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A FRAMEWORK FOR ASSESING POTENTIAL NITROGNE LOSS FROM FARMS IN HAWKES BAYS TUKITUKI CATCHMENT

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It is widely accepted that the water quality of many New Zealand rivers is degraded, and changes need to be made. One of the main causes of poor water quality is excessive nitrogen. Discharges of nutrients, including nitrogen can be managed through the use of the tool, Overseer.

We, alongside other regional councils, have used Overseer in Regional Plans and to gather modelled output data on different farm systems Industry groups have for some time debated the use of Overseer as a tool for regional council's planning and consent process.

In late 2018, the Ministry for the Environment and the Ministry for Primary Industries commissioned a review of Overseer by a Science Advisory Panel. A technical review of the Overseer model began in early 2020. The findings were released in August 2021.

The panel considered Overseer's ability to estimate nitrogen loss across a range of conditions found in New Zealand and concluded that they wouldn't have confidence in Overseer to estimate the volume of nutrient loss and whether nitrogen was being increased or reduced as a result of on-farm actions

The Government has committed to test, upgrade or supplement Overseer over the next 12 months and will support the use of Overseer over this time to enable regulatory requirements to be met.

In the meantime Hawkes Bay Regional Council (the Council) was required to continue to implement our Tukituki Catchment Plan. In view of the SAP review of Overseer and the Government, the Council was unable to continue with implementation of the Tukituki Catchment plan as it is currently proposed in the Tukituki Catchment Plan (PC6) Procedural Guidelines

We determined that we will be unable to reliably assess whether individual high leachers are exceeding their Land Use Capability Nitrogen allowance, based on Table 5.9.1D of the Tukituki Catchment Plan, without the use of Overseer. Enforcement of this rule based on Overseer outputs would also be unlikely to succeed. Therefore, we did not believe that we will be able to require applications for individual high leachers that are located outside a DIN (Dissolved inorganic Nitrogen) exceeding sub-catchment, or determine activity class of consent based off Overseer Nitrogen loss outputs.

In light of this an approach was developed in house by a working group with two options to satisfy Tukituki plan requirements:

1. Prepare an Overseer nutrient budget or

2. Provide some of the information from Schedule XXI of the Tukituki plan to provide an assessment of potential for N loss across all farm types.

This was socialised with the primary industry representative group who collaborated on the original Procedural Guidelines in 2019. Members of the Procedural Guidelines group indicated a preference to work together to further develop the second option so that there is consistency in the way these are provided and calculated.

The final matrix that is outlined below has been developed with a regional context specifically for Hawkes Bay. Data from real farms with spread across each industry (arable, dairy and drystock) Overseer published budgets (anonymised) was used to determine the Imported Nitrogen in fertiliser and feed and stocking rates, these were then split into three categories. If this matrix was used in other regions it is unlikely that it would work as intended, due to differences in fertiliser use and application. The Hawke's Bay Tukituki context is one where some sub-catchments are exceeding their DIN limits based on measurements in stream. Properties within these catchments have a range of potential risks for N loss.

Individual discussions were had with some group members on tool options before reporting a revised approach back to the group for comment. Two meetings were held, with the second meeting socialising the two-tier risk matrix. General agreement was concluded by the group around the structure and purpose of the matrix.

From discussions with each industry, it was determined the ***most useful*** simple N risk indicators are likely to be:

Activity risks

- **Stocking rate** - This could be peak or wintering numbers or both (provided as RSU). A table of stock classes and RSU will need to be provided.
- **N imported** –
    a) Fertiliser N applications (kgN/ha) and
    b) N imported from feed (kgN/ha)
- **Wintering practices** – winter cropping (collect and provide winter crop type and area)

Timing risks

- Winter crop fallow (May -Aug) – Information – Yes/No
- Timing of N fertiliser applications (high risk months May-Aug) Information – Yes/No

A 'Two Tiered Risk Matrix' was developed, based off the conversations had with industry and the discussion above around most useful, balanced with ease of data collection across industry indicators of Nitrogen potential loss risk.

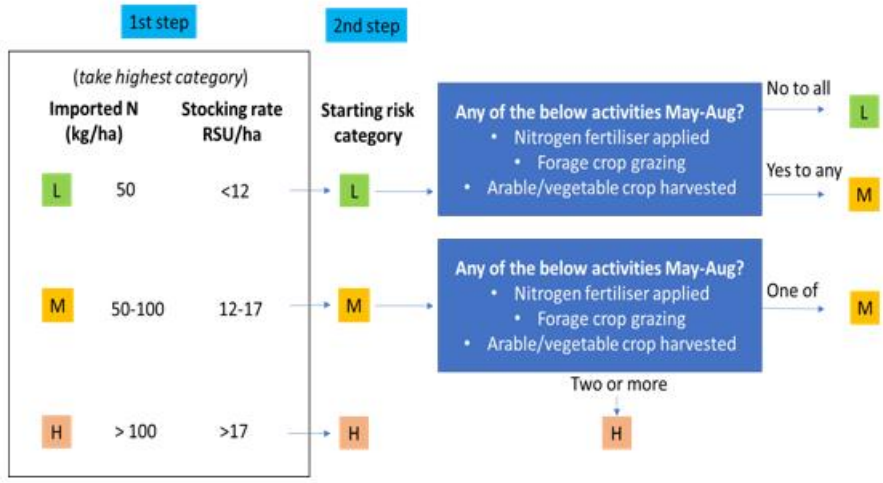

Figure 1 – The Two Tier risk Matrix

Firstly, Imported Nitrogen (in fertiliser and feed, in kg/ha/yr) and stocking rate (in RSU/ha) are checked against the three categories. Whichever of the two is the highest has the initial category applied to it low, medium or high.

Eg a farm imports 55kg/N/yr in fertiliser and feed and has a stocking rate of 11 RSU/ha would take the imported N as the highest category and be 'medium' for the first step.

If the property comes out 'high' it stays high. If the property comes out low or medium, three key questions are then asked:

1. Do you use any Nitrogen fertiliser between May and August?
2. Do you graze any forage crops by stock between May and August?
3. Do you harvest any arable or vegetable crop between May and August?

Depending on how many of the above questions apply to the farm it will stay in its initial category or move up to a medium or high category.

The limitations of the model must be considered, it is a coarse approach not accounting for:

- N fixation
- Climate and soil (location risk factor)
- stock type

Its strengths are in its quick level of assessment, less data needs to be collected and can be collected in a more consistent way. It gives some level of assessment without the requirement to use Overseer if that's what a landowner chooses to do.

The matrix was then socialized with the farm plan providers, to be used when updating a landowners FEMP and applying for consent. It is intended that by the provider running through the matrix and having the conversation with the landowner, a part of the FEMP update and the consent application can be structured based off the result of the matrix. Noting this is a potential risk of Nitrogen leaching from the farm, and does not account for other contaminants, these should still be addressed in both the FEMP and consent application.

Eg if a farm uses winter Nitrogen and has cattle grazing winter forage crops these activities should be discussed in the application, and mitigated/managed appropriately (Intensive Winter grazing modules, timing of fertiliser applications with soil temperature and buffers)

To determine the data needed in the matrix, either an Overseer file would be used to gather the figures straight out of (eg RSU/ha) or a calculator supplied by HBRC to determine Nitrogen content in feed and RSU/ha. Fertiliser Nitrogen content per hectare can be determined from fertiliser records.

The level of risk determined from the matrix is a way for the consent team to triage what applications they may need to pay more attention to. It isn't something that would hold landowners to a specific set or mitigations or certain reductions. It's a flag for the future around the farm system, and a way to identify higher risk activities if they are undertaken on farm, to assess these and manage risks effectively.

Existing relationships and group setting of procedural guidelines was key in developing this tool so quickly, the buy in and enthusiasm from industry to work together on a pragmatic tool was applaudable. Because of this the Council was able to be agile and respond to a large area of concern in Tukituki regulation in a timely manner.

Refs

https://www.hbrc.govt.nz/assets/Document-Library/Reports/Government-response-to-the-findings-of-the-overseer-peer-review-report-final.pdf

https://www.hbrc.govt.nz/environment/farmers-hub/in-the-tukituki-catchment/overseer-review/