**Lewkowich Engineering Associates Ltd.**
geotechnical • health, safety & environmental • materials testing

Simcic + Uhrich Architects
Suite 230 – 3 West 3rd Avenue
Vancouver, BC
V5Y 3T8

File No.: F1667.02
Date: July 17, 2014

Attention: Mr. Bill Uhrich, Architect, AIBC, MRAIC

**PROJECT: HORNBY ISLAND FIRE HALL, HORNBY ISLAND, BC**

**SUBJECT: GEOTECHNICAL ASSESSMENT**

Dear Mr. Uhrich,

## 1. INTRODUCTION

As requested, Lewkowich Engineering Associates Ltd. (LEA) has carried out a geotechnical assessment of the above referenced property with respect to the proposed fire hall. This report provides a summary of our findings and recommendations.

## 2. BACKGROUND

LEA understands the proposed development consists of a 700m$^2$ (7500ft$^2$), 4 bay fire hall of conventional construction methods supported by a cast-in-place concrete foundation system, as well as the installation of associated civil works and services. We understand that this building will be designed constructed according to post disaster facility standards.

## 3. ASSESSMENT OBJECTIVES

Our assessment, as summarized within this report, is intended to meet the following objectives:

i. Determine whether the land is considered safe for the use intended (defined for the purposes of this report as construction of a fire hall according to post disaster facility standards and the installation of associated civil works and services), with the probability of a geotechnical failure resulting in property damage of less than 10 percent (10%) in 50 years, with the exception of geohazards due to a seismic event which are based on a 2 percent (2%) probability of exceedance in 50 years, provided the recommendations in this report are followed.

ii. Identify any geotechnical deficiency that might impact the design and construction of the

development, and prescribe the geotechnical works and any changes in the standards of the design and construction of the development that are required to ensure the land, buildings, and works and services are developed and maintained safely for the use intended.

iii. Acknowledge that Approving and/or Building Inspection Officers may rely on this report when making a decision on applications for the development of the land.

## 4. ASSESSMENT METHODOLOGY

a. The subsurface geotechnical investigation was carried out on July 4, 2014 using a Yanmar rubber tracked mini excavator provided by LeBaron Contracting. A total of eight (8) test pits (TP 14-01 to TP 14-08) were advanced at locations within the proposed development area. All test holes were backfilled upon completion.

b. Guelph permeameter testing was performed to estimate the Field Saturated Hydraulic Conductivity ($K_{fs}$) of soils in proximity to the proposed septic system.

c. Laboratory testing was performed on collected soil samples to determine gradations and suitability for various construction applications.

d. A site plan showing the location of the test holes (Figure 1), as well as test pit logs are attached, following the text of this report.

## 5. SITE CONDITIONS

### 5.1 General

a. The civic address of the proposed development property is 3875 Central Road, located on Hornby Island. The property is situated on the north side of Central Road and bounded by a Ministry of Transportation and Infrastructure aggregate pit to the west and Joe King Ball Park to the east.

b. The property relief is generally flat with an average down sloping grade of 5% towards the north. Existing infrastructure included a gated gravel road that ran along the north west boundary and provided access to the aggregate pit to the west. The proposed construction area was otherwise vegetated with mature coniferous trees, medium sized deciduous trees, and low growing underbrush dominated by salal.

c. Groundwater seepage was not observed in any of the test holes. Groundwater levels can be expected to fluctuate seasonally with cycles of precipitation. Groundwater conditions at other times and locations can differ from those observed within the test pits at the time of our assessment.

## 5.2 Soil Conditions

a. Hornby Island is founded on basaltic rock that forms a part of the island arc Wrangellia. Shallow bedrock encountered during the investigation is believed to be a part of the Geoffrey Formation. This formation generally consists of thickly bedded conglomerate interbedded with medium to coarse grained sandstone.

b. Sandstone and conglomerate bedrock was observed at 0.75m below the existing grade. The surface of the bedrock appears to follow the relief of the existing surface grade. Typically, the soils consisted of either weathered sand stone or conglomerate overlain with a mat of organic roots mixed with sand, gravel, and silt.

c. The main strata are discussed in general below. Detailed descriptions of the subsurface conditions are provided on the attached test pit logs (TP 14-01 to TP 14-08).

d. Light brown, dry, sand, gravel, organics (roots, moss) and silt (topsoil) was encountered in the majority of the test holes at depths from 0.0m to 0.3m. This material was generally loose, and contained a significant amount of organics (vegetation root systems). This material will not be suitable for re-use as a structural fill material and only marginally suitable for re-use as

a growing medium in landscaped or untraveled areas.

e. Below the surficial layer, we observed compact, light brown to reddish brown, dry, poorly graded gravel with sand, some cobbles, traces of silt, and a significant amount of organics (roots). This material originated from the underlying, weathered bedrock, with gravel and cobble sized particles of the parent material below. It was generally encountered at depths ranging from 0.3m to 0.75m. This material would not be suitable for re-use as an engineered fill material given the significant amounts of organics. This material may be useful as a non-load bearing fill.

f. All of the soils that were sampled and tested had a fines content of less than 10% passing the 75μm sieve.

g. Depths are referenced to the existing ground surface at the time of our field investigation. Soil classification terminology is based on the Modified Unified classification system. The relative proportions of the major and minor soil constituents are indicated by the use of appropriate Group Names as provided in ASTM D2487 Figures 1a, 1b, and 2. Other descriptive terms generally follow conventions of the Canadian Foundation Engineering Manual.

h. Soil samples of a 25mm crushed material from the neighbouring aggregate pit were evaluated for use as a structural fill. We estimated the stockpile to contain approximately 200m$^3$ of material.

### 5.4 On Site Infiltration and Stormwater Disposal

a. Guelph permeameter test results for Field Saturated Hydraulic Conductivity ($K_{fs}$) are summarized in the table below. It should be noted that the double head method provided negative results. The negative results are indicative of soil heterogeneity such as root holes and poorly graded aggregates. Saturated soil sloughing into the base of the test holes was

also observed and may have skewed results.

b. As a rough comparison, we estimated hydraulic conductivity (K) using Hazen's empirical relationship based on the effective size ($D_{10}$) of collected samples. The results were an order of magnitude higher than field test results. We have not considered these results in our recommendations given the heterogeneity of the soils.

| **Field Saturated Hydraulic Conductivity ($K_{fs}$)** | | | |
|---|---|---|---|
| Test Hole | Head = 5 cm | Head = 10cm | Average |
| PH 14-01 | $3.72 \times 10^{-3}$ cm/s | $1.63 \times 10^{-3}$ cm/s | $2.67 \times 10^{-3}$ cm/s |
| PH 14-02 | $1.40 \times 10^{-3}$ cm/s | $8.14 \times 10^{-4}$ cm/s | $1.11 \times 10^{-3}$ cm/s |

## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 General

From a geotechnical point of view, the land is considered safe for the use intended (defined for the purposes of this report as construction of a fire hall according to post disaster facility standards and the installation of associated civil works and services), with the probability of a geotechnical failure resulting in property damage of less than 10 percent (10%) in 50 years, with the exception of geohazards due to a seismic event which are based on a 2 percent (2%) probability of exceedance in 50 years, provided the recommendations in this report are followed.

### 6.2 Removal of Unsuitable Materials and General Excavation Recommendations

a. Prior to construction, all unsuitable materials should be removed to provide a suitable base of support. The average stripping depth within the development area will be approximately

0.7m below existing grade to suitable bearing free of organics. Unsuitable materials include any non-mineral material such as vegetation, topsoil, peat, fill or other materials containing organic matter, as well as any soft, loose, or disturbed soils.

b. Ground water ingressing into any excavations should be controlled with a perimeter ditch located just outside of the building areas, connected to positive drainage.

c. The Geotechnical Engineer is to confirm the removal of unsuitable materials and approve the exposed competent inorganic subgrade.

d. We understand that the design elevations for the proposed development area may include manipulating the current topography of the subject area to create a flat area for the building footprint on the down sloping existing grade.

### 6.3 Structural Fill

a. Where fill is required to raise areas that will support buildings, slabs, or pavements, structural fill should be used. The Geotechnical Engineer should first approve the exposed subgrade in fill areas, to confirm the removal of all unsuitable materials. The thickness of structural fill should be consistent in all areas below the footing elevation to minimize differential settlements.

b. Structural fill should be inorganic sand and gravel. If structural fill placement is to be carried out in the wet season, material with a fines content limited to 5% passing the 75μm sieve should be used, as such a material will not be overly sensitive to moisture, allowing compaction during rainy periods of weather.

c. Structural fill should be compacted to a minimum of 95% of the corresponding Modified Proctor maximum dry density (ASTM D1557) in foundation and floor slab areas, as well as in paved roadway and parking areas.

d. Structural fills under foundations should include the zone defined by a plane extending

down and outward a minimum 0.5m from the outer edge of the foundation at an angle of 45 degrees from horizontal to ensure adequate subjacent support.

e. Compaction of fill should include moisture conditioning as needed to bring the soils to the optimum moisture content and compacted using vibratory compaction equipment in lift thickness appropriate for the size and type of compaction equipment used.

f. A general guideline for maximum lift thickness is no more than 100mm for light hand equipment such as a "jumping-jack," 150mm for a small roller and 300mm for a large roller or heavy (>500 kg) vibratory plate compactor or a backhoe mounted hoe-pac or a large excavator mounted hoe-pac, as measured loose.

g. It should be emphasized that the long-term performance of buildings, slabs, and pavements is highly dependant on the correct placement and compaction of underlying structural fills. Consequently, we recommend that structural fills be observed and approved by the Geotechnical Engineer. This would include approval of the proposed fill materials and performing a suitable program of compaction testing during construction.

### 6.4 Use of Local Materials

We understand that the Client wished to minimize the amount of material imported to the site. The native material we observed onsite has higher organic contents and would not be suitable for use as engineered fill. However, we have no objections to using the 25mm crushed material from the neighbouring aggregate pit as engineered fill to support structures.

### 6.4 Foundation Design & Construction

a. LEA recommends designing the foundation to bear directly on the bedrock at an average depth of 0.75 below existing grade. Structural fill may be used as a bearing material if recommendations in this report are adhered to.

b. Foundation loads should be supported by shallow bedrock, or structural fill. Foundations

may be designed according to SLS criteria based on an allowable bearing capacity of 150 kPa if founded on approved structural fill materials as outlined above, or 250 kPa if founded on bedrock. These values assume a minimum 0.6m depth of confinement or cover. The ULS values are 200 kPa for structural fill materials, and 350 kPa for bedrock.

c. Provided the recommendations in this report are followed, we expect that total building settlement will not exceed 25mm, with total differential movement not exceeding 15mm between column spacing.

d. Prior to construction, the building area should be stripped to remove all unsuitable materials to provide a competent soil subgrade for the footing support.

e. Exterior footings should be provided with a minimum 0.6m depth of ground cover for frost protection purposes.

f. Prior to placement of concrete footings, any bearing soils that have been softened, loosened, or otherwise disturbed during the course of construction should be removed, or else compacted following our recommendations for structural fill. Compaction will only be feasible if the soil has suitable moisture content and if there is access to heavy compaction equipment. If no structural fill is placed, a smooth-bladed clean up bucket should be used to finish the excavation.

g. The Geotechnical Engineer should evaluate the bearing soils at the time of construction to confirm that footings are based on appropriate and properly prepared founding material.

### 6.5 Seismic Issues

a. No compressible or liquefiable soils were encountered during the test pitting investigation.

b. Based on the 2012 British Columbia Building Code, Division B, Part 4, Table 4.1.8.4.A, "Site Classification for Seismic Site Response," the soils and strata encountered during the test pitting investigation would be "Site Class C" (Very Dense Soil or Soft Rock).

## 6.6 Modulus of Subgrade Reaction

The Modulus of Subgrade Reaction, $k_s$ , while typically a constant, yields variable amounts of "reaction" based on the mass being supported and the thickness of the soil. For design purposes, a value of 60,000 kN/m$^3$ may be employed. It is recommended that foundations are designed in consultation with the Geotechnical Engineer.

## 6.7 Permanent Dewatering

a. Conventional requirements of the 2012 British Columbia Building Code pertaining to building drainage are considered suitable at this site. Once final plans and tentative elevations are determined, the Geotechnical Engineer should be consulted to provide further dewatering data.

b. We recommend using a $K_{fs}$ of 1.0 x $10^{-3}$cm/s (unfactored) for the design of stormwater infiltration or storage facilities. The civil engineering designer should apply a factor of safety at their discretion.

c. Given the impervious nature of the shallow bedrock, on-site infiltration or storage facilities of collected storm water should be located downgrade of building and civil infrastructure. These facilities should also be sited in a way that does not adversely affect existing or proposed infrastructure on neighbouring properties.

## 6.8 Pavement Design – On Site Roadways & Parking Areas

a. Any organic or deleterious material should be removed from beneath the designated roadway, driveway, or parking areas prior to subgrade preparation. If fill is required to bring the subgrade up to a desired elevation, structural fill should be used.

b. An estimated soaked California bearing ratio of 3.0% and a 20 year design life have been used in the following recommended pavement designs.

i. Areas subject to car and light truck vehicles:

Estimated E.S.A.L. = $2 \times 10^4$

| | |
|---|---|
| Asphaltic Concrete Pavement | = 50 mm |
| Granular Base Course (19mm crush) | = 100 mm |
| Standard Subbase Preparation (SGSB) | = 300 mm |

ii. Areas subject to delivery and garbage trucks:

Estimated E.S.A.L. = $1 \times 10^5$

| | |
|---|---|
| Asphaltic Concrete Pavement | = 75 mm |
| Granular Base Course (19mm crush) | = 150 mm |
| Standard Subbase Preparation (SGSB) | = 300 mm |

d. It is recommended that a reinforced concrete slab be utilized where garbage dumpsters are located. The slab should be large enough to contain the disposal unit and front tires of the garbage truck during disposal operations.

## 7. GEOTECHNICAL ASSURANCE AND QUALITY ASSURANCE

The 2012 British Columbia Building Code requires that a geotechnical engineer be retained to provide Geotechnical Assurance services for the construction of buildings. Geotechnical Assurance services include review of the geotechnical components of the plans and supporting documents, and responsibility for field reviews of these components during construction.

## 8. ACKNOWLEDGEMENTS

Lewkowich Engineering Associates Ltd. acknowledges that this report may be requested by

the building inspector (or equivalent) of the local governing authority as a precondition to the issuance of a building permit. It is acknowledged that the Approving Officers and Building Officials may rely on this report when making a decision on application for development of the land. We acknowledge that this report has been prepared for, and at the expense of Island West Coast Developments Ltd. We have not acted for or as an agent of the local governing authority in the preparation of this report.

## 9. LIMITATIONS

The conclusions and recommendations submitted in this report are based upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction or further investigation. The recommendations given are based on the subsurface soil conditions encountered during the bore hole investigation, current construction techniques, and generally accepted engineering practices. No other warrantee, expressed or implied, is made. Due to the geological randomness of many soil formations, no interpolation of soil conditions between or away from the bore holes has been made or implied. Soil conditions are known only at the bore hole locations. If other soils are encountered, unanticipated conditions become known during construction or other information pertinent to the structures become available, the recommendations may be altered or modified in writing by the undersigned.

## 10. CLOSURE

Lewkowich Engineering Associates Ltd. appreciates the opportunity to be of service on this project. If you have any comments, or additional requirements at this time, please contact us at your convenience.

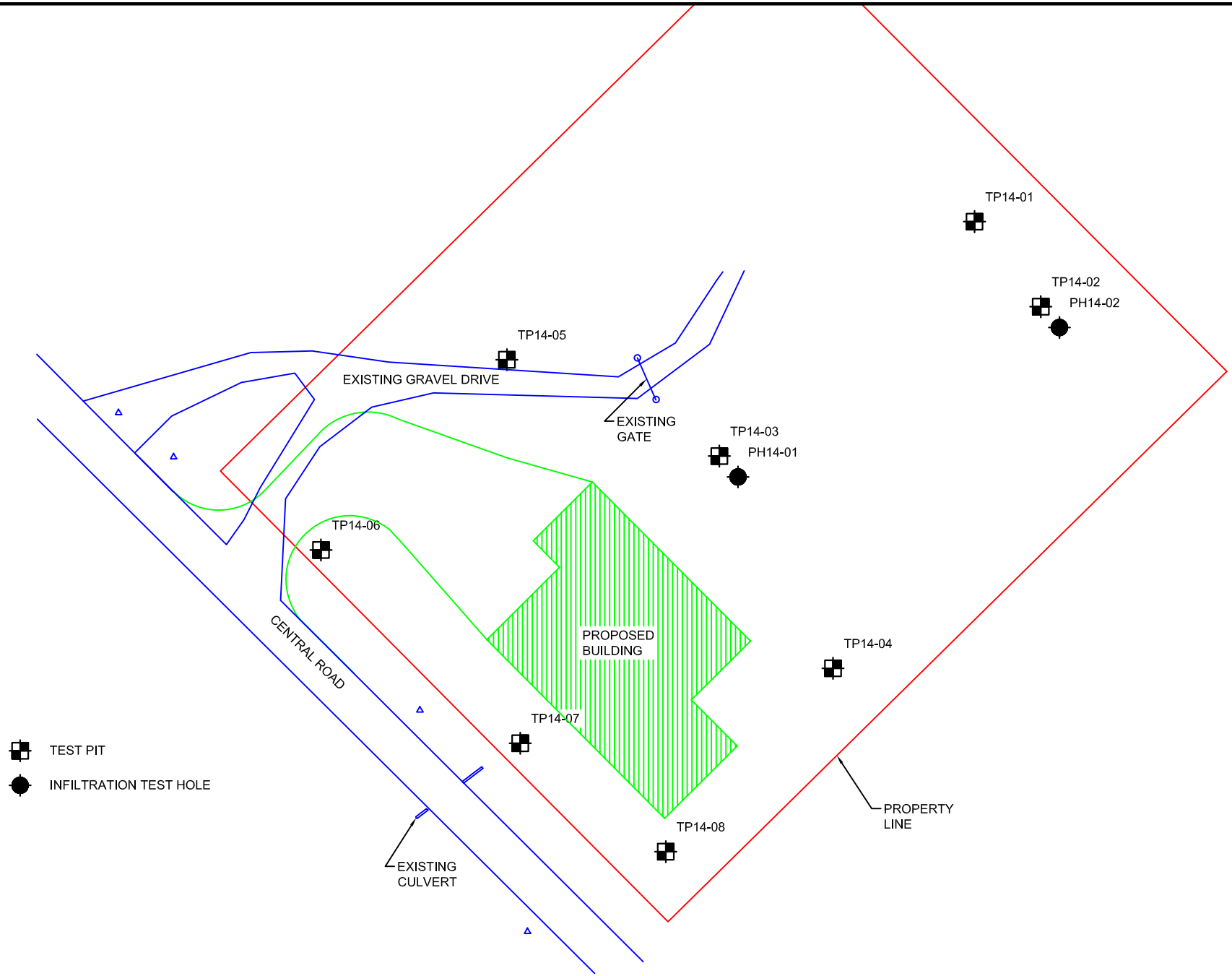
Respectfully Submitted,
**Lewkowich Engineering Associates Ltd.**

Johannes Fischer, EIT

PROFESSIONAL ENGINEER
PROVINCE OF BRITISH COLUMBIA
C.M. HUDEC
# 29249

Chris Hudec, M.A.Sc., P.Eng.
Project Engineer

Attachments: Site Plan (FIGURE 1); Test Pit Logs (TP 14-01 to TP14-08)




| REV No. | DATE DD-MM-YY | BY | P.Eng. | REVISION DESCRIPTION |
|---|---|---|---|---|
| | | | | |

DRAWING TITLE
TEST PIT SITE PLAN

PROJECT NAME
HORNBY FIRE HALL
3875 CENTRAL ROAD, HORNBY ISLAND, BC

LEGAL DESCRIPTION

ENGINEER'S SEAL

| PLOT DATE DD-MM-YY | DRAWN BY |
|---|---|
| 17-07-14 | JF |
| REVIEWED BY | SCALE |
| CMH | NTS |
| PROJECT No. | DRAWING No. |
| F1667 | 01 |

LEA
Lewkowich Engineering Associates Ltd.

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

File Number: F1667 TP14-01

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 | | 0.0m - 0.15m<br>Sand, some silt and organics (roots), trace gravel, loose, light brown-grey, dry |
| | | 0.15m - 0.75m<br>Sand with gravel (blocky sandstone), some organics (roots), trace gravel, trace silt, compact, poorly graded, light brown, dry (weathered sandstone) |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (sandstone)<br>No groundwater seepage<br>End test pit at 0.75m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

File Number: F1667 TP14-02

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 | | 0.0m - 0.15m<br>Sand, some silt and organics (roots), trace gravel, loose, light brown-grey, dry |
| | | 0.15m - 0.7m<br>Sand with gravel (well rounded), some organics (roots), trace silt, compact, poorly graded, red-brown |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (conglomerate)<br>No groundwater seepage<br>End test pit at 0.70m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

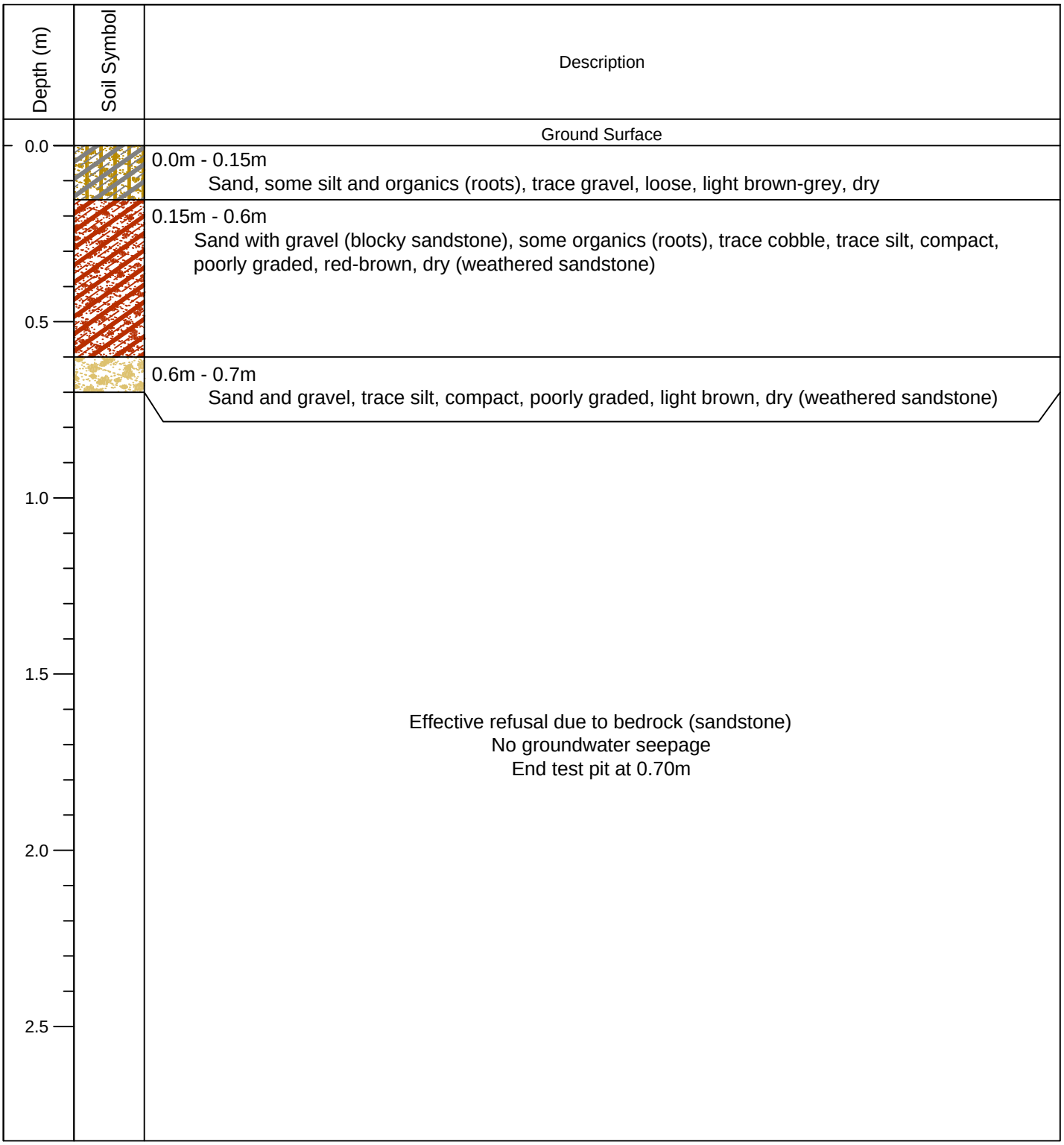
Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

# TEST PIT LOG

Lewkowich Engineering Associates Ltd.

File Number: F1667 TP14-03
Project: Hornby Fire Hall
Location: 3875 Central Road, Hornby Island, BC




Logged By: JF Date: July 4, 2014
Reviewed By: CH Sheet: 1 of 1
Digging Method: Yanmar Rubber-tracked Mini-Excavator


Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

# TEST PIT LOG

Lewkowich Engineering Associates Ltd.

File Number: F1667 TP14-04

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 | | 0.0m - 0.15m<br>Sand, some silt and organics (roots), trace gravel, loose, light brown-grey, dry |
| | | 0.15m - 0.75m<br>Sandy gravel with trace silt, organics, and cobble, compact, poorly graded, light brown, dry |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (sandstone)<br>No groundwater seepage<br>End test pit at 0.75m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

# TEST PIT LOG

Lewkowich Engineering Associates Ltd.

File Number: F1667 TP14-05

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 | | 0.0m - 0.2m<br>Sand, some silt and organics (roots), trace gravel, loose, light brown-grey, dry |
| | | 0.2m - 0.8m<br>Sandy gravel (well rounded), with trace silt and organics, compact, poorly graded, light brown, dry (weathered conglomerate) |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (conglomerate)<br>No groundwater seepage<br>End test pit at 0.8m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

Lewkowich Engineering Associates Ltd.

# TEST PIT LOG

File Number: F1667 TP14-06

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 | | 0.0m - 0.4m<br>Sand, some silt and organics (roots), trace gravel, loose, light brown-grey, dry |
| 0.5 | | 0.4m - 0.7m<br>Sandy gravel (well rounded), some cobbles, trace silt and organics, compact, poorly graded, light brown, dry (weathered conglomerate) |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (conglomerate)<br>No groundwater seepage<br>End test pit at 0.7m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

# TEST PIT LOG

Lewkowich Engineering Associates Ltd.

File Number: F1667 TP14-07

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| 0.0 | | Ground Surface |
| |  | 0.0m - 0.6m<br>Gravel and sand, some to trace silt, some organics (roots), loose to compact, light brown, dry |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (conglomerate)<br>No groundwater seepage<br>End test pit at 0.6m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com

# TEST PIT LOG

Lewkowich Engineering Associates Ltd.

File Number: F1667 TP14-08

Project: Hornby Fire Hall

Location: 3875 Central Road, Hornby Island, BC

| Depth (m) | Soil Symbol | Description |
|---|---|---|
| | | Ground Surface |
| 0.0 |  | 0.0m - 0.2m<br>Sand, some silt and organics (roots, moss), trace gravel, loose, light brown-grey, dry |
| |  | 0.2m - 0.7m<br>Well graded gravel, some sand, trace silt, compact, brown, dry (weathered conglomerate) |
| 0.5 | | |
| 1.0 | | |
| 1.5 | | Effective refusal due to bedrock (conglomerate)<br>No groundwater seepage<br>End test pit at 0.7m |
| 2.0 | | |
| 2.5 | | |

Logged By: JF Date: July 4, 2014

Reviewed By: CH Sheet: 1 of 1

Digging Method: Yanmar Rubber-tracked Mini-Excavator

Suite A - 2569 Kenworth Road
Nanaimo, British Columbia, V9T 3M4
Phone: (250) 756-0355
Fax: (250) 756-3831
Email: geotech@lewkowich.com