BEFORE THE HEARING PANEL

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of Proposed Plan Change 29 to the Nelson Resource Management Plan

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REBUTTAL STATEMENT OF EVIDENCE OF DAN CHAMBEROSE

Dated 19 AUGUST 2024

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1. INTRODUCTION

1.1 My full name is Daniel Thomas Chamberose, and I am an Associate Engineering Geologist at Beca Limited.

1.2 My qualifications and experience were set out in my Primary Statement of Evidence dated 24 June 2024. I repeat the confirmation in my Primary Statement of Evidence that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

1.3 In this statement of rebuttal evidence, I respond to the evidence of:

a) Sally Hargraves representing Bayview Nelson Ltd, GP Investments Ltd, Nelson North Ltd, 588 Ltd, and Suffolk Heights Ltd

b) Cameron Lines representing Bayview Nelson Ltd, GP Investments Ltd, Nelson North Ltd, 588 Ltd, and Suffolk Heights Ltd

1.4 This rebuttal statement does not respond to every matter raised in the evidence of a submitter within my area of expertise. I have focussed this rebuttal statement on the key points of difference.

2. KEY ISSUE 1: FAULT DEFORMATION AND FAULT AWARENESS OVERLAYS – RECURRENCE INTERVALS (RIS)

2.1 Section 3.3.2 of the Geotechnical Natural Hazards Joint Witness Statement of 31 July 2024 (JWS) details reasons for disagreement between experts on recurrence intervals in Plan Change 29 (PC 29) fault overlays. Below I set out further discussion around RIs and the current approach in Plan Change 29 (PC29) in addition to this section of the JWS.

2.2 In the JWS I said that recurrence intervals were not considered as part of the fault overlay mapping. To clarify this statement, the faults included in the fault overlays are active faults by GNS definition that have ruptured and/or caused ground deformation during the last 125,000 years (i.e. have a recurrence interval of less than this) or show geomorphic evidence of ground deformation. This is with the exception of the Jenkins, Hira and Grampian Faults. Table 1 Below summarises information held on the faults included in the fault overlays. These faults were originally included Johnston & Nicol, 2013 named fault hazard corridors which were then

updated in 2019. As mentioned in my evidence Paragraph 6.3 to 6.5, the Beca scope of work was to update the overlays for these faults and these are currently in the operative plan.

Table 1: Summary of faults in the Nelson region, included in the fault overlays.

Fault	**Recurrence interval**	**Source/comments**
Flaxmore	6 - 6.7ka	University of Canterbury MSc thesis[1] – trenching of 2m high fault scarp at Oakland farm, Stoke. Included in original fault hazard corridor[2].
Waimea	5 - 10ka	On the Active Faults Database GNS 2024. Included in original fault hazard corridor.
Eighty-Eight	3.5 – 5ka	On the Active Faults Database GNS 2024. Included in original fault hazard corridor.
Jenkins	Unknown	No known fault scarp. Favorably orientated in current stress field so could have sympathetic movement if nearby fault was to rupture. Included in original fault hazard corridor.
Whangamoa	Unknown	On the Active Faults Database GNS 2024 (unknown recurrence). 2m high fault scarp in Whangamoa Valley likely to be Holocene fault rupture (in the last 12,000 years). Included in original fault hazard corridor.
Bishopdale	Unknown	On the Active Faults Database GNS 2024 (unknown recurrence). 4m high fault scarp at Bishopdale likely to be Holocene fault rupture (in the last 12,000 years). Included in original fault hazard corridor.
Grampian	Unknown	No known fault scarp. Unfavorably orientated in current stress field. Included in original fault hazard corridor.
Hira	Unknown	No known fault scarp. Favorably orientated in current stress field so could have sympathetic

[1] Wiffin, R. 2023. Active Faulting and Hazards of the Waimea-Flaxmore Fault System, Nelson, New Zealand. MSc Thesis, University of Canterbury

[2] Johnston, M. R and Nicol, A. 2013. Assessment of the location and paleoearthquake history of the Waimea-Flaxmore Fault System in the Nelson-Richmond area with recommendations to mitigate the hazard arising from fault rupture of the ground surface. GNS Science Consultancy Report 2013/186.

Fault	Recurrence interval	Source/comments
		movement if nearby fault was to rupture. Included in original fault hazard corridor.

2.3 The updates to the fault overlays followed Step 1 and 2 of the risk-based approach in the MfE guidance[3]. NCC have addressed the other steps in the MfE risk-based approach by adopting regulatory methods (rules) to address the risks associated with the hazard. The MfE guidance says as part of principal 2 *'Plan to avoid fault rupture hazard before development and subdivision. This is the safest and most satisfactory long-term solution for current and later landowners and for the territorial authority.'*

2.4 The MfE guidance describes in section 10.13 that *Building within a fault avoidance zone should be discouraged wherever possible. Even when a fault has a long recurrence interval, the chance exists that the fault may move during the lifetime of a building.*

2.5 The guidance talks about recurrence intervals being a statistical measurement that may not be an accurate predictor for future movement on a fault and uses the White Creek Fault as an example. The White Creek Fault has a long recurrence interval of more than 20,000 years, but it ruptured in the 1929 Murchison earthquake. In Nelson there have been limited detailed fault studies to determine accurate recurrence intervals using recent fault ruptures (i.e. ruptures in the last 12,000 years) so some uncertainty around recurrence intervals is present.

2.6 The MfE guidance mentions Nelson City Council (NCC) and the current NRMP rules that applied to the then named fault hazard corridor as an example and say that NCC takes a precautionary approach to fault rupture, acknowledging that the faults have low activity and long recurrence intervals.

[3] Kerr, J., Nathan, S., Van Dissen, R., Webb, P., Brunsdon, D and King, A. 2003. Planning for Development of Land on or close to Active Faults. Report for the Ministry for the Environment by the Institute of Geological & Nuclear Sciences. Institute of Geological & Nuclear Sciences Client report 2002/124 440W103301, July 2003.

2.7 I support this precautionary approach as allowing certain buildings across active faults in my opinion is a short-term view which goes against the general commentary of the MfE guidance around avoiding faults (mentioned above). This precautionary approach takes into consideration some uncertainty around recurrence intervals given little detailed fault studies have occurred on the faults in the region. The approach and proposed provisions also allow more detailed information to be captured on the location of faults and may possibly instigate studies on recurrence intervals in the region to better inform people of the hazard. In time this will likely give a much better picture of the fault hazards in the region.

2.8 I am mindful that the MfE guidance was produced in 2003 and it has not been updated for over 20 years. At the QuakeCoRE seminar in May 2024, the general consensus of attendees (technical people from industry and universities with experience or interest in earthquake resilience) in a workshop was that the MfE guidance is due an update in the coming years once funding was available. It was also discussed that the update might consider engineering design in fault zones, future mapping of fault zones and vulnerability/fragility. There were no discussions around the suitability of the current MfE guidance.

2.9 I consider that the rules proposed for the plan change relating to the fault overlays which trigger consent and require geotechnical assessment to better define the risks when developing within the fault overlays are appropriate from a geotechnical point of view. These rules are presented in the natural hazards – Geotechnical section of the 42A report and addendum report.

3. KEY ISSUE 2: FAULT DEFORMATION AND FAULT AWARENESS OVERLAYS – UPDATES TO OVERLAY

3.1 Refer Section 3.3.1 of the JWS. Cameron Lines has provided information on the location of the fault through the Bayview subdivision area. I have reviewed this and confirm it is appropriate to amend the overlay as shown below in my view.

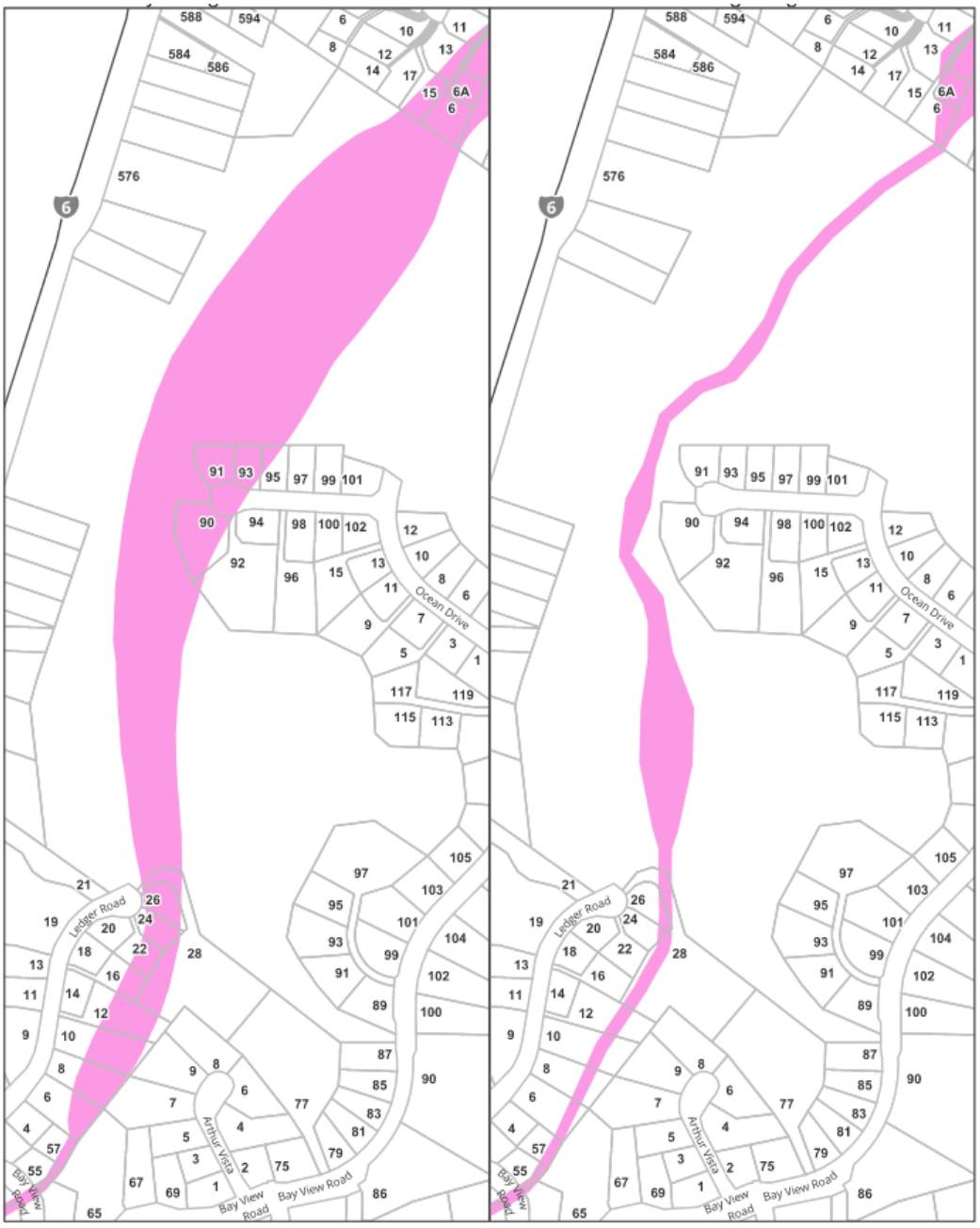


Figure 1: Recommended amendment to fault deformation overlay based on records provided by Cameron Lines. Left – existing overlay; Right – revised overlay. Note: There is a difference at the southern end between the information provided and information held on the existing fault hazard corridor which was amended by Mike Johnston during the 2019 update of the corridor. The tie-in point with the existing corridor has been used, rather than the submitters tie-in point.

3.2 Sally Hargraves has also mentioned that some additional information relating to the location of the fault in the Nile Street area is available. If available in time it will be presented at the hearing.

4. KEY ISSUE 3: SLOPE INSTABILITY SUSCEPTIBILITY OVERLAYS AND DEBRIS RUN-OUT OVERLAY – COMBINING AREA 2 AND 3 OVERLAYS AND CONSIDERATION OF RULES TO BE APPLIED

4.1 It is important to reiterate and clarify the intent of the slope instability susceptibility overlays. These were completed at a regional scale (1:5,000) with the intent of informing the need for further geotechnical assessment where site specific consideration of slope instability risks should be completed. The susceptibility overlays do not consider risk and do not explicitly consider previously engineered certified/modified land.

4.2 The slope overlays were formed using LiDAR from 2008 - 2015 so if any modification of land occurred post the date the dataset covered, it will not be reflected in the overlays. The update following August 2022 storm event of the overlays did not re-map the whole study area. It was focused on areas where new damage was observed following the event and looked at existing slope overlay categories (i.e. Area 2 and 3) and where it was deemed appropriate to change them based on what was observed in the new datasets provided, including some observations from Beca staff during the response (i.e. cross-checking/validating existing overlay in areas of observed damage).

4.3 Section 3.4.1 (i) of the JWS outlines that experts agree Area 2 and 3 of the overlays be combined for different reasons (referred to as the combined overlay from now on). Cameron Lines and Sally Hargraves consider that these differences are due to inaccuracies in the interpretation (including geomorphic mapping) and application of the methodology. I do not agree with this, and I consider there may be subtle differences in interpretation of the same desktop information and datasets at a regional scale (1:5,000) between different geo professional people completing the same exercise using the same methodology. Additionally, if site specific information is known or available to one of these people, it would likely influence the interpretation of the datasets used to complete the exercise.

4.4 The intent of the regional scale overlays is to highlight areas where a more detailed site-specific assessment is required to further detail slope instability considerations at a site. Using site specific information or knowledge to challenge the accuracy of a regional scale assessment

where its very intent is to trigger that level of detailed assessment will always show differences. That being said, the examples provided in Cameron Lines evidence highlight that there could be Area 2 pieces of land within Area 3, which could result in different consenting requirements being applied.

4.5 The splitting of the original susceptibility overlay was based on the suggestion by Slope Instability Technical Working Group (SI-TAG) to reflect the varying nature of slope susceptibility in the region which may warrant separate planning considerations to better manage activities that might trigger instability in these areas. The overall extent of the overlay (including all Area 1, 2, 3 and Runout extents) using the data available at the time were largely in agreement with SI-TAG following the August 2022 storm update to the overlays.

4.6 Therefore, I agree that combining Area 2 and 3 into one overlay could assist with providing a workable outcome for the plan change.

4.7 Section 3.4.1 (iii) of the JWS describes that earthworks and stormwater/drainage rules are to be considered in the combined overlay. This is because they are the activities that could potentially trigger slope instability.

4.8 Amendments to the earthworks rules for the combined overlay in my opinion could be:

(a) cuts do not exceed 1.2m in height and 3m3 in volume.

(b) fill does not exceed 0.6m in height and 10m3 in volume.

4.9 In my opinion, these rules are appropriate from a geotechnical perspective for the combined overlay because earthworks outside of these quantities could potentially affect the stability of areas identified as susceptible by the overlays.

5. KEY ISSUE 4: SLOPE INSTABILITY SUSCEPTIBILITY OVERLAYS AND DEBRIS RUN-OUT OVERLAY – LAND WITHIN 100M DOWN SLOPE OF FAULTS

5.1 An action from Section 3.4.1 (ii) of the JWS was for me to review the overlays to determine if there are any areas that specifically relate to land 100m downslope of faults as shown on the methodology tree. To confirm,

the faults used for this exercise are the faults shown on the GNS active faults database (Refer Table 1 – Waimea and Bishopdale Faults only within study area), no other faults were considered. I have reviewed the overlays in relation to these faults and there do not appear to be any areas that are specifically included in the combined overlays because of this criterion. This step in the methodology tree currently has no effect on the combined overlays as they are already covered by other criteria in the methodology tree. Therefore, no amendments are required

6. KEY ISSUE 5: SLOPE INSTABILITY SUSCEPTIBILITY OVERLAYS AND DEBRIS RUN-OUT OVERLAY – STABILISED/MODIFIED LAND AND THE OVERLAYS

6.1 Refer Section 3.4.1 (iv) of the JWS. Cameron Lines and Sally Hargraves have provided me with information relating to submitter's land where large-scale earthworks have been created and remapping of the Area 2 and 3 overlay extents within these areas has been suggested for consideration/exclusion from the overlays. The following comments assume the recommendation to combine Area 2 and 3 overlays is accepted.

6.2 From the examples provided, if updated data sets were used (such as the 2022 LiDAR) to run through the same methodology for the overlays, I agree that some areas would be excluded from the overlay as a result of modification of slopes that have altered the contour of the land.

6.3 This exercise can be completed, but the following needs consideration:

(a) If this was completed for these specific submitters, there would be differences in datasets used between these specific submitter's areas and the remaining areas in the overlays.

(b) If the 2022 dataset was used to update the entire overlays, the boundaries of the overlays might shift (due to limitations, accuracy of the new datasets and re-drawing of boundary extents), resulting in some properties being included that previously were not, and others that are now excluded as a result of the new dataset limitations or where modification has occurred.

(c) In my opinion, it is a function of when is most appropriate time to complete an update to the overlays using the latest datasets and consideration of the time required to complete this and provide updated outputs.

6.4 I have discussed with Ms Carter whether planning provisions could be put in place as part of PC29 to capture areas that were modified since the time of overlay creation rather than altering the overlays. This is presented in the natural hazards – Geotechnical section of the 42A report and addendum report.

6.5 Consideration of engineered slopes within the overlays has been requested by submitter's experts. There are many engineered slopes in the region where earthworks such as cut/fill or retaining structures have been constructed. The overlays do not explicitly differentiate engineered slopes from natural slopes.

6.6 In my opinion, the overlays should not specifically exclude these engineered slopes unless they are excluded due to the criteria of the methodology tree when using updated datasets. This is because they are likely to still exhibit some characteristics that indicate susceptibility.

6.7 From a technical perspective, I appreciate that engineered modification of land where slope instability has been appropriately considered/designed/constructed will generally have a positive effect on reducing risk of instability at a site.

6.8 However, if these engineered/modified slopes trigger the susceptibility criteria of the methodology tree (using the most up to date datasets), it is not appropriate or practicable to exclude them from the overlays purely on the basis they have been engineered. This is because (in addition to reasons outlined in my evidence – Paragraph 5.19, 5.23 to 5.25):

(a) Engineering work or modified land may still be considered susceptible as it is designed to certain standards and if design life/design event exceeded, maintenance not performed, and/or

modification of the works occurs, it may affect its susceptibility to slope instability.

(b) The time elapsed since the engineered works were completed would need consideration and their appropriateness against current standards and climate change effects.

(c) It would likely require review of whether these slopes have been engineered and the standards to which they are designed.

(d) Consideration of previously engineered slopes would require looking through all property files individually to consider the site-specific information which for a regional assessment is not practicable.

7. KEY ISSUE 6: SLOPE INSTABILITY SUSCEPTIBILITY OVERLAYS AND DEBRIS RUN-OUT OVERLAY – DISCLAIMER ON VIEWING SCALE

7.1 In Section 3.5 of the JWS there is agreement that there needs to be a disclaimer on viewing scale of the overlays, but specific wording was not proposed.

7.2 A suggested disclaimer for consideration on the slope overlays is as follows: *The [Insert new name of overlays if combined] overlays have been prepared at a regional scale (1:5,000) to identify land potentially susceptible to slope instability and impacts from the slope instability run out for district plan planning purposes only. The overlays are intended to inform the possible need for further site-specific geotechnical assessment. These overlays are not intended to show specific details for each property and should not be relied on as the basis for making any decision in relation to potential risk nor should they be relied upon for insurance purposes.*

8. KEY ISSUE 7: SLOPE INSTABILITY SUSCEPTIBILITY OVERLAYS AND DEBRIS RUN-OUT OVERLAY – 27 BAY VIEW ROAD

8.1 Section 3.4.1 of the JWS mentions the slope overlays in the vicinity of 27 Bay View Road and finalisation of the mapping as well as the rationale for why this site is included in the overlay.

8.2 The rear of the property at 27 Bay View Road and surrounding hillslope is identified as having the following attributes when mapped at a scale of 1:5,000, which places the site partially within Area 3 (Figure 2 below):

(a) Land with slopes between 25° and 35° and containing geomorphic evidence of instability as identifiable in Digital Elevation Model (DEM) Hill shade model and/or aerial imagery.

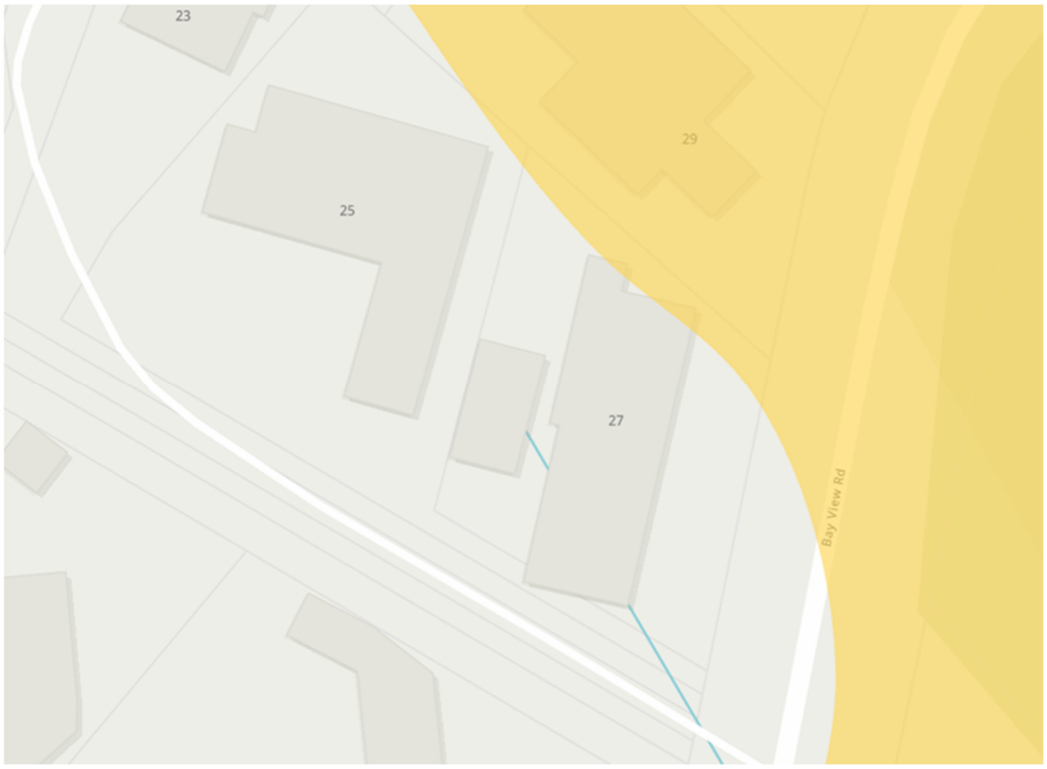


Figure 2: Snip of 27 Bay View Road and Area 3 of the overlay coverage of the site.

8.3 I attended the site (viewed from the road and surrounds) on the 12th of August 2024 and looked at datasets used for the overlays (contour data and LiDAR) to determine if the mapped boundary at the site is commensurate with the scale the mapping was completed at.

8.4 Observations of the site include:

(a) This property and surrounding properties have been terraced through the use of various retaining walls of differing heights and types (both standalone walls and some forming part of dwelling structures) which have created some gently sloping areas within their property boundaries.

(b) Overall slope angles across parts of the property between road level and opposing sides of the property are typically in the order

of 15° to 20°. The steepest areas of the property across retaining structures are up to 26°.

(c) Immediately across the road from this property there is evidence of hummocky terrain on slopes between 20-30° that likely indicates historic instability has occurred in the vicinity at some time in the past. This hummocky area currently sits within the overlay.

(d) Based on the contour of the land, it appears that the hummocky terrain could have likely extended under the property at 27 Bay View Road and surrounding properties which is possibly why the terracing occurred on these properties to create flatter building platforms.

(e) When visualising the overlay boundary while standing on on-site, the boundary follows a steeper section of slope on the opposite side of the road, then cuts across the road through the gently sloping terraced area between the road and the 27 Bay View Road dwelling and links up with another steeper area (25°) on the lower part of the 29 Bay View Road property.

8.5 After looking at the site-specific detail of this particular property the reason it is included in the overlay is due to the overlay boundary line being drawn to link up steeper areas that show evidence of instability either side of the site and is appropriately shown when considered at the scale the overlay was completed (1:5,000).

8.6 I appreciate that there will be properties (like this property) in the region that will sit wholly or partially within the overlays that will have areas within them of flat/gently sloping land when considered at the site-specific scale. However, given potential regression of slope failures into flat land from slopes above/below and to have overlay boundaries that are continuous to apply planning controls to, it is not practical to exclude each site specific flat/gently sloping area unless it is large enough to be considered at the 1:5,000 scale the maps are intended for.

19 August 2024