GEOPACIFIC
CONSULTANTS

P (604) 439 0922
geopacific.ca
1779 West 75th Avenue
Vancouver, B.C. V6P 6P2

City of Coquitlam
3000 Guildford Way
Coquitlam, B.C.
V3B 7N2

January 8, 2026
File: 25291
R1

Attention: Pierce Redon

**Re: Geotechnical Investigation Report – Cottonwood Tennis Courts**
**566 Cottonwood Ave, Coquitlam, B.C.**

## 1.0 INTRODUCTION

We understand that the City of Coquitlam plans to construct new tennis courts at the above address in Coquitlam, BC. Based on drawings provided to us by the City, dated December 8, 2025, it is proposed to construct 3 new asphalt surfaced tennis courts. The new courts will include a cast in place (CIP) concrete retaining wall, a 3 m high chain link fence, new light poles, and metal fence. The CIP retaining wall will be up to 1.2 m in height. We expect loading to be relatively light form the proposed improvements.

The following provides the results of our previous investigation of the general area and makes geotechnical recommendations for the design and construction of the proposed tennis courts. This report was prepared exclusively for the City of Coquitlam for their use and for the use of others on their team.

## 2.0 SITE DESCRIPTION

The project area is located approximately 250 m west of the intersection of Alder Avenue and Cottonwood Avenue in Coquitlam, B.C. The western half of the site is currently an active construction site, while the east half is improved with a single family home. The project area is bounded by Cottonwood Avenue to the north, existing residential developments to the east, Cottonwood Park to the south and an active construction site to the west. The site is relatively flat at an elevation of 107 m geodetic according to the City of Coquitlam's online GIS *QtheMap.*

The site location relative to the surrounding area is shown on our Drawing No. 25291-01, following the text of this report.

## 3.0 FIELD INVESTIGATION

GeoPacific previously completed a geotechnical investigation in the area on August 18, 2025, including 2 test holes in the area of the new tennis courts. The investigation was completed using a track mounted auger drill rig supplied and operated by Southland Drilling of Delta, BC. The test holes were advanced to depths of up to 4.6 m below the current site grades. The test holes were supplemented with Dynamic Cone Penetration Test (DCPT) soundings to characterize the relative density/consistency of the soils encountered. Disturbed samples were collected from auger flights for logging and laboratory testing.

Drilling operation was supervised by a member of our technical team and all test holes were backfilled in accordance with provincial abandonment requirements following classification, soil sampling and logging. Prior to our investigation, a BC-One-Call request was placed to locate the underground services. In addition, all test hole locations were cleared from underground utilities using geophysical methods, completed by our technical team.

The approximate locations of the test holes are shown on Drawing 25291-01, following the text of this report. Detailed test hole logs are presented in Appendix A.

## 4.0 SUBSURFACE CONDITIONS

### 4.1 Soil Conditions

The general geology of the proposed upgrades, according to the Geological Survey of Canada (GSC) map 1484A, consists of Vashon Drift and Capilano Sediments consisting of lodgment and minor flow till, lenses and interbeds of substratified glaciofluvial sand to gravel, and lenses and interbeds of glaciolacustrine laminated stony silt.

A general description of the soils encountered at the site during our investigation is provided below. For specific subsurface soil descriptions at each test hole location, please review our test hole logs in Appendix A, following this report:

#### FILL

The area at the test hole locations is surfaced with sand fill that extends up to 1.5 m below site grades. The fill is generally loose, becoming compact to dense with depth, moist, and tan in colour.

#### SILTY SAND/SANDY SILT (VASHON DRIFT)

Vashon Drift (Glacial Till) deposits of silty sand or sandy silt were encountered below the fill at the test hole locations. The till layer is generally comprised of very dense, silty, fine to medium grained sand with trace to some gravel content and is grey to brown in colour. The till layer extended beyond of the depths of the investigation.

### 4.2 Groundwater Conditions

The static groundwater table is estimated to be between 14 and 15 m below site grades based on our previous investigations in the area. Perched groundwater may be encountered overlying the low permeable glacial till between 0.9 and 1.5 m below site grades. The groundwater levels are expected to fluctuate during the year with higher levels expected during the winter months or after prolonged periods of rain.

## 5.0 DISCUSSION

As noted above, it is proposed to construct 3 new asphalt surfaced tennis courts. The new courts will include a cast in place (CIP) concrete retaining wall, a 3 m high chain link fence, new light poles, and metal fence. The CIP retaining wall will be up to 1.2 m in height. We expect loading to be relatively light form the proposed improvements.

We expect the improvements will be founded on existing compact fill or dense to very dense glacial till. The existing soils on-site are <u>not</u> liquefiable during the design earthquake defined in the 2024 British Columbia Building Code (BCBC) design earthquake.

We confirm, from a geotechnical standpoint, that the proposed improvements are feasible provided the recommendations outlined in section 6.0 of this report are incorporated into the overall design.

## 6.0 DESIGN RECOMMENDATIONS

### 6.1 Site preparation

Prior to construction of the tennis court, retaining walls or light poles, any vegetation, organic top soils, loose fills, and loose or otherwise disturbed materials should be removed from the project area to expose a subgrade of compact sand fill or dense to very dense glacial till. Based on the results of our previous geotechnical investigation, we expect the minimum stripping depths would be less than 0.3 m.

We understand the existing residential homes will be demolished and the basements will be backfill prior to the tennis court construction. Grade reinstatement should be completed using engineered fill. In the context of this report, "Engineered Fill" is generally defined as clean sand to sand and gravel containing silt and clay less than 5 % by weight, compacted in 300 mm loose lifts to a minimum of 95% of the ASTM D1557 (Modified Proctor) maximum dry density at a moisture content that is within 2% of optimum for compaction.

### 6.2 Foundations

Any foundation which are founded on existing compact fill or dense to very dense glacial till, as described in Section 4.1, can be designed on the basis of a serviceability limit state (SLS) bearing pressure of 120 kPa. Factored ultimate limit state (USL) bearing pressures, for transient loads such as those induced by wind and earthquakes, may be taken as 180 kPa.

We estimate for foundations designed as recommended, settlements will not exceed 25mm total and 2mm per metre differential.

Irrespective of the allowable bearing pressures given, pad footings should not be less than 600mm by 600mm and strip footings should not be less than 450mm in width. Footings should also be buried a minimum of 450mm below the surface for frost protection.

Adjacent footings should achieve a maximum elevation difference equal to half of their horizontal distance to avoid superimposing the upper foundation loading to the lower foundation.

*Foundation subgrades must be inspected by the geotechnical engineer prior to footing construction.*

### 6.3 Seismic Site Designation

We have considered the BCBC 2024 design earthquake which has a 2% probability of exceedance over a 50-year period which equates to a return period of 2475 years. Accordingly, we have considered an earthquake having a peak horizontal ground acceleration of 0.44 g for this site (Natural Resources Canada 2020, Site Coordinates: 49.258 N and 122.888 W).

As noted above, the site is underlain by dense glacially deposited soils within 1.5 m of existing site grades. The Therefore, the site qualifies as "Site Designation $X_C$" as defined in Table 4.1.8.4B. of the BCBC 2024. Based on previously undertaken investigations in the area, the subsurface soils are not considered prone to ground liquefaction or other forms of ground softening caused by earthquake-induced ground motions.

## 6.4 Earth Pressures on CIP Retaining Walls

The earth pressures on buried portions of foundation walls depends on a number of factors including the backfill material, surcharge load, backfill slope, drainage, rigidity of the wall and method of construction including sequence and degree of compaction. We recommend that the retaining walls be designed to resist the following lateral earth pressures:

Static: Triangular soil pressure distribution of 5.0H kPa, where H is equal to the total wall height in metres.

Seismic: Inverted triangular soil pressure distribution of 3.0H kPa, where H is equal to the total wall height in metres.

The seismic pressure should be combined with the static earth pressure when assessing the wall resistance to earthquake loading. Additional lateral surcharge loading associated with uniform surcharge loads (q), against the retaining walls may be taken as 0.27q, in addition to the pressures noted above. We recommend a minimum surcharge of 10 kPa be considered for traffic loading.

We understand that passive resistance and sliding resistance may be relied upon to resist lateral loads. Sliding resistance can be calculated by assuming an unfactored coefficient of sliding resistance of 0.50. The unfactored passive pressure developing against the retaining wall can be assumed to be 72H kPa rectangular where H is the height of soil acting against the retaining wall.

We have assumed that a free draining granular backfill will be used behind the retaining walls and that a perimeter drainage system will also be employed to collect any water from behind the walls. Therefore, our wall loading scenarios presented above assume that no water pressure will be generated behind the walls. The wall backfill is to be comprised of free-draining material consistent with the description of engineered fill provided in Section 6.1 of this report and the drainage behind the wall as described in Section 6.5 below.

Compaction of retaining wall backfill within 1.5m of the walls should be compacted in maximum 200 mm thick loose lifts using a maximum 500 lbs. walk behind vibratory plate tamper to prevent development of any significant compaction induced stress against the retaining wall.

All earth pressures are based upon no surcharges or slopes above the walls. All soil parameters and loads are assumed to be unfactored.

*The geotechnical engineer should be contacted for the review of all backfill materials and procedures.*

## 6.5 Retaining Wall Drainage

The retaining walls are understood to be designed with a perimeter drainage system. The drainage pipes shall not be less than 100 mm in diameter and consist of a perforated material standard outlined in Section 9.14.3.1 – Division B, Part 9, of the BCBC. The perimeter drainage shall be covered with a minimum of 300 mm of 19 mm clear crush gravel or rounded drain rock. The drainage rock is to be encapsulated with a non-woven geotextile. The drainage system should be connected to the site storm water system. The drainage system shall be provided with cleanouts to allow cleaning of the system. The size and spacing of the cleanouts shall be in conformance with Table 2.4.7.2 – Division B, Part 2 of the British Columbia Plumbing Code.

### 6.6 Retaining Wall Design Criteria – Typical Factors of Safety

The minimum design condition factors of safety outlined in EGBC's Retaining Wall Design, version 1.2, dated October 10, 2024, should be considered by the retaining wall designer. We have attached Table 4 from EGBC retaining wall practice guidelines noted above as an appendix to this report for ease of reference as requested by the retaining wall designer.

### 6.7 Tennis Court Pavement Structure

As noted above, the new tennis courts will be surfaced with asphalt. Once site preparation works are completed as outlined in Section 6.1, the tennis courts should be constructed to meet the minimum pavement structure thickness outlined in Table 1 below, which is required by the City of Coquitlam.

**Table 1: Recommended Tennis Court Pavement Structure**

| Material | Min. Thickness (mm) |
|---|---|
| Acrylic Court Surfacing | - |
| Asphalt Surface Course (MMCD Upper Course #2) | 40 |
| Asphalt Base Course (MMCD Lower Course #2) | 60 |
| Crushed Granular Base Course | 150 |
| 6 mm poly Weed barrier | - |

Granular base course shall consist of 19 mm minus crushed gravel, free from any organics, foreign matter, or deleterious substances. The gravel shall be durable, uniform in quality, and 100% of the gravel shall have at least one fractured face. The aggregate shall conform to the gradation curve given in Master Municipal Construction Document (MMCD) Section 31 05 17 2.10.1 Granular Base and shall have a minimum CBR (ASTM D1883) of 60 at 95% Modified Proctor Dry Density (MPDD).

The asphaltic concrete pavement shall be provided and placed in accordance with MMCD specifications. Paving of hot mix asphalt should be completed during favourable weather conditions and when the ambient air temperature is a minimum of 5°C.

### 6.8 Temporary Excavations

We expect that temporary excavations would be relatively shallow and less than 1.2 m deep, except for the construction of the CIP retaining wall. The existing soils should be excavated at a slope of 1 horizontal to 1 vertical (1H:1V). It should be appreciated that temporary cut slopes which extend beyond a 2H:1V projection taken from any adjacent footing or the corner of adjacent pipes should be reviewed by the geotechnical engineer prior to execution. Light seepage during the wetter months of the year should be expected due to the formation of perched groundwater. Inflows are expected to be handled adequately with sumps and sump pumps.

*Temporary cut slopes in excess of 1.2 m in height must be covered in polyethylene sheeting and require review by a professional engineer in accordance with Work Safe BC guidelines, prior to worker entry.*

## 7.0 DESIGN REVIEWS AND CONSTRUCTION

The preceding sections make recommendations for the design and construction of the proposed improvements. We have recommended that we be retained for the review of certain aspects of the design and construction. It is important that these reviews are carried out to ensure that our intentions have been adequately communicated. It is also important that any contractors working on the site review this document prior to commencing their work.

It is the responsibility of the contractors working on-site to inform GeoPacific a minimum of 24 hours in advance that a field review is required. In summary, reviews are required by geotechnical engineer for the following portions of the work:

| | |
|---|---|
| 1. Stripping | Review of site stripping. |
| 2. Excavation | Review of temporary cut slopes and soil conditions. |
| 3. Foundation | Review of foundation subgrade prior to foundation construction. |
| 4. Engineered Fill | Review of compaction of engineered fill. |
| 5. Pavement Structure | Review of pavement structure subgrade and pavement structure gravels. |

## 8.0 CLOSURE

This report has been prepared exclusively for our client for the purpose of providing geotechnical recommendations for the design and construction of the proposed improvements. The report remains the property of GeoPacific Consultants Ltd. and unauthorized use of, or duplication of, this report is prohibited.

We are pleased to assist you with this project and we trust this information is helpful and sufficient for your purposes at this time. However, please do not hesitate to call if you should require any clarification.

For:
**GeoPacific Consultants Ltd.**

Austin Lockstidt, B.A.Sc., EIT.
Project Engineer

**Reviewed By:**

A. M. GOSSEN
# 52067
2026-01-09
Permit to Practice EGBC
1000782

Alex Gossen, M.Eng., P.Eng.
Senior Geotechnical Engineer

L E G E N D :

🟥 - APPROXIMATE TENNIS COURT UPGRADE AREA

TH25-00 ⊕ - APPROXIMATE TEST HOLE LOCATIONS

REFERENCE:

**GEOPACIFIC**
VANCOUVER KAMLOOPS CALGARY

1779 W. 75th Avenue
Vancouver, B.C. V6P 6P2
P 604.439.0922
F 604.439.9189

| | | |
|---|---|---|
| DATE: SEPTEMBER 29, 2025 | | |
| DRAWN BY: ALO | APPROVED BY: AG | REVIEWED BY: AG |
| SCALE: NOT TO SCALE | | |

# PROPOSED TENNIS COURT UPGRADES
COTTONWOOD AVENUE, COQUITLAM, BC
GEOTECHNICAL INVESTIGATION AREA

FILE NO.: 25291
DWG. NO.: 25291-01

REVISIONS:
A.
B.
C.

ORIGINAL PAPER SIZE 8.5"x11"

# APPENDIX A – TEST HOLE LOGS

# Test Hole Log: TH25-04

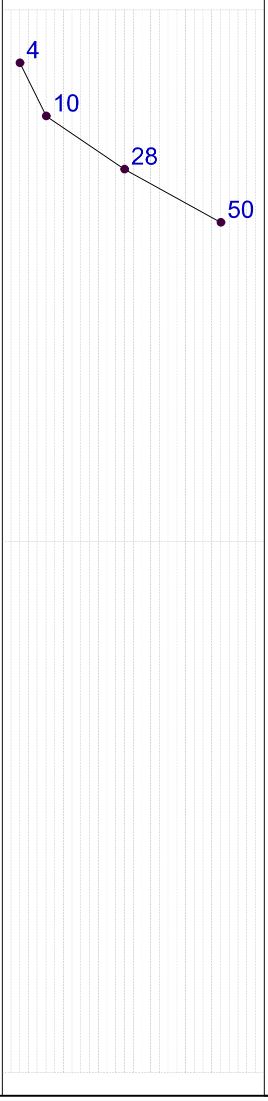
**File:** 14317-A

**Project:** Whitgift Gardens - Whitgift Gardens - Transfer of Property to City of Coquitlam

**Client:** Concert Properties Ltd.

**Site Location:** 550 Cottonwood Avenue, Coquitlam, BC

GEOPACIFIC
CONSULTANTS
1779 West 75th Avenue, Vancouver, BC, V6P 6P2
Tel: 604-439-0922 Fax:604-439-9189

| INFERRED PROFILE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Depth | Symbol | SOIL DESCRIPTION | Depth/Elev (m) | Moisture Content (%) | DCPT<br>● (blows per foot) ●<br>10 20 30 40 50 | Groundwater / Well | Remarks |
| ft m<br>0 0 | | Ground Surface | 0.0 | | | | |
| 1<br>2<br>3 | | ***FILL***<br>Sandy Fill, fine to medium grained sand, loose to compact, tan, moist | 0.9 | |  | | |
| 1<br>4<br>5<br>6<br>2<br>7<br>8<br>9<br>10<br>3<br>11<br>12<br>13<br>4<br>14<br>15 | | ***GLACIAL TILL***<br>Silty Sand trace to some gravel, dense to very dense, light grey, moist<br>Increase in amount of gravel from 10' | 4.6 | | | | Fines content 45.2% from 10' to 15' |
| 16<br>5<br>17<br>18<br>19<br>6<br>20 | | End of Borehole | | | | | |

Logged: LS
Method: Track-Mounted Auger
Date: August 18th, 2025

Datum: Ground Elevation
Figure Number: 4
Page: 1 of 1

# Test Hole Log: TH25-05

***File:*** 14317-A

***Project:*** Whitgift Gardens - Whitgift Gardens - Transfer of Property to City of Coquitlam

***Client:*** Concert Properties Ltd.

***Site Location:*** 550 Cottonwood Avenue, Coquitlam, BC

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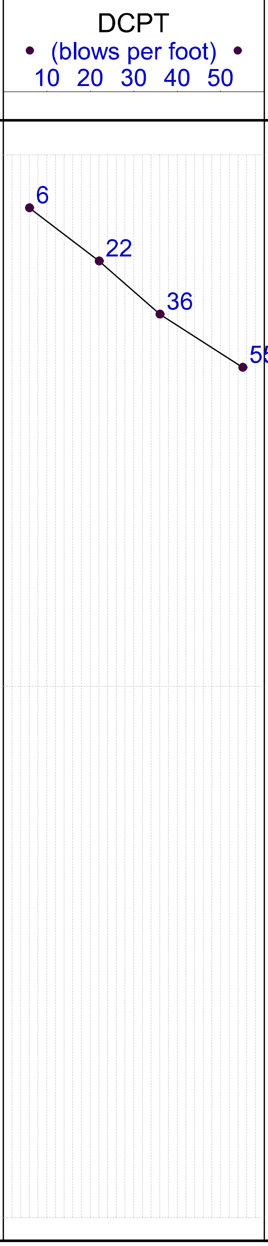
Tel: 604-439-0922 Fax:604-439-9189

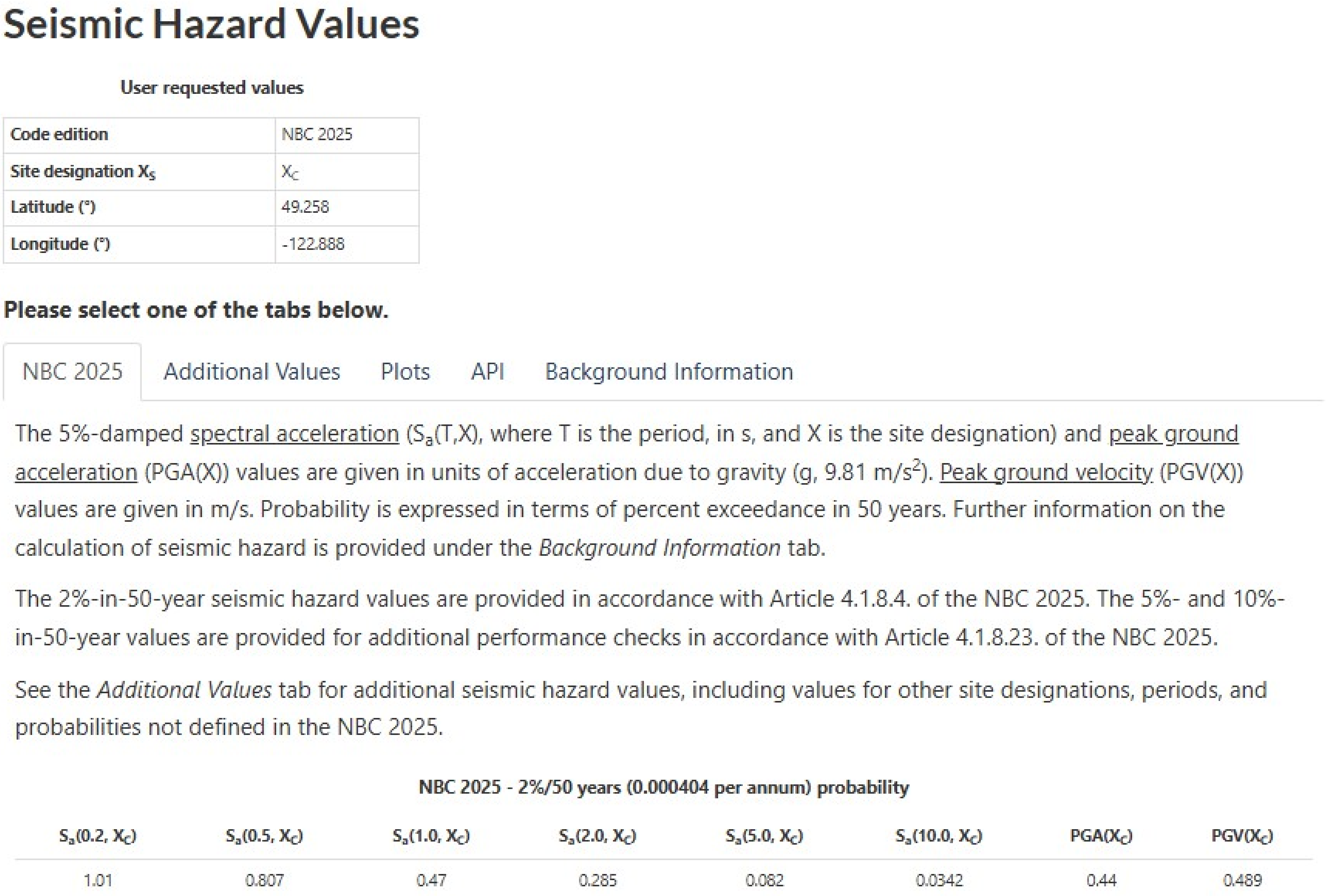
| INFERRED PROFILE | | | | | | | |
|---|---|---|---|---|---|---|---|
| Depth | Symbol | SOIL DESCRIPTION | Depth/Elev (m) | Moisture Content (%) | DCPT (blows per foot) | Groundwater / Well | Remarks |
| ft m |  | Ground Surface | 0.0 | | | | |
| 0–5 ft |  | ***FILL***<br>Sandy Fill, fine to medium grained sand, loose to compact, tan, moist | 1.5 | | 6<br>22<br>36<br>55 | | |
| 5–10 ft |  | ***GLACIAL TILL***<br>Sandy Silt trace gravel, stiff to very stiff, light grey, moist | 3.0 | | | | Fines content 87.3% from 5' to 10' |
| 10–15 ft |  | ***GLACIAL TILL***<br>Silty Sand trace to some gravel, dense to very dense, grey, moist | 4.6 | | | | Fines content 37.2% from 10' to 15' |
| |  | End of Borehole | | | | | |



Logged: LS
Method: Track-Mounted Auger
Date: August 18th, 2025

Datum: Ground Elevation
Figure Number: 5
Page: 1 of 1

# APPENDIX B – SEISMIC HAZARD VALUES



# Seismic Hazard Values

**User requested values**

| | |
|---|---|
| **Code edition** | NBC 2025 |
| **Site designation $X_S$** | $X_C$ |
| **Latitude (°)** | 49.258 |
| **Longitude (°)** | -122.888 |

**Please select one of the tabs below.**

The 5%-damped spectral acceleration ($S_a(T,X)$, where T is the period, in s, and X is the site designation) and peak ground acceleration (PGA(X)) values are given in units of acceleration due to gravity (g, 9.81 m/s$^2$). Peak ground velocity (PGV(X)) values are given in m/s. Probability is expressed in terms of percent exceedance in 50 years. Further information on the calculation of seismic hazard is provided under the *Background Information* tab.

The 2%-in-50-year seismic hazard values are provided in accordance with Article 4.1.8.4. of the NBC 2025. The 5%- and 10%-in-50-year values are provided for additional performance checks in accordance with Article 4.1.8.23. of the NBC 2025.

See the *Additional Values* tab for additional seismic hazard values, including values for other site designations, periods, and probabilities not defined in the NBC 2025.

**NBC 2025 - 2%/50 years (0.000404 per annum) probability**

| $S_a(0.2, X_C)$ | $S_a(0.5, X_C)$ | $S_a(1.0, X_C)$ | $S_a(2.0, X_C)$ | $S_a(5.0, X_C)$ | $S_a(10.0, X_C)$ | $PGA(X_C)$ | $PGV(X_C)$ |
|---|---|---|---|---|---|---|---|
| 1.01 | 0.807 | 0.47 | 0.285 | 0.082 | 0.0342 | 0.44 | 0.489 |

# APPENDIX C – EGBC RETAINING WALL FACTOR OF SAFETY TABLE

Volume 1 (Publication No. FHWA-NHI-10-024) (FHWA 2009)

- Chapter 4 of FHWA Design and Construction Guidelines for Geosynthetic Reinforced Soil Abutments and Integrated Bridge Systems (Publication No. FHWA-HRT-17-080) (FHWA 2018)

## 3.3 RETAINING WALL PERFORMANCE REQUIREMENTS

### 3.3.1 PERFORMANCE EXPECTATIONS

Retaining Walls must be designed and constructed in such a way that they continue to meet design and performance criteria under static and dynamic loading conditions over their design life.

Examples of design and performance criteria include the following:

- Total and differential settlement, rotation, and sliding over the design life is compatible with the function, performance requirements, and wall materials
- Non-collapse during the design seismic event
- Drainage system remains functional
- Durability of Wall Facing

### 3.3.2 FACTOR OF SAFETY

The minimum factor of safety for Retaining Wall design must be established based on the specific site requirements. Table 4: Retaining Wall Design Criteria – Typical Minimum Factors of Safety lists generally accepted design criteria for Retaining Walls; however, Engineering Professionals should always check with the local Regulatory Authority to determine what requirements are in place.

If there are no factor of safety requirements, the ones provided in Table 4 should be used. Where these factors of safety cannot be met, the appropriate jurisdictional body should be notified.

*Table 4: Retaining Wall Design Criteria – Typical Minimum Factors of Safety*

| DESIGN CONDITION | MINIMUM FACTOR OF SAFETY | | |
|---|---|---|---|
| | STATIC LOADING | 1-IN-475-YEAR SEISMIC EVENT | 1-IN-2,475-YEAR SEISMIC EVENT |
| GLOBAL STABILITY | | | |
| Long-term | 1.5 | 1.2 | 1.1[a] |
| End of construction/transient loading | 1.3 | N/A | N/A |
| EXTERNAL STABILITY | | | |
| Sliding | 1.5[b] | 1.2 | 1.1[a] |
| Overturning | 2.0 | 1.5 | 1.1[a] |
| Bearing | 2.0 to 3.0[c] | 1.5 | 1.1[a] |
| PERFORMANCE | | | |
| Long-term | Varies depending on end use | Repairable damage[d]<br>No collapse | Extreme damage[e]<br>No collapse |