Site Memorandum

Project Name	Mount Welcome		
Memo Topic	RFI response		
Memo Date	4 June 2026	**ENGEO Project No.**	019796.000.002
To	William Dorset	**Copy**	
Author	Karen Jones	**Reviewer**	NA

1 Introduction

ENGEO Ltd was requested to provide a response to the request for more information ('RFI') for the reports we have provided for the Mount Welcome development at Pukerua Bay. The 22 RFIs and covering letter (ref 1015972.2000 dated 2 April 2026) have been provided by Tonkin and Taylor on behalf of the Porirua City Council.

The RFIs and our responses are attached to the rear of this document as Appendix 1 in a spreadsheet form.

RFI number	T+T Review Comments	ENGEO Response
Site Investigation and Ground Model		
1	The number and spacing of intrusive investigation points appear insufficient to capture the anticipated variability in subsurface conditions across the site. The ground model should be supported by an appropriate level of intrusive investigation (e.g. boreholes and test pits) and laboratory testing to define soil and rock stratigraphy, groundwater conditions, areas of weak ground or uncontrolled fill, and any evidence of slope instability. As a guide, MBIE Module 2 Table 2.1 recommends a minimum number of investigation locations based on site area.	The geology of the site is not particularly variable and we consider that the investigation undertaken are sufficient for this stage of the project. Module 2 recommends 166 investigation locations. We have completed 50 and completed a comprehensive site walkover to identifiy geological and geomorphological features. Given the topography there are many parts of the site that are inaccesible for borehole rigs and excavators. An appropriate level of supervision will be required during the earthworks stage to continually reference the ground conditions to the geological model.
2	In the material properties and slope stability analyses, loess and colluvium have been treated as a single unit. This assumption may not be appropriate, as it does not account for differences in soil structure and the collapsible behaviour of loess and its sensitivity nature to saturation and disturbance. Further justification or sensitivity assessment is required.	For this reason we assumed very conservative parameters for the colluvium/loess unit and have used parameters for loess rather than colluvium. Limit equilibrium slope stability modelling software does not model differences in soil structure and collapsible behaviour. We have modelled the loess/colluvium unit in each slope model with a cohesion of 1 to reflect its sensitivity to saturation. Therefore we do not consider that a sensitivity assessment is required.
Liquefaction and Seismic Hazards		
3	Liquefaction-prone soils are identified within low-lying gullies and valleys; however, the assessment appears to focus on building platforms and does not clearly address wetlands or embankments constructed from unsuitable materials. Please provide information on liquefaction risks and associated consequences for these features.	We have provided a plan showing the areas where there are gully areas containing possible liquefiable soils and the proposed locations of the wetlands and the unsuitable embankment. This shows that three of the five wetlands are not within areas expected to contain potentially liquefiable soil. The ground in the proposed location of the two wetlands in gullies may be liquefiable. The proposed location of the unsuitable embankment is partially within a gully with potentially liquefiable soil. At this stage, investigations in the base of the gullies is not possible due to restricted/difficult access. Where there is potentially liquefiable soil, any fill embankments will be founded on rock or keyed in below any liquefiable material and suitable drainage will be installed.
4	Liquefaction potential within the low-lying gully and the post-seismic stability of the embankment constructed from unsuitable material, including the potential for flow failure, do not appear to have been assessed and should be addressed.	The main gully is not being developed, apart from a wetland being constructed within it (see above). We have modelled the seismic stability of the unsuitable material in Appendix 9 of the report using conservative geotechnical parameters and conservative gradients. As stated above, any fill embankment will be founded on rock or keyed in below any liquefiable material and suitable drainage will be installed. Failure of the unsuitable embankment is expected in a ULS event. We have based our risk assessment on likelihood and consequence of failure and, because the likelihood of failure is low and consequence is low as there are no structures near or below the toe of the slope, the risk to life or injury in a ULS event is low.
5	The estimated seismic-induced slope displacement ranges from 120 mm to 1400 mm. Please provide an assessment of the potential effects of these displacements on underground services.	The estimated slope displacements quoted are for ULS events. Underground services are not expected or required to remain operable after a ULS event. Underground services are, however, required to remain operable post SLS event. The majority of the services will be located beneath the roadways. Of the slopes we modelled where there may be small scale failures in a SLS event, these failures are expected either from slopes below building platforms or above building platforms where underground services are not expected to be located. All services will be located outside the potential failure zones where possible, or slope stabilisation measures will be put in place, such as, the use of geogrid.
Slope Stability and Rock Behaviour		
6	The slope stability analyses do not appear to account for persistent defects or unfavourably oriented discontinuities within the rock mass. It is unclear how unfavourable defects would be managed if encountered, including any mitigation measures.	Due to the high density of fractures within Greywacke rock, it is not practical to assess continuous rock defects until the cuts are excavated. An engineering geologist will be onsite regularly during construction to identify any unfavourable or persistent defects. Slopes will be either modified if possible or suitable engineering solutions will be installed, such as, rock bolting or anchored mesh, or catch fences where suitable.
7	Results of the slope stability analyses indicate that anticipated seismic displacements for the proposed fill batters are likely to be moderate to large. Mitigation measures will be required for these batters to reduce displacement risk under ULS earthquake loading. A feasibility-level design should be provided to demonstrate that suitable mitigation options are achievable.	In Section 8.2 we acknowledge that mitigation measures will be required for all fill batters due to the expected seismic displacement; mitigation will likely be either reducing the slope angles or geogrid reinforcement. We provide a slope model of the slope with the largest expected displacements (Section B) which includes the installation of geogrid beneath the building platforms. This indicates that it is possible to achieve a reduction in the expected displacement. With the geogrid as shown the displacement reduces from 340-440mm to 100-200mm in a ULS event. Note that this geogrid arrangement is not the final design.
Drainage, Erosion and Fill Performance		
8	Please provide design details of subsoil drainage for fill slopes over gullies or within areas of significant fill depth, including discharge locations.	Slope specific subsoil drainage for fill slopes will be designed in conultation with the civil engineer. Typically, a subsoil drain will be placed up the centre of the gully at the beginning of the project. After this, laterial subsoil drains will be placed at the rear of the fill embankments at 1/3rd increments up the slope which tie into the central gully drainage trench. Additionally, during earthworks, if seepage is encountered during excavation of fill benches, this will be captured with drainage (wrapped novocoils) tied into the centre gully drainage trench.
9	ENGEO recommends diverting free-flowing water away from fill slopes and applying hydroseeding. However, the erosion control approach is not clearly defined, including surface water interception, drainage pathways, and discharge locations. Further detail is required.	The 10-year event is contained within the piped network, with erosion protection detailed at each outlet and discharge locations shown on the stormwater design plans. Scour and erosion for stormwater outlets will be designed in accordance with the SMP (Section 6.14) and detailed at detailed design. Given the steep network, 100-year flows are largely contained within the network; where overland flow occurs, it runs down the batters at shallow depths and low velocities, with batters to be planted. The 100-year flow paths are shown in the Envelope Flood Risk Assessment and Flood Maps.
10	If seepage is encountered in exposed cut faces, please comment on mitigation measures to manage slumping, muddy flows, and other associated instability.	If this occurs, drainage will be installed/drilled into the slopes to discharge to the base of slope.
11	Please provide details of measures to manage surface water and groundwater infiltration.	Surface water is managed in accordance with the stormwater plans and SMP, with flows directed through the network to the designated management areas and devices
12	In the slope stability analysis, please consider the potential for increased pore water pressure or saturation of fill embankments due to surface water infiltration, particularly where site-won materials contain a high proportion of fines.	In our slope models we have modelled each slope with raised groundwater as well as a saturated fill surface to consider the effects of surface water infiltration.
13	Some fill embankments will disrupt existing natural drainage paths. Please outline mitigation measures to maintain overland flow continuity.	All existing flow paths have been designed with outlets to match the pre-development discharge. This has been informed by ecology and hydrology input to ensure existing hydrology and flow paths are respected
14	Discharge locations of stormwater pipes are shown; however, outlet details are not provided. If discharging to gullies, please confirm whether erosion assessments have been undertaken and provide details of mitigation measures.	Scour and erosion for stormwater outlets will be designed in accordance with the SMP (Section 6.14) and detailed at detailed design.
15	For cut batters greater than 8 m where loess soils are present, please provide details of the proposed erosion design to mitigate the development of tunnel gullies.	Erosion controls will need to be slope-specific and will be completed at detailed design stage. Surface water will be directed away from the cut slopes with the use of cut-off drains at the crest of slopes and slopes will be planted to minimise erosion. SED zones will be detailed in the completion report if loess is present on building platforms.
Materials, Settlement and Ground Conditions		
16	ENGEO considers the risk of collapsible soils to be very low; however, this is not clearly justified given the presence of loess.	Where there is loess soil beneath structures, the majority of the this will be removed therefore the risk is low. Where loess remains, drainage will be installed to direct water away. SED zones will be detailed in the completion report if loess is present on building platforms.
17	Please comment on the erodibility of loess soils and the potential effects of sediment generation on stormwater systems, including proposed management measures.	Where stormwater flows over loess soil, erosion is possible. Overall sediment loss will be reduced with retirement from grazing, planting and stormwater diversion. Rain gardens have been designed in accordance with Wellington Water standards and will capture 90% of sediment from the reticulated stormwater system. The project ecologist has confirmed that there will be some natural load from undeveloped areas of the site into retention wetlands, but this will be less than is occurring at present and wetlands will be able to receive the sediment without needing to be cleaned out. Stormwater flow will not be concentrated within loess cuts or embankments.
18	ENGEO notes potential differential settlement for buildings on mixed cut and fill ground; however, the feasibility of foundation solutions to address this has not been demonstrated and requires clarification.	Where this occurs this will be clearly stated in the completion report as a specific engineer design zone and will need to be considered during house design - by a notice on the title if required
19	Please identify contingency measures to address potential subgrade settlement.	If soft subgrade is encountered, this will be excavated and removed.
20	Please outline remedial options for areas containing non-engineered fill, weak ground, or unsuitable materials where undercutting is not feasible (e.g. due to groundwater).	We do not anticipate any non-engineered fill in areas where it cannot be excavated. In the unlikely event that areas of weak ground or unsuitable material are encountered where structures are required, preloading of the ground may be utilised.
Stormwater Wetlands and Embankments		
21	ENGEO proposes stormwater retention wetlands using site-won soils; however, ground conditions and associated geotechnical risks in these areas have not been clearly defined. Further clarification is required.	Evaluation of ground conditions and associated geotechnical risks have been assessed based on boreholes and test pits in the general areas as well as laboratory testing. Results are intended to be used to inform derivation of geotechnical parameters and assessment of the embankment geometry and configuration. ENGEO will complete a detailed design report (Overseen by a Recognised Dam Engineer (PIC/DSAP) concerning each of the wetlands which will include: - Determination of pre-development groundwater levels. - Determination of ground model (geological stratigraphy). - Derivation of geotechnical engineering parameters for soils used in modelling. - Computational slope stability and seepage analyses of stormwater embankments. We will complete iterative design of the embankments until acceptable FoS are achieved for all design cases to meet NZSOLD Dam Safety Guidelines (2024). - Consolidation / settlement analysis of embankments (using Settle 3). - Production of a Detailed Dam Design Report summarising laboratory test results and analyses for each of the stormwater embankments, including geotechnical recommendations for soil parameters, design slopes for the proposed stormwater embankments and conduit penetration recommendations. - Liaison with Civil Engineers and complete plan check on their drawings and advise on relevant earthworks specifications pertaining to the Wetland Embankments.
Earthworks within covenant areas		
22	Covenant areas within the proposed development are protected by way of Conservation Covenants under section 77 of the Reserves Act 1977. Please clarify if proposed earthworks are likely to impact on the two covenant areas shown within Lot 1311.	The Lot 1311 covenant area does not currently exist and will be created through a conservation covenant being placed on the title when created through the subdivision process following the completion of earthworks, refer to proposed conditions of consent 101, 102 and 114 in Appendix 7 of the Substantive Application.