GEOTECHNICAL INVESTIGATION

MIRAMICHI SHORES - PHASE 4 SUBDIVISION
SAUGEEN SHORES, ONTARIO

CMT Project 20-626.R01

Prepared for:

Miramichi Shores Land Development Ltd.

December 14, 2020

CMT ENGINEERING INC.

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December 14, 2020 20-626.R01

Miramichi Shores Land Development Ltd.
10 Collard Way
Port Elgin, Ontario
N0H 2CO

Attention: Mr. Brad Pryde

Dear Sir:

Re: Geotechnical Investigation
Miramichi Shores - Phase 4 Subdivision
Saugeen Shores, Ontario

As requested, CMT Engineering Inc. conducted a geotechnical investigation at the above-referenced site, and we are pleased to present the enclosed report.

We trust that this information meets your present requirements, and we thank you for allowing us to undertake this project. Should you have any questions, please do not hesitate to contact our office.

Yours truly,

Shawn Wheatley, M.Eng.

ks

1cc: Cobide Engineering Inc. - Stephen J. Cobean, P.Eng.

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1.0 INTRODUCTION

The services of CMT Engineering Inc. (CMT Inc.) were retained by Mr. Stephen Cobean, P.Eng., FEC of Cobide Engineering Inc., on behalf of Mr. Brad Pryde, P.Eng. of Miramichi Shores Land Development Ltd., to conduct a geotechnical investigation for the proposed Miramichi Shores – Phase 4 Subdivision project in the Town of Saugeen Shores, Ontario. The location of the site is shown on Drawing 1.

It is understood that the project will involve the construction of a residential subdivision comprising 14 single-detached residential lots. The proposed lots will be serviced with municipal watermain and storm sewers. Sanitary servicing will be provided by private individual on-site septic systems.

The purpose of the geotechnical investigation was to assess the existing soil and groundwater conditions encountered in the boreholes/monitoring wells. Included in the assessment are the soil classification and groundwater observations, as well as comments and recommendations regarding geotechnical resistance (bearing capacity); serviceability limit states (anticipated settlement); dewatering considerations; site classification for seismic site response; recommendations for site grading, site servicing, excavations and backfilling; recommendations for slab-on-grade construction; pavement design/drainage; soil design properties; and a summary of the laboratory results.

The recommendations in this report are solely based on the soil conditions encountered in the boreholes advanced on the subject site.

2.0 EXISTING SITE CONDITIONS

The site currently has an undulating and forested topography with a small creek meandering through the property. The owner has constructed un-paved trails through the property, along with wooden bridges at various locations over the creek. The site is heavily vegetated with mature trees and low-lying vegetation. The site is bounded by residential properties to the south, and vacant wooded areas to the north, east and west.

3.0 FIELD AND LABORATORY PROCEDURES

Prior to the commencement of the field drilling program, underground service locates were organized by CMT Inc. to ensure that underground utilities would not be damaged.

The field investigation was conducted on November 16, 2020, and comprised the advancement of four (4) boreholes/monitoring wells (referenced as Boreholes 20-01 to 20-04), utilizing a Geoprobe 7822DT drillrig operated by employees of CMT Drilling Inc.

The boreholes/monitoring wells ranged in depth from approximately 3.05 m (10.0 ft) to 4.57 m (15.0 ft) below the existing ground surface elevations. Standard penetration testing (SPT) and sampling was carried out in all boreholes using 38 mm inside diameter split spoon sampling equipment and an automatic hammer, in accordance with ASTM D 1586 "Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils". SPT soil sampling was generally conducted at 0.76 m (2.5 ft) intervals to approximately 2.59 m (9.5 ft). Due to heaving wet sand conditions, sampling was not able to be undertaken below 2.59 m (9.5 ft) in the boreholes, however the monitoring wells were able to be installed at a depth of approximately 4.57 m below the existing ground surface. Technical staff from CMT Inc. observed the drilling operation and collected and logged the recovered soil samples. A small portion of each sample was placed in a sealed, marked jar for moisture content determinations.

Representative samples from the following boreholes/monitoring wells and depths were submitted to the CMT Inc. laboratory in St. Clements, Ontario for grain size analyses:

- Borehole 20-01 - approximate depth 2.29 m to 2.90 m (7.5 ft to 9.5 ft)
- Borehole 20-02 - approximate depth 2.29 m to 2.90 m (7.5 ft to 9.5 ft)
- Borehole 20-03- approximate depth 2.29 m to 2.90 m (7.5 ft to 9.5 ft)
- Borehole 20-04- approximate depth 2.29 m to 2.90 m (7.5 ft to 9.5 ft)

The borehole logs are provided in Appendix A and the resulting grain size analyses can be found in Appendix B.

CMT Inc. may be contacted for additional laboratory testing on samples should it be required. Samples are typically kept for three months, unless other arrangements are made.

Boreholes 20-01 to 20-04 were equipped with 38 mm diameter PVC monitoring wells comprising a 3.0 m long prepacked screen backfilled with #2 sand filter and then riser pipe, backfilled with bentonite. The monitoring wells were installed according with the Ontario Water Resources Act, Regulation 903 (O.Reg. 903) by well technicians licensed by the Ministry of the Environment, Conservation and Parks (MECP), working for a contractor also licensed by the MECP. The monitoring wells are registered with the MECP and must be decommissioned in accordance with O.Reg. 903 prior to future construction. CMT Drilling Inc. can provide decommissioning services when required. The well log records are provided in Appendix C.

The geotechnical investigation was completed in conjunction with a hydrogeological assessment by GAMAN Consultants Inc., to be submitted by GAMAN Consultants Inc. under separate cover.

Cobide Engineering Inc. surveyed the ground surface elevations at the borehole/monitoring well locations. The ground surface elevations at the borehole/monitoring well locations ranged from about 180.78 m to 184.91 m. The locations of the borehole/monitoring wells are shown on Drawing 2.

4.0 SUBSOIL CONDITIONS

The soils encountered in the boreholes/monitoring wells are described briefly below and a more detailed stratigraphic description is provided on the borehole logs in Appendix A. The following paragraphs have been simplified into terms of major soil strata. The soil boundaries indicated have been inferred from non-continuous samples and observations of sampling and drilling resistance and typically represent transitions from one soil type to another rather than exact planes of geological change. Further, the subsurface conditions are anticipated to vary between and beyond the monitoring well locations.

4.1. Topsoil/Buried Topsoil

Loose, dark brown, silty, organic topsoil was encountered at the surface of Boreholes 20-01 to 20-04. The surficial topsoil was considered to be in a moist state and ranged in thickness from approximately 80 mm to 220 mm (average 132 mm) at the borehole/monitoring well locations. An approximately 100 mm thick layer of saturated buried topsoil was encountered within the disturbed/reworked sand in Borehole 20-04. The thickness of the topsoil is anticipated to vary throughout the site. Materials designated as topsoil in this report were classified based solely on visual and textural evidence. Testing of organic content or for other nutrients was not carried out. Therefore, materials classified herein as topsoil cannot necessarily be relied upon for support and growth of landscaping vegetation without supplemental soil nutrient analyses.

4.2. Disturbed/Reworked Sand

Brown, dark brown, grey, and/or red disturbed/reworked sand with trace silt and clay, as well as trace to some organic material, and up to trace wood pieces, was encountered underlying the topsoil in Boreholes 20-01 and 20-04. The disturbed/reworked sand was considered to be very loose, with SPT N-values ranging from 1 to 2 blows per 0.30 m (average 2 blows per 0.30 m). The disturbed/reworked sand was considered to be moist to saturated, with moisture contents ranging from about 10.0% to 75.5% (average 37.2%).

4.3. Sand

Light brown, brown, to grey sand with trace silt and clay, and up to trace gravel, was encountered underlying the disturbed/reworked sand soils in Boreholes 20-01 and 20-04 and underlying the topsoil in Boreholes 20-02 and 20-03. The sand was considered to be loose to compact, with SPT N-values ranging from 4 to 16 blows per 0.30 m (average 10 blows per 0.30 m). The sand was considered to be moist to saturated, with moisture contents ranging from about 5.8% to 27.0% (average 22.1%). Heaving conditions in the sand were observed below the water table.

4.4. Groundwater

Monitoring wells were installed in each of the boreholes (a total of 4 monitoring wells) to measure the static groundwater levels. The water levels were measured by CMT Inc. personnel on November 16, 2020 following installation and again on November 24, 2020, and by Cobide Engineering on December 8, 2020. The recorded groundwater elevations in the monitoring wells, the approximate zone of saturation observed, as well as the ground surface and bottom of monitoring well elevations, are provided in the following table:

Borehole/ Monitoring Well No.	Ground Surface Elevation (m)	Approximate Elevation of Water in Monitoring Well Nov 16, 2020 (m)	Approximate Elevation of Water in Monitoring Well Nov 24, 2020 (m)	Approximate Elevation of Water in Monitoring Well Dec 8, 2020 (m)	Approximate Zone of Wet to Saturated Soils (m)	Bottom of Monitoring Well Elevation (m)
20-01	184.60	183.85	183.79	183.88	183.84 to 181.55 (termination)	180.03
20-02	184.91	183.62	183.57	183.65	183.87 to 181.86 (termination)	180.34
20-03	182.90	181.35	181.30	181.38	182.14 to 179.85 (termination)	178.33
20-04	180.78	180.37	180.37	180.43	180.56 to 177.73 (termination)	177.73

As shown in the table above, the measured elevation of groundwater in the monitoring wells ranged from approximately 180.43 to 183.88 m (December 8, 2020) or from approximately 0.35 m to 1.52 m below the existing ground surface elevations. The higher zone of saturation elevations can be attributed to mounding effects (capillary rise) in the sand soils.

It should be noted that some of the native soils had relatively high moisture contents and there is a potential for these soils to exhibit rapid dilatancy, heavy seepage and sloughing of excavation walls during construction, especially when excavations extend below the water table. Groundwater conditions are generally dependent on the amount of precipitation, control of surface water, as well as the time of year, and can fluctuate significantly in elevation and volume.

The monitoring wells must be decommissioned in accordance with O.Reg. 903, prior to the start of construction. CMT Drilling Inc. can provide decommissioning services when required.

Recommendations with respect to dewatering conditions are provided in Section 5.8 of this report.

5.0 DISCUSSION AND RECOMMENDATIONS

This section of the report provides CMT Inc.'s interpretation of the factual geotechnical data obtained during the investigation and is intended for the guidance of the owner and design engineer. Where comments are made on construction, they are provided only to highlight those aspects which could affect the design of the project. Contractors bidding on or undertaking the work should make their own independent interpretation of the factual subsurface information provided as it affects their proposed construction means and methods, equipment selection, scheduling, pricing, and the like.

Utilizing the information gathered during the geotechnical investigation and assuming that the borehole/monitoring well information is representative of the subsoil conditions throughout the site, the following comments and recommendations are provided:

5.1. Serviceability and Ultimate Limit Pressure

Based on the information obtained from the boreholes/monitoring wells, the following table provides the estimated geotechnical reaction at the Serviceability Limit States (SLS) and factored geotechnical resistance Ultimate Limit States (ULS) pressures at the various elevations, including soil types:

Borehole/ Monitoring Well No.	Ground Surface Elevation (m)	SLS kPa (psf)	ULS kPa (psf)	Estimated Highest Founding Elevation (m)	Depth to Highest Founding Elevation (m)	Soil Type
20-01	184.60	50 (1,000) 150 (3,000)	751,500) 225 (4,500)	183.84 to 183.08 183.08 to 181.55 (termination)	0.76 1.52	Sand (saturated) Sand (saturated)
20-02	184.91	75 (1,500) 150 (3,000)	110 (2,200) 225 (4,500)	183.87 to 182.62 182.62 to 181.86 (termination)	1.04 2.29	Sand (wet/saturated) Sand (saturated)
20-03	182.90	75 (1,500) 150 (3,000)	110 (2,200) 225 (4,500)	182.14 to 180.61 180.61 to 179.85 (termination)	0.76 2.29	Sand (wet) Sand (saturated)
20-04	180.78	150 (3,000)	225 (4,500)	178.49 to 177.73 (termination)	2.29	Sand (saturated)

Soils suitable to support conventional foundations were generally encountered underlying the topsoil and disturbed/reworked soils encountered in the boreholes/monitoring wells. Should foundations be designed to be constructed at elevations higher than the elevations provided in the table above, then structural fill will be required in order to achieve the design grades for the proposed foundations. The serviceability limit pressure of structural fill consisting of good quality granular material placed and compacted in accordance with Section 5.4.4 of this report and constructed on approved competent native soil is estimated to be at least 150 kPa (3,000 psf) at SLS and 225 kPa (4,500 psf) at ULS. Alternatively, lean mix concrete fill could be utilized, or footings could be stepped down to bear on approved undisturbed founding soils. Due to the presence of soft/loose native soils and potential wet soil conditions, it is imperative that the founding soils be assessed at the time of construction by qualified geotechnical personnel in order to confirm their founding suitability.

Due to the presence of heaving/flowing sands, and the depth of founding excavations, it may prove difficult to subexcavate the unsuitable soils to construct a structural fill pad in some areas; therefore, a deep foundation system such as helical piles may be a more efficient and cost effective option.

Footings may be placed at a higher elevation relative to another footing provided that the slope between the outside face of the footings is separated by a minimum slope of 10 horizontal to 7 vertical (10H:7V) with an imaginary line projected from the underside of the footings.

With respect to the Serviceability Limit State (SLS), the total and differential footing settlements are not expected to exceed the generally acceptable limits of 25 mm (1") and 19 mm (3/4") respectively.

All exterior footings must be provided with a minimum of 1.2 m of soil cover or equivalent thermal insulation (sufficient thermal insulation is required to protect all footings and slab-on-grades during construction until such a time that the structure is heated) in order to provide protection from frost action.

It should be noted that the native soils that exist at or below founding elevations may be in a wet/saturated state and may be too wet to provide suitable bearing for foundations without construction of a mud mat or granular drainage layer. It is imperative that the founding soils be inspected and approved by competent geotechnical personnel to ensure that the founding soils are suitable for bearing. Dewatering during construction may be required (see Section 5.8 of this report), along with the potential construction of a mud mat or granular drainage layer.

At the time of investigation, the proposed founding elevations were not available. CMT Inc. would be pleased to review design drawings when they become available and provide further recommendations with respect to bearing and foundation elevations.

5.2. Seismic Site Classification

The site classification for seismic response in Table 4.1.8.4 of the 2012 Ontario Building Code relates to the average properties of the upper 30.0 m of strata. The information obtained in the geotechnical field investigation was gathered from the upper 3.05 m of strata. Based on the information gathered in the geotechnical field investigation, the site classification for seismic site response would be considered Site Class D (stiff soils) for structures founded on the native soils or structural fill at the recommended founding elevations provided in Section 5.1 of this report. The structural engineer responsible for the design of the structure should review the earthquake loads and effects.

5.3. Soil Design Parameters

The following table provides estimated soil design parameters for imported granular fill, as well as the existing native soils encountered on-site. It should be noted that earth pressure coefficients (Ka, Kp, Ko) provided are for flat ground surface conditions and will differ for areas with slopes or embankments. The estimated soil design parameters can be utilized for the design of perimeter shoring, foundations and retaining walls, as required. A qualified engineer should be retained in order to design the helical pile system (if required), using the soil design properties for the native soils shown in the table below:

Soil Type	Soil Density (kg/m^3)	Friction Angle (Degree)	Coefficient of Active Pressure (K_a)	Coefficient of Passive Pressure (K_p)	Coefficient of At-Rest Pressure (K_o)	Coefficient of Friction (μ)	Cohesion (kPa)
Imported Granular 'A'/ Granular 'B' (OPSS 1010)	2,100	34°	0.28	3.54	0.44	0.45	0
Sand	1,800	33°	0.29	3.39	0.46	0.43	0

5.4. Site Preparation

The site preparation for the proposed new subdivison is anticipated to include topsoil stripping, vegetation grubbing, the subexcavation of all buried topsoil, and relatively loose/soft native soils deemed not capable of supporting the design bearing capacity, the removal or relocation of any existing services, followed by the placement of structural fill (as required) and site grading to achieve proposed grades.

5.4.1. Topsoil Stripping/Vegetation Removal

Due to the undulating topography, it should be expected that the thickness of topsoil may vary significantly throughout the site. All existing topsoil, vegetation and trees (including tree root structures as well as any loose soils that are typically associated with root structures) must be removed from within the proposed building and driveway/roadway envelopes to expose approved competent subgrade soils. The topsoil may be used in landscaped areas where some settlement can be tolerated; otherwise, it should be properly disposed of off-site. It would also be sound construction practice to subexcavate all existing buried topsoil from within the paved roadway and driveway areas; however, this may not be cost-effective. If the existing buried topsoil is left in place, provisions for the alterations to the design of the pavement structure should be included in the tender documents. Review of the subgrade and potential changes to the design of the pavement structure, as required, will be addressed at the time of construction.

The volume of topsoil removed during the stripping process can be influenced by the equipment utilized for the stripping process as well as the moisture conditions at the time of stripping. If an excavator with a smooth bucket is utilized for stripping, there would generally be less potential for topsoil to become intermixed with the underlying, generally loose/soft subsoil and therefore less concern of over-excavation to remove all topsoil. If the topsoil is stripped with wheeled equipment or bulldozers, then there is an increased potential for the topsoil and subsoil to become intermixed, subsequently requiring additional excavation to remove all topsoil. This is further influenced by rutting which can occur during wet conditions.

5.4.2. Unsuitable Soil Removal

All existing buried topsoil and disturbed soils containing organics, as well as any native soils that have inadequate bearing capacity or has been disturbed by construction processes and is deemed unsuitable to support foundations or slab-on-grades, must be subexcavated from within the proposed building envelopes to expose approved competent subgrade soils. It would also be sound construction practice to subexcavate all existing unsuitable material from the paved roadway and driveway areas; however, this may not be cost-effective. At a minimum, thorough inspection will be required at the time of construction to assess the condition of the existing disturbed soils to ensure there is no buried topsoil or other deleterious materials within the prepared subgrade. Review of the subgrade and potential changes to the design of the pavement structure, as required, will be addressed at the time of construction.

Prior to reusing excavated material on-site as potential bulk fill in the driveways, thorough field inspection and approval by qualified geotechnical personnel would be required to ensure that existing materials do not comprise organics, topsoil or other deleterious materials.

5.4.3. Removal/Relocation of Existing Services

Any existing/abandoned underground services (if present) that may be located within the proposed building envelopes, roadway and driveway areas should be removed/relocated. This includes any existing field tiles or existing subdrains that may be present. Any existing tile drains that may be located within the proposed building structure envelopes must be completely removed to a minimum distance of 15.0 m (50.0 ft) outside of the structure envelope. If left in place, the location of existing services must be reviewed to ensure that they do not conflict with the proposed foundation location. All drains and any terminated piping that is left in place must be completely sealed with watertight mechanical covers, concrete or grout at termination points to prevent the migration of soils into pipe voids which can result in potential settlement. All existing trench backfill material associated with any field drains or underground services must be subexcavated and the subsequent excavation should be backfilled with approved soils placed in accordance with Section 5.4.4 of this report.

The monitoring wells that have been installed during this investigation can be decommissioned by an MECP licensed well contractor with a Class 1, Class 2 or Class 3 license in accordance with Reg. 903. CMT Drilling Inc. can provide decommissioning services when required.

5.4.4. Site Grading

Following stripping of the topsoil, vegetation, trees roots (including all relatively loose soils associated with the tree roots), as well as the subexcavation of existing fill and any relatively soft native soils deemed unsuitable of supporting the design bearing capacity, the exposed subgrade soils must be proof-rolled, and any soft or unstable areas must be further subexcavated and replaced with approved fill materials. Any fill materials required to achieve the design site grades should be placed according to the following procedures:

- Should the native subgrade soils at the design founding elevation in the proposed building envelope comprise wet or saturated soils, as was observed in the boreholes/monitoring wells, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) is recommended;

- Prior to placement of any structural fill or bulk fill, the subgrade for the proposed fill area must be prepared large enough to accommodate a 1:1 slope commencing a distance of 1.0 m beyond the outside edge of the proposed foundation and pavement/concrete edge down to the approved competent founding soils;

- Soils approved for use as structural fill must be placed in loose lifts not exceeding 0.3 m (12") in depth for granular soils (recommended fill material) and 0.2 m (8") in depth for silts and clays (not recommended for this application), or the capacity of the compactor (whichever is less);

- Imported granular fill materials (OPSS 1010 Type II or Type III Granular 'B' recommended for this application) can be compacted utilizing adequate heavy vibratory smooth drum compaction equipment;

- Fine-grained silt and clay soils (not recommended) must be compacted utilizing adequate heavy padfoot vibratory compaction equipment;

- Approved fill materials must be at suitable moisture contents to achieve the specified compaction. The wet to saturated soils encountered in the boreholes/monitoring wells would generally be considered difficult for use as structural fill as they would require extensive air-drying in order to achieve the specified density. Soil moisture will also be dependent on weather conditions at the time of construction. Granular soils may require the addition of water in order to achieve the specified compaction;

- Approved structural fill materials that will support structures (including foundations, interior slab-on-grades, sidewalks and large expansive exterior slabs) must be compacted to 100% standard Proctor maximum dry density (SPMDD);

- Approved bulk fill (exterior foundation wall backfill in landscaped areas, bulk fill for roadway (including sidewalk subgrade) and driveways) must be compacted to a minimum 98% SPMDD;

- Granular 'B' subbase and Granular 'A' base materials for the roads and driveways must be compacted to 100% SPMDD;

- It is recommended that compactive effort be applied to bulk fill in landscaped areas in order to reduce the effects of long-term settlement.

Based on the subsurface conditions observed in the boreholes/monitoring wells, wet or saturated soils should be expected, depending on the depth of excavation. As such, for soils excavated from the zone of saturation, significant air-drying along with working of the soils may be required in order to achieve the specified

compaction of 100% SPMDD for structural fill and 95% SPMDD for bulk fill for the parking lot and driveways. Utilizing the existing soils during site grading may be more achievable if work is completed during the generally drier summer months. Reuse of excavated soils on-site will be subject to approval from qualified geotechnical personnel.

Due to the fine-grained and non-cohesive nature of the native sand soils, they will be easily disturbed and subject to strength loses, making travel on this material somewhat difficult with conventional rubber tired construction equipment such as dump trucks and even smooth drum vibratory compactors. Conditions should be expected to worsen, if the subgrade soils are in a wet to saturated condition. Therefore, it is recommended that construction traffic be minimized, where possible, from driving on the native subgrade soils. Depending on the time of year, it may be required to construct a haul road utilizing a Granular 'B' base and potentially installation of a reinforcing geotextile and/or geogrid (such as Terrafix 200W and/or Tensar TX5, or equivalent) under the Granular 'B' base to ensure that the subgrade does not migrate up into the granular base, which can create soft and unstable conditions.

5.5. Foundation Subgrade Preparation

The native soils encountered in the boreholes/monitoring wells are sensitive to change in moisture content and can become loose/soft if the soils are subjected to additional water or precipitation, as well as severe drying conditions. The native subgrade soils could also be easily disturbed if traveled on during construction. Once they become disturbed, they are no longer considered adequate for the support of shallow foundations. As noted above, the native soils that exist at potential founding elevations may be in a wet/saturated state and may be too wet to provide suitable bearing for foundations without drainage or construction of a granular drainage layer. It is imperative that the subgrade soils be inspected and approved by competent geotechnical personnel to ensure that the founding soils are suitable for bearing. Dewatering during construction may be required (see Section 5.8 of this report), along with the potential construction of a granular drainage layer.

To ensure and protect the integrity of the founding soils during construction operations, the following is recommended:

- During construction, the subgrade should be sloped or ditched to a sump (as required) located outside the building footprints (if feasible) in the excavation to promote surface drainage of rainwater or seepage and the collected water should be pumped out of the excavation. The hydrogeological consultant must be consulted prior to any on-site water being pumped and/or discharged to municipal outlets to ensure that proper procedures are followed. It is critical that all water be

controlled (not allowed to pond) and that the subgrade and foundation preparation commence in dry conditions;

- Should the native subgrade soils at the design founding elevation in the proposed building envelopes comprise saturated soils, as was observed in the boreholes/monitoring wells, then a granular drainage layer, constructed in accordance with Section 9.14.4 of the current Ontario Building Code (OBC) is recommended;

- Construction equipment travel and foot traffic on the founding soils should be minimized;

- If construction is to be undertaken during subzero weather conditions, the founding native soils and any potential fill materials must be maintained above freezing;

- Prior to pouring concrete for the foundations, the founding soils must be cleaned of all disturbed or caved materials;

- The foundation formwork and concrete should be installed as soon as practical following the excavation, inspection and approval of the founding soils. The longer that the excavated soils remain open to weather conditions and groundwater seepage, the greater the potential for construction problems to occur;

- If it is expected that the founding soils will be left open to exposure for an extended period of time, it is recommended that a 75 mm concrete mud slab be poured in order to protect the structural integrity of the founding soils.

5.6. Slab-on-Grade/Modulus of Subgrade Reaction

Prior to the placement of the granular base for the slab-on-grade construction, the subgrade soils should be proof-rolled. Any soft or weak zones, as well as any potential unsuitable soils in the subgrade, should be subexcavated and backfilled with approved fill materials (see Sections 5.4.4 and 5.10 of this report).

The following table provides the estimated modulus of subgrade reaction (k) for imported granular fill, as well as the native soils encountered on-site:

Soil Type	Modulus of Subgrade Reaction (k)
Imported Sand and Gravel (OPSS 1010)	81,000 kN/m^3 (300 lb/in^3)
Sand	47,500 kN/m^3 (175 lb/in^3)

Floor slabs can be founded on a minimum thickness of 100 mm (4") of coarse, clean granular material containing not more than 10% of material that will pass a 4 mm sieve in accordance with the current OBC. The use of 19 mm clear crushed stone assists in creating a moisture barrier by reducing/preventing capillary rise of moisture from the subgrade. Compactive effort is required to consolidate the clear stone. The 19 mm clear crushed stone should meet the physical property and gradation requirements of OPSS 1004.

It is recommended that areas of extensive exterior slab-on-grade be constructed with a Granular 'B' subbase (450 mm) and a Granular 'A' base (150 mm), as well as incorporating subdrains, to promote rapid drainage and reduce the effects of frost heaving. This is particularly critical at barrier-free access points and at the location of out-swinging doors. Alternatively, structural frost slabs could be designed and constructed, or sufficient thermal insulation could be provided, at all door entrances and areas of barrier-free access.

5.7. Excavations

All excavations must be carried out in accordance with Ontario Regulation 213/91 (Reg 213/91) of the Occupational Health and Safety Act and Regulations for Construction Projects.

Type 3 Soils - In general, the reworked/disturbed sand and native sand encountered in a drained state (not wet or saturated), would be classified as Type 3 soils under Reg 213/91. The Type 3 soils must be sloped from the bottom of the excavation at a minimum gradient of 1 horizontal to 1 vertical. Soils underlain by Type 4 soils that are exposed in the excavation must be treated accordingly as Type 4 soils (see below). All saturated soils encountered must be treated as Type 4 soils, as described below.

Type 4 Soils - In general, any wet to saturated soils would be classified as Type 4 soils under Reg 213/91. Type 4 soils must be sloped from the bottom of the excavation at a minimum gradient of 3 horizontal to 1 vertical.

Sloughing of the excavation walls should be expected when excavating into wet to saturated soils. As such, it may be necessary to increase the width of the excavations to accommodate sloughing soils.

If it is not practical to excavate according to the above requirements, then a trench support system (designed in accordance with the Ontario Health and Safety Act Regulations) may be utilized. When using a temporary trench support system consisting of trench boxes to reduce the lateral extent of the excavations, it should be noted that the support system is intended primarily to protect workers as opposed to controlling lateral soil movement. Any voids between the excavation walls and the support system should be immediately filled to reduce the potential for loss of ground and to provide support to

existing adjacent utilities and roadways, and it is recommended that the excavation be carried out in short sections, with the support system installed immediately upon excavation completion.

5.8. Construction Dewatering Considerations

As requested, four (4) monitoring wells were installed as a part of this investigation. The groundwater measurements in the monitoring wells ranged in elevation from approximately 180.43 m in to 183.88 m, on December 8, 2020. Additionally, wet to saturated soils were observed in the boreholes/monitoring wells conducted as part of this investigation. As such, it is critical that provisions for site dewatering be part of the site development and construction process.

Seepage control requirements and groundwater conditions during construction are generally dependent on the amount of precipitation, control of surface water, the time of year, the area of work on the site, the depth of the excavations, and can fluctuate significantly in elevation and volume. As required, seepage should generally be adequately controlled using conventional construction dewatering techniques such as pumping from sump pits. Seepage through the sand soils is expected to be constant; therefore, it may be necessary to increase the number of pumps during construction to effectively drain larger construction areas. Significant sloughing of the excavation walls should be expected when excavating into saturated soils, as such it may be required to excavate larger areas to account for sloughing soils. It should also be expected that pumps and hoses may plug up with fine-grained soils, resulting in the requirement for continuous maintenance.

Dewatering should be performed in accordance with OPSS 517 and the control of water must be in accordance with OPSS 518. It is the responsibility of the contractor to propose a suitable dewatering system based on the groundwater elevation at the time of construction. Collected water should discharge a sufficient distance away from the excavation to prevent re-entry. Sediment control measures must be installed at the discharge point of the dewatering system to avoid any potential adverse impacts on the environment.

5.9. Service Pipe Bedding

It is expected that the native soils encountered in the geotechnical investigation may be in a wet to saturated state, and therefore it may be necessary to increase the thickness of the granular base and/or utilize 19 mm clear stone to create an adequate supporting base for the service pipes, manholes and catch basin structures. As such, it is recommended that provisions for extra pipe bedding and clear stone be part of the project tendering and construction process.

Pipe embedment, cover and backfill for both flexible and rigid pipes should be in accordance with all current and applicable OPSS, OPSD, and OBC standards and guidelines, and as follows:

Flexible Pipes – The pipe bedding should be shaped to receive the bottom of the pipe. If necessary, pipe culvert frost treatment should be undertaken in accordance with OPSD-803.030 and OPSD-803.031. The trench excavations should be symmetrical with respect to the centreline of the pipe. The granular material placed under the haunches of the pipe must be compacted to 95% SPMDD prior to the continued placement and compaction of the embedment material. The homogeneous granular material used for embedment should be placed and compacted uniformly around the pipe. Should wet conditions be encountered at the base of the trench, the pipe bedding should consist of 19 mm clear crushed stone (meeting OPSS 1004 specifications). Normally, it would be recommended to wrap the clear crushed stone with geotextile to prevent fine soils from entering the clear stone and thereby creating voids around the pipe. However, in the saturated conditions expected, it is not typically feasible to wrap the clear stone, nor is it necessary, as the void space is quickly filled with fine soils as water (with suspended fine soils) rapidly enters the excavation.

Rigid Pipes - In general, the pipe installation recommendations for rigid pipes are the same as those for flexible pipes, except that the minimum bedding depth below a rigid pipe should be $0.15D$ (where D is the pipe diameter). In no case should this dimension be less than 150 mm or greater than 300 mm.

The general contractor is responsible to protect service piping from damage by heavy equipment.

5.10. Perimeter Building Drainage, Foundation Wall Backfill and Trench Backfill

In order to assist in maintaining a dry building with respect to surface water seepage, it is recommended that exterior grades around the buildings be sloped down and away at a 2% gradient or more, for a distance of at least 1.5 m to 2.0 m (depending on property setbacks). Any surface discharge rainwater leaders must be constructed with solid piping that discharges with positive drainage at least 1.5 m away from building foundations and/or beyond sidewalks to a drainage swale or appropriate storm drainage system.

The founding elevations for the proposed structures were not available at the time of preparation of this report. CMT Inc. can provide further recommendations for building drainage once the design drawings are completed and the founding elevations have been confirmed.

Depending on the design founding elevations and groundwater conditions at the time of construction, it may be necessary to install a granular drainage layer to provide a suitable base for the foundations. The granular drainage layer must conform to the requirements listed in Section 9.14.4 of the OBC 2012.

Foundations constructed within or below a zone of saturation as noted in the boreholes would be subject to flooding in the event of a power failure or equipment malfunction. Therefore, it would be recommended that foundations be constructed above the saturated zones noted in this report. If this is not feasible, it is recommended that a good quality sump pump be utilized in each residential unit and that, at a minimum, each system should be equipped with a battery backup (in the event of a power outage, keeping in mind that battery backup time is limited) preferably with a separate functioning sump pump. Groundwater elevations (perched and regional water tables) are dependent on weather and seasonal conditions and should be expected to fluctuate. The groundwater conditions should be expected to exist even following backfilling.

The construction of foundations and slab-on-grades within or below zones of saturation will require design of site-specific waterproofing and dewatering systems constructed in accordance with the 2012 OBC. If required, it would be recommended that a waterproofing supplier/specialist be consulted to recommend an appropriate product and installation requirements that would be suited to this site.

At this time, it is uncertain if the new residences will have basement structures. Given the relatively shallow saturated soil conditions observed in the boreholes, it is recommended that whether or not the new residences have basements, that an exterior perimeter drainage system comprising perforated drainage pipe with a factory installed filter sock, bedded in 19 mm clear crushed stone and wrapped in geotextile filter fabric such as Terrafix 270R (or equivalent), be installed at an elevation that is below any proposed basement slab-on-grade elevation or at the founding elevation (for residences with no basements) and be provided with positive drainage into a sump pit. The portion of the piping that connects the exterior drainage system into the sump pit must comprise solid piping to prevent exterior water from being introduced into the interior subslab stone. It may be prudent to install perforated drainage pipe in the interior basement as well to provide an outlet for any water that may collect in the subslab stone. Alternatively, an exterior sump pit could be installed so that exterior water is not introduced into the structure, only to be pumped back out of the structure. It is also recommended that a capped cleanout port(s) be extended up to the ground surface elevation to provide future access (if required). The rainwater leaders must not be connected to the perimeter drainage system.

In order to reduce the effects of surficial frost heave in areas that will be hard surfaced, it is recommended that the exterior foundation backfill consist of free-draining granular material such as approved on-site sand or imported Granular 'B' Type I or Type III (OPSS 1010), with a maximum aggregate size not exceeding 100 mm, and that it extend a minimum lateral distance of 600 mm out from the foundation. It is critical that particles greater than 100 mm in diameter are not in contact with the foundation wall to prevent point loading and overstressing. The backfill material used against the foundation walls must be placed so that the allowable lateral capacities of the foundation walls are not exceeded. Where only one side of a foundation wall will be backfilled, and the height of the wall is such that lateral support is required, or where the concrete strength has not

been achieved, the wall must be braced or laterally supported prior to backfilling. In situations where both sides of the wall are backfilled, the backfill should be placed in equal lifts, not exceeding 200 mm differential on each side during backfill operations and the backfill should be compacted to a minimum of 100% SPMDD.

The native soils (non-organic) are generally considered suitable for reuse as trench backfill and bulk fill in the roadways and driveways; however, the wet to saturated soils may require significant air-drying in order to achieve the specified compaction. Air-drying cannot typically be achieved during winter construction; therefore, depending on the time of year that construction takes place, it may be more feasible to utilize an imported granular fill for this project.

Backfilling operations should be carried out with the following minimum requirements:

- Adequate heavy smooth drum or padfoot vibratory compaction equipment (suited to soil type) should be used for the compaction and to break down any large blocky pieces of soil;
- Loose lift thicknesses should not exceed 0.3 m (12") for granular soils or 0.2 m (8") for silt soils or the capacity of the compactor (whichever is less);
- The soils must be at suitable moisture contents to achieve compaction to a minimum 95% SPMDD in non-structural bulk fill areas. Service trenches excavated the zone of influence of footings for structures must be compacted to a minimum of 100% SPMDD;
- It is recommended that inspection and testing be carried out during construction to confirm backfill quality, thickness and to ensure that compaction requirements are achieved;
- Service trench backfill materials may consist of approved excavated soils with no particles greater than 100 mm and no topsoil or other deleterious materials;

If construction operations are undertaken in the winter, strict consideration should be given to the condition of the backfill material to make certain that frozen material is not used.

5.11. Pavement Design/Drainage

All existing topsoil (including buried topsoil), vegetation (including tree root structures as well as any loose soils that are typically associated with root structures), and loose/soft native soils must be stripped and subexcavated from within the proposed roadways and driveways; however, this may not be cost-effective. At a minimum, any existing buried topsoil, and disturbed/reworked soils with intermixed organic material should be subexcavated from the roadways and driveways to prevent problems associated with frost

heaving such as loss of structural integrity and frost boils. Thorough inspection and proof-rolling will be required at the time of construction to assess the existing soils to ensure there is no buried topsoil, or other deleterious materials within the subgrade. Remedial action will also be required to further consolidate the existing disturbed/reworked soils and/or loose/soft native soils if it is decided to leave them in place. It would be expected that significant air-drying may be required in order to achieve the design compaction. If the existing disturbed/reworked soils are left in place in the roadways and driveways, provisions for the alterations to the design of the pavement structure such as increasing the thickness of the Granular 'B' base, installing a reinforcing geotextile and/or installing biaxial geogrids, should be included in the tender documents. Review of the subgrade and potential changes to the design of the pavement structure, as required, will have to be addressed at the time of construction.

Prior to placement of the granular base, the subgrade must be proof-rolled, and any soft or unstable areas should be subexcavated and replaced with suitable drier materials. The subgrade should be graded smooth (free of depressions) and properly crowned to ensure positive drainage, with a minimum grade of 3% toward the drainage outlet or curb line (provided that collection and proper gravity drainage to a suitable outlet is provided). When service pipes are installed, pipe bedding and backfilling should be undertaken as indicated in Sections 5.9 and 5.10 of this report.

Rapid drainage of the pavement structure is critical to ensure long-term performance and to help minimize frost heave. It is recommended to install minimum 100 mm diameter perforated subdrains to collect and redirect water beneath the pavement surface (provided gravity drainage to a suitable outlet can be provided). Subdrains should be designed and installed in accordance with OPSS 405 and OPSD 216.021. If Granular 'A' bedding (OPSS 1010) is utilized, the subdrains should be equipped with a factory installed filter sock. If 19 mm clear stone (OPSS 1004) is utilized as bedding for the subdrain, then the bedding must be wrapped completely with geotextile filter fabric such as Terrafix 270R (or equivalent) and a factory installed filter sock is not required. Installation of rigid subdrains allows for better grade control and less potential for damage during installation. Positive drainage through grade control of subdrains is critical, as improperly installed subdrains can turn drainage systems into reservoirs, which can fuel frost action. The subdrains will hasten the removal of water, thereby reducing the risk and effects of frost heaving and load transfer in saturated conditions. It is suggested that subdrains be installed at regular intervals (to be designed based on layout of catch basins and storm sewers) through paved areas. It is also recommended to install subdrains through any areas that cannot tolerate differential frost heave such as accessibility ramps/sidewalks. The subdrains should be installed within a 0.3 m (1.0 ft) by 0.3 m (1.0 ft) trench in the subgrade and bedded approximately 50 mm (2") above the bottom of the trench. The subgrade must be prepared with positive drainage to the subdrains and the subdrains must be installed with positive drainage into a catch basin structure or other suitable outlet.

The native subgrade soils are sensitive to change in moisture content and can become loose or soft if the soils are subject to inclement weather and seepage or severe drying. Furthermore, the subgrade soils could be easily disturbed if traveled on during

construction. As such, where this material will be exposed, it is recommended that the granular subbase be placed immediately upon completion of the subgrade preparation to protect the integrity of the subgrade soils.

It is expected that the roadways and driveways will experience mostly light traffic (personal vehicles) and some heavy traffic (delivery trucks, as well as maintenance and emergency vehicles). Based on the anticipated vehicle loading and frost-susceptibility of the subgrade soils, the following pavement design is provided:

Material	**Recommended Thickness For New Pavement**
Asphaltic Concrete	HL3 - 40 mm (1.5") HL4 or HL8 - 50 mm (2.0")
Granular 'A' Base	150 mm (6.0")
Granular 'B' Subbase	450 mm (18.0")

Given the potential for wet subgrade conditions, it is recommended that the pavement subgrade soils be assessed at the time of excavation by qualified personnel. Depending on conditions encountered at the time of construction, remediation options may need to be undertaken to construct a stable pavement base. These options may include subexcavation and increasing the thickness of the Granular 'B' subbase, the use of geotextile and/or geogrid, or a combination of all. As such, it is recommended that provisions for subexcavation and disposal of wet soils, importing and placing additional Granular 'B' (OPSS 1010), as well as supply and placement of a geotextile (Terrafix 270R or equivalent) and geogrid (Tensar TX5 or equivalent) should be included in the tender documents.

The granular base and subbase materials must conform to the physical property and gradation requirements of OPSS 1010 and must be compacted to 100% SPMDD. Asphaltic concrete should be supplied, placed and compacted to a minimum 92.0% Marshall maximum relative density, in accordance with OPSS 1150 and OPSS 310.

Construction joints in the surface asphalt must be offset a minimum of 150 mm to 300 mm (6" to 12") from construction joints in the binder asphalt so that longitudinal joints do not coincide.

Where new asphalt is joined into existing asphalt, it is recommended that the existing asphalt be sawcut in a straight line prior to being milled to a depth of 40 mm and a width of 150 mm as per OPSD 509.010. It is recommended that a tackcoat in conformance with OPSS 308 be applied to the edge and surface of all milled asphalt prior to placement of new asphalt.

The pavement should be designed to ensure that water will not pond on the pavement surface. If the surface asphalt is not placed within a reasonable time following placement of the binder asphalt, it is recommended that the catch basin lids are set at a lower elevation or apertures provided to allow surface water to drain into the catch basins and not accumulate around the catch basins. The strength of the pavement structure relies on all of the components to be in place in order to provide the design strength; therefore, it is strongly recommended that the surface asphalt be placed shortly after placement of the binder asphalt so as to avoid undue stress on the binder asphalt by not having the complete pavement structure in place.

It should be noted that currently, asphalt mixes tend to be more flexible, and as such, there is a tendency for damage to occur from vehicles turning their steering wheels or applying excessive brake pressure. The damage can occur from both passenger vehicles as well as delivery trucks and the condition is further intensified during hot weather.

5.12. Excess Soil Management

5.12.1. Chemical Testing was NOT Undertaken

Generally, if surplus soils are to be exported off-site, it will be necessary to perform chemical analysis of the soils. Chemical analysis was not undertaken as part of this geotechnical investigation. Should chemical analysis tests be required, the required tests vary and will be dependent on the disposal site utilized by the general contractor.

Most commonly, the soils are tested for the following:

- F1-F4, VOC's, BTEX as per O. Reg. 153/04 as amended by R511
- SVOC as per O. Reg. 153/04 as amended by R511
- Metals/Inorganics as per O. Reg. 153/04 amended by R511

The chemical analysis results are then compared to Ontario Regulation 153/04 - as amended by O.Reg. 511 – April 15, 2011 Standards = [Suite] – ON-511-T1/T2-SOIL-RPI. Specifically, the results are typically compared to *T1-Soil-Res/Park/Inst/Ind/Com/Commu Property Use*, *T2-Soil-Res/Park/Inst. Property Use (Coarse)* and *T3-Soil-Res/Park/Inst. Property Use (Fine)*.

5.12.2. TCLP Requirement

If soils are transported to a landfill facility, additional chemical testing in accordance with Ontario Regulation 347, Schedule 4, as amended to Ontario Regulation 558/00, dated March 2001, Toxicity Characteristic Leaching Procedure (TCLP) will be required.

When transporting soils off-site, the following is recommended:

- All chemical analyses and environmental assessment reports must be fully disclosed to the receiving site owners/authorities, who must agree to receive the material.
- An environmental consultant must confirm the land use at the receiving site is compatible to receive the material.
- An environmental consultant must monitor the transportation and placement of the materials to ensure that the material is placed appropriately at the pre-approved site.
- The excess materials may not be transported to a site that has previously had a Record of Site Condition (RSC) filed, unless the material meets the criteria outlined in the RSC.

It should be noted that landfill sites will generally only accept laboratory test results that have been completed within 30 days of exporting. Therefore, it is recommended that provisions for chemical analysis be included in the tender documents. It should also be noted that the laboratory testing generally takes five (5) working days to process with a regular turnaround time.

5.13. Radon

According to information provided by Health Canada, radon is a radioactive gas that is naturally formed through the breakdown of uranium in soil, rock and water. When radon escapes the earth in the outdoors, it mixes with fresh air, resulting in concentrations that are too low to be of concern. However, when radon enters an enclosed space, such as a building, high concentration of radon can accumulate and become a health concern. Health Canada indicates that most buildings and homes have some level of radon in them. Unfortunately, it is not possible to predict before construction whether or not a new building will have high radon levels as radon can only be detected by radon measurement devices, which would be installed in a building, post construction. Section 9.13.4.1 Soil Gas Control of the current 2012 Ontario Building Code (OBC) states that *"Where methane or radon gases are known to be a problem, construction shall comply with the requirements for soil gas control in MMAH Supplementary Standard SB-9, Requirements for Soil Gas Control".*

6.0 SITE INSPECTIONS

Qualified geotechnical personnel should supervise excavation inspections as well as compaction testing for structural filling, site grading and site servicing. This will ensure that footings are founded in the proper strata and that proper material and techniques are used and the specified compaction is achieved. CMT Engineering Inc. would be pleased to review the design drawings and provide an inspection and testing program for the construction of the proposed development.

7.0 LIMITATIONS OF THE INVESTIGATION

This report is intended for the Client named herein and for their Client. The report should be read in its entirety, and no portion of this report may be used as a separate entity. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties.

The recommendations made in this report are in accordance with our present understanding of the project. We request that we be permitted to review our recommendations when the drawings and specifications are complete, or if the proposed construction should differ from that mentioned in this report.

It is important to emphasize that a soil investigation is, in fact, a random sampling of a site and the comments are based on the results obtained at the test locations only. It is therefore assumed that these results are representative of the subsoil conditions across the site. Should any conditions at the site be encountered which differ from those found at the test locations, we request that we be notified immediately in order to permit a reassessment of our recommendations.

It should be noted that this report specifically addresses geotechnical aspects of the project and does not include any investigations or assessments relating to potential subsurface contamination. As such, there should be no assumptions or conclusions derived from this report with respect to potential soil or water contamination. Soil or water contamination is generally caused by the presence of xenobiotic (human-made) chemicals or other alteration processes in the natural soil and groundwater environment. If necessary, the investigation, assessment and rehabilitation of soil and water contaminants should be undertaken by qualified environmental specialists.

The samples obtained during the geotechnical investigation will be stored for a period of three months, after which time they will be disposed of unless alternative arrangements are made.

We trust that this report meets with your present requirements. Should you have any questions, please do not hesitate to contact our office.

Prepared by:

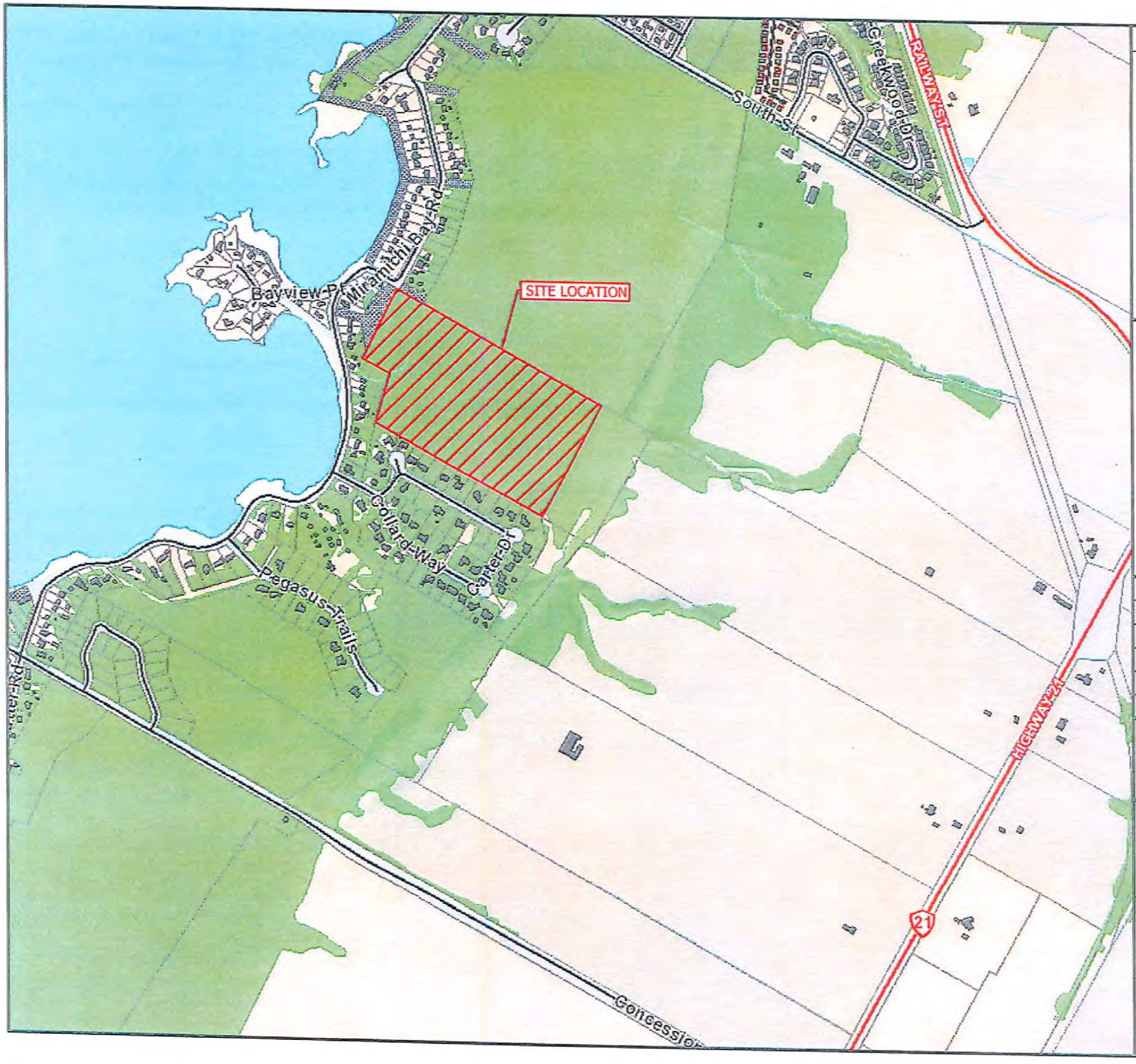
Shawn Wheatley, M.Eng.

ks

LICENSED PROFESSIONAL ENGINEER
2020/12/14
N. J. CHORTOS
100210851
PROVINCE OF ONTARIO

Reviewed by:

Nathan Chortos, P.Eng.



NOTES:

Base map provided by Wellington County

N

NO.	DESCRIPTION	DATE

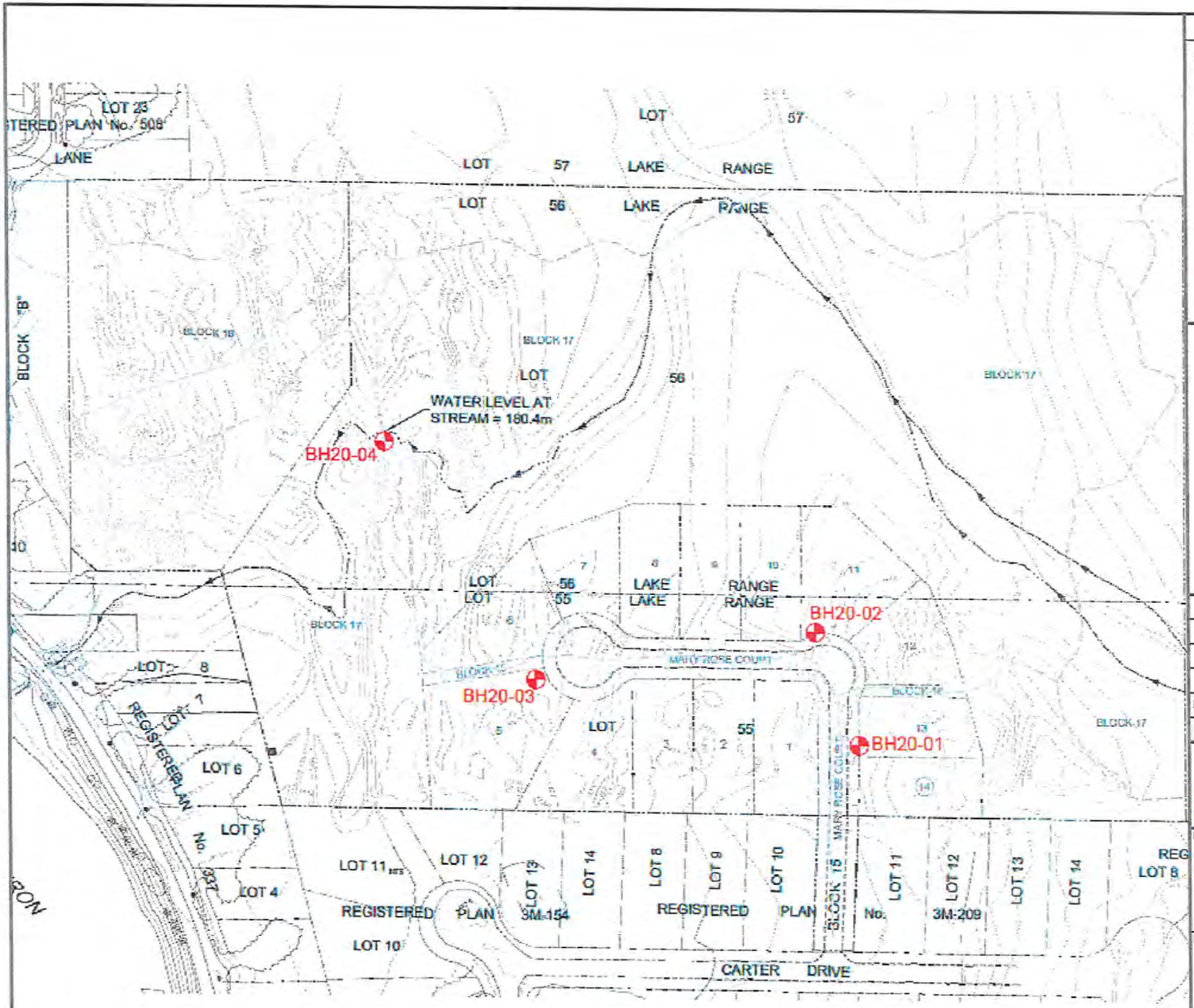
REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
Fax: 519-699-4664
www.cmtinc.net

PROJECT:
Geotechnical Investigation
Miramichi Shores Pase 4
Proposed Subdivision
Town of Saugeen Shores

DRAWING TITLE:
SITE LOCATION MAP

PROJECT NO.:	DATE:
20-626	December 14, 2020
SCALE: N.T.S.	DRAWING NO. 1



NOTES:

1. This drawing is for information purposes only. Locations and sizes of existing and proposed structures are approximate only, and should not be used for construction.
2. Base drawing provided by Cobide Engineering Inc

LEGEND

CMT Borehole/Monitoring Well (2020)

NO.	DESCRIPTION	DATE

REVISIONS

CMT ENGINEERING INC.
1011 Industrial Crescent, Unit 1
St. Clements, Ontario N0B 2M0
Tel.: 519-699-5775
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PROJECT:
Geotechnical Investigation
Miramichi Shores Pase 4
Proposed Subdivision
Town of Saugeen Shores

DRAWING TITLE:
SITE PLAN SHOWING MONITORING WELL LOCATIONS

PROJECT NO.:	DATE:
20-626	December 14, 2020
SCALE: N.T.S.	DRAWING NO. 2

APPENDIX A

BOREHOLE LOGS

BOREHOLE NUMBER BH20-01

CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT LOCATION: Saugeen Shores, Ontario
PROJECT NUMBER: 20-626
DRILLING DATE: 20-11-16
GROUND ELEVATION: 184.60 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	SPT N VALUE (10 20 30 40) / POCKET PEN. (kPa) (90 180 270 360) / MOISTURE CONTENT (%) (12 24 36 48)	WELL DIAGRAM
		TOPSOIL Very loose, black, sandy topsoil, moist (130 mm)	0.00, 184.60					
		DISTURBED SAND Very loose, dark brown reworked/disturbed sand, trace silt and clay, some organics, moist	0.13, 184.47	SPT 1	20	0-1-1-1 (2)	2; 19.9	Bentonite Seal; Water Level: 183.877 m on Dec 8/2020
1		**SAND** Loose, brown sand, trace silt and clay, saturated	0.76, 183.84	SPT 2	44	1-2-2-2 (4)	4; 27	38 mm Riser
		Becoming grey, compact	1.52, 183.08	SPT 3	100	4-6-5-5 (11)	11; 24.8	
2				SPT 4	100	4-7-9 (16)	16; 22.8	
3		Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 181.55					#3 Sand Pack; 38 mm Screen
4								

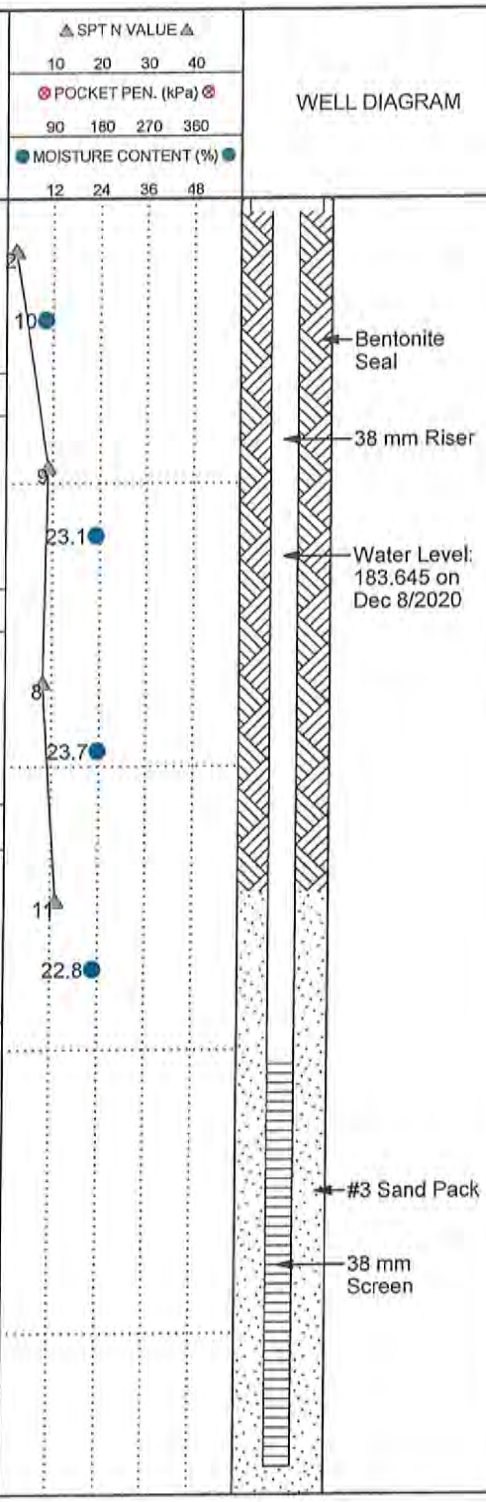
Bottom of borehole at 4.57 m, Elevation 180.03 m.

BOREHOLE NUMBER BH20-02

CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT LOCATION: Saugeen Shores, Ontario
PROJECT NUMBER: 20-626
DRILLING DATE: 20-11-16
GROUND ELEVATION: 184.91 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
		TOPSOIL Very loose, black, sandy topsoil, moist (80 mm)	0.00, 184.91			
		DISTURBED SAND FILL Very loose, grey reworked/disturbed sand, trace silt and clay, trace organics and roots, moist (200 mm)	0.08, 184.83	SPT 1	66	0-1-1-1 (2)
		Becoming red	0.28, 184.63			
1		**SAND** Loose, grey sand, trace silt and clay, wet	1.04, 183.87	SPT 2	70	3-4-5-4 (9)
		Becoming saturated	1.52, 183.39	SPT 3	61	4-4-4-4 (8)
2		Becoming compact	2.29, 182.62	SPT 4	100	5-5-6 (11)
3		Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 181.86			
4						



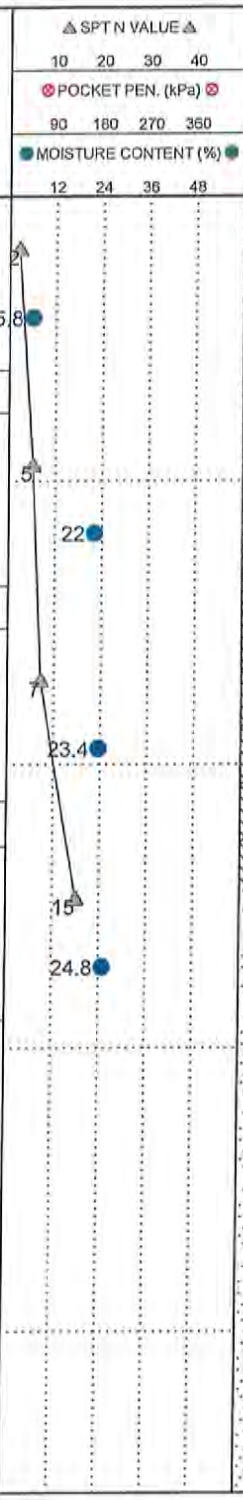
Bottom of borehole at 4.57 m, Elevation 180.34 m.

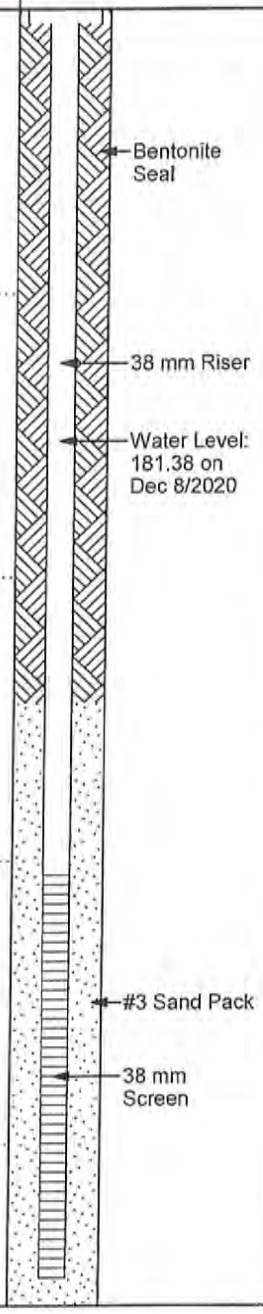
BOREHOLE NUMBER BH20-03

CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 182.90 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
		TOPSOIL Very loose, black, sandy topsoil, moist (100 mm)	0.00, 182.90			
		DISTURBED SAND FILL Very loose, brown reworked/disturbed sand, trace silt and clay, some organics, moist (100 mm)	0.10, 182.80			
		SAND Very loose, light brown sand, trace silt and clay, moist	0.20, 182.70	SPT 1	61	0-1-1-1 (2)
		Becoming loose, grey, wet	0.76, 182.14	SPT 2	20	3-2-3-3 (5)
				SPT 3	61	2-2-5-5 (7)
		Becoming compact, saturated	2.29, 180.61	SPT 4	100	2-6-9-9 (15)
		Compact, saturated sand, trace clay and silt (Based on visual inspection. Not confirmed by SPT sampling)	3.05, 179.85			





WELL DIAGRAM

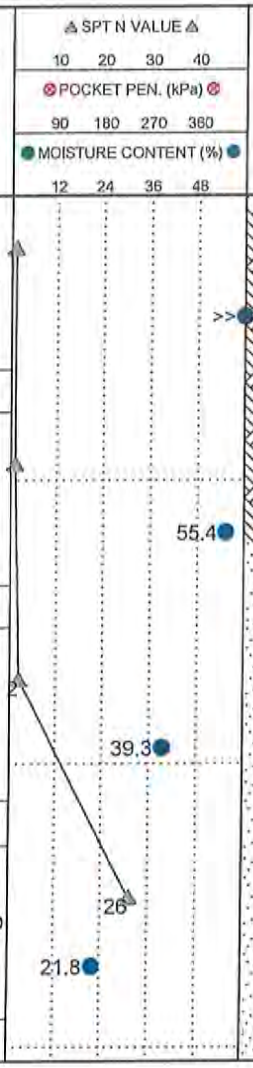
Bottom of borehole at 4.57 m, Elevation 178.33 m.

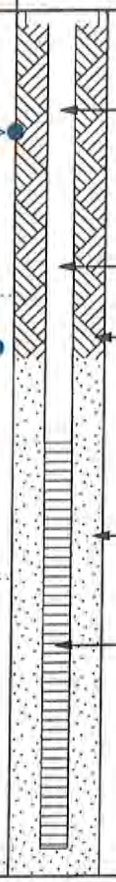
BOREHOLE NUMBER BH20-04

CMT Engineering Inc.
1011 Industrial Crescent,
St. Clements, ON, N0B 2M0
Telephone: 519-699-5775

PROJECT: Miramichi Shores - Phase 4 Subdivision
PROJECT ADDRESS:
PROJECT NUMBER: 20-626
PROJECT LOCATION: Saugeen Shores, Ontario
DRILLING DATE: 20-11-16
GROUND ELEVATION: 180.78 m
DRILLING CONTRACTOR: CMT Drilling Inc.
LOGGED BY: SW
DRILLING EQUIPMENT: Geoprobe 7822DT
SAMPLING METHOD: SPT

DEPTH (m)	GRAPHIC LOG	MATERIAL DESCRIPTION	Depth, Elevation (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)
		TOPSOIL Very loose, black, sandy topsoil, wet (220 mm)	0.00, 180.78			
		DISTURBED SAND Very loose, grey reworked/disturbed sand, trace gravel, silt and clay, some organics, trace wood, saturated	0.22, 180.56	SPT 1	0	0-0-1-1 (1)
1		**BURIED TOPSOIL** Very loose, black, silty organic burried topsoil layer, saturated (100mm)	0.86, 179.92			
		SAND FILL Very loose, grey sand fill, trace gravel, silt and clay, trace organics, trace wood, saturated	0.96, 179.82	SPT 2	100	0-1-0-1 (1)
2				SPT 3	80	0-0-2-2 (2)
		SAND Compact to dense, grey sand, trace silt, clay and gravel, saturated	2.29, 178.49	SPT 4	100	4-9-17-20 (26)
3						





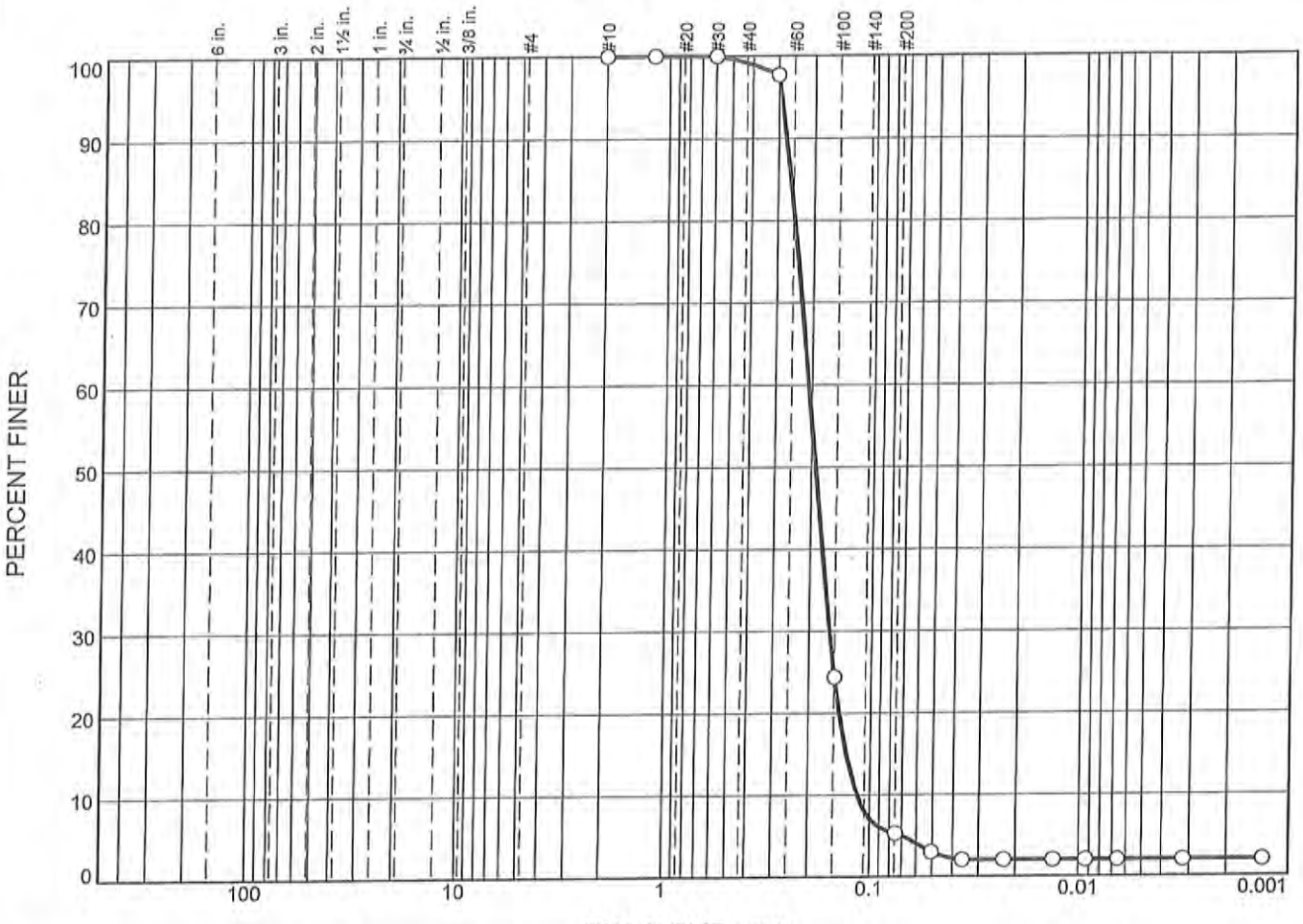
Bottom of borehole at 3.05 m, Elevation 177.73 m.

BOREHOLE LOG WITH WELL2 20-626 - BH LOGS.GPJ CMT_TEMPLATE_2020-05-15.GDT 21-01-06

APPENDIX B

GRAIN SIZE ANALYSES

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	0.9	93.8	3.3	2.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH20-01	4	2.29-2.90m	sand, trace silt and clay	SP-SM
				Sampled by SW of CMT Engineering Inc., November 16, 2020	
				Tested by JM of CMT Engineering Inc., November 18, 2020	

CMT Engineering Inc.

St. Clements, ON

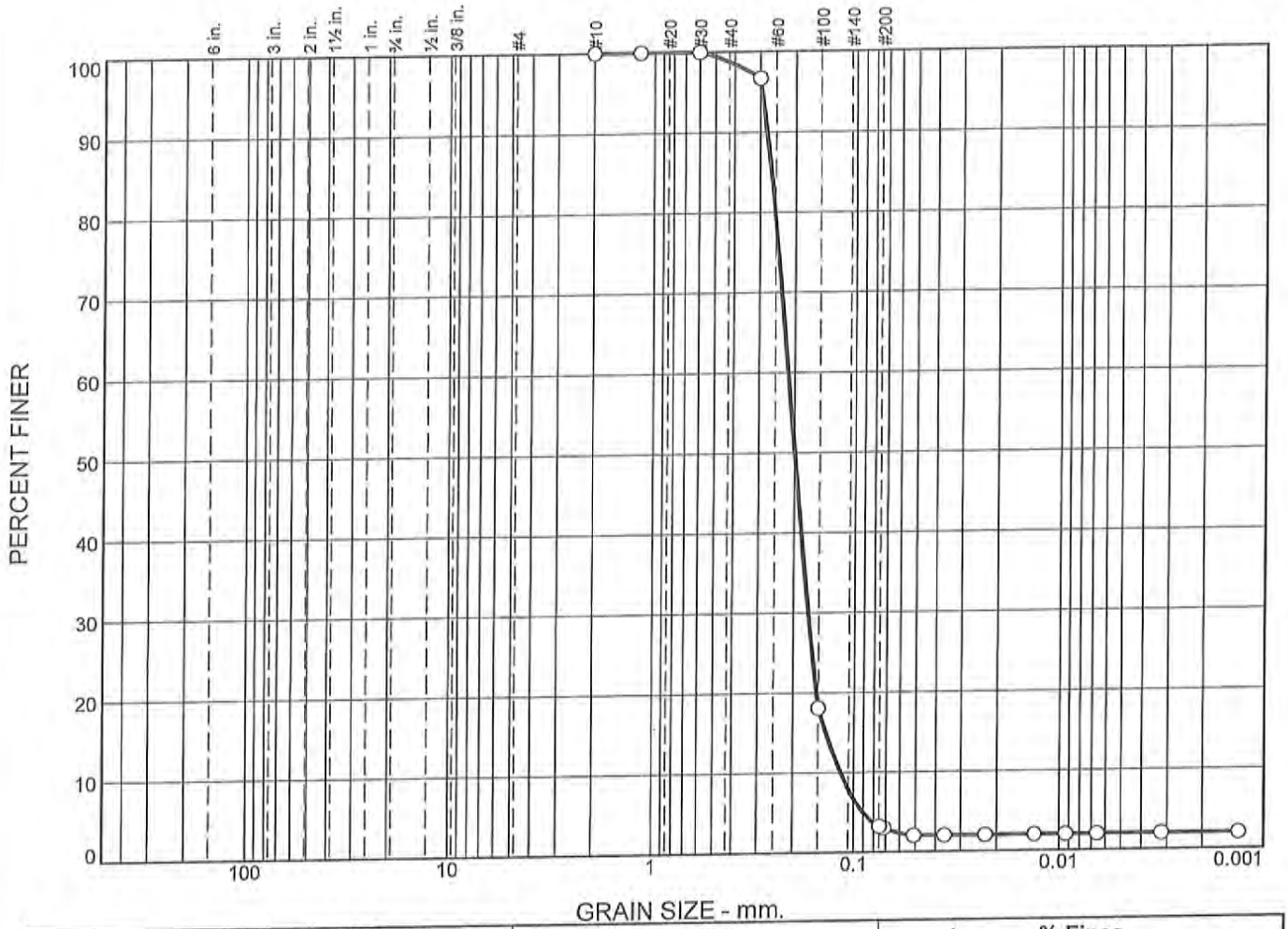
Client: Miramichi Shores Land Development Ltd.

Project: Miramichi Shores - Phase 4 Subdivision
Saugeen Shores, Ontario

Project No.: 20-626

Figure 1

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	1.2	95.6	1.2	2.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH20-02	4	2.29-2.90m	sand, trace clay and silt	SP
				Sampled by SW of CMT Engineering Inc., November 16, 2020	
				Tested by JM of CMT Engineering Inc., November 18, 2020	

CMT Engineering Inc.

St. Clements, ON

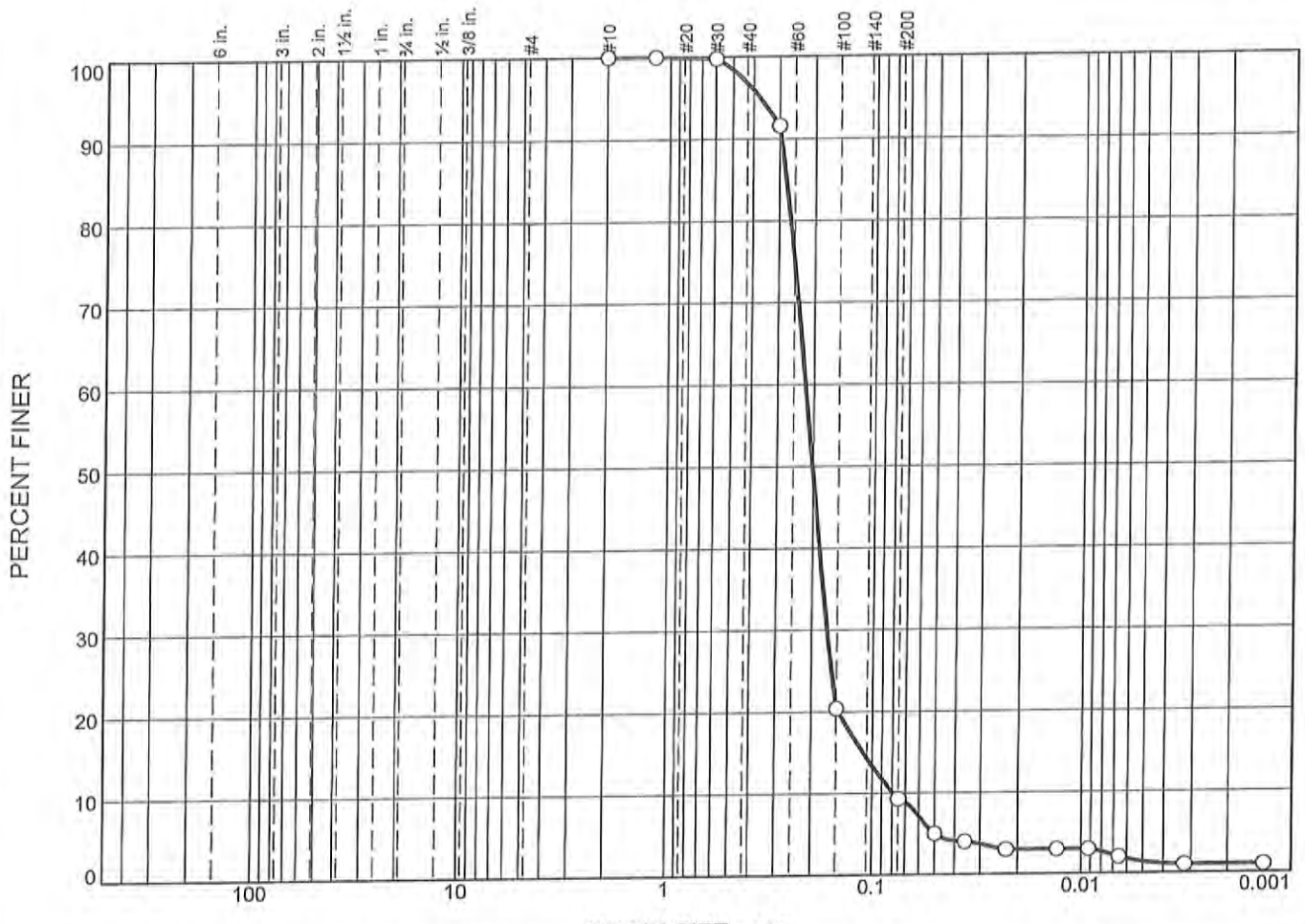
Client: Miramichi Shores Land Development Ltd.

Project: Miramichi Shores - Phase 4 Subdivision
Saugeen Shores, Ontario

Project No.: 20-626

Figure 2

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	0.0	0.0	3.3	87.4	8.3	1.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH20-03	4	2.29-2.90m	sand, trace silt and clay	SP-SM
				Sampled by SW of CMT Engineering Inc., November 16, 2020	
				Tested by JM of CMT Engineering Inc., November 18, 2020	

CMT Engineering Inc.

St. Clements, ON

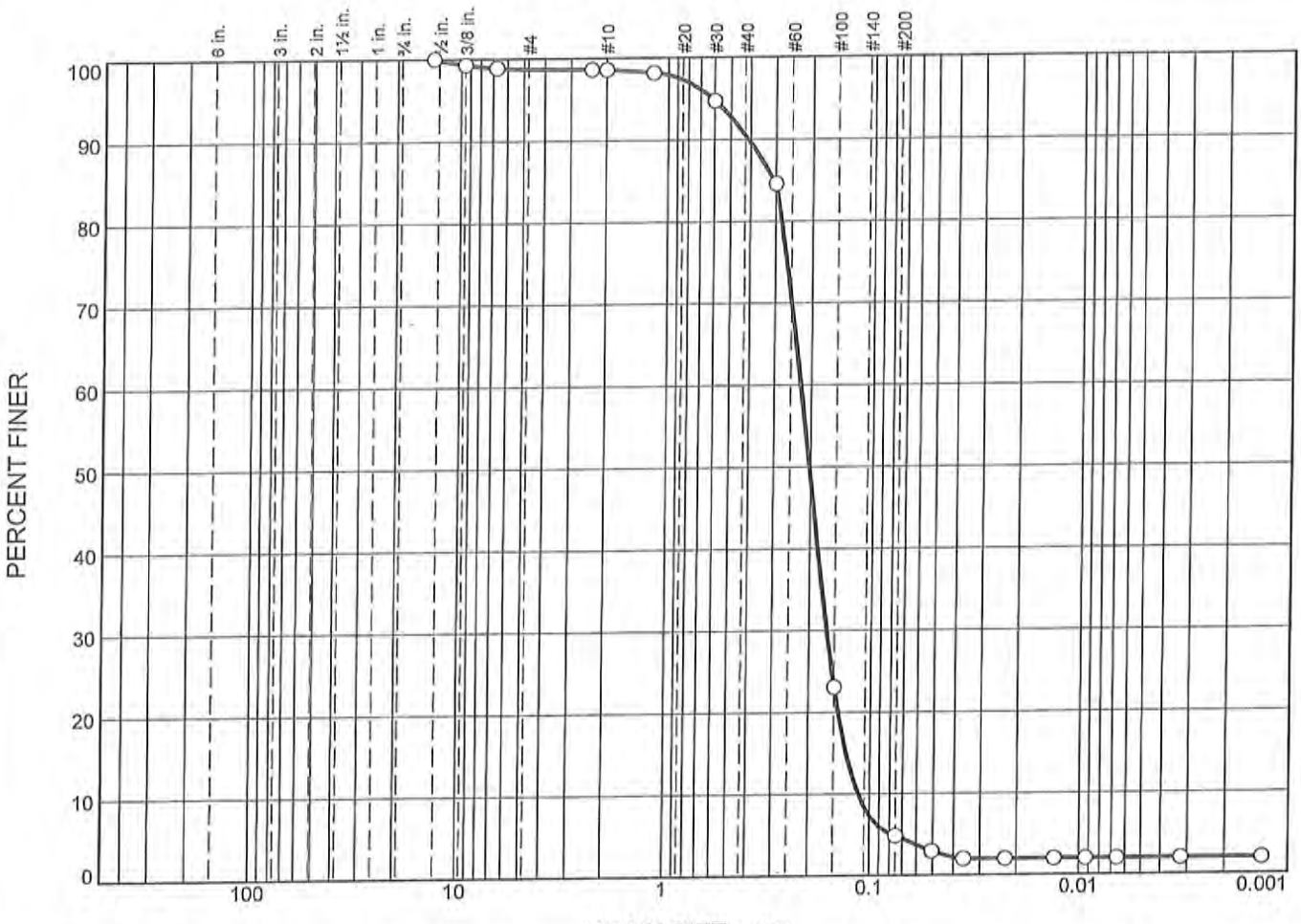
Client: Miramichi Shores Land Development Ltd.

Project: Miramichi Shores - Phase 4 Subdivision
Saugeen Shores, Ontario

Project No.: 20-626

Figure 3

Particle Size Distribution Report



	% Cobbles	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	0.0	1.3	0.1	8.1	85.7	2.8	2.0

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	BH20-04	4	2.29-2.90m	sand, trace silt, clay and gravel	SP
				Sampled by SW of CMT Engineering Inc., November 16, 2020	
				Tested by JM of CMT Engineering Inc., November 18, 2020	

CMT Engineering Inc.

St. Clements, ON

Client: Miramichi Shores Land Development Ltd.

Project: Miramichi Shores - Phase 4 Subdivision
Saugeen Shores, Ontario

Project No.: 20-626

Figure 4

APPENDIX C

WELL LOG RECORDS

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

Notice of Collection of Personal Information

Personal information contained on this form is collected pursuant to sections 35-50 and 75(2) of the *Ontario Water Resources Act* and section 16.3 of the Wells Regulation. This information will be used for the purpose of maintaining a public record of wells in Ontario. This form and the information contained on the form will be stored in the Ministry's well record database and made publicly available. Questions about this collection should be directed to the Water Well Customer Service Representative at the Wells Help Desk, 125 Resources Road, Toronto Ontario M9P 3V6, at 1-888-396-9355 or wellshelpdesk@ontario.ca.

Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 295008

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name
PRYDE	BRAD
Organization	**Email Address**
MIRAMICHI SHORES LAND DEVLOPMENT LTD	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	10	COLLARD WAY	PORT ELGIN

Country	Province	Postal Code	Telephone Number
CAN	ON	N0H2C0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	TRAIL	CARTER DRIVE	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
PORT ELGIN	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	469256	4924134	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 10 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	10

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	4	3/8 HOLEPLUG	0.09
4	10	#2 SAND	0.13

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

☐ Water Supply ☐ Replacement Well ☐ Test Hole
☐ Recharge Well ☐ Dewatering Well ☑ Observation and/or Monitoring Hole
☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality
☐ Abandoned, other (specify) _____
☐ Other (specify) _____

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.06	0	5

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.56	Plastic	10	5	10

10. Water Details

Water found at Depth (ft)	☐ Gas	Kind of water	☐ Fresh	☐ Untested	☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	10	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain

If flowing give rate

☐ Flowing (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

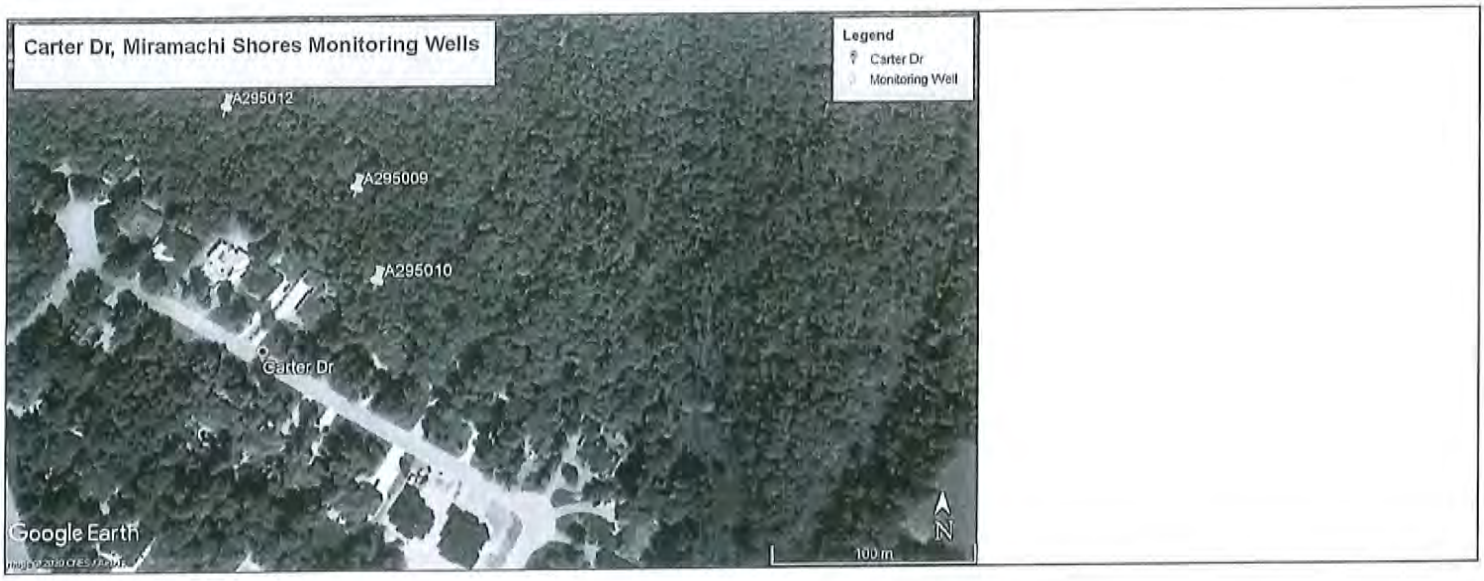
☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger



14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2020/11/16

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2020.12.08 20:36:35 -05'00'	2020/12/08

17. Ministry Use Only

Audit Number

L4U4 947T

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

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Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 295009

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name
PRYDE	BRAD
Organization	**Email Address**
MIRIAMICHI SHORES LAND DEVELOPMENT LTD	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	10	COLLARD WAY	PORT ELGIN

Country	Province	Postal Code	Telephone Number
CAN	ON	N0H2C0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	TRAIL	CARTER DR	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
PORT ELGIN	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	469336	4923919	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 15 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown				0	15

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	8	3/8 HOLEPLUG	0.17
8	15	#2 SAND	0.15

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

☐ Water Supply ☐ Replacement Well ☐ Test Hole
☐ Recharge Well ☐ Dewatering Well ☑ Observation and/or Monitoring Hole
☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality
☐ Abandoned, other (specify) _____
☐ Other (specify) _____

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole or Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.06	0	10

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.56	Plastic	10	10	15

10. Water Details

Water found at Depth (ft) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	15	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain

If flowing give rate

☐ Flowing (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger

14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2020/11/16

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2020.12.08 20:51:07 -05'00'	2020/12/08

17. Ministry Use Only

Audit Number

P2BK QM72

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

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Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A 295010

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name
PRYDE	BRAD
Organization	**Email Address**
MIRIAMICHI SHORES LAND DEVELOPMENT LTD	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village
	10	COLLARD WAY	PORT ELGIN

Country	Province	Postal Code	Telephone Number
CAN	ON	N0H2C0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	TRAIL	CARTER DRIVE	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
PORT ELGIN	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	469352	4923856	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 15 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	15

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	8	3/8 HOLEPLUG	0.17
8	15	#2 SAND	0.15

5. Method of Construction *

☐ Cable Tool ☐ Rotary (Conventional) ☐ Rotary (Reverse) ☐ Boring ☐ Air percussion ☐ Diamond
☐ Jetting ☐ Driving ☐ Digging ☐ Rotary (Air) ☐ Augering ☑ Direct Push
☐ Other (specify) _____

6. Well Use *

☐ Public ☐ Industrial ☐ Cooling & Air Conditioning
☐ Domestic ☐ Commercial ☐ Not Used
☐ Livestock ☐ Municipal ☑ Monitoring
☐ Irrigation ☐ Test Hole ☐ Dewatering
☐ Other (specify) _____

7. Status of Well *

☐ Water Supply ☐ Replacement Well ☐ Test Hole
☐ Recharge Well ☐ Dewatering Well ☑ Observation and/or Monitoring Hole
☐ Alteration (Construction) ☐ Abandoned, Insufficient Supply ☐ Abandoned, Poor Water Quality
☐ Abandoned, other (specify) _____
☐ Other (specify) _____

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.06	0	10

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.56	Plastic	10	10	15

10. Water Details

Water found at Depth (ft)	☐ Gas	Kind of water	☐ Fresh	☐ Untested	☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	15	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain

If flowing give rate

☐ Flowing (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger

14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2020/11/16

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2020.12.08 20:57:31 -05'00'	2020/12/08

17. Ministry Use Only

Audit Number

A4WT KZGH

Ontario

Ministry of the Environment, Conservation and Parks

Well Record - Regulation 903

Ontario Water Resources Act

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Fields marked with an asterisk (*) are mandatory.

Well Tag Number *
A295012

Type *

☑ Construction ☐ Abandonment

Measurement recorded in: *

☐ Metric ☑ Imperial

1. Well Owner's Information

Last Name and First Name, or Organization is mandatory. *

Last Name	First Name
PRYDE	BRAD
Organization	**Email Address**
MIRAMICHI SHORES LAND DEVELOPMENT LTD	

Current Address

Unit Number	Street Number *	Street Name *	City/Town/Village	
	10	COLLARD WAY	PORT ELGIN	
Country	**Province**		**Postal Code**	**Telephone Number**
CAN	ON		N0H2C0	

2. Well Location

Address of Well Location

Unit Number	Street Number *	Street Name *	Township
	TRAIL	CARTER DRIVE	

Lot	Concession	County/District/Municipality

City/Town	Province	Postal Code
PORT ELGIN	Ontario	

UTM Coordinates	Zone *	Easting *	Northing *		Municipal Plan and Sublot Number
NAD 83	17	469247	4923981	Test UTM in Map	

Other

3. Overburden and Bedrock Material *

Well Depth * 15 (ft)

General Colour	Most Common Material	Other Materials	General Description	Depth From	Depth To

				(ft)	(ft)
Brown	Sand			0	15

4. Annular Space *

Depth From (ft)	Depth To (ft)	Type of Sealant Used (Material and Type)	Volume Placed (cubic feet)
0	8	3/8 HOLEPLUG	0.17
8	15	#2 SAND	0.15

5. Method of Construction *

- [ ] Cable Tool
- [ ] Rotary (Conventional)
- [ ] Rotary (Reverse)
- [ ] Boring
- [ ] Air percussion
- [ ] Diamond
- [ ] Jetting
- [ ] Driving
- [ ] Digging
- [ ] Rotary (Air)
- [ ] Augering
- [x] Direct Push
- [ ] Other (specify) _____

6. Well Use *

- [ ] Public
- [ ] Industrial
- [ ] Cooling & Air Conditioning
- [ ] Domestic
- [ ] Commercial
- [ ] Not Used
- [ ] Livestock
- [ ] Municipal
- [x] Monitoring
- [ ] Irrigation
- [ ] Test Hole
- [ ] Dewatering
- [ ] Other (specify) _____

7. Status of Well *

- [ ] Water Supply
- [ ] Replacement Well
- [ ] Test Hole
- [ ] Recharge Well
- [ ] Dewatering Well
- [x] Observation and/or Monitoring Hole
- [ ] Alteration (Construction)
- [ ] Abandoned, Insufficient Supply
- [ ] Abandoned, Poor Water Quality
- [ ] Abandoned, other (specify) _____
- [ ] Other (specify) _____

8. Construction Record - Casing * (use negative number(s) to indicate depth above ground surface)

Inside Diameter (in)	Open Hole **or** Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness	Depth From (ft)	Depth To (ft)
1.5	Plastic	0.06	0	10

9. Construction Record - Screen

Outside Diameter (in)	Material (Plastic, Galvanized, Steel)	Slot Number	Depth From (ft)	Depth To (ft)
1.56	Plastic	10	10	15

10. Water Details

Water found at Depth (ft) ☐ Gas Kind of water ☐ Fresh ☐ Untested ☐ Other

11. Hole Diameter

Depth From (ft)	Depth To (ft)	Diameter (in)
0	15	3.5

12. Results of Well Yield Testing

☐ Pumping Discontinued

Explain

If flowing give rate

☐ Flowing (GPM)

Draw down

Time (min)	Static Level	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)														

Recovery

Time (min)	1	2	3	4	5	10	15	20	25	30	40	50	60
Water Level (ft)													

After test of well yield, water was

☐ Clear and sand free ☐ Other (specify)

Pump intake set at (ft)	Pumping rate (GPM)	Duration of pumping hrs + min	Final water level end of pumping (ft)	Disinfected? * ☐ Yes ☑ No

Recommended pump depth (ft)	Recommended pump rate (GPM)	Well production (GPM)

13. Map of Well Location *

Map 1. Please Click the map area below to import an image file to use as the map. ☐ Make map area bigger

14. Information

Well owner's information package delivered	Date Package Delivered (yyyy/mm/dd)	Date Work Completed (yyyy/mm/dd) *
☐ Yes ☐ No		2020/11/16

Comments

15. Well Contractor and Well Technician Information

Business Name of Well Contractor *	Well Contractor's License Number *
CMT DRILLING INC	7366

Business Address

Unit Number	Street Number	Street Name *
1	1011	INDUSTRIAL CRES

City/Town/Village *	Province	Postal Code *
ST CLEMENTS	ON	N0B 2M0

Business Telephone Number	Business Email Address
519-699-5775	info@cmtinc.net

Last Name of Well Technician *	First Name of Well Technician *	Well Technician's License Number *
BLACK	CHRIS	3711

16. Declaration *

☑ I hereby confirm that I am the person who constructed the well and I hereby confirm that the information on the form is correct and accurate.

Last Name	First Name	Email Address
BLACK	CHRIS	cblack@cmtinc.net

Signature		Date Submitted (yyyy/mm/dd)
Chris Black	Digitally signed by Chris Black Date: 2020.12.08 20:44:18 -05'00'	2020/12/08

17. Ministry Use Only

Audit Number

KIBY AU58