

25 September 2025

Avant Property Development Ltd
Attn: Shane Kelly
Suite 104, 110 Parnell Road
Parnell
Auckland 1052

Dear Shane

Geotechnical PIC Statement for Stages 1-3 Culverts - Rangitooopuni Riverhead, Forestry Road, Riverhead, Auckland

(Our Reference: 020190.000.001_23)

1 Introduction

ENGEO Ltd was requested by Avant Property Development Ltd to prepare a geotechnical statement to address the council Request for Information (RFI) with regards to proposed Culvert 1-1 and Culvert 7 for Stages 1 -3.

This letter should be read in conjunction with the Maven response to the Annexures to Memorandum of Planning Matters for Auckland Council – Project FTAA-2504-1055, dated 17 September 2025, specifically Annexure 9.

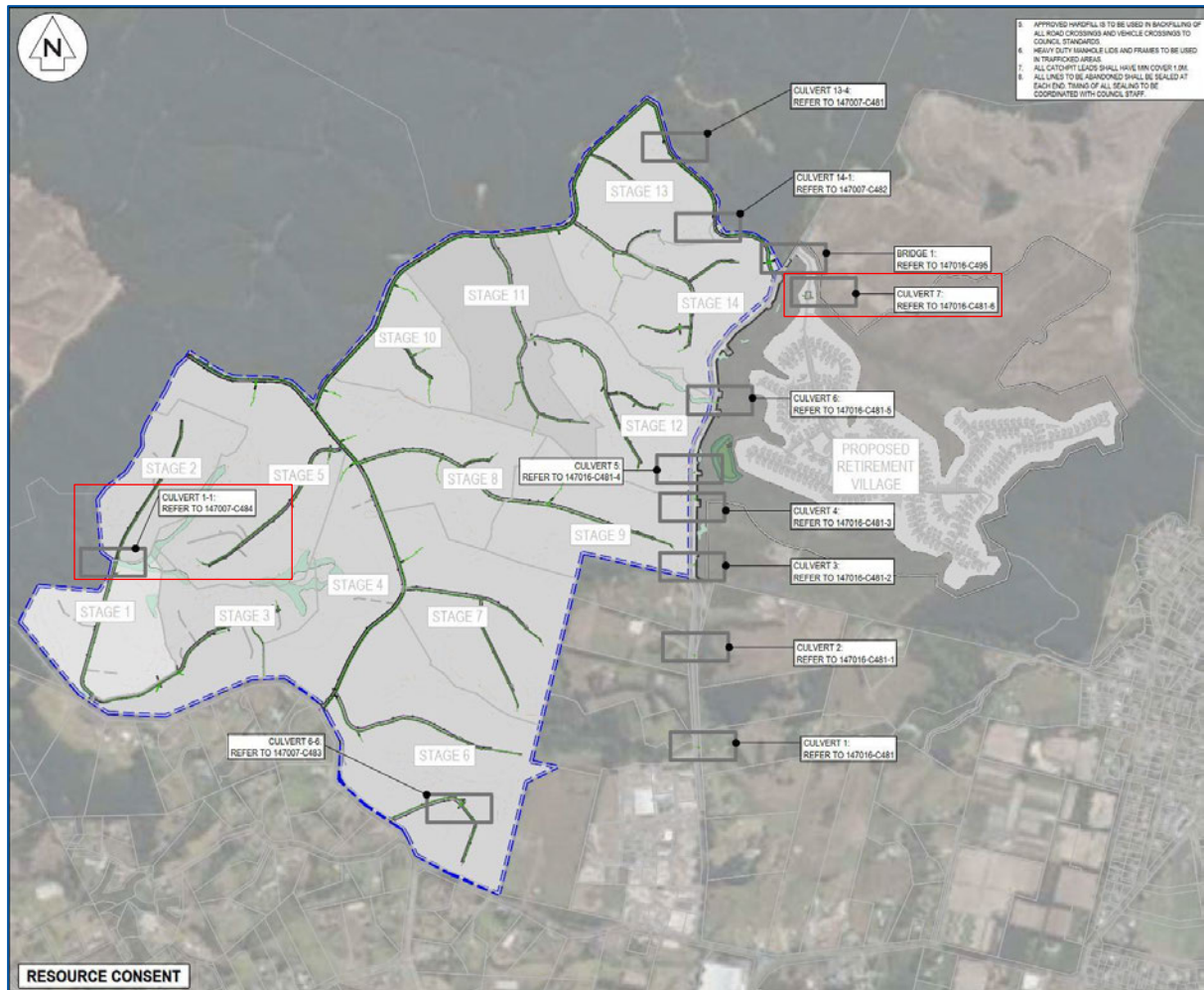
ENGEO has completed the geotechnical resource consent level documentation that is supporting this fast-track application and have experience in assessing and designing dam structures.

2 Proposed Conceptual Design

Two new culvert locations with associated road embankments are proposed as part of the development, as shown in Figure 1. The primary purpose of the culverts is to pass water underneath the road. The culverts and associated embankment have also been conceptually designed by Maven Associates to provide temporary attenuation of peak flows from the development in certain conditions to mitigate downstream flooding. The status of the culvert structures under the AUP is addressed in planning commentary. We understand they are not defined as dams under the AUP.

We consider other legislation in the context of our expertise. As the culvert / embankment structures will (temporarily) retain water, the Building (Dam Safety) Regulations (2022) define them as dams. This assessment refers to the structures as dams in that context.

Figure 1: Culvert Location Plan



Each of the embankments will feature a low-level culvert penetration to allow passage of water through the embankment during normal operation; Culvert 1-1 (1200 mm diameter) located under the Joint Owned Access Lot (JOAL) which serves Stages 1 and 2, and Culvert 7 (600 mm diameter), located downstream of the proposed retirement village. A summary of the proposed dam embankment characteristics is provided in Table 1. These will be refined during detailed design of the development.

Table 1: Proposed Dam Embankment Characteristics

Characteristic	Value	
Location	Culvert 1-1	Culvert 7
Culvert Diameter	1.2 m	0.6 m
Type of Embankment	Zoned Earth Fill Embankment	Zoned Earth Fill Embankment
Upstream Batter Slope	1V:3H	1V:3H
Downstream Batter Slope	1V:3H	1V:3H
Crest Width	6 m	5 m
Crest Level	RL 58.87 m	RL 38.2 m
Height of Dam	5.5 m	8.8 m
Emergency Spillway Type	1.5 m x 4 m box culvert	Broad Crested Weir Spillway
Emergency Spillway Weir Level	RL 56.6 m	RL 38.2 m
Maximum Possible stored volume	17,067 m ³ (at RL 58.87 m)	19,969 m ³ (at RL 38.2 m)

Soils throughout the site typically comprise clayey SILT and clay with organic SILT underlain by weak siltstone and sandstone belonging to the East Coast Bays Formation. The upper clayey SILT layers are typically very soft and unsuitable for supporting the proposed dam embankments. It is likely that the new dam embankments will be founded beneath these softer soils into a more competent silt, clay or siltstone / sandstone layer.

Groundwater levels vary across the entire site due to the varying geology and topography. Further assessment of the regional groundwater level will be undertaken as part of the detailed design phase.

The dam embankments are proposed to be zoned, with a low permeability site won clay lining the upstream embankment, and imported granular materials, such as GAP65 or pit run gravels being used to construct the downstream portion (toe) of the embankment.

The dam embankments are currently proposed to be battered at a slope no steeper than 1V:3H. Based on our experience of similar soils and the zoned configuration we believe that the embankments will meet the stability and performance requirements of the New Zealand Dam Safety Guidelines (NZSOLD, 2024). This assumption will be validated during detailed design of the dam embankments.

3 Applicability of Building (Dam Safety) Regulations 2022

When considering the maximum storage volume behind Culvert 1-1, we have assumed that both the low-level culvert (1-1) and the emergency spillway box culvert will become blocked. Therefore, the maximum storage volume retained behind the dam is a function of the dam crest and has been calculated to be 17,067 m³.

However, when considering the maximum storage volume behind Culvert 7, we did not think it plausible that the broad crested weir spillway could become blocked. Consequently, the maximum storage volume behind Culvert 7 has been calculated with the water level set at the emergency spillway level (RL 38.2 m), which generates a storage volume of 19,969 m³.

Under the Building (Dam Safety) Regulations (MBIE, 2022), each of the reservoirs impounded behind the two dams are considered to not be 'classifiable' as their individual storage volume is less than the regulations specify (< 20,000 m³). Therefore, a Potential Impact Classification (PIC) assessment is not required.

A comprehensive earthworks specification and design drawings should be provided to the earthworks contractor prior to starting excavations and an inspection and test plan agreed, along with a robust erosion and sediment control plan.

4 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, Avant Property Development Ltd, 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 and site assessments 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 of the ground 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.
- iv. This Limitation should be read in conjunction with the Engineering NZ / ACENZ Standard Terms of Engagement.
- 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



**Mark Broughton, CMEngNZ (CPEng),
RecEng DSAP, RecEng PIC**

Associate Geotechnical Engineer

Report reviewed by



Rowan Cook, CMEngNZ (PEngGeol)

Associate Engineering Geologist