1.0 INTRODUCTION

The Little Salmon Carmacks First Nation (LSCFN) retained EBA Engineering Consultants Ltd. (EBA) to complete a geotechnical evaluation at the sites proposed for a Day Care Centre building (Lot 1059) and Social Services building (Lots 1060 and 1061) in Carmacks, YT.

The purpose of the evaluation was to determine subsurface soil conditions to assist in the recommendations for the proposed new buildings foundation design and construction.

Authorization to proceed was received from Chief Eddy Skookum by signed EBA proposal obtained through email from Mr. Rob Sieniuc of Broadway Architects.

The recommendations for the two buildings foundation design and construction included herein are based on geotechnical information from investigations conducted on site and EBA’s knowledge of activities previously conducted near the subject site. This report has been prepared in accordance with generally accepted Geotechnical Engineering practices. For additional conditions regarding this report, please refer to the attached General Conditions.

1.1 PROJECT DESCRIPTION

The sites are located within the LSCFN village (Lot 1122 Quad 115 I/1 c – 1B/D) Carmacks, Yukon. The approximate UTM coordinates for Lot 1059 (Day Care Centre) are 6,885,620 N and 432,600 E, and for Lots 1060 and 1061 (New Social Services building),
6,885,600 N and 432,600 E in Zone 8 on mapsheet 115 I/1. The site locations are shown in Figure 1.

According to the preliminary floor plans provided by Broadway Architects the Day Care Centre will be a single storey structure, with over 450 m$^2$ of total floor space, and the Social Services building will have over 870 m$^2$ of main floor space, with a 105 m$^2$ basement hat will be used for mechanical and storage.

It is understood that a heated crawlspace constructed on strip and spread concrete foundations are desired for each proposed building, however monolithic slab on grade foundations may also be a possibility. Access roads, parking, and on site sewage disposal systems are also required for these two developments.

2.0 SITE INVESTIGATION

On May 20, 2009, four testpits (locations shown on the attached site plan) were excavated with a Hitachi 200 tracked excavator, owned and operated by Berdoe Enterprises of Carmacks, Yukon. Mr. James Buyck, EBA representative, was on site to direct the testpitting, prepare detailed soil logs, and obtain representative soil samples. Disturbed soil samples were collected at regular intervals or from changes in soil conditions from the testpit sidewalls to a maximum depth of 1.2 m, and from the bucket of the excavator for depths exceeding 1.2 m. The soil samples were returned to EBA’s Whitehorse laboratory for natural moisture content determination. Moisture content results are shown on the attached EBA testpit logs and the particle size analysis test results follow the logs.

Approximate UTM (NAD83) coordinates, noted on the testpit logs, were determined with the use of a hand held GPS unit for the testpit locations.

A photographic record was taken and is available upon request.

3.0 SITE CONDITIONS

3.1 SURFACE FEATURES

All three lots are covered with coniferous and deciduous trees of medium size and varying density. The local topography is mostly flat with a slight depression 1.0 m in depth crossing through the middle of the site in the north/south direction. A cleared right-of-way with overhead power lines passes through the site in a west/east direction along the property lines of Lot 1059 and the other Lots 1060 and 1061.

3.2 SUBSURFACE CONDITIONS

The subsurface conditions were determined through interpretation of data obtained from the geotechnical investigation conducted by EBA on May 20, 2009.
The testpit locations are shown in Figure 1 and the corresponding testpit logs have been attached to this report. A summary of the subsurface conditions is provided in Table 1.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>W14101253-TP01</th>
<th>W14101253-TP02</th>
<th>W14101253-TP03</th>
<th>W14101253-TP04</th>
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</thead>
<tbody>
<tr>
<td>ORGANICS</td>
<td>0 – 0.2</td>
<td>0 – 0.2</td>
<td>0 – 0.2</td>
<td>0 – 0.2</td>
</tr>
<tr>
<td>SAND – trace to some silt</td>
<td>0.2 – 1.5</td>
<td>0.2 – 1.3</td>
<td>0.2 – 0.6</td>
<td>0.2 – 0.7</td>
</tr>
<tr>
<td>GRAVEL – sandy, trace of silt</td>
<td>1.5 – 3.5</td>
<td>1.3 – 3.3</td>
<td>0.6 – 3.0</td>
<td>0.7 – 3.0</td>
</tr>
<tr>
<td>- Cobbles</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>End of Testpit</td>
<td>3.5</td>
<td>3.3</td>
<td>3.0</td>
<td>3.0</td>
</tr>
</tbody>
</table>

General subsurface conditions consist of an organic cover underlain by 0.6 – 1.5 m of SAND with trace to some silt. The sand is generally fine to medium grained with layers of medium grained sand, light brown in colour and damp. Coarse clean sandy GRAVEL underlies the sand, and is well graded, sub-rounded, mottled grey, black, and brown in colour and dry. The sand portion of this gravel layer was found to be coarse grained. Cobbles were encountered throughout the gravel layer, and sloughing of the gravel sidewalls was prevalent.

3.3 **GROUNDWATER**

Groundwater was not encountered within the four testpits excavated. From previous work completed in the area, groundwater is not anticipated to at least a depth of 20 m.

3.4 **PERMAFROST**

Permafrost was not encountered during the investigation.

3.5 **BEDROCK**

Bedrock was not encountered during the investigation.

4.0 **RECOMMENDATIONS**

The site conditions encountered during the geotechnical investigation are generally suitable for either a monolithic slab on grade, or a strip and spread footing foundation system.
4.1 MONOLITHIC SLAB ON GRADE

A monolithic slab on grade foundation system for the two building can be designed and constructed based on the following recommendations:

- A subcut of at least 0.3 m should be undertaken to remove all organic material within the building footprint prior to construction. The underlying sand is considered re-useable as general fill and landscaping. The subcut should extend an additional 1.0 m out from the foundation perimeter.

- The excavation should be completed such that the native soils beneath the subcut are not disturbed. If the surface of the native soils is disturbed it should be compacted to at least 98% of the maximum dry density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content prior to the placement of any fill.

- The fill is to be non-frost susceptible (NFS) pit run gravel conforming to the specification in Table 2, placed in lifts no thicker than 200 mm, moisture conditioned and compacted to at least 98% of the maximum dry density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content.

- A 100 mm thick lift of basecourse gravel, conforming to the specification shown in Table 2, should be placed beneath all concrete elements. The basecourse gravel should be compacted to at least 98% of the maximum dry density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content before the placement of any concrete.

<table>
<thead>
<tr>
<th>TABLE 2: RECOMMENDED GRANULAR MATERIAL SPECIFICATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>80 mm Pit Run Gravel</strong></td>
</tr>
<tr>
<td><strong>Particle Size (mm)</strong></td>
</tr>
<tr>
<td>80.000</td>
</tr>
<tr>
<td>25.000</td>
</tr>
<tr>
<td>12.500</td>
</tr>
<tr>
<td>5.000</td>
</tr>
<tr>
<td>1.250</td>
</tr>
<tr>
<td>0.315</td>
</tr>
</tbody>
</table>

- Footings within the slab can be designed on the basis of an allowable bearing pressure of 144 kPa (3000 psf) when constructed on the engineered fill pad.

- Concrete elements must be cast onto a clean compacted granular surface. It is important that no loose or disturbed material be allowed to remain on the bearing
surface of the excavation. An acceptable surface must be prepared by moisture conditioning and the use of mechanical compaction equipment.

- Excavations must be protected from the inflow of surface water at all times and concrete elements should not be cast directly into or over seasonally frozen soil.
- A moisture barrier, such as polyethylene sheeting, should be placed immediately beneath the slab to enhance curing.
- Final site grading must direct all water away from the foundation elements of the structure. Ponding adjacent to the foundation could have detrimental effects on these structural elements. Runoff from the roof must be directed onto splash pads and away from the building. This is particularly important during the late fall, just prior to freeze-up.

4.2 STRIP AND SPREAD CONCRETE FOOTINGS

Concrete strip and spread footings for the buildings can be designed and constructed based on the following recommendations:

- A subcut of at least 0.3 m should be undertaken to remove all organic material and surficial soils within the building footprint prior to construction. The underlying sand is considered re-useable as general fill, landscaping, and for use in the on-site sewage disposal system.
- The subcut should extend an additional 1.0 m out from the foundation perimeter.
- The top of the footings should be set at least 0.6 m below the final graded surface of the lot to provide recommended bearing pressure; however for a full or partial basement it may be desirable to set these footings deeper than 0.6 m.
- The excavation should be completed such that the native sand beneath the subcut is not disturbed. If the surface of the native sand is disturbed it should be compacted to at least 98% of the maximum dry density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content prior to concrete placement.
- Strip and spread footings can be designed on the basis of an allowable bearing pressure of 144 kPa (3000 psf) when constructed on the undisturbed native soil. Minimum footing widths shall be 0.406 m for strip footings and 0.914 m for spread footings.
- Total settlement of the footings founded on native soils at depth should be less than 25 mm with a maximum differential settlement of 19 mm over the length of the structure.
- Footings must be cast onto clean undisturbed native soil. It is important that no loose or disturbed material be allowed to remain on the bearing surface of the footing excavation. An acceptable surface must be prepared by moisture conditioning and the use of mechanical compaction equipment.
• Excavations must be protected from the inflow of surface water at all times and concrete elements should not be cast directly into or over seasonally frozen soil.

• A moisture barrier, such as polyethylene sheeting, should be placed immediately beneath all floor slabs and concrete foundation elements to enhance curing.

• Final site grading must direct all water away from the foundation elements of the structure. Ponding adjacent to the building must be prevented, as water infiltration adjacent to the foundation could have detrimental effects on these structural elements. Runoff from the roof must be directed onto splash pads and away from the building. This is particularly important during the late fall, just prior to freeze-up.

### 4.3 BASEMENT WALL PRESSURES

Basement walls should be designed to resist lateral earth pressures, in the at rest condition, and may be designed using the following expressions, which assumes a triangular pressure distribution:

\[
P_o = k_o \gamma_b \cdot H + q
\]

Where:

- \( P_o \) = lateral earth pressure at rest condition where no movements of walls occur at a given depth (kPa)
- \( k_o \) = coefficient of earth pressure at rest condition, use 0.5 for backfill material such as silts and clays, use 0.45 for sands and gravels
- \( \gamma_b \) = bulk unit weight of soil for backfill - for silts and clays use 19 kN/m\(^3\), and for sands and gravels use 21 kN/m\(^3\)
- \( H \) = depth below final grade (m)
- \( q \) = and surcharge pressure at ground level (kPa)

If drainage (weeping tile) is not provided, allowance should be made for hydrostatic pressures. Below the groundwater table a value of bulk unit weight of 9 kN/m\(^3\) for silts and clays, and 11 kN/m\(^3\) for sands and gravels should be used. In addition, the hydrostatic pressure due to water should be applied.

\[
P_w = \gamma_w \cdot H_w
\]

Where:

- \( P_w \) = hydrostatic pressure (kPa)
- \( \gamma_w \) = unit weight of water (9.8 kN/m\(^3\))
- \( H_w \) = depth below top of water table (m)
density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content.

4.2 CONCRETE

It is recommended that all concrete be designed, mixed, and placed in accordance with the most recent edition of the Canadian Standards Associations (CSA) standard CAN/CSA-A23.1. According to this standard, concrete should be designed to at least satisfy minimum durability requirements as defined by its exposure class.

The exposure class of the concrete is dependent upon the presence or lack of chlorides, sulphates, freezing and thawing conditions and saturated conditions. Based on the aforementioned recommendations the foundation system will have concrete exposed to cycles of freezing and thawing, would be in dry conditions and not exposed to chlorides or sulphates. Type GU cement is considered acceptable. Furthermore, the governing exposure class for foundation elements at this site should be "F-2".

In addition to the above, CAN/CSA-A23.1 also provides recommendations for cold weather concrete placement. These include protecting freshly placed concrete from freezing temperatures.

4.3 ON-SITE SEWAGE DISPOSAL SYSTEMS

The percolation rate in the coarse granular soils at these sites is less than 1 minute/25mm. The construction of a 600 mm thick sand filter will be required, placed in a manner to obtain a minimum 5 minute/25 mm percolation rate, as per Environmental Health (EH) regulations.

The native sand materials found overlying the gravel soils within the four testpits were considered for sand filter material. Three samples considered representative of the native sand were tested for particle size analysis and plotted with the EH Absorption Bed/Sand Filter specification. The sand samples were found to be overly fine grained and were either only partially within the prescribed specification or completely non-conforming. Although this sand would be acceptable as pipe bedding, or backfill around the septic tanks, it is not recommended for use as sand filter material due to the inconsistent non-conforming gradation.

A borrow source located at km 4 along the Robert Campbell Highway, commonly used for sand filter material, was also sampled, tested and did meet the required specification. It is recommended that this source be considered for the sand filter material.

The results of each particle size analysis are attached.
The above noted expression assumes: native material or backfill material compacted to at least 95% of the maximum dry density using standard effort (as per ASTM D698) at a moisture content of ± 2% of optimum moisture content, and horizontal ground behind the basement wall. If ground surface slopes upwards away from the wall, design wall pressures should be re-evaluated.

Backfill around basement walls should not commence before the concrete walls have reached a minimum two-thirds of its 28-day strength and first floor framing and basement floor slabs are in place. Only hand operated compaction should be employed within 600mm of the concrete basement walls.

4.4 SEISMIC CONDITIONS

The 2005 National Building Code requires that a site classification based on soil conditions be established for new buildings. Based on soil conditions noted, it is EBA’s conclusion that the soils in the vicinity of the subject site correspond to those described in Site Classification D, per Table 4.1.8.4.A, NBCC 2005.

Based on the 2005 National Building Code Seismic Hazard Calculation specific to Carmacks Yukon, the peak horizontal ground acceleration (PGA) is 0.109 g for Site Classification D. This parameter has a 2% probability of being exceeded within 50 years.

4.5 EXCAVATION SIDESLOPES

Stripping or general excavations for services should have the perimeter sloped back at an angle no steeper than 1H:1V; however, some sloughing of the excavation walls should be anticipated. Spoil piles should be kept a distance away from the excavation crest equivalent to or greater than the excavation depth. If the excavation is deeper than 1.2 m the sideslopes must be shored or shaped in accordance with the most recent edition of the Occupational Health and Safety Regulations.

4.6 SITE GRADING

Backfill around any foundation system should consist of free-draining granular material, capped with topsoil or other relatively impervious soils. All non-structural fill should be placed in lift thicknesses not exceeding 0.3 m and compacted to at least 95% of the maximum dry density using standard effort (as per ASTM D698). Final site grading should enhance positive drainage and direct water away from the structure.

4.1 ACCESS ROAD AND PARKING

It is recommended that the access road and parking area be constructed of 300 mm of pit run gravel capped with 150 mm of crushed gravel, conforming to the specifications shown in Table 2. These materials should be compacted to at least 98% of the maximum dry
4.4 DESIGN, INSPECTION, AND TESTING SERVICES

It is recommended that EBA be given the opportunity to review the details of the final design related to the geotechnical aspects of the building foundation, prior to construction. Experience has shown that this action may prevent inconsistencies, poor performance, and/or increased costs that may lead to disputes.

The following inspections are recommended during construction of the structural foundation system and to ensure compliance to the recommendations presented herein:

- Sub-cut inspection before placement of fill material or concrete elements;
- Compaction testing during pit run gravel and basecourse placement, if applicable;
- Reinforcement inspection and concrete testing of the foundation elements.

EBA would be pleased to perform these services, if requested, as well, provision of the on-site sewage disposal design for each building.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the LSCFN and their agents. EBA does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the LSCFN, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in EBA’s Services Agreement and in the General Conditions included in this report.
6.0 CLOSURE

The information and recommendations presented herein are based on geotechnical information from investigations conducted on site. The conditions presented herein are believed to be representative for the site. However, if conditions differing from those presented in this report are encountered during subsequent phases of site workings, we request that EBA be notified so that the geotechnical recommendations can be re-evaluated in light of new findings.

Additional information regarding the use of this report is presented in the General Conditions, which form a part of this report. If additional information or clarification of any of the recommendations presented is required, please contact the undersigned.

Yours truly,

EBA Engineering Consultants Ltd.

James S. Buyck
Engineering Technologist
Direct Line: 867.668.2071 x226
(email: jbuyck@eba.ca)

Chadwyck Cowan, P.Eng.
Senior Project Engineer
Direct Line: 867.668.2071 x229
email: ccowan@eba.ca

JSB/jsb

Attachments:
EBA Geotechnical Report – General Conditions (2-pages)
Site Plan Showing Testpit Locations (Figure 1)
Testpit Logs (4-pages)
Particle Size Analysis (4-pages)
GEOTECHNICAL REPORT – GENERAL CONDITIONS

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of EBA’s Client. EBA does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than EBA’s Client unless otherwise authorized in writing by EBA. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of EBA. Additional copies of the report, if required, may be obtained upon request.

2.0 ALTERNATE REPORT FORMAT

Where EBA submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed EBA’s instruments of professional service), only the signed and/or sealed versions shall be considered final and legally binding. The original signed and/or sealed version archived by EBA shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of EBA’s instruments of professional service will not, under any circumstances, no matter who owns or uses them, be altered by any party except EBA. EBA’s instruments of professional service will be used only and exactly as submitted by EBA.

Electronic files submitted by EBA have been prepared and submitted using specific software and hardware systems. EBA makes no representation about the compatibility of these files with the Client’s current or future software and hardware systems.

3.0 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, EBA has not been retained to investigate, address or consider and has not investigated, addressed or considered any environmental or regulatory issues associated with development on the subject site.

4.0 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. EBA does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

5.0 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

6.0 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historic environment. EBA does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional investigation and review may be necessary.
7.0 SURFACE WATER AND GROUNDWATER CONDITIONS

Surface and groundwater conditions mentioned in this report are those observed at the times recorded in the report. These conditions vary with geological detail between observation sites; annual, seasonal and special meteorologic conditions; and with development activity. Interpretation of water conditions from observations and records is judgemental and constitutes an evaluation of circumstances as influenced by geology, meteorology and development activity. Deviations from these observations may occur during the course of development activities.

8.0 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

9.0 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

10.0 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques are known.

11.0 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

12.0 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

13.0 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

14.0 SAMPLES

EBA will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client’s expense upon written request, otherwise samples will be discarded.
SOIL DESCRIPTION

0

ORGANIC ROOT MATERIAL

0.5

SAND - some silt to silty, fine to medium grained, dense, moist, light to medium brown
- trace of silt, medium grained

1.5

fine to medium grained

2.5

GRAVEL - sandy, trace of silt, well graded sub-rounded gravel, medium to coarse sand, loose, dry, mottled grey, black and brown
- cobbles throughout gravel layer

END OF TESTPIT @ 3.5m
NOTE: sloughing throughout gravel layer

EBA Engineering Consultants Ltd

LOGGED BY: JSB COMPLETE DEPTH: 3.5m
REVIEWED BY: CPC COMPLETE: 5/20/2009
DRAWING NO: Page 1 of 1
## Soil Description

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>Sample Type</th>
<th>Moisture Content</th>
<th>Plastic M.C.</th>
<th>Liquid</th>
<th>Standard Penetration (N)</th>
<th>Unconfined (kPa)</th>
<th>Pocket Pen (kPa)</th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>ORGANIC ROOT MATERIAL</td>
<td>1</td>
<td>9.9</td>
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</tr>
<tr>
<td>1</td>
<td>SAND - silty, trace of gravel, fine to medium grained, dense, moist, medium brown</td>
<td>2</td>
<td>15.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- trace of silt, gravelly, fine to medium grained, sub-rounded particles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- sand becomes fine grained from 0.8m to 1.5m</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>GRAVEL - sandy, trace of silt, well graded sub-rounded gravel, medium to coarse sand, loose, dry, mottled grey, black and brown</td>
<td>4</td>
<td>3.8</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>- cobbly throughout gravel layer</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td>END OF TESTPIT @ 3.3m</td>
<td>5</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Major sloughing throughout gravel layer

---

**EBA Engineering Consultants Ltd.**

**Logged By:** JSB  
**Reviewed By:** CPC  
**Completion Depth:** 3.3m  
**Complete:** 5/20/2009  
**Drawing No:** Page 1 of 1
SOIL DESCRIPTION

0
ORGANIC ROOT MATERIAL

0.5
SAND - silty, trace of gravel, fine to medium grained, dense, moist, medium brown
- trace of silt
- gravelly, fine to medium grained, sub-rounded particles

1
GRavel - sandy, trace of silt, well graded sub-rounded gravel, medium to coarse sand, loose to compact, dry, mottled grey, black and brown
- cobbly throughout gravel layer

1
SAND - silty, trace of gravel, fine to medium grained, dense, moist, medium brown
- trace of silt
- gravelly, fine to medium grained, sub-rounded particles

3
END OF TESTPIT @ 3.0m
NOTE: sloughing throughout gravel layer
**SOIL DESCRIPTION**

<table>
<thead>
<tr>
<th>Depth (m)</th>
<th>SAMPLE NUMBER</th>
<th>SAMPLE TYPE</th>
<th>MOISTURE CONTENT</th>
<th>STANDARD PENETRATION (N)</th>
<th>UNCONFINED (kPa)</th>
<th>POCKET PEN. (kPa)</th>
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<tbody>
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<td>0</td>
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<td>21.1</td>
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</tr>
<tr>
<td></td>
<td>2</td>
<td>SAND - silty, fine grained, dense, moist, light to medium brown</td>
<td></td>
<td>9</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- trace of silt and gravel, medium to coarse grained</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>GRANULES - sandy, trace of silt, well graded sub-rounded gravel, medium to coarse sand, loose to damp, mottled grey, black and brown</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- cobbly throughout gravel layer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0 m</td>
<td></td>
<td>END OF TESTPIT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>NOTE: sloughing throughout gravel layer</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LOGGED BY: JSB
REVIEWED BY: CPC
LOGGED: 2/11/2009
REVISED: 5/20/2009
EBA Engineering Consultants Ltd.
PARTICLE SIZE ANALYSIS TEST REPORT
ASTM D422 & C136

Client: LCSFN
Project No.: W14101253  
Client Rep.: Mr. James Baker
Site: Carmacks, YT  

Material Type: SAND-trace of silt, trace gravel  
Date Tested: 26-May-2009  
By: JSB
Sample No.: Filter sand  
Soil Description: 
Sample Loc.: Borrow - km 4 Campbell Hwy  
USC Classification: Cu:
Sample Depth:  
Sampling Method: 
Date sampled: 20-May-2009  
By: JSB
Moisture Content: 10.5

<table>
<thead>
<tr>
<th>Particle Size (mm)</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>100</td>
</tr>
<tr>
<td>25</td>
<td>100</td>
</tr>
<tr>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td>12.5</td>
<td>99</td>
</tr>
<tr>
<td>10</td>
<td>98</td>
</tr>
<tr>
<td>5</td>
<td>98</td>
</tr>
<tr>
<td>2</td>
<td>97</td>
</tr>
<tr>
<td>0.85</td>
<td>95</td>
</tr>
<tr>
<td>0.425</td>
<td>36</td>
</tr>
<tr>
<td>0.25</td>
<td>16</td>
</tr>
<tr>
<td>0.15</td>
<td>6</td>
</tr>
<tr>
<td>0.075</td>
<td>3</td>
</tr>
</tbody>
</table>

Notes:
1. The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
2. The description is visually based & subject to EBA description protocols
3. If cobbles are present, sampling procedure may not meet ASTM C702 & D75


Reviewed By: ____________________________

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PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Client: LCSFN
Project No.: W14101253  
Client Rep.: Mr. James Baker
Site: Lot 1060, Carmacks, YT

Material Type: SAND-trace of silt  
Date Tested: 23-May-2009  
By: JSB
Sample No.: TP01-1  
Soil Description:  
Sample Depth: 0.3-0.5  
USC Classification: Cu:
Sample Loc.:  
Sampling Method:  
Date sampled: 20-May-2009  
By: JSB  
Moisture Content: 10.0

Notes:
1. The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
2. The description is visually based & subject to EBA description protocols
3. If cobbles are present, sampling procedure may not meet ASTM C702 & D75


Reviewed By: ________________
PARTICLE SIZE ANALYSIS TEST REPORT

ASTM D422 & C136

Client: LCSFN

Project No.: W14101253  
Client Rep.: Mr. James Baker

Site: Carmacks, YT  

Material Type: SAND (SM) - some silt  
Sample No.: TP02-2

Date Tested: 23-May-2009  
By: IM

Sample Loc.:  
Sample Depth: 0.6-0.8

USC Classification: Cu:  
Sampling Method: Cc:

Date sampled: 20-May-2009  
By: JSB

Moisture Content: 15.1

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PARTICLE SIZE (mm)  
PERCENT PASSING

0.075 18  
0.15 81  
0.25 90  
0.425 96  
0.85 100  
1.0 100  
2.0 100  
3.0 90  
4.8 100  
9.5 90  
14.0 80  
20.0 60  
30.0 30  
40.0 10  
50.0 30  
60.0 10  
75.0 30  
100.0 10  
150.0 5  
200.0 5  
300.0 5

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Notes:
1. The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
2. The description is visually based & subject to EBA description protocols
3. If cobbles are present, sampling procedure may not meet ASTM C702 & D75


Reviewed By: ____________________________

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**PARTICLE SIZE ANALYSIS TEST REPORT**

**ASTM D422 & C136**

**Project:** New Daycare Cent. & S.S. Bldg.  
**Client:** LCSFN  
**Project No.:** W14101253  
**Client Rep.:** Mr. James Baker  
**Site:** Lot 1061, Carmacks, YT  
**Material Type:** SAND (SM) - trace of silt  
**Date Tested:** 23-May-2009  
**By:** IM  
**Sample No.:** TP02-3  
**Sample Loc.:** Lot 1061, Carmacks, YT  
**Sample Depth:** 1.0-1.2  
**USC Classification:** Cu:  
**Sampling Method:**  
**Date sampled:** 20-May-2009  
**By:** JSB  
**Moisture Content:** 3.8

### Particle Size Analysis Table

<table>
<thead>
<tr>
<th>Particle Size (mm)</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>0</td>
</tr>
<tr>
<td>200</td>
<td>0</td>
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<tr>
<td>150</td>
<td>0</td>
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<td>0</td>
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<td>0</td>
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<tr>
<td>10</td>
<td>0</td>
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<tr>
<td>5</td>
<td>100</td>
</tr>
<tr>
<td>2</td>
<td>100</td>
</tr>
<tr>
<td>0.85</td>
<td>99</td>
</tr>
<tr>
<td>0.425</td>
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</tr>
<tr>
<td>0.25</td>
<td>67</td>
</tr>
<tr>
<td>0.15</td>
<td>39</td>
</tr>
<tr>
<td>0.075</td>
<td>5</td>
</tr>
</tbody>
</table>

**Notes:**

1. The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
2. The description is visually based & subject to EBA description protocols
3. If cobbles are present, sampling procedure may not meet ASTM C702 & D75

**Specification:** Appendix C Absorption Bed/Sand Filter - Environment Health - Design for the septic tank and soil absorption system.

**Reviewed By:** ____________________________

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