MT MESSENGER BYPASS PROJECT: SUMMARY OF EVIDENCE OF KENNETH JOHN BOAM (PROJECT DESIGN) FOR THE NZ TRANSPORT AGENCY

1. I was the Alliance Design Manager for the Project from the time the Alliance was appointed to progress the Project in March 2017 through to March 2018. In March 2018 Mr Bruce Symmans took over the Design Manager role with responsibility for developing the detailed design.

2. During my time as Design Manager I had overall day-to-day responsibility for the design of the route options (both "offline" and "online") that were the subject of multi-criteria analyses at two workshops (MCA1 and MCA2); the development of the selected Project option for lodgement; and subsequent development of the Project for pricing and to provide the basis for the detailed design process.

3. In terms of the alternatives development and assessment process, I note that all "offline" options were developed to similar design standards with a safe operating speed of 100kph. Topographical and boundary constraints meant that one of the two "online" options assessed at MCA1 had a safe operating speed of 70kph while the other had a safe operating speed of 100kph. The "online" option appraised at MCA2 had a safe operating speed of 70kph.[1]

Humphrey flyover

4. A key tool developed to assist the design of the Project is 'Humphrey', which is a computer generated three dimensional visualisation tool that provides a realistic appreciation of route options. Humphrey was used by the design team to develop route options and by the experts that undertook multi-criteria assessments. Humphrey is a dynamic tool that has provided invaluable assistance to the design of the Project, especially as it involved difficult terrain which less advanced tools are limited in catering for.

5. A 'flyover' of the Project route via Humphrey is being shown at the hearing.[2] I note that while the images generated by Humphrey are valuable in that they accurately represent the extents and impacts of alignments on the landscape, they do not represent the finished appearance of the Project in the way that a photomontage does. For example, the indigenous vegetation in Humphrey is represented by a mottled green render draped over the topographic model while embankments and cuttings are coloured green and two shades of brown, respectively. In practice, the engineered surfaces of the project will be encouraged to revegetate (as per the LEDF).

[1] See paragraphs 45 – 56 of my evidence for my discussion re alternatives.
[2] This was attached via dropbox link as Appendix 1 to my evidence.

Design philosophy and approach

6. The Project design philosophy is to providing an outstanding scenic highway that is safe, efficient and resilient and that minimises its cultural, social and environmental impact. The Project objectives have driven the design of the Project, for each objective there are specific design solutions that respond to it.[3]

7. Where possible, each design solution has avoided, remedied and / or mitigated the environmental, social, and cultural impacts of the Project. The Project alignment reflects a carefully considered route that '*treads lightly on the landscape*' in accordance with the design philosophy of the Project.

8. To avoid adverse effects, the particular avoidance measures adopted in the design of the alignment are:

   (a) avoiding a significant cut through the key ridgeline adjacent to Mt Messenger by incorporating the tunnel, and avoiding a cut and fill approach encroaching on the sensitive environment across a tributary valley of the Mimi River by incorporating the bridge;

   (b) avoiding significant trees, where feasible, by modifying the alignment of the road corridor or through physical works;[4]

   (c) avoiding adverse effects on ecology by use of MSE embankments to provide steeper batter slopes; and

   (d) mitigating the design of cuttings, embankments and landscape treatments to facilitate natural revegetation.

9. A range of mitigation measures have been included in the design of the Project to address environmental effects that could not be avoided.[5]

10. The ecology and landscape measures set out in the ELMP and LEDF are fundamental to the design of the Project, particularly in terms of avoiding, remedying and mitigating adverse environmental effects.[6]

Design description

11. The bypass is approximately 6km long, with tie-ins to the existing SH3 at either end. Compared to the existing road, the design achieves reduced gradients, increased lane widths and forward visibility, wider shoulders, a lower summit, and a tunnel clearance

[3] See Table 1 on page 9 of my evidence in chief, as well as the more detailed philosophy for responding to the objectives at paragraph 31.
[4] This reduced the number of significant trees affected from 22 to a maximum of 17.
[5] See paragraph 37 of my evidence in chief.
[6] Those documents are discussed in more detail by other witnesses.

envelope that will allow over-dimension loads to use the route. The design enables a safe 100kph operating speed and includes resilience measures devised to minimise the potential for rockfall debris encroaching on the carriageway. It also enables shorter journey times for all road users.

12. My evidence includes an end-to-end description of the Project alignment,[7] which is followed by a more detailed summary of the key design elements of the Project, including:

    (a) the road cross-section and proposed side barriers;[8]

    (b) traffic services;[9]

    (c) pavements and surfacing;[10]

    (d) network utilities;[11]

    (e) the bridge, and the tunnel including portals and the tunnel control building;[12]

    (f) cut slopes and fill embankments;[13] and

    (g) operational stormwater arrangements and the proposed permanent stream diversions.[14]

13. As explained in my evidence, the Project design is and will continue to be (in the final detailed design stage) based on the relevant design standards.

Response to submissions and the NPDC Section 42A Report

14. In simple terms, I consider the design-related issues raised in the submissions to be addressed appropriately in the design of the Project. I note in particular that we received advice from Dr Mike Revell, Principal Scientist – Meteorology with NIWA in respect of potential ice and fog issues in the Mangapepeke Valley; I first discussed these issue with Dr Revell in July 2017.[15]

[7] Paragraphs 57 – 76.
[8] Paragraphs 79 – 90.
[9] Along with provision for pedestrians and cyclists, maintenance bays and property and track access: paragraphs 91 – 107.
[10] Paragraphs 108 – 110.
[11] Paragraph 111.
[12] Paragraphs 112 – 128.
[13] Paragraphs 129 – 145.
[14] Paragraphs 146 – 181.
[15] Appendix 3 to my evidence sets out Mr Revell's view on these issues; my evidence responds to submissions at paragraphs 183 – 220.

15. My evidence responds to relatively minor design issues raised in the NPDC Section 42A Report. As explained in my evidence, those issues will be reviewed and finalised in the detailed design process.[16]

Clarifications

Deep Road Cuttings

16. My evidence refers both to cuttings being designed to "avoid" rockfall encroaching on the carriageway, e.g. in Table 1; and to "minimise" rockfall debris encroaching on the carriageway, e.g. in Paragraph 41(c).

17. The cross section of cuttings with catch ditches at the base of cut slopes (Figure 16) and steel mesh rock drapes on the faces of cuttings greater than 20m deep is designed to maximise the resilience of the route. However, it is possible that small pieces, or slabs, of rock may detach from cut faces and, while it is unlikely that debris will encroach on the carriageway, it is not impossible. Hence, the correct statement is that cuttings have been designed to minimise rockfall debris finding its way onto the carriageway.

18. Referring to Mr Symmans' evidence,[17] I note that during detailed design some fine tuning of each rock cut is likely to achieve the optimal balance of resilience to the carriageway as well as achieving the landscape principles set out in the LEDF.

Assessment of Alternatives

19. In Paragraph 49 of my evidence I refer to eleven "offline" corridors and one "online" corridor. As stated, each of the "offline" corridors had a structural and earthworks option. To clarify, two structural options were considered in the "online" corridor, hence 24 options were considered in total.

20. Paragraph 52(a) states that the number of bridges in Option Z7 was reduced to 2 or 3. Both numbers of bridges were considered, the difference in bridge numbers being whether access was provided under the bypass to the Ngāti Tama block and the Mt Messenger track west of the bypass.

Correction

21. In Paragraph 51 I refer to Option Z2 twice. The second reference is an error and should read "Z4", i.e. an option with a safe operating speed of 100kph.

[16] See paragraphs 221 – 227 of my evidence.
[17] Paragraphs 98, et. seq.