Tonkin+Taylor

Job No: 30848.2000
15 July 2019

Auckland Council
Private Bag 92300
Auckland 1142

Attention: Irshaad Chawdhary

Dear Irshaad

Huia Water Treatment Plant Replacement Project
Response to draft request for further information - Land Stability

Auckland Council (AC) has issued a draft s92 request for additional information regarding geotechnical aspects of the resource consent application submitted for the Huia Water Treatment Plant (WTP) Replacement Project. Geotechnical issues were limited to the following reports prepared by Tonkin & Taylor Ltd (T+T) and appended to the AEE:

> Tonkin & Taylor, 2019. *Huia Water Treatment Plant Replacement Project. Groundwater and settlement effects.* Report prepared for Watercare Services Limited dated May 2019. Appendix H of the AEE.
>
> Tonkin & Taylor, 2019. *Huia Water Treatment Plant Replacement Project. Preliminary Land Stability Assessment.* Report prepared for Watercare Services Limited dated May 2019. Appendix I of the AEE.

Since the submission of those two reports, T+T has undertaken further technical works, which are presented in the following addenda:

> Tonkin & Taylor, 2019. *Huia Water Treatment Plant Replacement Project. Addendum to the Preliminary Land Stability Assessment Report.* Report prepared for Watercare Services Limited dated July 2019.
>
> Tonkin & Taylor, 2019. *Huia Water Treatment Plant Replacement Project. Addendum to the Groundwater and Settlement Effect Reports.* Report prepared for Watercare Services Limited dated July 2019.

Each of the questions/comments provided by AC are presented below, together with T+T's response. Where required, the response directs the reader to the relevant section of the addenda where technical matters are discussed in more detail.

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Question 1:

The level of information provided in the geotechnical report is limited. There are no geological cross-sections provided for Reservoir 2, so we do not know what kind of sublayers and what thickness of the different soils types are present at Reservoir 2 location. The application indicates undertaken earthworks - fill approx.10m thickness within the Reservoir 2 location, which is substantial and will have high possibility of inducing fill settlement of the ground. Tonkin & Taylor report does not provide any assessment on this one. Moreover, the report is titled as preliminary land stability assessment, but there are no stability assessments and factor of safety evaluation was provided to confirm.

T+T Response

- The site of Reservoir No. 2 was investigated by T+T in 2010[1] as part of an early WTP upgrade assessment. This used project-specific as well as historic investigations undertaken by others. T+T (2010) provided a detailed geotechnical assessment of what is now the Reservoir No. 2 site, including the development of geological sections and slope stability models. These existing assessments are considered to be suitable for use in this assessment;
- With regards to the geological profile at the Reservoir No. 2 site, this is presented as Figure A2 in the *Addendum to the Preliminary Land Stability Report*. This has been taken directly from T+T (2010) with the Reservoir No. 2, and the proposed engineered fill embankment superimposed;
- An assessment of the settlement induced by the placement of the fill to form the building platform at the Reservoir No. 2 site is presented in Section 5 of the *Addendum to the Preliminary Land Stability Report*. The analyses show that induced settlements are larger than would normally be tolerated by a structure such as Reservoir No. 2, which will require addressing in detailed design, most likely through the installation of pile foundations, or by ground improvement by either removal of the underlying colluvium, or strengthening the soil with elements such as stone columns. Preloading is not considered to be a viable treatment as this has the potential to temporarily lower the stability of the slope. We consider this to be a minor technical issue best left to the preliminary design and detailed design stages of the project;
- Slope stability assessments of the Reservoir No. 2 site are presented in Section 4.4 of the *Addendum to the Preliminary Land Stability Report*. These confirm that the slope on which the reservoir and fill embankment will be placed is adequately stable under both static and seismic design cases.
- The stability of the Reservoir No. 1/tunnel shaft and replacement WTP sites are assessed in Sections 4.2 and 4.3 of the Addendum to the Land Stability Report (T+T, 2019c) respectively, although we do not believe that they were the subject of this question.

Question 2:

The report does indicate that secant piles and other retaining structures will be installed to support substantial excavations and filling for reservoirs, tunnel shaft and treatment plant, but the report does not include any soil strength and retaining wall design parameters. It is appreciated that the actual design of the walls and retaining structures are not part of the regional consent, but it is expected that the soil strength and design recommendations should be included in the geotechnical

[1] Tonkin & Taylor, 2010. *Huia Water Treatment Plant Rebuild, Geotechnical Investigation and Assessment*. Report prepared for Watercare Services Limited dated October 2010.

report now and this should be based on factual investigation data and not on the assumption or inferred data. No investigation was undertaken within the Reservoir 1 location.

T+T Response

The AEE application acknowledged that no recent project-specific geotechnical investigations have been undertaken due to constraints on vegetation clearance and access for drilling rigs etc. Although no geotechnical investigations have been undertaken within the actual footprint of Reservoir No. 1, there are nevertheless several dozen investigation points in the general WTP area, as well as within the immediate vicinity of Reservoir No. 1. Notwithstanding the fact that recent project-specific investigations have not been able to be completed to date, we consider that the quantity of geotechnical data currently available for the proposed project site exceeds that available for many similar projects at the resource consent application stage.

There will of course be a need for additional geotechnical investigations to be undertaken once access to these sites is available. Nevertheless the abundant available data across the broader site has demonstrated a consistency of results that provides appropriate confidence in the ground models presented in the AEE. Given the level of expertise that has been used to develop the ground model, we do not consider the ground models to simply be assumed and therefore in some respect insufficiently reliable.

Derivation of soil strength and retaining wall design parameters are not required as part of a regional resource consent application. The purpose of the geological and geotechnical assessment reports presented in the AEE was to determine the fundamental ground conditions and identify appropriate means of construction and their likely effects i.e. identifying geological or geotechnical factors that might be considered fatal flaws.

Notwithstanding the above, the *Addendum to the Preliminary Land Stability Report* provides geotechnical design parameters derived from a consideration of all of the available data for the site – see Section 2.0. Retaining wall design parameters have not been provided as these relate to specific retaining wall type that are currently unknown or undecided. The Indicative Construction Methodology Report prepared by Alta indicates that the deep excavations may be constructed from bored piles, sheet piles or concrete caissons.

Retaining wall design parameters are not of value at this stage of the project. What is important is whether any or all of the proposed retaining wall construction methods can actually be successfully undertaken. On the basis of the investigations untaken to date, we consider that this is indeed the case. We assess that the submitted documents achieve this. Following further investigations, it will be up to the design team to determine what construction methodology is most appropriate.

Question 3:

Construction methodology and timeline is provided with the application, but this is not entirely accepted, since in the absence of detailed stability assessment one cannot confirm suitability of the proposed methodology. As mentioned above, with substantial fill, potential for fill induced settlement cannot be ignored and if the settlement is significant than perhaps other methodology such as pre-loading of site or combination of engineering structures would be necessary. In given limited geotechnical information it is difficult to ascertain appropriateness of the proposed methods, and therefore council would expect further information around global stability, fill induced settlement, geological cross-section etc.

T+T Response

We do not believe that this question is relevant to a resource consent application. Issues such as preloading, settlement and the stability of an engineered embankment are matters for detailed design and are not relevant to a regional resource consent application. It is known from the available

geotechnical data that the site does not contain ground conditions that are so unusual that constructability could possibly be called into question. Indeed the existing WTP demonstrates constructability.

Notwithstanding this, the Addendum to the Lands Stability Report presents the following:

- Geotechnical design parameters (Section 2);
- A discussion of geological conditions at Reservoir No. 2 (Section 3.1);
- Slope stability analyses at Reservoir No. 2 (Section 4.4);
- Settlement of the Reservoir No. 2 fill embankment; and
- Discussion on the stability of the escarpment and adjacent areas (Section 4.1).

Question 4:
Effects of seismic events – Assessment of land stability, based on factual data, should be included in the report, which is not provided.

T+T Response

The effect of seismic events on stability of Reservoir No. 2 is presented in Section 4.4 of the *Addendum to the Preliminary Land Stability Report*. The stability of the other elements of the project are described in Sections 4.2 and 4.3. This has shown that the seismic stability of the Reservoir No. 2 site is adequate. From this we know that the flatter Reservoir No. 1/Tunnel Shaft and Replacement WTP sites to be at least as stable.

We consider seismic design to be a matter for detailed design

Question 5:

The engineering plan indicates new stormwater drains will be installed and the plan indicates that one of the SW pipe segments will cross the Woodland Road. The SW pipe will need to remain as a private asset and since the pipe will be crossing the AT asset, an easement will be required. This is not a DE matter, but I would like to highlight this so that appropriate easement can be created. Please highlight this to AT.

T+T Response

Acknowledged.

Question 6:

The groundwater and settlement report indicates groundwater drawdown will spread beyond the Woodlands Road and the anticipated settlement would be between 30mm to 80mm. The length of the road affected by this would be about 300m. Please highlight this to AT to assess effects of the ground settlement on the pavement structures.

T+T Response

Acknowledged.

Yours sincerely

Kevin J. Hind
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15-Jul-19
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