EMSNM-005 – Advanced Mitigation

Contents

1 Introduction

Advanced Mitigation (AM) describes a set of on-farm practices that can be implemented by MHV Water shareholders to improve water use efficiency, reduce N surplus, and reduce risk of contamination entering point sources beyond that expected at Good Management Practice.

Defining AM has the advantage of setting new expectations to drive continuous improvement as well as reduce nitrogen losses to groundwater. Where a property is audited as meeting AM, The Matrix N load calculations can be updated to reflect the implementation of the higher standards of practice, and therefore a tool available to the scheme to achieve consented N loss reduction targets.

This document outlines the requirements of shareholders to be assessed as Advanced Mitigation to allow MHV Water to allocate the Advanced Mitigation management standard to a property using The Matrix.

2 Purpose

The purpose of this document is to promote continuous improvement through the implementation of Advanced Mitigation, provide Farm Environment Plan Auditors guidance to consistently identify AM practices on shareholder properties as well as satisfy condition 12(g) of resource consent CRC185857, which states:

Provide reproducible methodology on:

(i) How the nutrient load limits are calculated, and the rationale for that nutrient load calculation applied; and

(ii) How nutrients from all land subject to this resource consent will be accounted for

3 Background

This document has been prepared in consultation with Barrhill Chertsey Irrigation Limited, Ashburton Lyndhurst Irrigation Limited, Macfarlane Rural Business, primary industry representatives and farmers to guide auditors on how to give farmers credit for beyond Good Management Practice, currently measured as an "A" audit grade in the existing auditor framework developed by Environment Canterbury.

The basis for Advanced Mitigation (AM) is the 2013 planning narrative developed as part of the nutrient limit setting process within the Hekeao/Hinds catchment for Plan Change 2 of the Land and Water Regional Plan (PC2) (Appendix 1).

Since the AM framework was developed, Environment Canterbury have released the Industry-Agreed Good Management Practices relating to water quality in 2015 and established the Canterbury FEP Audit Framework.

The representative farm system nutrient budgets prepared for PC2 planning process form the basis of The Matrix, which is a catchment nitrogen modelling tool used by Barrhill Chertsey Irrigation Limited (BCIL), MHV Water, and Ashburton Lyndhurst Irrigation Limited (ALIL) to set their consented nitrogen load limits and determine compliance against them. The Matrix has been deemed equivalent to Overseer by Environment Canterbury in 2020, having been validated for each scheme.

Therefore, the AM practices described in this document go beyond the expectations of the *Industry Agreed Good Management Practice relating to water quality* document and relate to farm systems typical in the Mid-Canterbury catchment, to address water quality issues specific to this area, with

nutrient losses from these properties reported by the mid-Canterbury schemes through The Matrix in accordance with their Environmental Management Strategies.

4 Scope of Advanced Mitigation

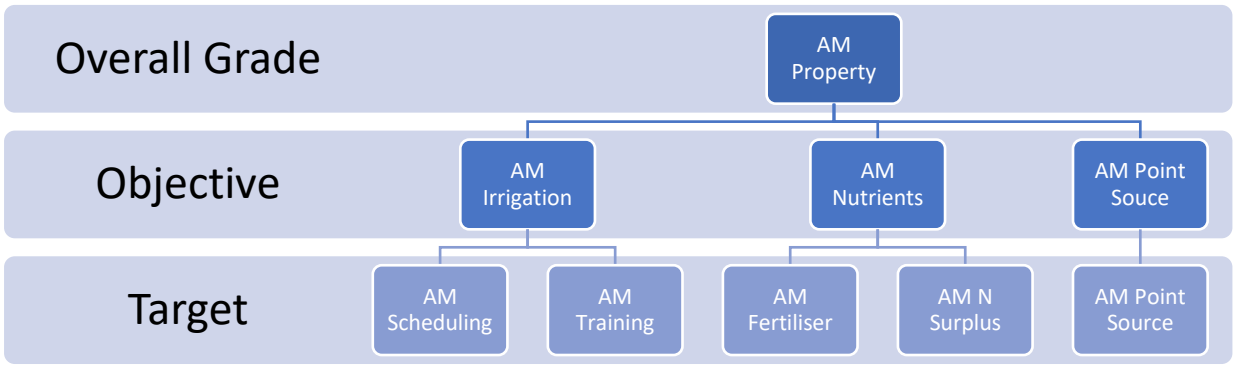
Adoption of Advanced Mitigations as described in this document are intended to apply to farms managed under the BCI, MHV Water and ALIL nutrient discharge resource consents, located between the Rakaia and Rangitata River between the foothills and the sea. Adoption of Mid-Canterbury Advanced Mitigation practices may be applicable in other catchments, with similar farm systems and groundwater water quality issues. However, care should be taken when applying the Advanced Mitigation framework outside of mid-Canterbury to ensure environmental outcomes sought in those areas are adequately addressed by the practices described in this document.

5 Using this Document

This document is intended to be a guidance tool for auditors to assist them in ascertaining where investments in technology and farm management techniques are sufficiently beyond those expected at GMP to be considered "Advanced Mitigation".

A property is deemed "Advanced Mitigation" when:

- A property is an "A" audit grade[1]; and
- All 5 additional Advanced Mitigation targets are met, where applicable[2]



Where a property overall grade is audited as "Advanced Mitigation", the schemes can apply the "Advanced Mitigation" management standard in The Matrix and report a lower nitrogen loss for the property in accordance with EMSNM-004, The Matrix.

The guidance notes are broken down into *Target*, *Outcome*, *Example Questions, Example Reasons For,* and *Typical Evidence.* Many of the practices referred to in this framework are either not easily modelled or not at all considered within Overseer, yet they have been scientifically proven to either improve resource use efficiency or reduce nitrogen losses to water. Therefore, in order to encourage continuous improvement of on farm nutrient management practices (which are to the ultimate advantage of the

[1] In accordance with the Canterbury Certified Farm Environment Plan Auditor Manual, May 2020
[2] The Advanced Mitigation targets are specified in Table CRC211511-1 of resource consent CRC211511. AM can still be achieved overall if some of the targets are not applicable on a property, for instance if there are no point sources or dryland.

community and catchment), it is important to reflect operators' investment of time and money in these technologies by way of recognition through the audit process.

Not all *Reasons For* detailed in this document are necessary, but mitigations commiserate to the risk presented by the farming activities need to be implemented for the auditor to be assured the outcomes are met for each target.

Section in Notes	Description
Target	Target as written in CRC211511.
Outcome	Outcomes required to demonstrate target is met.
Example Questions	Example of questions an auditor could ask to understand if outcome is met.
Example Reasons For	Types of reasons which justify grading target as met.
Typical Evidence	Type of evidence which could be provided to an auditor to demonstrate outcome is met.

6 Auditor Guidance – Key Principles of Advanced Mitigation

1. An AM target can only be assessed where the equivalent GMP target achieved a High Level of Confidence grading
2. AM is intended to be cost-neutral or beneficial to *a typical Mid-Canterbury farm*
3. AM target is met where underlying outcomes are demonstrated to be achieved

7 Irrigation Target 1 – Irrigation Scheduling

Irrigation Target 1	Outcome
To minimise water use and drainage during times of high nitrogen loss risk, irrigation water is applied so that the timing and depth targets crop requirements and optimizes capture of rainfall to minimise drainage	***The auditor should seek to ensure irrigation systems are designed to reduce drainage through efficient and differential application of irrigation to match crop requirements and maximise capture of rainfall.*** A. Efficient System 95% of irrigated area on property utilises a system which can achieve 80% efficiency[3]. B. Differential Irrigation Irrigation system able to vary application by irrigation management zone[4] on 95% of irrigated area on the property. C. Strategic Irrigation Scheduling Optimise capture of rainfall predominantly through strategic management of irrigation, by irrigation management zone through the shoulders of the irrigation season. D. Accuracy of Tools Irrigation system and scheduling tools are maintained to optimise accuracy in application.

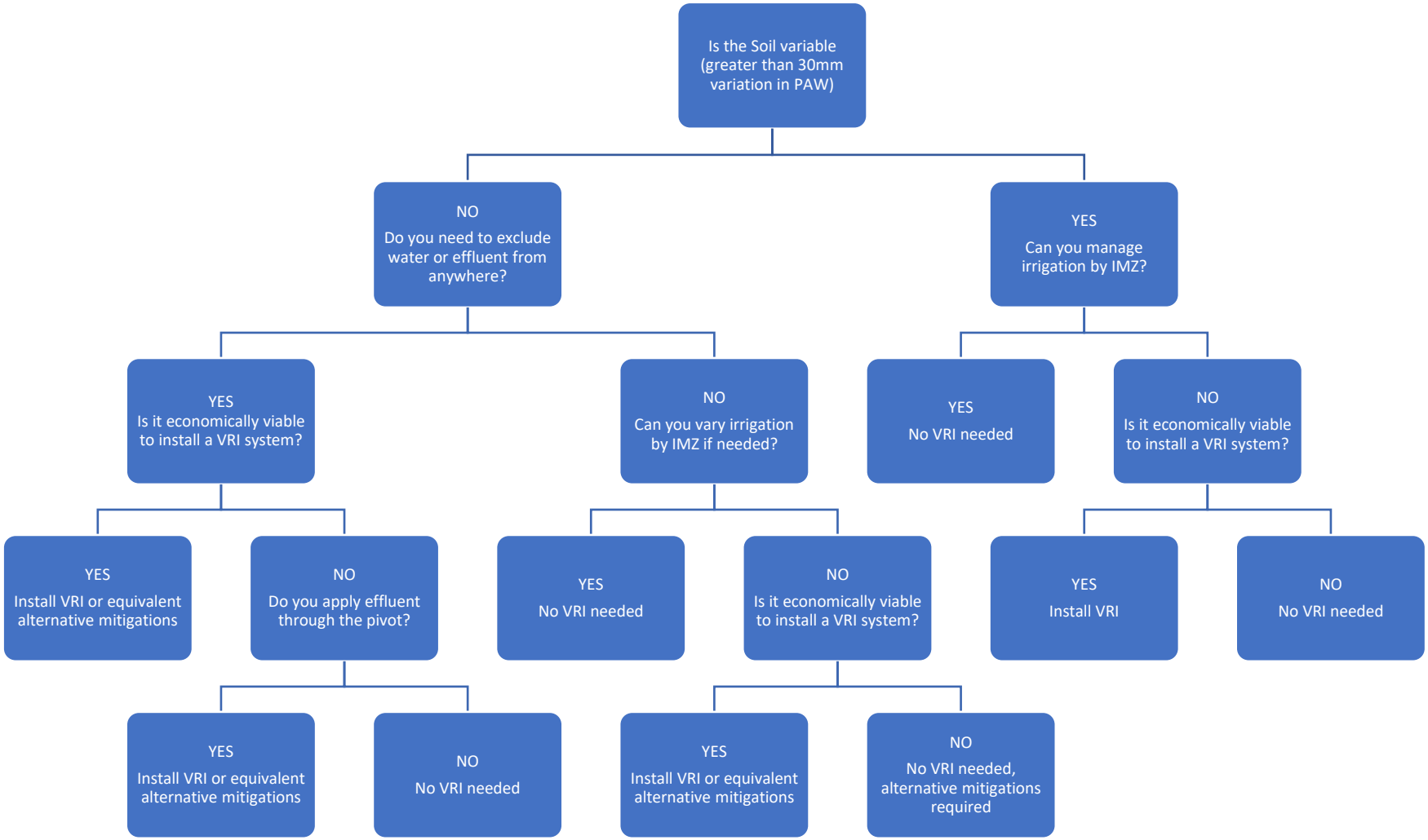
Example Questions	Example Reasons For	Typical Evidence
Efficient System		
Is 95% of the irrigated area irrigated by a system able to achieve 80% irrigation efficiency? Are the limitations of the irrigation systems known and how are these risks managed to achieve 80% efficiency or vary application rate to meet crop demand? Has an infrastructure improvement been considered to achieve efficiency and flexibility standards? If so, was it implemented? If not, why not and what other practices are used on farm to mitigate risk and improve water use efficiency to 80%?	More than 95% of irrigated area irrigated by a system that can achieve 80% irrigation efficiency or better. High application depth systems upgraded and/or managed to ensure 80% efficiency or better is achieved. High application rate systems upgraded and/or managed to avoid ponding or run-off. Irrigation system design prevents irrigation of non-productive land.	Irrigation system evaluation Visual assessment/Farm Visit & Tour Irrigation System Maps Irrigation system efficiency calculations Irrigation minimum application capability report

[3] As defined in the document *Irrigation Guidance for FEP Auditors (June 2021)* prepared by Environment Canterbury.

[4] An Irrigation Management Zone (IMZ) is an area of land with similar irrigation requirements within one property, taking into consideration irrigation system, soil type, crop demand.

Example Questions	Example Reasons For	Typical Evidence
What steps are taken to avoid irrigation of non-productive land?		
Differential Application Capability		
How are irrigation management zones identified on your property? How do irrigation systems adjust application depths according to irrigation management zone? Where irrigation management zones vary annually, how do you adjust your irrigation systems to continue to deliver the appropriate amount of water by crop?	Paddock layout enables differential irrigation management. Irrigation infrastructure managed to apply irrigation by irrigation management zone VRI used where applicable	Irrigation systems and mitigations consistent with decision tree Property specific soil mapping NDVI Maps, Satellite/Aerial/drone Images or equivalent VRI feasibility report (where applicable) VRI prescription maps (where applicable)
Strategic Irrigation Decisions		
How do you schedule your irrigation? By irrigation management zone currently? How do you monitor crop water demand by irrigation management zone? When is there a high risk of drainage from rainfall on your property and what steps do you take to mitigate the risk? How do you use your irrigation scheduling data to inform irrigation management decisions on farm?	Objective soil moisture monitoring tool is available for each irrigation management zone. Irrigation trigger points are adjusted according to risk throughout the season and by irrigation management zone. Crops receive water according to their demand. Property specific weather forecasting information utilise to support irrigation scheduling decisions. Irrigation application rate is aligned to the 90th percentile, 28-day volume from IrriCalc for 95% of irrigated area.	Irrigation scheduling data Proof of placement maps and per crop water application records Soil moisture monitoring data by irrigation management zone. IrriCalc summary report
Accuracy of Data		
How is your irrigation scheduling tool(s) calibrated? What other tools are used in conjunction with irrigation scheduling data to make decisions? What information do you have available to anticipate rainfall and PET for your property?	Irrigation scheduling tool(s) are calibrated regularly Property specific rainfall and PET data used to support decision making.	Irrigation Scheduling Tool Calibration Record Rainfall and PET m Property specific soil PAW maps Yield Maps

7.1 Irrigation Differential System Decision Tree



8 Irrigation Target 2 - Training

Irrigation Target 2	Outcome
The irrigation manager(s) understands the relationship between the irrigation system, soil, and climate in order to achieve the irrigation management requirement (a)	***The auditor should seek to assure themselves that the irrigation manager(s) are sufficiently knowledgeable in their irrigation systems and supporting tools*** A. Training All irrigation manager(s) are trained to understand the property's irrigation system and its limitations B. Understanding All irrigation manager(s) can articulate reasons for steps taken to minimise risk of drainage by irrigation management zone

Example Questions	Example Reasons For	Typical Evidence
	Training	
How do you ensure all irrigation manager(s) can identify irrigation management zones and manage their specific risks to minimise drainage?	Irrigation manager(s) can identify irrigation management zones and describe how the differing risk factors are managed to minimise drainage. Irrigation manager(s) attend regular training on effective management of the farm's irrigation system. Clear communication between entire farm team involved with on the day-to-day operation (e.g., owners, managers, staff)	Irrigation management procedures and training records Irrigation training and development courses
	Understanding	
Describe how your irrigation system is efficient, targeted, strategic and accurate to minimise drainage and optimise capture of rainfall. Please explain your soil moisture trace, trigger and refill points and how you use it to minimise drainage from both irrigation and rainfall How is rainfall and PET data utilised to refine irrigation scheduling decisions to capture rainfall?	Irrigation manager(s) can clearly articulate the capability and limitations of their irrigation system and reasons for actions required to mitigate risk of drainage. Irrigation manager(s) have ownership over the property's irrigation system design and irrigation scheduling decision making processes Operator can demonstrate a clear understanding of the relationship between their soils PAW, their irrigation systems and related tools to optimise capture of rainfall.	Verbal conversation Demonstrating understanding Support provided from irrigation specialist

9 Nutrient Management Target 1 – Fertiliser Management

Nutrient Target 1	Outcome
To lower soil nitrogen surplus from higher risk land use activities and to reduce leaching of nitrogen, fertiliser is applied based on the variability of soils and crop health throughout the season both within paddocks and between paddocks	***The auditor should seek to assure themselves that N surplus is reduced by targeting fertiliser applications to address variability both between and within paddocks.*** A. Base Soil Fertility Soils have sufficient base fertility to optimise plant yield and existing nitrogen remaining in the soil is utilised where possible. B. Identification of Variability Property has assessed and identified sources of variability on their land. C. Targeted application Fertiliser applications are targeted to meet the need of a plant, and account for variability both within and between paddocks D. Adaptive management Plant growth and performance is monitored throughout the season, with fertiliser plans adapted in response to realised growth.

Example Questions	Example Reasons For	Typical Evidence
	Base Soil Fertility	
What are your fertility goals for the property? Can you step me through your nutrient management policy? (One or two paddock examples to ensure specifics are covered in limited time available) How do you identify potential pools of nitrogen within your soils which could be utilised by your crop throughout its growth season? What information did you use to feed into the fertiliser prescription of a particular crop? How do you identify nutrient deficiencies in your crop and what steps have your taken to rectify any issues?	All paddocks soil sampled at least once every two years or clear long-term data to provided support to a different regime. Base soil fertility within optimal range for all key macronutrients Fertiliser plans take into consideration crop requirements, and soil fertility, including mineralizable N. Fertility trends over time collated and identified Yield mapping data used to inform fertiliser prescriptions for following crop.	Paddock soil test results Mineralisable and/or Deep N test results Herbage test results Yield maps Quick N tests

Example Questions	Example Reasons For	Typical Evidence
	Soil N testing is completed for all crop paddocks. Soil N testing (Deep N, soil available N or mineralizable N soil tests) completed after all high N deposition crops. Herbage test completed when growth variance identified.	
Variability Identification		
How do you identify variability within and between paddocks on your property? What activities contribute to increasing or decreasing variability of nutrients within or between paddocks on your property?	Paddock variability is identified and reasons for variance understood. Grid or inter paddock soil sampling completed once every three years over the whole property. Property specific soils analysis completed by a suitably qualified professional to identify variability in water holding capacity and/or soil texture. Yield mapping data used to identify high and low performing areas on farm. Feed wedge utilised to identify paddock growth curves. Regular pasture walks completed to identify parts of paddocks performing differently to the rest. Able to demonstrate minimal variability on the property. Back fencing of stock to manage nutrient transfer within paddock.	Paddock scale soil fertility and/or herbage tests Satellite or drone imagery Paddock scale PAW assessment Paddock history Yield map EM map Soils map Identification of stock camps and low producing areas on farm. Understanding of stock behaviour within paddock Feed wedge or other pasture growth management tool.
Targeted Application		
How is variability in fertility within and between paddocks taken into consideration with your fertiliser plan? How is fertiliser applied to the land to match plant requirements? Do you have a variable nitrogen application policy? What systems do you have in place to manage this? Have you considered variable rate fertiliser?	Variable fertiliser routine is implemented on this property. Fertiliser applications are less than 100 kg N/ha or justifiable if more. Differential fertiliser application where known transfer of nutrients occurs within a paddock. Precision fertiliser application records support fertiliser planning requirements.	Paddock specific fertiliser applications Crop N use requirement calculations Variable rate fertiliser prescriptions Variable rate applications (not an average but a per ha application etc) N fertiliser benchmarking data

Example Questions	Example Reasons For	Typical Evidence
How do you adjust your fertiliser applications to taken into consideration stock camps and nutrient transfers within paddocks? Do you implement other techniques to avoid nutrient transfer by stock within your paddock?	Variable rate fertiliser is being used appropriately and plan is based on soil/herbage/paddock history and seasonal effects Paddock scale soil texture and/or fertility taken into consideration with for fertiliser inputs. N fertiliser applications are avoided or minimized on low or non-productive areas of the farm. N fertiliser applications are reduced on dryland corners of paddocks. Fertigation technology utilised on the property.	
Adaptive Management		
How do you monitor crop performance over a season? How do you adapt your fertiliser plans to account for seasonal variability? How do you adjust your fertiliser prescription in response to adverse events that impact yields, such as disease, frost or hail, drought etc?	Crop growth monitored and fertiliser regime adjusted to match actual progress. Forage health and growth sensor technology employed to monitor actual crop performance. Herbage tests completed to identify deficiencies throughout the season. Plans to adapt fertiliser plans when required and/or appropriate (I.e., season growth requires less N) Regular pasture monitoring is occurring on farm and information is being recorded and used to make relevant decisions for fertiliser. Fertiliser manager clearly able to articulate plans and strategy with the ability to adapt depending on the season.	Weather records – i.e., to explain extra fertiliser applications due to rain in December Satellite or drone imagery Supply and Demand Curves and management plan

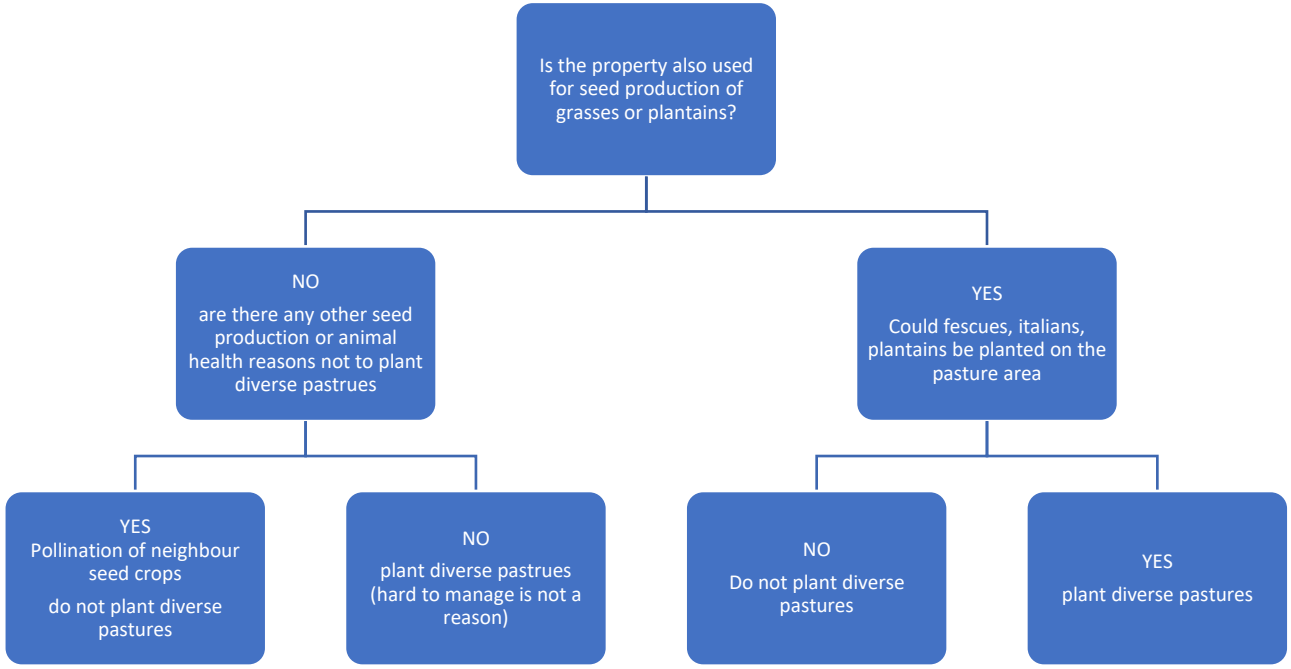
10 Nutrient Management Target 2 – N Surplus Reduction

Nutrient Target 2	Outcome
To improve N fertiliser utilisation, reduce soil nitrogen surplus and lower the risk of nitrogen leaching and increase nitrogen uptake from the soil by optimising pasture and crop growth.	***The auditor should seek to assure themselves that all suitable tools are implemented to improve plant uptake of nitrogen and reduce N surplus from livestock grazing and intensive winter grazing.*** A. Risk Assessment Property has completed a risk assessment to understand and quantify N brought into and removed from the system, how it is stored in the soil and when and how it is likely to be lost to the environment. B. Pasture or Crop N Uptake Optimised Pasture and crop is managed to optimise uptake of N from the soil. C. Applicable N Loss Mitigations Tools and techniques to minimise nitrogen surplus are implemented

Example Questions	Example Reasons For	Typical Evidence
Risk Assessment		
Has a risk assessment been undertaken to identify sources and timing of nitrogen loss from your farm system? What are the sources of N within your farm system? What are identified as N sources within your farm system and how are these managed? I.e clover	N loss risks are clearly identified	Demonstrated understanding of sources and timing of N loss from property. N Pool graphs from Overseer
Pasture or Crop N Uptake		
How do you predict future feed supply and demand – is nitrogen the answer or what are methods are you using to meet these surplus and deficits? How does your crop rotation optimise uptake of nitrogen from the soil? How are you managing your pastures to reduce N requirements for growth and flatten out your feed curve?	Feed grown to match demand. Is there a plan implement to address typical lows in pasture growth, i.e., diploids with a range of heading dates, tetraploid paddocks included in the rotation for winter growth	Animal Demand v Feed Demand curves for your system
N Loss Mitigations		

Example Questions	Example Reasons For	Typical Evidence
How do you manage available N in your soil to your advantage to produce product and minimise losses? How are you reducing demand for N in the high-risk seasons (Autumn)? Are you using catch crops and why/why not? (Cost benefit or neutral?) Are you using mixed swards and why? How do you maintain them? Can we use low N alternatives for feed? Does this fit into your system? why/why not? i.e., using maize silage Low N pastures (plantain?) Are you reducing N in the diet else were i.e., using low N supplements?	Actions taken which mitigate identified risks of N loss from the property. Dry off date brought forward to reduce autumn feed demand. Additional mitigations implemented when higher autumn/winter stocking rates on the property. Management plan to establish plantain in the pasture mix. Actions taken to ensure property weighted average of 5% plantain by content persist in pastures. Low protein feed introduced from Autumn Early culling to reduce feed demand in the autumn. Feed pads utilised to capture nitrogen in the high-risk times of the year. Diverse pastures available on the property. Crop rotation optimises uptake of surplus N from the soil.	Seed mix Diverse pastures visual assessment. Pasture regeneration plan Physical evidence that plantain is in both new and established pastures. Multiple season proof of your management plan (I.e., Culling guide, dry off management, MINDA records, culling sheets) N surplus benchmarking data Autumn grazing management plan

10.1 Recommended Diverse Pastures Applicability Decision Tree:



11 Point Source Target 1

Point Source	Outcome
Point source discharges from critical source area such as farm silage, offal pits, rubbish dumps, animal holding areas, soakholes, fuel and agrichemical storage, consumable waste and well head security are managed to prevent as much as practicable contaminants from entering ground or surface waters.	***The auditor should seek to assure themselves that point source contaminants are managed to prevent discharges of contaminants into surface or ground water.*** A. Waste Management Waste production is minimised or managed to reduce need to dispose of offal, rubbish, or other consumable waste on-farm. B. Farm Silage, and Animal Holding Areas[5] Run-off from farm silage and animal holding areas is managed to avoid contamination to surface or groundwater. C. Fuel and Agrichemical Storage Fuel and Agrichemical storage complies with regulatory requirements D. Soakholes Soakholes are located and managed to minimise drainage of unclean water. E. Well Head Security All wells on the property are secure and complies with regulatory requirements

Example Questions	Example Reasons For	Typical Evidence
	Waste Management	
How do you manage waste on farm and what do you do to try reducing waste? How do you manage your surplus calves to avoid them becoming a point source?	No rubbish dumps, offal holes or other on-farm waste disposal on the property. Consumable waste is managed to avoid burning or dumping on site. Consumable waste is recycled and/or removed from the property using a reputable service provider. Dead animals are composted on-site.	Farm dairy assessment or equivalent has passed. Quality assurance assessment Visual assessment Farm maps Waste removal invoices Mating plans demonstrating evidence of optimising value of all calves born on farm.

[5] As defined in the Canterbury Land and Water Regional Plan as: Means an area of land in which the construction of the holding area or stocking density precludes maintenance of pasture or vegetative groundcover and is used for confining livestock for more than 30 days in any 12-month period or for more than 10 consecutive 24 hour days at a time. For the avoidance of doubt, this definition includes milking platforms, feed pads, wintering pads, and farm raceways used for stock holding purposes during milking, but excludes sheep and cattle yards constructed on pasture or bare soil.

Example Questions	Example Reasons For	Typical Evidence
	Dead animals are removed from the property. All stock on farm going into a value chain where possible. Waste management complies with industry requirements.	Stock recs to animals born vs sold
Farm Silage and Animal Holding Areas		
How are animal holding areas and silage stacks constructed to avoid discharge of contaminants into the ground or run-off to surface water?	All animal holding areas and silage stacks are constructed to collect run-off and avoid discharge to ground- or surface water.	Visual Assessment
Fuel and Agrichemical Storage		
How/are Agrichemicals and liquid fertilizer and fuel stored on property? Is it possible for contaminants to come from the storage of these things? Do you have an emergency management plan in case of major contaminant event?	Fuel and agrichemical storage facilities, including for liquid fertiliser, comply with regulatory requirements Emergency management plan in place in case of spill. Fuel and chemical storage areas are located more than 50 m from a watercourse Fuel and chemical storage areas are sealed to avoid contamination to groundwater	Farm dairy assessment or equivalent has passed. Quality assurance assessment Chemical handling certificate Visual assessment Emergency management plan
Soakholes		
Do you have any soakholes? Where do they drain and how do you mitigate contaminants getting into them? What do you do with problem areas that regularly or permanently collect water?	No soakholes located on the property Soakholes only drain clean stormwater from buildings. Water from races, paddocks or other high-risk areas of contamination is treated prior to drainage into a soakhole. Wet land surrounding soakholes is fenced off to prevent stock access. Vegetation planted in areas which collect run-off from tracks and paddocks. Farm tracks and hard stand areas are constructed to avoid artificial ponding of stormwater.	Visual assessment Farm map Planting plan
Wellhead Security		
Do you have bores/wells on farm – how are they protected from contaminants? What actions have you undertaken to cap unused bores on the property?	All bores on the property comply with regulatory requirements. All bores located on the property are registered with ECan All unused bores are capped	Well head assessment Compliance Monitoring Report Visual Assessment

Example Questions	Example Reasons For	Typical Evidence
	All bores in use have a robust collar, surrounded by a concrete pad and located to avoid contamination from entering the well.	

12 Relevant Documents

Document
Resource Consent CRC185857
Resource consent CRC211511
MHV Water Environmental Management Strategy
EMSNM – 004 The Matrix
EMSFEP – 002 Audit Process
Industry-agreed Good Management Practices relating to water quality
Everest, M. *Hinds Catchment Nutrient and On-Farm Economic Modelling*, Technical Report No R13/109 (2013)
Irrigation Guidance for FEP Auditors (June 2021) prepared by Environment Canterbury
Canterbury Certified Farm Environment Plan Auditor Manual May 2020

13 Document Management Control

Version	Date Reviewed	Purpose / Amendments	Section Reviewed	Reviewer	Status
1.0	May 2022	Development of EMSNM - 005	All	Eva Harris	FINAL DRAFT
1.0	May 2022		All	Mel Brooks	Approved

Appendix 1: Advanced Mitigation Origins

Advanced Mitigation (AM) 1, 2 and 3 was developed by Mark Everest on behalf of Environment Canterbury to understand the economic impact of implementation of different practices to achieve different water quality outcomes in the Plan Change 2 (PC2) area[6]. Advanced Mitigation 1 was the scenario where the implemented practices were beyond Good Practice, but still remained cost-neutral or beneficial to a typical farm in the Hekeao/Hinds catchment. The nutrient losses from these scenarios were calculated using representative Overseer nutrient budgets and fed into groundwater models to establish the necessary N reduction targets in the PC2 area. The final outcome of PC2 anticipated adoption of Advanced Mitigation 1 practices to achieve 2030 N reductions targets and Advanced Mitigation 2 for all dairy farms to achieve the 2035 water quality targets.

The practices described as AM1 as part of the solutions package include:

- Installation of soil moisture monitoring gear and VRI on existing centre pivots.
- No May urea applications.
- Adjust cropping fertiliser rates and types to best suit plant requirements and timings.
- Use of yield maps to define an assumed 10% of the paddock which only yields half of the paddock average
- Use variable rate fertiliser technology
- Limit each urea application to 140 kg N/ha
- Variable Rate Fertiliser
- Gibberellic Acid to substitute some Spring and Autumn Nitrogen on Pastures
- Nitrification Inhibitor use combined with nitrogen based fertiliser reductions to match.
- Mixed Pasture Sward.
- Short Rotation Ryegrass and White Clover Pasture.
- Modify existing centre pivot irrigators to Variable Rate Irrigation technology on 90% of area
- Optimise stocking rates.

The AM1 nutrient budgets used for the PC2 limit-setting process have been used in The Matrix and formed part of the equivalence approval. Changes to these nutrient budgets for The Matrix will first need approval from ECan.

Key points to note about the history of AM1:

- Based on *typical* farm systems located in the Hekeao/Hinds catchment
- AM practices target key water quality issues identified in the Hekeao/Hinds sub-regional process
- AM intended to be cost-neutral or beneficial to *a typical farm* in the Hekeao/Hinds catchment
- AM nutrient budgets form part of the Matrix equivalence approval
- All schemes used the AM narrative above in the consent process

AM may change and evolve over time, but at the date of this report, the practices that described within this summary are represented by the Advanced Mitigation Overseer Nutrient Budget files used in The Matrix.

[6] Everest, M. *Hinds Catchment Nutrient and On-Farm Economic Modelling*, Technical Report No R13/109 https://api.ecan.govt.nz/TrimPublicAPI/documents/download/1991180 (2013)