDOOR ACTIVITY SPACE  |
| 4               | POOL BUILDING          |
| 5               | DRAMA BUILDING         |
| 6               | CAMPER RESIDENCE       |
| 7               | SUMMER STAFF RESIDENCE |
| 8               | MATURE STAFF RESIDENCE |
| 9               | FLEX                   |
| 10              | DIRECTOR'S CABIN       |
| 11              | EQUESTRIAN STABLES     |
| 12              | GREENHOUSE             |
| 13              | COOKING PROGRAM        |

| REVISIONS |                                   |            |
|-----------|-----------------------------------|------------|
| No.       | Description                       | Date       |
| 05        | ISSUED FOR SITE PLAN APPLICATION  | 2025/08/05 |
| 06        | REVISED PER DECEMBER 2025 DRAWING | 2026/01/23 |
| 07        | REVISED PER FEBRUARY 2026 DRAWING | 2026/02/10 |
| 08        | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09        | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| BENCHMARK: |             |           |
|------------|-------------|-----------|
| No.        | DESCRIPTION | ELEVATION |
| ##         | XXX         | XXX.XX    |
|            |             |           |
|            |             |           |
|            |             |           |



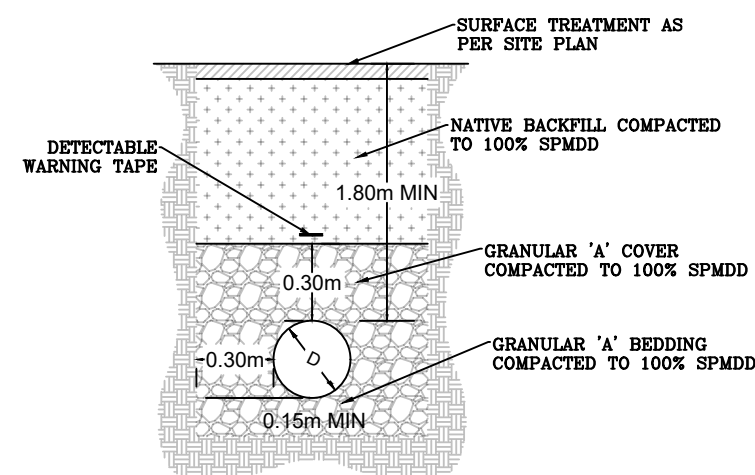
Client / Land Owner: CAMPFIRE CIRCLE

Project: 565 WESLEY ACRES ROAD  
BLOOMFIELD ONTARIO  
Drawing Title: SANITARY WASTEWATER PLAN

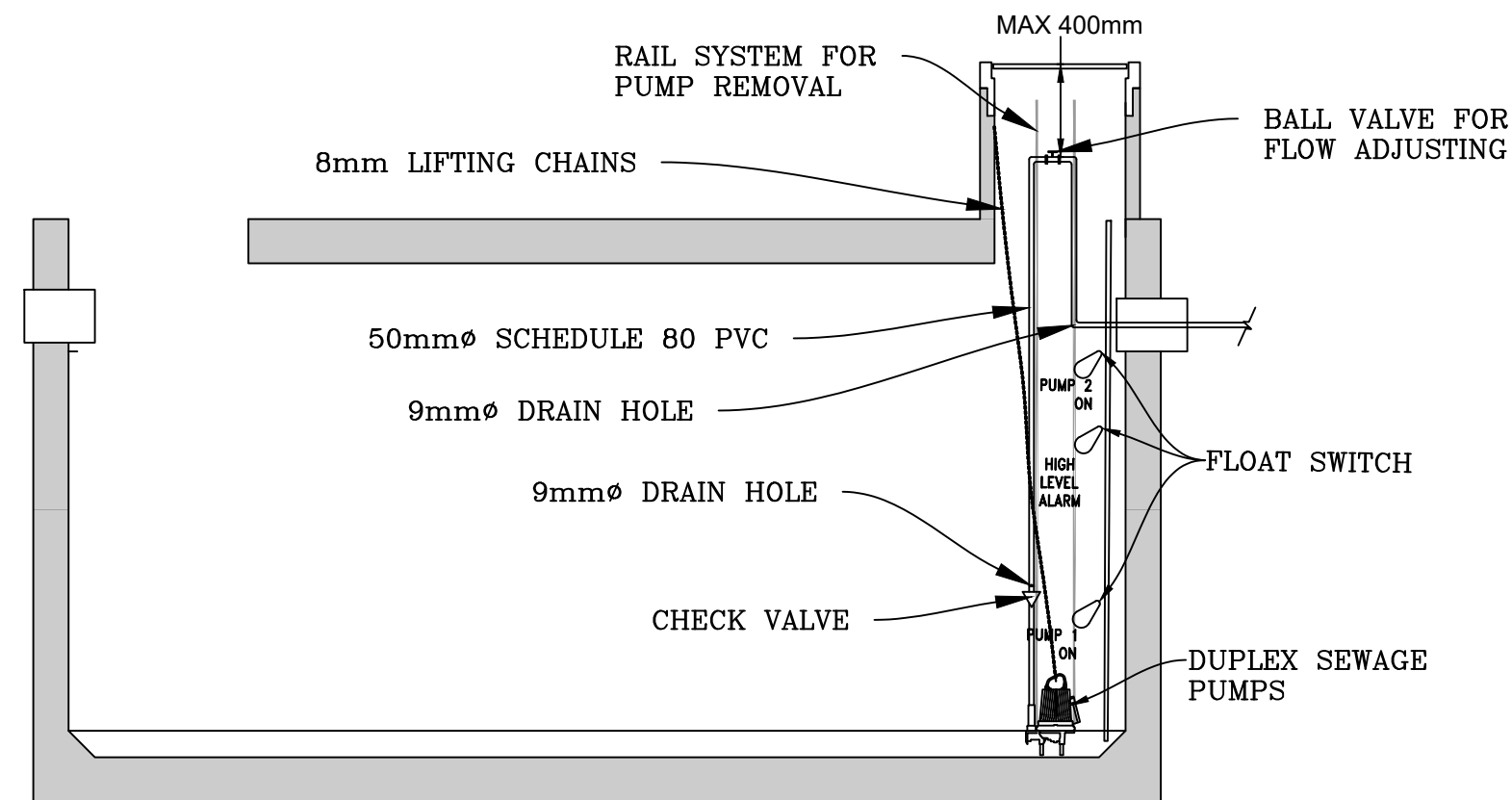
|                       |                             |
|-----------------------|-----------------------------|
| Drawn by: LM          | Project Number: GW-23003-16 |
| Checked By: MB        | Drawing Number: C-101       |
| Scale: 24"x36" 1:1500 |                             |
| Date: AUG 12, 2026    | SHEET 1 of 3                |



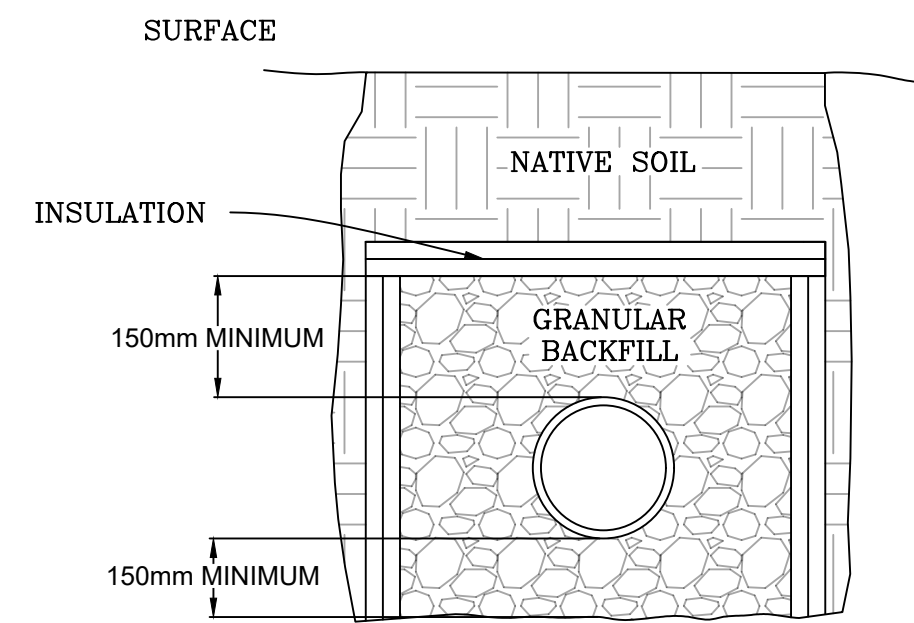
- NOTES:
- SANITARY OUTLET INVERT IS ASSUMED TO BE 1.0m BELOW FINISHED FLOOR ELEVATION (FFE)
  - SANITARY OUTLET FROM 2-STORY BUILDINGS IS ASSUMED TO BE 1.0m BELOW UPPER FLOOR FFE.
  - MANHOLES TO BE AS PER OPSD 701.010.
  - ALL GRAVITY SEWER MAIN PIPE TO BE PVC SDR35.
  - ALL FORCEMAINS TO BE 150 PSI POLYETHYLENE.
  - ALL FORCEMAINS UNLESS OTHERWISE NOTED ARE 50mmØ.
  - ALL FORCEMAINS IF NOT SELF DRAINING TO BE BURIED 1.5m DEEP, INSULATED, OR HEAT TRACED TO PREVENT STANDING WATER FROM FREEZING.



SANITARY TYPICAL TRENCH



TYPICAL PUMP CHAMBER  
SCALE: NTS

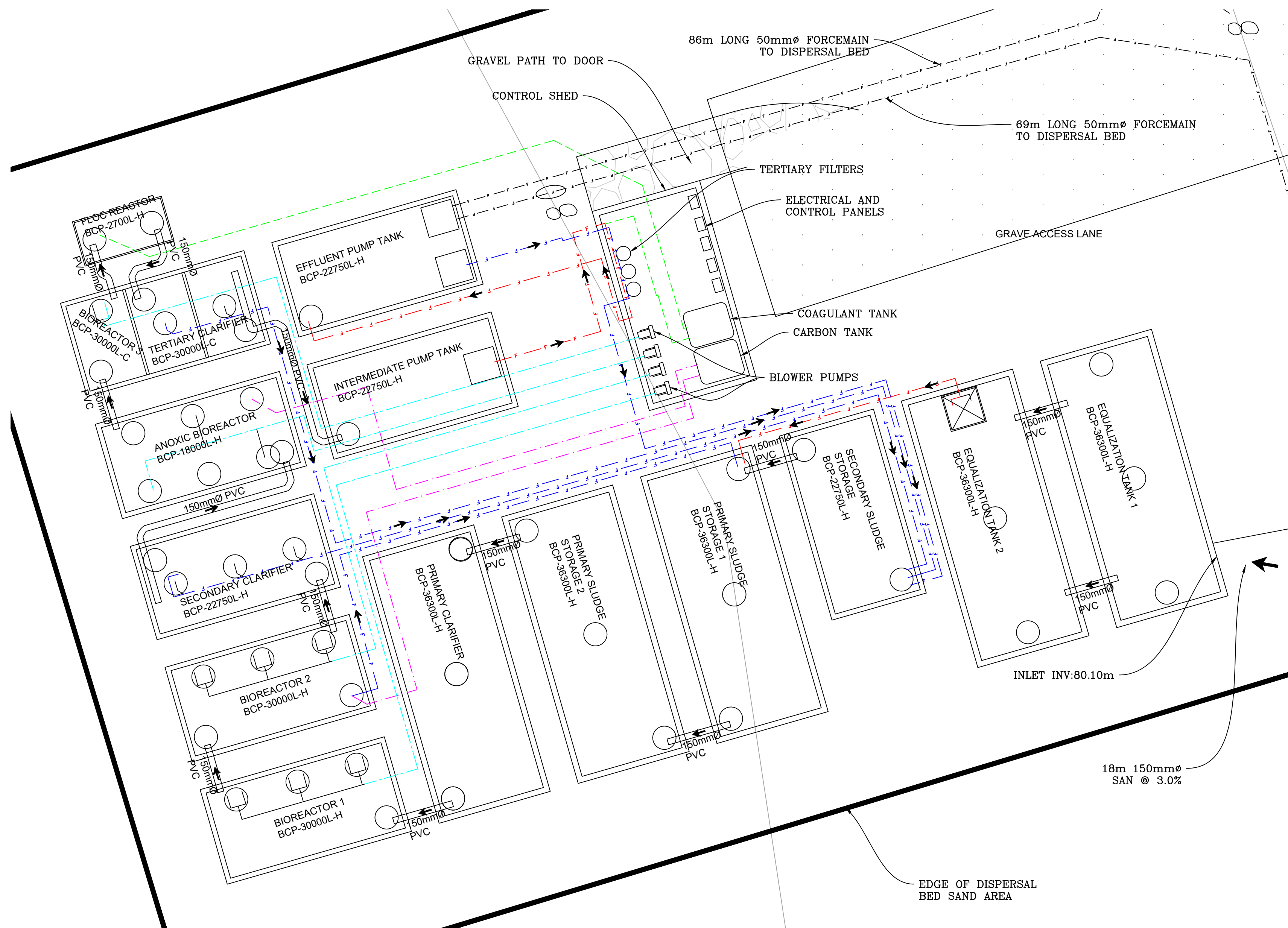


- NOTES:
- INCREMENTS OF THICKNESS SHALL BE 50MM.
  - INSULATION TO BE STYROFOAM SM HI-40 OR EQUIVALENT.
  - TO BE USED WHEN GROUND COVER IS LESS THAN 1.2m FOR STORM SEWER, 1.5m FOR SANITARY SEWER AND 1.7m FOR WATERMAIN.

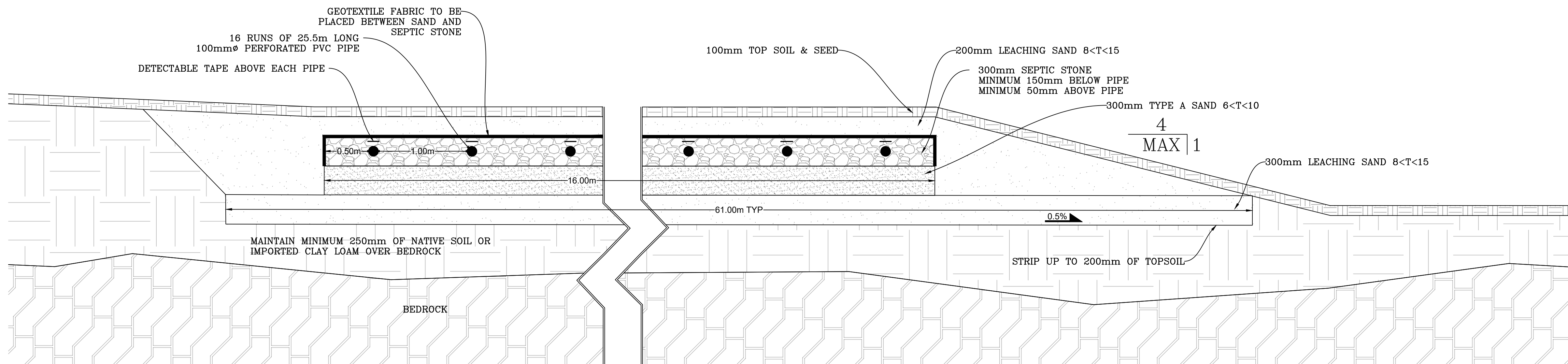
PIPE INSULATION TABLE

| GROUND COVER    | INSULATION THICKNESS (mm) |
|-----------------|---------------------------|
| 500 to 1500mm   | 100                       |
| 1500mm and over | 50                        |

PIPE INSULATION DETAIL



1 WASTEWATER TREATMENT SYSTEM DETAILS  
SCALE: 1:75



2 DISPERSAL BED PROFILE  
SCALE: 1:25



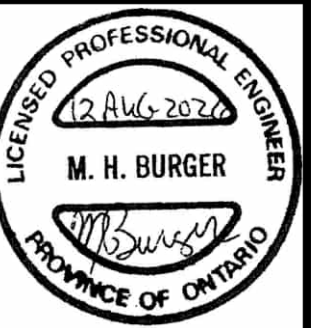
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- LEGEND
- NEW 50mm FORCEMAIN
  - NEW 50mm FORCEMAIN
  - NEW 6mm CARBON LINE
  - NEW 50mm AERATION
  - NEW 6mm COAGULANT LINE

| REVISIONS |                                   |            |
|-----------|-----------------------------------|------------|
| No.       | Description                       | Date       |
| 05        | ISSUED FOR SITE PLAN APPLICATION  | 2025/08/05 |
| 06        | REVISED PER DECEMBER 2025 DRAWING | 2026/01/23 |
| 07        | REVISED PER FEBRUARY 2026 DRAWING | 2026/02/10 |
| 08        | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09        | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| BENCHMARK: |             |           |
|------------|-------------|-----------|
| No.        | DESCRIPTION | ELEVATION |
| ##         | XXX         | XXX.XX    |

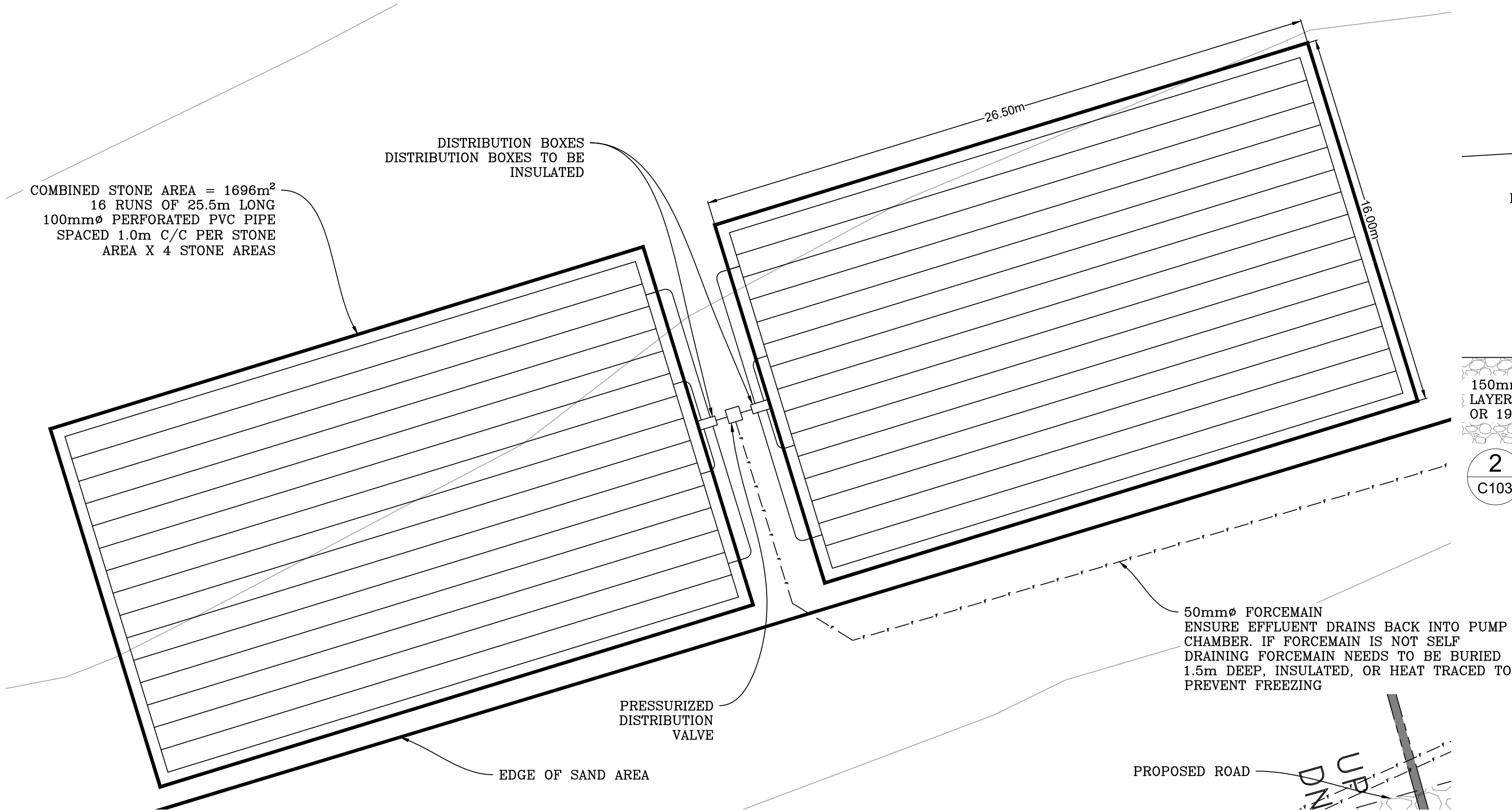


Client / Land Owner: CAMPFIRE CIRCLE

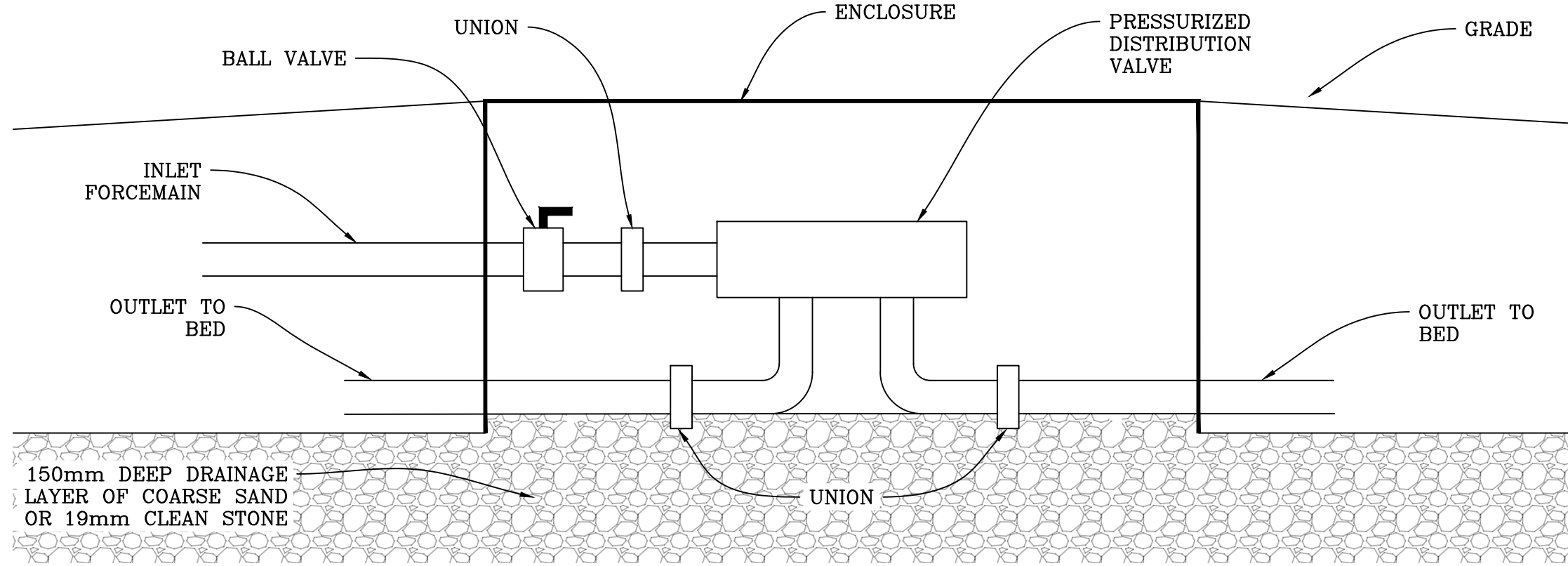
Project: 565 WESLEY ACRES ROAD  
BLOOMFIELD ONTARIO  
Drawing Title: NOTES AND DETAILS

|                         |                             |
|-------------------------|-----------------------------|
| Drawn by: LM            | Project Number: GW-23003-16 |
| Checked By: MB          | Drawing Number: C-102       |
| Scale: 24"x36" AS NOTED |                             |
| Date: AUG 12, 2026      | SHEET 2 of 3                |





**1 DISPERSAL BED STONE AREA AND PIPE DETAIL**  
C-103 SCALE: 1:150



**2 DISTRIBUTING VALVE DETAIL**  
C103 NTS

**Pump Chambers and Pumps**

| Pump Chamber | Working Volume (L) | Maximum Combined Head (m) | Pump Required         | Flow (L/s) |
|--------------|--------------------|---------------------------|-----------------------|------------|
| PC1          | 1200               | 11.58                     | LIBERTY LEH100 Series | 3          |
| PC2          | 7200               | 17.51                     | LIBERTY LEH200 Series | 3          |
| PC3          | 8000               | 13.44                     | LIBERTY LEH100 Series | 3          |
| PC4          | 6000               | 6.78                      | LIBERTY LE100 Series  | 3          |
| PC5          | 450                | 6.13                      | LIBERTY LE50 Series   | 3          |
| PC6          | 2900               | 16.94                     | LIBERTY LEH200 Series | 3          |
| PC7          | 7200               | 7.04                      | LIBERTY LE100 Series  | 3          |

**GENERAL NOTES:**

- THE ORIGINAL TOPOGRAPHY AND GROUND ELEVATIONS, SERVICING AND SURVEY DATA SHOWN ON THIS PLAN ARE SUPPLIED FOR INFORMATION PURPOSES ONLY. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO VERIFY THE ACCURACY OF ALL INFORMATION OBTAINED FROM THESE PLANS. ALL DIMENSIONS AND INVERTS MUST BE VERIFIED PRIOR TO CONSTRUCTION. IF THERE IS ANY DISCREPANCY THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY.
- ALL ELEVATIONS PROVIDED ARE GEODETIC AND UTILIZE METRIC UNITS UNLESS OTHERWISE NOTED.
- THE CONTRACTOR IS RESPONSIBLE FOR DETERMINING THE EXACT LOCATION, SIZE, MATERIAL AND ELEVATIONS OF ALL EXISTING UTILITIES PRIOR TO COMMENCING CONSTRUCTION. PROTECT AND ASSUME ALL RESPONSIBILITY FOR EXISTING UTILITIES WHETHER OR NOT SHOWN ON THE DRAWINGS. IF THERE ARE ANY DISCREPANCIES THE CONTRACTOR IS TO NOTIFY THE ENGINEER PROMPTLY. GAS, HYDRO, CABLE, TELEPHONE, OR ANY OTHER UTILITY THAT MAY EXIST ON SITE MUST BE LOCATED BY ITS OWN UTILITIES AND VERIFIED.
- ALL UNDERGROUND SERVICES, MATERIALS AND INSTALLATIONS TO BE IN ACCORDANCE WITH ONTARIO PROVINCIAL STANDARDS AND SPECIFICATIONS UNLESS OTHERWISE STATED (OPSS).
- ALL DISTURBED AREAS TO BE RESTORED TO ORIGINAL CONDITION OR BETTER UNLESS OTHERWISE SPECIFIED. ANY GRASSED AREAS DISTURBED ARE TO BE REINSTATED WITH MINIMUM 100mm TOP SOIL AND SEED. ROAD CUTS TO BE REINSTATED WITH TOPSOIL AND SEED.
- THE CONTRACTOR IS RESPONSIBLE FOR ALL LAYOUT FOR CONSTRUCTION PURPOSES.
- TREES DESIGNATED BY THE ENGINEER MUST BE PROTECTED AND MAINTAINED DURING CONSTRUCTION AS PER OPSD 220.010
- CONTRACTOR TO OBTAIN AND PAY FOR ALL NECESSARY PERMITS FROM THE COUNTY, MUNICIPALITY AND/OR CONSERVATION AUTHORITY PRIOR TO COMMENCING CONSTRUCTION.
- EXCAVATE AND DISPOSE OF ALL EXCESS EXCAVATED MATERIAL, SUCH AS ASPHALT, CURBING AND DEBRIS, OFF SITE TO THE SATISFACTION OF THE ENGINEER OR THE COUNTY, MUNICIPALITY OR CONSERVATION AUTHORITY.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL TRAFFIC CONTROL AND SAFETY MEASURES DURING THE CONSTRUCTION PERIOD, INCLUDING THE SUPPLY, INSTALLATION, AND REMOVAL OF ALL NECESSARY SIGNAGE AND SPECIFICATIONS.
- ALL DIMENSIONS AND INVERTS MUST BE VERIFIED BEFORE CONSTRUCTION, IF THERE IS ANY DISCREPANCY THE CONTRACTOR MUST NOTIFY THE ENGINEER PROMPTLY.
- CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR ALL PROPOSED MATERIALS FOR REVIEW AND APPROVAL BY THE STAMPING ENGINEER OR THEIR REPRESENTATIVE.
- TOPSOIL TO BE STRIPPED.
- GRANULAR 'A' AND GRANULAR 'B' TO BE COMPACTED TO 98% SPD UNLESS OTHERWISE STATED.
- REINSTATE TRENCHES IN GRANULAR AREA WITH 150mm GRANULAR 'A' & 300mm GRANULAR 'B'.
- BACKFILL TO AT LEAST 300mm ABOVE TOP OF PIPE WITH GRANULAR 'A'

**ENVIRONMENTAL**

- EROSION AND SEDIMENT CONTROLS SHALL BE INSTALLED PRIOR TO CONSTRUCTION AND MONITORED AND MAINTAINED BY THE CONTRACTOR UNTIL COMPLETION. THE TEMPORARY SEDIMENT AND EROSION CONTROL MEASURES MUST BE REMOVED ONCE THE SITE HAS BEEN STABILIZED AND SITE WORKS COMPLETED.
- REGARDLESS OF SITE SPECIFIC ITEMS DETAILED ON THE PLANS, THE CONTRACTOR SHALL INSTALL EROSION CONTROL MEASURES TO SUIT THE PROPOSED WORK METHODS TO CONTROL SEDIMENT FROM RUNNING OFF THE SITE OR INTO WATER BEARING FEATURES PRIOR TO ANY DISTURBANCE. FOLLOWING CONSTRUCTION, DISTURBED AREAS, AS WELL AS PROPOSED GRASSED AND VEGETATED SURFACES SHALL BE REINSTATED..

- IN THE EVENT THAT HUMAN REMAINS ARE ENCOUNTERED DURING CONSTRUCTION, THE MINISTRY OF CITIZENSHIP, CULTURE AND RECREATION SHALL BE NOTIFIED IMMEDIATELY AND THE REGISTRAR OR DEPUTY REGISTRAR OF THE CEMETARIES REGULATION UNIT OF THE MINISTRY OF CONSUMER AND COMMERCIAL RELATIONS (416) 362-8392, SHALL BE NOTIFIED IMMEDIATELY.
- IN THE EVENT THAT BURIED ARCHEOLOGICAL REMAINS ARE FOUND DURING CONSTRUCTION ACTIVITIES, THE MINISTRY OF CITIZENSHIP, CULTURE AND RECREATION SHALL BE NOTIFIED IMMEDIATELY.
- WHILE UNDERTAKING CLEARING, DEMOLITION, EXCAVATION OR CONSTRUCTION THE OWNER AND THEIR CONTRACTORS SHALL BE VIGILANT FOR THE POTENTIAL PRESENCE OF UNDERGROUND FUEL TANKS, CONTAMINATED SOIL OR GROUNDWATER, BURIED WASTE OR ABANDONED WATER WELLS. IF ANY OF THE ABOVE ARE ENCOUNTERED OR SUSPECTED, THE OWNER SHALL ENSURE THAT:
  - ANY SOIL OR GROUNDWATER CONTAMINATION ENCOUNTERED IS REMEDIATED TO APPLICABLE STANDARDS AS DEFINED WITHIN O.REG OR AS REVISED;
  - ANY WASTES GENERATED BY SITE CLEAN-UPS ARE MANAGED IN ACCORDANCE WITH APPLICABLE LAWS AND STANDARDS;
  - ANY ABANDONED FUEL TANKS ENCOUNTERED ARE DECOMMISSIONED IN ACCORDANCE WITH APPLICABLE LAWS AND STANDARDS;
  - ANY UNUSED WATER WELLS (DRILLED OR DUG) ARE PROPERLY ABANDONED IN ACCORDANCE WITH ONTARIO REGULATIONS 903 WELLS OR AS ADVISED;
  - IF IT APPEARS LIKELY THAT CONTAMINATION EXTENDS BEYOND THE BOUNDARIES OF THE SUBJECT PROPERTY, THE OWNER NOTIFIES THE LOCAL OFFICE OF THE MINISTRY OF ENVIRONMENT.
  - CONSTRUCTION WASTES ARE NOT TO BE BURIED WITHIN THE PROPERTY THAT IS THE SUBJECT OF THIS AGREEMENT, AND THE OWNER AND THEIR CONTRACTORS REPORT ALL SPILLS TO THE MINISTRY OF THE ENVIRONMENT'S SPILLS ACTION CENTRE (1-800-268-6060) AND TO THE MUNICIPALITY FORTHWITH.

**SANITARY**

- EACH DISTRIBUTION BED TO BE SPLIT INTO TWO (2) CELLS. FLOW TO BE SPLIT AND ALTERNATE BETWEEN CELLS USING AN AUTOMATIC DISTRIBUTING VALVE ASSEMBLY. AUTOMATIC DISTRIBUTING VALVE TO BE ORENCO MODEL: V6402A OR APPROVED EQUIVALENT.
- DISTRIBUTING VALVE TO BE LOCATED NOT MORE THAN 600mm BELOW DISTRIBUTION LINES.
- DISTRIBUTING VALVE TO BE INSTALLED AS PER MANUFACTURERS INSTALLATION INSTRUCTIONS AND GUIDLINES.
- CONTRACTOR IS RESPONSIBLE FOR COMMISSIONING THE DUPLEX EFFLUENT PUMP SYSTEM.
- TYPE A DISPERSAL BED TO BE CONSTRUCTED AS PER OBC 8.7.7.1. SEPTIC STONE GRADATIONS AS PER OBC 8.7.3.3.
- TYPE A SAND TO BE 6<T<10 WITH A MAXIMUM 5% OF PARTICLES WITH A DIAMETER OF 75µm OR LESS, PASSING THROUGH A 0.074mm (No. 200) SIEVE. AS PER OBC 8.7.7.1.(4)(a).
- SEPTIC STONE AS PER OBC 8.7.7.1.(6), 8.7.3.3.(2) AND TABLE 8.7.3.3
- THE HEADER AND DISTRIBUTION LINES SHALL BE INSTALLED AS PER OBC 8.7.2.2.
- DISTRIBUTION BOXES TO BE RAISED, INSULATED AND LEVELED ON A COMPACTED BASE.
- PUMP CHAMBERS AND PUMPS AS PER TABLE.
- SEWAGE PUMP CONTROL PANELS TO BE TO BE SJE RHOMBUS IFS SERIES DUPLEX CONTROLLER 240V, 15 AMP, OR APPROVED EQUIVALENT.
- NEW DUPLEX DEMAND CONTROLLERS WITH AUDIBLE & VISUAL ALARMS TO BE INSTALLED ON 100mm X 100mm X 1.5m PRESSURE TREATED WOOD POST ADJACENT TO SEWAGE PUMP CHAMBERS OR ON WALL OF BUILDING FOR EASE OF MAINTENANCE. IF MOUNTED IN MECHANICAL ROOM SEAL ALL DUCTS ENTERING BUILDING WITH EYS FITTING TO PREVENT GAS TRANSFER.
- ALL ELECTRICAL WORK MUST BE COMPLETED IN ACCORDANCE WITH ELECTRICAL CODE & BE PREFORMED BY A LICENCED ELECTRICIAN IN GOOD STANDING WITH THE ESA.
- FORCEMAIN IF NOT SELF DRAINING TO BE BURIED 1.5m DEEP, INSULATED OR HEAT TRACED TO PREVENT STANDING WATER FROM FREEZING.

- SEWER TRENCHING AND BEDDING SHALL CONFORM TO OPSD 802.010 AND 802.013 UNLESS NOTED OTHERWISE.
- ALL PIPE ELBOWS TO BE LONG SWEEP RADIUS.
- ANY AREAS WHERE TRAFFIC IS EXPECTED TO CROSS OVER FORCEMAINS INSTALL FORCEMAINS INSIDE 100mmØ SDR 35 PVC PIPE.
- BNA-MBBR PUMP CHAMBER TO BE EQUIPPED WITH ON/OFF FLOAT SWITCH. PUMP CHAMBER TO BE EQUIPPED WITH HIGH LEVEL ALARM FLOAT. REDUNDANT LAG FLOAT CONTROL SWITCH TO BE INSTALLED ABOVE HIGH LEVEL ALARM FLOAT CONTROL SWITCH.
- HIGH LEVEL ALARM CONTROL WIRE AND PUMP CONTROL WIRE TO BE INSTALLED IN SEPARATE CONDUIT, FROM ELECTRICAL SUPPLY TO PUMP CHAMBER
- TANKS TO BE BACKFILLED WITH 300mm OF GRANULAR 'A' OR SAND FILL.
- TANKS TO BE PLACED ON 300mm OF GRANULAR 'A' COMPACTED TO 98% SPD.
- TANKS TO BE EQUIPPED WITH RISERS. TANKS TO HAVE MINIMUM 300mm COVER.
- ALL TANKS TO BE INSTALLED AS PER MANUFACTURERS SPECIFICATIONS AND INSTALLATION INSTRUCTIONS.
- BNA-MBBR TREATMENT PLANT TANKS AND PRE-TREATMENTS TANK TO BE INSTALLED AS PER MANUFACTURERS SPECIFICATIONS.

**ELECTRICAL**

- ALL ELECTRICAL WORK TO BE COMPLETED IN ACCORDANCE WITH ESA STANDARDS.
- ELECTRICAL CONDUIT FOR CONTROLLER TO BE 50mmØ RIGID PVC AND 25mmØ RIGID PVC FOR ALARM UNLESS SPECIFIED OTHERWISE.
- ELECTRICAL CONDUIT TO BE INSTALLED WITH SWEEPS ON EACH CORNER.
- EXTERNAL ELECTRICAL PANEL TO BE IN NEMA 4 CERTIFIED OUTDOOR LOCKABLE ENCLOSURE MOUNTED ON TWO (2) 4X4 PRESSURE TREATED POSTS AND 20mm PLYWOOD.
- PANEL TO BE SIZED TO ACCOMMODATE BREAKERS AND CIRCUITRY FOR CONTROLLERS, PUMP CHAMBER CONTROLLER, AND TWO (2) SPARES.



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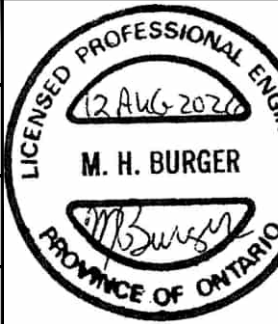


**CALCULATIONS AS PER ONTARIO BUILDING CODE PART 8  
DAILY DESIGN SEWAGE FLOW DETERMINATION (Q)**

- RESIDENTIAL UNITS (CAMPER AND STAFF RESIDENCES)  
- 411 BEDS @ 200L/DAY PER BED = 82,200 L/DAY  
NOTE: ACCESSORY AND COMMUNAL BUILDING INCLUDED IN RESIDENTIAL FLOWS  
- 2 DIRECTORS CABIN  
- 2 BEDROOMS = 1,100 L/DAY  
**TOTAL (Q) = 83,300 L/DAY**  
**LOADING**  
EXISTING SOIL:  
T=TIME > 50 (CLAY)  
TYPE A DISPERSAL BED:  
FLOW RATE > 3000L/DAY  
THEREFORE RATE IS 50L/m²  
STONE AREA= 1696m² → Q/50 → 83,300/50 = 1666m² (REQ'D)  
SAND AREA= 10902m² → QxT/400 → 83,300x50 = 10412.5m² (REQ'D)

| No. | Description                       | Date       |
|-----|-----------------------------------|------------|
| 05  | ISSUED FOR SITE PLAN APPLICATION  | 2025/08/05 |
| 06  | REVISED PER DECEMBER 2025 DRAWING | 2026/01/23 |
| 07  | REVISED PER FEBRUARY 2026 DRAWING | 2026/02/10 |
| 08  | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09  | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| No. | DESCRIPTION | ELEVATION |
|-----|-------------|-----------|
| ##. | XXX         | XXX.XX    |
|     |             |           |
|     |             |           |
|     |             |           |



Client / Land Owner:  
**CAMPFIRE CIRCLE**

Project:  
**565 WESLEY ACRES ROAD**  
**BLOOMFIELD** **ONTARIO**  
Drawing Title:  
**NOTES AND DETAILS 2**

|                         |                    |
|-------------------------|--------------------|
| Drawn by: LM            | Project Number:    |
| Checked By: MB          | <b>GW-23003-16</b> |
| Scale: 24"x36" AS NOTED | Drawing Number:    |
| Date: AUG 12, 2026      | <b>C-103</b>       |
|                         | SHEET 3 of 3       |



## Appendix B

### Wastewater Calculation Sheets



**System 1**

| Building               | Capacity | Unit        | OBC Reference            | Flow per unit (L/day) | Total Flow (L/day) | Notes                                      | Pump Chamber | Flow to Pump Chamber (L/day) |
|------------------------|----------|-------------|--------------------------|-----------------------|--------------------|--------------------------------------------|--------------|------------------------------|
| Summer Staff Res.      | 66       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 10149              |                                            | PC2          | 31369                        |
| Mature Staff Residence | 10       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 1538               |                                            |              |                              |
| CAMPER RESIDENCE #6    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| CAMPER RESIDENCE #7    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| CAMPER RESIDENCE #8    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| CAMPER RESIDENCE #9    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| HOSPITAL               | 8        | staff bed   | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 1230               |                                            | PC3          | 36350                        |
|                        | 0        | Exam rooms  | NA                       | 0                     | 0                  | Included in Residential                    |              |                              |
|                        | 5        | Patent Beds | NA                       | 0                     | 0                  | Included in Residential                    |              |                              |
| CAMPER RESIDENCE #3    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            | PC4          | 31322                        |
| CAMPER RESIDENCE #4    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| CAMPER RESIDENCE #5    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| LODGE                  | 1080     | Meal        | Table 8.2.1.3.B.(11)(i)  | 12                    | 12960              | 360 seats serving 3 meals per day per seat |              |                              |
| Pool Building          | 75       | Person      | Table 8.2.1.3.B.(23)     | 40                    | 3000               |                                            | Gravity      | NA                           |
| Drama Building         | 75       | Person      | Table 8.2.1.3.B.(2)(a)   | 8                     | 600                |                                            |              |                              |
| CAMPER RESIDENCE #1    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| CAMPER RESIDENCE #2    | 32       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 4921               |                                            |              |                              |
| INDOOR ACTIVITY        | 200      | Person      | Table 8.2.1.3.B.(2)(a)   | 8                     | 1600               |                                            |              |                              |
| DIRECTOR'S CABIN       | 2        | bedrooms    | Table 8.2.1.3.A(2)(4)(b) | NA                    | 1100               |                                            |              |                              |
| Equestrian Stables     | 30       | Person      | Table 8.2.1.3.B.(2)(a)   | 8                     | 240                |                                            | PC6          | 6837                         |
| Greenhouse             | 75       | Person      | Table 8.2.1.3.B.(2)(a)   | 8                     | 600                |                                            |              |                              |
| FLEX                   | 39       | bed         | Table 8.2.1.3.A(2)(a)(i) | 153.77                | 5997               |                                            |              |                              |

Total 83300 L/day

Total number of beds 411

Flow from Residential Units @ 200L/day

82200 L/day

Flow from Residential Units @ 200L/day + Directors Cabin

83300 L/day

Note residential flow reduced to 153.77L/day for residential building without kitchens to account for duplication of flows at restaurant, pool and assembly areas

Note: Laundry included in other flows

sand

stone

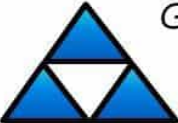
10413 1666 Required

10902 1696 Provided

Pump Sizing Table

| Wastewater type | from | to  | Pipe Length<br>(m) | Pump Elevation<br>(m) | Receiver<br>Elevation (m) | elevation head<br>(m) | friction head<br>(m) | MAX HEAD<br>(m) | MAXIMUM COMBINED<br>HEAD (m) | pump required         | Flow (L/s) | Forcemain Diameter<br>(mm) |
|-----------------|------|-----|--------------------|-----------------------|---------------------------|-----------------------|----------------------|-----------------|------------------------------|-----------------------|------------|----------------------------|
| Sewage          | PC1  | MH1 | 193                | 74.90                 | 77.55                     | 2.65                  | 8.93                 | 11.58           | 11.58                        | LIBERTY LEH100 Series | 3          | 50                         |
| Sewage          | PC2  | PC3 | 270                | 75.78                 | 80.80                     | 5.02                  | 12.49                | 17.51           | 17.51                        | LIBERTY LEH200 Series | 3          | 50                         |
| Sewage          | PC3  | MH8 | 270                | 79.60                 | 80.55                     | 0.95                  | 12.49                | 13.44           | 13.44                        | LIBERTY LEH100 Series | 3          | 50                         |
| Sewage          | PC4  | PC7 | 95                 | 78.31                 | 80.70                     | 2.39                  | 4.39                 | 6.78            | 6.78                         | LIBERTY LE100 Series  | 3          | 50                         |
| Sewage          | PC5  | PC3 | 29                 | 79.77                 | 80.80                     | 1.03                  | 5.10                 | 6.13            | 6.13                         | LIBERTY LE50 Series   | 3          | 38                         |
| Sewage          | PC6  | MH8 | 227                | 74.11                 | 80.55                     | 6.44                  | 10.50                | 16.94           | 16.94                        | LIBERTY LEH200 Series | 3          | 50                         |
| Sewage          | PC7  | MH7 | 108                | 79.50                 | 81.54                     | 2.04                  | 5.00                 | 7.04            | 7.04                         | LIBERTY LE100 Series  | 3          | 50                         |

Pump assumed to be 1.2 m below pump chamber inlet



Groundwork  
Engineering  
Limited

Sanitary Sewer Calculation Sheet

| DRAINAGE AREA DESCRIPTION                                       |         |      |           |                  |           |            | SANITARY FLOWS  |              |                 |                  |                    |                |                       |            | PIPE DATA                             |              |      |              |                     |                     |                   |         |                   |               |             |  |
|-----------------------------------------------------------------|---------|------|-----------|------------------|-----------|------------|-----------------|--------------|-----------------|------------------|--------------------|----------------|-----------------------|------------|---------------------------------------|--------------|------|--------------|---------------------|---------------------|-------------------|---------|-------------------|---------------|-------------|--|
| LOCATION                                                        | MANHOLE |      |           | INCREMENTAL AREA |           |            | Σ<br>Population | Σ<br>P(1000) | q<br>(L/day)    | Peak<br>Factor M | Peak Flow<br>(L/s) | Σ<br>AREA (ha) | Infiltration<br>(L/s) | Q<br>(L/s) | SIZE<br>(mm)                          | SLOPE<br>(%) | DR   | AREA<br>(m²) | WETTED<br>PERIMETER | HYDRAULIC<br>RADIUS | CAPACITY<br>(L/s) | Q/Qfull | VELOCITY<br>(m/s) | LENGTH<br>(m) | FALL<br>(m) |  |
|                                                                 | FROM    | TO   | Catchment | Floor Area       | Area (ha) | Population |                 |              |                 |                  |                    |                |                       |            |                                       |              |      |              |                     |                     |                   |         |                   |               |             |  |
| Staff Residences                                                | MH1     | PC2  | PC2       |                  |           | -          | -               | -            | 11687           | 4.000            | 0.54               | 0.00           | 0.00                  | 0.54       | 100                                   | 1.00         | 0.04 | 0.0079       | 0.3142              | 0.0250              | 5.17              | 0.10    | 0.66              | 54            | 0.540       |  |
| Campers 8 and 9                                                 | MH3     | MH2  | PC2       |                  |           | -          | -               | -            | 9842            | 4.000            | 0.46               | 0.00           | 0.00                  | 0.46       | 100                                   | 2.00         | 0.04 | 0.0079       | 0.3142              | 0.0250              | 7.31              | 0.06    | 0.93              | 54            | 1.080       |  |
| Campers 6, 7, 8, and 9                                          | MH2     | PC2  | PC2       |                  |           | -          | -               | -            | 19684           | 4.000            | 0.91               | 0.00           | 0.00                  | 0.91       | 100                                   | 2.00         | 0.05 | 0.0079       | 0.3142              | 0.0250              | 7.31              | 0.12    | 0.93              | 67            | 1.340       |  |
| Lodge<br>Campers 1 and 2<br>Campers 1, 2, and 3,<br>Drama, Pool | Lodge   | PC4  | PC4       |                  |           | -          | -               | -            | 12960           | 4.000            | 0.60               | 0.00           | 0.00                  | 0.60       | 100                                   | 1.00         | 0.04 | 0.0079       | 0.3142              | 0.0250              | 5.17              | 0.12    | 0.66              | 54            | 0.540       |  |
|                                                                 | MH5     | MH4  | PC4       |                  |           | -          | -               | -            | 9842            | 4.000            | 0.46               | 0.00           | 0.00                  | 0.46       | 100                                   | 1.00         | 0.04 | 0.0079       | 0.3142              | 0.0250              | 5.17              | 0.09    | 0.66              | 53            | 0.530       |  |
|                                                                 | MH4     | PC4  | PC4       |                  |           | -          | -               | -            | 18363           | 4.000            | 0.85               | 0.00           | 0.00                  | 0.85       | 100                                   | 1.00         | 0.05 | 0.0079       | 0.3142              | 0.0250              | 5.17              | 0.16    | 0.66              | 80            | 0.800       |  |
| Flex<br>Flex                                                    | Flex    | MH6  | PC6       |                  |           | -          | -               | -            | 5997            | 4.000            | 0.28               | 0.00           | 0.00                  | 0.28       | 100                                   | 3.00         | 0.03 | 0.0079       | 0.3142              | 0.0250              | 8.95              | 0.03    | 1.14              | 22            | 0.660       |  |
|                                                                 | MH6     | PC6  | PC6       |                  |           | -          | -               | -            | 5997            | 4.000            | 0.28               | 0.00           | 0.00                  | 0.28       | 100                                   | 2.40         | 0.03 | 0.0079       | 0.3142              | 0.0250              | 8.00              | 0.03    | 1.02              | 66            | 1.584       |  |
| PC7<br>All Buildings                                            | MH7     | MH8  | WWTS      |                  |           | -          | -               | -            | 42764           | 4.000            | 1.98               | 0.00           | 0.00                  | 1.98       | 150                                   | 2.20         | 0.06 | 0.0177       | 0.4712              | 0.0375              | 22.59             | 0.09    | 1.28              | 53            | 1.166       |  |
|                                                                 | MH8     | WWTS | WWTS      |                  |           | -          | -               | -            | 83300           | 4.000            | 3.86               | 0.00           | 0.00                  | 3.86       | 150                                   | 3.00         | 0.07 | 0.0177       | 0.4712              | 0.0375              | 26.38             | 0.15    | 1.49              | 14            | 0.420       |  |
|                                                                 |         |      |           |                  |           |            |                 |              |                 |                  |                    |                |                       |            |                                       |              |      |              |                     |                     |                   |         |                   |               |             |  |
|                                                                 |         |      |           |                  |           |            |                 |              |                 |                  |                    |                |                       |            |                                       |              |      |              |                     |                     |                   |         |                   |               |             |  |
|                                                                 |         |      |           |                  |           |            |                 |              |                 |                  |                    |                |                       |            |                                       |              |      |              |                     |                     |                   |         |                   |               |             |  |
| DESIGN PARAMETER                                                |         |      |           |                  |           |            |                 |              | Designed By:    |                  |                    |                |                       |            | PROJECT:                              |              |      |              |                     |                     |                   |         |                   |               |             |  |
| Mannings n = 0.0130                                             |         |      |           |                  |           |            |                 |              | Lucas McCallum  |                  |                    |                |                       |            | 565 Wesley Acres Road                 |              |      |              |                     |                     |                   |         |                   |               |             |  |
| Average Daily Flow (q)= As per Part 8 OBC                       |         |      |           |                  |           |            |                 |              | Checked By:     |                  |                    |                |                       |            | LOCATION:                             |              |      |              |                     |                     |                   |         |                   |               |             |  |
| Infiltration Rate (I) = 1.8 L/day/m of puplic sewer*            |         |      |           |                  |           |            |                 |              | Martin Burger   |                  |                    |                |                       |            | 565 Wesley Acres Road, Bloomfield, ON |              |      |              |                     |                     |                   |         |                   |               |             |  |
| *Infiltration rate based on the Stevens-Schutzbach Method       |         |      |           |                  |           |            |                 |              | Dwg. Reference: |                  |                    |                |                       |            | Project Number: GW-23003-16           |              |      |              |                     |                     |                   |         |                   |               |             |  |
|                                                                 |         |      |           |                  |           |            |                 |              | C-101           |                  |                    |                |                       |            | Date:<br>July 23, 2026                |              |      |              |                     |                     |                   |         |                   |               |             |  |

## 565 Wesley Acres Road - PC1 Daily Breakdown

|                                                                                                                                 |                             |                                   |                       |              |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------|-----------------------|--------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                             | Pump Chamber (1,200 L) - Daily    |                       |              |
| Peak Daily Flow = 2,000 L                                                                                                       |                             |                                   | Pump Chamber Vol. (L) |              |
| Hour of Day                                                                                                                     | Hourly Flow (L)             | Vol. out to<br>Treatment Unit (L) | At Start of Hr        | At End of Hr |
| 6:00 AM                                                                                                                         | 233                         | 10800                             | 0                     | 0            |
| 7:00 AM                                                                                                                         | 233                         | 7920                              | 0                     | 0            |
| 8:00 AM                                                                                                                         | 233                         | 7920                              | 0                     | 0            |
| 9:00 AM                                                                                                                         | 0                           | 7920                              | 0                     | 0            |
| 10:00 AM                                                                                                                        | 0                           | 7920                              | 0                     | 0            |
| 11:00 AM                                                                                                                        | 167                         | 7920                              | 0                     | 0            |
| 12:00 AM                                                                                                                        | 167                         | 7920                              | 0                     | 0            |
| 1:00 PM                                                                                                                         | 167                         | 7920                              | 0                     | 0            |
| 2:00 PM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 3:00 PM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 4:00 PM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 5:00 PM                                                                                                                         | 267                         | 7920                              | 0                     | 0            |
| 6:00 PM                                                                                                                         | 267                         | 7920                              | 0                     | 0            |
| 7:00 PM                                                                                                                         | 267                         | 7920                              | 0                     | 0            |
| 8:00 PM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 9:00 PM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 10:00 PM                                                                                                                        |                             | 7920                              | 0                     | 0            |
| 11:00 PM                                                                                                                        |                             | 7920                              | 0                     | 0            |
| 12:00 AM                                                                                                                        |                             | 7920                              | 0                     | 0            |
| 1:00 AM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 2:00 AM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 3:00 AM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 4:00 AM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| 5:00 AM                                                                                                                         |                             | 7920                              | 0                     | 0            |
| Balancing Capacity                                                                                                              | Daily Design Flow = 2,000 L |                                   |                       |              |

|                     |        |
|---------------------|--------|
| Daily Flow          | 2000 L |
| Pump Chamber Volume | 1200 L |
| Pipe Length         | 193 m  |
| Pipe Diameter       | 0.05 m |
| Pipe volume         | 379 L  |
| Max Combined Volume | 646    |
| FOS                 | 85.85% |



## 565 Wesley Acres Road - PC2 Daily Breakdown

|                                                                                                                                 |                                     |                                           |                                       |                     |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------|---------------------------------------|---------------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                                     |                                           | <b>Pump Chamber (7,200 L) - Daily</b> |                     |
| <b>Peak Daily Flow = 31,369 L</b>                                                                                               |                                     |                                           | <b>Pump Chamber Vol. (L)</b>          |                     |
| <b>Hour of Day</b>                                                                                                              | <b>Hourly Flow (L)</b>              | <b>Vol. out to<br/>Treatment Unit (L)</b> | <b>At Start of Hr</b>                 | <b>At End of Hr</b> |
| 6:00 AM                                                                                                                         | 3660                                | 10800                                     | 0                                     | 0                   |
| 7:00 AM                                                                                                                         | 3660                                | 10800                                     | 0                                     | 0                   |
| 8:00 AM                                                                                                                         | 3660                                | 10800                                     | 0                                     | 0                   |
| 9:00 AM                                                                                                                         | 0                                   | 10800                                     | 0                                     | 0                   |
| 10:00 AM                                                                                                                        | 0                                   | 10800                                     | 0                                     | 0                   |
| 11:00 AM                                                                                                                        | 2614                                | 10800                                     | 0                                     | 0                   |
| 12:00 AM                                                                                                                        | 2614                                | 10800                                     | 0                                     | 0                   |
| 1:00 PM                                                                                                                         | 2614                                | 10800                                     | 0                                     | 0                   |
| 2:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 3:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 4:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 5:00 PM                                                                                                                         | 4183                                | 10800                                     | 0                                     | 0                   |
| 6:00 PM                                                                                                                         | 4183                                | 10800                                     | 0                                     | 0                   |
| 7:00 PM                                                                                                                         | 4183                                | 10800                                     | 0                                     | 0                   |
| 8:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 9:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 10:00 PM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 11:00 PM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 12:00 AM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 1:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 2:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 3:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 4:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 5:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| <b>Balancing Capacity</b>                                                                                                       | <b>Daily Design Flow = 31,369 L</b> |                                           |                                       |                     |

|                     |         |
|---------------------|---------|
| Daily Flow          | 31369 L |
| Pump Chamber Volume | 7200 L  |
| Pipe Length         | 270 m   |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 531 L   |
| Max Combined Volume | 4714    |
| FOS                 | 52.75%  |

## 565 Wesley Acres Road - PC3 Daily Breakdown

|                                                                                                                                 |                              |                                   |                                |              |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------|--------------------------------|--------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                              |                                   | Pump Chamber (8,000 L) - Daily |              |
| Peak Daily Flow = 36,350 L                                                                                                      |                              |                                   | Pump Chamber Vol. (L)          |              |
| Hour of Day                                                                                                                     | Hourly Flow (L)              | Vol. out to<br>Treatment Unit (L) | At Start of Hr                 | At End of Hr |
| 6:00 AM                                                                                                                         | 4241                         | 4241                              | 0                              | 0            |
| 7:00 AM                                                                                                                         | 4241                         | 4241                              | 0                              | 0            |
| 8:00 AM                                                                                                                         | 4241                         | 4241                              | 0                              | 0            |
| 9:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 10:00 AM                                                                                                                        | 0                            | 0                                 | 0                              | 0            |
| 11:00 AM                                                                                                                        | 3029                         | 3029                              | 0                              | 0            |
| 12:00 AM                                                                                                                        | 3029                         | 3029                              | 0                              | 0            |
| 1:00 PM                                                                                                                         | 3029                         | 3029                              | 0                              | 0            |
| 2:00 PM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 3:00 PM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 4:00 PM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 5:00 PM                                                                                                                         | 4847                         | 4847                              | 0                              | 0            |
| 6:00 PM                                                                                                                         | 4847                         | 4847                              | 0                              | 0            |
| 7:00 PM                                                                                                                         | 4847                         | 4847                              | 0                              | 0            |
| 8:00 PM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 9:00 PM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 10:00 PM                                                                                                                        | 0                            | 0                                 | 0                              | 0            |
| 11:00 PM                                                                                                                        | 0                            | 0                                 | 0                              | 0            |
| 12:00 AM                                                                                                                        | 0                            | 0                                 | 0                              | 0            |
| 1:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 2:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 3:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 4:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| 5:00 AM                                                                                                                         | 0                            | 0                                 | 0                              | 0            |
| Balancing Capacity                                                                                                              | Daily Design Flow = 36,350 L |                                   |                                |              |

|                     |         |
|---------------------|---------|
| Daily Flow          | 36350 L |
| Pump Chamber Volume | 8000 L  |
| Pipe Length         | 270 m   |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 531 L   |
| Max Combined Volume | 5378    |
| FOS                 | 48.76%  |

## 565 Wesley Acres Road - PC4 Daily Breakdown

|                                                                                                                                 |                                     |                                           |                                       |                     |
|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|-------------------------------------------|---------------------------------------|---------------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                                     |                                           | <b>Pump Chamber (7,200 L) - Daily</b> |                     |
| <b>Peak Daily Flow = 31,322 L</b>                                                                                               |                                     |                                           | <b>Pump Chamber Vol. (L)</b>          |                     |
| <b>Hour of Day</b>                                                                                                              | <b>Hourly Flow (L)</b>              | <b>Vol. out to<br/>Treatment Unit (L)</b> | <b>At Start of Hr</b>                 | <b>At End of Hr</b> |
| 6:00 AM                                                                                                                         | 3654                                | 10800                                     | 0                                     | 0                   |
| 7:00 AM                                                                                                                         | 3654                                | 10800                                     | 0                                     | 0                   |
| 8:00 AM                                                                                                                         | 3654                                | 10800                                     | 0                                     | 0                   |
| 9:00 AM                                                                                                                         | 0                                   | 10800                                     | 0                                     | 0                   |
| 10:00 AM                                                                                                                        | 0                                   | 10800                                     | 0                                     | 0                   |
| 11:00 AM                                                                                                                        | 2610                                | 10800                                     | 0                                     | 0                   |
| 12:00 AM                                                                                                                        | 2610                                | 10800                                     | 0                                     | 0                   |
| 1:00 PM                                                                                                                         | 2610                                | 10800                                     | 0                                     | 0                   |
| 2:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 3:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 4:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 5:00 PM                                                                                                                         | 4176                                | 10800                                     | 0                                     | 0                   |
| 6:00 PM                                                                                                                         | 4176                                | 10800                                     | 0                                     | 0                   |
| 7:00 PM                                                                                                                         | 4176                                | 10800                                     | 0                                     | 0                   |
| 8:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 9:00 PM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 10:00 PM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 11:00 PM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 12:00 AM                                                                                                                        |                                     | 10800                                     | 0                                     | 0                   |
| 1:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 2:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 3:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 4:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| 5:00 AM                                                                                                                         |                                     | 10800                                     | 0                                     | 0                   |
| <b>Balancing Capacity</b>                                                                                                       | <b>Daily Design Flow = 31,322 L</b> |                                           |                                       |                     |

|                     |         |
|---------------------|---------|
| Daily Flow          | 31322 L |
| Pump Chamber Volume | 7200 L  |
| Pipe Length         | 116 m   |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 228 L   |
| Max Combined Volume | 4404    |
| FOS                 | 63.48%  |

## 565 Wesley Acres Road - PC5 Daily Breakdown

|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                                    | Pump Chamber (450 L) - Daily   |                       |              |
|---------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------|-----------------------|--------------|
| Peak Daily Flow = 1,100 L                                                                                                       |                                    |                                | Pump Chamber Vol. (L) |              |
| Hour of Day                                                                                                                     | Hourly Flow (L)                    | Vol. out to Treatment Unit (L) | At Start of Hr        | At End of Hr |
| 6:00 AM                                                                                                                         | 128                                | 128                            | 0                     | 0            |
| 7:00 AM                                                                                                                         | 128                                | 128                            | 0                     | 0            |
| 8:00 AM                                                                                                                         | 128                                | 128                            | 0                     | 0            |
| 9:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 10:00 AM                                                                                                                        | 0                                  | 0                              | 0                     | 0            |
| 11:00 AM                                                                                                                        | 92                                 | 92                             | 0                     | 0            |
| 12:00 AM                                                                                                                        | 92                                 | 92                             | 0                     | 0            |
| 1:00 PM                                                                                                                         | 92                                 | 92                             | 0                     | 0            |
| 2:00 PM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 3:00 PM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 4:00 PM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 5:00 PM                                                                                                                         | 147                                | 147                            | 0                     | 0            |
| 6:00 PM                                                                                                                         | 147                                | 147                            | 0                     | 0            |
| 7:00 PM                                                                                                                         | 147                                | 147                            | 0                     | 0            |
| 8:00 PM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 9:00 PM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 10:00 PM                                                                                                                        | 0                                  | 0                              | 0                     | 0            |
| 11:00 PM                                                                                                                        | 0                                  | 0                              | 0                     | 0            |
| 12:00 AM                                                                                                                        | 0                                  | 0                              | 0                     | 0            |
| 1:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 2:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 3:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 4:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| 5:00 AM                                                                                                                         | 0                                  | 0                              | 0                     | 0            |
| <b>Balancing Capacity</b>                                                                                                       | <b>Daily Design Flow = 1,100 L</b> |                                |                       |              |

|                     |         |
|---------------------|---------|
| Daily Flow          | 1100 L  |
| Pump Chamber Volume | 450 L   |
| Pipe Length         | 29 m    |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 57 L    |
| Max Combined Volume | 204     |
| FOS                 | 120.95% |



## 565 Wesley Acres Road - PC6 Daily Breakdown

|                                                                                                                                 |                             |                                   |                                |              |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------|--------------------------------|--------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                             |                                   | Pump Chamber (2,900 L) - Daily |              |
| Peak Daily Flow = 6,837 L                                                                                                       |                             |                                   | Pump Chamber Vol. (L)          |              |
| Hour of Day                                                                                                                     | Hourly Flow (L)             | Vol. out to<br>Treatment Unit (L) | At Start of Hr                 | At End of Hr |
| 6:00 AM                                                                                                                         | 700                         | 10800                             | 0                              | 0            |
| 7:00 AM                                                                                                                         | 700                         | 10800                             | 0                              | 0            |
| 8:00 AM                                                                                                                         | 770                         | 10800                             | 0                              | 0            |
| 9:00 AM                                                                                                                         | 70                          | 10800                             | 0                              | 0            |
| 10:00 AM                                                                                                                        | 70                          | 10800                             | 0                              | 0            |
| 11:00 AM                                                                                                                        | 570                         | 10800                             | 0                              | 0            |
| 12:00 AM                                                                                                                        | 570                         | 10800                             | 0                              | 0            |
| 1:00 PM                                                                                                                         | 570                         | 10800                             | 0                              | 0            |
| 2:00 PM                                                                                                                         | 70                          | 10800                             | 0                              | 0            |
| 3:00 PM                                                                                                                         | 70                          | 10800                             | 0                              | 0            |
| 4:00 PM                                                                                                                         | 70                          | 10800                             | 0                              | 0            |
| 5:00 PM                                                                                                                         | 870                         | 10800                             | 0                              | 0            |
| 6:00 PM                                                                                                                         | 870                         | 10800                             | 0                              | 0            |
| 7:00 PM                                                                                                                         | 870                         | 10800                             | 0                              | 0            |
| 8:00 PM                                                                                                                         | 70                          | 10800                             | 0                              | 0            |
| 9:00 PM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| 10:00 PM                                                                                                                        | 0                           | 10800                             | 0                              | 0            |
| 11:00 PM                                                                                                                        | 0                           | 10800                             | 0                              | 0            |
| 12:00 AM                                                                                                                        | 0                           | 10800                             | 0                              | 0            |
| 1:00 AM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| 2:00 AM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| 3:00 AM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| 4:00 AM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| 5:00 AM                                                                                                                         | 0                           | 10800                             | 0                              | 0            |
| Balancing Capacity                                                                                                              | Daily Design Flow = 6,837 L |                                   |                                |              |

|                     |         |
|---------------------|---------|
| Daily Flow          | 6837 L  |
| Pump Chamber Volume | 2900 L  |
| Pipe Length         | 227 m   |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 446 L   |
| Max Combined Volume | 1316    |
| FOS                 | 120.43% |

## 565 Wesley Acres Road - PC7 Daily Breakdown

|                                                                                                                                 |                             |                                   |                       |              |
|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-----------------------------------|-----------------------|--------------|
|  <b>GROUNDWORK<br/>ENGINEERING<br/>LIMITED</b> |                             | Pump Chamber (6,000 L) - Daily    |                       |              |
| Peak Daily Flow = 32,922 L                                                                                                      |                             |                                   | Pump Chamber Vol. (L) |              |
| Hour of Day                                                                                                                     | Hourly Flow (L)             | Vol. out to<br>Treatment Unit (L) | At Start of Hr        | At End of Hr |
| 6:00 AM                                                                                                                         | 2586                        | 2586                              | 0                     | 0            |
| 7:00 AM                                                                                                                         | 2586                        | 2586                              | 0                     | 0            |
| 8:00 AM                                                                                                                         | 3020                        | 3020                              | 0                     | 0            |
| 9:00 AM                                                                                                                         | 1297                        | 1297                              | 0                     | 0            |
| 10:00 AM                                                                                                                        | 1297                        | 1297                              | 0                     | 0            |
| 11:00 AM                                                                                                                        | 2528                        | 2528                              | 0                     | 0            |
| 12:00 AM                                                                                                                        | 2528                        | 2528                              | 0                     | 0            |
| 1:00 PM                                                                                                                         | 2528                        | 2528                              | 0                     | 0            |
| 2:00 PM                                                                                                                         | 1297                        | 1297                              | 0                     | 0            |
| 3:00 PM                                                                                                                         | 433                         | 433                               | 0                     | 0            |
| 4:00 PM                                                                                                                         | 1297                        | 1297                              | 0                     | 0            |
| 5:00 PM                                                                                                                         | 3266                        | 3266                              | 0                     | 0            |
| 6:00 PM                                                                                                                         | 3266                        | 3266                              | 0                     | 0            |
| 7:00 PM                                                                                                                         | 3266                        | 3266                              | 0                     | 0            |
| 8:00 PM                                                                                                                         | 1297                        | 1297                              | 0                     | 0            |
| 9:00 PM                                                                                                                         | 0                           | 0                                 | 0                     | 0            |
| 10:00 PM                                                                                                                        | 0                           | 0                                 | 0                     | 0            |
| 11:00 PM                                                                                                                        | 0                           | 0                                 | 0                     | 0            |
| 12:00 AM                                                                                                                        | 0                           | 0                                 | 0                     | 0            |
| 1:00 AM                                                                                                                         | 0                           | 0                                 | 0                     | 0            |
| 2:00 AM                                                                                                                         | 0                           | 0                                 | 0                     | 0            |
| 3:00 AM                                                                                                                         | 0                           | 0                                 | 0                     | 0            |
| 4:00 AM                                                                                                                         | 0                           | 0                                 | 0                     | 0            |
| 5:00 AM                                                                                                                         | 864                         | 864                               | 0                     | 0            |
| Balancing Capacity                                                                                                              | Daily Design Flow = 32,922L |                                   |                       |              |

|                     |         |
|---------------------|---------|
| Daily Flow          | 32922 L |
| Pump Chamber Volume | 6000 L  |
| Pipe Length         | 108 m   |
| Pipe Diameter       | 0.05 m  |
| Pipe volume         | 213 L   |
| Max Combined Volume | 3479    |
| FOS                 | 72.48%  |

## Appendix C

### Wastewater Treatment Plant Design and Specifications



September 25, 2025

**All Bidders**

**Groundwork Engineering Limited**

Unit 640, 654 Norris Court  
Kingston, ON K7P 2R9

Contact : **Lucas McCallum**  
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[www.bna-inc.ca](http://www.bna-inc.ca)

Proposal No  
**0306**

**RE: Children's Camp WWTS**

We are pleased to present the following proposal for the referenced wastewater treatment system, located at **565 Wesley Acres Rd, Bloomfield, ON K0K 1G0**. Our proposal includes a general process description and scope of supply. The standard terms and conditions, calculation summary, and proposed layout drawing are appended. Detailed construction drawings will be provided on placement of order.

Thank you for the opportunity to provide a proposal for this project; we look forward to working with you. Should you have any questions or concerns please call me at your convenience.

Sincerely,

**Bergmann North America Inc.**

Miles MacCormack, P.Eng. | President  
[miles@bna-inc.ca](mailto:miles@bna-inc.ca)

**Please sign and return a copy of this cover letter as your acceptance and approval of this proposal. The specified deposit is required to begin ordering and production.**

Authorization Signature: \_\_\_\_\_

Provisional Items Included (#): \_\_\_\_\_

Requested Delivery Date: \_\_\_\_\_



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## **Appendices:**

Appendix 1 – Standard Terms and Conditions

Appendix 2 – Calculation Summary

Appendix 3 – Proposed Layout Drawing

## 1. Project Understanding and Design Criteria

The design parameters for this facility as requested by **Groundwork Engineering Limited (the Engineer)** are summarized in Table 1 below:

| Table 1. – Process Design Parameters                                                     |                           |                        |                        |           |
|------------------------------------------------------------------------------------------|---------------------------|------------------------|------------------------|-----------|
| Flowrate                                                                                 |                           | Influent (mg/L)        | Effluent Objectives *  |           |
| Average                                                                                  | ≤ 57.3 m <sup>3</sup> /d  | BOD <sub>5</sub> ≤ 350 | CBOD <sub>5</sub> ≤ 10 | mg/L      |
| Design                                                                                   | ≤ 81.85 m <sup>3</sup> /d | TSS ≤ 300              | TSS ≤ 10               | mg/L      |
| Equalized                                                                                | ≤ 3.41 m <sup>3</sup> /hr | TKN ≤ 100              | **TIN ≤ 3.9            | mg/L as N |
|                                                                                          |                           | TP ≤ 15                | TP ≤ 0.15              | mg/L      |
| * Effluent objectives are based on monthly average basis.<br>**Total Inorganic Nitrogen. |                           |                        |                        |           |

The wastewater treatment system is installed in sub-grade precast-concrete tanks consisting of the following unit processes (in order of process flow) as per Table 2 below:

| Table 2. – Unit Processes and Tank Volumes                                                                                                                                                                                                                                                                                                                                   |                     |            |           |                |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|------------|-----------|----------------|
| Unit Process                                                                                                                                                                                                                                                                                                                                                                 |                     | # of Tanks | Tank ID # | Nominal Volume |
|                                                                                                                                                                                                                                                                                                                                                                              |                     |            |           | IG             |
| Influent Equalization Tanks                                                                                                                                                                                                                                                                                                                                                  |                     | 2          | 1,2       | 10,000         |
| Secondary (offline) Sludge Storage                                                                                                                                                                                                                                                                                                                                           |                     | 1          | 3         | 5,000          |
| Primary Treatment                                                                                                                                                                                                                                                                                                                                                            | Sludge Storage      | 2          | 4,5       | 10,000         |
|                                                                                                                                                                                                                                                                                                                                                                              | Primary Clarifier   | 1          | 6         | 10,000         |
| Secondary Treatment                                                                                                                                                                                                                                                                                                                                                          | Bioreactor 1        | 1          | 7         | 6,600          |
|                                                                                                                                                                                                                                                                                                                                                                              | Bioreactor 2        | 1          | 8         | 6,600          |
|                                                                                                                                                                                                                                                                                                                                                                              | Secondary Clarifier | 1          | 9         | 5,000          |
| Tertiary Treatment                                                                                                                                                                                                                                                                                                                                                           | Anoxic Bioreactor   | 1          | 10        | 4,000          |
|                                                                                                                                                                                                                                                                                                                                                                              | Bioreactor 3        | 1          | 11        | 6,600          |
|                                                                                                                                                                                                                                                                                                                                                                              | Tertiary Clarifier  |            |           | 6,600          |
|                                                                                                                                                                                                                                                                                                                                                                              | Floc Reactor        | 1          | 12        | 600            |
| Intermediate Pump Tank                                                                                                                                                                                                                                                                                                                                                       |                     | 1          | 13        | 5,000          |
| Effluent Pump Tank                                                                                                                                                                                                                                                                                                                                                           |                     | 1          | 14        | 5,000          |
| * Approximate working volumes take invert levels into account; therefore, may be slightly different than rated (nominal) tank sizes. For the sedimentation tanks complete with hoppers and sloped side walls, working tank volumes would be significantly less than nominal tank sizes. Equivalent volume tanks may be considered pending cost review and proposal revision. |                     |            |           |                |



## 2. Process Description

The following summarizes unit processes and associated tanks as specified in Table 2.

### *Flow Balancing*

Balancing of maximum daily inflow as per Table 1 is provided using (2) Equalization Tanks (hydraulically connected at bottoms) equipped with duplex equalization pumps.

Wastewater is pumped from the Equalization Tanks at a time dose rate as noted in Table 1 into the primary treatment stage.

### *Primary Treatment*

Dosed wastewater from the Equalization Tanks undergoes primary treatment using (2) Primary Sludge Storage tanks followed by (1) Primary Clarifier tank. The Primary Sludge Storage tanks provide settling and storage of primary solids. The Primary Clarifier tank provides additional settling and conditioning of the wastewater including pre-anoxic denitrification with carbon supplementation.

### *Secondary Treatment*

Secondary treatment is accomplished through the iQ.MBBR™ system which utilizes a moving bed biofilm reactor (MBBR) process. The biological stage consists of (2) aerobic bioreactors in series containing specially designed plastic carrier media having a specific surface area of  $500 \text{ m}^2/\text{m}^3$ . Microorganisms attach to the carrier media and consume the organic material in the wastewater. Oxygen needed for the aerobic treatment process is supplied by (2) regenerative air blowers and distributed in the biological reactors stage by fine bubble diffusers. The blowers are controlled using dissolved oxygen (DO) sensors to run only when required. Media retaining screens are installed in each bioreactor to keep the carrier media in place while allowing the process wastewater and excess biosolids (sludge) to pass through.

In Bioreactor 2, (1) recirculation pump returns part of the process mixed liquor at up to **3 x design flow** to the Primary Sludge Storage tank to achieve a minimum level of 75% total nitrogen reduction. Supplemental carbon (primary) is dosed into the recirculation line to ensure mixing in the primary treatment tanks; dosing is flow paced based on the influent Equalization Pump operation.

### *Tertiary Denitrification*

Tertiary denitrification is provided using (1) Anoxic Bioreactor to remove any residual nitrate nitrogen to the objective indicated in Table 1. The Anoxic Bioreactor is an MBBR containing specially designed plastic carrier media having a specific surface area of  $500 \text{ m}^2/\text{m}^3$ . Denitrifying bacteria attach to the carrier media and consume the nitrate and nitrite in the secondary effluent using supplemental carbon as an energy source under low oxygen conditions. The Anoxic Bioreactor sized to remove up to **20.1 mg/L** of residual nitrate at design flow (**1.65 kgNO<sub>3</sub>/d**) based on a recommended loading rate of  $0.5 \text{ gNO}_3/\text{m}^2\text{-d}$ . Supplemental carbon (tertiary) dosing is flow paced based on the influent Equalization Pump operation and proportioned to limit residual nitrate. The carbon supplement is intermittently mixed in the reactor via (3) mixing pumps. The Anoxic



Bioreactor is fully mixed periodically using coarse bubble diffusers and (1) dedicated regenerative air blower to remove any excess biomass while limiting the oxygen added.

Effluent from the Anoxic Bioreactor may contain residual CBOD<sub>5</sub> and TSS. To ensure the effluent meets the required criteria, further aerobic treatment and clarification is provided.

#### *Tertiary Effluent Polishing and Phosphorus Reduction*

Tertiary effluent polishing is provided using (1) Bioreactor 3 followed by (1) Floc Reactor and (1) Tertiary Clarifier. Bioreactor 3 acts as an aerobic MBBR polisher to consume any excess carbon from the tertiary process, working on the same treatment principles as the two main bioreactors, and includes (1) regenerative air blower to supply air to the process.

The phosphorus reduction system eliminates phosphorus by chemical precipitation. The system doses coagulant (Clariphos or approved equivalent) into the Floc Reactor tank for initial mixing of the chemical. Once the coagulant is added into the system, secondary sludge settles out in the Tertiary Clarifier. The coagulant is stored in a chemical tank equipped with a low-level alarm switch. The coagulant dosing pump doses the calculated amount on a flow proportional basis and (1) mixing pump and eductor assembly, and (1) linear blower and coarse bubble diffuser assemble are used to provide mixing during chemical dosing.

From the Floc Reactor, wastewater flows by gravity into the Tertiary Clarifier equipped with (2) sloped wall hoppers, (1) floating sludge (skimmer) pump and (2) sludge return pumps. Sludge settles to the bottom of the hoppers and is returned to the Sludge Storage tank along with any floating sludge removed by the skimmer pump.

#### *Intermediate Pump Tank*

From the Secondary Clarifier, the wastewater is discharged to (1) Intermediate Pump Tank complete with duplex (2) intermediate (effluent) pumps directed to the tertiary filtration system.

#### *Tertiary Filtration*

From the Intermediate Pump Tank, the wastewater is discharged to the Tertiary Filtration system. Enhanced (tertiary) phosphorus reduction and filtration is achieved using a pressurized filter system having a nominal 5 µm filtration efficiency to reduce total suspended solids and total phosphorus to the required effluent criteria. A chemical dosing pump doses the calculated amount of coagulant on a flow-proportional basis into a static mixer prior to filtration. This trim dosing of coagulant mineralizes remaining dissolved phosphorus and creates filtrable floc particles which are removed by the filter media and backwashed out to the Secondary Sludge Storage tank. The tertiary filter system consists of (3) filter modules arranged in parallel, each unit rated at 41.7 L/min, (1) static mixer, (1) chemical dosing pump, (1) air compressor unit, (2) backwash pumps located in the Effluent Pump Tank, and (1) controller to automatically initiate backwash based on maximum elapsed time and/or totalized flow. The Backwash Tank is sized to provide sufficient additional storage volume to backwash all filters in parallel using filtered effluent.



### Effluent Pump Tank

From the tertiary treatment system, the wastewater is discharged to (1) Effluent Pump Tank complete with duplex (2) filter backwash pumps and duplex (2) effluent pumps (to be confirmed by Engineer) discharging to the subsurface (area bed) infiltration system. The Effluent Pump Tank is sized to provide sufficient fixed storage volume for a full filter backwash cycle.

### Secondary Sludge Storage

All biological sludge from the Secondary and Tertiary Clarifiers, and tertiary sludge from the Tertiary Filter is stored in (1) offline Secondary Sludge Storage tank. Supernatant from this tank flows by gravity back to the start of the treatment system at the Primary Sludge Storage tank.

### Controls and Infrastructure

Five (5) control panels will control the treatment plant, Equalization and Effluent Pump Tanks, and include GPRS remote monitoring with current sensing on each output. Flow data logging is available on the equalization and effluent pumps based on pump run time, and a flow meter is included for the effluent discharged via the Tertiary Filter system. A control building or mechanical room is required for this system to contain the blowers, chemical dosing system, filter system, and control panels (see Provisional Items below).

## 3. Scope of Work

| Qty                                                                                       | Model                  | Description                                                                                                                                             |
|-------------------------------------------------------------------------------------------|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Concrete Tanks, Precast (*may be substituted subject to availability and approval)</b> |                        |                                                                                                                                                         |
| 1                                                                                         | Brooklin: BCP-36300L-H | Equalization Tank c/w (1) carbon vent lid and (2) 6" bottom openings for hydraulic interconnection                                                      |
| 1                                                                                         | Brooklin: BCP-36300L-H | Equalization Tank c/w (1) 900mm SQ concrete riser & aluminum hatch assy., (1) carbon vent lid, and (2) 6" bottom openings for hydraulic interconnection |
| 1                                                                                         | Brooklin: BCP-22750L-H | Secondary Sludge Storage tank                                                                                                                           |
| 2                                                                                         | Brooklin: BCP-36300L-H | Primary Sludge Storage tanks                                                                                                                            |
| 1                                                                                         | Brooklin: BCP-36300L-H | Primary Clarifier                                                                                                                                       |
| 1                                                                                         | Brooklin: BCP-30000L-H | Bioreactor 1                                                                                                                                            |
| 1                                                                                         | Brooklin: BCP-30000L-H | Bioreactor 2                                                                                                                                            |
| 1                                                                                         | Brooklin: BCP-22750L-C | Secondary Clarifier w/ (2) custom half-partition walls                                                                                                  |
| 1                                                                                         | Brooklin: BCP-18000L-H | Anoxic Bioreactor                                                                                                                                       |
| 1                                                                                         | Brooklin: BCP-30000L-C | Bioreactor 3 / Tertiary Clarifier w/ (1) full partition and (1) custom half-partition wall                                                              |
| 1                                                                                         | Brooklin: BCP-2700L-H  | Floc Reactor                                                                                                                                            |
| 1                                                                                         | Brooklin: BCP-22750L-H | Intermediate Pump Tank c/w (1) 900mm SQ concrete riser & aluminum hatch assy.                                                                           |
| 1                                                                                         | Brooklin: BCP-22750L-H | Effluent Pump Tank c/w (2) 900mm SQ concrete riser & aluminum hatch assys.                                                                              |



## iQ.MBBR™ System Equipment Package

|     |                                                                                                                                                                                                                                                                                                                           |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| lot | 20.4 m <sup>3</sup> of carrier media (500 m <sup>2</sup> /m <sup>3</sup> ), (40) MRB20-Sil fine bubble diffusers, (4) 4-port and (6) 3-port aeration manifolds, aeration piping, (3) 6" media retention screens, (1) 6" flap-check valve, and (2) 6" carbon vent filters for Bioreactors 1 & 2                            |
| 2   | Regenerative air blowers (FPZ model SCL R40-MD-4-3, 4 HP, 240 VAC/3-phase) each c/w VFD (Yaskawa model GA50UB018ABA, or eq.), air filter, discharge pressure relief valve, check valve, pressure gauge, piping assembly                                                                                                   |
| 2   | Dissolved oxygen sensor (optical, 4-20 mA, In-Situ mode RDOX or eq.)                                                                                                                                                                                                                                                      |
| 11  | Submersible sump pumps (Goulds model LSP0311F, 120 VAC) [sludge return, surface skimmer, recirculation, mixing]                                                                                                                                                                                                           |
| 1   | Submersible sump pump (Grundfos model KP350, 120 VAC) [recirculation]                                                                                                                                                                                                                                                     |
| 5   | PE hopper assemblies for Secondary and Tertiary Clarifier                                                                                                                                                                                                                                                                 |
| lot | Carbon dosing system, including (2) chemical dosing pumps (Stenner model E10-LHH), (2) chemical flow meters (Keyence model FD-XS8), tubing, 1,000 L storage tote, 920 L of carbon (Micro-C 2000 or equivalent), and low-level float switch                                                                                |
| lot | Coagulant dosing system, including (2) chemical dosing pumps (ProMinent model CNPb-0704 and Stenner model E10-LHH), (1) back-pressure valve, (2) chemical flow meters (Keyence model FD-XS8), tubing, (1) 2" static mixer, 1,000 L storage tote, 920 L of coagulant (Clariphos or equivalent), and low-level float switch |
| 2   | Sewage pumps ( <b>Liberty model LE52M-2, 0.5 HP, 208-240 VAC/1-ph, or eq.</b> ), c/w c/w (2) guide rail and discharge base assy., (2) level floats, isolation & check valves, and discharge piping assemblies for Equalization Tanks                                                                                      |
| 2   | Intermediate (effluent) pumps ( <b>Liberty model FL102M-2, 1 HP, 208-240 VAC/1-ph, or eq.</b> ), c/w (2) guide rail and discharge base assy., (2) level floats, isolation & check valves, and discharge piping assemblies for Intermediate Pump Tank                                                                      |
| lot | Tertiary filter system c/w (3) filter units ( <b>Ropen model VPMF-MQ-TB3</b> , (1) set of automatic isolator valves for treated water backwash, (1) filter inlet/outlet pressure gauge assy., and misc. piping installed in Control Shed                                                                                  |
| 2   | Ultrasonic flow meters (Keyence model FDQ-50C, or eq.) for filter discharge and filter backwash                                                                                                                                                                                                                           |
| 2   | Backwash pumps ( <b>Liberty model FL52M-2, 0.5 HP, 208-240 VAC/1-ph, or eq.</b> ), c/w (2) guide rail and discharge base assy., (1) level float, isolation & check valves, and discharge piping assemblies for Effluent Pump Tank                                                                                         |
| 2   | Effluent pumps ( <b>Liberty model FL52M-2, 0.5 HP, 208-240 VAC/1-ph, or eq.</b> ), c/w (2) guide rail and discharge base assy., (2) level floats, isolation & check valves, and discharge piping assemblies for Effluent Pump Tank                                                                                        |
| 5   | Control panels [click + clean® model <b>CP8-B22-C13-IM-4G:32A(1)</b> , <b>CP8-B22-C13-IM-4G:32A(1)</b> , <b>CP8-D02-B22-C12-4G:32A(1)</b> , <b>CP8-D02-C13-IM-4G:32A(1)</b> , and <b>CP8-B24-C12-4G:32A(1)</b> ] c/w 1-year Remote Monitoring (GPRS)                                                                      |

## Additional Scope

|                                                                                                                                                                                                                                       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Delivery and placement of tanks onsite including 20 h (2 days) crane rental (additional extra)                                                                                                                                        |
| All access risers to grade (includes 24" of riser height)                                                                                                                                                                             |
| Installation by our technicians of all pumps and process equipment within tanks, and internal and interconnecting piping and fittings within the treatment system envelope (excludes areas in Owner scope as shown in layout drawing) |

|  |                                                                                            |
|--|--------------------------------------------------------------------------------------------|
|  | Operation & Maintenance Manual                                                             |
|  | Installation assistance (4 trips, 9 days, 3 technicians)                                   |
|  | Startup and Training for Maintenance Staff (1 trips, 2 days, 2 technicians)                |
|  | (1) Year of Service (4 service visits, <u>excluding sampling and additional chemical</u> ) |

#### 4. Price Breakdown

| Item Description              |  |
|-------------------------------|--|
| Tanks & Equipment Package     |  |
| Installation / Startup Labour |  |
| Transportation                |  |
| Service (see above scope)     |  |
| <b>Total</b>                  |  |

Availability: Estimated 12 – 16 weeks from deposit receipt.

Terms: 25% Deposit, 40% on delivery, 25% Net 30 from delivery, 10% Net 30 from commissioning, OAC subject to credit application. This price is valid for 60 days from the date of this proposal.

#### 5. Exclusions to Scope of Work

- Any excavation or backfill (BNA is not responsible for any settling of tanks, pipes etc. due to improper backfill and compaction around tanks).
- Any grading to ensure surface water runoff around treatment plant area.
- Any insulation, anchoring, tank wrapping, or additional measures for high water table / flooding (BNA is not responsible for any issues caused by tank flotation).
- Any leakage or water-tightness testing of tanks or piping (tanks generally must be backfilled prior to any water filling/testing, consult BNA prior to filling).
- Any electrical works including power supply, electrical connections, wiring, or conduit (electrical scope may be quoted on request).
- Any inspections, permits, fees or locates.
- Any plumbing connections or piping outside of treatment system area.
- Control building (see Provisional Items below).
- Any additional tankage or equipment not included in this scope of work, i.e., leaching bed components, external pump stations (may be quoted on request), etc.

#### 6. Provisional Items

| Item | Item Description                                                                                                                                                                                                                                                                                              | Price |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1    | <b>Control Shed:</b><br>Supply and install (1) concrete control shed, Brooklin Concrete Products <b>Model 105</b> (13'6" x 8'4" x 7'10" [4102mm x 2540mm x 2387mm] ID, or equivalent), delivered and placed at site c/w exhaust fan and thermostat (electrical, insulation, heating & lighting are by others) |       |



## 7. Construction Requirements

To complete the installation of our product, the Owner shall procure its own Contractor(s) to complete all excavation and electrical works. BNA will provide delivery of the tanks and equipment to the site, and our installation team will install the process equipment and provide assistance to the Contractor(s). All of the equipment and piping within the treatment system envelope will be provided and installed as part of our scope of work. Project schedule and tank delivery plan must be submitted a minimum of two (2) weeks in advance to ensure delivery timing.

The Contractor shall be required to sign a construction scope check list prior to delivery to indicate understanding and acceptance of scope.

## 8. Electrical Requirements

The required electrical power supply to the Blower Control Building is 120 – 240VAC/1-phase/60Hz with a connected/peak load of approximately 96.2/65.2 A at 240VAC/1-ph, and 67.8 A at 120VAC/1-ph (peak load of approximately 99.1 A at 240 VAC/1-ph, excludes utility loads); if electrical supply differs from this specification, Owner or Contractor must inform BNA with equipment order. The system as proposed is estimated to require the following power supply circuits (to be determined based on final pump and blower specification):

- 4 x 240 VAC/1-phase @ 30 A
- 1 x 240 VAC/1-phase @ 20 A
- 4 x 120 VAC/1-phase @ 20 A
- 2 x 120 VAC/1-phase @ 15 A

## 9. Service Requirements

The iQ.MBBR™ process is a cost effective and easy to operate system with relatively low maintenance requirements. In basic terms, the Owner of the system is responsible to have a service contract in place with a BNA authorized Service Provider, that the system is operated within the specified design parameters, that the system is functioning normally (i.e., no local alarms or visible problems), and that the accumulated sludge is pumped out by licensed sewage hauler as requested by the Service Provider. The Service Provider shall, using standard industry practice and based on recommended service frequency and/or remote monitoring, ensure that the system equipment is functioning properly, the system is meeting performance specifications, and if not, adjust the system operational parameters accordingly to mitigate performance requirements and/or provide additional services as required.

Basic routine maintenance on the system will take approximately 2 h onsite. BNA recommends for a large/complex commercial application that the system be serviced on at least a bi-monthly basis. One day of training along with one (1) year of service (6 service visits) is included in the purchase price of the system (excluding sampling and chemical beyond the included 6 months estimated supply). Should our services be retained after the included first year, our service fees for this treatment system will be billed at a current rate of **\$850.00** for one service visit plus \$145.00 per hour for any additional hours onsite. We can also provide training or field support if required for a local service provider. Phone support is included in the remote monitoring Package (see below).



## 10. GPRS Remote Monitoring

The click+clean® control panel comes standard with a GPRS module that allows the maintenance provider to remotely connect to the control panel via wireless connection. This also allows for the control panel to instantly send information to the maintenance provider in case of an alarm or problem should arise with the treatment plant (i.e., power outage, mechanical failure, etc.). Through GPRS and the operation of the treatment plant, the amount of scheduled maintenance visits can be reduced as well as provide assurance of 24/7 round the clock operation. The initial cost for the module is included in the purchase price of the panel and includes one year of data monitoring fee. A yearly service fee of **\$960.00** plus taxes will be required to maintain this service for the (5) WWTS control panels. Ethernet options are also available on request.

## 11. Advantages of the iQ.MBBR™ Process

The iQ.MBBR™ process offers a custom designed solution which can be installed in a small footprint and offer low energy and operating costs. The process can also be retrofit in existing tanks or to upgrade existing systems. One of the unique benefits of the iQ.MBBR™ process is the ease of operating the system. The carrier media in the system is self-cleaning, does not clog and never has to be replaced. The process is designed for intermittent aeration allowing flexible operational settings with minimal energy consumption. Should influent strength or flow increase, the operator can simply increase aeration times in the bioreactors or add media. The operation cycle of the sludge return pump is designed so that the final clarifier is completely clean of secondary sludge. As a result of denitrification, the formation of floating sludge may occur in the final clarifier; this material is removed through a floating skimmer and returned to the sludge storage chamber. The two most common situations that cause failure in other wastewater process are overload and under-load conditions. Overloading occurs during concentrated periods of water usage in a short time while under-loading occurs during periods of inactiveness. These conditions in other biological processes cause the treatment performance to stop functioning. These problems are minimized in the iQ.MBBR™ process and unlike activated sludge processes, secondary sludge is not returned to the bioreactors in order to maintain the bacterial culture.

BNA has developed a unique control unit for the electrical supply and automatic control of the system. Each control panel comes standard with GPRS remote monitoring and data logging. This allows for instant notification of alarms and also allows the operator to change settings remotely. Each output also monitors current (amperage) instead of relying on floats or pressure sensors alone for mechanical failures. Current sensors can allow for issues to be detected before major problems occur. The control panel also has analog inputs for additional sensors should they be required on any project (i.e., turbidity, dissolved oxygen, etc.). A battery backup is provided for the panel to ensure that notifications are still sent during power outages.

In summary, the iQ.MBBR™ process is a robust cost-effective wastewater treatment process that takes up a small footprint while providing optimal performance. The system allows for significant operational flexibility and provides peace of mind in cases where influent strengths and flows may vary from anticipated design.

## **Appendix 1 – Standard Terms and Conditions**



**BERGMANN NORTH AMERICA INC.**  
**GENERAL TERMS AND CONDITIONS OF SALE**

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The following terms and conditions of sale ("Terms") shall apply and incorporated by reference into all transactions between the parties to any sale of goods ("Products") and/or services ("Services") by Bergmann North America Inc. ("BNA") to the purchaser ("Purchaser"). By placing an order, Purchasers accept or shall be deemed to have full knowledge of the Terms herein and agree to BNA's Terms, including the Limited Warranty, which are subject to change from time to time without prior notice.

- 1) **GENERAL:** In the event of any conflict or inconsistency between these Terms and the terms and conditions contained in Purchaser's order or in any other form issued by Purchaser, whether or not any such form has been acknowledged or accepted by BNA, these Terms & Conditions of Sale shall prevail. No waiver, alteration or modification of these Terms shall be binding upon BNA unless made in writing and signed by a duly authorized representative of BNA.
- 2) **ORDER ACCEPTANCE & CONFIRMATION:** All orders are subject to acceptance by BNA; any errors and omissions are subject to correction. BNA reserves the right to modify unordered Products from time to time, including the right to discontinue the Products.
- 3) **QUOTATIONS & ESTIMATES:** Unless waived or otherwise stated, BNA quotations and/or estimates shall be null and void unless accepted by Purchaser within thirty (30) days from the date of quotation or estimate.
- 4) **TAXES:** All prices do not include sales taxes. Applicable Canadian Federal or Provincial taxes will be added and billed at the rate in effect at the time of shipment. Payment of taxes is the sole responsibility of Purchaser unless Purchaser provides BNA with a valid exemption certificate acceptable to the applicable taxing authority.
- 5) **PRICES | COST OF TRANSPORTATION:** BNA's prevailing prices for Products and Services at the time of shipment will apply, except as otherwise provided in a written quotation or contract. BNA may, in its sole discretion, require advance payment or a deposit for Products and Services. Unless otherwise stated, all prices are in Canadian Dollars F.O.B. shipping point.
- 6) **DELIVERY SCHEDULES:** BNA makes every effort to meet delivery schedules as requested. Delivery shall depend on the prompt receipt by BNA of the information required to meet production schedules. Delivery schedules (including time for shipment) are approximate and are based on conditions at the time of BNA's quotation or estimate and acceptance of Purchaser's order.
  - (a) BNA cannot guarantee and Purchaser expressly releases BNA from any liability for any loss or damage resulting from a failure to deliver or delays in delivery caused by any conditions related to, or caused by, failure to process or inaccurate processing of time-sensitive information and/or mechanisms. BNA may extend delivery schedules or may, at its option, cancel Purchaser's order in full or in part without liability other than to return any deposit which is unearned by reason of the cancellation.
  - (b) BNA reserves the right to make partial shipments and to submit invoices for partial shipments.
- 7) **SITE DELIVERIES – CONCRETE PRODUCTS:** BNA may sub-contract concrete product deliveries via 3<sup>rd</sup> party mobile crane truck within the rated load and crane reach capacity for the equipment. Product/s will be set in to prepared excavation at the prevailing prices at the time of shipment, subject to equipment availability.
  - (a) Purchaser is responsible for providing an accessible, level, and stable surface sturdy enough to accommodate the vehicle and the span of the crane stabilizers/outriggers; BNA is not responsible for driveway or other surface damage due to machine/material delivery weight; Restoration of all affected existing surfaces by others.
  - (b) CRANE TRUCK OPERATORS WILL NOT ATTEMPT ANY OPERATION THAT MAY INVOLVE ANY PERSONAL SAFETY HAZARD, CONTRAVENE APPLICABLE LEGISLATION, OR JEOPARDIZE EQUIPMENT.
  - (c) Any additional 3rd-Party on site delivery requirements shall be observed.
  - (d) BNA does not assume any liability for delay or non-delivery caused by failure of transportation facilities, accident, or any other unforeseen cause/s beyond our control.
  - (e) If pre-arranged crane equipment is unable to safely offset at a site due to adverse soil conditions or any other site condition or conditions/s beyond our control, the driver will either unload on the ground or return to the supplier plant as instructed by the Purchaser and/or their agent and/or BNA. HIRING A LONGER REACHING CRANE, ADDITIONAL PERMITS, AND/OR RE-ORDERING THE DELIVERY IS THE RESPONSIBILITY OF THE PURCHASER, AND IS AT THE PURCHASER'S EXTRA COST.
  - (f) Special methods of transportation will be used upon Purchaser's request and at Purchaser's own additional expense.
- 8) **INSTALLATION:** Unless otherwise expressly stipulated, the Products shall be installed by and at the risk and expense of Purchaser. If BNA is requested to supervise such installation, or parts thereof, BNA's responsibility shall be limited to exercising that degree of skill customary in the trade in supervising installations of a similar type. Purchaser shall remain responsible for all other aspects of the work including compliance with the local regulations. Responsibility for site safety and construction means and methods remain with Purchaser and/or its agents.
- 9) **WASTEWATER TREATMENT SYSTEMS:** Wastewater treatment systems must be installed, commissioned and serviced by certified contractors at recommended intervals. Owners of treatment systems are required to operate their system according to manufacturer's requirements and government regulations.
  - (a) Manufacturers and service providers do not, and cannot control the effluent that enters the Owner's system; It is the responsibility of the Owner, as the Operator, to ensure their treatment system meets government standards for operation.
- 10) **CHANGES & CANCELLATION:** Orders accepted by BNA are not subject to changes or cancellation by Purchaser without prior written consent. In such cases where BNA authorizes changes or cancellation, BNA reserves the right to charge Purchaser reasonable costs based upon expenses already incurred and commitments made by BNA, including, without limitation, any

## GENERAL TERMS AND CONDITIONS OF SALE (Continued)

labour done, material(s) purchased, BNA's usual overhead and reasonable profit and cancellation charges from its' suppliers.

- 11) **ACKNOWLEDGMENTS:** Purchaser expressly acknowledges and agrees that Purchaser has accepted the product information and/or drawings, terms and conditions and the necessary installation requirements, suitability for use, and regulatory compliance. The purchaser shall rely entirely on its own inspection and knowledge of the goods being purchased, there being no representations, conditions, warranties or collateral contracts made by or on behalf of BNA other than as set out herein.

- (a) Products will be quoted and shipped according to information and specifications provided by Purchaser. Purchaser is responsible to verify all specifications and quantities of Products prior to finalizing and submitting its order;
- (b) Purchaser is solely responsible for the proper installation and/or intended use of the Products.

- 12) **NO COPYING OR REVERSE ENGINEERING:** No copyrights, patents, trademarks or any other intellectual property rights are assigned to Purchaser hereunder. Purchaser is expressly prohibited and shall not copy, analyze or create derivative works, decompile, or reverse engineer or cause a third party to copy, analyze or create derivative works, decompile or reverse engineer any confidential information, product designs, or other intellectual property for any purpose. Purchaser acknowledges that its failure to comply with the provisions of this section may cause irreparable harm to BNA which cannot be adequately compensated for in damages, and accordingly acknowledges that BNA will be entitled to claim, in addition to any other remedies available to it, interlocutory and permanent injunctive relief to restrain any anticipated, present or continuing breach of this Section.

- 13) **FORCE MAJEURE:** BNA will not be responsible for any failure or delay in its performance due to causes beyond its reasonable control, including, but not limited to, labor disputes, strikes, lockouts, shortages of or inability to obtain labor, energy, raw materials or supplies, war, terrorism, riot, natural disasters or governmental action. The acceptance of delivery of Products by Purchaser shall constitute a waiver of all claims for loss or damage due to any delay whatsoever.

- 14) **EXPORT CONTROL LAWS:** BNA will not be the exporter under any circumstances. . It is the sole responsibility of Purchaser at its own expense to satisfy all legal requirements for the export and use of the Products from Canada.

- 15) **TITLE:** Title and ownership of the products, goods or equipment shall remain with BNA and shall not pass to the Purchaser until all amounts owing by the Purchaser have been paid in full. Purchaser grants to BNA a security interest in such products, goods and equipment and in all other personal property owned by it.

- 16) **TERMS OF PAYMENT:** Unless otherwise stated in a quotation, invoices on approved credit accounts are due and payable within thirty (30) days of invoice date. Where credit is not established, payment is due at time of purchase through cash, cheque, Interac Debit, Visa or MasterCard, or other methods that may become available from time to time. All payments must be in Canadian dollars. Unless specifically provided in an invoice, no cash discount shall be available to Purchaser.

- (a) PAYMENT IN FULL IS NOT SUBJECT TO HOLDBACKS EXCEPT BY WRITTEN AGREEMENT AT TIME OF ORDER,

AND, IN NO CASE IS PAYMENT CONTINGENT ON THE PURCHASER RECEIVING PAYMENT FROM PURCHASER'S CUSTOMER.

- (b) Should payment not be made to BNA when due, BNA reserves the right to suspend all future delivery or other performance with respect to Purchaser without liability or penalty; Purchaser agrees that BNA may retain all payments which have been made on account of the purchase price as liquidated damages,

- 17) **CREDIT:** Credit requests are subject to the completion and submission of the prevailing BNA Credit Application & Agreement by the Purchaser. Credit approval is at BNA's sole discretion. The applicable terms and conditions of the BNA Credit Agreement shall prevail at the sole discretion of BNA. Charging of interest shall not be construed as BNA granting any extension of time in the terms of payment.

- 18) **NO SET-OFF:** Purchaser may not set-off any amounts due to Purchaser against any amount due to BNA in connection with any transaction. Purchaser may not make any deduction from any payment due hereunder by reason of loss or damage to Products in transit.

- 19) **WARRANTY:** BNA sub-contracts concrete Products designed for use at maximum one (1) Meter burial depth in non-traffic areas unless otherwise stated. BNA concrete Products are covered by a twelve (12) month limited warranty (the "Limited Warranty") against defects in material and workmanship from the date of delivery to Purchaser unless otherwise stipulated in writing by BNA.

- (a) BNA nor its' supplier will be responsible or liable under the Limited Warranty for (i) any defects attributed to normal wear and tear, or failure of any part or parts from external forces, including without limitation corrosive effluents, corrosive soils, vehicular or other impact, frost heave, vandalism, earthquake or other Force Majeure; (ii) Products not installed and/or maintained according to applicable laws, codes and BNA's instructions (iii) use of the Products with incompatible goods or unintended use; (iv) defects in any portion or part of the Products manufactured and/or installed by others.
- (b) Purchaser shall give BNA an opportunity to investigate any alleged defects; BNA will make every good faith effort to repair, or at its sole option, replace at no charge any Products found to be defective during the Limited Warranty period.
- (c) The Limited Warranty specifically excludes other on-site service time and materials.
- (d) For components not supplied by BNA, the warranty is determined by the original equipment manufacturer and/or supplier. Any components found to be defective must be offered at, or shipped freight prepaid to the BNA facility for inspection and examination. BNA's obligation under the manufacturer or supplier warranty is limited to repair or replacement. Manufacturer's warranties specifically exclude other on-site service time & materials.

- 20) **SERVICES:** BNA may provide Services pursuant to the specifications, assumptions and such other information set out in a quotation or estimate. Unless otherwise set out in the applicable quotation or estimate, Purchaser will pay all labour time and materials, and usual and customary fees incurred by



## GENERAL TERMS AND CONDITIONS OF SALE (Continued)

BNA and its personnel during the performance of the Services. BNA may, in its sole discretion, subcontract or otherwise provide the Services (or parts thereof) through third parties. PURCHASER SHALL REMAIN RESPONSIBLE FOR ALL OTHER ASPECTS OF THE WORK INCLUDING COMPLIANCE WITH THE LOCAL

REGULATIONS. RESPONSIBILITY FOR SITE SAFETY AND CONSTRUCTION MEANS AND METHODS REMAIN WITH PURCHASER AND/OR ITS AGENTS.

(a) Services will be performed in a professional manner consistent with applicable industry standards. Except as otherwise provided in a quotation or contract, BNA will, within the period of one-hundred & twenty (120) days following the date of installation of Products, repair any defective workmanship in Services. THIS WARRANTY IS EXCLUSIVE. BNA EXPRESSLY DISCLAIMS, AND PURCHASER EXPRESSLY WAIVES, ALL OTHER WARRANTIES, REPRESENTATIONS AND GUARANTEES, WHETHER ORAL OR WRITTEN, IMPLIED OR STATUTORY IN RESPECT OF SERVICES OR ANY PORTION THEREOF, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

21) **WARRANTY DISCLAIMER:** BNA makes every effort to accurately describe Product information and/or drawings and its Services. Such descriptions are for identification purposes only and do not express or imply a warranty or condition that the Products are appropriate for a particular purpose. No warranty or condition, express or implied, other than as set forth in the Limited Warranty above is made or authorized by BNA.

22) **LIMITATION OF LIABILITY AND TIME FOR CLAIMS:** Any liability for indirect, special, exemplary, punitive, consequential or incidental damages is expressly disclaimed by BNA. BNA's liability in all events for all damages, losses and causes of action (whether in contract, tort or otherwise) shall be limited in the aggregate to, and shall not exceed, the purchase price paid by the Purchaser for the Product in question. Any claims against BNA must be brought within one (1) year after the cause of action arises, notwithstanding any applicable statute of limitations.

23) **PRODUCT RETURNS:** Any cancellation or return must be approved by BNA (in its discretion), be accompanied by proof of purchase, and may be subject to restocking and other charges. In the event of approval of a return request, (a) all returns must be shipped freight prepaid at Purchaser's expense; and (b) only Products of current manufacture in salable for condition will be accepted for credit.

24) **INDEMNITY:** Purchaser hereby assumes and agrees to indemnify, defend, and hold harmless BNA, each of its affiliates and/or all of their respective agents, directors, officers, employees, subcontractors, suppliers and invitees from and against any and all sums, losses, damages, claims, costs, duties, suits, actions, causes of action, liabilities, demands and expenses (including legal fees and other legal expenses on a full indemnity basis) of whatsoever kind and nature arising out of (a) Purchaser's purchase, use, possession, ownership, operation, condition, resale, transfer, import, export, transportation, disposal, operation of the Product or otherwise relating to, connected with in any way, arising out of, or on account of Products, Services or these Terms; and/or (b) Purchaser's violation or alleged violation of

any foreign, federal, provincial, county, municipal or local laws or regulation. This indemnity will survive termination of the Terms.

25) **CONFIDENTIALITY:** Except as required by law or with the express written consent of BNA, Purchaser agrees to receive and maintain all information received from BNA, including without limitation, pricing and specifications, in confidence, using the same degree of care which Purchaser employs with its own confidential information, provided this is no less than a reasonable standard of care, and Purchaser will not disclose to any person or entity or make public or authorize the disclosure of any such information and will not use such information for any purpose, except as expressly agreed to by BNA in writing or in another applicable agreement between BNA and Purchaser. Purchaser acknowledges that its failure to comply with the provisions of this section may cause irreparable harm to BNA which cannot be adequately compensated for in damages, and accordingly acknowledges that BNA will be entitled to claim, in addition to any other remedies available to it, interlocutory and permanent injunctive relief to restrain any anticipated, present or continuing breach of this Section.

26) **WAIVER:** BNA's failure to insist on strict performance of these Terms or to enforce a default upon the occurrence of any single, repeated, or continuing violation of any particular term or condition hereof, shall not be considered a waiver of BNA's right to insist on strict performance of these Terms or to enforce a default with respect to the violation of any other term or condition or, at any later time or upon any subsequent occurrence, with respect to that particular term or condition.

27) **SEVERABILITY:** If any provision of the Terms and Conditions is held to be void, null, unlawful or otherwise unenforceable, that provision shall be treated as a separate and independent clause. The remainder of the Terms and Conditions will continue to be in full force and effect.

28) **GOVERNING LAW:** These terms and conditions will be governed by, and interpreted and enforced in accordance with, the laws in force in the Province of Ontario and shall be treated in all respects as an Ontario Contract.

29) **ENTIRE AGREEMENT:** These Terms, and any quotation or estimate that incorporates these Terms by reference, are the complete and exclusive agreement between the parties and supersedes all provisions and concurrent agreements, understanding, negotiations and discussions, whether oral or written of the parties and there are no warranties, representations or other agreements between the parties in connection with its subject matter except as specifically set forth in these Terms.

30) **MISCELLANEOUS:** These Terms are binding upon and inure to the benefit of the parties hereto and their respective successors, permitted assigns and transferees. Each Party's obligations which by their nature are intended to survive beyond the termination, cancellation or expiration of these Terms, shall survive including without limitation, Purchaser's payment obligations, confidentiality obligations, indemnifications, any disclaimer of warranties, limitations of liability and time for claims, severability, governing law, dispute resolution, entire agreement and this Section 30). Purchaser may not assign these Terms or any rights or obligations hereunder without BNA's prior written consent.

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## **Appendix 2 – Calculation Summary**

# Wastewater Treatment System Calculation Summary

Project:

0306

Children's Campground - WWTS



## Design Parameters:

|                                  |       |                   |                                                    |       |                                        |
|----------------------------------|-------|-------------------|----------------------------------------------------|-------|----------------------------------------|
| Influent BOD <sub>5</sub> =      | 350   | mg/L              | Effluent BOD <sub>5</sub> =                        |       | mg/L                                   |
| Influent TSS =                   | 300   | mg/L              | Effluent CBOD <sub>5</sub> =                       | 10    | mg/L                                   |
| Influent TKN =                   | 100   | mg/L              | Effluent TSS =                                     | 10    | mg/L                                   |
| Influent TP =                    | 15    | mg/L              | Effluent TAN =                                     |       | mg/L                                   |
| Average Flow, Q <sub>A</sub> =   | 57.3  | m <sup>3</sup> /d | Effluent TIN =                                     | 3.90  | mg/L (Nitrate)                         |
| Design Flow, Q <sub>D</sub> =    | 81.85 | m <sup>3</sup> /d | Effluent TN =                                      |       | mg/L                                   |
| Peak Flow, Q <sub>P</sub> =      | 8.19  | m <sup>3</sup> /h | Effluent TP =                                      | 0.150 | mg/L                                   |
| Equalized Flow, Q <sub>E</sub> = | 3.41  | m <sup>3</sup> /h | Effluent EC/FC =                                   |       | CFU/100 mL                             |
| Influent BOD <sub>5</sub> Load = | 28.65 | kg/d              | Influent CBOD <sub>5</sub> Population Equivalent = | 477   | PE (@0.6 gCBOD <sub>5</sub> /person-d) |
| Influent TN Load =               | 8.19  | kg/d              | Influent TN Population Equivalent =                | 682   | PE (@0.12 gTN/person-d)                |

## Treatment Process Selection:

C+N3+P Carbon Oxidation + Total Nitrogen Reduction (>90%) + Total Phosphorus Reduction (>0.8 mg/L)

|     |                            |       |                   |        |       |
|-----|----------------------------|-------|-------------------|--------|-------|
| 300 | = % Internal Recirculation | 10.23 | m <sup>3</sup> /h | 170.52 | L/min |
|     | = % Effluent Recirculation | -     | m <sup>3</sup> /h | -      | L/min |

## Influent Flow Equalization (EQT):

| Design Criteria                |          | Min. Volume         | EQT Tank Selection (model) | Quantity | Specified Volume    |
|--------------------------------|----------|---------------------|----------------------------|----------|---------------------|
| Hydraulic Retention Time (HRT) | ≥ 18 h   | 61.4 m <sup>3</sup> | BCP-36300L-H               | 2        | 78.3 m <sup>3</sup> |
| Parameters as Specified        |          |                     | Internal Length =          | 7.011 m  |                     |
| Hydraulic Retention Time (HRT) | = 23.0 h |                     | Internal Width =           | 2.744 m  |                     |
|                                |          |                     | Nominal Depth =            | 2.036 m  |                     |
|                                |          |                     | Depth Override =           |          |                     |

## Sludge Storage, Inline + Offline (SS1 + SS2):

| Design Criteria                    |                       | Min. Volume         | SS1 Tank Selection (model) | Quantity | Specified Volume           |
|------------------------------------|-----------------------|---------------------|----------------------------|----------|----------------------------|
| Min. Sludge Haulage Frequency      | = 3.33 months         | 72.6 m <sup>3</sup> | BCP-36300L-H               | 2        | 76.9 m <sup>3</sup>        |
| Hydraulic Retention Time (HRT)     | ≥ 2 h                 |                     | Internal Length =          | 7.011 m  |                            |
| Primary+Secondary Sludge Volume    | = 34.9 m <sup>3</sup> |                     | Internal Width =           | 2.744 m  |                            |
| Tertiary Sludge Volume (see below) | = 10.5 m <sup>3</sup> |                     | Nominal Depth =            | 2.036 m  |                            |
|                                    |                       |                     | Depth Override =           | 2.00 m   |                            |
| Parameters as Specified (Inline)   |                       |                     | SS2 (Offline)              |          |                            |
| Total Hydraulic Retention Time     | = 5.6 h               |                     | Tank Selection (model)     | Quantity | Specified Volume (Offline) |
| Estimated Sludge Storage Time      | = 10.5 months         |                     | BCP-22750L-H               | 1        | 23.3 m <sup>3</sup>        |
| Parameters as Specified (Offline)  |                       |                     | Internal Length =          | 4.801 m  |                            |
| Total Hydraulic Retention Time     | = 68.3 h              |                     | Internal Width =           | 2.337 m  |                            |
| Estimated Sludge Storage Time      | = 6.3 months          |                     | Nominal Depth =            | 2.075 m  |                            |
|                                    |                       |                     | Depth Override =           |          |                            |
|                                    |                       |                     |                            |          | Total Volume               |
|                                    |                       |                     |                            |          | 100.2 m <sup>3</sup>       |

## Primary Clarifier (PC):

| Design Criteria                        |                                          | Min. Volume         | PC Tank Selection (model) | Quantity | Specified Volume       |
|----------------------------------------|------------------------------------------|---------------------|---------------------------|----------|------------------------|
| Hydraulic Retention Time (HRT)         | ≥ 2.0 h                                  | 27.3 m <sup>3</sup> | BCP-36300L-H              | 1        | 36.3 m <sup>3</sup>    |
| Parameters as Specified                |                                          |                     | Internal Length =         | 7.011 m  |                        |
| CBOD <sub>5</sub> Reduction in Primary | = 33.0 %                                 |                     | Internal Width =          | 2.744 m  |                        |
| Unit Flow w/Recirculation              | = 13.64 m <sup>3</sup> /h                |                     | Nominal Depth =           | 2.036 m  |                        |
| Hydraulic Retention Time (HRT)         | = 2.7 h                                  |                     | Depth Override =          | 1.886 m  |                        |
| Surface Overflow Rate (SOR)            | = 0.71 m <sup>3</sup> /m <sup>2</sup> /h |                     |                           |          | Specified Surface Area |
| SOR MOE Guideline ≤                    | 1.25 m <sup>3</sup> /m <sup>2</sup> /h   |                     |                           |          | 19.2 m <sup>2</sup>    |



# Wastewater Treatment System Calculation Summary

Project:

0306

Children's Campground - WWTS



## Aerobic Bioreactors (BR):

### Design Criteria

|                                         |   |                                         |             |                     |
|-----------------------------------------|---|-----------------------------------------|-------------|---------------------|
| Hydraulic Retention Time (HRT)          | ≥ | 3 h                                     | Min. Volume | 51.0 m <sup>3</sup> |
| Media CBOD <sub>5</sub> Surface Loading | ≤ | 2 gCBOD <sub>5</sub> /m <sup>2</sup> -d |             |                     |
| Media TAN Surface Loading               | ≤ | 1 gTAN/m <sup>2</sup> -d                |             |                     |
| Minimum Media Volume                    | = | 19.2 m <sup>3</sup>                     |             |                     |

### Parameters as Specified

|                                         |   |                                            |
|-----------------------------------------|---|--------------------------------------------|
| Hydraulic Retention Time (HRT)          | = | 4.4 h                                      |
| Media Volume                            | = | 20.4 m <sup>3</sup>                        |
| Media Surface Area                      | = | 10,200 m <sup>2</sup>                      |
| Media Filling Degree                    | = | 34 %                                       |
| Media CBOD <sub>5</sub> Surface Loading | = | 1.88 gCBOD <sub>5</sub> /m <sup>2</sup> -d |
| Media TAN Surface Loading               | = | 0.80 gTAN/m <sup>2</sup> -d                |

### Aeration Design

|                                      |   |                           |
|--------------------------------------|---|---------------------------|
| Design Oxygen Demand                 | = | 47.93 kgO <sub>2</sub> /d |
| Specified Aeration Rate              | = | 200. Nm <sup>3</sup> /h   |
| Specified Aeration Running %         | = | 46%                       |
| Specified Aeration Running Time      | = | 11.1 hr/d                 |
| Specified Oxygen Transfer Efficiency | = | 7.7%                      |
| Specified Oxygen Supply @25°C        | = | 47.93 kgO <sub>2</sub> /d |
| Specified Mixing per Unit Volume     | = | 0.93 L/s-m <sup>3</sup>   |
| Specified Mixing per Surface Area    | = | 2.48 L/s-m <sup>2</sup>   |

## BR1

| Tank Selection (model) | Quantity |
|------------------------|----------|
| BCP-30000L-H           | 1        |
| Internal Length =      | 4.801 m  |
| Internal Width =       | 2.337 m  |
| Nominal Depth =        | 2.695 m  |
| Depth Override =       | m        |

### Specified Volume

30.2 m<sup>3</sup>

### Specified Surface Area

11.2 m<sup>2</sup>

## BR2

| Tank Selection (model) | Quantity |
|------------------------|----------|
| BCP-30000L-H           | 1        |
| Internal Length =      | 4.801 m  |
| Internal Width =       | 2.337 m  |
| Nominal Depth =        | 2.695 m  |
| Depth Override =       | 2.620 m  |

### Specified Volume

29.4 m<sup>3</sup>

### Specified Surface Area

11.2 m<sup>2</sup>

### Specified Total Volume

59.6 m<sup>3</sup>

### Specified Total Surface Area

22.4 m<sup>2</sup>

## Blower Model

| Blower Model                  | Quantity               |
|-------------------------------|------------------------|
| SCL R40-MD-4-3                | 2                      |
| Diffuser Length =             | 40 m                   |
| Design Blower Pressure =      | 310 mbar               |
| Design Blower Rate / Blower = | 100 Nm <sup>3</sup> /h |
| Specified Power / Blower =    | 2.99 kW                |
| Amperage =                    | 11.1 Amp               |

| PSI       | WG (in)   |
|-----------|-----------|
| 4.5       | 124.5     |
| 58.9      | scfm      |
| 4.0       | HP        |
| VFD spec. | BA0018FAA |

## Secondary Clarifier (SC):

### Design Criteria

|                                |   |                                        |             |                     |
|--------------------------------|---|----------------------------------------|-------------|---------------------|
| Hydraulic Retention Time (HRT) | ≥ | 3.0 h                                  | Min. Volume | 10.2 m <sup>3</sup> |
| Max. Surface Overflow Loading  | ≤ | 0.80 m <sup>3</sup> /m <sup>2</sup> /h |             |                     |

### Parameters as Specified

|                                |   |                                        |
|--------------------------------|---|----------------------------------------|
| Unit Flow w/Recirculation      | = | 3.41 m <sup>3</sup> /h                 |
| Hydraulic Retention Time (HRT) | = | 4.1 h                                  |
| Surface Overflow Rate (SOR)    | = | 0.30 m <sup>3</sup> /m <sup>2</sup> /h |
| Max. SOR by MOE Guideline      | ≤ | 1.38 m <sup>3</sup> /m <sup>2</sup> /h |

## SC

| Tank Selection (model) | Quantity |
|------------------------|----------|
| BCP-22750L-H           | 1        |
| Internal Length =      | 4.801 m  |
| Internal Width =       | 2.337 m  |
| Nominal Depth =        | 2.075 m  |
| Depth Override =       | m        |
| Number of Hoppers =    | 3        |

### Specified Volume (with hoppers)

14.1 m<sup>3</sup>

### Specified Surface Area

11.2 m<sup>2</sup>

## Tertiary Denitrification System (ABR):

### Design Criteria

|                                               |   |                                         |             |                     |
|-----------------------------------------------|---|-----------------------------------------|-------------|---------------------|
| Design Flow                                   | = | 81.85 m <sup>3</sup> /d                 | Min. Volume | 13.2 m <sup>3</sup> |
| Remaining Nitrate to Remove                   | = | 20.1 mg/L                               |             |                     |
| Nitrate Mass Loading                          | = | 1.65 kgNO <sub>3</sub> /d               | 75%         | Denit. Credit.      |
| Maximum Media NO <sub>3</sub> Surface Loading | ≤ | 0.5 gNO <sub>3</sub> /m <sup>2</sup> -d |             |                     |
| Minimum Media Volume                          | = | 6.6 m <sup>3</sup>                      |             |                     |

### Parameters as Specified

|                                       |   |                                          |
|---------------------------------------|---|------------------------------------------|
| Hydraulic Retention Time (HRT)        | = | 5.0 h                                    |
| Media Volume                          | = | 7.8 m <sup>3</sup>                       |
| Media Surface Area                    | = | 3,900 m <sup>2</sup>                     |
| Media Filling Degree                  | = | 45 %                                     |
| Media NO <sub>3</sub> Surface Loading | = | 0.42 gNO <sub>3</sub> /m <sup>2</sup> -d |

## ABR

| Tank Selection (model) | Quantity |
|------------------------|----------|
| BCP-18000L-H           | 1        |
| Internal Length =      | 4.801 m  |
| Internal Width =       | 2.337 m  |
| Nominal Depth =        | 1.528 m  |
| Depth Override =       | m        |

### Specified Volume

17.1 m<sup>3</sup>



# Wastewater Treatment System Calculation Summary

Project:

0306

Children's Campground - WWTS



## Tertiary Bioreactor (BR3):

BR3

### Design Criteria

|                                         |   |                                         |             |                    |
|-----------------------------------------|---|-----------------------------------------|-------------|--------------------|
| Hydraulic Retention Time (HRT)          | ≥ | 2.5 h                                   | Min. Volume | 8.5 m <sup>3</sup> |
| Media CBOD <sub>5</sub> Surface Loading | ≤ | 2 gCBOD <sub>5</sub> /m <sup>2</sup> -d |             |                    |
| Minimum Media Volume                    | = | 2.5 m <sup>3</sup>                      |             |                    |

### Tank Selection (model) Quantity

|                   |         |
|-------------------|---------|
| BCP-30000L-S-1/3  | 1       |
| Internal Length = | 1.549 m |
| Internal Width =  | 2.337 m |
| Nominal Depth =   | 2.644 m |
| Depth Override =  | 2.694 m |

### Specified Volume

|                        |
|------------------------|
| 9.8 m <sup>3</sup>     |
| Specified Surface Area |
| 9.8 m <sup>2</sup>     |

### Parameters as Specified

|                                         |   |                                            |
|-----------------------------------------|---|--------------------------------------------|
| Hydraulic Retention Time (HRT)          | = | 2.9 h                                      |
| Media Volume                            | = | 3.2 m <sup>3</sup>                         |
| Media Surface Area                      | = | 1600 m <sup>2</sup>                        |
| Media Filling Degree                    | = | 32.8 %                                     |
| Media CBOD <sub>5</sub> Surface Loading | = | 1.53 gCBOD <sub>5</sub> /m <sup>2</sup> -d |

### Aeration Design

|                                      |   |                          |
|--------------------------------------|---|--------------------------|
| Design Oxygen Demand                 | = | 6.55 kgO <sub>2</sub> /d |
| Specified Aeration Rate              | = | 30.0 Nm <sup>3</sup> /h  |
| Specified Aeration Running %         | = | 43%                      |
| Specified Aeration Running Time      | = | 10.3 hr/d                |
| Specified Oxygen Transfer Efficiency | = | 7.6%                     |
| Specified Oxygen Supply @25°C        | = | 6.55 kgO <sub>2</sub> /d |
| Specified Mixing per Unit Volume     | = | 0.85 L/s-m <sup>3</sup>  |
| Specified Mixing per Surface Area    | = | 2.30 L/s-m <sup>2</sup>  |

### Blower Selection (model) Quantity

|                               |                       |
|-------------------------------|-----------------------|
| SCL R30-MD-2-3                | 1                     |
| Diffuser Length =             | 6 m                   |
| Design Blower Pressure =      | 303 mbar              |
| Design Blower Rate / Blower = | 30 Nm <sup>3</sup> /h |
| Specified Power / Blower =    | 1.5 kW                |
| Amperage =                    | 5.96 Amp              |

|           |           |
|-----------|-----------|
| PSI       | WG (in)   |
| 4.39      | 121.5     |
| 17.66     | scfm      |
| 2.00      | HP        |
| VFD spec. | BA0010FAA |

## Tertiary Clarifier (TC):

TC

### Design Criteria

|                                |   |                                       |             |                    |
|--------------------------------|---|---------------------------------------|-------------|--------------------|
| Hydraulic Retention Time (HRT) | ≥ | 2.5 h                                 | Min. Volume | 8.5 m <sup>3</sup> |
| Maximum Surface Area Loading   | ≤ | 0.8 m <sup>3</sup> /m <sup>2</sup> -d |             |                    |

### Tank Selection (model) Quantity

|                     |         |
|---------------------|---------|
| BCP-30000L-S-2/3    | 1       |
| Internal Length =   | 3.175 m |
| Internal Width =    | 2.337 m |
| Nominal Depth =     | 2.695 m |
| Depth Override =    | 2.52 m  |
| Number of Hoppers = | 2       |

### Specified Volume (with hoppers)

|                        |
|------------------------|
| 12.6 m <sup>3</sup>    |
| Specified Surface Area |
| 7.4 m <sup>2</sup>     |

### Parameters as Specified

|                                |   |                                        |
|--------------------------------|---|----------------------------------------|
| Unit Flow w/Recirculation      | = | 3.41 m <sup>3</sup> /d                 |
| Hydraulic Retention Time (HRT) | = | 3.7 h                                  |
| Surface Area Loading (SOR)     | = | 0.46 m <sup>3</sup> /m <sup>2</sup> -d |

## Phosphorus Reduction System:

FR

### Design Criteria

|                                       |   |                           |             |                    |
|---------------------------------------|---|---------------------------|-------------|--------------------|
| Include Coagulant Dosing (Y/N)        | = | Y                         | Min. Volume | 1.7 m <sup>3</sup> |
| Coagulant Molar Ratio (RE300)         | = | 2.56 mol/L                |             |                    |
| Density of Coagulant (RE300)          | = | 1.63 kg/L                 |             |                    |
| Stoichiometric Ratio                  | = | 1 mol/molP                |             |                    |
| Assumed TP removed in Biomass/Primary | = | 20 % of CBOD <sub>5</sub> |             |                    |
| Remaining TP to Remove                | = | 11.85 mg/L                |             |                    |
| Coagulant Dosing Rate at Design Flow  | = | 12.23 L/d                 |             |                    |
| Pump Design Safety Factor             | = | 8                         |             |                    |
| Minimum Dosing Pump Flow Rate         | = | 4.08 L/h                  |             |                    |
| Storage Capacity (mo)                 | 3 | 770.7 L                   |             |                    |
| Estimated Tertiary Sludge             | = | 104.7 L/d                 |             |                    |

### Tank Selection (model) Quantity

|                   |         |
|-------------------|---------|
| BCP- 2700L-H      | 1       |
| Internal Length = | 2.286 m |
| Internal Width =  | 0.99 m  |
| Nominal Depth =   | 1.295 m |
| Depth Override =  | 0.8 m   |

### Specified Volume

|                    |
|--------------------|
| 1.8 m <sup>3</sup> |
|--------------------|

### Chemical Pump (model) Quantity

|                           |          |
|---------------------------|----------|
| ProMinent CNPb-0704       | 1        |
| Specified Pump Capacity = | 4.40 L/h |
| Maximum Pump Pressure =   | 3.50 bar |

|              |
|--------------|
| 73.33 mL/min |
| 50.76 psi    |

## Intermediate Pump Tank (IPT):

IPT

### Design Criteria

|                                |   |       |             |                     |
|--------------------------------|---|-------|-------------|---------------------|
| Hydraulic Retention Time (HRT) | ≥ | 6.0 h | Min. Volume | 20.5 m <sup>3</sup> |
|--------------------------------|---|-------|-------------|---------------------|

### Tank Selection (model) Quantity

|                   |         |
|-------------------|---------|
| BCP-22750L-H      | 1       |
| Internal Length = | 4.801 m |
| Internal Width =  | 2.337 m |
| Nominal Depth =   | 2.075 m |
| Depth Override =  | m       |

### Specified Volume

|                     |
|---------------------|
| 23.3 m <sup>3</sup> |
|---------------------|

### Parameters as Specified

|                                |   |       |
|--------------------------------|---|-------|
| Hydraulic Retention Time (HRT) | = | 6.8 h |
|--------------------------------|---|-------|

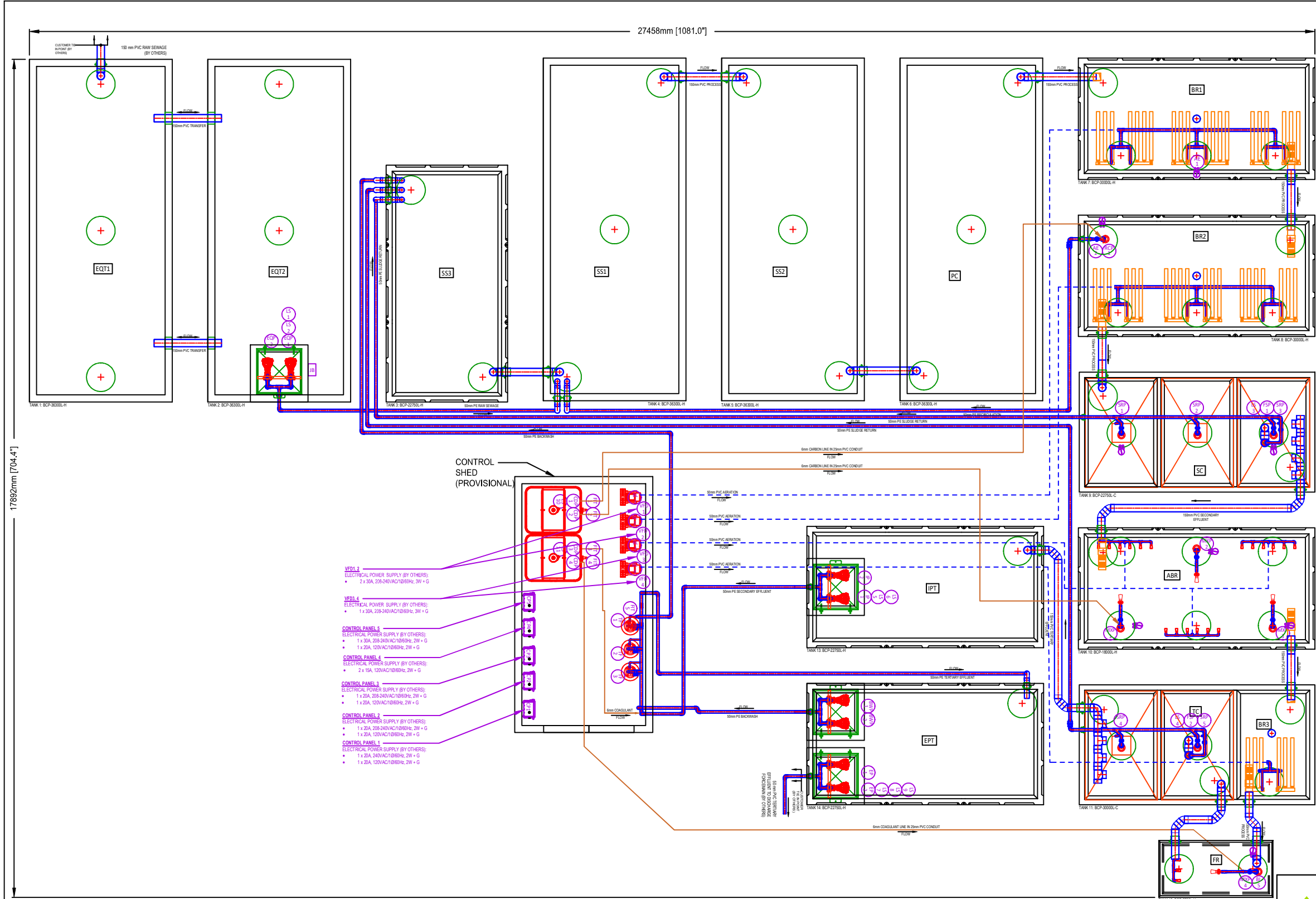
Wastewater Treatment System Calculation Summary

Project: 0306  
Children's Campground - WWTS



| Effluent Pump Tank (EPT):      |          |                                 | EPT                    |          |                     |
|--------------------------------|----------|---------------------------------|------------------------|----------|---------------------|
| Design Criteria                |          |                                 | Tank Selection (model) | Quantity | Specified Volume    |
| Hydraulic Retention Time (HRT) | ≥ 6.0 h  | Min. Volume 20.5 m <sup>3</sup> | BCP-22750L-H           | 1        | 23.3 m <sup>3</sup> |
|                                |          |                                 | Internal Length =      | 4.801 m  |                     |
|                                |          |                                 | Internal Width =       | 2.337 m  |                     |
|                                |          |                                 | Nominal Depth =        | 2.075 m  |                     |
|                                |          |                                 | Depth Override =       |          |                     |
| Parameters as Specified        |          |                                 |                        |          |                     |
| Hydraulic Retention Time (HRT) | = 6.83 h |                                 |                        |          |                     |

## **Appendix 3 – Proposed Layout Drawing**



| TANK LIST    |                          |        |                       |
|--------------|--------------------------|--------|-----------------------|
| PROCESS NAME |                          | TANK # | ~ WORKING VOLUME (m³) |
| EQP1,2       | EQUALIZATION TANK        | 1,2    | 78.3                  |
| SS3          | SECONDARY SLUDGE STORAGE | 3      | 23.3                  |
| SS1,2        | PRIMARY SLUDGE STORAGE   | 4,5    | 76.9                  |
| PC           | PRIMARY CLARIFIER        | 6      | 36.3                  |
| BR1          | BIOREACTOR 1             | 7      | 30.2                  |
| BR2          | BIOREACTOR 2             | 8      | 29.4                  |
| SC           | SECONDARY CLARIFIER      | 9      | 14.1                  |
| ABR          | ANOXIC BIOREACTOR        | 10     | 17.1                  |
| BR3          | BIOREACTOR 3             | 11     | 9.8                   |
| FR           | FLOC REACTOR             | 12     | 1.8                   |
| TC           | TERTIARY CLARIFIER       | 11     | 12.6                  |
| IP           | INTERMEDIATE PUMP TANK   | 13     | 23.3                  |
| EPT          | EFFLUENT PUMP TANK       | 14     | 23.3                  |

PROCESS FLOW  
AERATION  
CHEMICAL DOSING  
ELECTRICAL

BL BLOWER  
VFD VARIABLE FREQUENCY DRIVE  
CDP CHEMICAL DOSING PUMP  
SRP SLUDGE RETURN PUMP  
FSP FLOATING SLUDGE (SKIMMER) PUMP  
EQP EQUALIZATION PUMP  
RCP RECIRCULATION PUMP  
EP EFFLUENT PUMP  
LS LEVEL SWITCH (FLOAT)  
FIT FLOW INDICATING TRANSMITTER  
TF TERTIARY FILTER  
UV UV DISINFECTION UNIT  
CP CONTROL PANEL  
IP INTERMEDIATE PUMP  
BWP BACKWASH PUMP

- NOTES:
- A. ALL WORK, INSTALLATION AND CONNECTIONS IN RELATION TO THE TREATMENT SYSTEM SHALL BE DONE IN ACCORDANCE WITH THE WRITTEN INSTRUCTIONS PROVIDED BY BERGMANN NORTH AMERICA INC. AND IN ACCORDANCE WITH ALL APPLICABLE LOCAL CODES AND REGULATIONS.
  - B. ALL ACCESS OPENINGS MUST BE INSTALLED TO GRADE AND SECURED TO PREVENT ACCIDENTAL OR UNAUTHORIZED ACCESS.
  - C. A MAXIMUM OF 1 METRE BURIAL DEPTH IS ALLOWABLE ON TOP OF ANY TANKS IN A NON-TRAFFIC AREA. EXTRA REINFORCEMENT IS REQUIRED FOR USE IN AREAS WITH VEHICULAR TRAFFIC AND BURIAL DEPTHS OVER 1 METRE.

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CHILDREN'S CAMP WWTS

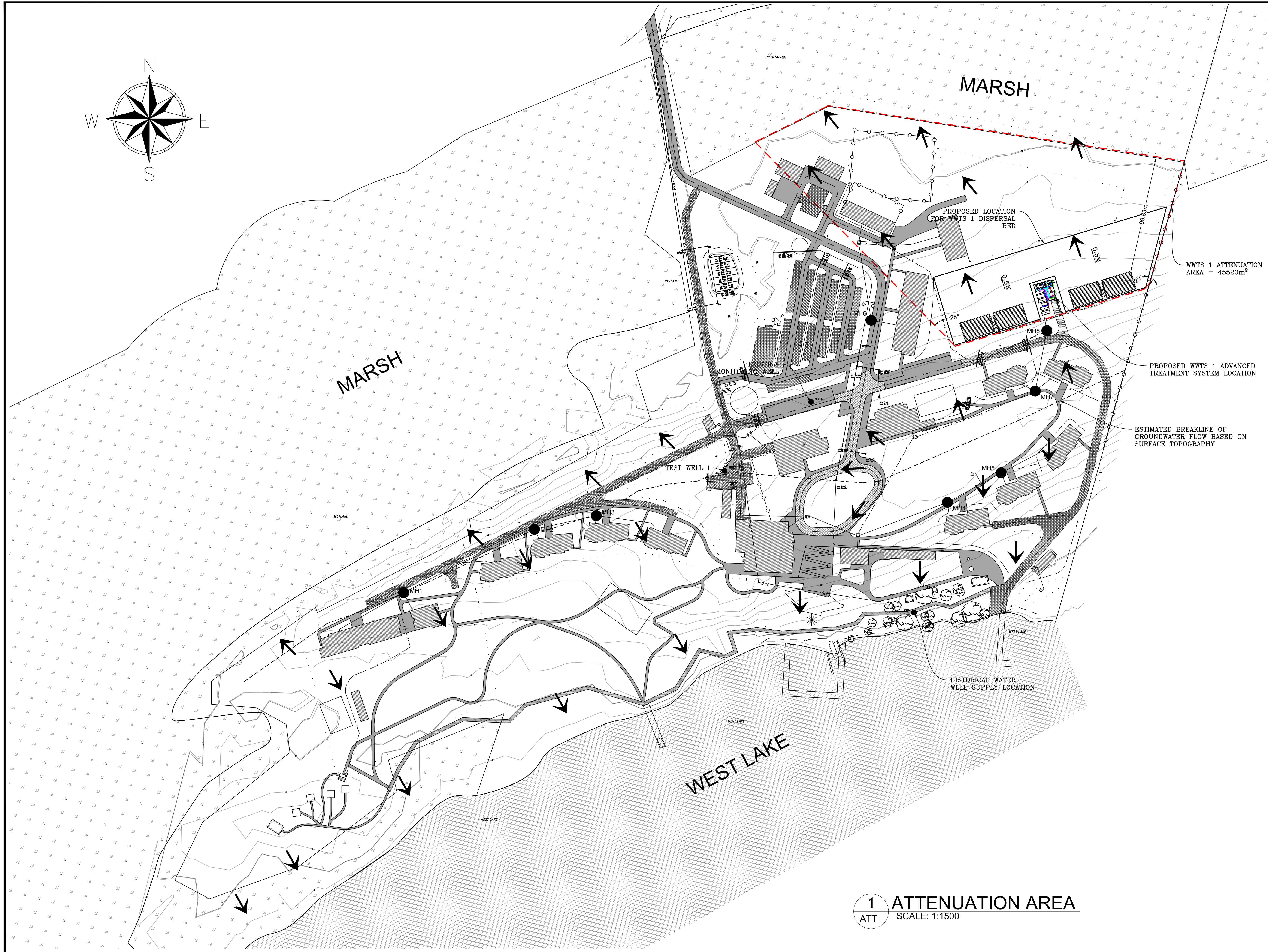
|                                               |  |                 |                    |                                    |
|-----------------------------------------------|--|-----------------|--------------------|------------------------------------|
| DRAWING: PLAN LAYOUT<br>FOR PROPOSAL<br>Rev.0 |  | DRAWN BY:<br>MM | APPROVED BY:<br>MM | SHEET<br>1 of 1                    |
| DATE: 2025/09/24                              |  | SCALE: 1:100    |                    | BERGMANN NORTH AMERICA INC. © 2025 |



## Appendix D

### Attenuation Drawing





UNIT 640 - 654 NORRIS COURT  
KINGSTON ONTARIO  
OFFICE (613) 634-1789  
[www.groundengineer.ca](http://www.groundengineer.ca)



LEGEND  
--- NEW 50mm FORCEMAIN  
↓ GROUNDWATER FLOW ARROW

NOTES:  
MARSH BOUNDARIES AS PER ECOLOGICAL SERVICES  
NATURAL HERITAGE IMPACT ASSESSMENT REPORT DATED  
APRIL 28, 2024.

| REVISIONS |                                   |            |
|-----------|-----------------------------------|------------|
| No.       | Description                       | Date       |
| 05        | ISSUED FOR SITE PLAN APPLICATION  | 2025/08/05 |
| 06        | REVISED PER DECEMBER 2025 DRAWING | 2026/01/23 |
| 07        | REVISED PER FEBRUARY 2026 DRAWING | 2026/02/10 |
| 08        | REVISED PER JULY 2026 DRAWING     | 2026/07/06 |
| 09        | REVISED PER AUG 6, 2026 DRAWINGS  | 2026/08/12 |

| BENCHMARK: |             |           |
|------------|-------------|-----------|
| No.        | DESCRIPTION | ELEVATION |
| ##.        | XXX         | XXX.XX    |
|            |             |           |
|            |             |           |



Client / Land Owner: CAMPFIRE CIRCLE

Project: 565 WESLEY ACRES ROAD  
BLOOMFIELD ONTARIO  
Drawing Title: ATTENUATION AREA

|                       |                             |
|-----------------------|-----------------------------|
| Drawn by: LM          | Project Number: GW-23003-16 |
| Checked By: MB        | Drawing Number: ATTENUATION |
| Scale: 24"x36" 1:1500 | Date: AUG 12, 2026          |
| Date: AUG 12, 2026    | SHEET 1 of 1                |

1 ATT SCALE: 1:1500