Ministry for Primary Industries
Manatū Ahu Matua

To: Hon Damien O'Connor, Minister of Agriculture
From: Julie Collins, Deputy Director-General, Policy and Trade

Update on Overseer peer review findings and fact-checking

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Background

1. In B21-0083 we provided you and the Minister for the Environment, Hon David Parker with an update on the Overseer peer review process and the work programme the Ministry for Primary Industries (MPI) and the Ministry for the Environment (MfE) are initiating in response.

2. This aide memoire provides some more detail on the likely findings of the Overseer whole-model peer review report (the report) and the fact-checking process.

3. We invite you to forward this aide memoire to the Minister for the Environment before your meeting on 11 February.

The likely findings of the report

4. The report is still being finalised, but at this stage the panel have serious concerns with the Overseer model. The panel conclude that they do not have confidence that the model structure can adequately predict nutrient loss. For example, they lack confidence that Overseer can adequately compare management regimes on the same farm to assess whether the long-term annual average nitrogen losses are lower or higher than a baseline Overseer estimate.

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5. Briefly, the panel are concerned because:
   a) the model does not balance mass – in other words, the amount of nitrogen that enters the system is not equal to the amount of nitrogen that leaves the system and there is no quantifiable reason for this;
   b) Overseer focuses on nitrate and lacks an explicit treatment of ammoniacal nitrogen, organic nitrogen, or soil organic matter dynamics. These are likely to be important contributors to water quality outcomes in many regions in New Zealand (e.g., in Northland less than one third of the nitrogen is rivers is nitrate);
   c) Overseer represents the soil as single unrelated layers; the panel believe that a multi-layer model would allow for more accurate modelling of the distribution of water and nutrients in the soil. This raises doubts as to whether Overseer can accurately capture the movement of nutrients through the soil profile, considering nutrients at different depths have different potential for leaching;
   d) Overseer uses average climate data, which doesn't allow for the modelling of episodic processes (e.g., heavy rain over two or three days), which are critical drivers of nutrient losses and nutrient enrichment episodes;
   e) Overseer uses monthly time-steps to model most processes, which, like average climate data, do not allow for modelling episodic processes; and
   f) critical landscape factors, such as cracking soils, are not considered, but they are important drivers of nutrient movement.

Fact-checking progress

6. The fact-checking process was outlined in B21-0083. Overseer Ltd's written fact-checking feedback raised some concerns about the panel's report. It argued that addressing some of the panel's concerns would require too much data to implement or would require too much input data from users. It was also suggested that some of the panel's concerns were not material. Some small inaccuracies (e.g., referencing) were also raised.

7. In workshops between the panel and Overseer Ltd representatives on 2nd and 4th of February discussion points were:
   a) the rationale for not including ammoniacal or organic nitrogen or soil organic matter dynamics;
   b) the rationale for the use of average climate data;
   c) the need for a multi-layer soil model compared with a single layered soil model; and
   d) the rationale for not needing to balance mass.

8. A key discussion point was understanding that Overseer was designed to model farm management and farm mitigations, and to encourage farmers to design and manage their farm systems to reduce their environmental impact. Therefore, Overseer argued environmental effects that are largely outside the farmer's ability to influence are not included – specifically heavy rainfall events. The Overseer scientists explained that Overseer, therefore, does not attempt to model episodic rainfall events, despite their important effect on the receiving environment's total nitrogen loads (via both leaching of nitrate and overland flows resulting in other forms of nitrogen entering waterways). The panel consider that an effective regulatory or decision support tool should take episodic events into account, so that farmers and regulators can plan accordingly.

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9. There may be a difference of view between the panel and company about what constitutes an episodic rainfall event and what constitutes an extreme weather event. The panel agrees that it would be unreasonable to expect farmers to manage for extreme weather events nor to attempt to include them in a model. However, heavy rainfall is frequent in New Zealand. The panel will be discussing this point and its implications further.

10. Another key discussion point was around the concepts of accuracy and precision. Overseer Ltd representatives said that the Overseer model does not claim to be accurate. The panel's view is that a model should be accurate and precise enough for its intended purpose so that users and regulators have confidence that management mitigation strategies will improve environmental outcomes.

    e) Accuracy refers to the closeness of Overseer's estimate to the true value.

    f) Precision includes repeatability (the variation arising despite constant conditions over a short time period) and reproducibility (the variation arising despite constant conditions over longer time periods).

11. Overseer Ltd representatives agree with the need to make improvements to the model. However, they believe more work needs to be done to identify which improvements would be most useful. However, in the panel's view, addressing their concerns would fix up some basic problems with the model structure.

12. At the conclusion of the fact-checking meetings, the panel members were comfortable that they had understood the model correctly. The AgResearch scientists present for Overseer Ltd agreed with the panel that addressing some of their concerns (e.g. the need for a multi-layer soil model) would not require too much data to implement.

Next steps

13. The panel will need to make some changes to the report in light of the fact-checking feedback. This will include correcting small mistakes (such as referencing the wrong document) and reframing the executive summary to better highlight the positive attributes of Overseer in light of our new understanding of Overseer's design purpose. Precise phrasing of conclusions and recommendations may change, but the panel's core concerns and conclusions are unlikely to change.

14. It, therefore, remains likely that the panel's final conclusions will be that they do not have confidence in Overseer's prediction of nutrient loss.

15. The panel is likely to finalise their report in the first quarter of 2021. Once the report has been finalised, we will provide you with more detail on their findings and how the government could respond.

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