

24 May 2022

Mr Kurt Kerrison  
Gresham Trustee Limited  
Level 2, 161 Cuba Street  
Te Aro  
Wellington 6011

Dear Kurt

**RE: RFI Responses - 240 Kapiti Road, Paraparaumu Beach, Paraparaumu**  
**(Our Reference: 19667.000.001\_04)**

## 1 Introduction

ENGEO Ltd completed a geotechnical investigation and provided a desktop study report, and a site investigation and geohazard assessment report for the proposed residential subdivision at 240 Kapiti Road, Paraparaumu Beach, Paraparaumu (our ref: 19667.000.000\_01 dated 18/11/21, 19667.000.000\_02 dated 28/01/2022). This report was submitted to Kapiti Coast District Council, and a Request for Further Information (RFI) was received.

ENGEO has been requested by our client Gresham Trustee Limited to provide responses to the geotechnical queries. The statements from Council are provided below.

We have been provided with a copy of Cuttriss Ltd's Cut to Fill Earthworks Plan (Drawing No:22930-SK sheets 1-4, dated 12/01/2022).

- 1. There will be around 1 – 3 meter deep cut along the neighbouring boundary highlighted as below. The ENGEO Geotechnical report supplied doesn't address the effects on the neighbouring land due to the proposed activities and no recommendation is supplied to mitigate these effects. Geo-professional shall review the final earthwork plans supplied with RC application and provide and recommendation / mitigation measures.*
- 2. Geo-tech report concludes that site sandy soil can only be used as fill as long as it meets the standards and requires lab testing prior to using it as fill on site. Please confirm for lab testing – provide evidence that the site cut soil can be used as fill as this might have impact on total material import / export to and from site and expected traffic movement.*
- 3. No recommendation is provided for proposed retaining wall. Geo-professional / suitable qualified person to review earthworks plan and provide construction methodology of proposed retaining wall (specifically along the highlighted boundary below) to ensure there will be reduced impacts on the neighbouring land.*

4. *Geo-professional needs to confirm the effects of lateral spreading will be no problem to the new build as well as neighbouring land due to proposed earthworks (cut) by reviewing the final earthworks and any field investigation required.*

## 2 Geotechnical Responses

### 2.1 Site Boundary Cut Earthworks

The project team have discussed the suitability, and constructability of the proposed cut and retaining structures along the eastern boundary of the site. The proposed earthworks plan from Cuttriss Ltd indicate that cuts up to 3 m high will be required along the boundary in this area, to achieve the desired finished ground levels.

The project team have considered both the temporary stability of the proposed earthworks during construction, and the long-term stability of the ground following the completion of the proposed development. We have agreed on the following methodology, subject to detailed design:

#### Phase 1 – Temporary Retaining During Earthworks

To safely complete the necessary cuts along the eastern boundary, temporary retaining measures will be required prior to undertaking the cut earthworks. Through discussion with the client and Halverson Civil Ltd, we have agreed that a series of CFA Piles could be installed from existing ground level, in the areas where the proposed cuts are greater than 1.5 m. In areas where the proposed cuts are less than 1.5 m, Sheet Piles could be used. Once the temporary retaining measures have been completed, the ground in-front of the wall can be safely removed, without affecting the neighbouring properties.

The CFA Piles, and Sheet Piles will be partially embedded in liquefiable material, which is likely to be acceptable for the temporary stability case, however the liquefaction risk will need to be mitigated for the retaining structure to be acceptable over its design life.

#### Phase 2 – Ground Improvement to Reduce Liquefaction Risk

Following the cut earthworks along the eastern boundary, the ground in front of the CFA Pile Wall/ Sheet Piles will require ground improvement to reduce the risk of liquefaction in the soils supporting the wall. ENGEО and the project team have considered densification of the soil immediately in front of the proposed wall via Displacement Drilled Piles (DDP), or Stone Columns as possible suitable solutions in this situation.

The suitability of the DDP ground improvement method will be tested on site prior to any earthworks being undertaken. Halverson Civil Ltd has proposed to install DDP's on the site, in a series of test grids consisting of piles in a 9 x 9 lattice to approximately 8 m below ground level. CPT testing will be conducted prior to the installation of the piles and compared to further CPT tests completed following their installation. Shear wave velocity geophysical testing will also be completed, to further assess the effectiveness of the trial in stiffening the soil and reducing the risk of liquefaction induced damage.

Should the results of the DDP trials indicate that the liquefaction risk has not been adequately mitigated, we consider that stone columns will be an appropriate alternative solution.

### Phase 3 – Permanent Retaining

Once the liquefaction risk in the soils in front of the wall has been suitably mitigated, the cut will be permanently retained via an L shaped, concrete block cantilever wall. This will allow the retained structure to rely on the strength of the improved ground within the site boundary, and no longer require the support of the potentially liquefiable soils on neighbouring properties.

The details of these retaining walls, and the proposed liquefaction mitigation methods will be established and confirmed during the detailed design phase of the project.

## 2.2 Soil Testing

A sample of the recovered soils was taken from the site at 240 Kapiti Road and delivered to Material Advisory and Testing Services Laboratory (MATS Lab). MATS Lab completed a standard compaction test, and a particle size distribution test on the recovered soils. The results of the testing indicated that the soil was a fine to medium sand, with a maximum dry density of 1.47 t/m<sup>3</sup> at an optimum water content of 22.5%.

We consider the site won sand to be acceptable for use as fill material for the proposed development, although as with all sandy soils use for fills, control of the moisture during fill placement will be both important and challenging.

## 2.3 Site Boundary Fill Earthworks

The proposed cut / fill plans from Cuttriss Ltd show that fill will be placed up to 1.4 m high around parts of the western and north-western boundaries. Retaining walls will be required in these areas for vertical fills to be achieved.

ENGEO considers that gravity or L-shaped block cantilevered walls will be suitable for retained heights in this area up to 1.4 m. Setback distances for the proposed buildings may also be required, at roughly a 1:1 ratio (i.e. 1.4 m setback for 1.4 m retained height), unless the walls are specifically designed to support building surcharge loads.

The foundations of these retaining walls will require some form of liquefaction mitigation, such as the geogrid reinforced fill rafts that have already been proposed for the site.

The details of these retaining walls will be established during the detailed design phase of the project, for Building Consent.

## 2.4 Lateral Spreading Hazard

As discussed in our Site Investigation and Geohazard Assessment Report (19667.000.000\_02 dated 28/01/2022), lateral spreading has the potential to affect the easternmost corner of the proposed development under ULS conditions. As discussed in that same report we assess that the hazard can be suitably mitigated via the placement and compaction of geogrid reinforced, engineered fill rafts beneath building footprints, with the potential to combine this with Rib Raft, or waffle slab foundations.

The proposed earthworks and retaining structures will not substantially worsen the lateral spreading hazard to the neighbouring properties, provided they are designed in line with the methodologies outlined in our previous reporting and within this letter.

### 3 Limitations

We have prepared this letter in accordance with the brief as provided. This letter has been prepared for the use of our client, Gresham Trustee 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.

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. Only a limited amount of information has been collected to meet the specific financial and technical requirements of the Client's brief and 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.

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.

This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.

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We trust that this information meets your current requirements. Please do not hesitate to contact the undersigned on (04) 472 0820 if you require any further information.

Report prepared by



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Report reviewed by



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Principal Geotechnical Engineer