BEFORE THE WAIPĀ DISTRICT COUNCIL

IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	of Proposed Plan Change 20 – Airport Northern Precinct Extension to the Operative Waipā District Plan

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STATEMENT OF EVIDENCE OF KORI LENTFER

(GEOTECHNICAL)

28 FEBRUARY 2023

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Environment Law and Strategy

INTRODUCTION

Qualifications and experience

1. My name is Kori Lentfer.

2. I am an Associate Engineering Geologist with CMW Geosciences and a member of Engineering NZ, and the New Zealand Geotechnical Society. I have 19 years of geotechnical engineering experience both internationally and in New Zealand, which has focused primarily on assessments of land, building and infrastructure development over variable terrain and geological conditions. Areas of particular experience include geotechnical land stabilisation, geomorphological mapping and ground model development, engineering geology of weak soil / rock masses, soft ground / peat remedial engineering, earthworks design, earthworks quality assurance and construction supervision.

3. I am familiar with the application site and the surrounding locality. I have read the relevant parts of: the application; submissions; further submissions and the Section 42A Report.

Involvement in Proposed Plan Change 20

4. I have been engaged by Titanium Park Limited ("TPL") and Rukuhia Properties Limited ("RPL") to prepare evidence for Proposed Plan Change 20 ("PC20"). I was the author of the Preliminary Geotechnical Investigation Reports associated with TPL/RPL's PC20 request.[1] I have also been involved in Titanium Business Park with my previous employer Coffey Geotechnics where I planned and implemented the geotechnical site investigation for the site and prepared an earlier geotechnical investigation report in 2011. I have visited the site and the locality on multiple occasions since 2011.

Code of Conduct

5. I confirm that I have read the Code of Conduct for Expert Witnesses contained in the Environment Court Practice Note (2023) and I agree to comply with it. In that regard, I confirm that this evidence is written within my expertise, except where I state that I am relying on the evidence of another person. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

[1] (GIR) (ref. HAM2020-0020AB Rev.0 dated 23 April 2021 (that related to the TPL land) and (GIR) (ref. HAM2021-0073AC Rev.1 dated 19 December 2022 (that related to the RPL land).

SCOPE OF EVIDENCE

6. In my evidence, I:

   (a) provide a summary of my key conclusions in an Executive Summary;

   (b) provide an update on changes to the National Seismic Hazard Model and Earthquake Engineering Module 1 that have occurred since the preparation of my reports;

   (c) summarise the relevant aspects of PC20 with respect to geotechnical engineering;

   (d) set out an assessment of PC20 with respect to anticipated geotechnical effects;

   (e) set out my recommendations that should be addressed at the detailed design stage through the resource consent and building consent processes;

   (f) comment on submissions; and

   (g) respond to the s42A Report.

EXECUTIVE SUMMARY

7. The geotechnical reports presented the results of geotechnical investigations and a geohazards assessment of the TPL and RPL properties located adjacent to Hamilton Airport and south of Raynes Road and east of Ohaupo Road, Hamilton ("the Site").

8. The majority of the approximately 130ha site is situated on a near level terrace at RL 49 to 52m underlain by Hinuera Formation alluvium. Two low hills up to RL 62.5m are present in the eastern part of the site that are underlain by older volcanic ash and silts/clays of the Walton Subgroup.

9. The Structure Plan for the Site depicts the development of a business park consisting of industrial and commercial lots with associated roading, green spaces and stormwater attenuation basins.

10. I consider that the Site is suitable for the level of development that is facilitated by PC20 subject to my geohazards assessment and geotechnical recommendations (summarised below) being addressed at the subdivision consent and detailed design stage, and later when building consent is obtained.

The National Seismic Hazard Model and Earthquake Engineering Module

11. Since preparing my report for the TPL Site, the Ministry of Business, Innovation and Employment Earthquake Engineering Module 1 has been updated. However, the

changes to this document have not changed my conclusions as to the acceptability of the Site for development as facilitated by PC20. In particular, the Module 1 update has required an increased level of earthquake shaking (peak ground acceleration) to be used when assessing liquefaction risk. Also, the use of aging-factors (strength gain factors for aged soils) has been restricted. This has resulted in an overall increased liquefaction risk and additional recommendations and remedial options have been provided to reduce this risk to acceptable levels, as detailed below. My recommendations represent best practice and are an appropriate response to the geotechnical condition of the Site.

12. The proposed update to the National Seismic Hazard Model ("NSHM") provides an estimate of the likelihood and strength of earthquake ground shaking at any given site in New Zealand and considers how different parts of the country might behave in the event of large magnitude earthquakes. The NSHM is used to inform technical standards for earthquake engineering design as well as providing critical information for earthquake risk. The proposed changes to the NSHM, as it relates to the Site, are to reduce the peak ground acceleration which is the critical input for liquefaction analysis. The design earthquake magnitude may also change slightly, but this is not a significant input. The outcome of the NHSM update will be to reduce the liquefaction risk for the Site, but until the MBIE modules are updated later in 2023, we cannot base our design on the ground shaking hazard from the NSHM but will be able to do so in the consenting stage.

CONTEXT AND BACKGROUND

Site Description

13. The Site comprises an area of approximately 130ha and is shown on Figure 1 below.

Figure 1 – Site Location Plan

14. The current general landform, together with associated features located within and adjacent to the Site is presented on the Coffey Geotechnics site plan (Figure 2) and CMW Geosciences site plan (Figure 3). The majority of the Site is near level with a gentle grade towards the north and west. Existing ground levels for the majority of the site range from RL48.5m (Moturiki Vertical Datum) in the west to RL52.5m at the southern boundary. Two low hills are located in the north-east that rise up to RL62.5m.

15. The Site is bound to the north by Raynes Road, to the west by Narrows Road and Ohaupo Road, and to the south and east by airport airside land. Middle Road extends between the TPL and RPL blocks. An existing dwelling and farm buildings are present within the TPL block. The RPL block includes several agriculture research related buildings.

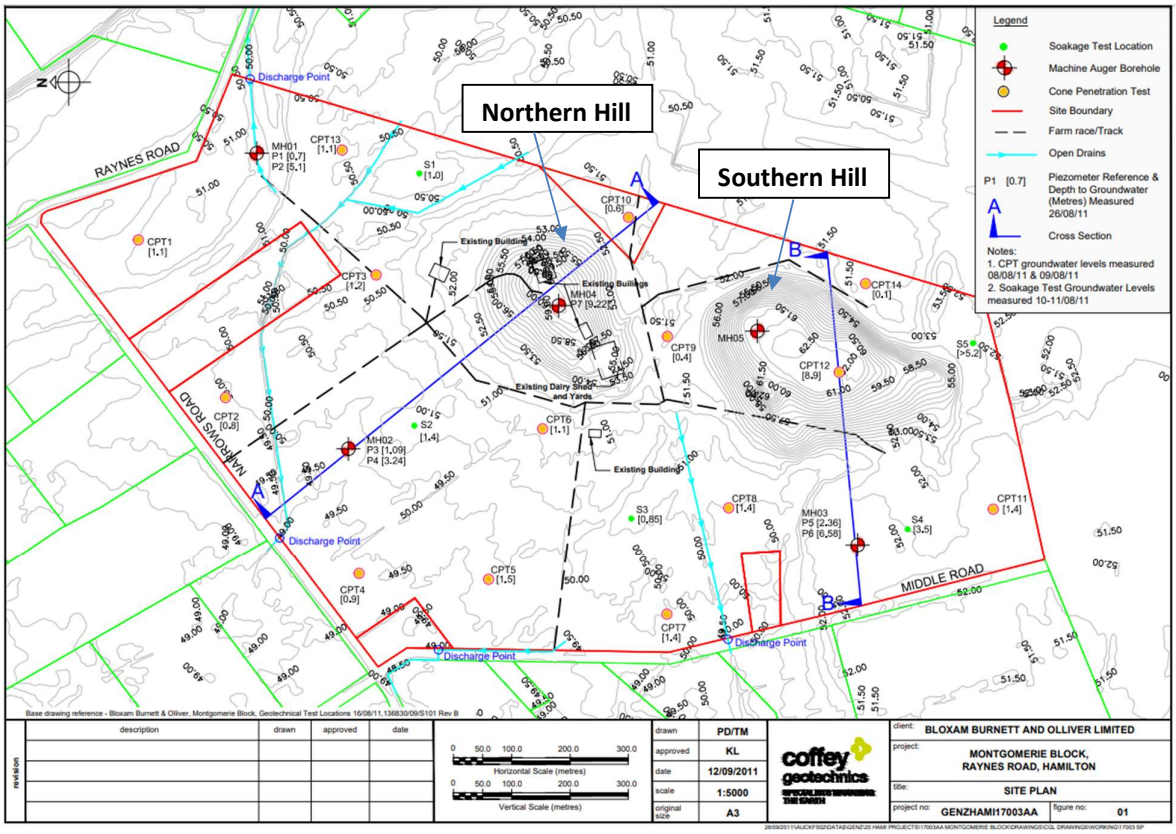

Figure 2 – Site Plan with Geotechnical Test Locations (TPL Block)

16. A series of open drains flow from east to west across the TPL Block (Figure 2), that flow through several culverts beneath Middle and Narrow Roads bordering the site.

17. The RPL Block landform grades gently from south to north. An open drain flows to northwards from within the lower-lying northern portion of the RPL Block (Figure 3).

18. Historical aerial photographs for both TPL and RPL Blocks show that the land has been farmed since prior to 1943 with little change since then.

19. The Kerepehi Fault is the nearest known active fault and is located approximately 38km to the east of the site. Therefore, the risk of fault rupture affecting the site is very low.

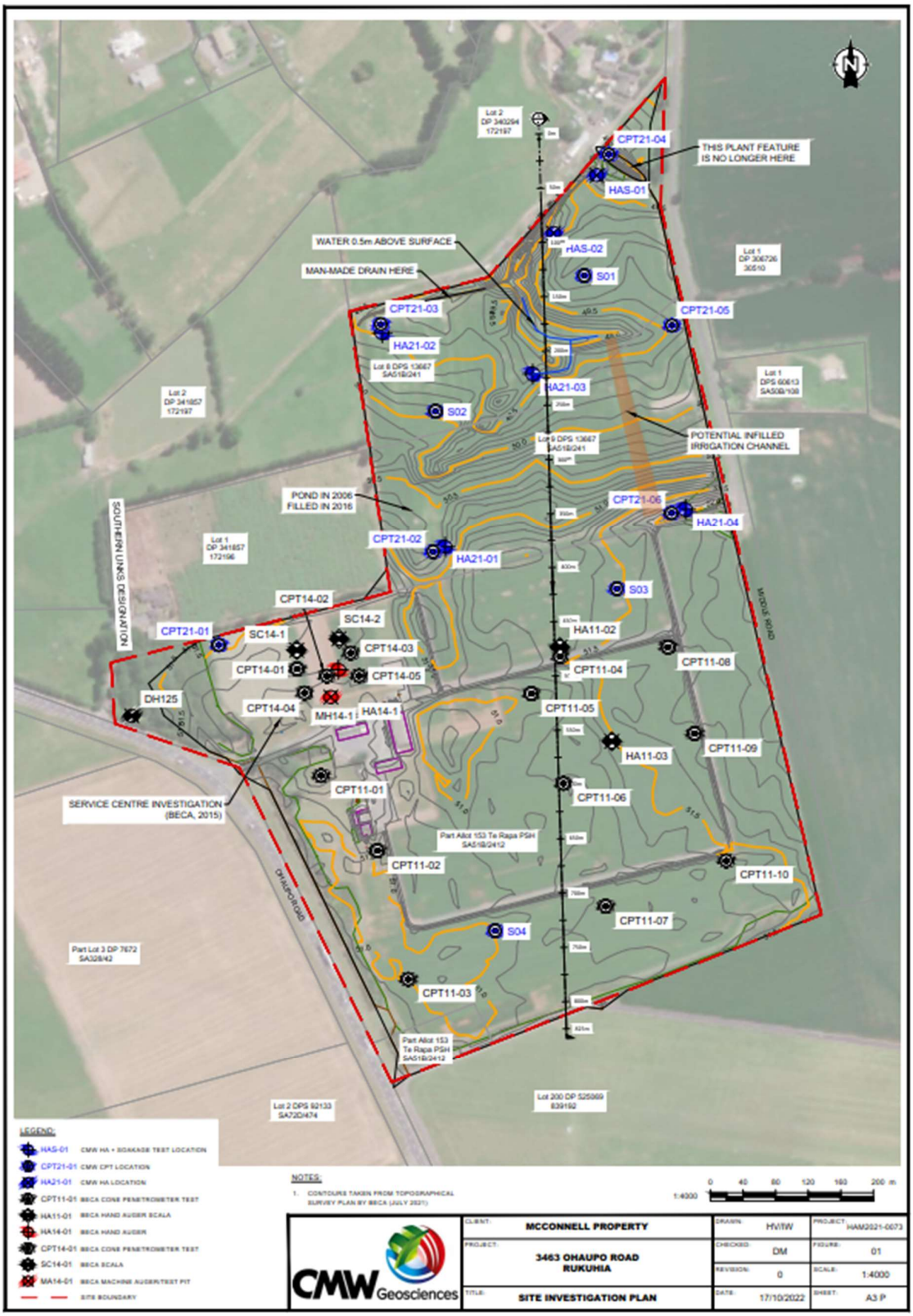

Figure 3 – Site Plan with Geotechnical Test Locations (RPL Block)

OVERVIEW OF THE PLAN CHANGE

20. The development facilitated by PC20, as shown on the Structure Plan (refer Figure 4 below), is to create multiple industrial and commercial lots of varying sizes with associated access roads connecting to future roads in the north, south and west. This is generally consistent with the land development proposed at the time of the Coffey site investigation and my subsequent geotechnical reports.

21. At the time of writing my reports (as is the situation with most plan changes) the proposal is in planning and preliminary urban design phase and no earthworks or engineering design drawings have yet been developed. I prepared my reports and this evidence on the basis that a future development will mostly comprise minor cuts and fills to form a near level site supporting commercial and industrial buildings with shallow strip and pad foundations and widespread floor loads of up to 35kPa.

22. It is anticipated that the Southern Hill (as indicated on Figure 2) will be cut down to near the surrounding ground level. Cut soils are generally expected to be suitable for reuse as structural earthfill subject to conditioning including moisture control and blending. The northern hill ("The Hub" area shown on the Figure 4) will largely remain. Slope stability risk is considered to be negligible or the northern low hill ("The Hub" area) due to the low slope gradients. Proposed earthworks cuts/fill will be subject to geotechnical review at the resource consent stage.

23. A series of stormwater attenuation basins / swales are proposed along the eastern and western TPL Block boundaries, plus smaller stormwater swales within the bat corridor. Basin depths are proposed to be in the order of 1.5m.

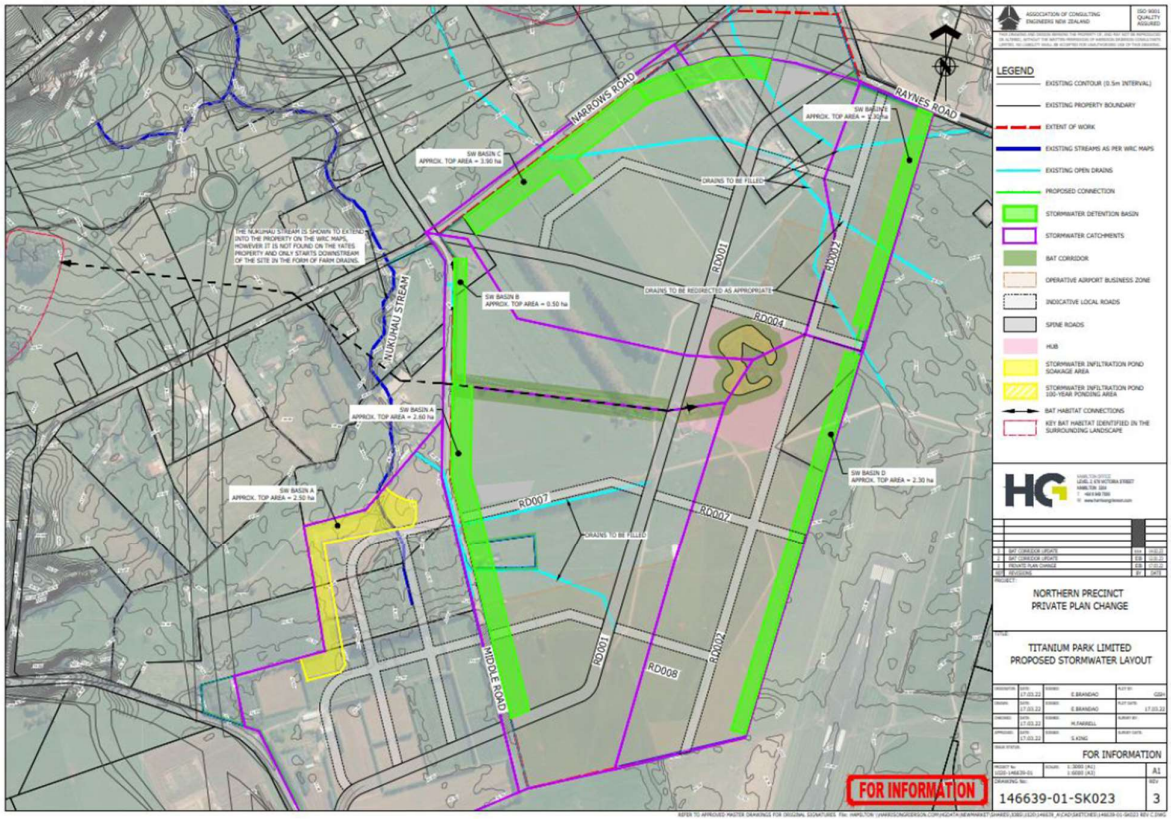

Figure 4 – Proposed Stormwater Layout Plan

24. Based on the results of the geotechnical investigations at the Site and subject to the preliminary recommendations (discussed below) being implemented at the detailed design/consenting stage, I consider that the Site is suitable for the proposed level of development which is appropriate from a geotechnical perspective.

RECOMMENDATIONS FOR SITE WORKS

25. As a consequence of the updates to the National Seismic Hazard Model and the Earthquake Engineering Module 1 discussed above, the ULS liquefaction risk for the Site has increased to significant based on the liquefaction analysis results, without an Ageing Factor applied.

26. Shear wave velocity testing completed suggests an Ageing Factor of 1.3 in the Walton Subgroup and Aging Factor ranging from 1 to 1.28 in the Hinuera Formation. Typically, shallow foundation types are considered feasible for the Site, subject to further assessment at the detailed design stage, and would need to comprise stiffened raft type foundations, with subgrade soils comprising geogrid reinforced granular material (sand or gravel) placed to the engineered fill specification.

27. I set out below my various recommendations which should be considered in the subsequent consenting stages (subdivision and building consent):

(a) Depending on the proposed building development and tolerance to settlement due to ULS earthquake shaking, deep ground improvement may be appropriate to limit settlements. Further site and laboratory testing is recommended at the subdivision consent stage to define an appropriate Ageing Factor for the Site and provide a more detailed and specific liquefaction analysis.

(b) An option for TPL and RPL at the subdivision consenting stage is to undertake a Site Specific Seismic Hazard Assessment that can justify a reduced ULS peak ground acceleration for the Site and result in a reduction in liquefaction and lateral spread risk for development.

(c) The depth of stormwater soakage basin excavations below existing levels should be limited wherever possible, to reduce the risk of lateral spreading during ULS earthquake conditions. A 1.5m maximum basin depth is proposed at present which is considered appropriate. Seismic slope stability analyses at detailed design stage for the subdivision consent for the stormwater basins is required to demonstrate compliance with the project design criteria.

(d) Following the onset of liquefaction, liquefied soils behave as a very weak undrained material, which can give rise to lateral spreading where a free face is present within the vicinity of the site. Literature suggests that lateral spreading may occur if laterally persistent liquefied layers are present within a depth of two times the free face height. This risk should be further assessed at the resource consent stage once earthworks plans have been formalised and soakage basin locations and dimensions are confirmed. If required, specific mitigation measures include ground improvement using cohesive (clay) buttress fills, geogrid/geofabric reinforced fills, rammed aggregate piers / stone columns.

(e) For large commercial / industrial buildings with widespread foundation loads of 35kPa, preliminary static settlements of 10 to 265mm are estimated. The soils most prone to settlement are typically below 10m depth. The upper bound values are considered to be overestimates as the CPT Qc values within the upper Walton Subgroup – Puketoka Formation soils underestimate soil strength and stiffness due to the sensitivity of these soils to disturbance. Typically, shallow foundation types are considered feasible subject to further assessment at the time of Building Consent.

(f) For particularly heavy building loads, ground improvement may be required to mitigate excessive settlement. Appropriate options include:

- shallow undercut and replacement of any low-strength near surface soils;
- temporary surcharge (pre-load) fill embankment construction above design finished level to over-consolidate the compressible soils;
- compensated foundation design using lightweight geofoam to keep pressures below pre-consolidation pressures within compressible soils;
- deeper ground improvement beneath the building footprint to transfer loads from the structure to more competent underlying soils at depth.

(g) A preliminary geotechnical ultimate bearing pressure of 300 kPa should be available for foundations in most areas. However reduced bearing pressures may be required where Puketoka Formation silt/clay is near finished levels. Improvement of near surface soil bearing capacity can typically be achieved with conventional compaction equipment during earthworks and is a matter that should be addressed during the subdivision consent stage.

(h) During late winter/spring conditions (August to November) groundwater levels ranged between 0.1m and 5.4m below ground level within Hinuera Formation soils with shallower depths in the north and west. Trench collapse may pose problems in low-lying parts of the Site where excavations are in loose soils and/or extend below the water table. To avoid that risk, temporary dewatering and trench support or battering may be required in the lower lying portions of the Site including near the intersection of Narrows Road and Middle Road.

(i) Measured groundwater was more than 7m below ground level below the elevated hills, so risk of trench collapse in these areas is considered low.

(j) Hinuera Formation sands are considered suitable road subgrade materials. If loose sands are exposed, proof rolling is typically effective to increase California Bearing Ration (CBR) values. Hinuera Formation silts and Walton Subgroup silts and clays may require undercutting and replacement with a subgrade improvement layer.

(k) The Hinuera Formation sandy soils at the Site are considered suitable to provide a seepage function for the design of stormwater attenuation and soakage basins.

28. The above recommendations represent good engineering practice that are commonly applied for land development and are considered suitable to address the natural hazard risks for the Site. In my experience, these recommendations do not need to be incorporated into PC20 provisions because they are better suited to forming conditions applied at the resource consent stage, as they are based on specific details most relevant for that development stage.

THE NATIONAL ADAPTION PLAN 2022

29. The National Adaptation Plan 2022 has been reviewed with respect to PC20 and the facilitated development which it enables. The mitigation measures described above are considered adequate to account for climate change effects and respond appropriately to the National Adaption Plan.

RESPONSE TO SUBMISSIONS RAISED

30. The submissions to PC20 did not raise any geotechnical issues requiring response.

RESPONSE TO THE SECTION 42A REPORT

31. The s42A report does not raise any issues on geotechnical matters that require my comment.

Kori Lentfer
CMW Geosciences

28 February 2023