Before the Hearings Commissioners at Christchurch City Council

under: the Resource Management Act 1991

in the matter of: an application by Ryman Healthcare Limited for resource consent to establish and operate a comprehensive care retirement village at 100-104 Park Terrace and 20 Dorset Street, and 78 Park Terrace, Christchurch

between: **Ryman Healthcare Limited**
Applicant

and: **Christchurch City Council**
Consent Authority

Summary of evidence of **Pierre John Malan** on behalf of Ryman Healthcare Limited

Dated: 25 January 2021

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SUMMARY OF EVIDENCE OF PIERRE JOHN MALAN ON BEHALF OF RYMAN HEALTHCARE LIMITED

1 My full name is Pierre John Malan. My qualifications and experience are set out in my statement of evidence dated 6 January 2021. I repeat the code of conduct statement contained in my statement of evidence.

2 This statement summarises my statement of evidence and responds to the evidence of Mr John Aramowicz.

Summary of evidence

3 In my opinion, the Site is suitable in geotechnical terms for the Proposed Village, provided the recommendations in the Geotechnical Report lodged with Ryman's resource consent application are considered and implemented in the detailed design. There are no outstanding geotechnical issues between myself and Ms McDonald.

4 The subsurface geological conditions at the Site are similar, and typical of Christchurch. The geological profile consists of fill overlying alluvial deposits including silts, sands, gravels and peat materials that extend to gravels at around 20 m depth.

5 My evidence addresses the key geotechnical risks that I have identified at the Site, relating to the potential for: liquefaction effects under seismic loading, consolidation settlement / subsidence effects, and effects relating to the proposed basement including mechanical deformation in the temporary (during construction) and permanent (during operation) cases.

6 I am satisfied that these risks can be managed to appropriately low levels.

7 I have reached these conclusions by characterising the Site geological conditions using the site investigation data, and then assessing the geological hazards at the site. I have considered foundation options in light of those potential hazards. I am satisfied that normally adopted foundation systems such as those proposed are appropriate.

8 The proposed foundation and retention system comprises a continuously supported stiff (and effectively impermeable) perimeter wall, rigid elements/piles beneath the building footprint, with a rigid (metre thick) concrete floor slab. This system provides a stable foundation for the building. It also addresses the potential for deformations and potential effects on groundwater. It will also be installed without causing any meaningful vibrations.

9 I have also considered various neighbouring locations around the Site perimeter, in the context of the proposed construction

sequence, adjacent structures and geological conditions, and the structural characteristics of the perimeter wall. Based on my experience and the analysis carried out, I am satisfied that while a low level of deformation is possible at neighbouring sites, I do not expect it to lead to damage to structures adjacent to the site. I would characterise such risks as being of low to very low probability and of low consequence. In the unlikely event that damage does occur, in my opinion it would be cosmetic and repairable.

10 Any residual effects on structures located near the boundaries that may occur will be addressed by consent conditions requiring Ryman to offer pre and post construction condition surveys of nearby structures, and 'make good' any damage that is attributable to excavation and construction activities.

Response to Mr Aramowicz

11 I consider the key remaining geotechnical issue in dispute between myself and Mr Aramowicz relates to the risk of property damage at 15 Salisbury Street arising from the proposed basement works at the Ryman boundary, resulting from deformations caused by:

11.1 The scale and proximity of the construction works;

11.2 Dewatering; and

11.3 Vibration.

Overview

12 Mr Aramowicz considers the proposed basement and dewatering to be a high risk to the property at 15 Salisbury Street. He recommends that the basement at the boundary be further setback, and that additional geotechnical and groundwater effects analysis be carried out to determine what would be a safe setback.

13 I do not agree with this conclusion, and am satisfied with the assessment set out in my evidence and the current setbacks of the basement at the Site. I set out below specific responses to issues raised, and clarify some misunderstandings by Mr Aramowicz related to the geometry and proposed installation methods. In particular, in my view, the perimeter retention system is an appropriate response to deformation and instability risk at the Site, and provides an unusually stiff perimeter to mitigate possible deformation effects.

14 Despite this position, Ryman asked me to recommend an adjustment to the basement wall adjacent to 15 Salisbury Street that effectively eliminates any potential deformation effects in this location. The plans at **Appendix 1** identify a design refinement which shifts the basement back from 15 Salisbury Street. This realignment is possible at this location as there are no above-

ground structures (i.e. this area is garden). In my view, the setback distance will ensure no deformation occurs on 15 Salisbury Street that would result in damage to any existing structures, particularly the pool.

15 I note that I have not addressed Mr Aramowicz's comments about future Building Act processes, save to say I disagree with this analysis.

Basement geometry and deformation assessment

16 Mr Aramowicz (paragraph 26) states that drawing S01.A0-040 shows the basement to be 0.6 m from the northern boundary of 15 Salisbury Street. He infers that setback based on the distance to the indicative wall thickness shown by the drawing. He concludes that there is insufficient space to install temporary retention between the basement wall and the site boundary.

17 For clarity, I note that the retention system comprises both the temporary and permanent solution, and will be installed inside the wall thickness shown on the drawing. Figure 1 below shows typical offsets of the clutch tubes from the boundary at 15 Salisbury Street.

18 The retention system is expected to comprise an 813 mm diameter steel tube (shown on the Figure as 850 mm, and the thickest part of the retaining wall). This will be embedded within a pre-drilled, concrete filled hole approximately 960 mm diameter. The piles will be spaced 300 mm apart along the wall (i.e. at 1113 mm centres, with the clutches fully covering the 300 mm gap between tubes). The steel tube wall thickness will be around 10 mm.

19 The typical setbacks to the 15 Salisbury Street boundary are therefore approximately:

- 1575 mm to the internal basement face (and the basis for my statements in evidence and reports)
- 725 mm to the likely closest approach of the steel tube to the boundary.
- 1150 mm to the centreline of the piles (and the closest approach of the excavation to the boundary)

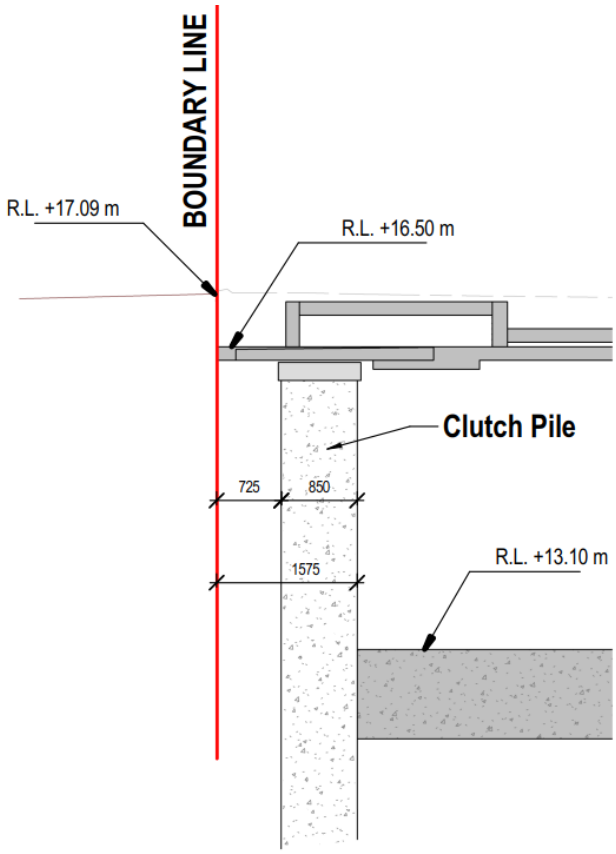

Figure 1 – Section at 15 Salisbury Street (from WAM)

20 Deformations will reduce as the setback from the perimeter wall increases. I have presented in my evidence the likely maximum wall deformations. The potential settlements I presented in my evidence in chief are based on these maximums, and are not tied to specific wall setbacks. The observed settlements during construction are therefore likely to be lower.

Deformation monitoring and condition surveys

21 At multiple locations in Mr Aramowicz evidence (including 36, 44, 51, 87) he infers that moderate to high damage is anticipated based on Ryman's offer to undertake surveys and deformation monitoring. As I have explained, this level of damage is not contemplated. There is a low to very low risk of low level cosmetic damage at most. Building surveys are in my view, an appropriate response to this degree of risk.

Dewatering effects

22 At paragraphs 73-79, Mr Aramowicz discusses dewatering. He notes (paragraph 76) that some amount of groundwater drawdown will occur to adjacent land, although he is unable to assess whether this is any greater than normal seasonal variation.

23 Groundwater effects are addressed in Ryman's regional groundwater application, which is the reason why the geotechnical

reports did not address this matter in detail. That application includes further detail on the modelling carried out and, as I understand, was not publicly notified by the Regional Council

24 While dewatering effects fall outside the scope of this Application, I note that the geotechnical design responds to subsidence risks by providing a continuous, effectively impermeable perimeter wall that will be welded in the upper 5 m, and extend to the underlying Christchurch Formation sands. The clutches will be newly manufactured (ie not re-used from previously installed piles), and fully waterproofed with WADIT (or a similar material) to effectively eliminate water inflows. This technique provides an effectively impermeable perimeter wall, and hence mitigates the adjacent drawdown risk. This approach has been successfully used previously in basements with little to no seepage through the clutches.

25 Based on this, I conclude that flows through the wall are not anticipated, and that consequential drawdown immediately adjacent to the wall is not therefore expected.

Vibration

26 The potential for vibration at the Site to cause subsidence at adjacent properties is raised by Mr Aramowicz in paragraphs 55-79. His concerns are raised based on the possibility of vibratory techniques being adopted, including driven piles and ground improvement vibration causing subsidence or localised liquefaction. He presents observations nearby where ground improvement probes caused ground settlement.

27 For clarity, for the foundation and retention, no techniques are proposed that could cause any meaningful vibration (i.e. pile driving or ground improvement). The retention and any foundation elements are expected be constructed using augering type approaches. The retaining steel tubes will be pushed into concrete filled holes that are a larger diameter than the tube. Augering holes does not typically generate any meaningful vibration, and this technique has been successfully used at numerous sites around Christchurch.

28 On this basis, I do not consider that vibration is a consequential risk at this site.

Conclusion

29 I conclude that there is no geotechnical issue that would preclude the granting of consent for the Proposed Village on the basis of the conditions proposed by Dr Mitchell.

Pierre Malan
25 January 2021

APPENDIX 1