BEFORE THE INDEPENDENT HEARINGS PANELS APPOINTED TO HEAR AND MAKE RECOMMENDATIONS ON SUBMISSIONS AND FURTHER SUBMISSIONS ON PROPOSED PLAN CHANGE 1 TO THE NATURAL RESOURCES PLAN FOR THE WELLINGTON REGION

UNDER	the Resource Management Act 1991 (the Act)
AND	
IN THE MATTER	of Hearing of Submissions and Further Submissions on Proposed Plan Change 1 to the Natural Resources Plan for the Wellington Region under Schedule 1 of the Act

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STATEMENT OF REBUTTAL EVIDENCE OF THOMAS EDWARD NATION

ON BEHALF OF GREATER WELLINGTON REGIONAL COUNCIL

HEARING STREAM 3 – RURAL LAND USE ACTIVITIES, FORESTRY INCLUDING VEGETATION CLEARANCE AND EARTHWORKS

16 May 2025

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INTRODUCTION

1 My full name is Thomas Edward Nation. I am a Director and Spatial Analyst at Collaborations.

2 I have read the evidence and statements of Dr Leslie Robert Basher on behalf of Wairarapa Federated Farmers– Submitter 193.

3 In preparing this rebuttal evidence, I have considered Dr Basher's evidence against the Council's hearing stream 3 primary evidence and technical reports relative to erosion mapping and landsliding. I have also carried out additional GIS mapping to illustrate how some of Dr Basher's commentary relates to the PC1 erosion risk mapping.

QUALIFICATIONS, EXPERIENCE AND CODE OF CONDUCT

4 My qualifications and experience are set out in paragraphs 5 to 8 of my primary evidence[i] for HS3 on erosion risk mapping. I repeat the confirmation given in that report that I have read and agree to comply with the Code of Conduct for Expert Witnesses.

RESPONSES TO SUBMITTER EVIDENCE

5 My evidence addresses:

5.1 The appropriateness of the revised erosion risk mapping regarding the scale of the mapping, the Revised Universal Soil Loss Equation (RUSLE) and stream connectivity.

5.2 Dr Basher's commentary on alternative mapping outputs such as the Erosion Susceptibility Classification (ESC) in the National Environmental Standards for Plantation Forestry (NES-PF), and the Highly Erodible Land Model (HEL).

APPROPRIATENESS OF REVISED EROSION RISK MAPS

6 In paragraph 37 of his submission Dr Basher states: The mapping approach used has mapped large areas of land that by other classifications are generally considered not to have serious erosion management issues (i.e. significant areas of LUC class 6 land, and large areas mapped in the ESC as Moderate or High).

6.1 This isn't correct. The potential erosion risk maps (ERM's) developed for PC1[i] cover a similar but much smaller area than alternative, national scale assessments of erosion risk as they are mapped at a finer spatial resolution. The mapping represents a more refined output than the larger scale national models.

6.2 Early iterations of the 'Potential Erosion Risk' layers were assessed against farm-scale (1:10,000) GWRC Land Use Capability (LUC) mapping[ii] in the Takapu and Pouewe part-FMUs (Porirua Whaitua) which showed good agreement between the erosion risk layers and land mapped as LUC 6e or above (Easton et al., 2023[iii]). The GWRC LUC dataset is a detailed LUC layer that is based on field work developed by Dr Douglas Hicks for use at 1:10,000 (farm) scale that uses the same LUC classification as the national dataset. The layer covers part of the Te Awarua-o-Porirua Whaitua.

6.3 Land Use Capability (LUC) is a hierarchical classification identifying: the land's general versatility for productive use; the factor most limiting to production; and a general association of characteristics relevant to productive use[iv]. Table 1 outlines the LUC land classification.

Table 1 - LUC Classification[iv]

LUC Class code	Description
1	Land with virtually no limitations for arable use and suitable for cultivated crops, pasture or forestry
2	Land with slight limitations for arable use and suitable for cultivated crops, pasture or forestry
3	Land with moderate limitations for arable use, but suitable for cultivated crops, pasture or forestry
4	Land with moderate limitations for arable use, but suitable for occasional cropping, pasture or forestry
5	High producing land unsuitable for arable use, but only slight limitations for pastoral or forestry use
6	Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forest
7	Non-arable land with severe limitations to use under perennial vegetation such as pasture or forest
8	Land with very severe to extreme limitations or hazards that make it unsuitable for cropping, pasture or forestry
LUC Subclass Modifier	**Description**
e	erosion susceptibility, deposition or the effects of past erosion damage first limits production

w	soil wetness resulting from poor drainage or a high water table, or from frequent overflow from streams or coastal waters first limits production
s	soil physical or chemical properties in the rooting zone such as shallowness, stoniness, low moisture holding capacity, low fertility (which is difficult to correct), salinity, or toxicity first limits production
c	climatic limitations such as coldness, frost frequency, and salt-laden onshore winds first limits production

6.4 GIS analysis using the national LUC dataset[v] shows that within Te Awarua-o-Porirua and Te Whanganui-a-Tara Whaitua (i.e. all of PC1), 96,400 ha of land is classified as LUC 6e or above. Of this land, 11,580 ha is currently in Pasture and 8,800 ha in Forestry. Class 6e is defined as "Non-arable land with moderate limitations for use under perennial vegetation such as pasture or forest", with erosion susceptibility as the primary limiting factor. Classes 7 or 8 are "Non-arable land with severe (to extreme for class 8) limitations to use under perennial vegetation such as pasture or forest".

6.5 The 'Potential Erosion Risk' layer[i] for pasture maps 1,971 ha in the Highest Risk category across the two Whaitua, with this category representing the top 10th percentile relative to each Whaitua. Of this mapped land, 90% is also on LUC 6e or above with just 10% falling outside classes 6e or above.

6.6 National Highly Erodible Land (HEL[vi]) mapping classifies approximately 2,995 ha across the two Whaitua as 'High landslide risk' with connectivity to the stream network, and an additional 1,240 ha as 'High landslide risk' without connectivity to the stream network (4,235 ha in total, double what is mapped in PC1). This mapping is based on slope thresholds and landcover (lack of woody vegetation), so may be compared to the 'Potential Erosion Risk' layer for pasture (1,971 ha in the Highest Risk category, 3,720 ha in the now-removed High-Risk category). Note the latest Highly Erodible Land maps are not readily available online, the analysis here uses the available version (2012[vi]).

6.7 The NES-PF ESC mapping classifies approximately 66,240 ha as Moderate, High, or Very High risk across the two Whaitua. Of this land, 4,640 ha is currently in Pasture and 5,280 ha in Forestry. By comparison, the 'Potential Erosion Risk' mapping classifies 1,971 ha in Pasture and 991 ha in Forestry.

7 Paragraph 40c of Dr Basher's evidence states "*A further limitation of the landslide risk assessment is that it does not consider connectivity*"

7.1 I recognise this limitation of the modelling. Recent work in New Zealand has looked at spatial assessments of sediment delivery however have not been adopted in this project (Spiekermann et al., 2022[vii]). The method outlined requires an inventory of landslides scars and deposits which were not available for the two Whaitua at the time of the plan change.

7.2 Dr Basher references the sediment delivery ratio (SDR) adopted by SedNetNZ (0.5 for hill country and 0.1 for mountainlands), however the use of a single SDR value for all hill country would have no effect on the area of mapped erosion risk: only the predicted sediment load would reduce when the maps identify relative risk. (under the assumption that pasture and forestry do not occur on 'mountainlands'). An SDR has been applied in the contaminant load modelling developed to support the plan changes revised provision assessments, as presented in Mr Blyth's primary evidence Appendix A[viii].

8 Dr Basher generally does not support the use of the RUSLE based modelling approach. Paragraph 42 of Dr Basher evidence where its stated "The map of RUSLE-modelled surface erosion is in my view largely a slope map and the predictions of sediment yield (t ha^{-1} yr^{-1}) are likely to be highly unreliable, have high uncertainty and provide a poor basis for estimating the risk of surface erosion on pastoral grassland"

8.1 As outlined in Easton et al. (2023[ix]), the modelling is based on spatially varied factors accounting for annual rainfall, land cover, slope, flow accumulation, and soil type – not slope alone.

8.2 RUSLE model parameterisation is based on the dSedNet modelling undertaken for Te Awarua-o-Porirua Whaitua which was calibrated and validated to three sites with sub-daily records of sediment load. See Mr Blyth's rebuttal evidence paragraph 10 to 14 for more detail[x].

9 Paragraph 44 of Dr Basher's evidence suggests two alternative erosion risk models that are focussed on landslide risk: the (ESC) in the NES-PF, and the HEL Model.

9.1 A high-level comparison of these models to the 'potential erosion risk mapping' prepared for PC1 HS3 is given in paragraph 6.1 to 6.7 above.

9.2 Additional maps are provided in Appendix A (Figure 1 and **Error! Reference source not found.**). It is clear that the 5m^2 scale potential erosion risk mapping provides a refinement to the ESC and HEL maps and when used appropriately to support field assessments on the ground (as per Mr Blyth's rebuttal evidence paragraph 7), can be more beneficial to the Council (and the landowner) than a broader scale map.

CONCLUSIONS

10 The erosion risk mapping has been carried out at a much finer resolution to alternative national erosion layers, and when used appropriately to support field assessments on the ground, can be more beneficial to the Council (and the landowner) than a broader scale map (i.e. the ESC or HEL national maps). Spatial assessments in this rebuttal evidence have illustrated that the erosion risk mapping covers a similar but smaller and more target area of land than the alternative national scale models.

DATE: 13 May 2025

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Collaborations

REFERENCES

[i] Nation, T.E. 2025. Technical Evidence HS3 – Erosion Risk Mapping. Prepared for GWRC for PC1.

[ii] Esri. (n.d.).Landform Assessment LUC. ArcGIS Online. https://arcgis.com/home/item.html?id=1ae68caa6b0a491ea459db4d8f58574d

[iii] Collaborations, 2023. Erosion Risk Mapping for Plan Change 1 – Takapū and Pouewe Rural Property Analysis. Prepared for Greater Wellington Regional Council. 06 April 2023

[iv] Landcare Research. (n.d.). *LRIS Data Dictionary - v3*. LRIS Portal. https://lris.scinfo.org.nz/document/9162-lris-data-dictionary-v3/

[v] Landcare Research. (n.d.). *NZLRI Land Use Capability 2021*. LRIS Portal. https://lris.scinfo.org.nz/layer/48076-nzlri-land-use-capability-2021/

[vi] https://data.mfe.govt.nz/layer/53177-erosion-risk-north-island-2012/

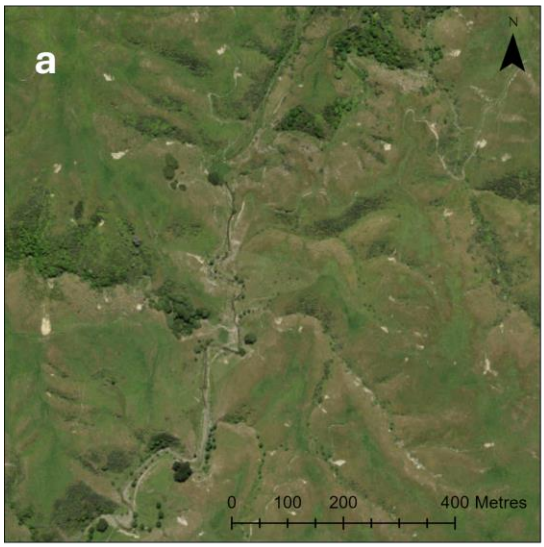
[vii] Spiekermann, R. I., Smith, H. G., McColl, S., Burkitt, L., & Fuller, I. C. (2022). Development of a morphometric connectivity model to mitigate sediment derived from storm-driven shallow landslides. *Ecological Engineering, 180*, 106676

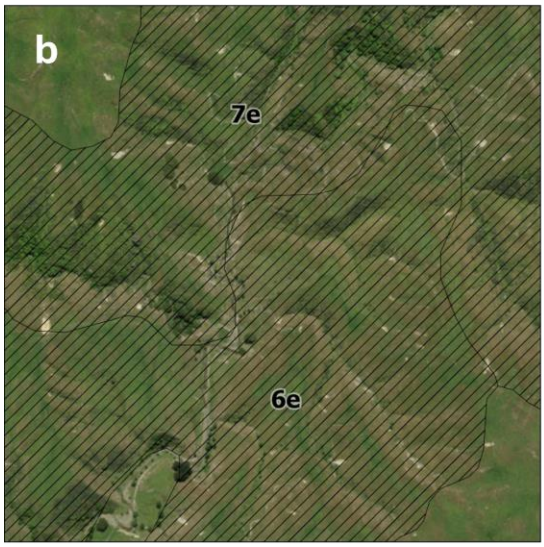
[viii] Blyth, J. M. 2025. Technical Evidence HS3 - PC1 Contaminant Load Modelling and Scenarios – Appendix A. Prepared for GWRC for PC1.

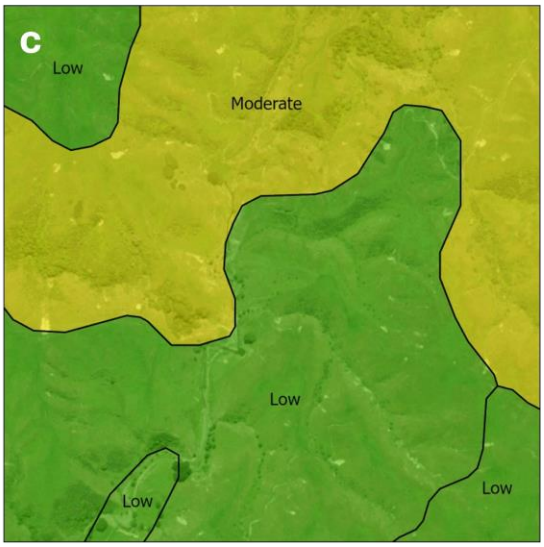
[ix] Easton, S., Nation, T. Blyth, J.M. 2023. Erosion Risk Mapping for Te-Awarua-o-Porirua and Te-Whanganui-a-Tara. Prepared for GWRC for PC1 by Collaborations.

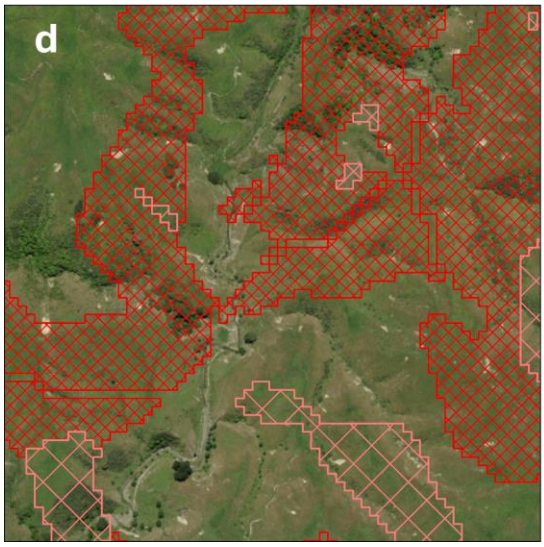
[x] Blyth, J.M. 2025. Technical Rebuttal Evidence HS3. Prepared for GWRC for PC1.

APPENDIX A









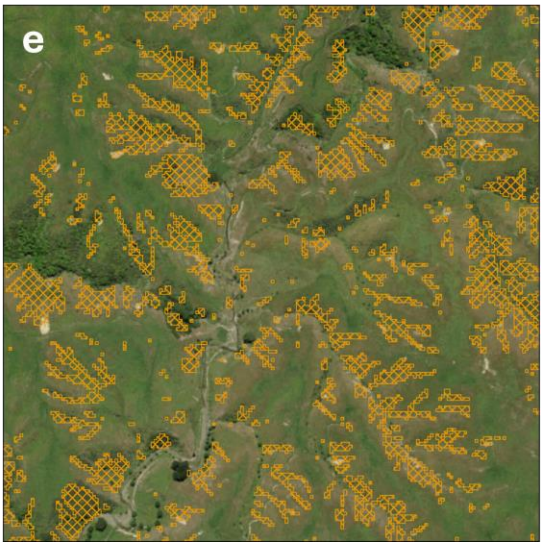


*Figure 1 Erosion Overlays for an eroding area with visible shallow landslide scars in the Pouewe part-FMU: **a.** aerial image **b.** LUC **c.** ESC **d.** HEL (Highly erodible land – connected to the stream network in dark red, Highly erodible land – not connected to the stream network in pink) **e.** Potential Erosion Risk (pasture)*

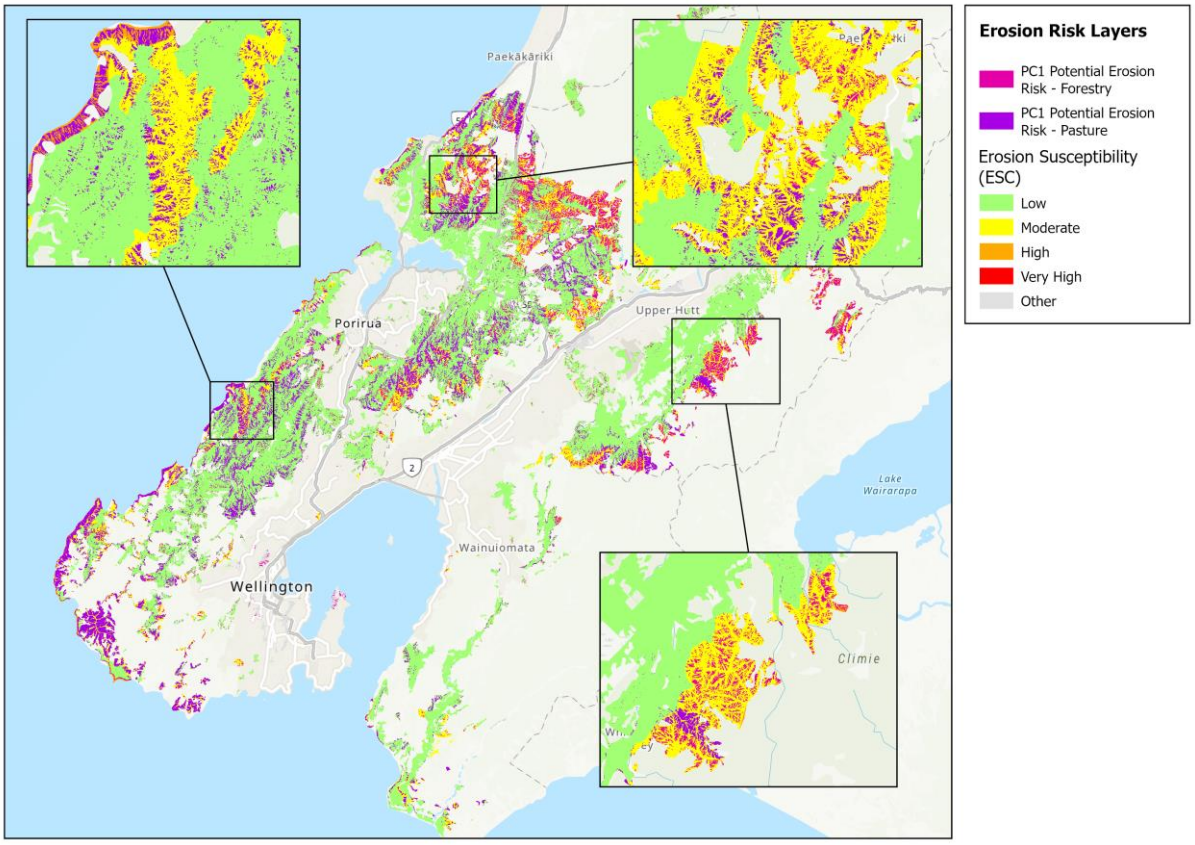


*Figure **Error! Main Document Only.** Comparison of PC1 Potential Erosion Risk layers and National ESC mapping. The mapped area has been clipped to land classified as pasture or forestry by the LCDB (v5, 2018)*