BEFORE INDEPENDENT HEARING COMMISSIONERS APPOINTED BY THE WAIKATO DISTRICT COUNCIL

IN THE MATTER	of the Resource Management Act 1991 (RMA)
AND	
IN THE MATTER	of the Proposed Waikato District Plan
BETWEEN	RANGITAHI LIMITED
	Submitter [No. 343]
AND	WAIKATO DISTRICT COUNCIL
	Local Authority

STATEMENT OF EVIDENCE IN REPLY OF KENNETH JOHN READ FOR RANGITAHI LIMITED

HEARING 27D – COASTAL HAZARDS

(GEOTECHNICAL ENGINEERING)

Dated: 16 April 2021

Solicitors on Record

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INTRODUCTION

- 1. My name is Kenneth John Read.
- I am Principal Geotechnical Engineer at CMW Geosciences in Hamilton. I hold the qualifications of MSc Engineering Geology (Newcastle University) and BSc Geology (University of Edinburgh). I am a Chartered Engineer (CPEng NZ) and a Chartered Geologist (CGeol. UK).
- 3. I have over 38 years' experience in Engineering Geology and Civil Engineering Consulting. I have wide experience in rock and soil slope stability assessment, foundation design and earthworks. My specialties are Engineering Geology and Geotechnical Engineering applications in highways, dams, earthworks, slope stability and land development for domestic and commercial usage. In previous employment in the UK, I carried out a small number of coastal cliff regression assessments for mortgage lenders in SW England. In 2020, I prepared a 'dangerous building' assessment for Waikato District Council for a coastal property at Port Waikato.
- 4. I prepared the geotechnical reports for the Rangitahi Precinct B and D Resource Consents in 2018, and I am familiar with the contents of geotechnical reports prepared by CMW Geosciences for Rangitahi Precinct A in 2017 and the earlier Coffey Geotechnics report to support the Rangitahi Private Plan Change. The land use and subdivision consents for Precinct A were granted in March 2017 and the land use and subdivision consents for Precincts B and D were granted in April 2018. The consents are subject to conditions requiring an Earthworks Management Plan, and the provision of a Geotechnical Completion Report. Where the Report recommended specific design or requirements for the construction of residential buildings those are recorded in a consent notice registered on the title.
- 5. I have been retained by Rangitahi Limited to prepare a statement of evidence on its submission on the Proposed Waikato District Plan (**pWDP**) for the Coastal Hazard Areas hearing. My evidence addresses the geotechnical assessments undertaken for those Precincts that have been through consenting processes as noted in paragraph 4 above – i.e. Precincts A, B and D.

- 6. I am familiar with the Raglan West area and surrounding environment. In addition to my work at Rangitahi, I have variously been employed on projects for Waikato District Council in Raglan, including assessment of landslip risk in the vicinity of a water reservoir tank off Hill Road, and Raglan water treatment plants. I have also assessed slips on SH23 for NZ Transport Agency/Waka Kotahi, and project managed and reported on site investigation and geotechnical design for the Te Uku Windfarm east of Raglan. I have also been engaged by landowners to provide geotechnical assessment of properties approximately 1.4km west of the Rangitahi Peninsular with similar geology.
- 7. In preparing this evidence I have read the following documents:
 - (a) Rangitahi's submission and further submission on the pWDP;
 - (b) Mr Ben Inger's statement of evidence on behalf of Rangitahi;
 - (c) The s.42A report for the Coastal Hazards Area hearing;
 - (d) Coffey Geotechnics (NZ) "Geotechnical Investigation Report for Proposed Residential Sub-division at the Rangitahi Development, Ototoru Road, Raglan". Ref: GENZHAMI17069AA-AB, dated 25 January 2013;
 - (e) CMW Geosciences "Geotechnical Investigation Report for Precinct A of the Rangitahi Peninsula Development, Raglan" Ref: HAM2016-0022AB rev 1 dated 28 November 2016;
 - (f) CMW Geosciences "Precinct A Development, Rangitahi Peninsula Raglan, Geotechnical Design Report" Ref: HAM2016-0022AH rev 0 dated 31 August 2017;
 - (g) CMW Geosciences "Rangitahi Peninsula Precinct B & D Geotechnical Investigation Report" Ref: HAM2017-0057AC Rev 1 dated 2 February 2018;
 - (h) CMW Geosciences "Rangitahi Peninsula Precinct B Geotechnical Design Report" Ref: HAM2017-0057AH, Rev G, dated 29 August 2018;

- (i) CMW Geosciences "Precinct A, Rangitahi Peninsula Development Raglan, Geotechnical Completion Report" Ref: HAM2018-0005AJ Rev 4, dated 26 June 2020; and
- (j) CMW Geosciences "Precinct B, Rangitahi Peninsula Development Raglan, Geotechnical Completion Report" Ref: HAM2019-0070AH Rev 1 dated 6 July 2020.

CODE OF CONDUCT

- 3. I have read the Environment Court Code of Conduct for expert witnesses and agree to comply with it.
- 4. I confirm that my opinions addressed in this statement are within my area of expertise except where I state that I have relied on the evidence of other persons. I have not omitted to consider materials or facts known to me that might alter or detract from the opinions I have expressed.

COASTAL HAZARD AREAS

Coastal Sensitivity (Erosion) and High Risk Coastal Hazard (Erosion)

- The Coastal Hazards chapter of the pWDP defines (and maps) two coastal erosion and coastal inundation management areas along the coastlines of Raglan and Port Waikato:
 - a) High risk coastal hazard area (erosion) and (inundation) the areas where there is significant risk from coastal erosion or inundation with existing sea level and coastal processes in the short term (within the lifespan of the District Plan).
 - b) Coastal sensitivity areas (erosion and inundation) the areas potentially vulnerable to coastal erosion and inundation over the period to 2120, assuming sea level rise of 1.0 m.
- 9. The plans in Annexure 1 of Mr Inger's evidence show the relationship between WDC's recommended coastal hazard overlays, lots at Rangitahi where titles have issued (Precincts A and B), lots which are subject to approved resource consents and lots which are under construction (Precinct D). With respect to Precincts A, B and D I note that:

- a) The High Risk Coastal Hazard (Inundation) Area and the Coastal Sensitivity Area (Inundation) overlays do not affect any residential lots which have been granted consents or issued titles within Precincts A, B and D.
- b) The changes which are recommended to the High Risk Coastal Hazard (Erosion) Area in the Section 42A Report mean that all but two of the residential lots within Precincts A, B and D would now be entirely unaffected by this overlay. Only small parts of the two residential lots, which are within Precinct D, would be affected by the overlay.
- c) Approximately 25 lots within Precincts A, B and D are partially affected by the Coastal Sensitivity Area (Erosion).

Section 42A Report

- 10. Section 1.13 of the s.42A Report Coastal Hazards Part 2 Maps recommends:
 - Reducing the extent of the High Risk Coastal Hazard (Erosion) Area for Rangitahi.
 - b) No change to the Coastal Sensitivity Area (Erosion).
- 11. Attached to my evidence as **annexure** "**A**" is an updated version of the map that was included with Rangitahi's submission showing the recommended change to the High Risk Coastal Hazard (Erosion) Area. This has been prepared by others.

COASTAL EROSION ASSESSEMENTS FOR RANGITAHI PENINSULA

12. As noted in the Introduction, I prepared the geotechnical assessments for the Comprehensive Development Plan (**CDP**) land use and Subdivision Consent applications for Precincts B and D. I am also familiar with the earlier reports prepared by CMW for Precinct A, and Coffey Geotechnics for the Rangitahi development (as a whole). I confirm that the geotechnical assessment reports which were prepared by CMW for lodgement with the Resource Consent applications for Precincts A, B and D considered the risks of coastal erosion.

- 13. Coastal slope sensitivity to climate change is not specifically mentioned or addressed in the reports. However, the process of assessing risk to the development from slope instability considers changes to the degree of stability due to variation and increases in soil saturation through surface water infiltration and changes in groundwater levels. I consider that the potential effects of increased rainfall and extreme weather events that may occur through climate change are therefore suitably addressed in the analyses and recommendations presented in reports undertaken for Precincts A, B and D as part of the consenting processes.
- 14. In particular, any stability and remedial works required to provide a suitable factor of safety for geotechnical issues will also protect against associated geotechnical risks associated with climate change on a site-specific basis. Therefore, in my view the geotechnical design requirements for 'specific design zones' will ensure that the residential development in Precincts A, B and D is resilient against increased soil moisture contents and porewater pressures that may result from climate change.
- 15. I detail the assessments undertaken below.

Precincts A and B

16. Initial preliminary work undertaken by Coffey Geotechnics (Report 7(d)) included study of historic aerial photographs, followed up by site inspection and mapping of coastal exposures and features. Of relevance to coastal processes is the following text and supporting figure:

Coastal cliffs up to approximately 20 metres high were located around the majority of the peninsula. Toe erosion was evident with on-going shallow soil instability plus evidence of deep seated landsliding as depicted on Figure 03

A copy of Figure 03 is presented in **annexure "B"**.

A geotechnical hazard zonation plan was then prepared by Coffey Geotechnical and presented as Figure 04 of that report. A copy of Figure 04 is also attached under **annexure B**.

17. Three hazard zones of 'moderate', 'high' and 'coastal cliffs' are defined in the Coffey report and shown on Figure 04. In summary, the 'moderate' and 'high'

hazard zones are defined based on the anticipated level of engineering and further geotechnical assessment and design required to enable development. The 'coastal cliff' zone was reported as an area generally where development was to be avoided though it was recognised that in some parts of the zone development may be feasible, but it would require comprehensive geotechnical investigation.

- 18. Further mapping of the coastal geomorphology was carried out by CMW Geosciences as part of the detailed site investigation works in Precincts A and B, (Reports 7(e) and 7(g)). The results of these were presented on Figures 02, and 04 respectively of those reports. Copies of those figures are presented in **annexure C**.
- 19. Coastal exposures inspected in Precinct B are indicated on Figure 02 of report7(g) and a copy of that figure is presented in **annexure D**.
- 20. Coastal regression was noted for both Precincts B and D in report 7(g) and a review of historic aerial images dated back to 1944 was undertaken to assess the historic rate of coastal regression. This was estimated to have been between 5m and 10m at some locations over a 73-year period in Precinct B. This large variation in the estimated rates reflects uncertainty in the methodology of comparison of images of varying scales, clarity and quality.
- 21. I consider that this mapping has highlighted those areas of Precincts A and B most at risk of coastal slope instability through rising sea levels and climate change.
- 22. As stated in para. [13] of my introduction, slope stability analyses carried out in the geotechnical design stages model increased groundwater levels and moisture content of the soils that may arise from extreme or prolonged wet weather events.
- 23. I consider that the findings of the various coastal mapping exercises, together with detailed geotechnical investigation, slope stability analyses and design have been suitably incorporated into the Geotechnical Design Reports for both Precincts A and B, and the Geotechnical Completion Reports for Precincts A and B. Through this work specific design zones for "slope", "coastal cliff" and "retaining" have been designated in both precincts. In the latter case Specific Design Zones (Retaining) apply in Precinct A where

retaining walls have been constructed as part of the earthworks. Copies of the drawings showing these zones are presented in **annexure E**.

24. I therefore consider that the recommendations already provided with respect to these Specific Design Zones and incorporated into existing consents adequately address the concerns of the S42a Coastal Hazard Reports authors in Precincts A and B.

Precinct D

- I refer to paras. [12] and [13] of my evidence regarding initial coastal mapping by Coffey Geotechnics which included Precinct D, and Figure 03 in annexure B.
- 26. Further mapping of the coastal geomorphology was carried out by CMW Geosciences as part of the detailed site investigation works in Precinct D (Report 7(g)). The results of this further mapping were presented on Figure 05 of that report and coastal locations specifically logged are shown on Figure 03 of that report. Copies of those figures are presented in **annexure F**.
- 27. No evidence of on-going or significant coastal erosion was observed during our mapping at that time.
- 28. Coastal regression is discussed and assessed in report 7(g) and a review of historic aerial images dated back to 1944 was also undertaken to assess the historic rate of coastal regression. No discernible coastal regression was observed for coastal slopes in those images over this 73-year period.
- 29. I consider that this mapping has highlighted those areas of Precinct D most at risk of coastal slope instability through rising sea levels and climate change.
- 30. As stated in para. [13] of my introduction slope stability analyses carried out in the geotechnical design stages for this precinct model increased groundwater levels and moisture content of the soils that may arise from extreme or prolonged wet weather events.
- 31. I consider that the findings of the various coastal mapping exercises, together with detailed geotechnical investigation, slope stability analyses and design have been suitably incorporated into the Geotechnical Design Report for Precinct D. Through this work "building set backs/building line restrictions"

were proposed. A copy of the drawing from the Geotechnical Design report showing these zones is presented in **annexure G**.

- 32. I note that the *"building set backs/building line restrictions"* closely follow the Coastal Sensitivity Area (Erosion) shown on the Revised Proposed District Plan Hazards Overlays presented in annexure A.
- 33. Earthworks for Precinct D are currently in progress. Geotechnical aspects of those works are being observed by others who will also prepare the Geotechnical Completion Report for those works.
- 34. Those carrying out that work must build on the existing coastal erosion and slope stability assessment. Waikato District Council is required to review and approve the Geotechnical Completion Report. The recommendations in the s.42A Coastal Hazard report could be taken into account when designating final 'specific design zones' allowing for coastal erosion and climate change sensitivity over the next 100 years.

CONCLUSION

- 35. In summary, I conclude that:
 - a) Coastal erosion has been considered and studied during the preparation of existing geotechnical reports for Precents A, B and D.
 - b) The sensitivity of coastal slopes with respect to rainfall and storm events increasing groundwater levels and porewater pressures (which act to increase slope stability risk) in the soil forming the coastal slopes has been assessed as part of the geotechnical analyses.
 - c) Whilst sea level rise and climate change are not addressed specifically in the reports prepared to date, the combined effects of the various studies of coastal erosion, and slope stability have been to delineate specific design zones that at least mirror the proposed revised "Coastal Sensitivity Area (Erosion)". The geotechnical design requirements for 'specific design zones' developed on a site specific basis will also ensure that the residential development in Precincts A, B and D is resilient against geotechnical risks that may result from climate change.
 - d) The High Risk Coastal Hazard (Inundation) Area and the Coastal

Sensitivity Area (Inundation) overlays do not affect any residential lots which have been granted consents or issued titles within Precincts A, B and D.

- e) Only two residential lots within Precincts A, B and D are affected by the proposed High Risk Coastal Hazard (Erosion) Area following the mapping changes recommended in the s42A Report. Only small parts of those lots, which are both in Precinct D, are affected by the overlay.
- f) I therefore consider that the geotechnical investigations and assessments to date, and the conditions already included in the existing consents for those lots potently affected by the proposed hazard area zonation satisfactorily address increased pore water pressures and slope instability which could be a potential effect of climate change. In the case of Precinct D where earthworks are in progress, I consider work completed to date by CMW also satisfactorily address these issues. The Geotechnical Completion Report, which will be prepared by others and require approval by Waikato District Council, will confirm where 'specific design areas' will be required.

Dated this 16th day of April 2020

Kenneth John Read

Annexure A

"Proposed District Plan Hazard Overlays, incorporating s42A recommended Changes" Wainui Environmental Drawing no WE1741-08-150 dated 13/04/2021



R INFORMATION	drawing number WE1741-08-150	Rev. B



Annexure B

Figure 03 "Geomorphological Plan" Rev A, dated 23/01/2013, from Coffey Geotechnical Report ref GENZI17069AA

Figure 04 "Geomorphological Hazard Zone Plan" Rev A, dated 23/01/2013, from Coffey Geotechnical Report ref GENZI17069AA



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Annexure C

Precinct A, Figure 02, "Geomorphology and Geological Plan" dated 13/07/2017, from CMW report ref HAM2016-0022AH Rev 0

Precinct B, Figure 04 "Geomorphology Map" dated 18/10/2017, from CMW report ref HAM2017-0057AC Rev 1



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Annexure D

Precinct B, Figure 03, "Site Investigation Plan" dated 22/11/2017, from CMW report ref HAM2017-0057AC Rev 1



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Annexure E

Precinct A, Drawing 03, "Retaining walls, subsoil drains and Specific Design Zone Plan" dated 25/06/2020, from CMW report ref HAM2018-0005AJ Rev 4

Precinct B, Drawing 03, "Specific Design Zones Plan" dated 27/05/2020, from CMW report ref HAM2019-0070AH Rev.1



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Annexure F

Precinct D, Figure 03 "Site Investigation Plan" dated 27/10/2017, from CMW report ref HAM2017-0057AC Rev 1

Precinct D, Figure 05 "Geomorphology Map" dated 27/10/2017, from CMW report ref HAM2017-0057AC Rev 1



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Annexure G

Precinct D, Appendix E "Geotechnical Remediation Plan" dated 22/11/2017, from CMW report ref HAM2017-0057AC Rev 1



GEOTECHNICAL REMEDIATION PLAN