Before an Independent Hearings Panel

The Proposed Waikato District Plan (Stage 1)

IN THE MATTER OF the Resource Management Act 1991 (**RMA**)

IN THE MATTER OF hearing submissions and further submissions on the Proposed Waikato District Plan (Stage 1):
Topic 25 – Zone Extents

PRIMARY EVIDENCE OF CHRISTOPHER JAMES EDWARDS ON BEHALF OF TATA VALLEY LIMITED

(Geotechnical)

17 February 2021

BUDDLE FINDLAY
NEW ZEALAND LAWYERS
Barristers and Solicitors
Auckland
Solicitor Acting: **Vanessa Evitt / Mathew Gribben**
Email: vanessa.evitt@buddlefindlay.com / mathew.gribben@buddlefindlay.com
Tel 64-9-358 2555 PO Box 1433 DX CP24024 Auckland 1140

1. SUMMARY OF EVIDENCE

1.1 My full name is Christopher James Edwards. I am a Senior Engineering Geologist at Lander Geotechnical Consultants Limited.

1.2 I am providing Geotechnical and Geological evidence in relation to proposed rezoning sought by TaTa Valley Limited ("**TVL**")[1] of land at 242 Bluff Road and 35 Trig Road, Pokeno ("the **Site**").

1.3 I have been involved in the development of the Site and this related rezoning proposal since January 2018 and have undertaken preliminary geotechnical investigations and analyses within the site.

1.4 Key geotechnical constraints for the site are slope stability (for the steep sided slope flanks generally around the perimeter of the Site) and consolidation settlement and liquefaction/ lateral spread (for the low-lying central portion of the Site). I have identified a number of conceptual engineering solutions to address these constraints which are typically developed at resource/ building consent phase when development proposals are finalised.

1.5 Once the development proposals for the Site are finalised at resource consent or building consent phase, further detailed geotechnical investigation and analysis will be required, ground models will need to be developed and final engineering solutions to the key geotechnical considerations will need to be made. In my opinion, there are practical engineering solutions or management approaches to appropriately address identified constraints at the time of resource or building consent.

1.6 Provided these prevailing/ perceived geotechnical issues are assessed and addressed during detailed site investigations for resource or building consents, the Site will be suitable for re-zoning to future Resort/ Accommodation use generally in accordance with the TVL resort zone provisions.

2. INTRODUCTION

2.1 My full name is Christopher James Edwards. I am an Engineering Geologist.

2.2 I hold a BSc (Tech) majoring in Earth Sciences, am a Professional Engineering Geologist (PEngGeol) and Chartered Member of Engineering New Zealand (CMEngNZ). My work experience includes significant land subdivisions across West,

[1] Submitter 574 and further submitter 1340.

Central and South Auckland over the past 15 years, including overseeing most Geotechnical aspects related to land use intensification and earthworks construction at Pokeno over the past 5 years, just to the north of this Site.

2.3 I have been employed by Lander Geotechnical Consultants since November 2015. I hold the position of Senior Engineering Geologist at Lander Geotechnical Consultants Limited based in Manukau.

2.4 My previous experience includes the following relevant projects:

(a) Resource consent, construction observations and geotechnical compliance reporting for the large-scale residential land development (for Dines Fulton Hogan Joint Venture) at Hitchen Rd, Pokeno.

(b) Resource consent, construction observations and geotechnical compliance reporting for the large-scale rural-residential land development (for Hughes Developments Limited) at Kowhai Downs (McIntosh Drive), Pokeno.

(c) Resource consent, construction observations and geotechnical compliance reporting for several large residential/ light commercial land developments in Takanini deep peat soils at 104, 114, 122 and 130 Cosgrave Road and 91, 121 and 127 Grove Roads, Takanini

2.5 I have been involved in the development of the Site and this related rezoning proposal since January 2018 and have undertaken preliminary geotechnical investigations and analyses within the Site.

2.6 These investigations have included the drilling of machine boreholes, hand auger boreholes and CPT soundings within select areas of site for initial development proposals on site, including farm sheds, accommodation buildings, wetland areas, roading and services infrastructure and associated earthworks.

2.7 The analyses I have undertaken using the ground investigation data collected to date have included initial computer slope stability assessments, vertical settlement assessments and liquefaction assessments.

2.8 The purpose of the investigations and analyses undertaken to date on site was to provide preliminary geotechnical guidance on feasibility of the initial development proposals.

2.9 I have visited the site on a number of occasions, with my last visit to the site in August 2020.

3. SCOPE OF EVIDENCE

3.1 My evidence addresses the following matters:

(a) Geotechnical Site context and characteristics of the site, including the geotechnical constraints and risks at the Site.

(b) Geotechnical design and management approach.

(c) Management of effects including the nature and type of ground improvements needed to mitigate geotechnical risk.

(d) Overall suitability of the Site for the proposed resort zoning.

4. CODE OF CONDUCT

4.1 I have read the Environment Court's Code of Conduct for Expert Witnesses, and I agree to comply with it. My qualifications as an expert are set out above. I confirm that the issues addressed in this brief of evidence are 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.

5. SITE CONTEXT AND CHARACTERISTICS

5.1 Figure 1 below is the approximate extent of the site and the various geological units.

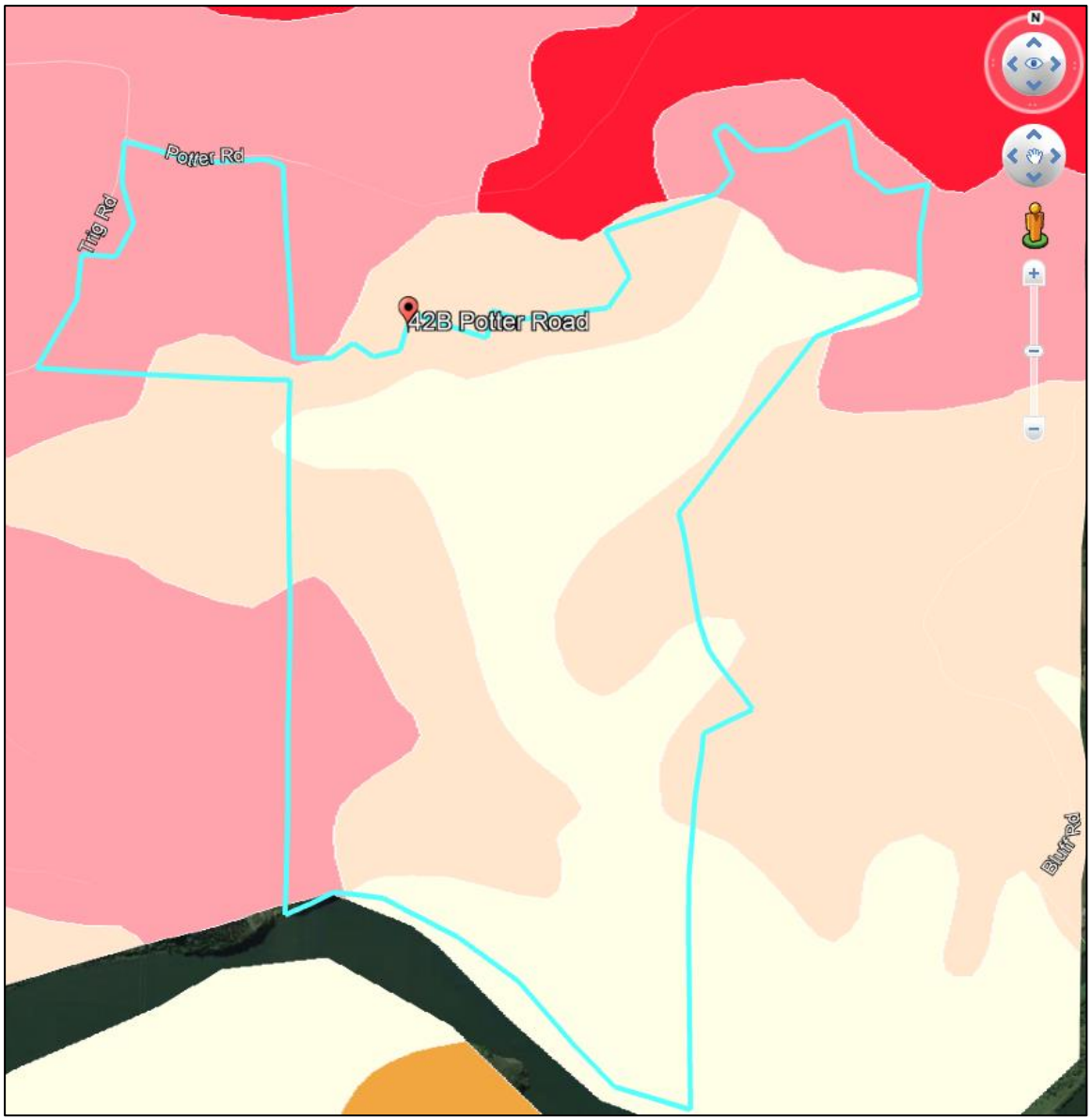

Figure 1: Geological Setting (subject area approx. shown by blue line); source GNS QMaps.

= *Tauranga Group Recent Alluvium and Colluvium*

= *Puketoka Formation Alluvial Muds, Gravels, Peat, Lignite, Tephra, Pumice*

= *South Auckland Volcanic Field Ash, Lapilli and Lithic Tuff*

= *South Auckland Volcanic Field Lava (Basalt)*

5.2 The Geological setting comprises:

(a) Tauranga Group (≤14,000 yrs; Holocene) Alluvium and Colluvium within the central low-lying portion of the site;

(i) The geotechnical investigations to date (including machine boreholes and CPT soundings) have found that these deposits are typically 10m to 20m deep within the northern portions of the low-lying areas and deepen to greater than 20m towards the Waikato River. The deposits are a mix of inorganic and organic clays, silts and sands as well as peat layers, often described as soft (with SPT 'N' values typically reading as 0).

(b) Puketoka Formation (3.6 Mya – approx. 0.5Mya) around the flanks of the central low-lying portion of the Site.

(i) The geotechnical investigations to date (including machine boreholes and CPT soundings) inferred that these deposits underlay the Tauranga Group deposits described above within the central low-lying portion of the Site. The deposits area a mix of typically inorganic clays, silts and sands (with some isolated organic horizons), often described as stiff to hard in strength (with SPT 'N'; values often ranging between 10 and >50, typically increasing with depth).

(c) South Auckland Volcanic Field (0.78 Mya – 14,000 yrs) Ash and Tuff within the elevated north-east, north-west and south-west portion of the Site; and

(i) The geotechnical investigations to date (including machine boreholes and hand auger boreholes) confirmed the presence of these deposits with the deposits typically comprising of stiff to hard clayey silts and silty clays with some loose to medium dense sandy silt and fine sand layers. SPT 'N' values typically ranged from 10 to >50)

(d) South Auckland Volcanic Field (0.78 Mya – 14,000 yrs) Basalt (lava) rock beneath the relict volcano beyond the north-east boundary of the Site.

(i) The geotechnical investigation within the Site did not encounter the presence of these deposits, however, basalt has been encountered within investigations directly north-east of the Site.

5.3 Based on the geologic setting and our investigations to date, I consider the Site has the following constraints and risks:

(a) Slope instability associated with soil movement is a risk for the various steep sided flanks that surround the low-lying central valley area.

(b) Compressible organic and/or cohesive soils within the low-lying valley area within the central portion of the site (i.e. within the recent Tauranga Group soils) – refer to Figure 2 for appropriate extent of 'low lying valley area' - and near other watercourses on site resulting in long term consolidation settlement, which is typical of recent (i.e. young Holocene) alluvial deposits.

(c) Liquefaction of saturated fine granular soils and/or cyclic softening of saturated cohesive soils is a possible characteristic of the Tauranga Group deposits situated within the central low-lying portions of the Site.

(d) Lateral spread associated with seismic/ liquefaction events is a consideration for low-lying Tauranga Group soils situated near an unretained/ free face (i.e. within proximity of the Waikato Riverbank directly adjacent the southern boundary of the site).

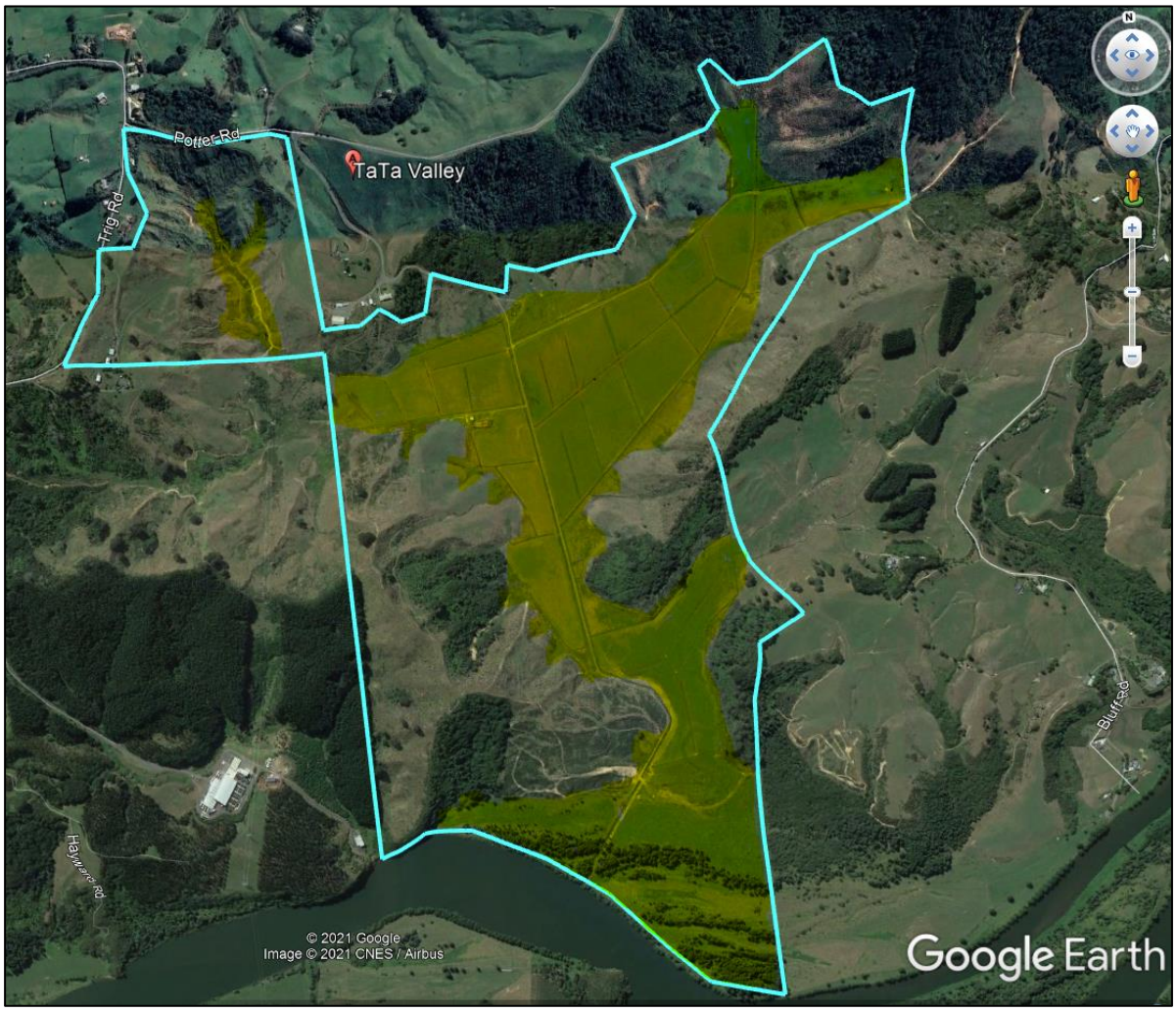

Figure 2: Plan showing approximate extent of 'low lying valley area', as highlighted in yellow

6. RELEVANT PARTS OF REZONING PROPOSAL

6.1 The full details of TVL's rezoning proposal are outlined in the primary evidence of Christopher Scrafton for this topic.

6.2 The key parts of the proposal I have considered for the purposes of my assessment and evidence are:

(a) The proposed Hotel Precinct (refer Figure 3 below).

(b) The “NZ hub” buildings area within the TVL resort zone (to be located within the northern portion of the central valley area).

(c) Associated infrastructure (e.g. roading, services) that will service the project.

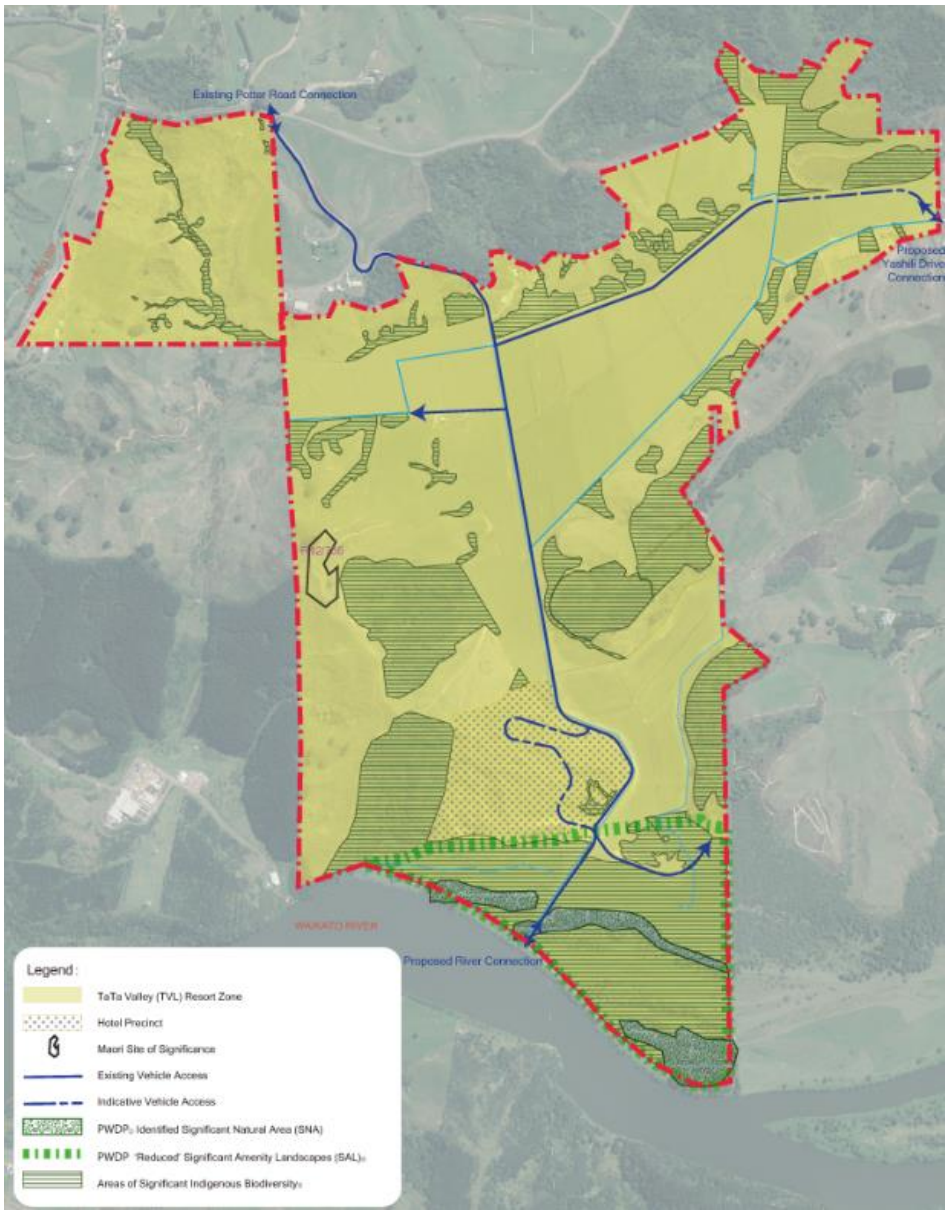

Figure 3: Proposed Zone and Precinct Plan

7. GEOTECHNICAL DESIGN AND MANAGEMENT APPROACH

7.1 From the geotechnical investigations (machine boreholes, hand auger boreholes and CPT soundings) and preliminary assessments undertaken to date, conceptual engineering solutions for the key geotechnical constraints of slope stability, consolidation settlement, liquefaction and lateral spread have been developed as follows:

(a) For areas with identified slope stability concerns (i.e. sided flanks that surround the low-lying central valley area), conceptual earthworks solutions to address slope stability concerns comprise stability undercuts at the base of proposed fill batters (to 'key' fills into competent natural ground), geogrid face tightening stabilisation of steep fill batters, erosion control of sensitive soil (volcanic ashes) cut batters with geotextile products and geotechnical drainage to control ground water levels.

(b) In addition to this, the design of building platforms within proximity of such slopes can be addressed with appropriate setbacks from slopes or engineering measures such as in-ground barrier pile walls which are typically matters for resource and building consent.

(c) Within the low-lying central valley area (as shown in Figure 2 above) within the central portion of the site, conceptual design solutions to address consolidation settlement/ liquefaction/ lateral spread concerns include:

(i) Ground improvement (e.g. undercutting of soft/ organic alluvial deposits, replacement with engineered fills with geogrid reinforcement and preloading development areas to force expected settlements to occur prior to construction occurring); or

(ii) Specific engineer designed building platform foundations (i.e. piled foundation systems) to address consolidation settlement/ liquefaction/ lateral spread concerns where necessary.

8. MANAGEMENT OF GEOTECHNICAL CONSTRAINTS AND ACHIEVING DEVELOPMENT OUTCOMES

8.1 Consideration of proposed building/ infrastructure within the outer areas of the Site displaying signs of slope instability will need to be assessed during detailed geotechnical investigations for resource consent or building consent. The geotechnical

investigation reporting will outline engineering measures necessary (if any) to maintain satisfactory factors of safety in accordance with Council regulations or outline/ inform appropriate setbacks from instability features for buildings/ infrastructure. These assessments will be undertaken as part of the preliminary design process.

8.2 Any areas that may be at risk from debris/ slope movements from any steep slopes above will need to be identified and risks to development below such areas established (if any, subject to development proposals) as part of the resource consent process.

8.3 Where development within the low-lying valley areas is proposed, specific foundation design will determine and address engineering solutions for consolidation settlement and liquefaction considerations and may involve ground improvement (undercutting and replacement, preloading and settlement monitoring, piling solutions or other engineering solutions).

8.4 Engineering solutions (i.e. ground improvement, specific foundation design) to lateral spread considerations will be required for any structures or infrastructure of relevance located within the low-lying alluvial sediments directly adjacent to the Waikato Riverbank.

8.5 In relation to the provisions of the TVL resort zone, I support the use of the Rural earthworks rule within the Proposed District Plan, which require as a matter of discretion (for resource consent applications for earthworks) consideration of 'geotechnical stability'. In relation to establishment of buildings that do not need significant earthworks, I do not consider it necessary to also require geotechnical information to be submitted with a resource consent application for a building on the Site, because this information requirement is adequately covered by the Building Act and building consent process.

9. OVERALL SUITABILITY OF SITE AND CONCLUSION

9.1 My work to date has focused on specific study areas and initial proposals within certain areas of the Site. This work developed geotechnical models and identified key geotechnical considerations for each focus area and outlined preliminary/ conceptual geotechnical designs showing that solutions to the key geotechnical considerations exist.

9.2 I reiterate that the key geotechnical constraints for the site are slope stability (for the steep sided slope flanks generally around the perimeter of the Site) and consolidation settlement and liquefaction/ lateral spread (for the low-lying central portion of the Site). I

have identified a number of conceptual engineering solutions to address these constraints, which are typically developed at resource/building consent phase when development proposals are finalised.

9.3 Once the development proposals for the site are finalised at resource consent or building consent phase, further detailed geotechnical investigation and analysis will be required, ground models will need to be developed and final engineering solutions to the key geotechnical considerations will need to be made. In my opinion, there are practical engineering solutions or management approaches to appropriately address identified constraints at the time of resource or building consent.

9.4 Provided these prevailing/ perceived geotechnical issues are assessed and addressed during detailed site investigations for resource or building consents, the Site will be suitable for re-zoning to future Resort/ Accommodation use generally in accordance with the TVL resort zone provisions.

Christopher James Edwards
17 February 2021