

Delmore Fast-Track

25/06/2025 – Auckland Council Response

Annexure 15:

Geotechnical

Frank Zhou

MEMO

Date: 24 June 2025

To: Carly Hinde Premium Project Lead

From: Frank Zhou Senior Geotechnical Specialist
Engineering, Assets and Technical Advisory

Reviewer: Kuanjin (Jin) Lee Senior Development Engineer
Regulatory Engineering - Central

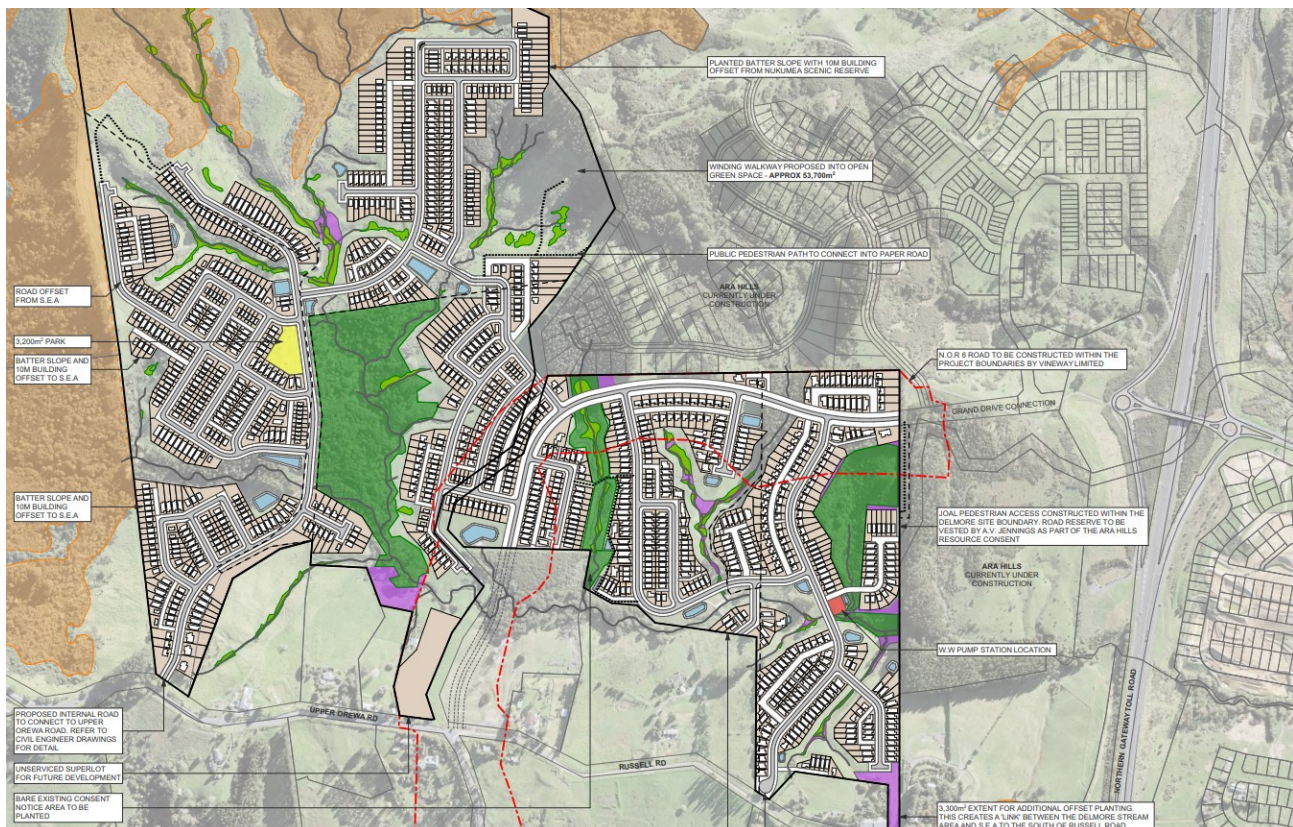
Subject: Geotechnical Regulatory Engineering Review
Fast Track Application – BUN60444768
88 Upper Orewa Road, Upper Orewa

INTRODUCTION

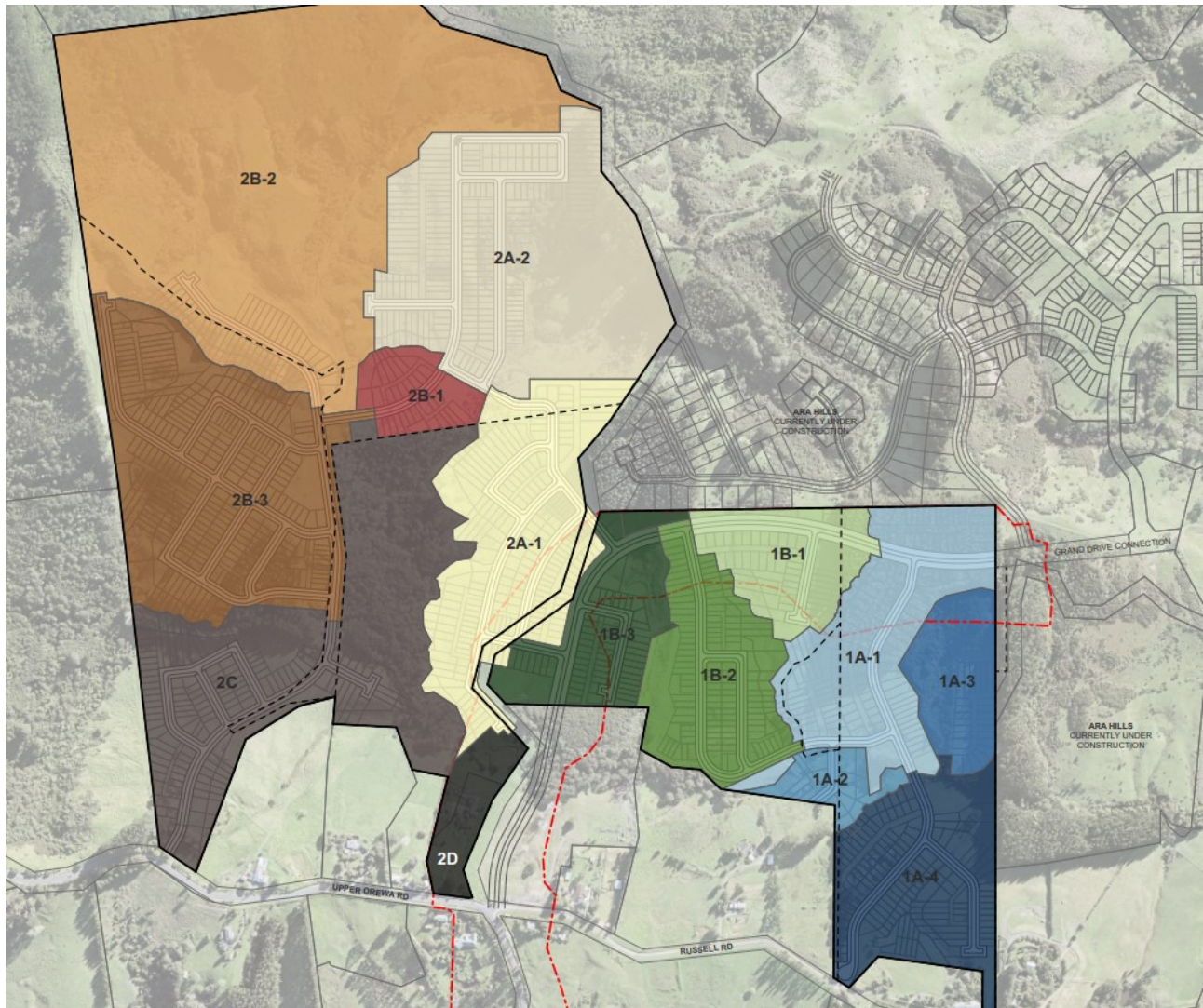
A consent is sought to develop 109.18 hectares of future urban zone land in 2 principal stages (6 substages), including approximately 1,250 dwellings, one superlot, supporting infrastructure, 28 new roads (including one arterial road) and 18 drainage reserves to be vested to Council, as well as associated works at the subject site.

The subject site comprises 88, 130, 132 Upper Orewa Road and 53A, 53B and 55 Russell Road, Orewa. Once completed, the development is intended to be called Delmore.

Overall Site Plan



Proposed Development



The following documents were reviewed:

- Geotechnical Report by Riley Consultants (reference: 240065-E, dated: 14 February 2025 (issue 1.0))
- Letter RE: Geotechnical Response to Council Queries Delmore Residential Development by Riley Consultants (reference: 240065-J, dated: 17 June 2025)
- Letter RE: Substantive Fast-track Application for Delamore by Barker & Associates (dated: 17 June 2025)

SUMMARY

We have reviewed the geotechnical information available to support the consent sought and have the following comments.

Staging of works

It is noted that earthworks and retaining are proposed to be staged, therefore we have queried how stability will be maintained between stages 1 and 2 and substages (particularly where earthworks and retaining are proposed at the stage boundaries). The applicant has confirmed that this will be addressed through temporary batter slopes (1V:2.5H) which will then be removed with subsequent implementation of the following stage. Representative slope stability assessments were provided and demonstrated that this can be satisfactorily achieved.

Geotechnical completion reporting is to be provided at the completion of each respective stage.

Geohazards

Geohazards such as land instability, subsidence and liquefaction has been addressed in the reporting provided. Mitigation measures to geohazards such as foundation design, MSE walls, reinforced earth batters, shear piles, counterfort drainage etc., are proposed to manage the risk posed by geohazards to the intended development and servicing areas (drainage reserves, pipe bridges, culverts and bridges).

A building restriction zone plan (clearly delineating development restrictions e.g., areas designated as no-build zones, buildable zones requiring specific design, and areas buildable in accordance with the consented proposal and Geotechnical Completion Reporting recommendations) is subject to further investigations and assessment and to be included with finalised Geotechnical Completion Reporting.

Slope stability analyses has been provided to verify the suitability of proposed residential development and updated following our requests to include expected surcharges, model constraints, soil parameter discrepancies, anomalous inputs. It is noted that a 50% saturation of engineered fill has been adopted to address the potential porewater pressure build up in the event of drainage system failure. We highly recommend that regular maintenance and monitoring of counterfort drainage be undertaken to prevent porewater pressure build up caused by drainage blockage. The slope stability analyses results appear reasonable and we note that 50% of the sections were assessed for the pre-development conditions to verify if the works exacerbated instability. The slope stability analyses indicate that the proposal achieves the minimum factor of safety requirements at the location of the areas of development under the Auckland Council Code of Practice for land development and subdivision. Where inadequate factor of safety was met, Riley Consultants report the analyses '*indicate that the proposed development will not negatively impact the stability of existing slopes at the site, including near the site boundaries nor through streams immediately beyond the proposed development areas*'..

It is noted that the soil parameters are inconsistently applied (e.g., unit weight for the very stiff ECBF changes from 18 kN/m³ to 20 kN/m³ in Proposed GL Section H – Remedials, Proposed Temp Cut Stage 1 – 2 etc.) in the Geotechnical Report (reference: 240065-E, dated: 14 February 2025 (issue 1.0)) and Letter by Riley Consultants (reference: 240065-J, dated: 17 June 2025). The reason for these changes is not clarified.

Effects of boundary excavation have been considered as part of our regulatory geotechnical review. We note that a significant cut up to 5.5 m in height is proposed along the boundary of Stage 1A-4. Our initial concern was that, if a conventional construction sequence were adopted, the temporary batter stability may be compromised, potentially affecting the stability of the adjacent land at 19A Kowhai Road, Upper. Riley has acknowledged this issue and provided comments on a preliminary boundary wall construction methodology, which involves installing the retaining wall piles first, followed by progressive excavation in front of the wall. Riley considers 'this sequence appropriate for managing stability risks during construction to ensure the property at 19A Kowhai Road is not adversely affected'. We generally agree with this approach. A finalised construction methodology should be prepared as part of the detailed design for the boundary retaining wall.

Significant filling works proposed may incur subsidence through ground settlement. It is noted that Riley has updated their recommendations to align with NZS4431:2022 to meet the minimum testing requirements following our query. Additionally, preliminary analysis of ground settlement within the fill has been provided indicating 45 mm of consolidation settlement. It is noted that this subsidence can pose a risk for future development and subdivision. Settlement Monitoring Plan for the earthworks has been agreed to be conditioned to manage the risk.

Liquefaction and lateral spread potential has been considered, and Riley Consultants concludes '*liquefaction and lateral spreading is considered to be unlikely to occur here during a ULS seismic event*'.

Servicing

We identified several potential conflicts between the geogrid reinforcement of the Mechanically Stabilised Earth (MSE) wall and the proposed infrastructure e.g., culverts 1 to 5 for wastewater, and culverts 2, 3, 5, and 6 for stormwater which may affect the stability of the proposed road and associated public utilities.

The applicant has verified that where proposed stormwater and wastewater pipes cross the gullies, they are vertically offset from the culverts at the base of the gullies and located within the upper part of the MSE wall. Therefore should not adversely affect the feasibility of the MSE walls and provision will be made for them during detailed design of the stability enhancement measures. We are agreeable that this be addressed as part of detailed design.

Further investigations

As acknowledged by Riley Consultants, additional testing is required to confirm the ground model and assist with slope stability assessment and enhancement measures. The applicant seeks to address this with detailed design. Plans showing the locations of further testing is intended has been supplied. It would be beneficial to have this information inform on geohazard characterisation and mitigation measures for the pursues of AUP assessment under E36 and E12 however we agree with Riley Consultants that the absence of this information does not preclude the feasibility of development nor the fast-track consenting process.

Other Matters

We have highlighted that consideration should be given to the potential migration of streams over the 100-year period for assessment under E36.9(2). Noting that streams can meander and encroach on building platforms/access ways therefore posing a risk to future development and potential development yield. We understand that Healthy Waters address this further in their memo (and have assessed the riparian margins as insufficient to allow for this migration and have recommended a further Geomorphic Risk Assessment to justify/assess this).

We initially raised queries regarding inconsistencies in the development plans and the absence of proposed remedial works for the steep batters along the shared boundary between Lots 173 to 182 and Lots 184 to 194, as well as along the north-western boundary of Lots 254 to 256. The applicant has confirmed that the discrepancies will be addressed, and a new retaining wall will be proposed to stabilise the batter slopes. While this response is generally acceptable, the updated plans have not been provided for our review at the time of preparing this memo. Therefore, this matter should be resolved following the review of the finalised development plans.

Condition Review

We are agreeable to the inclusion of Conditions 42 however this appears to be a duplication of Condition 65. We believe this is relevant during works rather than the post-completion of works and therefore condition 65 should be omitted.

We suggest that the following amendments be considered to the conditions below:

Land-use Condition		Commentary
21	Prior to commencement of earthworks activities, the consent holder must provide a detailed earthworks construction methodology written by the earthworks contractor endorsed by a chartered geo-professional who must provide written confirmation of the review. The methodology must include earthworks, boundary works and installation of slope protection measures in accordance with the recommendations provided within the Geotechnical Report (reference: 240065-E, dated: 14 February 2025 (issue 1.0)) and	<p>Change from 'shall' to 'must' to align with current practice.</p> <p>We suggest the inclusion of geotechnical report and letter by Riley Consultants as the Letter contains additional recommendations relevant to installation of services.</p> <p>Further, we suggest the construction</p>

	Letter by Riley Consultants (reference: 240065-J, dated: 17 June 2025) referenced in Condition 1 and submitted to Auckland Council.	methodology should include not only earthworks but the installation of slope protection measures therefore the condition is adapted to include this.
40	<p>The placement and compaction of fill material, construction of geogrid reinforced slopes, retaining walls and subsoil drainage works must be supervised by a suitably qualified engineering professional. In supervising the works, the suitably qualified engineering professional must ensure that they are constructed and otherwise completed in accordance with the recommendations contained within the Geotechnical Report (reference: 240065-E, dated: 14 February 2025 (issue 1.0)) and Letter by Riley Consultants (reference: 240065-J, dated: 17 June 2025) approved under Condition 1, relevant engineering code of practice and the detailed plans forming part of the application and approved under Condition 1.</p>	<p>Removed reference to 'Riley Consultants Ltd Geotechnical Investigation Report (ref:240065-F)' as such reporting has not been supplied to Council for review.</p> <p>We have assumed that this was submitted in error and referenced the Geotechnical Report supplied with lodgment.</p>
41	<p>Within 20 working days from the completion of earthworks, subsoil drainage and slope protection structures, a Geotechnical Completion Report signed by the chartered geo-professional must be provided to the Council. The Geotechnical Completion Report must include (but not to be limited to):</p> <ul style="list-style-type: none"> • Earthworks operations (e.g. fill compaction, testing, inspections etc.) • Results of settlement monitoring • Statement of professional opinion (as per schedule 2A of NZS4404:2010)] • Certified as-built plans for the implemented earthworks and subsoil drainage <p>The Geotechnical Completion Report must also provide justification on soil expansivity, subsoil site class, foundation requirements, confirming that the works have been completed in accordance with the approved construction methodology as required by Condition X and evidence of settlement monitoring (as required by Condition X) have been met. The Geotechnical Completion Report must include results of settlement monitoring and demonstration that sufficient settlement attenuation has occurred and be provided to the satisfaction of the Council.</p>	<p>Given the nature and scale of works, we suggest that Condition 41 be removed and replaced with a condition which is clear on Geotechnical Completion Reporting expectations.</p> <p>Additionally, Conditions 41 and 64 appears to be a duplication. We believe this is relevant during works rather than the post-completion of works and therefore condition 64 should be omitted.</p> <p>Condition X should include the provision of a Settlement Monitoring Plan to support the intended filling works.</p>

Subdivision Condition	Commentary
<p>86 A Geotechnical Completion Report (GCR) from a suitably qualified and experienced chartered geo-professional must be prepared and submitted to Auckland Council to confirm that all residential lots are stable and suitable for development when applying for a certificate under section 224(c). The GCR must include a Building Restriction Zone plan (if relevant) that identifies specific design zones and no-build zones. Development must be undertaken in accordance with the recommendations of the GCR.</p> <p>The preceding paragraph must be registered as a consent notice on the record(s) of title to be issued for Lot(s) X, Y, Z to ensure that it is complied with on a continuing basis. The specific name and date of the GCR provided must be referenced in the consent notice.</p>	<p>We understand from the Letter RE: Substantive Fast-track Application for Delamore by Barker & Associates (dated: 17 June 2025) that each subdivision stage is to include a condition that requires the GCR to be included as a consent notice to be included on the title.</p> <p>We agree with this approach and include recommended changes to this effect. We suggest that this be included for each stage (and substage) for clarity and an advice note referencing the Auckland Council Cod of Practice (Chapter 2) 2023 which detail expectations of a geotechnical completion report is included.</p>

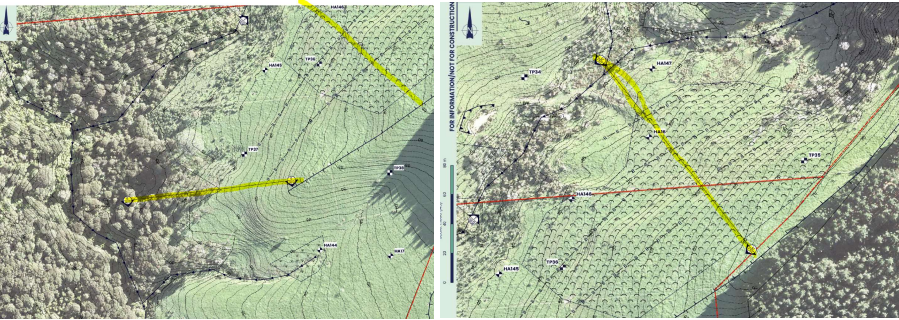
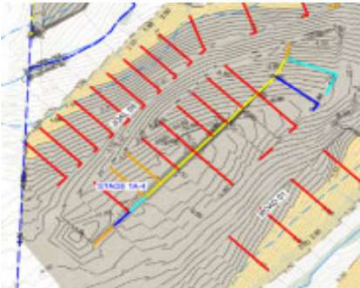

We recommend some additional conditions be considered for:

- Settlement Monitoring Plan for the significant filling works proposed and for this to be referenced in Condition 41 (**Condition X**)
- An Operation and Maintenance Plan for the subsoil drainage to prevent porewater pressure build up and increase risk of slope instability.

Assessment Conclusions

We believe the geotechnical assessment provides relevant detail for the scale of works intended. Some minor discrepancies in the analyses persist and we suggest that these be responded to by the applicant with detailed design to ensure that the slope stability and geotechnical risks are adequately managed and controlled as to not create adverse safety or operational issues.

Geotechnical commentary / concerns			Stage 1	Stage 2	Applicant Response 12/June/2025	Auckland Council Review Comments 18/June/2025
1	Staging	It is noted that earthworks and retaining are proposed to be staged, details should be provided to clarify how stability will be maintained between stages 1 and 2 and substages (particularly where earthworks and retaining are proposed at the stage boundaries).	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed
2		We agree that further testing and geotechnical completion reporting required to support project progression and detailed design. GCR should be included as a condition of consent for each stage.	Y	Y	Agree. This is included in the proposed consent conditions attached to our GIR. This has been provided in the Consent Conditions, to be provided June 19	Accepted and closed.
3	Services	Potential conflicts have been identified between the geogrid reinforcement of the MSE wall and the proposed infrastructure — specifically at culverts 1 to 5 for wastewater, and culverts 2, 3, 5, and 6 for stormwater. Please confirm with the wider project team the feasibility of implementing the MSE wall in its current form. If this is not feasible, alternative solutions should be provided, as the conflict may affect the stability of the proposed road and associated public utilities.	Y		Where proposed stormwater and wastewater pipes cross the gullies, they are vertically offset from the culverts at the base of the gullies and located within the upper part of the MSE wall. Accordingly, we consider that they should not adversely affect the feasibility of the MSE walls and provision will be made for them during detailed design of the stability enhancement measures.	Accepted and closed. The project team is aware of the issue and will address this in the detailed design.
4	Fill settlement	No settlement anlaysis was provided.	Y		To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed. Preliminary anlaysis of settlement within the fill has been provided, indicating up to 45mm consolidation settlement. Conditions will apply.
5		We agree that deep fills and compressible materials may result in settlement and settlement monitoring plan required.			Agree a monitoring plan should be prepared and it would be appropriate in this instance for it to be required as a condition of consent. This has been provided in the Consent Conditions, to be provided June 19.	Accepted and closed.
6	Missing Reporting	Historic reporting referenced in Section 2.6 of the geotechnical report should be supplied to inform on context and underlying geology and geohazards.	Y	Y	Refer to relevant documents provided 12 June.	Accepted and closed.
7	Specifications	Noted that earthworks specifications deferred to earthworks contractor and only broad elements included in reporting. Section 5.6.5 recommends fill companction testing values below NZS4431:2022 requirements. Suggest that specifications be justified where deviating from standards and be included as part of consent to capture effects and allow assessment of E12.6.2(2), E12.8.2(1)(c) and E39 for subdivision	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed. Criteria has been updated to minimum 150kPa.
8	Slope stability	Failure surfaces appear constrained by the horizontal boundary in some models (e.g., proposed GL Section A, Stage 1, Propsoed GL (RHS) - Section V for Stage 2) therefore should be extended to ensure that critical failure surfaces are captured.	Y	Y	We have reviewed the slope stability analysis outputs and note that where this occurs, the cross-section has been stopped at a gully invert (being the lowest point of the cross-section) or the slip circle with the minimum FoS is not constrained by the cross-section extent. On this basis we consider that our slope stability assessments have not been adversely influenced by the cross-section extents.	Accepted and closed.
9		Expected surcharges such as new dwellings, roads etc., have not been applied for the proposed development condition.	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
10		Soil parameters presented in Table 7 does not align with modelled parameters (e.g., unit weight of Medium Dense ECBF in table is 18 kN/m3 but in the Proposed GL (RHS) - Section V for Stage 2 seismic is 20 kN/m3). Discrepancies should be justified or revised.	Y	Y	This is a minor error on cross-section V. Stability analysis has been rerun and results are provided in a separate Geotechnical Response Memo on June 19. Changes to the FoS are minimal and all results still exceed the minimum required values.	Accepted and closed.
11		The stability analysis assumes that the fill material is completely dry. However, porewater pressure could potentially develop within the fill, particularly in the event of drainage system failure. Therefore, the potential effects of porewater pressure should be considered in the stability analysis to ensure a more conservative and realistic assessment.	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
12		Some cross sections (e.g., section N) is take oblique to the steepest contours which may not wholly capture the risk of instability.		Y	We have reviewed the cross-section positioning. In some cases the cross-sections aren't exactly orthogonal to contour. However, for sections where this occurs, the cross-section alignment is being influenced by the post development profile (which is considered to be more critical than the existing slope profile) in such cases and an aim to capture the deepest cuts and fills, or greatest retained heights etc. For some sections only the critical part being analysed is orthogonal to contour (eg cross-section AD in relation to the south facing slope), this is also considered appropriate in such instances. Overall, cross-section alignment has been chosen based on consideration of factors likely to be critical to post development stability. We consider this is a reasonable and appropriate approach.	Accepted and closed.
13		We note that some sections were determined based on a single investigation point, which limits the ability to verify soil strata dip angles and layer thicknesses (e.g., Sections R to T). Additionally, competent bedrock was assumed in certain sections of the stability analysis (such as Section B), despite not being observed in nearby hand-augered boreholes or test pits. To improve the reliability of the ground model and reduce associated uncertainties, we recommend undertaking further geotechnical investigations. This can be conditioned if aggregable.	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.

14		It would be beneficial to provide a stability analysis for Section AD, considering potential theoretical slip surfaces from left to right.		Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
15		We note that only proposed slope profiles have been assessed. For assessment against E12.8.2(1)(i) (the extent of risks associated with natural hazards and whether the risks can be reduced or not increased) please provide quantitative slope stability models and assessment for the existing condition for review.	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	<p>AC comments on 29/May/2025: it is acceptable to provide a comparison of stability analyses using selected sections for both the existing and proposed ground profiles. Please ensure that at least half of all sections are included, particularly those where the existing slope continues downward from the edge of the proposed development, as these may impact nearby features such as watercourses or neighbouring properties. A statement confirming that the selected sections are representative and appropriately capture these key site features should also be provided.</p> <p>Accepted and closed.</p>
16		It would be beneficial to provide a stability analysis for Section R, considering potential theoretical slip surfaces from right to left to capture the otherside of the MSE slope and palisade wall		Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
17		Please provide a slope stability assessment north of Section S, capturing the steep slopes expected at Lot 678 (in the scheme Plan by McKenzie) which appear steeper than Section S and may be surcharged by the accessway and future development.		Y	Cross-section U is aligned through the steep slopes to the north of Section S. Stability analysis results for cross-section U are attached to the GIR lodged with the application as Appendix 8 (ref:240065-F)	<p>Accepted and closed.</p> 
18	Geomorphic assessment	Considerations should be made to the potential migration of streams over the 100 year period for assessment under E36.9(2). Noting that streams can meander and therefore encroach on building platforms/access ways.		✗	Refer to 'Hazard Risk Assessment – AUP Standard E36.9(2)'	We have highlighted this to Planner that inputs from HW will should be sought for.
19	Remediation plan	We note the presence of steep cut batters at Stage 1A-4 along the shared boundary between Lots 173 to 182 and Lots 184 to 194, as well as along the north-western boundary of Lots 254 to 256. The gradient of these cut batters is not clearly indicated, and it is unclear how these will be managed in the long term. If specific design zones, MSE walls, or other forms of slope remediation are required, the remediation plan should be updated accordingly to address these areas.	Y		<p>We have reviewed the batter slopes in the vicinity of Lots 173-182, 184-194 and 254-256. For Lots 173-182 and 184-194, a retaining wall is proposed (refer McKenzie & Co drawing 3725-1-2506) between these blocks of lots there is a 1v in 3h batter above and below the retaining wall.</p>  <p>For lots 254-256, the RCB is proposed to be extended to provide support to the downslope edge of these lots. See the snip below in relation to Lots 254 to 256.</p> 	Accepted and closed.

20	Boundary wall	A significant cut, up to 5.5 m in height, is proposed along the boundary of Stage 1A-4. If the retaining wall is to be constructed using a conventional sequence, the temporary batter stability should be assessed to ensure that the stability of the adjacent land at 19A Kowhai Road, Upper, is not compromised.	Y		We envisage a partial top down construction methodology will be employed. The construction sequence is to be: (1) Cut down to the top of the wall and form the batter above it. (2) Drill the wall pile holes and concrete them in place. (3) Progressively excavate and install the wall rails and drainage - in a hit and miss pattern over short lengths of wall. This construction sequence will ensure that the full batter height does not need to be formed before the retaining wall is installed. We agree that it is important that the stability of this boundary is maintained during construction, and we consider that this construction sequence is appropriate for managing stability risks during construction to ensure that the property at 19A Kowhai Road is not adversely affected. The final construction sequence will be confirmed during detailed design.	Accepted and closed.
21	Geological cross sections	Would benefit reader to show geomorphic features on the surface, proposed roads, lot boundaries etc., and inferred underlying geology and groundwater levels rather than just investigation points.	Y	Y	To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
22	Other infrastructure	Geotechnical recommendations should be provided for proposed drainage reserves, pipe bridges around the wetland, culverts and bridges which form part of the access.	Y		To be addressed in a Geotechnical Response Memorandum due 19 June 2025	Accepted and closed.
23	Subdivision	We note that there labelling inconsistencies with the subdivision Lots between the McKenzie Scheme Plans and Appendix 15 by Terra Studio. We recommend that these discrepancies are resolved.		Y	Acknowledged, this will be addressed as part of final plan set on July 2.	Accepted and closed.
24	Development Restriction Zones	Following further assessment and analyses expected to support the consent, we recommend that a reassessment be made on whether Building Restriction Zones are required. We suggest that if so, this be provided in a clear plan as this may inform on Lot boundaries and building platform/accessways and not be delayed to completion reporting stage.	Y	Y	The typical building restrictions are outlined within Section 5.4 of the lodged GIR. A BRZ plan will be included in the GCR, which will include specific design zones and no-build zones. In the interim, the stability enhancement measures are being designed to accommodate the dwelling footprints and locations as proposed by Vineway Ltd. As outlined in the lodged GIR, specific foundation design will be required for dwellings generally within 5m of land that have gradients steeper than 1v in 4h. Areas affected by this requirement will be depicted as a specific design zone in the BRZ to be attached to the GCR. A no-build zone will also be shown. The extent of which will also be confirmed at GCR stage but will be assessed as part of the detailed design of the stability enhancement measures and the designs adjusted to ensure the no-build zone doesn't preclude residential development on the individual lots. The stability enhancement measures will also provide adequate FoS with respect to the roads and accessways. No specific building restrictions are anticipated for the roads and accessways.	<i>AC comments on 29/May/2025: at this stage, we would appreciate receiving high-level comments on the proposed Building Restriction Zone (BRZ). A finalised BRZ plan will be required in the GCR for each stage of development, to reflect any changes resulting from detailed design or construction variations. The BRZ plan should clearly delineate development restrictions, for instance, areas designated as no-build zones, buildable zones requiring specific design, and areas buildable in accordance with the consented proposal and GCR recommendations.</i> <i>Accepted and closed. SK190-193 shows future investigation areas.</i>