

**BEFORE THE HEARING PANEL**

**IN THE MATTER** of the Resource Management Act 1991

**AND**

**IN THE MATTER** of Proposed Plan Change 37 - Nukuhau (private) by AN Rajasingham LPT Trustees No 124 Limited anors to the Taupo District Council to rezone c.78ha of land in the Nukuhau area from Rural Environment to a mix of General Residential and Mixed Density Residential with a Neighbourhood Shopping Centre overlay.

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**STATEMENT OF EVIDENCE OF IAN KEITH HUGH GRAY (GEOTECHNICAL)**

**Dated 20 OCTOBER 2021**

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BARRISTER

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## **INTRODUCTION**

1. My full name is Ian Keith Hugh Gray.
2. I have a BSc (Geology) and am a CMEngNZ PEngGeol (#263322) with 20 years' experience. I hold the role of Work Group Manager – Civil at WSP in Taupo. I have spent 3 years working as a Geologist in Auckland and latterly 17 years working as an Engineering Geologist in Taupo including 10 years in a management position that involved the review of wide ranging geotechnical and engineering geology reports, and the past year seconded to Taupo District Council as Delivery Manager for the Taupo Town Centre Transformation Programme. I have recent and relevant experience as a specialist Geoprofessional.
3. I have been engaged by the applicant to provide evidence in respect of geotechnical matters relating to Private Plan Change 37: Nukuhau Private Plan Change (**PC37**).

## **CODE OF CONDUCT**

4. I have read the Environment Court Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2014 and agree to comply with it. I confirm that the opinions expressed 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.

## **SCOPE OF EVIDENCE**

5. My evidence will address the geotechnical setting, a site specific geotechnical assessment of ground and groundwater conditions, the

seismic setting, liquefaction potential, earthworks and stormwater, and other geohazards.

## **SUMMARY OF EVIDENCE**

6. A site walkover of five of the six sites was undertaken on 21 February 2019 by members of WSP to identify any geomorphic features that may have an impact on the development proposal. Site 5 could not be accessed, but visual observations were made from adjacent sites.
7. Following the site walkover, a comprehensive written report was prepared dated 27 October 2020 which addressed all relevant geotechnical issues (**Report**) I reviewed that Report. The Report is set out at Appendix I to the Plan Change Application documents.
8. In order to meet the requirements of New Zealand Standard (**NZS**) 4404:2010 'Land Development and Subdivision Infrastructure' and the Taupo District Council (**TDC**) Code of Practice for the Development of Land for subdivision of existing lots, I recommend the following:
  - a) Further detailed geotechnical investigations with accompanying subsurface investigations should be undertaken prior to each stage of subdivision development to inform detailed civil design and to identify areas of loose near-surface soils such as that encountered in BH04 (CN Top Ltd site, most northern block).
  - b) Shallow 'NZS 3604:2011-type' geotechnical investigations should ultimately be undertaken on each lot prior to application for building consent, to ascertain whether individual lots are able to be designed using the proprietary designs from that standard, or whether specific engineering design is required.

- c) Existing stormwater flow paths and gullies should be maintained where possible to avoid stormwater concentration in one area and reduce the chance of tomo formation. Requirements in the detailed stormwater report will supersede the requirements of this report.
- d) Dwellings should be provisionally offset at least 10 m from any steep-sided gullies such as the Brentwood Gully extension and the stormwater infiltration basins in the CN Top land (most northern block) in order to reduce the risk to dwellings from potential slope instability. It should be noted that subsequent detailed civil design may overrule this requirement if the landform is sufficiently modified and/or retained.
- e) Construction should be avoided on any areas of historic or uncontrolled fill, including the fill found on the Rajasingham site. Further investigation or removal of this fill is recommended prior to housing development in any areas of uncontrolled fill.
- f) Further investigation should be undertaken in the area surrounding CPT02 (Rajasingham site) to determine the presence and extent of a possible large tomo at 15m depth and its impact on future development. Geophysical investigations are recommended in this location to help to define the extent of the affected area. No construction is recommended in this area until the exact extent of this feature has been investigated and assessed.
- g) Construction should be avoided within any fault avoidance areas, including that of the fault identified in the north-western corner of 29 Watene Lane / Rangatira 8A6B2.
- h) Further investigation into groundwater levels across the site by installing and monitoring piezometers prior to subdivision. These

would be particularly useful in the localised areas where potential perched groundwater has been identified. The investigation points are discrete points and have been generalised to provide a geotechnical model for analysis. However, it should be noted that perched groundwater may exist at locations within the site that were not investigated. The depth to groundwater is uncertain. The groundwater depth will significantly influence liquefaction potential.

- i) In the event that shallow groundwater levels are identified and the probability of liquefaction increases from “low” (groundwater at depths greater than 15m), to “high” to “very high” (elevated or perched groundwater levels), measures such as those recommended in Canterbury Guidelines can be utilised to mitigate any risk to residential structures.
  - j) Further liquefaction analysis at the civil design stage when final ground levels are known as this will affect the amount of settlement experienced at each site during seismic events.
9. The proposed plan change area sits within the Wairakei – Tauhara Geothermal Field, which is subject to a number of areas of subsidence due to geothermal draw down. Information was sought from Contact Energy regarding settlement due to geothermal power development in the Nukuhau area in particular. The information provided indicates that this area is not within a known subsidence bowl and had not experienced significant settlement during the last area wide survey in February 2017.

## **CONCLUSION**

10. Based on the above information, I consider that all sites within the PC37 area would be generally suitable for residential development from a geotechnical perspective. Observed areas of immediate concern have been

highlighted and will need to be addressed during the civil design stage at the time of subdivision. It should be noted that due to the nature of the assessment, further unsuitable areas and or soils may be encountered during subdivision development and consideration should be given to this during the civil design stage.

**Ian Keith Hugh Gray**

**20 October 2021**