Before the Independent Hearing Panel
at Taupo

in the matter of: Proposed Plan Change 36 to the Taupo District Plan – Request under Schedule 1 of the RMA to rezone Rural Land to Residential at Whareroa North by The Proprietors of Hauhungaroa No. 6

to: **Taupo District Council**

Applicant: **The Proprietors of Hauhungaroa No.6**

Statement of Evidence by **Tony Kelly** on behalf of The Proprietors of Hauhungaroa No.6

29 April 2020

1. INTRODUCTION

1.1. My name is Tony Kelly. I am a Civil Engineer employed fulltime by Cheal Consultants Ltd. I have worked for 24 years as a civil engineer in the roading and land development fields for various contractors, local authorities and consultancies. I have a New Zealand Certificate in Engineering (Civil) and I am a graduate member of Engineering New Zealand.

1.2. My work over the past 15 years has included designing and assessing stormwater systems for land development projects. Since January 2018 I have been involved with the design and construction of several stormwater disposal systems in the Taupo district.

1.3. I confirm that I have read the "Code of Conduct for Expert Witnesses" contained in the Environment Court's Consolidated Practice Note 2014 and agree to comply with them in giving evidence in this proceeding. Except where I state that I am relying on evidence of another person, this written evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this evidence.

1.4. As part of my engagement on this project I visited the site on 5 February 2020.

1.5. In preparing this evidence I reviewed and considered the following documents:

- 1.5.1 Martinez, A., 18 October 2018. Verification of Geotechnical Constraints for Residential Development. Ref. IBA 1070L150, Cheal Consultants Limited.
- 1.5.2 Kelly, T., 26 September 2019. Preliminary Stormwater Assessment. Ref. IBA 1070 Rev.4, Cheal Consultants Limited.
- 1.5.3 Various submissions identified by Taupo District Council as relating to stormwater and engineering matters.
- 1.5.4 Phillips, M. and Gray, I., 31 March 2020. Proposed Plan Change 36 – Whareroa North – Initial Geotechnical Review. Ref. 2-37780.00, WSP Opus.
- 1.5.5 Bonis, M., 22 April 2020. S42A Planning Report on Submissions and Further Submissions, including attachments H and I. Planz Consultants Ltd (for Taupo District Council).
- 1.5.6 Phadnis, H., Geotechnical engineering evidence (as prepared for this hearing by my colleague at Cheal).

2. EXECUTIVE SUMMARY

2.1. My evidence is specific to the matters of stormwater engineering based on my 24 years' experience in the civil engineering field and my New Zealand Certificate in Engineering (Civil) qualification.

2.2. My evidence is based on a site visit and a review of the documents referred to in 1.5 above.

2.3. I conclude that subject to detailed site-specific engineering design following a full geotechnical site investigation, stormwater from the site can be dealt with in accordance with best practice

"low impact" principles that meet or exceed local and regional authority stormwater guidelines and requirements.

2.4. Both Taupo District Council (TDC) and Waikato Regional Council (WRC) have supported in principle the proposed stormwater strategy subject to detailed design following a full geotechnical site investigation, with TDC's stormwater evidence stating that "the proposed stormwater management regime is accepted in principle" and WRC's submission stating that WRC is "comfortable with the proposal to incorporate best practice stormwater design".

3. PLAN CHANGE 36: WHAREROA

3.1. In 2019 I prepared the Preliminary Stormwater Assessment report referred to in 1.5.2 above to accompany this plan change application. The approach I took was to broadly outline a strategy for dealing with post-development stormwater flows and quality on the site.

3.2. At the time of my involvement a concept plan had been prepared as part of the Plan Change application, and the Geotechnical report referred to in 1.5.1 above had been prepared by Cheal. As part of my preliminary stormwater assessment I considered the recommendations of the Geotechnical report prepared by Mr Andres Martinez (who has since left Cheal), and discussed the project's stormwater-related aspects with Mr Martinez.

3.3. I also discussed the project's broad stormwater-related issues, and my proposed approach to those issues, at an informal meeting in May 2019 with TDC stormwater asset manager Brent Aitken and TDC development engineer Roger Stokes.

4. PRELIMINARY STORMWATER ASSESSMENT

4.1. The Preliminary Stormwater Assessment prepared in 2019, and referred to in 1.5.2 above, broadly outlined a strategy to deal with post-development stormwater flows and quality from the site. A "low impact" design was taken, to utilise the site's natural soakage capabilities, reduce existing erosion patterns above the Whareroa Stream, and prevent water quality degradation in the stream itself.

4.2. It should be noted that the assessment was not a detailed design. If the plan change is approved and the development able to proceed, a detailed design including catchment modelling and precise detention pond sizing will be carried out as part of a resource consent application and following a full site geotechnical investigation.

4.3. As part of the assessment I undertook in 2019, the site's existing pre-development stormwater catchments and runoff volumes were considered. These are shown on drawing 1070-SK650 Rev A in Appendix 1. Pre-development Catchment B drains to the "bowl-shaped" depression above the Whareroa Stream. Some of Catchment B's pre-development runoff soaks into the ground, and some of it flows overland in a southerly direction to the erosion "scar" feature at the southern end of the catchment.

4.4. The Geotechnical report recommended reshaping the land around the lower part of the bowl-shaped depression, i.e above the erosion scar at the southern end of pre-development

Catchment B, to avoid overland flows causing further erosion of the scar. In accordance with this recommendation, the stormwater assessment proposed recontouring and planting the land above the erosion scar feature, to eliminate almost all overland flow to that point.

4.5. The site's post-development stormwater catchments and runoff volumes were also considered. These are shown on drawing 1070-SK656 Rev B in Appendix 2:

- Post-development Catchment A covers the "bowl" and deals with road and lot areas, and drains to Pond 1;
- Post-development Catchment B deals with road areas in the north-western part of the site, and drains to Pond 2;
- Post-development Catchment C deals with road areas in the north-eastern part of the site, and drains to Pond 3; and
- Post-development Catchment D deals with small road and lot areas in the eastern part of the site, and drains onto natural ground to the east of the proposed lots.

4.6. Ponds 1 and 2 are proposed to be sized to deal with the 1% AEP (100 year) storm, and Pond 3 is proposed to be sized to deal with the 2% AEP (50 year) storm. Pond 1 is proposed to be lined (i.e. constructed with an impermeable base and sides) due to its location within the pre-development Catchment B "bowl". Ponds 2 and 3 are located outside pre-development Catchment B and are therefore proposed to be non-lined to allow some soakage infiltration through their bases, which is standard practice for detention pond devices.

4.7. Ponds 1-3 are proposed to detain stormwater and discharge it at pre-development quantities. The discharge is proposed to be onto unmodified vegetated land below the ponds. This can be achieved by outletting the restricted flow from each pond into outlet swales which run parallel to the ground contour (i.e. along the slope), as shown on sketch drawing 1070-SK660 in Appendix 3. The swales would be fitted with level spreader bars to evenly spread flows along their length and periodically discharge unconcentrated sheet flows onto natural vegetated ground.

4.8. During preparation of the preliminary stormwater assessment, the possibility of directing stormwater from Pond 1 to the Whareroa Stream bed via a drilled pipeline was considered. This was subsequently discounted due to the invasive nature of such work on the stream bed and the potential for erosion of both the bank and the stream bed, including ground water making its way down the outside of the drilled pipeline and causing subterranean erosion alongside the pipeline.

4.9. The site's post-development soakage capabilities, specifically for the area overlying pre-development Catchment B which drains to the bowl, were also considered. These are also shown on drawing 1070-SK656 Rev B in Appendix 2:

- Soakage Area 1 covers the entire post-development Catchment A, and deals with road and lot runoff (lots within this soakage area will have above-ground stormwater tanks installed at the time of building to attenuate the 10% AEP (10 year) storm and restrict soakage outflows to predevelopment flow rates);
- Soakage Area 2 covers part of post-development Catchment B, and deals with road runoff; and
- Soakage Area 3 covers the remaining lot areas overlying pre-development Catchment B.

4.10. Conveyance of road runoff to the soakpits and ponds is proposed to be via grassed roadside swales, to provide treatment.

4.11. Thus, the approach taken for dealing with the site's post-development stormwater is to dispose of road and lot runoff for the 10% AEP (10 year) storm to soakholes, with runoff from up to the 1% AEP (100 year) storm draining to the ponds, with Ponds 1 and 2 attenuating the 1% AEP volume and Pond 3 attenuating the 2% AEP volume.

4.12. I discussed this approach with Mr Martinez, who advised that based on his Geotechnical report, soakage was feasible within pre-development Catchment B, subject to a full geotechnical site investigation as part of future detailed engineering design.

4.13. I also discussed this approach at an informal meeting in October 2019 with TDC stormwater asset manager Brent Aitken, who indicated agreement in principle with the proposals set out in the preliminary stormwater assessment, subject to future detailed engineering design and approval.

4.14. As part of the preliminary stormwater assessment runoff from the access road as shown on drawing IBA 1070-SK07 in Appendix 4 was briefly assessed, with the assessment made that stormwater from the access road could be dealt with using a low impact approach, utilising a combination of sheet flows (where runoff is distributed evenly off the road onto unmodified, vegetated ground), swales and soakholes.

5. SUBSEQUENT GEOTECHNICAL ADVICE

5.1. Following review of the submissions and the subsequent preparation of the geotechnical evidence as presented at this hearing by my colleague Harshad Phadnis, some changes will need to be made to the approach taken in the preliminary stormwater assessment as outlined above.

5.2. As discussed in 4.4 above, the preliminary stormwater assessment proposed recontouring and planting the area above the erosion scar, to eliminate almost all overland flow to that point. Mr Phadnis's evidence supports this approach.

5.3. Mr Phadnis's evidence also supports the proposed sheet flow discharge methodology for the stormwater ponds as discussed in 4.7 above, subject to geotechnical site investigation confirming the stability of the areas of natural vegetated ground below the ponds which will receive the periodic sheet flow discharges.

5.4. As discussed in 4.9 and 4.11 above, the preliminary stormwater assessment proposed disposing of road and lot runoff from the 10% AEP (10 year) storm to soakholes. Mr Phadnis's evidence supports this approach as the "typical scenario", subject to geotechnical site investigation which would include machine-drilled boreholes at detailed design stage to determine the likelihood of underground flowpaths within pre-development Catchment B.

5.5. In the event of the geotechnical site investigation revealing that underground flowpaths exist, which have the potential to adversely affect the erosion scar at the bottom of the bowl in a scenario described in Mr Phadnis's evidence as "worst case", then Mr Phadnis recommends that to protect the erosion scar at the bottom of the bowl, soakholes should not be utilised within pre-development Catchment B.

5.6. This alternative scenario would require piped reticulation to be installed to collect runoff and convey it to the ponds, and the ponds to be increased in size to handle the increased runoff which

would otherwise have been disposed of to soakholes. Swales could still be utilised for road runoff conveyance and treatment.

5.7. Mr Phadnis's evidence mentions the possibility of piping stormwater to the Whareroa stream, as raised by WSP Opus in the geotechnical review document referred to in 1.5.4 above. As discussed in 4.8 above, the possibility of directing stormwater from Pond 1 to the Whareroa Stream bed via a drilled pipeline was considered and subsequently discounted.

5.8. Mr Phadnis's evidence also addresses the access road, and states that the expected underlying pumiceous soils / ignimbrite can stand up very well with 1H:4V gradients and benching, which is the "typical scenario". As discussed in 4.14 above, a low impact approach involving a combination of sheet flows, swales and soakholes is proposed.

5.9. This will still be the broad approach for dealing with runoff from the access road, however collection and conveyance of runoff from steeper areas by way of channels and piped gravity reticulation, particularly where earthworked cuts and fills are necessary to form the road, will also be appropriate. Such reticulation is common engineering practice, and its extent in this case would be determined subject to geotechnical site investigation as part of future detailed engineering design.

5.10. These are all matters which, in my experience, are appropriately addressed at subdivision design and consenting stages, once the full geotechnical site investigation has been undertaken to inform that design process.

6. SUBMISSIONS

6.1. I confirm that I have read all of the submissions to the Plan Change. My comments regarding specific stormwater-related submissions are as follows:

Submitter	Submission Points	Rebuttal
Waikato Regional Council ("WRC")	<u>Outstanding geotechnical issues with the 'bowl' geological feature – Stormwater concern</u> The WRC submits that there is an unstable and retrogressive erosion feature in the proposed subdivision. This 'bowl' does not appear to have been sufficiently addressed in the geotechnical reporting accompanying the application. WRC deems that the information provided is insufficient to be able to undertake a complete assessment of the proposal against the hazard provisions contained within the WRPS. WRPS Section 6A(h) directs new development away from natural hazards. Further, District Plans shall incorporate a risk-based approach into the management of subdivision, use and development in relation to natural hazards and shall ensure that new development is managed so that natural hazard risks do not exceed acceptable levels (Section 13.1.1(a)). The 'bowl' feature may have implications for the design of stormwater infrastructure required to service the proposed development. The stormwater management systems will also need to be designed to	Refer 5.2-5.6.

	avoid or mitigate adverse effects on the receiving environment including the Whareroa Stream.	
Kia Paranihi	Outcomes of hapu hui have largely been worries about a raw scarp area above the stream which erodes at times of medium to heavy rainfall and also, the structure and placement of the bridge crossing of the stream. The scarp can erode, resulting in silt and pumice sand slipping into the stream and causing change to its outfall and nature. At the lakeside crossing of the stream it is possible cross it at ankle depth one day and above knee depth the next. This is a shock if you are unaware and there was a concern that the problem would increase with the development. While we acknowledge that this is a naturally and regularly occurring event every now and then given the pumice nature of the lakeside soil structure, we conveyed to the development consultants our wish to have this minimised to achieve stabilisation of the land as we are not far away. The developers response as outlined in the application is more than satisfactory and we are assured of ongoing consultation on the matter.	Submission supports the plan change. Refer 5.2-5.6.

7. SECTION 42A REPORT

7.1. I confirm that I have read the Section 42A Report referred to in 1.5.5 above and its attachments H and I which relate to stormwater. My comments regarding specific stormwater-related comments are as follows.

7.2. Regarding stormwater, the Section 42A Report itself only refers to comments by Mr Roger Stokes in Attachment I, which I address in 7.11 below.

7.3. Regarding Attachment H – Geotechnical, prepared by WSP Opus geotechnical engineer Ms Maddison Phillips and of which paragraphs 9.15-9.20 and 10.11-10.13 deal with stormwater issues, I respond to specific paragraphs as follows:

7.4. Paragraph 9.18 refers to the potential impact of stormwater soakholes on underground erosion. As discussed in 5.4 and 5.5 above, the geotechnical site investigation will include boreholes to determine the likelihood of underground flowpaths. If such underground flowpaths are found, soakholes will not be utilised within pre-development Catchment B. This point of concern will therefore be addressed.

7.5. Paragraph 9.19 refers to stability of the land between Pond 1 and the Whareroa stream bank, stating this "requires careful consideration". As discussed in 5.3 above, Mr Phadnis's evidence supports the proposed sheet flow discharge methodology for the stormwater ponds, subject to geotechnical confirmation of the stability of the areas of natural vegetated ground below the ponds. This point of concern will therefore be addressed.

7.6. Paragraph 9.20 refers to the erosion scar feature at the bottom of the "bowl", and sets out two potential options to mitigate stormwater impacts on the erosion scar feature: recontouring the land around the lower part of the bowl, and piping stormwater to the Whareroa stream.

7.7. As discussed in 4.4 and 5.2 above, recontouring and planting will be carried out above the erosion scar to eliminate almost all overland flow to that point. This point of concern will therefore be addressed.

7.8. As discussed in 4.8 and 5.5-5.7 above, piping stormwater down to the Whareroa stream has been discounted as an option because of the invasive nature of such work on the stream bed and the potential for erosion of both the bank and the stream bed. This point of concern has therefore been considered and discounted for now. If geotechnical investigations reveal that underground flowpaths exist and soakholes cannot be utilised within pre-development Catchment B, piped reticulation will instead collect stormwater and convey it to the ponds, which will be increased in size accordingly.

7.9. Paragraph 10.12 states that "the proposed disposal of stormwater on-site has significant geotechnical consequences if not adequately managed". As discussed throughout this evidence, the detailed stormwater design will follow and be informed by a full geotechnical site investigation. This point of concern will therefore be addressed.

7.10. Paragraph 10.13 refers to stormwater pond design lives and monitoring and maintenance programmes. Such considerations are appropriate for the detailed design phase and will form a standard part of any TDC resource consent and engineering approval conditions. The avoidance of "leakage or failure" will be a fundamental consideration of the detailed pond design and associated earthworks, which as discussed throughout this evidence will follow and be informed by a full geotechnical site investigation. These points of concern will therefore be addressed.

7.11. Regarding Attachment I – Infrastructure and Reserves, of which paragraphs 55-71 were prepared by TDC development engineer Roger Stokes and deal with stormwater issues, I concur with all aspects of Mr Stokes's evidence, which accepts in principle the proposed stormwater management regime "subject to the geotechnical engineers also being satisfied with the methodology proposed". Again, a full site geotechnical investigation will be carried out to inform the detailed stormwater system design. This point of concern will therefore be addressed.

8. CONCLUSION

8.1. It is my professional opinion that subject to detailed engineering design following a full geotechnical site investigation, stormwater from this proposed subdivision development site can be adequately dealt with both in terms of quality and quantity.

Tony Kelly
29 April 2020

APPENDICES

1. Cheal drawing 1070-SK650 Rev A
2. Cheal drawing 1070-SK656 Rev B
3. Cheal sketch drawing 1070-SK660
4. Cheal drawing IBA 1070-SK07