

EFFECTIVE USE OF OVERSEER IN REGULATION

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Introduction

In 2015, a collaborative project was launched to develop guidance on using the OVERSEER[®] Nutrient Budgets (OVERSEER) model in Resource Management Act (RMA) water quality management. The need for this project arose because of the growing role of OVERSEER in assisting regional councils to set and implement RMA water quality objectives and limits, especially under the National Policy Statement for Freshwater Management 2014 (NPS-FM). The project was governed and funded by regional councils, the Ministries for Primary Industries and Environment and industry bodies. Initial project outputs were a stocktake of existing regional council uses of OVERSEER and a ‘plain English’ technical description of OVERSEER.

The main project output was ‘Using OVERSEER in regulation - technical resources and guidance for the appropriate and consistent use of OVERSEER by regional councils’ (Freeman *et al*, 2016). That report provides detailed guidance, primarily for regional councils on the use of OVERSEER within regional plans and resource consents, alongside the relevant assumptions, limitations and principles that need to be taken into account. The report concludes that OVERSEER is suitable for estimating diffuse nitrogen (N) and phosphorus (P) losses from rural land, within the context of implementing the NPS-FM. Particular attention is paid to managing the impact of version updates and the inherent uncertainties of modelling. The report notes that the most appropriate approach to OVERSEER’s use will depend on the water quality objectives being sought and the specific catchment characteristics such as land use patterns/trends and nutrient attenuation.

This paper provides a high level summary of the Freeman *et al* (2016) report. A copy of the full report can be downloaded from: <http://overseer.org.nz/files/download/3575c5f091157fe>

There is no single correct approach to managing the impacts of land use on water quality, and OVERSEER may be used in different ways within these different approaches. This report identifies key messages, principles and practical guidance for using OVERSEER in the context of the overarching imperative to manage the impacts of land use on water quality. This guidance is complementary to OVERSEER’s traditional role as a decision support tool regarding on-farm fertiliser management.

Key messages

1. Providing the assumptions, limitations and principles are taken into account, OVERSEER is suitable to provide estimates of nutrient loss for use in the implementation of the NPS-FM.
2. The decision by a regional council on whether or not to use OVERSEER will be influenced by a range of factors such as:
 - the nature and extent of the water quality issue;
 - the specific characteristics of the catchments;
 - the state of knowledge about the water quality and catchment characteristics and the data available;
 - the likely sources of nutrient(s) contributing to the water quality issue and the ability to measure at or near source;
 - whether input-based or output-based methods of managing diffuse nutrient discharges are preferred;
 - consideration of the relevant assumptions, limitations and principles, particularly those relating to uncertainty and version change management;
 - the resources available to the regional council and the community; and
 - the overall planning approach and philosophy.
3. The most appropriate approach to using OVERSEER in the development of plan provisions will depend on the specific catchment characteristics, the extent of nutrient water quality issues, the level of information available, the resources available to develop and implement a regional plan, the objectives sought by the regional plan and the consideration of these in the context of the principles outlined in Table 1.
4. Plan objectives and policies specific to nutrient water quality need to be clear and directive to ensure the environmental results sought by the plan are clear and to provide clear guidance for resource consent decisions that involve OVERSEER nutrient loss estimates.
5. The specification of a source nutrient load in plan provisions (e.g. in objectives and/or policies) provides a high level of transparency and certainty. However, this is contingent on a robust mechanism to deal with improving information and model version changes where the specified load is largely reliant on OVERSEER estimates.
6. In addition to the existing guidance on resource consent conditions, there are important matters to be considered and incorporated in resource consent conditions that require an OVERSEER nutrient loss estimate. This is to ensure that the intent of limiting nutrient losses is achieved and ultimately that freshwater quality objectives are achieved.
7. OVERSEER is often a critical part of estimating catchment nutrient source loads. However, it is important to understand the implications of the different estimation

methods that can be used and the factors that need to be taken into account e.g. uncertainties related to OVERSEER estimates, catchment attenuation factors and OVERSEER version changes.

8. OVERSEER version changes are an essential consequence of improvements to the accuracy of OVERSEER estimates, broadening of its applicability and improving its usability and/or user interface. However, OVERSEER version changes (excluding usability and user interface changes) can result in significant changes to estimates of N and/or P loss. The consequential changes in nutrient loss estimates can vary significantly from property to property, depending on the range of soils, climate, climate patterns, topography and farm systems.
9. OVERSEER version changes can affect the understanding of source nutrient losses used in plan-making processes, and can potentially affect the status of activities under regional rules and/or resource consents. A range of methods can be used in regional plan provisions and resource consent conditions to avoid or minimise the consequences of version changes.
10. Uncertainty in OVERSEER nutrient loss estimates is inevitable and regional plan and resource consent decisions need to acknowledge and endeavour to reduce uncertainty. Uncertainty is not a reason to take no action. Rather, the higher the uncertainty, the greater the need for robust monitoring and review processes for plan provisions and resource consents.
11. Some uncertainty in OVERSEER nutrient loss estimates will be reduced by undertaking and incorporating further science e.g. collecting more evaluation data under different soils and climates. Other forms of uncertainty are essentially irreducible e.g. biological variability. There are options and methods for using OVERSEER and its outputs in a way that recognises and manages uncertainty in plan and resource consent processes.
12. Provided that the relevant assumptions, limitations and principles (Table 1) are taken into account, OVERSEER is suitable to model P as well as N source loss at a property and catchment level.
13. The receipt and long-term management of individual OVERSEER property files need well-designed data management and security systems to ensure that all legal, technical, and long-term information needs are met. Significant resources are required to develop and implement the necessary data provision and security measures.
14. OVERSEER modelling requires a detailed knowledge of the New Zealand farming system being modelled and a detailed understanding of OVERSEER. This is particularly significant for scenario modelling. Therefore, only people with the requisite knowledge should undertake OVERSEER modelling to meet regional plan and or resource consent requirements.

15. A high level of assurance about the fitness for purpose of an OVERSEER estimate of nutrient loss needs independent auditing by a person with significant knowledge of the modelled farming system and OVERSEER.
16. The use of OVERSEER requires an understanding of the functions and relationships of component parts of the model. This requires regular publication of the details of those functions and relationships.

Table 1: Principles for the use of Overseer in regulation

Planning principles

- 1 If OVERSEER is used to provide estimates of annual nitrogen and/or phosphorus loss from farm systems its assumptions and limitations need to be fully acknowledged and taken into account.

- 2 (i) The use of OVERSEER must recognise that new versions of OVERSEER are released regularly and plan provisions that specify OVERSEER should include a mechanism(s) to manage version change if required.
- 2(ii) Where OVERSEER has been used in calculating source or receiving environment catchment loads there must be a mechanism to periodically re-evaluate and update the assumptions in the supporting catchment science.

- 3 Where OVERSEER is used at multiple stages in a planning process (e.g., in the process of setting nutrient allowances and for assessing compliance), OVERSEER versions and data input standards should be consistent.

- 4 The use of OVERSEER must recognise that there are uncertainties in estimates of nutrient loss and this uncertainty must be identified, communicated and, as far as practicable, managed.

Supporting technical principles

- 1 The use of OVERSEER must recognise that OVERSEER only models some sources of nutrients.

- 2 The use of OVERSEER must recognise that OVERSEER does not model all farm management or mitigation practices and that there are some assumed management practices within the OVERSEER model

- 3 The use of OVERSEER must recognise that OVERSEER only estimates nutrient loss from the farm boundary and root zone.

- 4 The use of OVERSEER must recognise that OVERSEER is a steady-state model and does not model the effects of transition e.g., transition from dryland to irrigated or farm system change such as forestry to pastoral farming.

- 5 The use of OVERSEER must recognise that data inputs to OVERSEER (actual or estimated) need to reflect a long-term, biologically feasible farm system.

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- 6 OVERSEER requires significant expertise to enable farm systems to be modelled accurately and the use must recognise that the quality of the data inputs impacts on the uncertainty associated with the estimated nutrient losses.

 - 7 The use of OVERSEER must recognise the long-term climate input assumptions built into OVERSEER and choose data inputs consistent with those assumptions.

 - 8 The use of OVERSEER must recognise the differences in N and P loss processes and how these are modelled in OVERSEER.
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Conclusions

To ensure that OVERSEER continues to be used appropriately and effectively to assist in managing nutrient water quality, it will be necessary to both regularly review and update guidance on the model's use. It is vital that the model itself is maintained and enhanced in a transparent manner to meet the needs of regulators, industry and landowners. It is likely that OVERSEER will become an increasingly important tool for use by regional councils in managing freshwater quality, in both regulatory and non-regulatory contexts.

There are still some significant challenges facing the development, maintenance and application of OVERSEER. These challenges include:

- Developing a transparent process for determining how priorities for maintenance and development of the model should be set.
- Strengthening the scientific peer review process for its maintenance and development.
- Strengthening the model evaluation process, including corroboration, sensitivity analysis and uncertainty analysis.
- Increasing the awareness of the extent and importance of the uncertainties involved in OVERSEER estimates.
- Improving the model's transparency and documentation to ensure that users and stakeholders can have confidence in the model.
- Ensuring users are adequately trained and best practice is captured, shared and appropriately applied, including maintenance and dissemination of the guidance material.
- Improving farmer and agency awareness of the value OVERSEER provides to 'NZ Inc' in terms of enhancing water quality and productivity (see Journeaux, 2016).

Significant questions also remain over how the development and maintenance of the model should be funded. This includes questions around the relative split between the public and private benefit delivered by OVERSEER and therefore the appropriate sharing of costs between central and regional government and private users and beneficiaries. These issues will need to be resolved if the OVERSEER model is to fully achieve its potential as a tool in managing and regulating diffuse nutrient losses to water.

References

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- Watkins, N. & Selbie D. (2015) Technical description of OVERSEER for Regional Councils. AgResearch Contract Report RE500/2015/084.