SUBMISSION ON

‘Action for Healthy Waterways’

Proposed National Environmental Standards for Freshwater

Thursday 31st October, 2019

TO: Ministry for the Environment (consultation.freshwater@mfe.govt.nz)

NAME OF SUBMITTER: Horticulture New Zealand

Supported By: New Zealand New Zealand Kiwifruit Growers Incorporated (NZKGI), NZ Apple and Pears Inc, TomatoesNZ, New Zealand New Zealand Kiwiberry Growers, , Onions New Zealand, Vegetables New Zealand, Process Vegetables New Zealand, New Zealand Citrus Growers, , Potatoes New Zealand, Central Otago Fruit Growers Association, Tevoit Fruit Growers Association

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Introduction

Horticulture New Zealand (HortNZ) thanks The Ministry for the Environment (MfE) for the opportunity to submit on the proposed National Environmental Standard Freshwater (proposed NESFW).

Note: HortNZ has a separate submission on the draft NPSFM.

HortNZ recognises the significant challenges in putting in place a land and water management regime within New Zealand that seeks to maximise opportunities for the environment, economy and communities, but at the same time ensuring alignment with the mandatory directives of the Resource Management Act 1991 (RMA).

HortNZ could not gain an advantage in trade competition through this submission.

HortNZ wishes to be heard in support of our submission.

Background to HortNZ

HortNZ was established on 1 December 2005, combining the New Zealand Vegetable and Potato Growers' and New Zealand Fruitgrowers' and New Zealand Berryfruit Growers Federations.

HortNZ advocates for and represents the interests of 5000 commercial fruit and vegetable growers in New Zealand, who grow around 100 different crop types and employ over 60,000 workers. Land under horticultural crop cultivation in New Zealand is calculated to be approximately 120,000 hectares.

The horticulture industry value is $5.7 billion and is broken down as follows:

Industry value	**$5.7bn**
Fruit exports	$2.82bn
Vegetable exports	$0.62bn
Total exports	**$3.44bn**
Fruit domestic	$0.97bn
Vegetable domestic	$1.27bn
Total domestic	**$2.24bn**

For the first time New Zealand's total horticultural produce exports in 2017/2018 exceeded $3.44bn Free On Board value, 83% higher than a decade before.

It should also be acknowledged that it is not just the economic benefits associated with horticultural production that are important. The rural economy supports rural communities and rural production defines much of the rural landscape. Food production values provide a platform for long term sustainability of communities, through the provision of food security.

The total investment in New Zealand's horticultural sector is estimated to be in excess of $52 billion.

HortNZ's vision is *"healthy food for all forever"* and its mission is to create an enduring environment where growers prosper. This is done through enabling, promoting and advocating for growers in New Zealand.

HortNZ's Resource Management Act 1991 Involvement

On behalf of its grower members HortNZ takes a detailed involvement in resource management planning processes around New Zealand. HortNZ works to raise growers' awareness of the Resource Management Act 1991 (RMA) to ensure effective grower involvement under the Act.

The principles that HortNZ considers in assessing the implementation of the RMA include:

- The effects based purpose of the RMA;
- Non-regulatory methods should be employed by councils;
- Regulation should impact fairly on the whole community, make sense in practice, and be developed in full consultation with those affected by it;

- Early consultation of land users in plan preparation;
- Ensuring that RMA plans work in the grower's interests both in an environmental and sustainable economic production sense.

As a founding member of the Land and Water Forum, HortNZ has played an active role as a submitter and in previous consultations with Central and Regional government reform of freshwater management. This submission is informed by HortNZ staff and contractors currently engaged in most aspects of Central and Regional management of freshwater across New Zealand.

The importance of water and highly productive land for horticulture

Water is essential for the production of food. Horticultural production in all regions of New Zealand is reliant on reliable supplies of fresh water that are suitable for sustained crop production and post-harvest washing and processing.

The values of food production land are inseparable from connected freshwater. Freshwater is a necessary component of food production land because:

- Freshwater processes formed our most productive land through erosion and deposition creating plains of arable soil in the lowlands. These make up the 5% of New Zealand that is available for high value horticultural production (versatile soils).
- The value of this finite and precious resource is compromised without clean fresh water to cultivate crops, to wash and prepare food.
- Food cannot be grown without water and therefore cannot occur without discharges. The values of land and water and interlinked.

Food security

Current projections around New Zealand's expected population increase and annual food volumes available for consumption in New Zealand show that domestic vegetable supply will not be able to sustain our future population consumption needs.[1]

Already many New Zealanders, are struggling to meet the recommended daily intake of 3 plus vegetables and 2 plus fruit a day. In 2016/2017, only 38.8 percent of New Zealand adults and 49.8 percent of children met the recommended daily fruit and vegetable intake.[2] Those living in the most deprived neighbourhoods were less likely to meet the recommended intakes and were more likely to be obese.[3] 1 in 5 children are living in food insecurity[4].

Abstractions and discharges are need to grow the food New Zealanders need to eat. Reasonably priced health food is essential for human health.

Submission Structure

1. Executive Summary
2. Proposed NES – Freshwater
3. Resource Management (Measurement and Reporting Water Takes) – Water Quality – real-time reporting of water use
4. NES for Commercial Vegetables

Appendix A – HortNZ Decisions Sought on the Proposed NESFW

Appendix B – HortNZ Responses to Discussion Document Question

Appendix C – Example of FEP

[1] http://www.hortnz.co.nz/assets/Media-Release-Photos/HortNZ-Report-Final-A4-Single-Pages.pdf

[2] https://minhealthnz.shinyapps.io/nz-health-survey-2016-17-annual-data-explorer/_w_e9a07e83/_w_aa03fb73/_w_320818d4/_w_26fa6ce8/_w_f50ad45f/_w_dbba0f02/#!/explore-indicators.

[4] https://www.health.govt.nz/system/files/documents/publications/household-food-insecurity-among-children-new-zealand-health-survey-jun19.pdf

1. Executive Summary

Allow low impact irrigated horticulture to expand

We do not agree that low impact horticulture should be subject to a discretionary consent. Most land use change to low impact horticulture will result in improved water quality. Land use change towards low impact horticulture is an important option to both reduce water quality impacts and to reduce climate change impacts. We see these provisions particularly impacting on Māori developments, which may be on underdeveloped land. We provide two case studies which highlight that this provision could have adverse social, economic and cultural effects, with negligible positive and potentially negative water quality impacts.

Allow commercial vegetable growing to expand, within a consented framework

We support the permitted provisions for existing vegetable growers, and we are pleased that the need for vegetable growers to rotate crops is recognised within the rule.

We strongly support allowing commercial vegetable growing to expand. We are of the view this should be provided for as a controlled activity.

We strongly oppose the proposed discretionary activity and the proposed criteria. HortNZ has had economic analysis undertaken on these proposals. This found that to cover the cost of the offsetting required, the price of vegetables would need to increase between 16% – 50%. As vegetable growers aren't price setters, they simply wouldn't expand and New Zealanders would have fewer fresh vegetables. Economic analysis has indicated not allowing growers to expand would also increase the price of vegetables between 43%-58% by 2043.

Affordability is a key factor in why people eat less than the recommended intake of fruit and vegetables. If fruit and vegetable growing cannot expand to meet the growing demand with an increased population, the reduced availability of vegetables and an increased price would impact on the health of the most vulnerable people (Moore, Barton, & Young , 2019).

The predicted growth in the industry can be accommodated, easily within the improvements in water quality predicted from other sectors. Vegetables are an essential human health need, and we submit an achievable pathway must be provided to enable vegetable growing to expand to meet demand.

Horticulture is a minor activity in Schedule 1 catchments

Horticulture is a minor land use in all of the Schedule 1 catchments. It also a minor land use in two of the four possible additional catchments in the discussion document. HortNZ supports an Audited Farm Plan approach for managing nitrogen. For horticulture it doesn't follow that rapid reductions in nitrogen would be required in these catchments. Land use change to low impact horticulture should be encouraged.

We Support Independently Audited Industry Freshwater Farm Plans

HortNZ support all farms and orchards greater than 5 hectares having an independently audited FW-FP by 2025, or 2022 in the Schedule 1 catchments. These Plans will be best delivered though the existing GAP programmes. Approximately 3500 growers (90% of the crop) already have audited Farm Plans under either NZ GAP or Global GAP. These Plans will need to be updated to include any additional requirements as specified in the NES that are not already addressed in their Farm Plan.

2. Proposed NES – Freshwater

HortNZ has the following overall comments specific to the proposed NES – Freshwater.

Part 1 Preliminaries

Stringency

Generally, we agree with the proposed level of stringency, allowing regional plans to provide for stricter rules where it is deemed appropriate, however in the case of vegetable growing, there has been a failure of regional plans to regulate for vegetable growing and, in our view, a nationally consistent approach is warranted.

We call for a National Environmental Standard for Commercial Vegetable Growing, this is discussed in **Section 4.**

Charging for monitoring

A local authority has the ability to charge for monitoring (RMA s36 and s87BB). Any charge should be fair and reasonable. Furthermore, there should be a transparent procedure for questioning charges if a land owner has just reason to challenge the cost.

Part 2 Wetlands, rivers, and fish passage

Subpart 1 – Wetland

We support the intention to manage the effect of activities, including horticultural activities, on natural wetlands. Horticultural activities with potential effects on natural wetlands are: cultivation, private land drainage and water abstractions. The proposed methods manage potential effects through establishing buffers and with the activity status linked to hydrological effects thresholds.

We support providing provisions that enable managing the effects from existing public drainage network, in manner that recognises the public value of these networks. Horticulture activities occur on highly productive land, in low land locations. Maintaining the productive capacity of highly productive land depend on the efficient functioning of public and private land drainage.

It is important definitions on the difference between constructed wetlands and natural wetlands are clear. Natural wetlands must exclude constructed ponds (e.g.: sediment control ponds and water storage pongs) and riparian margins planted as part of creating stream buffers.

If definitions are not clear, the rules could create a disincentive to create soft-engineering approaches such as ponds and wetland for water quality treatments. If planted swamp riparian margins were counted as natural wetlands, this would create a disincentive to planting buffers (as opposed to leaving buffers in grass), as it would increase land retirement and threaten surface water abstractions, if these abstractions had the potential impact on swamp margins. Recommendations for appropriate definitions are described in **Appendix A.**

Subpart 2 – River bed infilling

We support the intention to manage the effect of activities, including horticultural activities, on stream and river beds. Horticultural activities with potential effects on stream and river beds includes site development, where stream reclamation and permanent diversion may

occur. Where this activity occurs to manage site flooding and erosion, it is proposed to be discretionary and for other reasons, non-complying.

We support providing provisions that enable managing the effects from existing public drainage network and flood protection, in manner that recognises the public value of these networks and schemes. Horticulture activities occur on highly productive land often, in low land locations. Maintaining the productive capacity of highly productive and depends on the efficient functioning of public land drainage and flood protection.

The provisions include offsetting for residual adverse effects. While we are not opposed to offsetting, this may be practically challenging for growers who often only own relatively small parcels of land. This means that they may be unable to achieve offsetting of natural streams on their own land. It is therefore important that offsetting is enabled at the sub-catchment or FMU scale. We have recommended a change to the provisions to reflect this, see **Appendix A**.

Definitions are not provided in this part and therefore it is assumed this provision would apply to any watercourse meeting the definition of a River in the RMA. The definition in the RMA can includes intermittently flowing watercourses and modified watercourses, but excludes artificial watercourses including farm drainage canals. The definition of a Drain, in the Land Drainage Act, 1908 includes watercourses defined as Rivers under the RMA, and artificial drainage water courses. Recommendations for appropriate definitions are described in **Appendix A**.

Subpart 3 – Fish passage

We support the intention to manage the effect on fish passage of new culverts, weirs and dams and passive and non-passive flap-gates. We support recognition that fish passage is not desirable in all rivers, due to the presence of fish pest species, such as koi carp.

Renewal of existing weirs and dams, that form part of existing flood protection and land drainage scheme may be impacted by these provisions.

We support providing provisions that enable managing the effects from existing public drainage network and flood protection, in manner that recognises the public value of these networks and schemes. Horticulture activities occur on highly productive land often in low-land locations. Maintaining the productive capacity of highly productive land depends on the efficient functioning of public flood control of land drainage. We and we have recommended a change to the provisions to reflect this, see **Appendix A**.

Part 3 Farming

Definitions for Part 3

We support the development of a set of consistent definitions to describe farming activity and believe that a set of nationally consistent definitions will assist in plan development and implementation.

We have made specific comments on definitions in **Appendix A.**

Applications

We support the application for horticultural farms of less than 5 hectares, in our view the area should be measured at the parcel scale.

Many orchards are smaller than 5ha, very few commercial vegetable operations (which often operate as enterprises across multiple sites) would be smaller than 5ha.

If the area was defined as production area, fewer orchards would be captured than a definition at the parcel scale, however we are of the view it is important to manage a farm in an integrated manner including the orchard or cropped part and the lower intensity verges and margins, which may offer opportunities for managing water quality effects.

Subpart 2 – Intensification

Geographic application of subpart 2

As no Regional Council has fully implemented the NPSFM 2019 as yet, it is unclear how the proposed polices would not undermine provisions established in regional plan's that have been designed to implement NPSFM 2017.

For example, through submissions to the Waikato Regional Council PC1, HortNZ has sought a restricted discretionary activity for a capped allowance of vegetable growing to provide for the demand for fresh vegetables created by population growth, at audited Good Management Practice (GMP). If the proposed provisions for new Commercial Vegetable Production (CVP) in the proposed NESFM were accepted, these would undermine the PC1 provisions. Furthermore, in the Horizons Region, the provisions for new CVP require meeting nitrogen leaching maximums based on Overseer models of dairy farms. These provisions do not allow crop rotation, which is stricter than the proposed NESFW. However, the Horizons One Plan rules only set limits for nitrogen and is less strict for other contaminants. Whether the grand-parented nitrogen leaching concentration, or the Horizons One Plan pastoral farming default concentrations are stricter or not, will depend on what the previous land use was. Applying for a resource consent in this situation is very uncertain.

We recommend that the NESFW includes an appendix which specifically identifies which regions the intensification rules apply to, which is updated as new plans become operative.

Duration of consents

If the NES is adopted as proposed, providing transitional regulations until limit setting processes to implement NPSFM 2019 are complete, then we support short-term consents.

Whether these should expire in 2030, depends on the degree to which it is realistic that the limit setting process proposed under the NPSFM 2019, can be fast-tracked such that the processes are complete by 2025.

We suggest direction is taken from Regional Council's on the likely timing of the completion of limit setting process, and that consent durations are granted by 5 years beyond that period, to provide some time for consent holders to adjust to a changing regulation.

Irrigated farming

HortNZ submits that increases in irrigated low impact horticulture should be a permitted activity.

The proposed intensification rules include a proposal to require water quality discharge consents for any expansion of 10 ha or more of irrigation. This will capture new orchard expansions. On average orchards use a third of the water of irrigated pasture and have lower leaching concentrations (Gentile, et al., 2014), produce less greenhouse gas

emissions (BERG, 2018), and have the highest revenue on per ha basis compared to any primary production land use (Ministry of Primary Industry, September 2019).

Capturing fruit and low impact horticultural production in the proposed NPSFM irrigation intensification rule is unlikely to result in improvements in water quality, and won't enhance the productive capacity of land or enable famers to transition to lower emission productive uses. In our view this policy is inconsistent with the proposed NPSFM and contrary to direction of the proposed National Policy Statement for Highly Productive Land (NPSHPL) and the Climate Change Response (Zero Carbon) Amendment Bill.

HortNZ surveyed product groups to estimate the degree of expansion predicted over the next 10 years. The following crops were surveyed: avocado, blackcurrant, boysenberry, buttercup squash, citrus, feijoa, kiwifruit, kiwi berry, passionfruit, persimmon, pipfruit, tamarillo, potatoes, onion, process vegetables and fresh vegetables. The surveyed crops made up 100,000 ha of an estimated 120,000 ha of horticulture in New Zealand in 2018. There was a predicted increase of 10,000 ha of additional fruit growing 2028. Most growth is expected in avocado, pipfruit and kiwifruit for export. All of this would be irrigated and would be impacted by this rule, either by increased regulatory costs or in some cases prevented. The potential economic impact of this provision, is highlighted in the Bay of Plenty case study included in the local government economic assessment.[5]

We propose that this rule excludes low impact horticulture systems. In most cases land use change to irrigated low impact horticulture would result in an improvement in water quality, and therefore this rule would add an unnecessary cost for no benefit. **Case Study One** below presents an example of Miro berry developments. These developments would likely result in water quality improvements compared to the existing use, as well as a range of economic, social and cultural benefits. However, this activity would be captured by this rule, adding an unnecessary cost and regulatory barrier.

Water quality

The discharge of nutrients is lower than most pastoral uses, and in most studies nutrient leaching rates are similar to or lesser than unirrigated sheep and beef farming. For example,

- A study of land on Poverty Bay estimated leaching rates for fruit and wine ranging from 5kg/ha to 18kg/ha, the same study estimated leaching from pasture at 19kg/ha (SPASMO)[6.]
- A study in the Hawkes Bay estimated leaching from fruit crops between7kg/ha and 26kg/ha (Overseer 6.2.2).[7]
- A study in Tasman estimated leaching from fruit and wine crops between 6 kg/ha and 36kg/ha (Overseer version 6.1)[8]
- The leaching rate for a large glass house, irrigating pasture with runoff water estimated a leaching rate of 20kg/ha[9].

[5] (Local Government New Zealand, 2019)
[6] (Gentile, et al., 2014) http://www.hortnz.co.nz/assets/Uploads/Plant-and-Food-Land-management-practices-and-nutrient-losses-from-farm-.pdf.
[7] (Ford s. , 2016)http://hortnz.co.nz/assets/Natural-Resources-Documents/Hawkes-Bay-Horticultural-Nutrient-and-Financial-Benchmarking-Results-FINAL.pdf
[8] (Ford S. , Nutrient Performance and Financial Analysis of Horticultural Systems in the Waimea Catchment, 2015) http://www.hortnz.co.nz/assets/Natural-Resources-Documents/Nutrient-Performance-and-Financial-Analysis-of-Horticultural-Systems-on-the-Waimea-Plains-Final-May-2015.pdf
[9] Barber, A 2019 Pers comms 29 October

- A recently published Plant and Food report calculated nitrogen balances from a survey of asparagus growers in the Waikato, and found, using a simple N surplus, the average surplus was 11.4kg/ha[10].

While irrigated horticulture has similar nutrient discharges to unirrigated sheep and beef, it has much lesser water quality impacts than unirrigated sheep and beef farming, because it discharges very low rates of bacteria and sediment.

In some instances, where the existing land use is maize the water quality impact of nitrogen may be greater from conversion to an irrigated orchard, the conversion would likely still result in an improvement in bacteria and sediment discharges.

We are aware of proposed developments, where under-developed Māori land is being considered for low impact, high value horticulture. For example; the collectively owned Māori land between Opotiki and Te Kaha and Māori land on the Poverty Bay Flats, as described in **Case Study Two** below. The Turanga development is an example of an opportunity for Māori land owners to improve the returns from their highly productive land. The development would have social, economic and cultural benefits, with negligible water quality impacts. The proposed rule, may prevent some of this highly productive land realising it productive capacity.

Given the water quality effects of converting land from one very low intensity land use to another low intensity land use will be negligible at the Freshwater Management Unit (FMU) scale, we are of the view this provision creates an unnecessary barrier and will exacerbate existing inequality in the allocation of natural resources, for negligible water quality benefit.

Efficient use

As well as haver lesser or negligible water quality effects compared with other land uses, low impact horticulture crops use much less water, on average one third[11] of the water of irrigated pasture, this is because of the efficient irrigation systems that can be used for static crops and the water demands of fruit.[12] This means, that water can be transferred from pastoral irrigators to horticultural uses and irrigate a much larger area, producing much more food for the same amount of water use. Low impact horticulture crops produce much more food that pastoral land uses on a per hectare, basis, for example 50t/ha of kiwifruit or citrus, 80T ha of apples[13], or 500 tonnes per ha of glass house tomatoes[14].

Irrigation of low impact horticulture is an efficient use of water. Efficient allocation and water use is encouraged in the proposed NPSFM 2019, but is disincentivised in the NES FW.

[10] (Hunt, Dellow, & Sinton, 2019)https://www.waikatoregion.govt.nz/assets/WRC/Council/Policy-andPlans/HR/Block3/HortNZ-1-Michelle-Sands-Evidence.pdf
[11] (Gentile, et al., 2014) http://www.hortnz.co.nz/assets/Uploads/Plant-and-Food-Land-management-practices-and-nutrient-losses-from-farm-.pdf
[12] (Ford S. , Memorandum to HortNZ NESFW, 2019)
[13] (Gentile, et al., 2014) http://www.hortnz.co.nz/assets/Uploads/Plant-and-Food-Land-management-practices-and-nutrient-losses-from-farm-.pdf
[14] Barnes, H 2019, Pers comms 29 October

Climate change

The Eat- Lancet Commission found that food is the single strongest lever to optimize human health and environmental sustainability and without action, the world risks failing to meet the United Nations Sustainable Development Goals and the Paris Agreement.

The Report recommended a transformation to healthy diets by 2050 requiring substantial dietary shifts, with global consumption of fruits, vegetables, nuts and legumes having to double, and consumption of foods such as red meat and sugar being reduced by more than 50%. "*The food we eat and how we produce it will determine the health of people and planet, and major changes must be made to avoid both reduced life expectancy and continued environmental degradation*." (Eat-Lancet, 2019).

The measure of New Zealand's success in adapting our food production system in a way that contributes to global efforts to reduce global warming, will be to reduce the overall carbon intensity of New Zealand's food production, by changing, but not reducing our production.

Horticulture, and in particular fruit for export, presents an opportunity for current and future generations to produce more food in New Zealand with much lower emissions than animal agriculture.

As we transition to a low emissions economy, farmers need options to reduce their emissions. For some farms in some locations converting part of their farm to a low impact irrigated horticulture production, provides an opportunity to reduce emissions in a manner that supports the economic viability of the farm. In New Zealand there are 1,000,000 ha of land that could potentially be converted to horticulture. If this land was converted to horticulture is would be as effective at reducing New Zealand's agricultural emissions as a methane vaccine[15].

The greenhouse gas and water quality targets are challenging for existing farmers. We acknowledge that the proposed NESFW is a transitional framework while water allocation policy is developed. However, the changes we make to farming systems in the next ten years will be critical in achieving the long-term climate and water quality outcomes. Farmers need options so they can respond to the challenges now. Where land use change is unlikely to result in adverse cumulative water quality effects and produces lesser greenhouse gas emissions, it should be encouraged, not constrained.

[15] (BERG, 2018) https://www.mpi.govt.nz/dmsdocument/32125/direct

CASE STUDY ONE: Miro Blueberries

Background

Miro Limited Partnership (Miro) is an integrated, Māori owned and operated horticultural company owned by 28 Māori shareholders (ranging from individuals to iwi, hapu and land trusts). Miro's vision is to transform underutilized Māori land into high-value horticulture, providing skilled jobs and employment pathways for Māori people. This will also have wider benefits such as promoting regional growth (and the national economy) and building higher productivity and environmentally sustainable systems in New Zealand.

Inputs for protected cropping of blueberries

Miro grows blueberries in a precision horticulture system, under poly tunnels, in fertigated 30 litre pots and substrate. On average there are 4500 plants per hectare.

Figure 1: Blueberry plants in a poly tunnel (Source: Miro)

Irrigation and feeding of the plants are done through an automated fertigation system via drippers directly into pots. Each plant is fed an average of 4L at peak season. The average run off out the bottom of the pots is 10% (range is 5-15%) depending on the season. This equates to 1800 litres per hectare per day at peak season. A good deal of this evaporates therefore run off in to soil is minimal (and some orchards have capture systems so there is no untreated run-off).

The berry variety Miro grows, has relatively low nitrogen demands, using far less nitrogen than vegetable crops grown in glasshouses, which are also low impact horticulture activities, and outdoor high value fruit crops.

Impacts of the NES-Freshwater on future development

Miro supports the principle of Te Mana o te Wai.

Miro have a pilot orchard in Te Teko comprising 6ha of production and a nursery (employing 65 local people) and have plans to scale this up and develop a further 22ha. Under the proposed NES-Freshwater provisions for irrigated farming, this expansion would require resource consent as a Discretionary Activity.

High value horticulture, such as blueberries, requires scale (10ha is seen as a minimum). As demonstrated in this example, limiting the scale of developments to 10ha could significantly limit the economic potential of Māori land and people. This is considered an unnecessary and inefficient regulatory barrier for what is a low impact horticultural activity (as with other glasshouse/covered crops and outdoor fruit and berry crops) in terms of having relatively low water quality impacts while also delivering significant positive benefits and being an environmentally sustainable land use that promotes the development of Māori land.

Unlike the bigger commercial growers these Māori entities do not have access to water or it is too expensive to access. In the future the NPSFM process may include a value assessment, that could provide water for Iwi/Marae, recognising the cultural value of development of Māori land, but this is quite different to Māori utilizing their primary asset (land) to generate economic and social returns for their people. In the next 10 years while the NES FW operates as a transitional set of regulations, the Miro developments, and any other Māori land owners transitioning to high value, environmentally sustainable horticultural crops at scale, would face increased regulatory barriers.

CASE STUDY TWO : Turanga Proposed Kiwifruit Development

Background

In Turanga (Gisborne), a high percentage of high value Māori land is underutilised by Turanga Māori. Under the leadership of Te Aitanga a Mahaki Trust, interested Māori landowners in Turanga came together as under a project called "Turanga Whenua, Turanga Tangata" or "the lands and the people of Turanga", 16 land blocks were identified as being capable of high value horticulture. Traditionally these areas have successfully grown food crops (such as citrus, avocados, feijoas and apples) as well as other crops such as maize, squash, and watermelons.

It is intended that over a 3 -year period cluster developments of kiwifruit, totalling 95.27 ha, will be established using a Joint Venture arrangement between Māori Landowners and investors which would include funding from Te Aitanga a Mahaki Trust (the Post Settlement Governance Entity) and Provincial Growth Fund (assuming the application is accepted).

The aim is to employ all local staff and to throughout the operation of the development and operation of the orchards train tangata whenua so that in time they can undertake the work themselves. This support the regional economy and enhances connection to the land.

Predicted losses from Kiwifruit

Kiwifruit has a predicted annual average Nitrate-Nitrogen (N) leaching loss rate of 9.9 kg/ha/y*, compared with 18.9 kg/ha/yr for pasture low intensity sheep and beef with no irrigation[16]. In the same study, maize cropping represented 30% of the Poverty Bay flats and had predicted annual average N leaching loss rate of 6.6 kg/ha/y and was assumed not to be irrigated.

Impacts of the NES-Freshwater on future development

- While some of this land may already have some irrigated production, there is some that might not be, for example land in maize. In this situation, **these developments would require a discharge resource consent under the Irrigated Farming rules as a Discretionary Activity.**

A condition of the consent required, is that '*the nitrogen, phosphorus, sediment, or microbial pathogen discharges of the farm that will result from the increased land used for irrigated production will not exceed the average discharges of those contaminants from the farm during the farm year 2017/2018'*

- In most circumstances a conversion of land to kiwifruit would be expected to result in reduced contaminant discharges. However, some of this land is cropping land, if this was in maize in the farm year 2017/2018 (which has a low N leaching rate) it would likely difficult to satisfy the Proposed NES criteria while maintaining a feasible operation. **The proposed NESFW could prevent Turanga Māori from be unable to get a resource consent for using underutilised land, for what is a low intensity impact activity in regard to nutrient leaching, and a very low impact activity for sediment and bacteria**.

This case study demonstrates that the proposed rules will have (what we believe to be) unintended consequences of limiting the potential of existing under-utilised land, particularly Māori land, to be used for a high-value horticultural use which if allowed would have negligible adverse and/or beneficial water quality impacts.

[16] Gentile R, Green S, Mason K, van den Dijssel C, Johnstone P,Clothier B. August 2014. Land Management Practices and Nutrient Losses from Farms on the Poverty Bay Flats. A Plant & Food Research report prepared for: Gisborne District Council. Milestone No. 59140. MSI Obj: SLURI Obj 3. Contract No. 30930. Job code: P/423059/01. PFR SPTS No. 10506.

*Note: The Kiwifruit study assumed 200kg/ha urea in September and 100 kg/ha Urea in October and no compost. This data was from a 2014 study, updated modelling is being done to that will support a new leaching figure (i.e. these leaching rates will may not align with current modelling)

HortNZ submits that increased in irrigated commercial vegetable growing should be a permitted activity.

Any expansion of vegetable growing will be captured by the CVP rules in the proposed NESFW. We have proposed a change in the definition of horticultural farm, so that expansion of commercial vegetable growing cannot occur on pastoral or arable farms without requiring a CVP consent. Removing commercial vegetable growing from this rule reduces administration, but expanded vegetable growing will still need a consent.

For vegetable growing, irrigation can be used as a means of controlling leaching. A study by Aqualinc[17], showed that in field case studies on vegetable crops, irrigation water reliability increased crop production by an average of 29% in the 2010/2011 irrigation season, with production on a single farm increasing by up to 89%. It has also shown that the quality of the production of vegetables was higher in irrigated vegetables versus non-irrigated vegetables. The effect of irrigation was higher for vegetables because their water stress tolerance is lower than for pasture and the irrigation trigger for vegetable crops is 20% higher than the plant available water (PAW) value for pasture.

Soil moisture fluctuates between field capacity, wilting point, and the 'preferred minimum soil moisture'. The field capacity is the maximum level of soil water available for plant extraction after gravitational drainage from a saturated condition falls to a rate that is insignificant. Wilting point is when soil profile is very dry and no soil water is available for plant extraction. By the time soil moisture reaches wilting point, vegetable crop plants are seriously damaged[18].

The amount of fertiliser that is applied to a vegetable crop is determined based on the average yield that is expected to be grown that year. This average yield is based on average climatic conditions that can be expected in the region that the property is located in. Irrigation is used to maintain yields when drought conditions occur, and to provide a buffer from the natural variability of the weather. Irrigation doesn't necessarily result in soil drainage and corresponding N leaching events, if it is used to maintain soil moisture in the optimum range. Optimum conditions will result in the maximum uptake of applied N, and less N leaching than if the plant was unable to reach the average yield due to wilting due to lack of water.

We see the highest leaching rates for vegetables in the mild North Island west coast growing areas that rely on rain water to support crop growth, for example leaching rates for vegetable growing in Pukekohe and Levin. Leaching rates estimated for the Waikato PC1 planning process were between 64 kg/ha and 73kg/ha[19] (Overseer 6.1*). This is higher than in Canterbury and Hawkes Bay where growers are less impacted by rain and more able to manage their leaching through the use of irrigation, for example the average estimate leaching for the Hawkes Bay (the case study in the MfE discussion document*) was estimated at 16kg/ha/yr[20] (Overseer version 6.2.2.*).

[17] (Rajanayaka, 2013)
[18] (Rajanayaka, 2013)
[19] (Ford S. , 2014)http://www.hortnz.co.nz/assets/Uploads/nutrient-performance-and-financial-analysis-of-lower-waikato-horticulture.pdf
[20] (Ford s. , 2016)http://hortnz.co.nz/assets/Natural-Resources-Documents/Hawkes-Bay-Horticultural-Nutrient-and-Financial-Benchmarking-Results-FINAL.pdf
*NOTE: the different versions of Overseer means that the leaching rates are not directly comparable, and different leaching rates will be calculated using the same model inputs in the latest version of Overseer.

While irrigation can reduce the water quality impacts of vegetable growing. We recognise the need to have resilient growing systems that are distributed across the country on highly productive land and that climate is also an important factor in determining where crops can be grown when.

Land use change to commercial vegetable production

HortNZ submits that existing vegetable growing should be a permitted activity and should be able to expand as a controlled activity provided the grower has an independently audited Farm Environment Plan, demonstrating good management practice and risk based best management practice.

The footprint of vegetable growing is very small, and its effects localised. We support all vegetable growers operating at audited Good Management Practice (GMP), or Best Management Practice (BMP) in catchments identified as a regional priority catchment for improvement. Any water quality improvements achieved by driving land use change away from vegetable growing are likely to be negligible, and often counter-productive when assessed across multiple contaminants and accounting for adverse modifications to hydrological regimes.

We recognise that the proposed NES provide a transitionary framework for managing intensification until an allocation system is developed.

In our view, an NES for commercial vegetable growing which provides long term certainty for the activity is required. This NES for commercial vegetable growing is our preferred long-term solution and is discussed separately below in **Section 4.**

We have provided comment on the proposed transitional NESFW, for commercial vegetable growing, and have proposed a wider range of policies, to manage not only commercial vegetable growing, but horticultural activities more broadly.

CVP - Permitted activity

We have developed a permitted activity for low intensity horticulture. This activity is not constrained by baseline land use. This proposal recognises that in almost all cases, land use change to a low intensity horticultural use will result in improvements in water quality. This policy reflects the proposals we have made to the proposed irrigation rule.

We strongly support the proposed permitted activity for CVP. This rule provides for crop rotation across an FMU, which is essential to maintain soil health. This rule framework is important to provide certainty and autonomy for growers, who often grow across owned and leased land, to be able to invest in their farming systems to achieve better environmental outcomes.

Water quality impacts from winter grazing exceed those from CVP on a Kg/Ha basis for nitrogen, sediment and *E. Coli*. From a water quality perspective there is no reason that commercial vegetable growing for humans should be regulated more stringently than growing vegetables for animals.

We recognise the it is important that farmers have sufficient food to feed their animals in winter. Winter is also a challenging time to grow enough food to feed humans in NZ. In winter New Zealanders depend on root vegetables harvested in the cooler parts of NZ such as Ohakune. These rotations are most likely to operate as small cropped areas leased from a pastoral farm, operating in pastoral rotations, where land will be cropped for one or two

years, and return to pasture for 5 to 10 years. In some cases, these rotations occur as part of a winter grazing rotation.

We have proposed a change to the definition of the commercial vegetable growing, so it does not only capture vegetable growing on horticultural farms. It also would capture all vegetable growing on pastoral and arable farms. This definition gives greater certainty that any increase vegetable growing is subject to a consenting regime that will be focused on industry specific good management practices.

We support the permitted existing area cap for intensive winter grazing, and accept a permitted existing area cap for CVP.

CVP- Controlled activity

We have proposed a controlled activity for expansion in CVP. This option, is a proposal that responds to Option 2 in the discussion document. We have proposed that vegetable growing can expand with risk-based BMP.

We have proposed a restriction (as part of the proposed controlled activity rule) so that the expansion of vegetable growing can only occur in sub-catchments where the total CVP area is less than 20%. In most sub-catchments the area of CVP is much less than 20%, but that there are some small sub-catchments, where vegetable growing makes up a larger proportion of the area. Water analysis indicates that in catchment with >20% CVP there is a likelihood that water quality will be poor[21]. The criteria proposed aims to direct CVP into less constrained locations. The consent applicant would need to indicate the sub-catchments which they would not increase their area within.

We also provide a controlled pathway for CVP that would be lost due to the permitted activity status of the baseline CVP. CVP farms are made up of owned and leased land and are often dynamic in their location. When one grower wins a contract with a supermarket or a processor to supply vegetables, they do not routinely buy the farm of the previous contractor. A new grower, grows a similar amount of vegetables on new land to satisfy an existing demand. Without a straight forward pathway to consent new land to respond to this market reality, the area of land for vegetable growing is likely to reduce over time. This replacement can occur in catchments where CVP exceeds 20%.

Growers predict that intensification (increased volume off the same land) is unlikely to continue to increase in the manner it has in past years. Intensification has occurred both as a result on new varieties improved technology (e.g.: GPS) which has enabled growers to use land more effectively. However, from a soil and water quality perspective, crop rotation remains essential and a larger proportion of land, than is currently set aside, is likely to be required to provide for water quality mitigation, such as buffer strips and sediment control ponds and still produce the same amount of food.

HortNZ undertake survey of vegetable product groups, about expected expansion between 2020 and 2030. It is expected that the vegetables area may expand from 60,000 ha to 72,000 ha. This is both for population growth and for increased export of potatoes and onions. If the increased area of potatoes and onions is achieved, the proportion of vegetables grown for domestic supply would shift from 80% to 73%. If on the other hand, more New Zealanders ate 3 plus vegetables per day, the domestic demand would expand more than the industry had predicted.

[21] (Nation & Blyth, 2019)

Domestic and export are grown in rotations on the same land. The process vegetable sector provides a greater proportion of crops for export, and has an important role in the economic sustainability of the fresh vegetable sector. For this reason, it would be impossible to provide additional land for industry growth exclusively for domestic purposes. We would not support the area cap being solely available to growers who only grow for domestic supply. That approach would undermine the economic viability of the domestic vegetable sector.

For example, for the potato industry, the export value as at December 2018 was $130 million dollars annually. The domestic value of the industry through to retail encompassing the entire value chain represents was $911 million dollars.

However, the export value is a wholesale value and therefore its impact is understated. The percentage of potatoes grown for processing is approximately 68%, potatoes grown for table consumption only represent 26% of all potatoes grown. The production of potatoes and potato products for export ensures the following:

- Ensures that there is an outlet for excess production to ensure that a boom bust cycle does not occur which would increase the financial risk to potato growers.
- Ensures that New Zealand Potato Growers remain internationally competitive given the low barriers to the import of potato products.
- Allows for the transfer of knowledge from International Processors present in New Zealand to ensure that the New Zealand Potato Industry operates at best practice. This is in the form of agronomic practice and research & development transfer.
- Keeps the industry at critical mass, the domestic potato product market (i.e. chips, crisps & hash browns) does not have sufficient demand on its own to make potato processing in New Zealand economic. In short if only potatoes are grown and processed for the domestic market large processors would cease operating and leave. This in turn would make the New Zealand Potato sector vulnerable to imported potato products and the entire industry would simply collapse.

To maintain vegetables for our current population some expansion of vegetable growing is required. To provide sufficient vegetables to meet New Zealanders health needs over the next ten years, some expansion is required.

CVP - Restricted discretionary activity

In some regions[22] HortNZ has proposed area caps linked to population demand. These caps have been made in the context of those existing plans, and it is worth noting, that that approach would require each region to expand its current growing area to keep up with population demand – even Auckland, where retaining vegetable growing land in the face of an expanding urbanisation has been challenging.

It is important that vegetable growing remains distributed across New Zealand to ensure national resilience from weather events for domestic vegetable supply. At the level of this proposed NESFW, it is not possible to anticipate what a suitable cap on future vegetable growing would be, or how that would play out at the regional level.

We strongly oppose the offset pathway being the only avenue for expansion of vegetable growing. Analysis undertaken by Stuart Ford as part of Waikato PC1 evidence, indicated that the cost of vegetables would have to increase by 16% - 50% to cover the costs of a grower meeting this consent condition. Stuart Ford has updated this analysis for other regions where land values are lower, and found that in Horizons and Canterbury the increase in the

[22]Waikato PC1 and Canterbury PC7

cost of vegetable would have to be 30%[23]. Stuart Ford finds that as Growers are not price setters, they are unlikely to undertake expansion, because they will not be able to meet the cost. The Deloitte Pukekohe Food hub, tested the impact on the price of vegetables if growers were not able to expand to meet demand and found that by 2043 the price of vegetables could increase by between 43% - 58%.[24]

Water Quality

The current area of vegetable growing is estimated to be 60,000 ha. If we assume that by 2030 vegetable growing expands by a further 12,000 ha. The increase in water quality load would easily be accommodated within the claw-back that is predicted to occur due to improvements in good management practice in the vegetable, dairy and sheep and beef sector. The estimate in expansion is conservative; in the past 10 years the area in commercial vegetables has declined in NZ[25].

We estimate that over the next ten years, that if on average a 10% reduction in nitrate leaching was achieved with widespread adoption of GMP for dairy farms and a 5% reduction in nitrate leaching was achieved by the adoption of GMP for CVP, then the predicted increase in nitrate load for vegetable growing could be accommodated within the clawback – effectively reducing the dairy clawback from 10% to 9%. If the CVP expanded by 20,000 ha it would only reduce the dairy clawback from 10% to 8%[26].

For the Waikato PC1 hearing, the evidence of Stuart Easton[27], demonstrated that an increase in vegetable growing could be easily accommodated within the water quality reductions that are predicted for dairy farming due to the proposed rules.

Allowing vegetable growing to expand is consistent with Te Mana o te Wai. It is a very efficient land use, and so expansion can be provided for and water quality will still improve provided all land uses operate at GMP.

Allowing the expansion of vegetable growing to occupy part of the water quality reduction that will be achieved by the dairy sector is consistent with Te Mana o te Wai, because it provides for a re-allocation of the some of the discharge allocation that has been allocated. The reallocation prioritises the essential health needs of people. In our view, over time as more reductions in water quality loads are required to achieve outcomes, these reductions need to be designed to provide sufficient allocation so we can grow the heathy food New Zealander need now and in the future.

Vegetables – an essential human health need

The benefits of fruit and vegetable consumption are well established, particularly their role in preventing general micronutrient-deficiencies and chronic diseases (Moore, Barton, & Young, 2019). Low fruit and vegetable intake are identified as a leading risk factor in loss of health. In New Zealand, having a high body mass index (i.e. being overweight or obese) has overtaken tobacco as a leading cause in health loss (Ministry of Health, 2013).The Institute for Health Metrics and Evaluation (IHME) carry out the Global Burden of Disease study. This study attempts to quantify the health loss due to various diseases and risks. The study

[23] (Ford S. , Memorandum to HortNZ NESFW, 2019)
[24] (Deloitte, 2018)http://www.hortnz.co.nz/assets/Deloitte/New-Zealands-food-story-The-Pukekohe-hub.pdf
[25] (Plant and Food, 2018)
[26] Assumes 60,000 ha CVP @ 70kg/ha and 5% improvement and 1,700,000 ha of dairy @30kg/ha and 10% improvement
[27] (Easton, 9 July 2019)https://www.waikatoregion.govt.nz/assets/WRC/Council/Policy-and-Plans/HR/Block3/HortNZ-6-v2.pdf

estimated that almost 800 deaths were caused by low vegetable intake in New Zealand in 2017, as well as quality of life lost due to morbidity (IHME, 2017).

The price of meeting micronutrient requirements is very expensive in New Zealand compared to other countries. Without changing the land use the situation is unlikely to get better and could get worse (Moore, Barton, & Young, 2019).

Affordability is a key factor in why people eat less than the recommended intake of fruit and vegetables. If fruit and vegetable growing cannot expand to meet the growing demand with an increased population, the reduced availability of vegetables and an increased price would impact on the health of the most vulnerable people (Moore, Barton, & Young , 2019).

In New Zealand, for families living in deprived areas, increases in fruit and vegetable prices especially around their off-season, compel them to substitute the purchase of healthier whole fruit and vegetables with cheap energy-dense and nutrient-poor products[28]

There is an extensive body of research indicating that children experiencing household food insecurity have lower fruit and vegetable intake, diets higher in fat, and are at an increased risk of obesity[29]

Higher food prices don't affect everyone equally; generally low-income households have a stronger response to changes in cost. Healthier food has been the first essential that low income families compromise on in times of hardship, exacerbating existing nutritional deficiencies resulting from general lack of money[30]In New Zealand, for families living in deprived areas, increases in vegetable prices especially around their off-season compel them to substitute the purchase of healthier whole fruit and vegetables with cheap energy-dense nutrient-poor products [31].

Grandparenting allocation is a pragmatic option and we accept it in the transition period. However, the reductions made by grand-parented activities must be sufficient to achieve progress towards water quality outcomes and provide for the essential human health needs of New Zealanders during the transition. In the past 10 years due to competition of land, the area in vegetable growing has declined, the price volatility has increased[32], and the consumption of 3+ vegetables a day has declined.

If the vegetable growing is unable to expand to provide for demand, it is health of New Zealanders who will suffer, and Te Mana o te Wai will not be achieved.

Relationship to proposed NPS HPL

The potential risks associated with the implementation of the proposed NPSFM and proposed NESFW are felt strongly by growers. Regional Council policy developed to implement the NPSFM 2014 and 2017 has served vegetable growers very poorly. For example, currently the Horizons Proposed Plan Change 2 caps the productive use of LUC I land at dairy farming, stripping the productive capacity of a nationally important vegetable growing hub that provides 20%[33] of New Zealand's green vegetables. We acknowledge that

[28] (Rush, Savila, Jalili-Moghaddam, & Amoah, 2018)
[29] (Ministry of Health, 2019)
[30] (Cheer, Kearns, & Murphy, 2002)
[31] (Rush, Savila, Jalili-Moghaddam, & Amoah, 2018)
[32] https://www.stats.govt.nz/indicators/consumers-price-index-cpi?gclid=Cj0KCQjw6eTtBRDdARIsANZWjYYzWVW0UmAjVys4HN_NlOFzElbLZmxuI9ladZmkXB2K6nyffRSoQxQaAtz8EALw_wcB
[33] (KPMG, 2017)http://www.hortnz.co.nz/assets/Media-Release-Photos/HortNZ-Report-Final-A4-Single-Pages.pdf

water quality needs to improve in degraded catchments. In sensitive and highly modified catchments, improvements are likely to require a more targeted Action Plan approach than simply limiting discharges and abstractions. (See **Case Study Three**).

If nutrient allocation policy significantly impacts the productive capacity of land, then we are of the view that land should not be prevented from being developed for urban uses.

However, the health needs of people, including access to reasonably prices fresh vegetables, needs to be considered in determining when and how improvements in water quality are achieved. An example of the tensions between food production and water quality is demonstrated in **Case Study Four**.

Food Security

New Zealand's food policy tends towards self-reliance, where we export a limited range of products (mainly food) and import goods including food. New Zealand is too remote to import fresh vegetables, except by air-freight, which can only provide for a fraction of demand and has a high carbon footprint. Most vegetables that New Zealand imports are processed. If we continue to lose the ability to grow fresh vegetables due to policy settings, there is a risk that fresh vegetables will become unaffordable, and contribute to reduced domestic food security.

Local production may provide a pseudo-subsidy through increased access to seasonal discounts and holding transports costs down. This would have long term public health benefits.[34]

The FAO[35] has provided a useful framework for how to consider the environmental sustainability of allowing for increased vegetable exports. This assessment notes the following is likely to be true for how increased export of vegetable crops can influence the dimensions of food security positively:

Availability: The availability of commercial vegetables locally is strongly and positively influenced by the utility of locally produced goods in overseas markets, particularly in the processed vegetables sector and in value – related trade goods such as ready prepared meals. Production for trade purposes also provides the incentive for processors to locate in New Zealand; such as McCains, Watties, Bluebird and Talleys. These provide goods into local retail and also send the same goods overseas, with the strong weight being on domestic supply. Processors have indicated their presence here relies on both domestic and export trade for the appropriate scale of production.

Access: Employment in the horticulture sector is significantly higher per hectare than pastoral production. Data produced by Rabobank[36] in relation to Horowhenua vegetable production showed that money cycled through the local and larger economy on a per hectare basis can be between 2-25 times that of other farming. Heinz Watties demonstrated the effect this can have on communities when applied to domestic and export production in their evidence on the WCO application for the Ngaruroro River[37].The presence of

[34] (Moore, Barton, & Young , 2019)
[35] (FAO, 2016)
[36] http://www.hortnz.co.nz/assets/Natural-Resources-Documents/Commercial-Vegetable-Production-total-cash-cycling-cf-other-May-2014.pdf
[37] https://www.epa.govt.nz/assets/FileAPI/proposal/NSP000041/Hearings-Week-02/fc3f606377/08-WCN-Stage-2-Heinz-Watties-Limited-Evidence-of-MPretty.pdf

commercial vegetable production in the rural community is a key enabler to elevated employment and access to the means to obtain food security.

Utilisation: It has not been until trade export exchanges increased that we have seen a greater diversity of products available in the partially cooked and processed space; and food technology / breeding have improved as a result as well. Food safety systems have advanced significantly as a result of export production and this has provided greater assurance of utilising the food products produced. The technology required to extend shelf life and manage cool chain directly benefits NZ consumers.

Stability: The FAO report shows that the stability of food production systems is greatly increased by trade because it makes it less volatile to climate shocks; oversupply and undersupply of core staples. If growers have confidence of goods reaching a market they are more likely to undertake the risks of production. However, if stability is affected by production that affects local indigenous food ecosystems or damages natural resource systems then stability is decreased. This is another core reason why the regulatory system should provide the opportunity for growth through a resource consent where cumulative effects can be measured and managed as opposed to a permitted activity which is less likely to be visible to the regulator.

Climate Change

The Paris agreement goals include limiting the global temperature to 1.5 degree and adapting to climate change and fostering a low emissions economy in a way that does not threatened food production.[38]

The Consumption of healthy and sustainable diets presents major opportunities for reducing greenhouse gas emissions from food systems and improving health outcomes.[39]

In New Zealand we already have food insecurity and the decisions we make about water allocation and how to develop a low emissions economy could either improve or reduce the food security of New Zealanders.

A 2019 Ministry of Health study has analysed household food insecurity among children in New Zealand (Ministry of Health, 2019). 174,000 (19%) children in NZ are estimated to live in food insecure households. When considering just the children in food insecure households, almost two-thirds lived in the two most deprived quintiles of neighbourhoods (Quintiles 4 and 5: 63.3%) (Ministry of Health, 2013).

If we choose not to allocate our resources to produce food for export, and there is not sufficient resources to produce enough fruit and vegetables to feed New Zealanders, we will have to import more vegetables and fruit. It is not possible to import sufficient fresh vegetables. We would be more dependent on frozen vegetables. The countries that we currently import vegetables from are predicted to experience increased food insecurity due to changes in their climate.

Observed climate change is already affecting food security through increasing temperatures, 13 changing precipitation patterns, and greater frequency of some extreme events.

[38] https://unfccc.int/sites/default/files/english_paris_agreement.pdf
(IPCC, 2019)[39] https://www.ipcc.ch/site/assets/uploads/2019/08/2f.-Chapter-5_FINAL.pdf

Te Mana o te Wai recognises the inter relationship between the health of water, people and the wider environment. Climate Change threatens to alter New Zealand's flow regimes with likely significant adverse effects, it threatens the health and wellbeing of New Zealanders and all people. New Zealand has an opportunity to transform our agricultural system so it produces more food and generates fewer emissions. The way water is managed over the next 10 years, will have an impact on our ability to contribute to the global effort required to improve the health of our climate.

CASE STUDY THREE: Action planning for commercial vegetable growing in Horowhenua

Background

Commercial vegetable growing has long occurred extensively in the Horowhenua, an area with a valued Chinese market garden history. The area became important increasingly important in the 1940's as other growing areas in the Hutt Valley and Otaki were lost to urbanisation.

This area contributes significantly to the regional economy and national food security. It is estimated that Commercial Vegetable Growing in the Horowhenua generates approximately 500 direct jobs and $80-100 million local spend per annum. Horowhenua is one of the few places in New Zealand suitable for growing winter greens and produces approximately 62,000 tonnes of healthy, affordable, domestically consumed vegetables.

In the Horowhenua Freshwater Management Unit (FMU), we estimate that there is approximately 1,200 ha of vegetable growing land, with 320ha in the Hokio 1a/1b catchment (Arawhata). The Hokio Catchment is a Target Water Management Sub (identified in the Horizons One Plan) due to its degraded water quality due to residential, business, industrial., and municipal facilities, pastoral farming (dairying and sheep and beef) and commercial vegetable growing. This catchment includes Lake Horowhenua (Punahau), a sacred taonga.

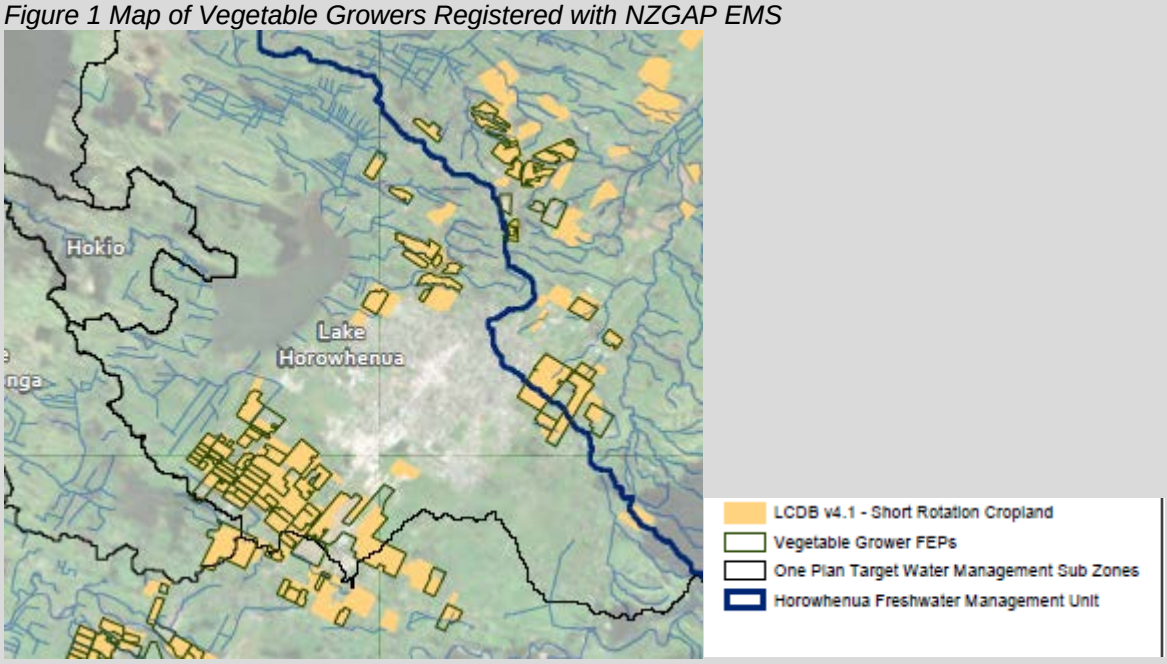
Implications of the Horizons One Plan

The Horizons One Plan lacks an achievable consenting pathway for commercial vegetable growing, by setting cumulative nitrogen leaching maximums based on pastoral farming activities. The limits imposed in the One Plan are not linked to water quality outcomes. The limits in the One Plan (current and proposed) are not achievable if commercial vegetation growing operations are to remain viable.

Growers recognise the need to improve their practices. 87% of growers in the District have signed up to the NZGAP EMS. Growers are working with Vegetables NZ, Potatoes NZ and HortNZ to improve practices and to adopt Best Management Practice standards.

Growers also recognise that the improvements required to achieve the health of Lake Horowhenua and its streams cannot be achieved with on-farm mitigations by vegetable growers alone.

Figure 1 Map of Vegetable Growers Registered with NZGAP EMS



Action planning to achieve an ecosystem-based solution

Growers, alongside Horowhenua District Council, iwi, Lake Horowhenua Trust and government agencies (as part of the Arawhata Wetland Alliance) are proposing to retire 70 ha of dairy land

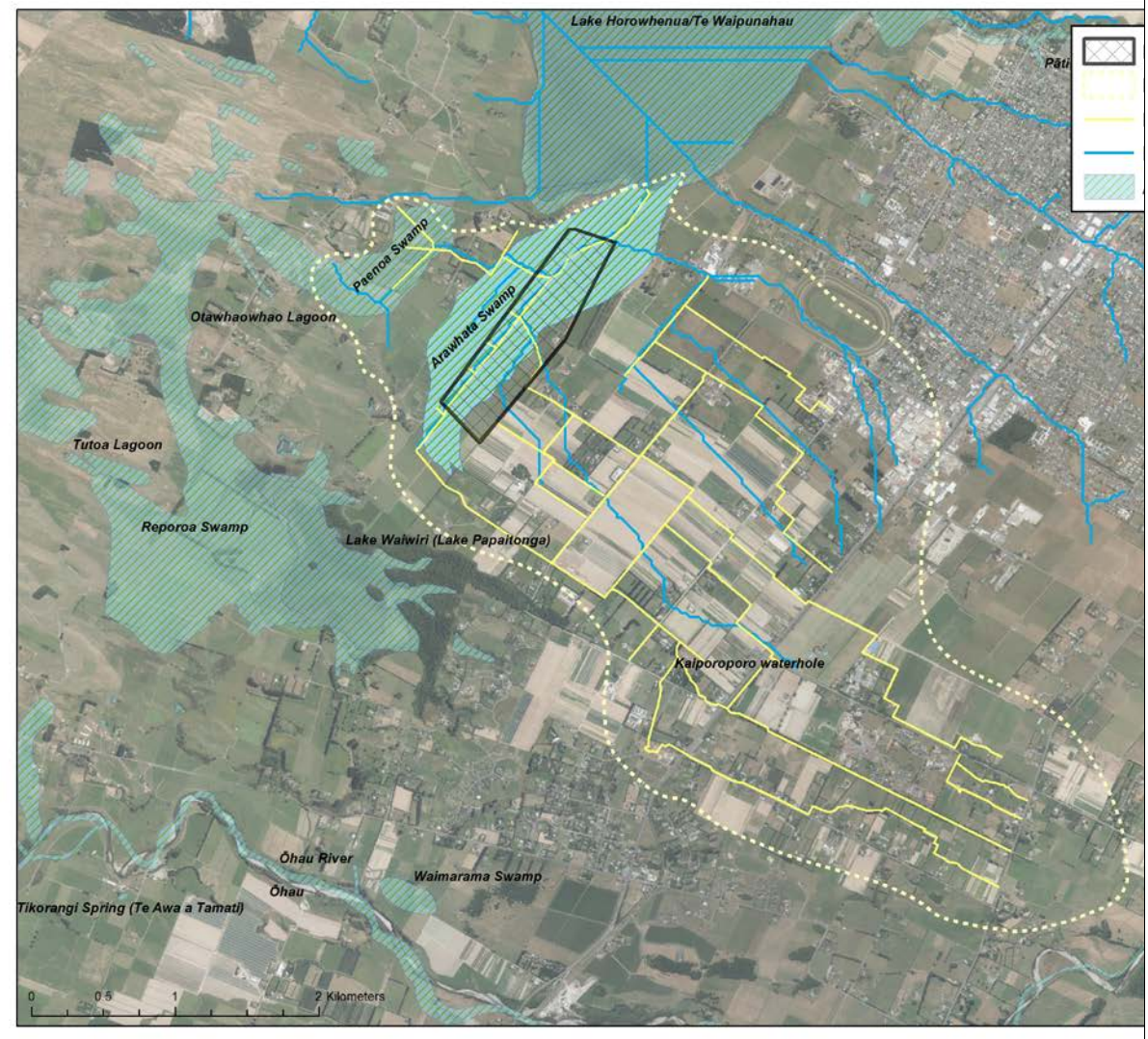
adjacent to Lake Horowhenua, that drains approximately 80 percent of land used for commercial vegetable growing in the Hokio Water Management Subzone (WMSZ),

This project is centred around the Arawhata stream. The Arawhata stream is heavily modified and has a drain morphology. The project seeks to establish a sediment removal and denitrification wetland to reflect the Arawhata swamp which once linked Lake Horowhenua and Lake Papaitonga. The project aims to enhance the cultural and ecological value of the land, improve the water quality of Arawhata Stream and Lake Horowhenua, while sustaining the social and economic benefits that Commercial Vegetable growing provides to the Horowhenua District.

While this project is still in its infancy, this project demonstrates the potential of action planning in some catchments to achieve benefits which far outweigh those that could be achieved by only setting limits. The limit setting approach proposed by Horizons would see vegetable replaced by pastoral farming, with limited improvement in water quality and a loss of healthy food.

This action plan approach enables vegetable growing to occur on highly productive soils, while aligning with community, environmental, iwi and hapu values.

The figure below shows the Arawhata catchment, and historic swamp lands.



CASE STUDY FOUR: Pukekohe food hub

Background

The Pukekohe Hub, a 4,359-hectare area with a unique temperate and generally frost-free climate and some of New Zealand's most fertile and productive soils, is a key growing area for New Zealand. Within the hub, vegetable growing is an inter-generational family business with strong community ties. The main crops are fresh vegetables including potatoes, carrots, leafy greens, brassicas, tomatoes and onions.

The Pukekohe supplies year-round vegetables to Auckland, as well as almost entirely meeting the domestic supply for carrots, potatoes and leafy greens in October, November and the early part of December. Pukehoke is one of the growing areas with the right conditions to enable winter production of certain vegetables such as leafy greens and brassicas.

Economic value of the Pukekohe Hub

Deloitte's 2018 report on the Pukekohe Hub estimated the regional economic contribution of horticulture industry within the hub to be $261 million per annum. The same report estimated that the population of Auckland is expected to be 37% higher in 2043 compared to 2018, which means by 2043 demand for fruit and vegetables in Auckland will be 33% higher.

Economic modelling by Deloitte estimated that constraints on production growth within the Pukekohe Hub could result in:

- Economic impacts of between $85million to $1.1 billion,
- Loss of between 3,500 – 4,500 jobs
- Loss of between 46-55% in output volume
- Prices 43% - 58% higher

The scenario modelled in the Deloitte report is the same as is proposed by the NES FW. Modelling undertaken for HortNZ by Sturt Ford has found that if vegetable growing had to meet the criteria in the proposed Discretionary rule, the price of vegetable would have to increase by between 16% and 50 in order for the grower to maintain their gross margin. He concludes growers would not expand under these conditions, and therefore the Deloitte Scenario of increased vegetable prices of between 43% - 58% higher by 2043 could be the outcome.

Tension between food production and water quality

There is a key tension between the need to protect food production, a key value articulated in the proposed National Policy Statement for Highly Productive Land (NPSHPL) and water quality and outcomes proposed in the draft NPSFM.

The Whangamarie and Waitangi streams have been identified in the Discussion document. These catchment's have poor water quality. In each of these catchment horticulture makes up less than 15% of the land area. Like most catchment in New Zealand the dominant land use is pastoral, these catchments have the added pressure of urban development, but undoubtedly commercial vegetable growing contributes to the freshwater quality pressures.

Our rule framework provides existing vegetable growing as permitted, and provides a controlled pathway for expansion in subcatchments where the CVP area doesn't already exceed 20%. In Pukekohe there are couple of catchments above this threshold (Mauku and Whakapipi), the remaining catchments are between 10 and 20% CVP. There is little point protecting the highly productive land in Pukekohe if it cannot be used for vegetable growing. Our provision provides for some expansion in this area.

There is a need to simultaneously recognise the value of freshwater and the value of vegetable growing for supporting the health of New Zealanders. It is important that land with the highest productive capacity is able to be utilised, in order to meet domestic food supply. In making decisions about water resources, the economic, social and cultural contribution of food production, the values associated with those contributions and the potential long-term outcomes for New Zealanders are considered.

Subpart 3 - Freshwater module of farm plans

HortNZ submits that all growers (>5ha) have an independently audited Freshwater Farm Plan by 2025, we will submit that auditing rather than certification is sufficient.

The provisions would require all vegetables growers to have a Freshwater Farm Plan by 2022, all land uses within Schedule 1 catchments by 2022 and all other land uses by 2025. We support prioritising the Freshwater Farm Plans in the Schedule 1 catchments. The 2022 deadline for all vegetable growers is unachievable and unwarranted.

This work, to have all vegetable growers with high quality independently audited FW-FPs, is under way with the Vegetable NZ roll out of the NZGAP EMS to their growers, and the Potatoes NZ nutrient taskforce.

We have asked Stuart Ford to review the economic analysis included within the discussion document.[40] This was from a survey of 28 Hawkes Bay growers in 2016 [41]. The average nitrogen leaching from the study for vegetables was 16kg/ha/yr. The review concludes that, 'while the information used is correct the manner in which it has been used is in our view incorrect and it is misleading in its conclusions'. For example:

- If a third of the area utilised is in affect leased that would reduce the annual average EBIT from the $8,832 to $7,999 based on the facts used to determine the average EBIT result.
- It is a pointless exercise to express a change in expenditure compared with the Gross Revenue of an operation and to try and portray it as an affordable item because it is a relatively small value when compared to the total Gross Revenue.

The true impact of a change in expenditure should be measured against the true profit which is best described as that sum available to the owners of the business after all costs have been deducted. In the example given there would no doubt be considerable debt to service, repayment of capital and then tax to be paid on the remainder to come off the EBIT result that was used in the example. If the comparison were to be made against this figure then it would have a far greater impact than that portrayed in the report.

5 ha threshold

HortNZ supports the 5ha threshold for Freshwater Farm Plans (FW-FP).

Most commercial vegetable growing operations exceed this size. There are many existing orchards that are smaller than 5ha; although most new orchards would exceed this size.

The kiwifruit industry is showing environmental leadership by promoting the audited FW-FP for all kiwifruit growers regardless of orchard size.

We support NZKGI's position, however HortNZ has discussed the threshold with the wider horticulture sector, and we are of the view that a realistic target for the horticulture sector is a >5h threshold. With this threshold we are confident we can meet the 2022 deadline for Schedule 1 catchments, and the 2025 deadline for the remaining locations. As a sector overall, we are not confident we can achieve FW-FPs by all the small growers by 2025.

All growers that export or sell crops through supermarkets have GAP farm plans. We are committed to rolling out the horticulture freshwater farm plans to these growers through the

[40] (Ford S. , Memorandum to HortNZ NESFW, 2019)
[41] (Ford s. , 2016)

GAP schemes, however we propose that auditing of the FW-FP module of GAP farms plans is voluntary for growers smaller than 5ha.

Content of FW-FP

We recommend that the following are also considered for required content of a FW-FP:

- reference to every relevant resource consent, along with the date it was granted and the date (if any) on which it expires;
- the location of source protection zones for human drinking water;
- The risk assessment part of the FW-FP must identify and assess the risk of contaminant losses from the farm, with consequent impacts on freshwater ecosystem health, associated with any of the following activities carried out on the farm; and
- Existing or previous land use that may be hazardous.

Certified Freshwater Farm Plans

The provisions require all Freshwater Farm Plans to be certified by an appropriately qualified adviser. The horticulture sector does not have a system for certification for horticulture farm plans, but instead tests the robustness and quality of farm plans via third party audits. HortNZ has participated in conversations led by Waikato Regional Council on the development of a certification programme. However, we have been disappointed by the focus of this certification programme on pastoral farming, including requiring Overseer modelling training and qualifications as a prerequisite. In our view this process was of replicating the issues the horticulture sector has had with the implementation of the NPSFM, which has focused on pastoral farming, and created rules that do not work for horticulture.

We see the certification programme as potentially being useful for the pastoral sector, because they (with the exception of Synlait) do not have robust auditing processes and assurance framework.

The horticulture sector is not opposed to certification, and we see a role for professionals supporting growers to develop Farm Plans. However, we don't believe certification should be mandatory.

By 2025 our sector can deliver independently audited FW-FPs. We are much less certain that we can deliver certified FW-FPs by this deadline. We are not convinced that the investment required to develop sufficient certified people would be worthwhile. In our view, effort would be better spent developing the capacity of growers to develop their own FW-FPs, and holding growers to account via independent audit.

Audit of compliance with FW-FP

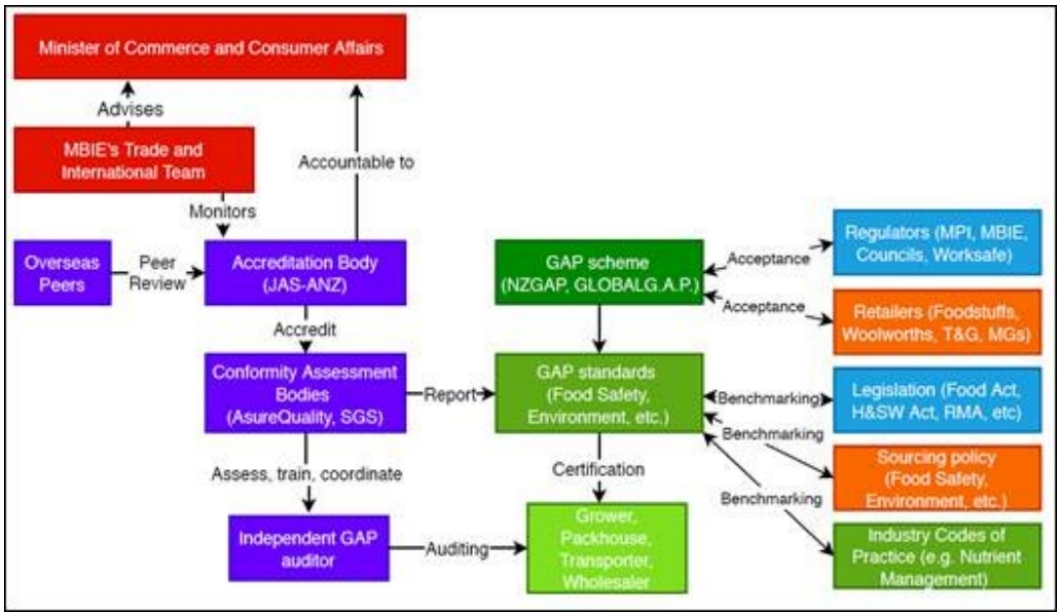
We propose that the existing GAP programmes are used to deliver the Freshwater Farm Plans.

The Horticulture sector already has a process and assurance framework for developing independently audited farm plans. This is the Good Agricultural Practice (GAP) system primarily used for food safety compliance with both market and regulatory requirements. The NZGAP Environment Management System (EMS) add-on has already been accepted by Environment Canterbury as a pathway for growers to demonstrate compliance with requirements for an independently audited Farm Environment Plan (FEP). The horticulture sector will invest further in this system to deliver independently audited Freshwater Farm Plans in all regions.

A comprehensive overview of the GAP assurance framework, and how GAP schemes deliver on environmental outcomes is provided in "HortNZ 4 – Damien Farrelly Evidence" submitter evidence for the proposed Waikato Regional PC 1.[42]

GAP standards in NZ horticulture are benchmarked to internationally recognised standards and all certified growers are audited by Independent Verification Agencies (IVA – also known as Certification Bodies) who are accredited by the Joint Accreditation System of Australia and New Zealand (JAS-ANZ). Growers must meet all relevant requirements in the GAP standard to attain certification, and they must continuously meet requirements of GAP standards, and make progress on industry objectives to maintain certification (Figure 1). GAP standards have recently been further developed to incorporate FEP requirements (e.g. NZGAP EMS add-on). Environment Canterbury has developed rules and an audit manual for council auditors, but has also recognised industry developed schemes with a credible governance, rules, assurance framework, auditors and audit processes. Currently, the only approved schemes in Canterbury are NZGAP and Synlait Lead with Pride.

Figure 1: New Zealand Conformance Infrastructure for GAP certification



An auditor should not help growers to develop their plans. In our view they need to be independent to be credible. The first audit will be focused on reviewing the content and implementation of the FEP, and will highlight where further improvements are required. The audit will also review the risk assessments undertaken by the grower (compared with the process in the codes and practice), and assess whether the proposed actions and timeframes support effective risk management.

Subsequent audits will assess the degree to actions have been implemented, and will account for any changes made to the Farm Plan. The auditor would again assess the degree to which the Farm Plan achieves effective risk management.

It is important that growers have ownership of the development and implementation of their own farm plans, rather than requiring the certified farm plan approach. The independently audited Freshwater Farm Plan process we propose provides growers with ownership of their farm plans and is likely to achieve better engagement, adoption, and positive environmental

[42] https://www.waikatoregion.govt.nz/council/policy-and-plans/plans-under-development/healthy-rivers-plan-for-change/the-hearings/submitter-evidence/

outcomes as the Freshwater Farm Plan becomes part of business planning and operations. Audited FW-FPs also provide councils and the public with confidence that growers are making progress on environmental objectives by adopting Good Management Practices and Best Management Practices consistent with accepted codes of practice.

The table below compares the NESFW proposal and the HortNZ recommendations

Growers

Govt's proposal	HortNZ proposal
All >5ha need certified and audited by 2025	All >5ha need ~~certified and~~ audited FEP by 2025
All <5ha are exempt	All <5ha develop FEP based on Agreed National Good Farm Practice Principles by 2025 (rather than NES requirements), but exempt from audit (audit is optional)
In identified high nitrogen or soil erosion catchments, additional nitrogen mitigations and an FEP by 2022	All need audited FEP with additional risk-based assessment (e.g. BMPs) by 2022

Vegetable Growers

Govt's proposal	HortNZ proposal
All need certified and audited FEP by 2022	All need ~~certified and~~ audited FEP by 2025
In identified high nitrogen or soil erosion catchments, additional nitrogen mitigations and an FEP by 2022	All need audited FEP with additional risk-based assessment (e.g. BMPs) by 2022

Content of FEP

Govt's proposal	HortNZ proposal
Farm details (name, location etc.)	Farm details (name, location etc.)
Farm map (features, risk areas, waterways etc.)	Farm map (features, risk areas, waterways etc.)
Risk assessment of contaminant loss from the farm	Risk assessment of contaminant loss from the farm
Identified actions and timeframes to address identified risks	Identified actions and timeframes to address identified risks (e.g. GMPs in Industry Guidelines and Codes of Practice)
Identified further actions and timeframes (according to rules or BMP) if in schedule 1 catchments	Identified further actions and timeframes (according to rules or BMP) if in schedule 1 catchments (e.g. BMPs in Industry Guidelines and Codes of Practice)

Certification of FEP

Govt's proposal	HortNZ proposal
FEPs only certified by approved FEP planner	No requirement for approved FEP planner. FEP audit instead

Audit of FEP

Govt's proposal	HortNZ proposal
FEPs only audited by approved FEP auditor	Approval of existing GAP auditors
Audit must be completed within 2 years of first certification	Audit completed by relevant deadline (2022 or 2025)
Audit report outcomes to Council	Nationally consistent reporting system via industry bodies

Subpart 4 - Nitrogen cap

The proposed NES identifies high nitrogen catchments. The proposal considers a range of options to reduce nitrogen discharges in these catchments. The first option is for pastoral farmers and requires Overseer modelling. There are two options that could apply to growers, these are a fertiliser cap or extra actions within Farm Environment Plans.

Schedule 1 Catchments

There are a number of growers within the Schedule 1 catchments. Horticulture is a very minor activity in all of the catchments. HortNZ data indicates:

- 280 growers in total
    - 132 in NZGAP
- 98 in GLOBALG.A.P.
    - 7 with apples
    - 56 with Avocados
    - 41 with Kiwifruit
- 37 vegetable growers in NZGAP
- 32 >5ha vegetable growers in NZGAP
- 1605 ha of vegetables in total in NZGAP

There are four possible additional catchments identified within the discussion document.

- Mangaone - Commercial vegetable production makes up approximately 2% of this catchment. DIN levels are elevated. *E. Coli* is in E band, which indicates pastoral activities that dominant the landscape, likely dominate the nitrate load.
- Waitohu - Commercial vegetable production makes up approximately 1% of this catchment. DIN levels are elevated. *E. Coli* is in D band, which indicates pastoral and urban activities likely dominate the nitrate load.
- Waitangi – Commercial vegetable production makes up 12% of land area. This stream is spring fed and its surface water catchment is probably not the only contributor to its water quality. DIN is elevated. *E. Coli* is in D band, which indicates pastoral and urban activities, likely contribute significantly to nitrate load.
- Whangamarie - Commercial vegetable production make up approximately 15% of the catchment (but 40% at the gauging site) This stream is spring fed and its surface water catchment is probably not that only contributor to its water quality. DIN is very elevated. *E. Coli* is in E band, which indicates pastoral and urban activities, likely contribute significantly to the nitrate load.

Fruit Growing

A small amount of fruit growing occurs in some Schedule 1 catchments. The water quality issues experienced in these catchments is not likely to be attributed to by fruit growing. If farmers in these catchments were able to convert some their land in these catchments to fruit growing, it would likely result in water quality improvements. We do not think it would be effective for additional mitigations to be required for fruit growers within Schedule 1 catchments

Vegetable Growing

A number of catchments that are important for vegetable growing have water quality that is below proposed national bottom lines. In some of these catchments, vegetable growing

occurs but is in an extensive rotation and a minor land use. However, some small stream catchments within the mild west coast growing hubs, which depend on rain and upon which New Zealanders depend for winter vegetables, are included.

Growers are concerned that in catchments where water quality is targeted for improvement, they may be unable to continue to grow vegetables if the regulations do not take into account the impact of potential farm scale nutrient limits on vegetable yields (Ford, 2014).

Some of these catchments are important for vegetables growing – for example Hauraki-Piako and the Pukekohe catchments. The catchments to the south of Levin, may become increasingly important for vegetable growing, if growers are required to reduce the intensity of growing around lakes Horowhenua and Papaitonga. Vegetable growing is likely to need to expand in some of these catchments in the next 10 years to feed New Zealand.

Over the coming 10 years, we need to see sufficient reductions made in catchments that are over-allocated due to pastoral uses, so that some re-distribution of the grand-parented load can occur. However, in some sub-catchments where there is relatively large proportion of vegetable growing (over 20%), and particularly where urban discharges contribute, the reductions from other pastoral land uses may not be sufficient to provide for an increase in vegetable growing. In these catchments, we suggest no increase in vegetable growing without offsetting across all contaminants.

Some redistribution of the grand-parented load is vital to enable New Zealanders to meet their essential human health needs, and to meet their social, economic and cultural wellbeing, while still making progress of achieving outcomes that provide for freshwater values, within acceptable timeframes.

Overseer 75th Percentile

We support the proposals to exclude horticulture from options reliant on Overseer, because Overseer is not a reliable tool for guiding on-farm decisions for horticultural growers.[43]

The percentile approach is unworkable for vegetable growers. It doesn't recognise the different crops have different leaching risks, but they also provide different nutrients and health depends on the supply of micro-nutrients that are supplied form a range of vegetables. The average annual nature assessment, does not recognise that vegetables need to grow them all year to meet domestic supply. In winter, the risks of leaching are greater, but the health of New Zealander depends on eating vegetables daily, winter growing is an integral part of our food system, some parts of New Zealand are more important for winter growing than other areas because of the combination of highly productive land, water, climate and other infrastructure.

A percentile approach where the leaching rates of vegetable growers is compared with pastoral farms is unworkable This is the approach used in the Horizons One Plan, which has adopted a pastoral "natural capital" approach. This approach has left vegetables unable to be consented, even though the nitrogen load from vegetable growing is much less than the load associated with pastoral farming and the productivity of vegetable growing on kg of food/ per kg of nitrogen is much more productive.

If a percentile approach was applied to vegetable growing without comparison to pastoral farms, it would target leafy greens grown for winter supply, because these crops due to

[43] (Parliamentary Commissioner for the Environment , 2018)https://www.pce.parliament.nz/media/196493/overseer-and-regulatory-oversight-final-report-web.pdf

rainfall and their shorter root mass have the greatest risk of leaching – they are also very important for supporting New Zealanders health.

Fertiliser Cap

We do not support the fertiliser cap option. This option is unworkable and inefficient. Different crops and crop rotations have different fertiliser demands. Reducing fertiliser in a manner an inconsistent with GMP would reduce yield. Reduced yield would reduce vegetables availability and increase the price of vegetables.

Requirements of crops differ and the amount of fertiliser required depends on the crop and the soil nitrogen at the time of planting. The soil nitrogen is related to the nitrogen left behind by the proceeding crop, and is attributed to both crop residue and the fertiliser applied which was not taken-up by the proceeding crop.

Below are three examples of the theoretical nitrogen requirements of different vegetable crops[44]. Of the three examples below, potatoes have the greatest required fertiliser (greater than 200kg/ha/yr), and are predicted to remove the greatest amount of nitrogen and therefore would theoretically have the lowest leaching risk.

- To yield 10 t/ha of onions, and assuming soil available nitrogen was 20kg/ha at the time of planting, then 140kg/ha of nitrogen fertilizer is recommended, if the removed yield was 8t/ha dry, then 120kg/ha would be removed with the crop, leaving 20kg/ha in the soil.
- To yield 87t/ha of russet burbank potatoes, and assuming soil mineral nitrogen to 60cm of 50 kg/ha at the time of planting, 225 kg/ha of nitrogen fertiliser is recommended, and 237 t/ha of nitrogen could be expected to be removed with the tubers, leaving no additional nitrogen in the soil
- To yield 40t/ha of butternut squash (water stressed), and assuming available nitrogen of 60 kg/ha in the soil, the recommended nitrogen fertiliser to grow the crop is 150kg/ha, and if only the marketable yield of 28t/ha was removed, 103 t/ha of nitrogen would be expected to be removed with the crop, leaving approximately 50kg/ha in the soil.

The values provided above are theoretical nitrogen requirements, plants uptake nitrogen and water as the grow, with the rate of growth is dependent on nutrients, temperature and light.

Leaching can occur due to rain or excessive irrigation, causing nitrogen to be washed into the deeper soils, which might be beyond the roots of shallow rooted crops such as onions. In heavy rain or in free-draining soils nitrogen may be washed into the groundwater before it can be taken up by the plants.

Excess leaching can also occur if conditions are too dry to enable the crop to grow and take up the fertiliser, creating a risk if subsequent rain occurs. For this reason, reliable irrigation is an important tool in managing leaching risk.

If nitrogen is lost to leaching before it can be taken up by the plant, the nutrients need to be replaced in order for the crop yield to be achieved, and therefore for outdoor growing the amount of fertiliser used is always likely to be somewhat more than theoretically required.

The risk of leaching nitrogen is minimized by fertilizing at the time of planting and during the growth phase through side-dressing. Other methods such as fertigation, where fertiliser is

[44] (Reid & Morton, 2019) https://zenodo.org/record/2401910#.Xbg2HZozbIU

applied with water several times during crop growth, or controlled-release fertilisers products that slowly release fertilizer are also good methods of reducing the risk of leaching.

In our view good management practices that support growers to match the nitrogen inputs to exceed the reasonable nitrogen requirements of the crops being grown, provides better direction for managing the water quality risks associated with growing crops compared with setting a maximum nitrogen limit.

N Surplus

An N surplus can be calculated in Overseer. Overseer is not a useful on farm decision support tool for growers, so few growers have developed models in Overseer. In his Waikato PC1 Evidence, Stuart Ford[45] illustrates that vegetable growers have efficient growing systems using the N surplus, as illustrated in the table below, reproduced from Stuart Ford's evidence. Using N surplus, would be favourable for vegetable growers, but we do not think it is as useful as an independently audited Farm Freshwater Plan process.

Farm Type	N leaching Kg / ha	N Surplus Kg / ha	N conversion efficiency %
CVP	81	31	76
Dairy	41	187	34

Without using an Overseer model, N Surplus can be calculated for individual crops. However, crops are grown in rotations. To understand the true N Surplus of the cropping system over a year, the N surplus of the sequence of crops would need to be calculated. This is a much more complex process. In his Waikato PC 1 evidence Chris Keenan[46] designs a possible method, however the complexity is such that it is similar to developing an Overseer model.

In addition, there is not a way of calculating N surplus for many crops. The recently published report, Nutrient Management for Vegetable Crops[47] has 15 crops, Overseer includes the same crops and an additional 4 crops. However, there are scores of crops grown in NZ that are not included. For example, of the vegetables listed in the HortNZ 2019 Levy Order, over 40 of these are not included in either the Nutrient Management for Crops in New Zealand or Overseer. Furthermore, the nutrient requirements of different varieties of the same vegetable vary. The Nutrient Management for Crops in New Zealand Manual includes 3 varieties of potatoes. However, there are more than 30 potato varieties that are grown in New Zealand, 12 of which are commonly grown.

FW-FP Option

For horticulture, we support addressing nitrogen losses within audited Farm Environment Plans.

[45] (Ford S. , Block 3, Waikato Plan Change 1 Hearing, 2019) https://www.waikatoregion.govt.nz/assets/WRC/Council/Policy-and-Plans/HR/Block3/HortNZ-5.pdf
[46] (Keenan, 2019) https://www.waikatoregion.govt.nz/assets/WRC/Council/Policy-and-Plans/HR/Block3/HortNZ-2.pdf
[47] (Reid & Morton, 2019) https://zenodo.org/record/2401910#.Xbg2HZozbIU

The HortNZ code of practice for nutrient management[48] sets out good management practices and best management practices to reduce the risk of leaching form vegetable growing. Some of crops have specific codes of practice, for example Code for practice for Glasshouse discharges.

All crops will require suitable codes of practice to support the development of the FW-FP, this will be required by 2022 to enable those growers within the Schedule 1 catchments to meet the deadline.

The NZGAP EMS provides a framework for assessing risks and prioritising actions. Other product groups will need to develop similar modules for their GAP programmes.

We propose that for CVP expansion and for horticulture within Schedule 1 catchments, that growers operate at risk based Best Management Practice (BMP).

Operating at BMP, means that the risks from the orchard or farm are considered and the risk for the catchment are considered. All of the Industry Code of Practice GMPs and BMPs are assessed and decisions on whether to implement each GMP or BMP is justified, and a risk-based action plan is developed.

In **Appendix C** an example Farm Environment Plan is developed; this illustrates a grower operating at BMP. All the GMP and BMP actions have been considered, and the appropriate GMPs and BMPs to manage risks on the specific farm have been identified.

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[48] (http://hortnz.co.nz/our-work/natural-resources/code-of-practice-for-nutrient-management/ Z code of practice).

3. Resource Management (Measurement and Reporting Water Takes) – Water Quality – real-time reporting of water use

The Government is proposing to amend the Resource Management (Measurement and Reporting Water Take) Regulations 2010 to mandate telemetry (direct electronic transmission). This requires measuring water use every 15 minutes and transmitting daily electronic records for takes using more than 5 litres per second. The requirement would be rolled out over time, starting with consents of 20 litres per second or more two years after the regulations come into force, through to six years for smaller consents.

HortNZ support real time reporting of water use in principle and consider there would be merit in reviewing the regulations. However, we do consider that there will be some limited circumstances that should be allowed as exceptions that should be provided for in any revision of the regulations.

In rural areas where there is limited, or no cell phone coverage/internet access, growers will not be able to use telemetry. Has consideration been given to exemption for these growers in these circumstances? Will the government look to upgrade telecommunication and internet systems in rural environments to support this proposal?

It is proposed that larger water take consent holders will require to have telemetry within two years of the commencement date and all other consent holders within six years. There is no analysis as to why these timeframes have been proposed and the industry would like to see a shorter implementation period to support quality water data being available.

4. NES for Commercial Vegetable Growing

Vegetables are grown predominately for domestic supply. Different rules in regional plans, impact on the competitiveness of the sector, and risk moving effects from one location to another, while also undermining the resilience and reliability and affordability of vegetables for New Zealanders, which are an essential human health need.

The footprint of vegetable growing is very small, and its effects are localised. We support all vegetable growers operating at audited Good Management Practice (GMP) or Best Management Practice (BMP) based on risk.

We are seeking nationally consistent a planning framework for commercial vegetables that would take precedence over all the existing rules regulating commercial vegetable growing in NZ.

A national planning approach is justified because:

- National food systems
- Healthy Food is essential for New Zealanders human health
- Failure of Regional Councils to provide for commercial vegetable growing
- A nationally consistent approach to regulation for commercial vegetable growing will improve investment decisions

The broad principals would be:

- Recognition that export and domestic vegetable growing is integrated across NZ's regions and consistent regulation is required
- Production is located on Highly Productive Land
- Crop rotation supported within Highly Productive Land
- Support existing vegetable growing with the ability for expansion within environmental constraints
- Risk based approach to good management practices aligned with GAP
- Farm Environment Plans which are nationally consistent and independently audited
- Consented activities to provide security and consistently assess risks
- Consents are granted to operator(s) not landowner's and the consented area is linked to Highly Productive Land within an FMU
- Enterprise consents supported
- Distributed across New Zealand to provide for resilience and seasonal food provision
- In sensitive catchments where audited GMP is insufficient to meet limits, an Action Plan approach to ensure the resilience of the food system is not threatened, by limits that drive land use change.

The standards for a national planning structure could include:

- Access to resources
- Facilities management
- Land management

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Appendix A: HortNZ Decisions Sought on the Proposed NESFM

Note: amendments sought to the notified text are shown in tracked changes, with additions shown in underline and deletions shown in ~~strikethrough~~, or to similar effect.

(1) The specific provisions that HortNZ's submission related to are:	(2) HortNZ's submission is that:		(3) HortNZ seeks the following decisions from MfE
Draft NES provision	**Support/Oppose**	**Reason**	**Decision Sought**
PART 2 – Wetlands, rivers and fish passage			
Subpart 1 - Wetlands			
constructed wetland	Support in part	The definition needs to be clear and concise. We also believe that this definition must reflect all the purposes for which the Act describes artificial watercourses (refer definition of River).	Amend as follows: ***Constructed wetland*** *means a wetland constructed by artificial means that:* *a) supports a natural ecosystem of plants that are ~~suited~~ adapted to wet conditions; and* *b) is constructed for a specific purpose in a place where a natural wetland does not already exist: Such purposes include:* *Areas of wetland habitat in or around bodies of water created for, or in connection with, any of the following:* • *nutrient attenuation;* • *effluent treatment and disposal systems;* • *stormwater management;* • *reservoir for firefighting;* • *hydroelectric power generation;* • *irrigation;* • *stock watering;* • *domestic and community water supply;* • *water storage ponds;* • *water supply canal* • *farm drainage canal* • *landscaping;*

			• *other artificial water storage facilities, ~~including~~ open drainage channels and engineered soil conservation structures, including sediment ponds;* • *conservation or biodiversity offsetting;* • *riparian planting* • *hunting*
natural wetland		The definition as proposed causes confusion and is inconsistent with the RMA.	Amend as follows: ***Natural wetland*** *means a wetland as defined in the Act ~~(regardless of whether it is dominated by indigenous or exotic vegetation),~~ except that it does not include:* *a) wet pasture, gully heads or paddocks where water temporarily ponds after rain in places dominated by pasture, or that contain patches of exotic sedge or rush species; or* *b) constructed wetlands; or* *c) geothermal wetlands*
Nationally significant infrastructure	Oppose in part	Not all major gas or oil pipeline services will be nationally significant. The definition needs to be clear and concise. The term 'such as' causes confusion and will be a source of contention in the future.	Amend as follows: **Nationally significant infrastructure** means all or any of the following … (d) major gas or oil pipeline services (~~such as~~ the pipeline from Marsden Point to Wiri, and high pressure gas transmission pipelines from Taranaki) …

Public flood control or drainage	Support in part	This definition causes confusion. The National Planning Standard has a definition for drain: *means any artificial watercourse, designed, constructed or used for the drainage of surface or subsurface water but excludes artificial water courses used for the conveyance of water for electricity generation, irrigation or water supply purposes.* The proposed definition could be broadened to refer to all drains. One option is to refer to the definition of drain in the Land Drainage Act: ***Drain** includes every passage, natural watercourse, or channel on or under ground through which water flows continuously or otherwise, except a navigable river, but does not include a water race as defined in section 58 hereof.* **Drainage works** *means drainage works of any sort, including the making of drains for receiving water in its natural flow on or from any hills or other sloping lands, and diverting the same to prevent its overflow on to any other lands on a lower level, as well as drains for carrying off water from any lands.* Given that the Government has already regulated these definitions, they should use them in other regulations that use the terms.	Amend as follows: **public flood control or drainage <u>works</u>** means work carried out: a) for flood control or flood protection purposes, by or on behalf of a local authority, including works carried out for the purposes set out in section 133 of the Soil Conservation and Rivers Control Act 1941; or b) for the purpose of drainage works. ~~by drainage districts, under the Land Drainage Act 1908~~, <u>Insert new definition as follows:</u> **Drainage works** has the same meaning as in the Land Drainage Act 1908 - *meaning drainage works of any sort, including the making of drains for receiving water in its natural flow on or from any hills or other sloping lands, and diverting the same to prevent its overflow on to any other lands on a lower level, as well as drains for carrying off water from any lands.*

		The earthwork disturbance provisions refers to 'earthwork disturbance for drainage' so it would be important that all drains are included in the public flood control or drainage. It would be better to specify wording rather than refer to another Act and not limit the definition to work by drainage districts.	
Earth disturbance	Support in part	Provides clarification. In local planning processes, HortNZ seeks to exclude cultivation from definition of 'earthworks', as earthworks rules are usually targeting bulk cut and fill for development, which is quite different to cultivation. However, 'earth disturbance' appears to be more refined and when reading the proposed rules, earth disturbance relates to restricting activities within a proposed setback from wetlands. However, it is important to retain flexibility in the rules to enable Good Management Practices such as a sediment control pond. The sediment control pond does require clearing from time to time. These practices can improve wetland health and should be encouraged. Please refer to HortNZ's Erosion and Sediment Control Guidelines (http://www.hortnz.co.nz/assets/Natural-Resources-Documents/ES-Control-Guidelines-1-1.pdf)	Amend as follows: ***Earth disturbance*** means … b) not including disturbance in the course of: i. planting indigenous plants for restoration or other environmental purposes; or …

		Therefore, HortNZ seeks a minor alteration to the definition to ensure that environmentally focused good management practices are encouraged and are not unintentionally caught by a consenting requirement.	
Earth disturbance for drainage	Support in part	We support this being limited to making new drainage ditches, or if necessary, amending to reflect meaningful deepening. Generally clearing or maintaining existing drainage ditches cannot be carried out with sufficient precisions to know that sediment being removed is not going beyond the previous base. This is likely to be unenforceable and make rules uncertain, and unclear.	Amend as follows: **Earth disturbance for drainage** means earth disturbance that involves making new drainage ditches or <u>substantially</u> deepening existing drainage ditches.
10. General earth disturbance – discretionary activity **11. General earth disturbance – non-complying activity**	Oppose in part	These provisions need to ensure greater ability for regional variation through appropriate planning processes. This may simply involve sufficient clarification on what is considered to be, or not to be, earth disturbance. For example; a sediment control pond does require clearing from time to time. These practices can improve wetland health and should be encouraged. Also farm tracks could also be caught by this rule, which we believe would be unintentional.	There should be provision for sufficient exemptions from the definition to address these issues and to ensure sufficient regional variation can occur. Not all earth disturbance can be appropriately managed through broad-brush national rules.
12. Earth disturbance for drainage – discretionary **13. Earth disturbance for drainage – non-complying**	Oppose in part	We have significant concerns with the arbitrary 100m setback from wetlands, in which any earth disturbance for drainage is prohibited unless it meets thresholds	There is a need for appropriate regional variation. A national, arbitrary 100m setback will not be necessary in all situations. These

14. Earth disturbance for drainage - prohibited		for discretionary or non-complying activities. There is a need for appropriate regional rules in this area. For instance, drainage activities below a sloped wetland may have no measurable impact yet will be caught by this rule. It is more appropriate for such determinations to be made at a regional or local scale. Many highly productive farmland areas, and urban areas, are on old peat wetlands. Experience and good practice are required to appropriately maintain the water table – too much drainage can cause subsidence, can destroy pasture. Good farm management in these areas requires that existing drains be maintained. New drains must also be made if/when water moves in the landscape. Water is not static; as an example, a seepage can move with time across a paddock, sometimes quite quickly and without obvious reason. Drainage will then need to be moved or added to address it. Drain maintenance is essential in many areas and should not be locked into a specific point in time. The proposed buffer distance of 100m between wetlands and drains may be appropriate in some landscapes, such as alluvial plains, but in other areas it will simply be arbitrary, excessive and unnecessary.	discussions are best placed to occur at local planning levels.

		Drainage may well be able to safely occur within 100m and not affect the hydrological function of wetlands. There is also potential confusion between this provision and the provisions for general earthworks disturbance, which has proposed controls within 10m of wetlands. Discretionary status is only provided for purposes of wetland restoration (and this comes with significant additional and costly technical requirements); or for public flood control or drainage; or related to operating nationally significant infrastructure. It is non-complying or prohibited if it goes beyond this. There is a considerable lack of clarity as to the difference between Clauses 13 and 14.	
16. Water take activities – discretionary activity	Oppose in part	There are considerable practical difficulties with meeting the requirements of these provisions given the very restrictive technical requirements imposed. Water take activities can only be discretionary if for purpose of education or recreation where change in water level is temporary, or for operational needs of a hydro scheme; or if it for restoration purposes and considerable conditions are met; or for public flood control or drainage or for nationally significant infrastructure purposes. Otherwise it is non-complying.	There is a need for appropriate regional variation. These technical requirements may well be appropriate, but these are best determined at a local scale.

Subpart 2 – River Bed infilling			
18. Infilling bed of river *Discretionary activity*	Support in part	The rule should include public land drainage to reflect the relationship between private and public drainage, on private land.	Amend as follows: **18. Infilling bed of river** *Discretionary activity* (1) The infilling of the bed of a river is a discretionary activity if it is part of an activity: … a) required for the purposes of flood prevention, <u>public land drainage</u> or erosion control; or …
Subpart 3 – Fish Passage			
21. Culverts *Discretionary activity* i.	Support in part	The matters for consideration should include flood prevention and/or public land drainage.	Amend as follows: **21. Culverts** *Discretionary activity* … (3) Any resource consent granted for the discretionary activity must be subject to the following conditions: … b) <u>Whether it is required for the purposes of flood prevention and / or public land drainage</u>
22. Weirs *Discretionary activity*	Support in part	The matters for consideration should include flood prevention and/or public land drainage.	Amend as follows: **22. Weirs** *Discretionary activity* …. c) <u>Whether it is required for the purposes of flood prevention and / or public land drainage</u>

	Support in part	The matters for consideration should include flood prevention and/or public land drainage.	Amend as follows: **23. Passive flap gates** … (2) Any resource consent granted for the non-complying activity must be subject to the following conditions: … c) Whether it is required for the purposes of flood prevention or public land drainage …
PART 3 – Farming			
arable farming	Support	Provides clarification	Retain as notified.
commercial vegetable production	Support in part	Glasshouse / Greenhouse vegetable growing has different environmental effects to outdoor vegetable growing and therefore should be managed differently. Land is periodically retired from growing vegetables to avoid soil borne diseases. This should be reflected in the definition to acknowledge the practice.	Amend as follows: **commercial vegetable production** means the outdoor commercial production ~~on a horticultural farm~~ of vegetable crops for human consumption, including low intensity vegetable crops~~.~~, and includes the periodic retirement of land as part of the crop rotation process.
Enterprise	Support in part.	We support the concept of an enterprise as this is needed to ensure that land leased or owned is captured within the definition of farm, horticultural farming, and commercial vegetable production. However, as proposed, it is not explicit that leased land is part of an enterprise. Leasing land is common practice in commercial vegetable production and it is therefore important that this is explicit in the definition.	Amend as follows: Enterprise means one or more parcels of land held in single or multiple ownership, including leased land (whether or not held in common ownership) ~~to support the principle land use, or land on which the principle land use is reliant,~~ which constitutes a single operating unit for the purpose of management.
pastoral farming	Support	Provides clarification	Retain as notified.

New definition: ***Low Impact Horticulture***	Support	Low impact horticulture has lower environmental impacts than other farming activities.	Insert new definition as follows: **Low impact horticulture** means where the predominant activity is growing any of the following crops: a) Fruit, berries, currants or grapes; b) Asparagus; c) Sweetcorn; d) Legumes; e) Indoor/Greenhouse vegetable production and/or Indoor/Greenhouse fruit production.
New definition: ***Highly Productive Land***	Support	This definition would be required to provide clarification for amendments sought by HortNZ to Clause 36.	Insert new definition as follows: **Highly productive land** has the same meaning as set out in the National Policy Statement for Highly Productive Land.
New Definition: ***Productive Capacity of Highly Productive Land***	Support	This definition would be required to provide clarification for amendments sought by HortNZ to Clause 36.	Insert new definition as follows: **Productive Capacity of Highly Productive Land** has the same meaning as set out in the National Policy Statement for Highly Productive Land.
26. Application of Part 3	Support in part	It is appropriate that small scale operations are excluded.	Retain as notified.
Subpart 2 - Intensification			
31. Geographic application of subpart 2.	Support in part	The geographic application as proposed in this clause is clear. However, we question if any regional council would be in a position to meet the requirements of clause 2a).	Consider the practical implications of this clause. If it can not be achieved, then the clause is pointless as it will not achieve the outcomes desired.
32. Duration of consents	Support in part	We question if it will be possible for regional councils to meet the deadline of	Amend as follows:

		2030 as proposed. It is unfair to burden consent applicants with a 12 month consent due to a council failing. This is an inefficient and ineffective mechanism. It would result in costly consent processes that will not be worth the effort, resulting in cessation of land use activities. A fairer and more realistic time frame would be 5 years (at a minimum). In addition, an alternative mechanism for achieving compliance should be considered; such as government assistance and guidance for those council's that are under resourced or falling behind. Or enforcement action by MfE on those Council's who fail to meet the specified timeframes. It is unfair to punish the constituents for institutional failure.	**32 Duration of consents** … (2) A resource consent granted for the purposes of this subpart after 31 December 2030 must expire within ~~1~~ 5 year after the date on which it is granted.
34 Irrigated farming *Permitted activity* *Discretionary activity*	Support	This rule assumes that irrigation means intensification of land use and therefore intensification of adverse environmental impacts. This is not always the case. Low impact horticulture has lower environmental impacts than other farming activities. The consenting pathway should reflect this. Commercial vegetable production is provided for a permitted activity rule (by proposed clause 3), because all expansion in commercial vegetable growing is captured by the proposed CVP rules.	Amend as follows: **34 Irrigated farming** *Permitted activity* (1) An increase in the amount of land used on a farm for irrigated production (other than production from effluent irrigation) is a permitted activity if the increase since the commencement date is 10 ha or less. (2) Any increase in the amount of land used on a farm for irrigated low impact horticulture is a permitted activity. (3) Any increase in the amount of land used for irrigated commercial vegetable

			production is a permitted activity.
36 Land use change to commercial vegetable production	Support in Part	HortNZ strongly supports the proposal that existing commercial vegetable production is a permitted activity within the proposed NES-FM. HortNZ supports any new or 'change of land use to' commercial vegetable production requiring a resource consent however HortNZ supports a restricted discretionary activity given the effects can be quantified and relate only to freshwater management matters. The NES as drafted, effectively does provide a restricted discretionary activity given it lists conditions. HortNZ also seeks a controlled activity for commercial vegetable production to provide for demand to meet anticipated population growth. The anticipated growth in vegetables is 12,000 ha this is equates to a 20% increase. This is a conservative estimate; there has been no expansion in vegetable growing at national level in the past 10 years. The predicted increase in nitrate load for vegetable growing could be accommodated within the clawback – effectively reducing the dairy clawback from 10% to 9%. The change would be neutral for sediment (with sediment retention ponds) and have benefits for *E. Coli.*	Amend as follows: **Land use change to commercial vegetable production** *Permitted activity* (1) Any change in land use to commercial vegetable ~~growing~~ production by a farm since the commencement date is a permitted activity if, following the change, the total area of land in a freshwater management unit that is used by the farm for that purpose does not exceed the greatest total amount used for vegetable growing in that freshwater management unit by the farm in any one farm year between the 2013/14 and 2018/19 farm years. *Controlled Activity* (2) Any change in land use to commercial vegetable production by a farm since the commencement date is a controlled activity where, the total area of land in a freshwater management unit used by the farm for that purpose increases by more than the greatest total amount of land used in the freshwater management unit for commercial vegetable production in any one farm year between 2013 and 2018; and where the total amount of land in a sub-catchment used by all farms for commercial vegetable production is no more than 20% of the total land use in that sub-catchment or where the consent is to

		In the past 10 years due to competition of land and regulations that prevented new growing, the area in vegetable growing has declined, the price volatility has increased[49], and the consumption of 3+ has declined. We need CVP regulations that support the health of New Zealanders. In addition, HortNZ seeks to work with the Government on a dedicated NES for Commercial Vegetable Production to ensure all matters can be considered and to provide national consistency for local authority rules across New Zealand.	replace baseline CVP area lost in the FMU due to change of growing operators in the FMU, The matters of control are as follows: 1) Expansion is located within sub-catchments where the total land area in commercial vegetable production of all existing commercial vegetable production does not exceed 20% of the sub-catchment land area. or 2) The consent is to replace baseline CVP area lost in the FMU due to change of growing operators in the FMU, 3) The land to be used for commercial vegetable production is identified as being Highly Productive Land; 4) The applicant has an audited FW-FP for the farm to which the application relates; and 5) The audited FW-FP demonstrates risk based best management practices to avoid, remedy, or mitigate the adverse effects of the activity's contaminant discharges into freshwater, or into land in circumstances that may result in the contamination entering water. *Restricted Discretionary Activity* (3) In all other situations where the total amount of land in a freshwater management unit used by a farm for

[49] https://www.stats.govt.nz/indicators/consumers-price-index-cpi?gclid=Cj0KCQjw6eTtBRDdARIsANZWjYYzWVW0UmAjVys4HN_NlOFzElbLZmxuI9ladZmkXB2K6nyffRSoQxQaAtz8EALw_wcB

			commercial vegetable production increases by more than the greatest total amount of land used in the freshwater management unit for ~~vegetable growing~~ commercial vegetable production by the farm in any one farm year between 2013 and 2018, the change is a restricted discretionary activity, ~~(3) Any resource consent granted for the discretionary activity must be granted subject to the following conditions:~~ The matters of discretion are as followings: a) the applicant has an ~~certified~~ audited FW-FP for the farm to which the application relates; b) the FW-FP ~~includes actions~~ demonstrates risk based good management practices to avoid, remedy, or mitigate the adverse effects of the activity's contaminant discharges into freshwater, or into land in circumstances that may result in the contamination entering water; c) the nitrogen, phosphorus, sediment, or microbial pathogen discharges of the farm that will result from the increased land used will not exceed the average discharges of those contaminants from the farm over the period 2013 – 2018. ~~(4) An application for a resource consent for the discretionary must include a certified FW-FP for the farm to which the application relates.~~ Note: Land that is periodically retired from commercial vegetable production, as part of the crop rotation process, can convert to

			low intensity horticulture, arable, sheep, beef, deer, dairy support or dairy farming.
New rule ***Land Use Change to Low Impact Horticulture***	Support	The new rule is required to provide for horticulture systems have low impacts on water quality. The permitted activity status reflects the low environmental impacts.	**Insert new rule** ***Land Use Change to Low Impact Horticulture*** *Permitted activity* (1) Any change in land use to low impact horticulture by a farm since the commencement date is a permitted activity.
37. Who must have FW-FP?	Oppose in Part	Please refer to further discussion in body of the submission. By 2025 our sector can deliver independently audited FW-FPs. We are much less certain that we can deliver certified FW-FPs by this deadline. We are not convinced that the investment required to develop sufficient certified people would be worthwhile. In our view effort would be better spent developing the capacity of growers to develop their own FW-FPs, and holding growers to account via independent audit. On a practical level, there is not the capacity of expertise within NZ to complete all FW-FPs within 2 years. We do not consider this is a risk-based requirement. Many vegetable growing rotations are not high leaching, all have lesser *E. Coli* discharges and many have	Amend as follows: **37 Who must have FW-FP?** (1) Within 2 years after the commencement date, the following farms that do not already have a certified FW-FP must have a audited ~~certified~~ FW-FP: ~~a) farms used for commercial vegetable production,~~ b) farms in the catchments and subcatchments identified in Schedule 1; c) farms in the Kaipara catchment that are on highly erodible land. (2) By 31 December 2025, every other farm to which this Standard applies must have a ~~certified~~ FW-FP.

		lesser sediment discharges than pastoral hill country.	
38. Content of FW-FP	Support in part	Consideration should also be given to the method of rotation for the commercial vegetable production, as this will have consequences for mitigations and actions. Methods include; market garden, intensive or extensive.	Amend as follows: **38. Content of FW-FP** **…** (3) The risk assessment part of the FW-FP must identify and assess the risk of contaminant losses from the farm, with consequent impacts on freshwater ecosystem health, associated with any of the following activities carried out on the farm: … j) <u>CVP rotation type (market garden, intensive, extensive)</u> …
40. Certification of FW-FP	Support in part	HortNZ is not opposed to Farm Plans and certification. We see a role for professional supporting growers to develop Farm Plans. However, we do not believe certification should be mandatory.	No requirement for approved FEP planner. FEP audit instead and a nationally consistent reporting system via industry bodies.
Audit of compliance with FW-FP	Support	HortNZ supports independently audited FW-Plans >5ha	• All >5ha need ~~certified and~~ audited FEP by 2025 • All <5ha develop FEP based on Agreed National Good Farm Practice Principles by 2025 (rather than NES requirements), but exempt from audit (audit is optional) • All high nitrogen catchments need audited FEP with additional risk based assessment (e.g. BMPs) by 2022

			• Approval of existing GAP auditors • Audit completed by relevant deadline (2022 or 2025)
Subpart 4 – nitrogen cap	Support	This subsection applied to pastoral and dairy farming only. HortNZ supports the exclusion of commercial vegetable production and low intensity horticulture from subpart 4. HortNZ is of the view that a risk-based approach to a Farm Environment Plan at good or best management practice is a more appropriate planning tool to manage a horticultural farm.	Retain exclusion of commercial vegetable production and low intensity horticulture as notified.
Good Management Practice		The NZGAP EMS includes practices that are defined as Good Management Practice and Best Management Practice. To meet the GMP audited standard the plan must consider and justify why each GMP has or hasn't been adopted. Assessment of the BMPs is recommended, but it is optional and would not be a factor in whether an audit was passed or failed. It is not necessary to adopt all GMPs and BMPs, some achieve similar outcomes. The EMS provide a range of options for growers on how to manage risks in the manner that best suits their circumstances.	As defined in Industry Codes of Practice GMP = Good Management Practice (Required where applicable based on a risk assessment) BMP = Best Management Practice (Recommended where applicable based on a risk assessment)
Best Management Practice		The NZGAP EMS includes practices that are defined as Good Management Practice and Best Management Practice.	As defined in Industry Codes of Practice

		To meet the BMP standard, all the GMPS and BMPS must be considered and the plan must justify why each GMP and BMP has or hasn't been adopted. It is not necessary to adopt all GMPS and BMPS, some achieve similar outcomes. The EMS provide a range of options for growers on how to manage risks in the manner that best suits their circumstances.	GMP = Good Management Practice (Required where applicable based on a risk assessment) BMP = Best Management Practice (Required where applicable based on a risk assessment)

Appendix B: HortNZ Responses to Discussion Document Questions

Question(s)	Specific provisions	Comments
1-8	Section 1.6 - Questions	The draft NPSFM will prevent the outcomes desired being achieve as it requires considerable redrafting to ensure the intent is understood in practice and achievable. As discussed in the submission above, there are many unintended consequences within the NPS. The best way forward for the draft NPSFM is to redraft, and establish a process for submissions to be heard. This would be more efficient and effective for timely implementation than continuing with the draft NPSFM as it is.
9-12	Te Mana o te Wai	HortNZ supports the concept of Te Mana o te Wai and the holistic framework for resource management that Te Mana o te Wai provides. However, as drafted, the description of Te Mana o te Wai and 2.1 Objective in the draft NPSFM are contrary to the purpose of the RMA. The RMA requires an overall judgement approach to management of all resources. This is appropriate as it enables a decision maker to consider the specific context of the matters they are assessing, including environmental bottom lines. Creating a long-term vision is a good method for achieving goals over time. However, a long-term vision is not an RMA method for good reason. This method more appropriately fits within a strategy/ action plan prepared under the LGA 2002 and then RMA plans are required to have regard to those strategies / action plans and their established long-term visions pursuant to s66(2)(c)(i) and s74(2)(b)(i) of the RMA.
13-16	New Māori Value	HortNZ acknowledges the benefits of adopting a Māori world view in managing our Environment. Māori values are currently incorporated into regional land and water plans across New Zealand, as required by the NPSFM. It is unclear what the compulsory tangata whenua values would be.
17	New planning process for freshwater	HortNZ opposes the proposed new planning process. Having experienced the ECan Act and the considerable 'unintended consequences' on horticulture in the Region due to the inability to appeal significant matters to the Environment Court, we would not want to see

		this replicated across the Country. HortNZ has been required to put more effort and money into ECan processes because of the reduced appeal rights under the ECan Act, and yet still came out with perverse outcomes for Canterbury Growers. If we had the ability to appeal on matters of substance, then the issues could have been resolved immediately. However, we were left arguing our points for six months before ECan agreed to a plan change, which took a further 18 months to promulgate and notify. Decisions are expected late 2020. This would mean that the issues will not be remedied for three and a half years. And there is still no guarantee that the unintended consequences will be fully addressed. The idea of a streamlined process is good in theory, but the reality is quite different. In removing appeal rights, we have also experienced a less helpful approach to RMA statutory processes when compared to other authorities who are subject to the RMA appeal rights. Removing appeal rights does not encourage the local authority to co-operate with stakeholders during statutory processes and reduces their desire to understand all issues We recommend an independent Water Commission is established to consider matters, other than points of law.
18	More integrated management of freshwater	HortNZ support the principle and practice of integrated management and believed that this is currently being achieved in many instances across New Zealand. We have concerns that some of the roles and responsibilities of regional council's and territorial authorities as outlined in the draft NPSFM seek to go beyond their functions as specified in the RMA and this direction in turn is beyond the functions of the Minister for the Environment (refer to Part 4 of the RMA). There is very good reason why the functions are divided as they are. Reasons include ensuring that local authorities have appropriate resources, including suitably qualified staff to fulfil the authority's functions; preventing duplication and ensuring efficient use of rate-payers and tax-payers money; separating the consenting functions from management functions (e.g. Territorial Authorities manage stormwater, wastewater and stormwater; but Regional Council's assess and issue consent's, and monitor the compliance with consent conditions).

19	Exceptions for major hydro schemes.	HortNZ does not support an exceptions regime in general. We do not support a differentiation between infrastructure for hydroelectric generation and other nationally significant infrastructure. We consider criteria would need to be established to assess exceptions against.
20-21	Attributes	HortNZ supports the concept of National Bottom Lines, it is critical to New Zealand communities and the New Zealand economy that these are set at appropriate levels that are supported by peer reviewed science.
22	Threatened indigenous species	All *compulsory values* and relevant *other values* must be considered equally within the context of an FMU.
23-24	Fish passage	HortNZ supports the provisions for fish passage,
25-26	Wetlands	In some places we have found ourselves inadvertently caught up in discussions on wetlands in relation to implementing Good Management Practices, in particular sediment control ponds and off-stream water storage. It is important that these Good Management Practices are not unintentionally constrained, thereby discouraging their use. It would be a perverse outcome if in attempting to protect wetlands, sediment in streams was to increase because dredging of sediment control ponds was not allowed. Similarly, there is environmental benefit in planting the edges of water storage ponds, however, this will also be discouraged if council staff begin classify them as manmade wetlands thereby preventing the use of the water when most needed.
27-29	Streams	We support the provisions, but it should eb acknowledged in some place offset may not possible and to
30-32	New Bottom Line for nutrient pollution	Bottom lines need to be supported by robust science and appropriate independent peer review. This science must support the application in all river and stream orders and all call catchments if they are to be credible national guidelines. Many rivers and streams in NZ have highly modified hydrology, and may never be able to reach a natural ecosystem state, by limiting abstractions and discharges. In locations where robust analysis indicates that limits cannot achieve outcomes sustainably within 30 years an action plan must be adopted.
33-35	Reducing sediment	HortNZ advocates for growers to operate a Good Management Practice (GMP) and have established a number of industry codes of practice and guidance documents for growers

		such as the Vegetable Washwater Discharge Code of Practice[50], Erosion and Sediment Control Guidelines for Vegetable Production[51], and Code of Practice for Nutrient Discharge[52].
36	Higher standard for swimming	HortNZ supports the provisions
37	Minimum flows	We support a stronger link between water limits and flows and levels.
38	Reporting water use	The position of HortNZ is that in order to manage a resource efficiently and sustainably, then monitoring and reporting must be based on robust scientific measurement. Regulators must use best practice based on good science when formulating catchment and aquifer allocation.
39	Raising the bar on ecosystem health	Refer to comments above for Reducing sediment.
40-42	Draft NPSFM	HortNZ is of the strong view that the draft NPSFM is in need of considerable redrafting. There are intentions within the draft NPSFM that are supported, but there are also elements that cause deep concern. HortNZ recommends that this document is re-drafted.
79-80	Aligning RMA national direction	Yes, there is tension between the draft NPSFM and the RMA. The NPSFM is a subsidiary instrument to the RMA. The draft NPSFM does not give effect to section 5 of the RMA. Separation of land and water values in the changes proposed in the draft NPSFM are not consistent with the principles of Integrated Management.

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[50] http://www.hortnz.co.nz/assets/Natural-Resources-Documents/VegetableWashwaterDischargeCOP.pdf
[51] http://www.hortnz.co.nz/assets/Natural-Resources-Documents/ES-Control-Guidelines-1-1.pdf
[52] http://www.hortnz.co.nz/assets/Uploads/Code-of-Practice-for-Nutrient-Management-v-1-0-29-Aug-2014.pdf

Appendix C - Example of a Best Management Practice FW-FP under the NZGAP EMS

AGRILINK

NZGAP NEW ZEALAND GOOD AGRICULTURAL PRACTICE

Environment

Case Study EMS

Grower X

October 2019

Contents

Summary

Background

This case study has been prepared to aid growers and consultants in preparing their NZGAP EMS in preparation for an external audit. It shows an example of a completed Template, whilst Part II contains examples of the necessary supporting evidence.

Highlights

Our example grower – Grower X – is located within the Pukekohe growing region and owns 1 property, on which they grow a crop rotation of onions, potatoes, and cabbages, plus cover crops when there is a sufficiently long enough break between crops.

As part of their EMS, Grower X has prepared an Action Plan, which is shown below and in the appendix.

The status of each of Grower X's paddocks is shown in Table 1, and the Action Plan is displayed in Template 10A, with further detail in Section 2B.

Table 1. Paddock mapping and Action Plan completion status

Block name	Paddock name	Area	**Unmitigated** erosion rate (t/ha/yr)	Has this paddock been fully mapped? (Template 5a)	Has an action plan been developed for this paddock?	Date for completion of mapping and Action Plan development
Home Farm	A	1.9	125	Yes	Yes	Complete
Home Farm	B	1.4	105	Yes	Yes	Complete
Home Farm	C	2.7	95	Yes	Yes	Complete
Home Farm	D	9.7	20	Yes	Yes	Complete
Home Farm	E	4.5	60	Yes	Yes	Complete
Home Farm	F	4.4	25	Yes	Yes	Complete

Part I – EMS

Farm Environment Plan

5A Property Plan (Map): Features to be included on the property plan (i.e. map)

Ref	Map Features	Complete? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No' for GMPs. Justify if 'n/a')	Evidence (e.g. map or description)	Level
		Y	P	N	n/a				
1	Property boundaries (currently owned and leased properties)	✓						Map 2A	GMP
2	Land management units (e.g. cropped areas)	✓						Map 2A	GMP
3	Potential critical sources (point and area) for contaminants (e.g. erosion risk, fertiliser storage)	✓						Map 2A	GMP
4	Permanent or intermittent rivers, streams, lakes, ponds, drains and wetlands	✓						Map 2A	GMP
5	Riparian vegetation and barriers/fences adjacent to waterbodies	✓						Map 2A	GMP
6	Any significant areas as defined by the local authority (e.g. significant indigenous biodiversity areas, cultural landscape values management area)	✓						Map 2A	GMP
7	The location of any spring heads, wetlands or spring-fed streams have been identified where required by the local authority	✓						Map 2A	GMP
8	Soil maps and/or descriptions	✓						Map 2A	GMP
9	Flow path of surface water entering and leaving each block/paddock (on cultivated land)	✓						Map 2A	GMP
10	Environmental actions/mitigations	✓						Map 2A	BMP
11	Other features (please specify):				✓				BMP

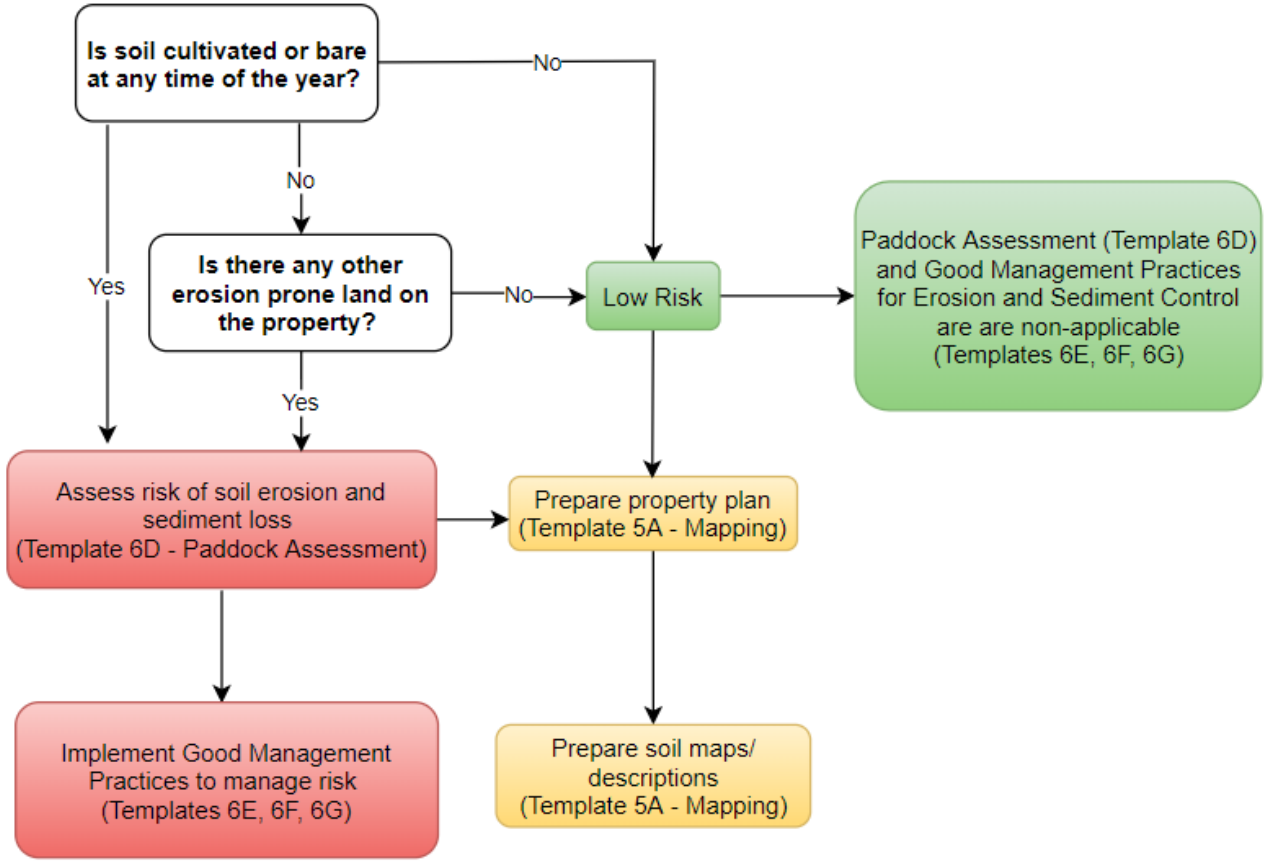
6A SOIL: Soil Quality, Health and Fertility – Assessment

Ref	Good/Best Management Practices	Complete? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Soil type, structure, texture and profile is assessed	✓						Map 2C	GMP
2	Soil drainage is assessed (poor/moderate/well drained)	✓						Map 2C	GMP
3	Soil nutrient testing is conducted on each paddock every 3 – 5 years (Nitrogen, phosphorus, magnesium, potassium)	✓						Map 2C	GMP
4	Soil testing is completed using a uniform or representative collection pattern (e.g. 'W' pattern)	✓							GMP
5	Soil testing is conducted on each paddock every year when a crop is going to be planted	✓						Map 2C	BMP
6	Soil testing is conducted every year based on GPS mapping			✓		March 2020	GPS is not currently used for soil testing but is being investigated.	Action Plan	BMP
7	N-Quick test and tool is used to inform decisions on nitrogen applications		✓			Oct. 2020	Quick N-test is currently being trialled.	Action Plan	BMP
8	Deep N tests are taken to determine the level of residual N that remains in the soil			✓		Oct. 2020	Currently sampling to 30cm. Will take 60-90cm alongside Quick-N test trial	Action Plan	BMP
9	Soil is assessed for compaction (e.g. using a penetrometer)		✓			Dec. 2019	Started doing prior to and following cultivation. Repair compaction meter	Action Plan	BMP
10	Soil pH is monitored	✓						Map 2C	BMP
11	Soil Organic Matter (OM) is monitored	✓						Map 2C	BMP
12	Soil biological activity is monitored			✓			Interested, but needs further investigation	Action Plan	BMP
13	Other (specify):				✓				BMP

6B SOIL: Soil Health and Fertility – Control Measures and Action Plan

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Choose appropriate crops *(for soil, climate, disease, and maximum uptake of nutrients from previous crop)*	✓						Mgmt history 2F	GMP
2	Use cover crops to enhance soil structure and organic matter, plus absorb excess nutrients	✓						Mgmt history 2F	GMP
3	Incorporate crop residues where possible	✓						Photo	GMP
4	Cultivate soil when conditions appropriate	✓							GMP
5	Minimise soil tillage as much as practicable	✓							GMP
6	Minimise fallow periods between crops	✓					Use cover crops where possible		GMP
7	Use crop rotation	✓						Mgmt history 2F	GMP
8	Retire or actively manage marginal land to ensure soil conservation measures are in place	✓					Marginal land is kept in native bush.	Map 2A	GMP
9	Use controlled trafficking		✓			On-going	GPS systems installed on a few tractors. Adding GPS to others	See traffic map. Action Plan	BMP
10	Adopt new technologies *e.g.* use of sub-soil aerator will allow roots deeper into soil		✓			On-going	Slow release fertilisers used, GPS tracked spreaders and drones investigated/used.		BMP
11	Other (specify):				✓				BMP

6C SOIL: Risk of soil erosion and sediment loss – *Property Assessment*



6D. SOIL: Risk of soil erosion and sediment loss – Paddock Assessment (for cultivated and bare soils)

Paddocks assessed (names/IDs):	
Description of property slope:	(Note: <1 degree = Low erosion risk, >1 degree = Medium/High erosion risk)

Ref	Good Management Practices (for individual paddock or summary of all paddocks)	Complete? (Yes, Partial, No, n/a)				Date to be completed (if 'Partial' or 'No')	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence (e.g. map or description)	Level
		Y	P	N	n/a				
1	Identify site specific risks of this paddock (e.g. soil type, slope, proximity to waterways, critical source areas)	✓						Map 2A	GMP
2	Describe paddock management risks (e.g. paddock use, previous use, crop type, crop coverage, cultivation technique)	✓							GMP
3	Assess the risk of soil erosion prior to carrying out all field operations	✓							GMP
4	Identify where surface water is entering paddocks (map or description)	✓						Map 2A	GMP
5	Identify where surface water leaves paddocks (map or description)	✓						Map 2A	GMP

Baseline / Unmitigated Risk Level (i.e. without any GMPs in place):	**High**
Risk Level with current practices in place (Template 6E, 6F, 6G):	**Medium**
Risk level with GMP in place (Template 6E, 6F, 6G, 10)**:**	**Medium**

Other identified risks:

6E. SOIL: Soil erosion and sediment loss - Implement and maintain measures for stopping or controlling surface water entering the paddock (for cultivated and bare soils)

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Interception drains		✓			April 2020	Some drains require digging out.	Map 2B	GMP
2	Correctly sized culverts		✓			April 2020	Some culverts need digging out and resizing.	Map 2B	GMP
3	Benched headlands	✓						Map 2B	GMP
4	Bunds		✓			April 2020	Complete bund along boundary	Map 2B	GMP
5	Grassed swales (control overland flow through the paddock)				✓		Not applicable to our topography.		GMP
6	Other (specify):				✓				BMP

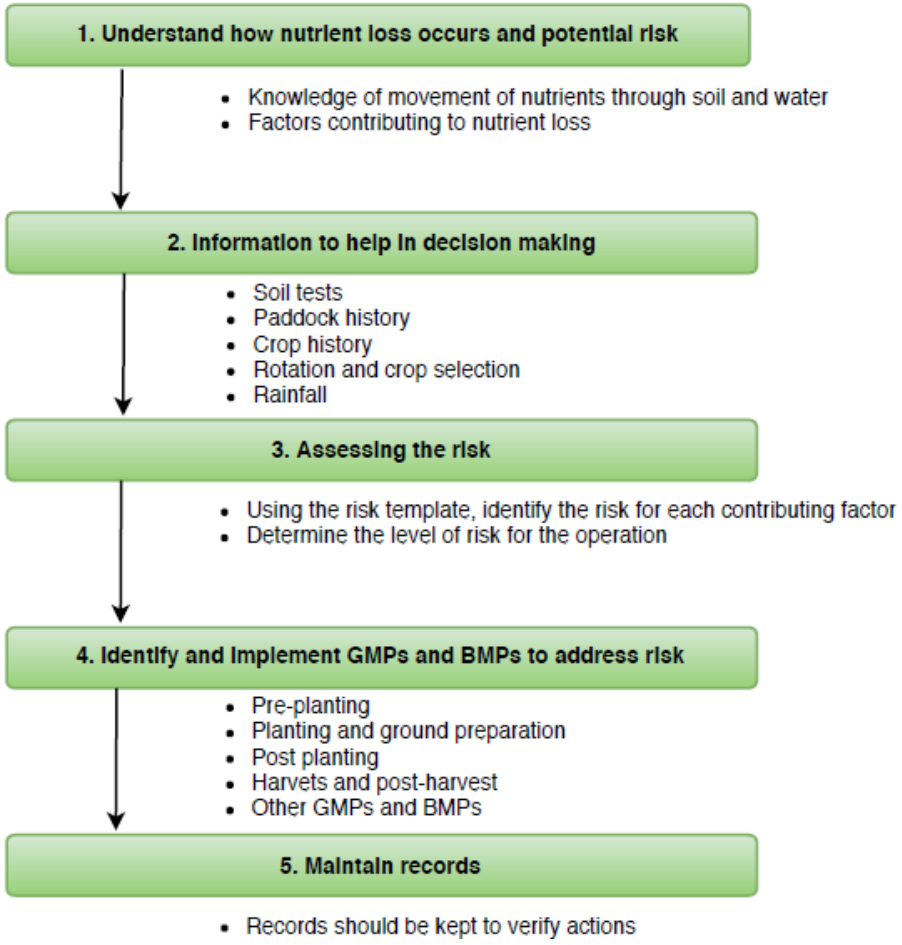
6F. SOIL: Soil erosion and sediment loss - Implement and maintain erosion control measures to reduce or minimise the risk of soil erosion (for cultivated and bare soils)

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Minimise cultivation passes	✓						Map 2B	GMP
2	Break crops / shelter belts (wind erosion)		✓				Home Farm has some shelter belts, though they are not necessary in this region due to low wind erosion.	Map 2B	GMP
3	Using short row lengths (>1 degree slope) (<200m recommended)		✓				Some paddocks have row lengths longer than 200m in Home Farm.	Map 2B	GMP
4	Cover crops / break crops (>1 degree slope)	✓						Map 2B	GMP
5	Wheel track ripping / Wheel track dyking (>1 degree slope)			✓			Not applicable to our conditions, was trialled but led to further erosion.		GMP
6	Contour drains (>1 degree slope)			✓			Not applicable to our conditions.		GMP
7	Other (specify): 1m setback from drains.			✓		May 2020	Leave an uncultivated 1m setback from drains.	Map 2B	BMP

6G. SOIL: Soil erosion and sediment loss – Implement and maintain sediment control measures to manage the water and suspended solids that move off the paddock (for cultivated and bare soils)

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Access ways are not at the lowest point of the paddock	✓						Map 2B	GMP
2	Raised access ways / Bunds		✓			April 2020	New bund	Map 2B	GMP
3	Vegetated buffers / Riparian margins / Hedges		✓			-	SRPs are used in preference of buffers, but most paddocks do have well established buffers on Home Farm.	Map 2B	GMP
4	Super silt fences			✓		-	Other practices used instead.	Map 2B	GMP
5	Stabilised drains and discharge points		✓			November 2020	Some drains require stabilisation.	Map 2B	GMP
6	Decanting earth bunds			✓		-	Other measures used.	Map 2B	GMP
7	Sediment retention ponds		✓			April 2020 – April 2021	Some existing SRPs need expanding, and a new SRP needs to be constructed in Home Farm.	Map 2B	GMP
8	Other (specify):				✓				BMP

7A. NUTRIENTS: Process for addressing risks of Nutrient Loss



7B. NUTRIENTS: Assessing the risk of Nutrient Loss

Ref	Contributing factor	Assessing extent of risk	Level of risk *(Low, Med,*
1	**Soil moisture**	Applications of N when soils that are saturated - high risk. Applications when soils are not saturated – lower risk *Note*: It is important to assess the soil moisture status before an application to ensure that the potential for leaching is minimised. Use of foliar applications can reduce the risk	Low
2	**Irrigation**	Use of irrigation – high risk *Note*: Risk can be reduced by ensuring that irrigation is used to maintain soil moisture at target levels and applications of N timed accordingly.	Medium
3	**Soil type**	Light soils – High risk. Medium soils – Medium risk. Heavy soils – Low risk	Low
4	**Paddock history**	Quantities of N applied not based on fertiliser recommendations or assessment of crop residues – high risk. Applications take into account fertiliser recommendations and crop residues to ensure that appropriate levels of N are applied - lower risk	Low
5	**Previous crop planted and residual N in the soil**	High residue crop – high risk. Crop failure or lower than anticipated yield – high risk Removal of previous residue – lower risk	Medium
6	**Crops being grown**	Shallow root vegetables – higher risk	Medium
7	**Crop yield and quality**	Nitrogen is used to achieve desired yield and quality. Inappropriate or excessive use can create quality issues and increase the risk of leaching – high risk	Medium
8	**Intensity of cropping**	Repeated cropping – higher risk	Medium
9	**Topography**	Sloped ground – higher risk of run off	High
10	**Plant uptake of nitrogen**	Low plant uptake - high risk High plant uptake - lower risk *Note:* There are a range of factors that contribute to the plant uptake of nitrogen and hence reduce the N in the soil able to be leached – e.g. time of years, growth stage, type and form of nitrogen, rooting depth. The combination of factors need to be assessed to determine uptake for each crop.	Low

11	**Timing of nitrogen application**	High level of base dressing at planting – high risk Applications split and matched to crop needs – lower risk	Low
12	**Fertiliser application methods**	Broadcast application – higher risk Application only to the row – reduced risk . Foliar applications – low risk	Medium
13	**Applications of organic manures**	Organic manures applied; but not taken into account for N balance – High risk, Taken into account for N balance – Lower risk	Medium
14	**Pest and disease**	Crop failure or lower than anticipated yield due to pest and disease – high risk	High
15	**Animals in the rotation**	Animals included in the rotation – higher risk. No animals – lower risk	Low
16	**Ground preparation and planting methods**	Direct drilling and reduced tillage – lower risk Presence of fines post cultivation – higher risk	Low
17	**Compaction**	Compacted soil will prevent roots being able to penetrate and access nitrogen. Compacted soil presents a higher risk.	Medium

Baseline / Unmitigated Risk Level (i.e. without any GMPs in place):	**High**
Risk Level with current practices in place (Template 7C):	**Medium**
Risk level with GMP in place (Template 7C)**:**	**Medium**

Other identified risks:

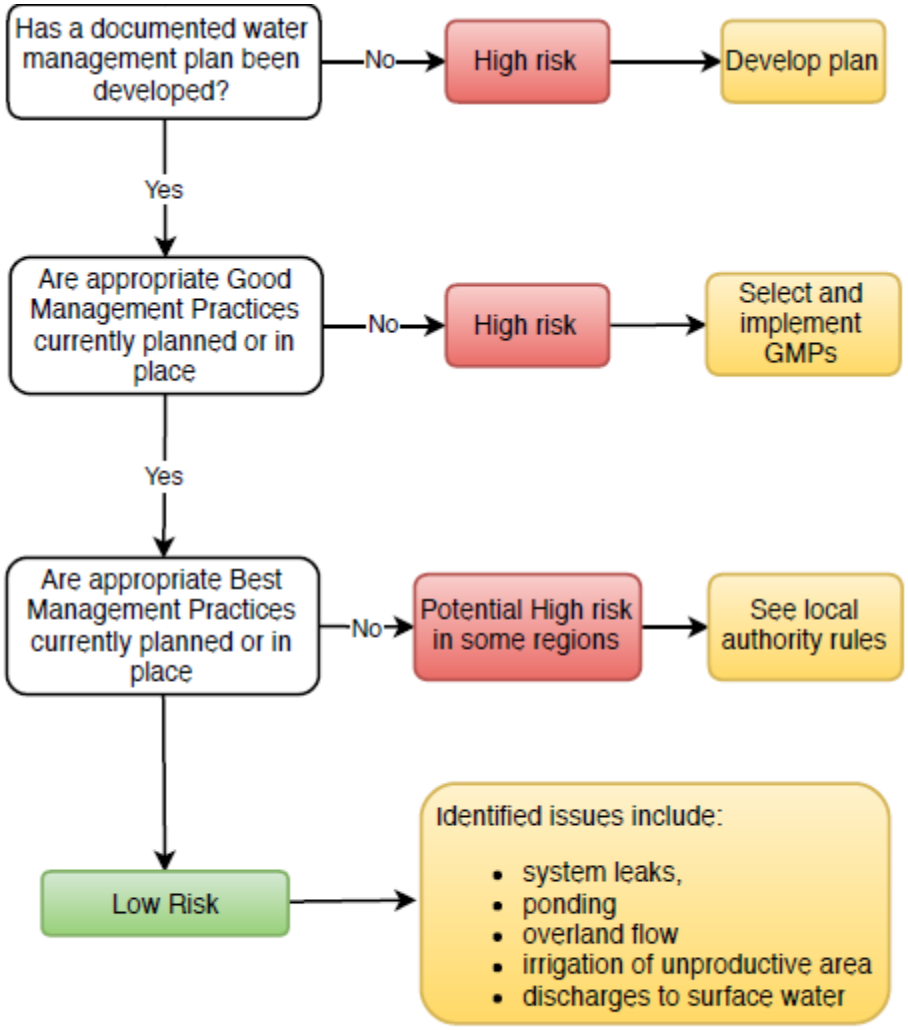
7C. NUTRIENTS: Implement measures to improve nutrient uptake and minimise nutrient loss

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
Pre-planting									
1	Plan fertiliser inputs for the crop	✓							GMP
2	Take into account any organic manures used				✓		No organic manures used in rotation		GMP
3	Take into account any animals in the rotation				✓		No animals used in rotation		GMP
4	Manage applications of nutrients taking into account rainfall, field capacity and soil saturation levels	✓							GMP
5	Obtain advise from a nutrient advisor or agronomist	✓				On-going	Fertiliser trials conducted by agronomist in conjunction with other growers in the area.		BMP
Planting									
6	Nutrient applications are informed by available information or fertiliser recommendations	✓							GMP
7	Fertiliser applications are applied relative to the predicted uptake levels of the plant from planting to maturity	✓							GMP
8	Improved fertiliser technology is used where appropriate (e.g. prills/coatings)	✓					Slow release fertilisers, spreading technology, drones	Fert application records	BMP
9	Controlled traffic farming technology is used to increase application efficiency		✓			On-going	GPS systems installed on spreaders	Visual, travel/ placement map	BMP
10	Crop calculators are used if available and practical for local conditions				✓		Not available		BMP
11	Other (specify):				✓				BMP

7C. NUTRIENTS (*Continued*): *Implement measures to improve nutrient uptake and minimise nutrient loss*

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
Post-planting									
12	Side dressings are used	✓						Fert inputs 2D and padd history 2F	GMP
13	Operators follow instructions for application, including avoiding spreading into water bodies	✓							GMP
14	GPS is used to monitor operator performance	✓					GPS systems installed on spreaders	Travel map	BMP
15	Nutrient levels are managed (and informed by soil tests) according to rainfall / irrigation, and will match likely yield and quality goals	✓						Fert plan	BMP
16	Leaf tests are conducted	✓							BMP
Harvest/Post-harvest									
17	As much harvestable crop as possible is removed	✓							GMP
18	Crop residues are incorporated where possible	✓						Photo	GMP
Other:									
19	Spreadmark accredited contractors are used	✓							BMP
20	AIRCARE™ accredited aerial operators are used if applicable				✓		Don't apply aerially		BMP
21	Machinery is upgraded to be more efficient/accurate	✓						Records	BMP
22	Other (specify):				✓				BMP

8A. WATER and IRRIGATION: Assessing the environmental risk of water use



8B. WATER and IRRIGATION: Water use – Implement measures to improve water use efficiency and minimise risk of nutrient loss

Ref	Good/Best Management Practices	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
	Pre-planting								
1	Plan irrigation requirements	✓						Irri mgmt 2E	GMP
2	Develop long-term irrigation plan	✓						Irri mgmt 2E	GMP
	Post-planting								
3	Volumes applied informed by relevant factors (e.g. Plant growth phase / soil type / water holding capacity and climatic conditions)	✓						Irri mgmt 2E	GMP
4	Water is applied to maintain soil moisture between the wilting point and field capacity where possible	✓						Irri mgmt 2E	GMP
5	Irrigation applied allows achievement of the yield target for fertiliser applied	✓						Irri mgmt 2E	GMP
6	Irrigation efficiency is measurable at greater than 80% (>80% of irrigation water is retained in root zone / target area)	✓						Irri mgmt 2E	BMP
7	Water use is metered	✓							BMP
8	Irrigation scheduling is undertaken using a crop model or tied into a soil moisture monitoring system	✓					Using tensiometers in some paddocks	Visual	BMP
9	On site soil moisture monitoring is conducted		✓				In some paddocks		BMP
10	Irrigation is variably applied within the paddock to maximise efficiency			✓			Technology isn't available to use this on our big gun irrigators.		BMP
11	Highly automated irrigation systems that allow more frequent applications of less water are used to maximise efficiency			✓			Technology isn't available to use this on our big gun irrigators.		BMP

Other:									
12	Non-irrigation water is used efficiently (e.g. wash water)	✓							GMP
13	Other (specify)				✓				BMP

9A MAHINGA KAI and BIODIVERSITY: Assessment

(Checklist question 9.4) Mahinga kai species largely relate to indigenous plant, bird and fish species and their ecosystems and habitats. Mahinga kai includes things such as species, natural habitats, materials and practices used for harvesting food, and places where food or resources are, or were, gathered. This includes:

- All waterways, drains (with water), wetlands, and springs
- Native vegetation and riparian areas
- Areas with specific mahinga kai species and their habitats.

Ref	Mahinga kai and biodiversity assessment	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed ? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	On-farm mahinga kai values have been identified (e.g. map of native vegetation, waterways, wetlands)	✓						Map 2A	GMP
2	Any key risks to mahinga kai have been identified (e.g. clearance of vegetation, drain maintenance)	✓							GMP
3	Ways to enhance on-farm biodiversity have been identified	✓							GMP
4	Other (specify):				✓				BMP

9A MAHINGA KAI and BIODIVERSITY: Implement measures to protect and enhance Mahinga kai values and biodiversity

Ref	Mahinga kai and biodiversity assessment	Currently Implemented? (Yes, Partial, No, n/a)				Date to be completed ? (if Partial or No)	Comment/Agreed Action (if 'Partial' or 'No'. Justify if 'n/a')	Evidence provided (e.g. record, photo, observation)	Level
		Y	P	N	n/a				
1	Mahinga kai values are considered when implementing other environmental actions (e.g. erosion and sediment control, riparian areas)	✓							GMP
2	Native vegetation and/or habitats are protected	✓							GMP
3	Waterway, drain management and vegetation clearance is carried out following good management practice	✓							GMP
4	Planting of native vegetation in shelterbelts or riparian areas	✓							BMP
5	Constructed wetlands developed for treating contaminants (e.g. nutrient run-off) to promote biodiversity and enhance mahinga kai values			✓			Not an option on our property		BMP
6	Pests are managed according to local authority rules	✓							BMP
7	Other (specify): (e.g. Local council requirements)				✓				BMP

10A ENVIRONMENTAL ACTION PLAN:

Ref.	Management area and risk addressed (e.g. soil erosion)	Action to be completed	Location	Person responsible	Expected Date of Completion	Actual Date of Completion	Evidence to be Provided (e.g. records, photo)
6A. 6	Soil nutrients	Investigate the use of GPS during soil testing.	Home Farm	XY	March 2020		Records
6A. 7	Soil nutrients	Purchase and trial Quick N-test. Test a soil sample prior to sending to lab.	Home Farm	XY	October 2020		Results recorded alongside lab test
6A. 8	Soil nutrients	Conduct some deep N tests (60-90cm) alongside Quick-N test trial	Home Farm	XY	October 2020		Lab test
6A. 9	Soil health	Repair compaction meter and record results in crop notes	Home Farm	XY	December 2019		Meter and notes
6A. 12	Soil health	Investigate how soil biological activity could be tested and discuss possible research with VR&I Board (Hort NZ)	Home Farm	XY	November 2020		Records / searches
6B. 9 **7C. 9**	Soil health Nutrients	As tractors are renewed, they are purchased with GPS controlled traffic capability.	Home Farm	XY	On-going		Visual
6E. 1	Soil erosion	The interception drain along the southern boundary needs re-digging. The culvert it leads to on the south-western edge of paddock C also needs digging out.	Home Farm	XY	April 2020		Before and after photos
6E. 4	Soil erosion	Bunds along the northern and western boundaries of paddock E should be installed so that overland flow from paddock E does not enter the clean drain.	Home Farm	XY	April 2020		Before and after photos

6G. 2	Soil erosion	Bunds along the northern edge of C should be installed above the clean drain originating from SRP1 so that overland flow is directed across the access way into SRP5.	Home Farm	XY	April 2020		Before and after photos
6G. 5	Soil erosion	For future best practice, do not cultivate within 1m of drains.	Home Farm	XY	Nov. 2020		Before and after photos
6G. 7	Soil erosion	A new SRP1 needs to be constructed at the north-western edge of paddock B. It should end just to the west of the culvert leading from the drain coming from paddock A. The emergency spillway and snorkel should be placed at the western end of the new SRP, so that the existing SRP1 acts as a drain.	Home Farm	XY	April 2020		Before and after photos
6G. 7	Soil erosion	The current SRP2 should be expanded to 1.0% in size, accepting overland flow from paddock D via the existing culvert. Outflow from the snorkel will enter the clean drain along the northern boundary of paddock F. The emergency spillway (11m) to be constructed along the northern edge so as to discharge into the clean drain.	Home Farm	XY	April 2021		Before and after photos
6G. 7	Soil erosion	The clean drain leading from SRP2 should continue past paddock F and into the neighbouring leased site, where it will terminate at the north-western corner. The existing SRP3 will need to be reconfigured as a drain, with outlet pipes being removed.	Home Farm	XY	April 2021		Before and after photos
6G. 7	Soil erosion	A new SRP3 should be constructed to accept flow from paddock F, with the outflow entering the clean drain running along the northern boundary of paddock F.	Home Farm	XY	April 2021		Before and after photos

6G. 7	Soil erosion	A new SRP4 should be constructed in the north-western corner of paddock E, with the existing pseudo-SRP being re-structured as a clean drain accepting the flow from paddocks A and B. The spillways and snorkel from the new SRP should be directed into this drain. Prior to construction of this, a silt fence should be installed in the existing SRP4 as a temporary measure.	Home Farm	XY	April 2020		Before and after photos
6G. 7	Soil erosion	The new SRP5 should be constructed by the culvert at the south-east boundary of paddock Db to accept flow from paddocks C and Da. The outflow from this SRP will then enter the existing culvert leading to the clean drain running along the eastern and northern boundaries of paddock 605.	Home Farm	XY	April 2020		Before and after photos

AGRILINK

NZGAP NEW ZEALAND GOOD AGRICULTURAL PRACTICE

Environment

Case Study Supporting Evidence

Grower X

October 2019

Contents

Part II – Supporting Evidence

2A: Maps

Figure 1. Legend for paddock maps

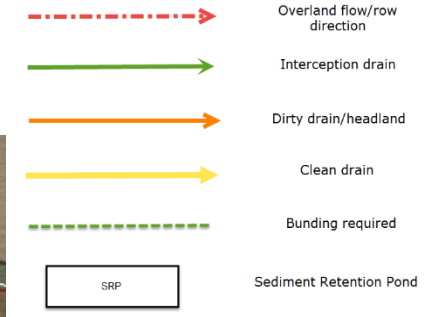


Figure 2. Map of Home Farm in its current state

2B: Maps

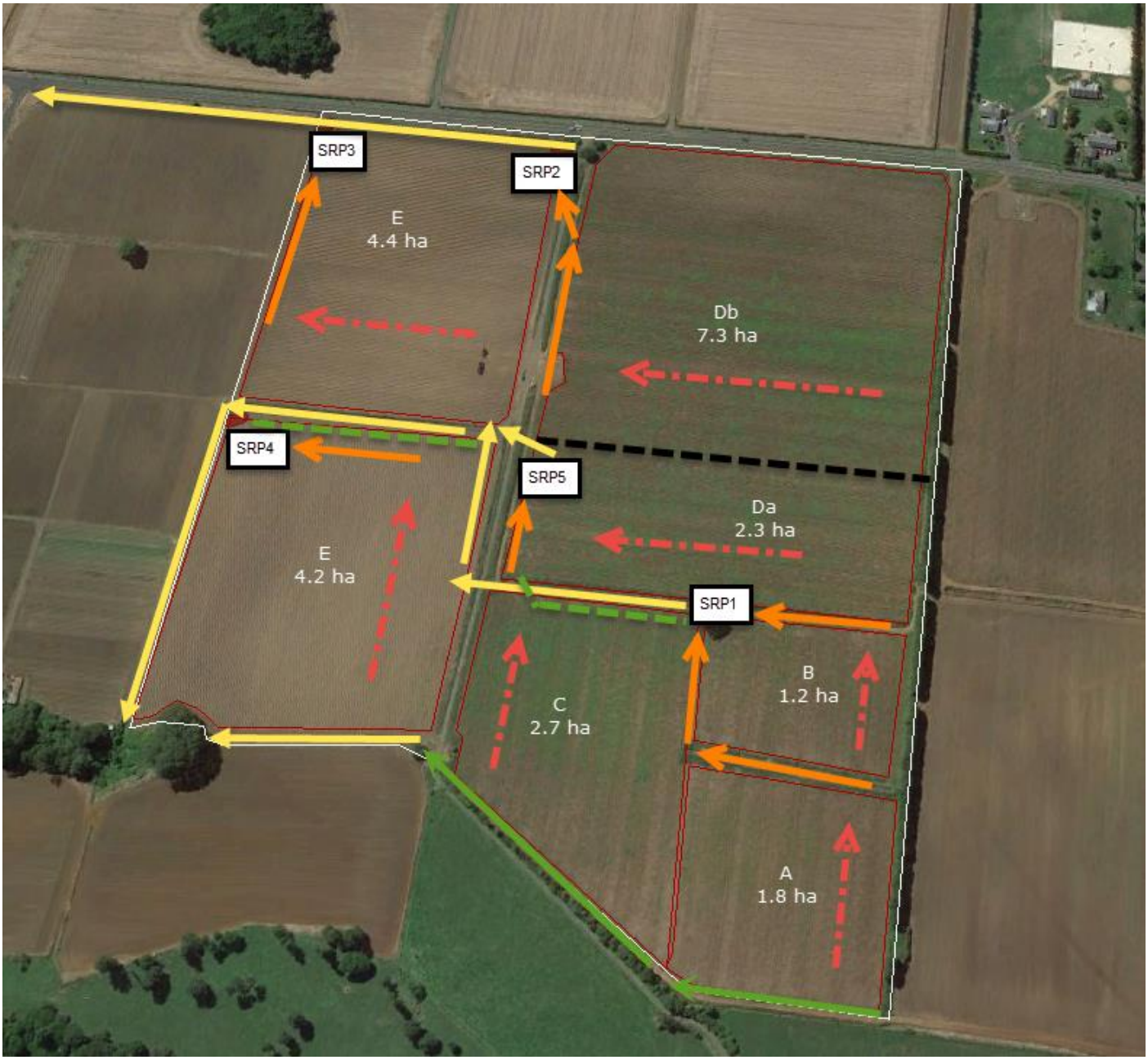


Figure 3. Map of Home Farm following implementation of action plan

2C: Soil Map

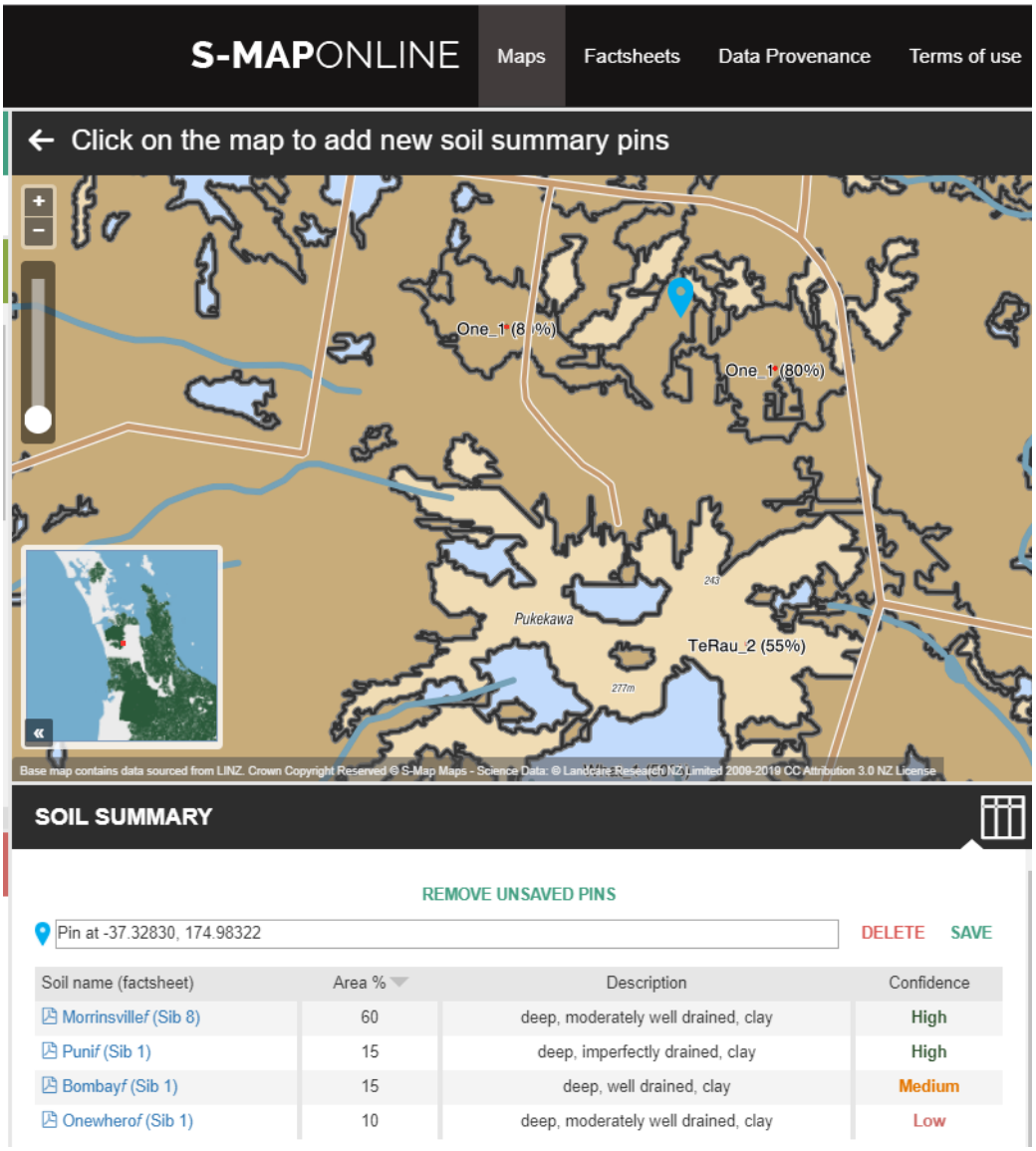


Figure 4. Soil map of Home Farm (from Landcare Research via S-map Online)

Manaaki Whenua
Landcare Research

S-map Soil Report

Report generated: 23-Oct-2019 from https://smap.landcareresearch.co.nz

S-map maps soils at a nominal scale of 1:50,000. At this scale it is common to identify two or more soil siblings that are likely to be present at the selected location. A more detailed resolution is needed to produce map units comprising a single soil sibling. Therefore, it is recommended that users consider the characteristics of each of the identified siblings, the expected proportion of each, and select the S-map sibling that best matches their field observations of the paddock. If no local information is available then it is common practice to select the dominant S-map sibling, i.e. the first listed sibling.

This information sheet describes the typical average properties of the specified soil to a depth of 1 metre, and should not be the primary source of data when making land use decisions on individual farms and paddocks.

Morrinsville*f*

Typic Orthic Granular Soil

Morr_8a.1 (60% of the mapunit at location (1775707, 5866862), Confidence: High)

Key physical properties

Depth class (diggability)		Deep (> 1 m)
Texture profile		Clay
Potential rooting depth		Unlimited
Rooting barrier		No significant barrier within 1 m
Topsoil stoniness		Stoneless
Topsoil clay range		50 - 70 %
Drainage class		Moderately well drained
Aeration in root zone		Unlimited
Permeability profile		Moderate
Depth to slowly permeable horizon		No slowly permeable horizon
Permeability of slowest horizon		Moderate (4 - 72 mm/h)
Profile available water	(0 - 100cm or root barrier)	Moderate (111 mm)
	(0 - 60cm or root barrier)	Moderate (67 mm)
	(0 - 30cm or root barrier)	Moderate (34 mm)
Dry bulk density, topsoil		1.08 g/cm³
Dry bulk density, subsoil		1.26 g/cm³
Depth to hard rock		No hard rock within 1 m
Depth to soft rock		No soft rock within 1 m
Depth to stony layer class		No significant stony layer within 1 m

Key chemical properties

Topsoil P retention	Medium (46%)

Figure 5. Example of an S-map report for one of the soil types on Home Farm

Eurofins - Totally Independent Truly Global

Grower	Farm	Field	Date	pH	BS_Ca	BS_K	BS_Mg	BS_Na
Grower X	Farm 1	A	11-09-19	6.0	58.9	9.4	9.9	0.5
		B	12-09-19	6.3	65.7	9.2	9.0	0.7
		C	13-09-19	6.7	71.4	8.5	9.4	0.8
		D	14-09-19	6.3	67.5	7.3	8.7	0.6
		E	15-09-19	5.9	59.1	8.8	9.0	0.5
		F	16-09-19	6.4	67.7	8.8	9.0	0.5
Grower X	Farm 2	Y	15-09-19	5.9	59.1	8.8	9.0	0.5
		Z	16-09-19	6.4	67.7	8.8	9.0	0.5

Grower	Farm	Field	Date	SO4	Olsen P	QT Ca	QT K	QT Mg	QT Na
Grower X	Farm 1	A	11-09-19	44	158	13	30	38	5
		B	12-09-19	47	156	14	29	35	6
		C	13-09-19	18	175	15	26	35	7
		D	14-09-19	27	132	14	22	32	5
		E	15-09-19	46	170	11	24	29	4
		F	16-09-19	9	151	13	23	34	5
Grower X	Farm 2	Y	15-09-19	46	170	11	24	29	4
		Z	16-09-19	9	151	13	23	34	5

						Trace Elements (EDTA)					
Grower	Farm	Field	Date	OMT	IncN	B	Co	Cu	Fe	Mn	Zn
Grower X	Farm 1	A	11-09-19	4.1	42	2.5	3.0	7.7	245	1465	10.4
		B	12-09-19	3.9	47	3.9	2.4	6.9	220	1567	13.0
		C	13-09-19	3.8	24	2.4	2.7	8.5	283	2125	15.8
		D	14-09-19	3.9	25	2.0	2.6	6.6	217	1431	7.9
		E	15-09-19	4.1	45	2.6	3.1	8.1	272	1445	11.1
		F	16-09-19	3.9	40	2.3	2.9	7.4	217	1522	10.0
Grower X	Farm 2	Y	15-09-19	4.1	45	2.6	3.1	8.1	272	1445	11.1
		Z	16-09-19	3.9	40	2.3	2.9	7.4	217	1522	10.0

Figure 6. Most recent soil test results for Grower X

Figure 6 shows the most recent soil test results for Grower X. Soil tests from previous years are available on request.

2D: Nutrient management fertiliser inputs

2018/19

Fert	Quant	N:P:K	Crop	Area
HYDRO-COMPLEX	150	12:05:14	Onion (ELK)	8.54
NPS	300	16:20:00		
CAN	600	26:0:0:2		
HYDRO-COMPLEX	150	12:15:14	Onion (RED 903S)	6.76
NPS	300	16:20:00		
CAN	500	26:0:0:2		

2017/18

Fert	Quant	N:P:K	Crop	Area
HYDRO-COMPLEX	800	12:05:14	Onion (RHI)	6.99
DAP	200	18:20:00		
CAN	200	26:0:0:2		
HYDRO-COMPLEX	550	12:15:14	Onion (WAIKATO)	7.39
DAP	200	16:20:00		
CAN	200	26:0:0:2		

2016/17

Fert	Quant	N:P:K	Crop	Area
HYDRO-COMPLEX	500	12:05:14	Onion (RED 903S)	8.54
DAP	200	18:20:00		
CAN	200	26:0:0:2		

Figure 7. Example of fertiliser records for Grower X onion crop

Figure 7 shows the most recent nutrient applications to onions on Home Farm. Nutrient applications from previous years and other crops are available on request.

2E: Water and irrigation management

Table 3. Proposed daily and annual takes at Home Farm

Description		**Units**
Bore(s) yield	70 – 90	m^3/hour
Peak daily take	**1,400 – 1,800**	**m^3/day**
Peak ET (January – 90th percentile)	3.3	mm
Application efficiency	85	%
Peak application rate	3.9	mm
Area	49.8	ha
Annual crop irrigation demand (90% reliability) – based on described crop mix	215	mm
Annual application rate (accounting for 85% application efficiency)	250	mm
Annual take	**124,000**	**m^3/year**

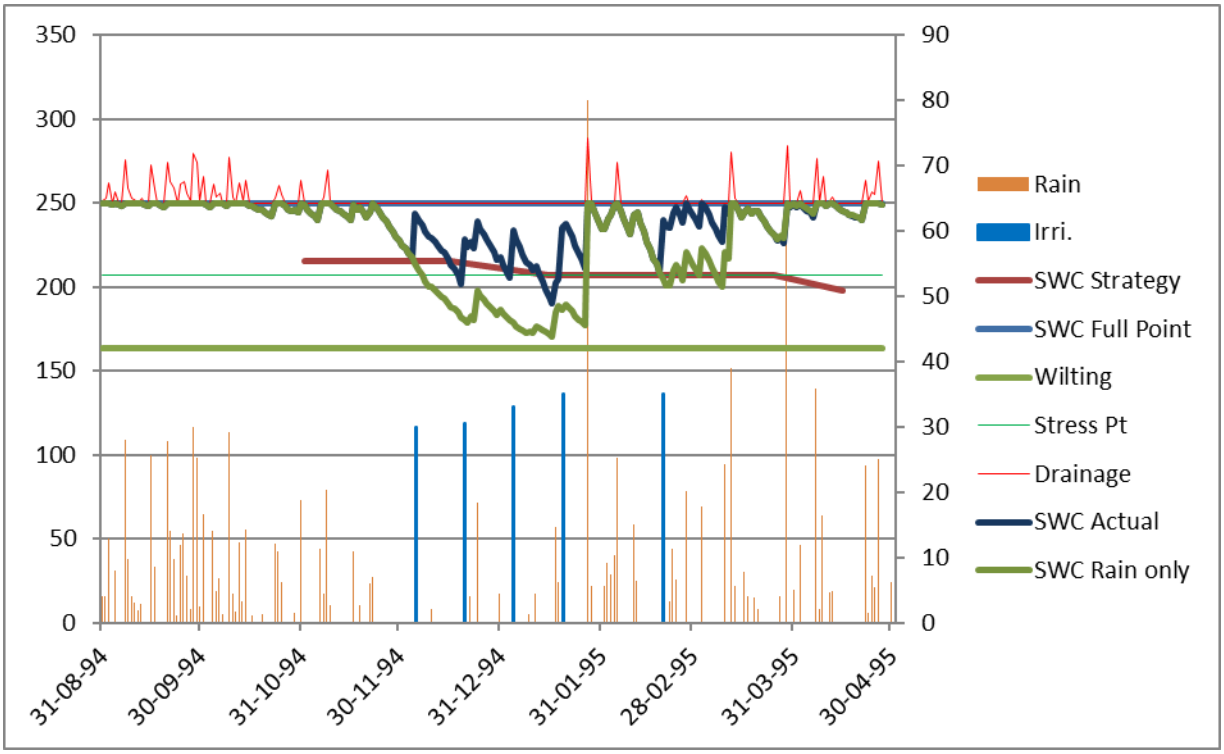


Figure 8. Example of the soil moisture for a November planted potato crop during an 'average' season at Home Farm

2F: Paddock management history

An example of the recent crop history for Home Farm is shown in Table 4. Full crop histories for Home Farm are available on request.

Table 4. Recent crop and fertiliser application history for Home Farm

Date	Crop	Activity
19-09-18	Potatoes	Glyphosphate to kill ryegrass
29-09-18	Potatoes	soil sensors emptied, sumps buried
07-10-18	Potatoes	Chiphoe grass
08-10-18	Potatoes	Deep ripping
12-10-18	Potatoes	Groundspread base fertiliser - 750kg/ha
	Potatoes	40% Superphosphate
	Potatoes	50% Muriate of potash
	Potatoes	5% Calmag
	Potatoes	3% Keiserite
	Potatoes	1% Boron
	Potatoes	1% Zinc
13-10-18	Potatoes	Powerharrow
14-10-18	Potatoes	Plant potatoes (Russett Ranger) Planting population is approx 41,500 seed pieces per hectare.
14-10-18	Potatoes	Planting fertliser (in furrow) 1,500kg/ha
	Potatoes	Azoxystrobin
	Potatoes	Imidacloprid
28-10-18	Potatoes	soil sensors dug up, emptied. Soils samples taken
02-11-18	Potatoes	Pre-emergence chemical
	Potatoes	Linuron
	Potatoes	Metribuzin
	Potatoes	Glyphosate
	Potatoes	Cyanazine
10-11-18	Potatoes	Spray application
	Potatoes	Fluazinam
17-11-18	Potatoes	Spray application
	Potatoes	Metalaxyl
	Potatoes	Lambda-cyhalothrin
20-11-18	Potatoes	TDR cables installed
24-11-18	Potatoes	Spray application
	Potatoes	Metalaxyl
	Potatoes	Magnesium
	Potatoes	Boron
	Potatoes	Spirotetramat

01-12-18	Potatoes	Spray application
	Potatoes	Mancozeb
	Potatoes	Spirotetramat
07-12-18	Potatoes	soil sensors emptied
08-12-18	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
11-12-18	Potatoes	Fertiliser application
	Potatoes	Ballance SustaiN 80kg/ha
14-12-18	Potatoes	Plant tissue samples
15-12-18	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
17-12-18	Potatoes	Pivot Irrigation - 30mm
22-12-18	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
29-12-18	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
30-12-18	Potatoes	Pivot Irrigation - 30mm
02-01-19	Potatoes	Fertiliser application
	Potatoes	Ballance SustaiN 80kg/ha
05-01-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
07-01-19	Potatoes	Pivot Irrigation - 25mm
11-01-19	Potatoes	soil sensors emptied
13-01-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
18-01-19	Potatoes	Fertiliser application
	Potatoes	Ballance SustaiN 60kg/ha
21-01-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
23-01-19	Potatoes	Pivot Irrigation - 35mm
28-01-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
29-01-19	Potatoes	Plant tissue samples

03-02-19	Potatoes	Fertiliser application
	Potatoes	Ballance SustaiN 100kg/ha
05-02-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
12-02-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
23-02-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
03-03-19	Potatoes	Spray application
	Potatoes	Fungicide
	Potatoes	Insecticide
07-03-19	Potatoes	soil sensors emptied, sumps buried, Crop (tuber) yields, TDR Readings,
10-04-19	Potatoes	Harvest - Potatoes
May	Onions	Lime application - 5t/ha
June	Onions	Cultivation - shallow Rip
June	Onions	Cultivation - power harrow
02-07-19	Onions	Lime application - 5t/ha
03-07-19	Onions	Drill onions (per bed = 8 rows at 6.2cm spacing)
05-07-19	Onions	Spray application - Residual Herbicide
06-07-19	Onions	Fertiliser Application - Serpentine Super 7k (800kg/ha)
12-07-19	Onions	Spray application - Herbicide
13-07-19	Onions	soil sensors dug up, emptied, soil samples taken and met station reinstalled
26-07-19	Onions	Visited site to test logger cable… couldn't get this to work.
02-08-19	Onions	soil sensors emptied
02-08-19	Onions	Re-tested logger… still not working
11-08-19	Onions	Logger now up and running - faulty connection to power source
19-08-19	Onions	Spray application - Herbicide + fungicide
29-08-19	Onions	Fertiliser Application - DAP @ 250kg/ha
10-09-19	Onions	Spray application - Herbicide + fungicide
12-09-19	Onions	soil sensors emptied
12-09-19	Onions	Spray application - Herbicide
14-09-19	Onions	Spray application - Herbicide
19-09-19	Onions	Spray application - Herbicide
18-10-19	Onions	soil sensors emptied
10-10-19	Onions	Spray application - Herbicide
19-10-19	Onions	Spray application - Herbicide
19-10-19	Onions	Fertiliser Application - Nitrophoska Extra @ 300kg/ha

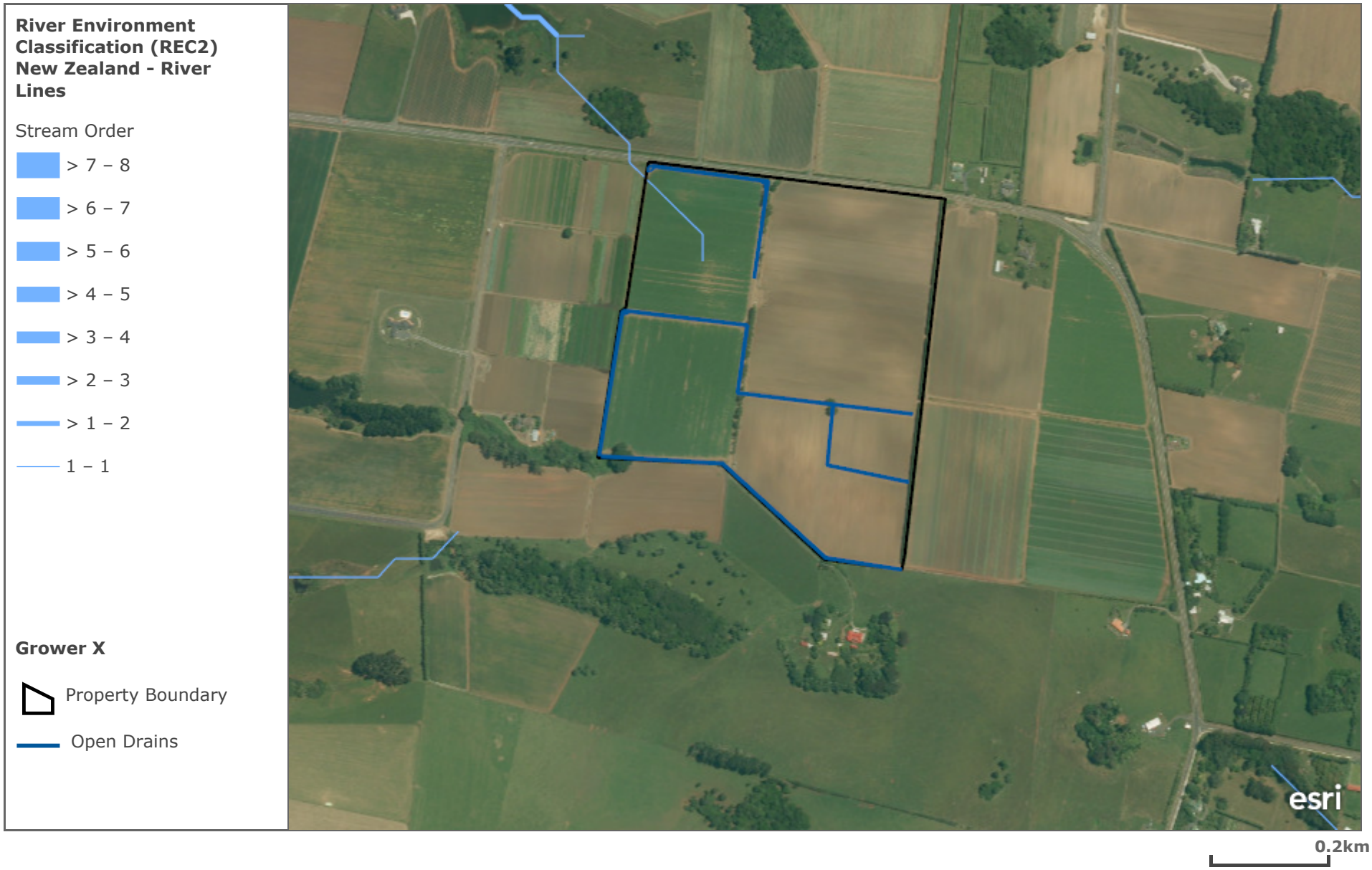
2G: Pictures

Image 1. Cultivation beside drain on Home Farm.

Image 2. An example of a blocked culvert on Home Farm.

Image 3. Recently installed Sediment Retention Pond on Home Farm.

Drains and Waterways



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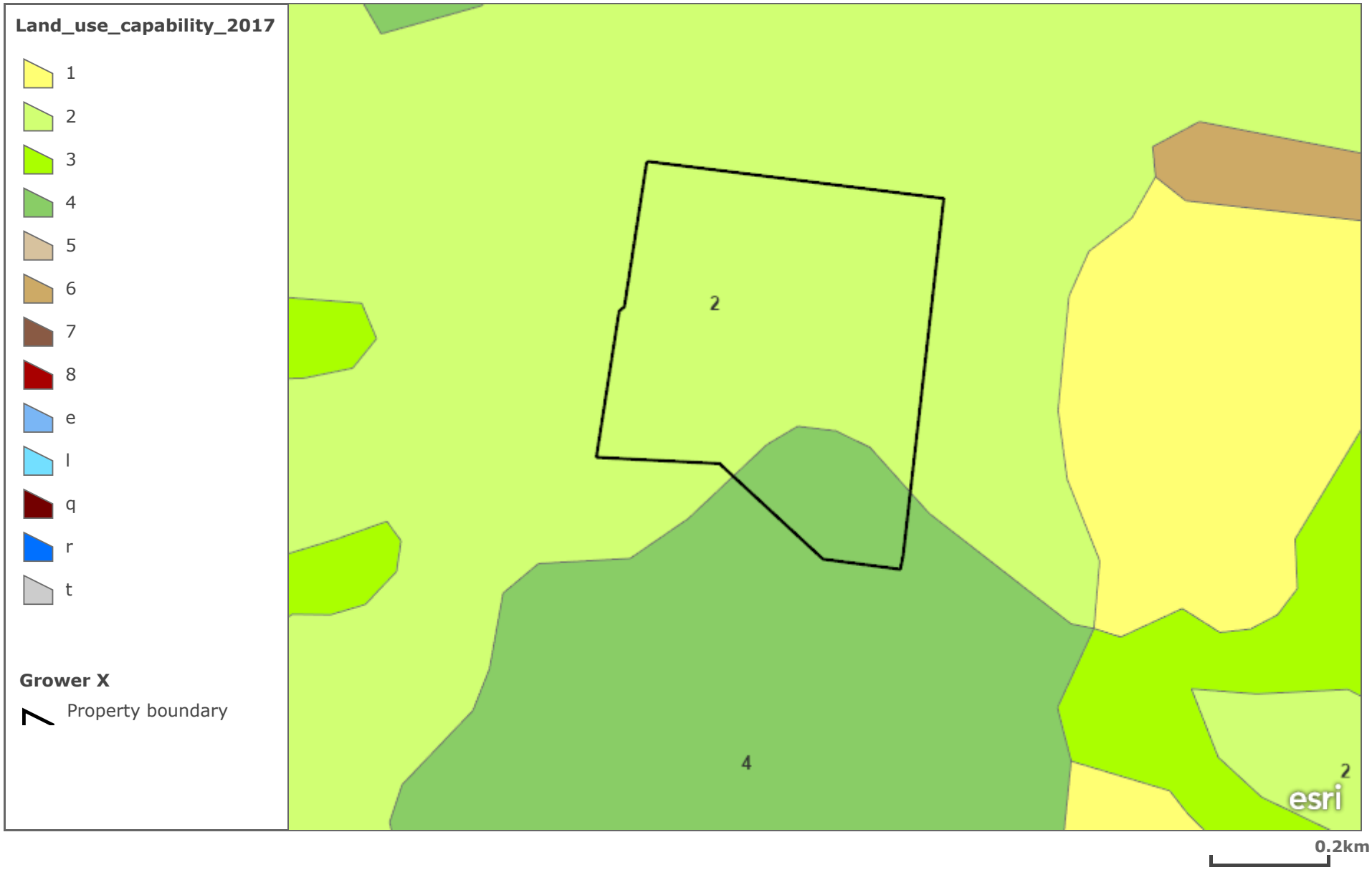
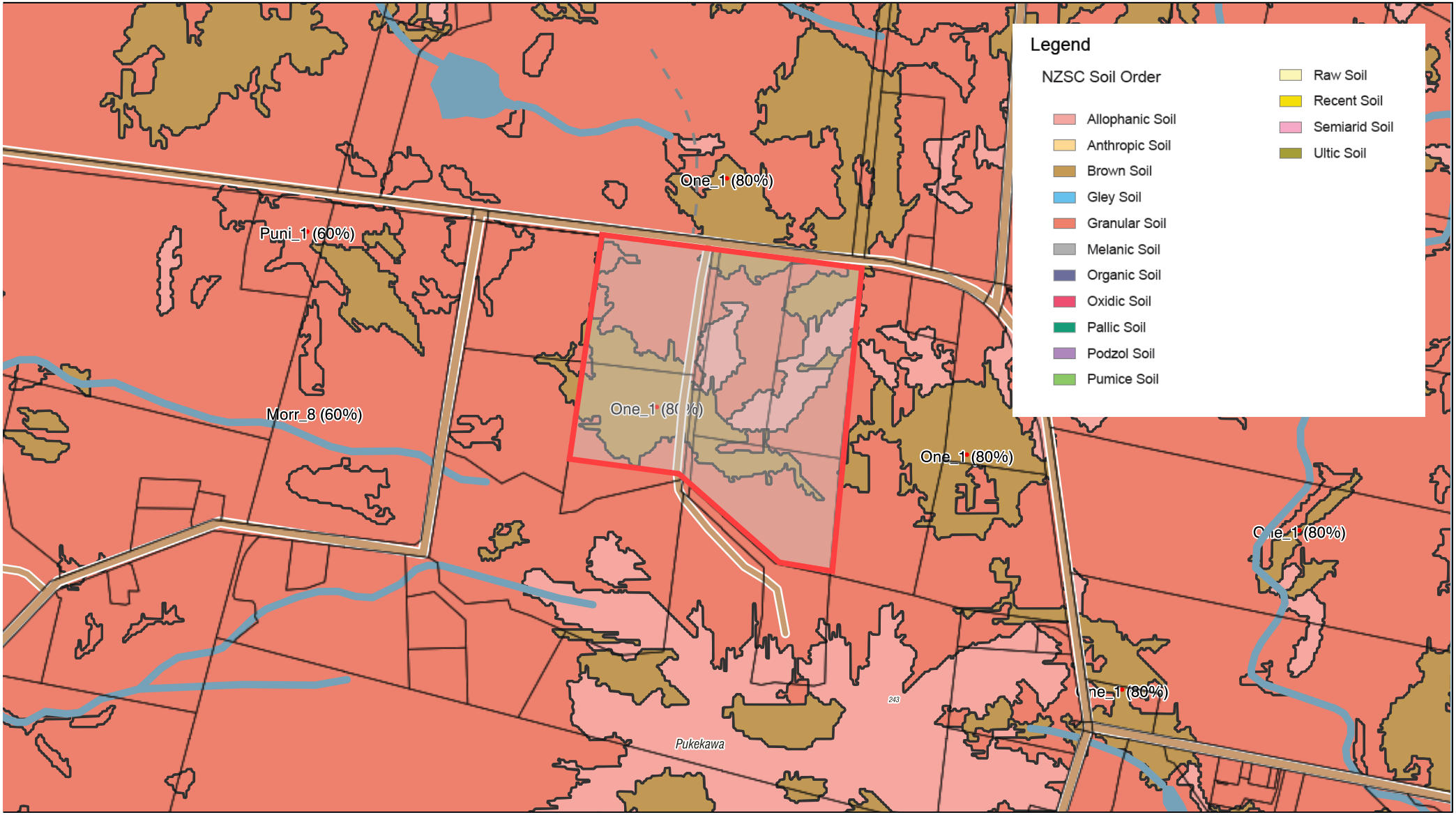


Soil Order



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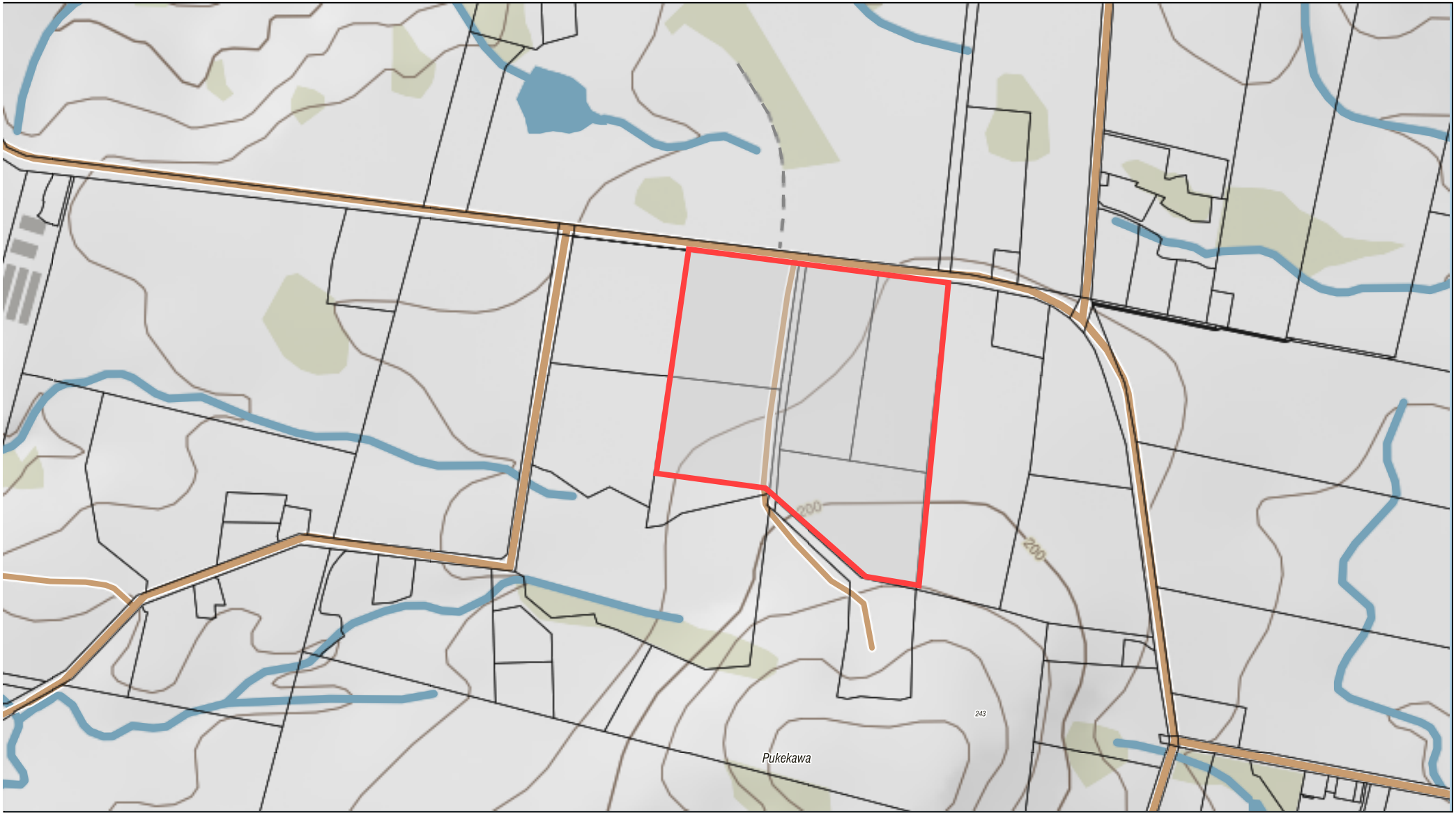

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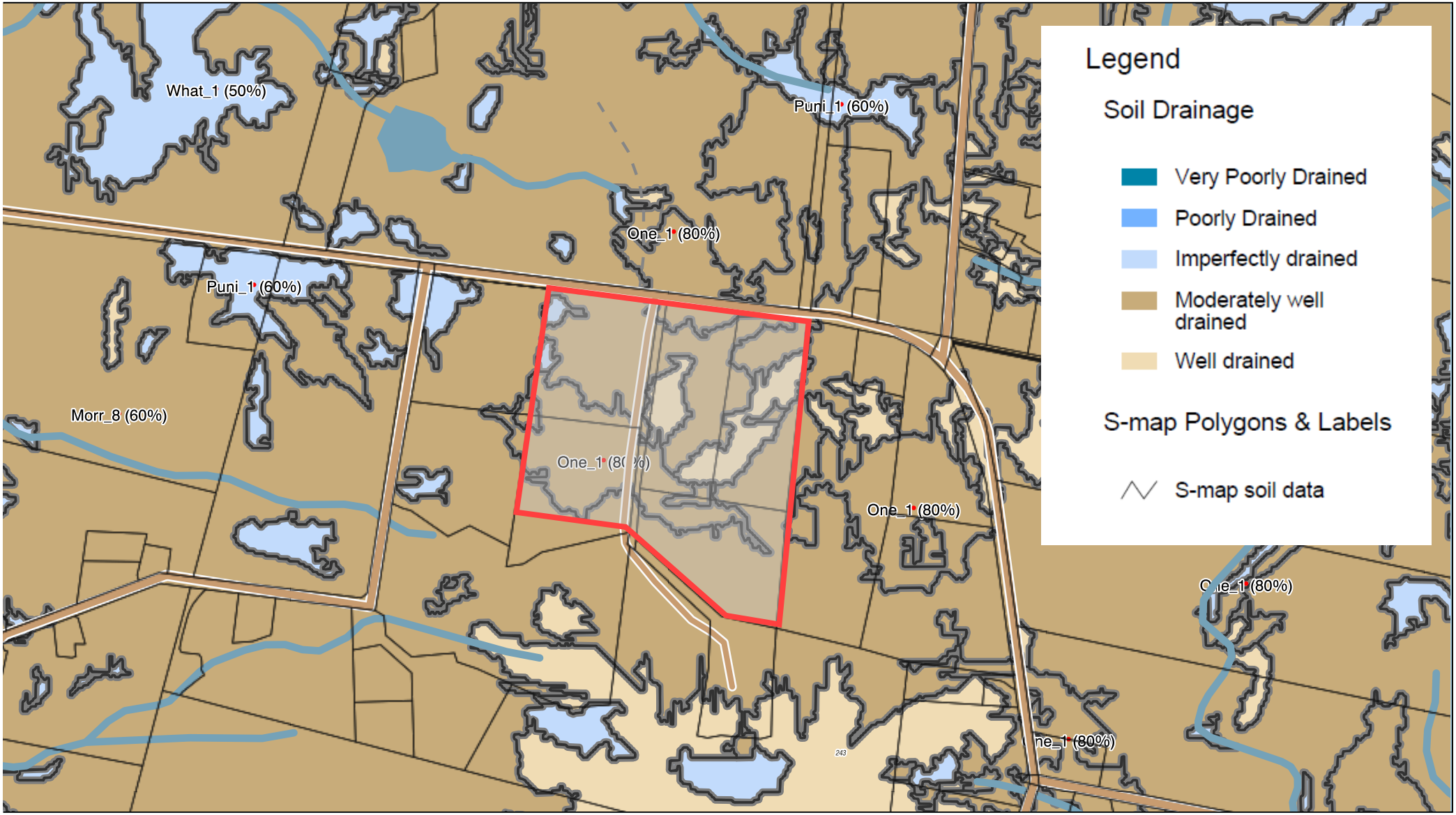
Soil Drainage



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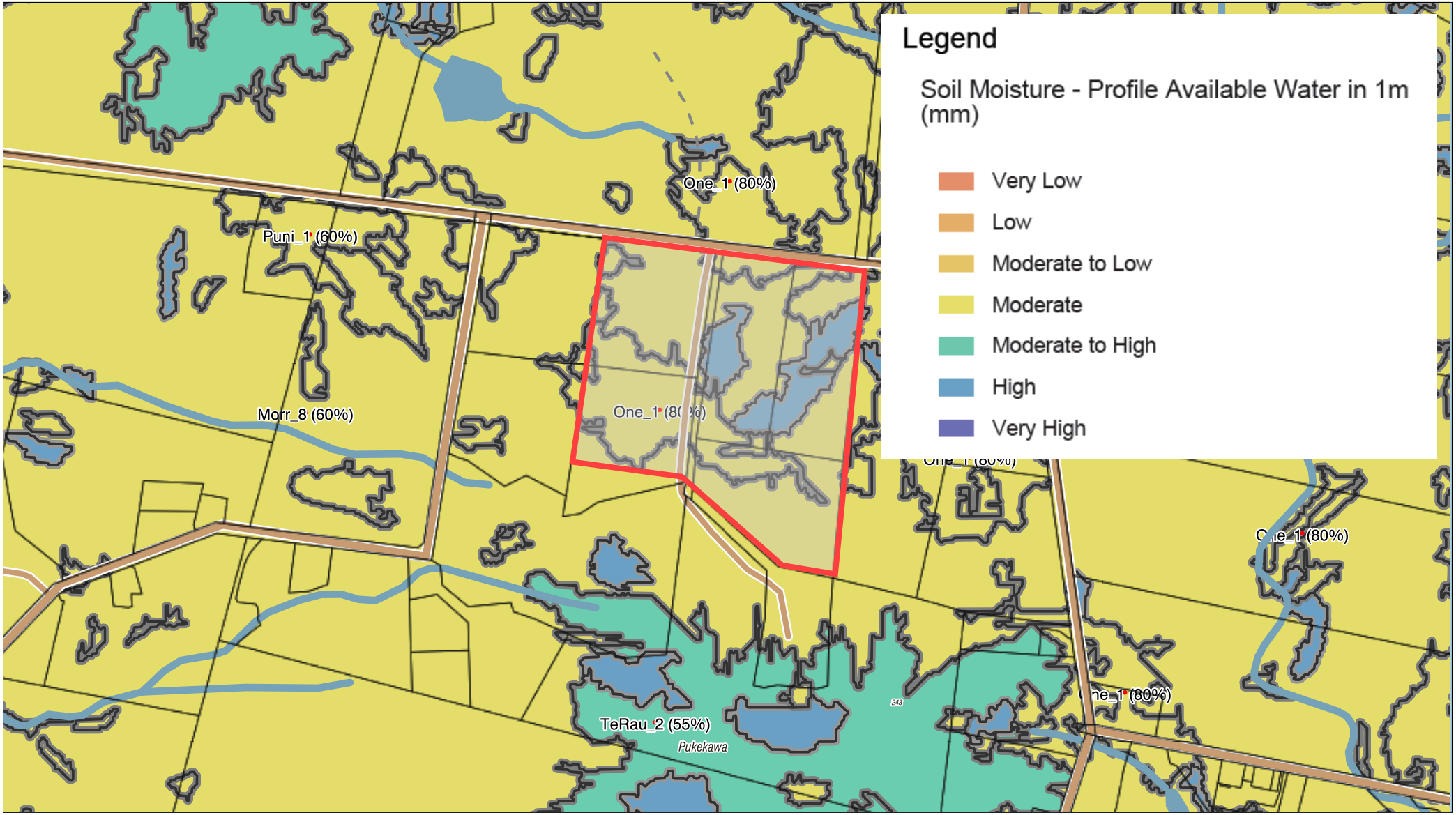
Soil Moisture



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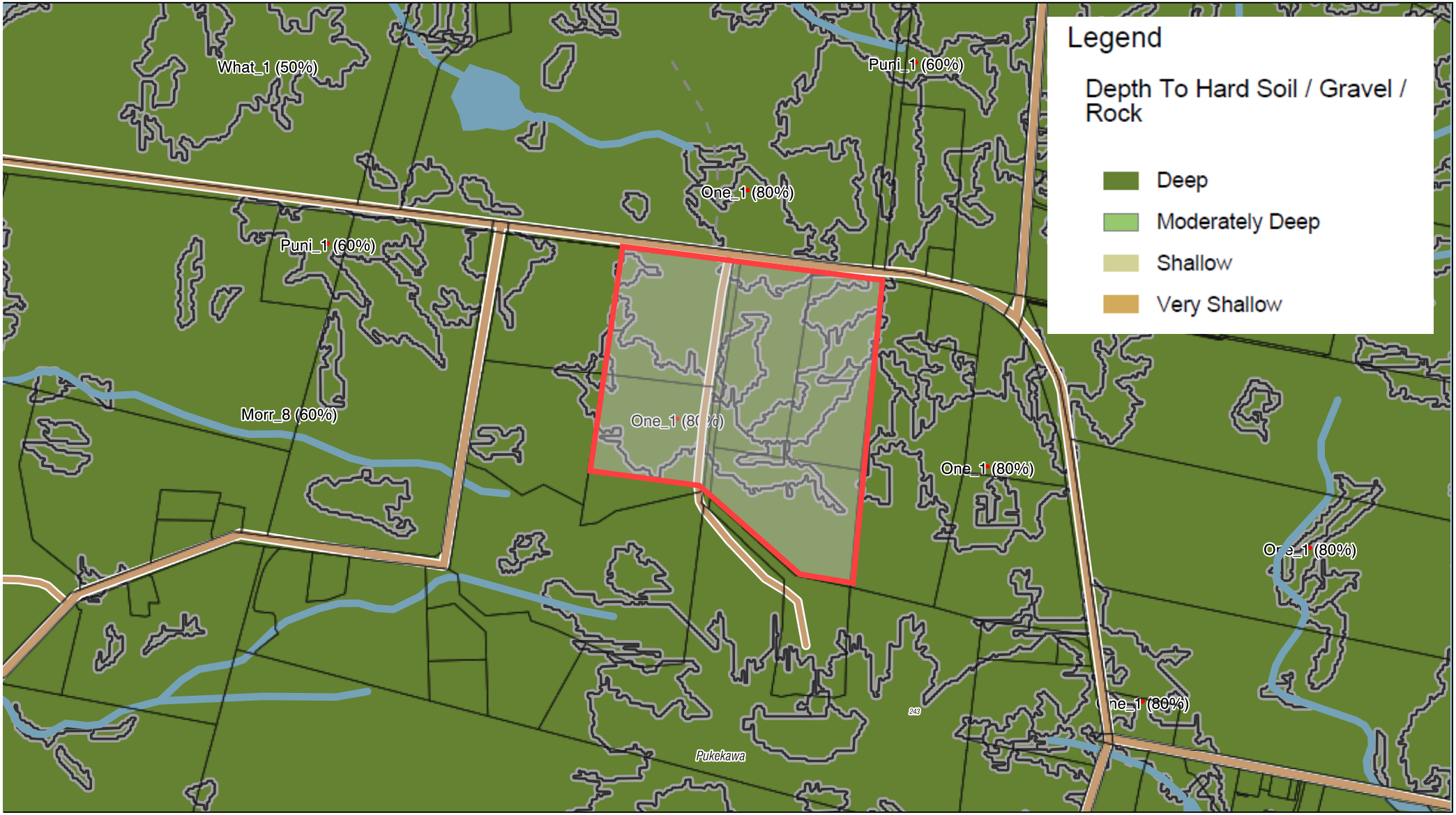
Depth to hard Soil / Gravel / Rock



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