

9 June 2021

Mr Forrest Suo
HND TS Limited
6 Scott Road
Hobsonville
Auckland 0618

Dear Forrest

RE: Fast Track Summary - 6 - 10 The Strand / 21 Hurstmere Road, Takapuna, Auckland
(Our Reference: 17733.000.000_02)

1 Introduction

ENGEO Limited (ENGEO) was requested by HND TS Limited to provide a geotechnical summary for the proposed development at 6 - 10 The Strand / 21 Hurstmere Road, Takapuna, Auckland (the site). This work has been carried out in accordance with our signed agreement with HND TS Limited.

ENGEO is an environmental and geotechnical consultancy with five offices and more than 90 technical staff in New Zealand. We also draw support from a network of over 220 technical staff in Australia and the United States. ENGEO specialises in providing geotechnical and contaminated land services to developers and landowners to support construction services. Our reports are used to support Resource and Building Consent Applications, and to ensure that works are conducted with due consideration to the potential risks arising from contaminated land and geotechnical properties of the ground.

My name is Paul Fletcher and I have worked for ENGEO since 2015. I have fifteen years' experience as a geotechnical Engineer in NZ. I have a Bachelor of Engineering Degree from the University of Auckland and completed my Masters Degree in Geotechnical Engineering at the University of New South Wales in Sydney.

ENGEO have been engaged to undertake geotechnical investigations at the site and to provide geotechnical consulting services to support the proposed development.

The development proposed for this site comprises a large mixed use; commercial and residential building with a deep basement. I have previously worked on a large number of mixed use buildings around Auckland and have a considerable body of experience with deep basement excavations in close proximity to existing structures.

2 Site Description

The site currently comprises a number of existing commercial buildings, including an at-grade carpark within 6 to 10 The Strand. The site is bordered by Hurstmere Road to the west, The Strand to the south, Channel View Road to the west, and neighbouring commercial properties to the north.

Site topography is generally gently sloping down towards the east (Takapuna Beach). Based on elevation contours shown on the Auckland Council GEOMAPs, site elevations varies between approximately 18.0 m RL at the western boundary to approximately 11.0 m RL at the north-eastern corner of the site.

3 Proposed Development

The conceptual architectural plans by Moller Architects Limited (dated 28 May 2021) indicate that the proposed development comprises the demolition of the existing structures on site, and the construction of an eleven-storey building with a two to four level basement.

A two-level basement is proposed in the upslope, western portion of the site (approximately across the footprint of 21 Hurstmere Road), with a proposed Finished Floor Level (FFL) of 11.0 m RL for the B2 basement level.

A four-level basement is proposed in the downslope, eastern portion of the site (approximately across the footprint of 6 to 10 The Strand), with a proposed Finished Floor Level (FFL) of 4.4 m RL for the B4 basement level.

Basement excavation depths will vary across the site, and will be up to approximately 14.0 m depth along the western side of the proposed B4 basement (allowing for up to 1.0 m excavation below the B4 FFL).

4 Geotechnical Investigations

ENGEO undertook initial geotechnical investigations at the site in October 2020, comprising two machine boreholes to a maximum depth of 50.1 m, four Cone Penetration Tests (CPTs) to a maximum depth of 22.4 m, and four shallow hand auger boreholes to a maximum depth of 1.3 m. Due to retail stores operating at the time, no geotechnical investigations were undertaken in the western portion of the site (within 21 Hurstmere Road).

ENGEO installed standpipe piezometers and electronic data loggers within the two machine boreholes, and monitored groundwater levels at the site over a period of four weeks between October and November 2020.

ENGEO commissioned Unconfined Compressive Strength (UCS) laboratory testing of two rock core samples retrieved from the machine boreholes.

ENGEO have also reviewed the historical geotechnical reports on the Council property files for the adjacent neighbouring sites to the west (33 to 56 and 45 Hurstmere Road), which included four machine boreholes drilled to depths of between 16.3 and 24.5 m bgl.

5 Geotechnical Conditions

Based on the findings from the initial ENGEO investigations, ground conditions at the site generally comprise:

- a. A surficial layer of undocumented fill down to a maximum depth of 3.0 m below ground level (m bgl), which generally comprise firm to stiff silts.
- b. Native alluvial soils to depths down to depths of between 14.0 and 17.0 m bgl, which generally comprise very soft to very stiff silts and clays, with localised organic soil layers.
- c. East Coast Bays Formation (ECBF) transitional soils and bedrock from 14.0 and 17.0 m bgl, which generally comprise very dense sand and extremely to very weak sandstone and siltstone.
- d. Groundwater levels vary between approximately 1.5 to 3.5 m bgl across the site.

Historical machine boreholes undertaken in the adjacent neighbouring sites at 33 to 56 and 45 Hurstmere Road indicated similar ground conditions to those encountered at the site, with the exception that the alluvial soils were overlain by a layer (up to 4 m thick) of volcanic Tuff (medium dense to dense sands and gravels) in some areas. Inferred ECBF transitional soils and bedrock was encountered at depths varying between approximately 14.0 and 21.0 m bgl, with the deeper ECBF level encountered at the western, upslope side of both properties.

6 Geotechnical Constraints

As no geotechnical investigations have been undertaken in the western portion of the site within 21 Hurstmere Road (apart from historical investigation data from the adjacent neighbouring sites), there is a risk that ground conditions in this area vary from the conditions encountered in the other areas of the site. Geotechnical investigations in this area are currently being planned to be undertaken in August 2021, which will mitigate this risk.

The proposed multi-level basement excavation (up to approximately 14.0 m depth) will be excavated within potentially low strength alluvial soils and will be in close proximity to neighbouring properties, including existing buildings along Hurstmere Road which are immediately adjacent to the site boundary. The primary geotechnical risk is that deflection of the basement retention structure leads to settlement and potential damage to the neighbouring land and buildings. This risk can be mitigated through conventional top-down basement construction methodologies, which will involve propping the basement retention structure prior to bulk excavations. Propping may consist of internal temporary props within the site, construction of ground floor and upper basement floors first and utilising these as floor props as excavations are progressed, or ground anchors drilled into the ECBF bedrock under the neighbouring properties (subject to property owner approvals).

The multi-level basement is expected to be extend below the groundwater table on site. The presence of low strength alluvial soils in the upper 10 m soil profile means that if the groundwater table is lowered as result of the excavations, there is a risk of ground settlement within neighbouring properties - due consolidation of the alluvial soils. This risk can be mitigated through the use of a tanked basement retention structure. These basements typically comprise a secant pile, diaphragm or a steel clutch pile retaining wall.

A consequence of the shallow groundwater levels on site and a deep tanked basement is that there will be significant hydrostatic uplift pressures on the basement floor slab. This can be addressed through suitable design of the base slab, which may comprise a monolithic concrete raft foundation with uplift anchors.

The proposed eleven-storey building will likely have significant foundation loads. The ECBF bedrock is considered to be a suitable founding layer for deep foundations supporting the new building.

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7 Limitations

- i. We have prepared this report in accordance with the brief as provided. This report has been prepared for the use of our client, HND TS Limited, their professional advisers and the relevant Territorial Authorities in relation to the specified project brief described in this report. No liability is accepted for the use of any part of the report for any other purpose or by any other person or entity.
- ii. The recommendations in this report are based on the ground conditions indicated from published sources, site assessments and subsurface investigations described in this report based on accepted normal methods of site investigations. This report does not purport to completely describe all the site characteristics and properties. The nature and continuity of the ground between test locations has been inferred using experience and judgement and it should be appreciated that actual conditions could vary from the assumed model.
- iii. Subsurface conditions relevant to construction works should be assessed by contractors who can make their own interpretation of the factual data provided. They should perform any additional tests as necessary for their own purposes.
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- v. This report is not to be reproduced either wholly or in part without our prior written permission.

We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (09) 972 2205 if you require any further information.

Report prepared by



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