

Farm Environmental Management Plan: Grays Hills Station

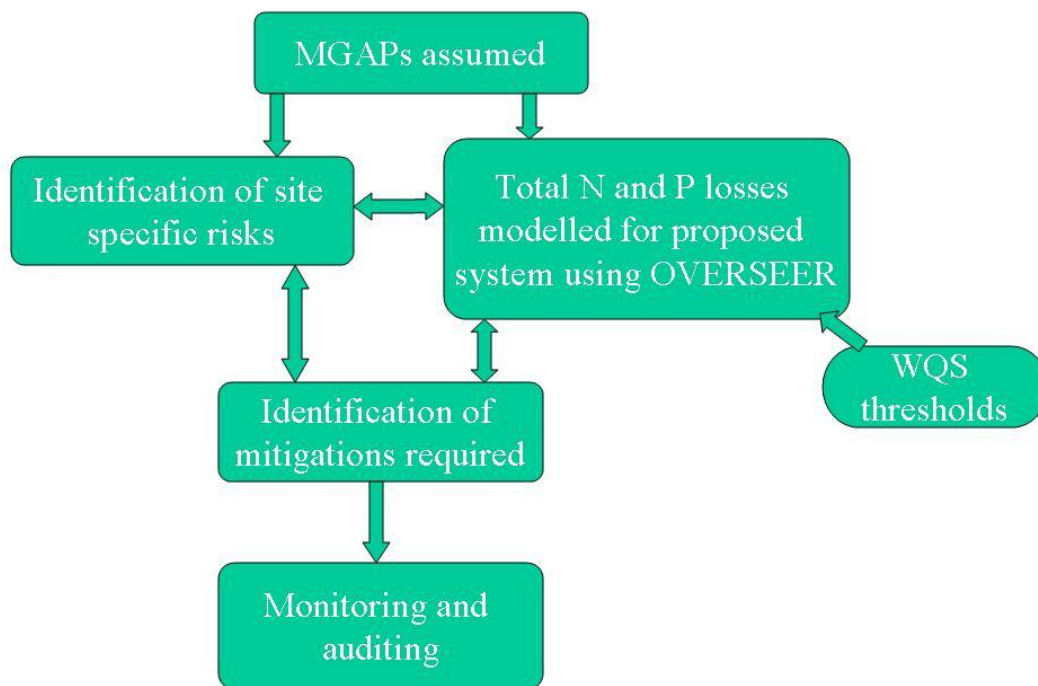
1. Introduction

The Water Quality Study ('WQS') funded by Mackenzie Water Research Limited ('MWRL'), found that the additional irrigation proposed in the catchment could take place without significant adverse effects on the environment providing that nutrient reduction occurred on the farms.

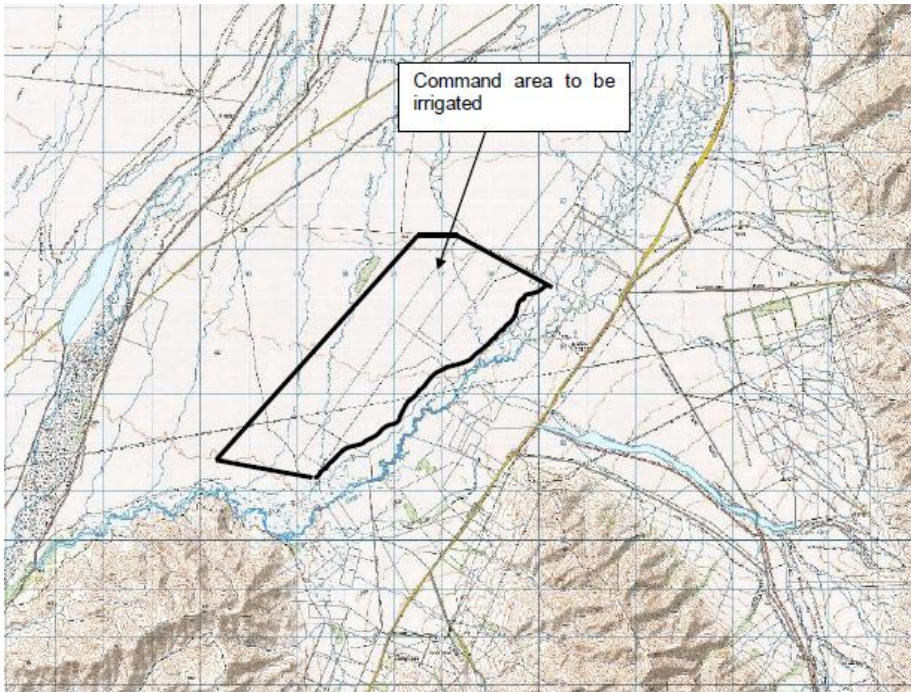
The process that was advocated for ensuring this on-farm nutrient reduction was through Farm Environmental Management Planning. A clear process for building a Farm Environmental Management Plan (FEMP) was laid out in the Water Quality Study and has been followed here. An overview schematic of the process of building a FEMP is shown in Figure 1.

The responsibility of the implementation, monitoring and auditing of the plan lies with the **farmer**.

Figure 1: Overview schematic of the process to build a Farm Environmental Management Plan



MGAP – Mandatory good agricultural practices



Map B: Proposed irrigation development

Table 1. Cover utilisation by season and stock class for current system

		Cover utilisation by season and stock class - CURRENT			
Class of stock		Spring	Summer	Autumn	Winter
Ewes	6300	Grass flats	Oversewn hill	Native	Oversewn hill
Hoggets	3700	Grass flats	Grass flats	Oversewn hill	Oversewn hill
Wethers	4000	Grass flats	Native	Native	Native
R1 Steers	20	Grass flats	Grass flats	Grass flats	Ryecorn
R1 Heifers	80	Grass flats	Grass flats	Grass flats	Ryecorn
Beef Cows	280	Native	Grass paddocks	Native	Native

Sheep = 12357 su

Cattle = 2972 su

2.2 Proposed farming system

The new development will mostly be for strategic feeding of breeding stock in the summer / autumn period, with the majority of the animals returning to the home block for the winter / spring period. The new irrigation will run mainly merino ewes and lambs but also some beef breeding cows and replacement heifers. Additional beef steers and merino wethers will also be run to enhance pasture performance, improve cash flow / profitability and give additional market options. The core farming business will essentially stay the same although 30% bigger but the overall sustainability will improve and the marketing of product will become a lot more assured. The risk to drought, extended dry periods

will be diminished but not dismissed so the farming system will be a lot more stable. The 30% growth will enable greater efficiencies without too many additions to our existing system.

Table 2. Cover utilisation by season and stock class for proposed system

	Cover utilisation by season and stock class – PROPOSED			
Class of stock	Spring	Summer	Autumn	Winter
Ewes 7500	Grass flats and ryecorn	Oversewn hill and irrigation	Native and irrigation	Oversewn hill
Hoggets 5100	Grass flats and ryecorn	Grass flats and irrigation	Irrigation and Oversewn hill	Oversewn hill
Wethers 4700	Grass flats	Native	Native and irrigation	Native
R1 Steers 140	Grass flats and ryecorn	Grass flats and irrigation	Grass flats and irrigation	Ryecorn
R1 Heifers 100	Grass flats and ryecorn	Irrigation and grass flats	Irrigation and grass flats	Ryecorn and grass flats
R2 Steers 50	Ryecorn	Irrigation and native	Irrigation	

The main plant species will be lucerne, 2/3 area with 1/3 area in ryegrass or ryecorn type, the rotation of pastures should therefore be extended out to 10 years. The lucerne also gives the additional option of hay, bailage, or seed should the growth get ahead. The grass based paddocks will be controlled by the stock but may need a bailage option if required, this is not intended.

2.3 Soils

In general the soils in this area are very light and easily eroded by wind, thus cropping large areas of land, in its current state, has to be undertaken with extreme care. It also means that this area is under constant threat from weed and pest species. One such pest species is rabbits, which can cause significant destruction of pasture. When pasture destruction is combined with regular nor-west winds, significant soil erosion can result. This means that this area really needs to be looked after or it will continue to erode.



Photo A: Soils on site

2.4 Topography

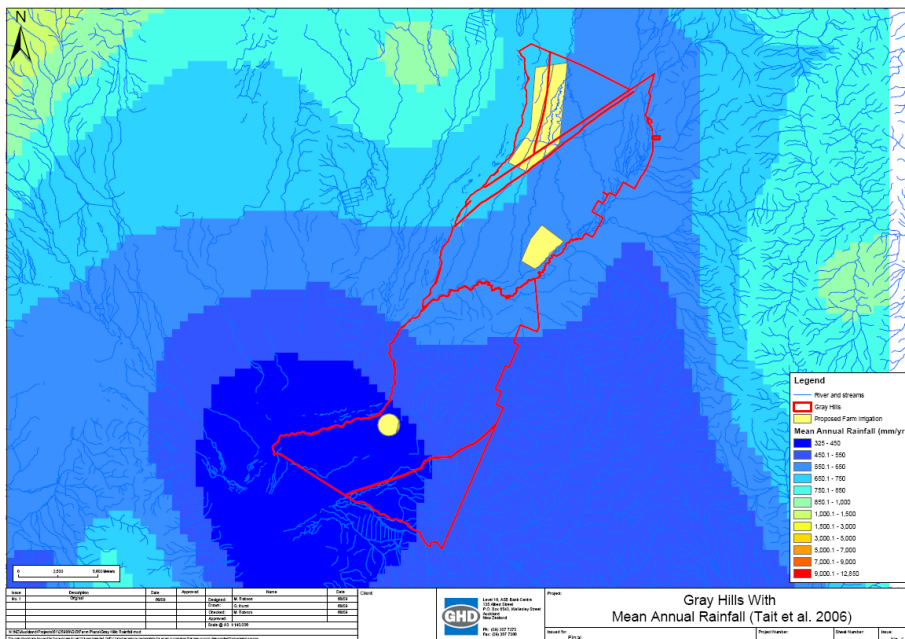
The topography of the site can be described as a mixture of river flats and steep hill country. As shown in the photo above.

2.5 Climate

Typical annual rainfall = 400 – 425 mm

Snow: some every year falls mostly late May – August

Temperature = Very hot summers and very cold winters (+ 35 degrees in summer, - 20 degrees in winter) usually about 120 days of frost (Apr - Oct)

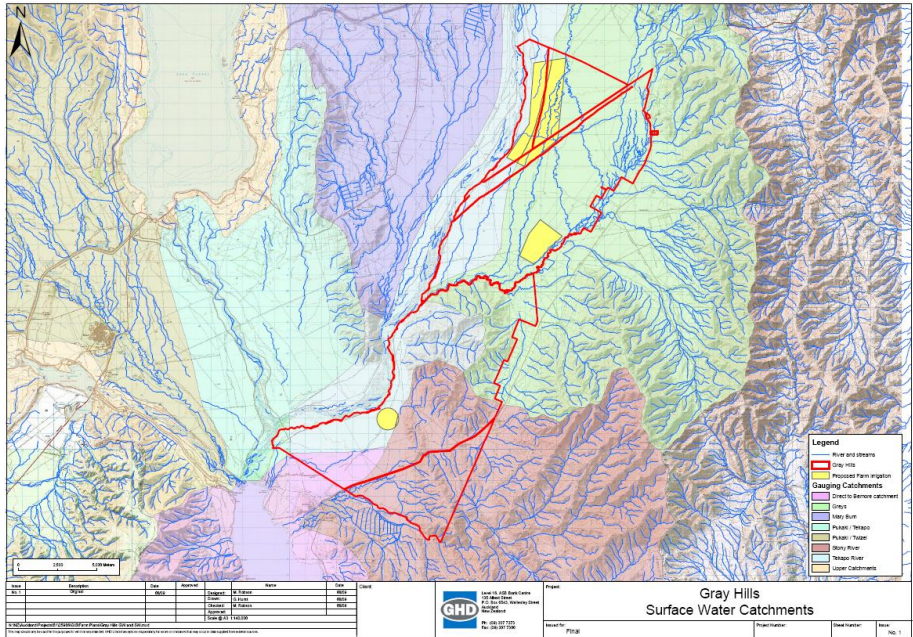


Map C: Mean Annual Rainfall

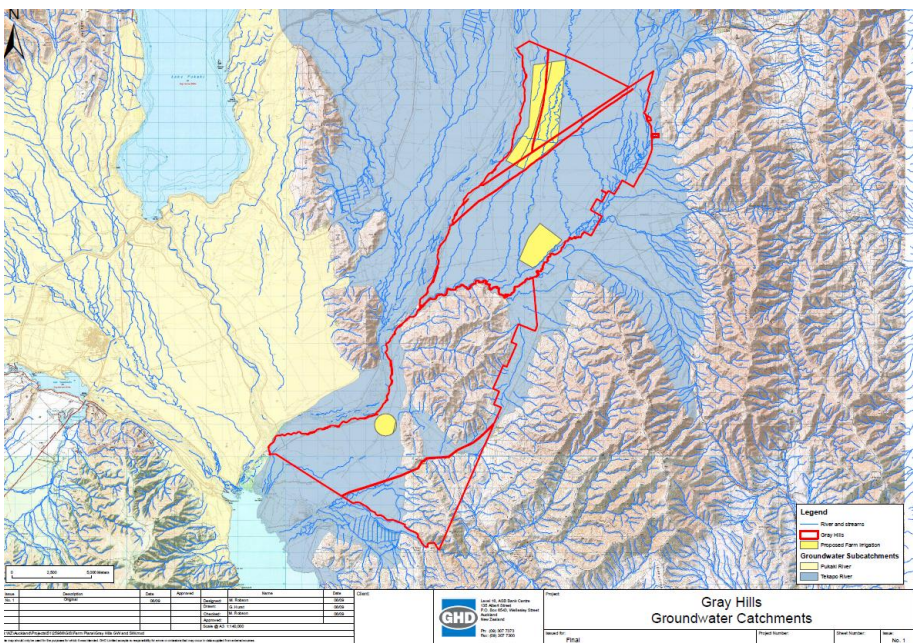
3. Environmental Context

The environmental context of the farm is a reference both to local and wider receiving environments.

Below are maps that show the receiving environments of Gray Hills.



Map D: Surface water receiving environment



Map E: Groundwater receiving environment

3.1 Water Quality Study receiving environments and mitigation requirements

Gray Hills, according to the WQS, lies in the Tekapo River groundwater catchments and direct to Lake Benmore, Grays, Tekapo and Stony River surface water catchments. These maps are shown above.

Table 3 shows the calculated nutrient mitigation requirement of the receiving environments determined in the WQS and the resulting thresholds for N and P for Gray Hills.

For this farm, the Lake Benmore mitigation requirements are the most stringent. These mitigation requirements cap Gray Hills Station's nutrient discharges at 64,114 kg N per annum and 1,374 kg P per annum.

3.2 Local receiving environments

The proposed new irrigation developments receiving environment will be the Grays River. The existing irrigation areas receiving environment will be the Tekapo River

Table 3. Water Quality Study mitigation requirements for Gray Hills

	Stream mitigation required for periphyton kg/ha irrigated land	Secondary Stream mitigation required for periphyton kg/ha irrigated land	Stream mitigation required for ANZECC kg/ha irrigated land	Secondary Stream mitigation required for ANZECC kg/ha irrigated land	GWR mitigation required kg/ha irrigated land	Lake Mitigation required kg/ha irrigated land
Grays Hills						
N	0	0	0	0	0	0
P	0.10	0	0	0	0	0

4. Farm Environmental Management Plan development

4.1 Stage 1 – Mandatory good agricultural practices

The table below shows the mandatory good agricultural practices that will be adopted. These include the base assumptions of OVERSEER and therefore help validate the use of the model on the farm.

Table 4. Mandatory good agricultural practices

Mandatory good agricultural practices	What these practices mean on farm
Fertilisers applied according to code of practice for fertiliser use	The fertiliser users' code of practice aims to ensure that where fertilisers are used that they are used safely, responsibly and effectively and in a way that avoids, remedies or mitigates any adverse environmental effects. The code of practice includes guidance on fertiliser use, application, storage, transport, handling and disposal.
Use a fertiliser recommendation system (nutrient budget) and account for all sources of nutrients including applied effluents and soil reservoirs accounted for	<p>Planning fertiliser applications to all crops, determining crop requirement and accounting for soil nutrients and organic nutrient supplies, all reduce the risks of applying excessive fertiliser above the crop requirement. This maximises the economic return from the use of fertilisers and reduces the risk of causing nutrient pollution of the environment</p> <p>Accounting for all sources of nutrients including imported sources and soil reservoirs is an important management measure in all farming systems and become especially important on farms where manure is produced and applied to the land. The re-application of organic manures to land is often thought of as a disposal of a waste product, and the available nutrients within the organic manures are not accounted for. The use of an integrated nutrient budgeting tool such as OVERSEER automatically accounts for nutrients supplied in organic manures.</p>
Fertiliser application applied evenly	The even application of fertiliser is an assumption of the OVERSEER model as included in the fertiliser code of practice. Fertiliser spreaders should be tested and calibrated in-house at least annually and every 5 years by an independent auditor.
Irrigation and effluent applied evenly	The even application of water and or effluent is an assumption of the OVERSEER model. Irrigators should be tested and calibrated in-house at least annually and then every 5 years in accordance with the code of practice for irrigation evaluation by a qualified irrigation auditor.
Crop, cultivation, nutrient inputs and yield records kept per farm management unit	<p>Maintaining good crop input records is important for:</p> <ul style="list-style-type: none"> • The calculation of cumulative annual organic fertiliser applications and also their contribution to long term nutrient supply; • The prediction of realistic crop yields that are used to determine crop requirements; • Providing accurate inputs to the OVERSEER nutrient

Mandatory good agricultural practices	What these practices mean on farm
	budgeting model that is being used here as a proxy for measuring diffuse nutrient losses.
Good design of irrigation systems	Design will match soil properties and low application amounts on shallower soil to prevent summer drainage.
Robust irrigation scheduling	Good irrigation scheduling to prevent summer drainage.
Supplement and feeding out management	To be addressed in the Farm Environmental Risk Assessment.
Winter grazing management	To be addressed in the Farm Environmental Risk Assessment.

4.2 Stage 2 – OVERSEER and meeting WQS mitigation requirements

The WQS thresholds set for Gray Hills, using the most stringent nutrient mitigation requirement, are 64,114 kg N/year and 1,374 kg P/year. The table below shows the output from OVERSEER for the modelled proposed farming system at Gray Hills. The results illustrate that the proposed farm system losses as modelled by OVERSEER are within the thresholds set out by the WQS. Management or mitigation strategies that have been used to meet this threshold are detailed in Section 5.

Table 5. Total N and P losses modelled by OVERSEER for the proposed farming system on Gray Hills and WQS thresholds

	OVERSEER modelling outputs kg/year	WQS threshold kg/year
Total N leaching/runoff	50,649	64,114
Total P leaching/runoff	1,162	1,374

4.3 Stage 3 – Identification and mitigation of site specific environmental risks

4.3 Farm Environmental Risk Assessment

- 4.3.1 No tracks on the farm are constantly used (twice daily) that are not culverted or bridged
- 4.3.2 No tracks on the property (that I was made aware of) had a direct runoff into a nearby water course, with the closest stream being approximately 20 meters from the track
- 4.3.3 The tracks out to the proposed irrigation area are built up and fenced, these tracks are used for shifting stock, and stick to the driest areas possible.
- 4.3.4 The main streams on the property (Grays River) are culverted and bridged in areas where stock are shifted across, the stock may enter the water way via a gate immediately upstream or downstream of the bridge. This is only in times when there are too large numbers for the bridge to handle.
- 4.3.5 There are small streams flowing through areas of green feed that are unfenced, allowing stock access (photo; Grays Hills-Evidence of an unfenced area of stream with little stock induced erosion). In these areas of green feed there can be up to 300 cattle rarely, more often around 80, but mainly sheep. The stock are not behind a wire so are not concentrated to one area.

- 4.3.6 No evidence on the property of previous runoff and soil wash
- 4.3.7 No silage pits located on the property, with all bailage being used
- 4.3.8 Stock can access the streams and the Grays River in areas, but in these areas there is a limited number of stock for a large area. In the areas where stock tends to be concentrated along the Grays River and swampy ground, these areas are fully fenced off, not allowing stock access (photo: Grays Hills-Swamp semi fenced off, with half pond allowed for stock water). The areas of most importance throughout the swamp and river are fenced.
- 4.3.9 The centre pivot that currently exists is ring fenced, and the proposed pivot/pivots will be ring fenced, this not allowing the stock to freely access the nearby streams. The irrigation is nowhere near any permanent water courses.
- 4.3.10 There are troughs located within the existing pivot, and the applicant will likely put troughs in the proposed area.
- 4.3.11 If spraying out paddocks a contractor is used
- 4.3.12 No border dykes on the property
- 4.3.13 Very little evidence of any bank side erosion in large waterways, majority of erosion in the larger waterways appears to be due to high water flows
- 4.3.14 If renewing a paddock of pasture, direct drilling is the preferred practice, but if the area has not been broken in for a substantial period of time it is ploughed and fallowed to allow for braking in of the soil.
- 4.3.15 Very little winter crop on the farm as bailage is mainly used to feed over the winter. If paddock is used for more intensive grazing over winter it will be re-drilled over the spring, (taking up any possible nutrients). Oats and Rye corn are used to break in new ground, these are alternated every year.
- 4.3.16 Soils are not left bare over the winter if possible.
- 4.3.17 There is no real immediate concern for any runoff from these winter grazed areas entering a waterway, as the nearest waterway is approximately (varies in areas) 300 meters away.
- 4.3.18 All the sets of yards on the property are located a great distance from any waterway, with the runoff being evaporated.
- 4.3.19 No problem from compacted soils.
- 4.3.20 Current pest control practices in place are; night shooting for rabbits, can poison again if rabbits begin to get bad again (avoid if possible), rabbit netting is evident throughout the majority of the farm, with around 200 kilometres over the whole farm. Spot spraying for gorse and broom is also in place.
- 4.3.21 Fertilisers used over the property are; majority urea, with 50 units of Nitrogen being used this year (usually 80), Lime and sulphur are also used at times. The proposed area (1500Hectares) hasn't had any fertilizer in around three years. On the property there is a more targeted fertilizer plan, with certain paddocks of interest getting the attention, there is a rotation of paddocks that receive fertiliser.

4.4 General issues on extensive high country farming systems

In extensive high country farming systems there are a number of issues that on more intensive farming systems would be assessed as being a risk to water quality but on extensive high country farming systems they have not been defined as a risk due to the extensive nature of the farming systems and the lower stocking rate per hectare. Some of these general issues have been identified below:

1. There will be areas within the farming system where tracks will cross waterways; these are tracks that are used irregularly, in extensive areas of the farm.
2. There are also areas within a high country farming system where stock will have unrestricted access to streams for crossings and stock water. This is an essential access for stock movement and stock water. On most farms there are a number of small creeks/streams that flow within the hill country and it would be logistically impossible to place stock crossings on all of these. There is also the need for stock to move across streams/creeks within a block (paddock) for grazing access. A reticulated water system would be unsustainable in the hill country as troughs would freeze solid in the winter months, preventing access to fresh drinking water.

3. Swamps/heavy grounds are an integral area in a high country farming system; they provide a water source and good grazing for stock in dry years. In undertaking the FERA it has been identified that all swamps/heavy ground need to be monitored to ensure that bank erosion, compaction and pugging does not occur.
4. Wind erosion is a significant issue in the upper Waitaki Catchment. The sparse vegetation on large areas of land in the Mackenzie Basin gives little protection to the shallow, friable soils which continue to be eroded by frost heave and westerly winds. A mean soil loss of 0.22 mm/year or 2.2 tonnes of soil lost per hectare across a number of sites within the Mackenzie Basin has been reported. While it cannot be assumed from this information that erosion rates will continue at this level in the future, the results do confirm a strong relationship between the percentage of vegetation cover and erosion risk. The problem of bare ground and exposure to wind erosion has been compounded since the early 1990s by the rapid spread of hieracium particularly on the poorest soils. One of the most significant impacts of further irrigation in this area would be a reduction in the amount of bare ground and corresponding reduction in wind erosion risk. (*Environmental, Economic and social impacts of irrigation in the Mackenzie Basin. Ministry for the Environment, February 2005.*)
5. Monitoring and identification of any problems arising for the above three issues has been included in Table 8.

5 Farm Environmental Management Plan for Grays Hills

5.1.1 Mitigation measures and management options adopted on Gray Hills

The table below shows the all the mitigation and management tools that are proposed to be undertaken on Gray Hills. Measures indicated as **FEMP stage 1 are those identified as Mandatory Good Agricultural Practice**, measures identified as **FEMP stage 2 are those changes that have been modelled in OVERSEER to meet the WQS mitigation requirement (if required)**, and those indicated as **FEMP stage 3 are mitigation measures chosen to ameliorate site specific environmental risks on the farm.**

Table 6. Table of mitigation options, monitoring and auditing for Gray Hills

FEMP stage	Measure	Monitoring	Auditing
1	Fertilisers applied according to code of practice for fertiliser use		Self certification
1	Accounting for all sources of nutrients including applied effluents and soil reservoirs	Soil and effluent testing and cumulative effluent inputs per management unit	Reconciliation of fertiliser, effluent and soil records with nutrient budget for example blocks. Submission of examples soil and effluent tests
1	Even fertiliser application	Calibrate and optimise fertiliser spreaders annually and every 5 years by an external auditor	Submission of testing and calibration
1	Even irrigation and effluent application	Calibrate and optimise irrigators annually in house and every 5 years by an external auditor	Submission of testing and calibration
1	Record crop, cultivation, nutrient inputs and yields per farm management unit	Upkeep of records	Submission of example block records
1	Good design of irrigation systems	Design of irrigation system by a certified professional	Irrigation system audited by a certified auditor every 5 years
1	Robust irrigation scheduling	Calculation of annual % effective water use	Submission of annual % effective water use
2	e.g. No winter application of fertiliser	Field records	Signed field records
2	N fertiliser applications split to under 50 kg N/application	Field records	Signed field records
2	No P fertiliser within three weeks of irrigation	Field records	Signed field records
2	Olsen P of below 30 maintained	Regular soil testing (every 3 years)	Submission of soil tests
3	Fence off any streams that may run through any green feed areas, if stock are not in these paddocks for large periods of the year then a temporary fence will be adequate	Photo and staff	Annual auditing visits and report
3	Fence off the Grays River as much as possible to restrict stock access to the river	Photos and annual survey of the erosion and compaction	Annual auditing visit until the fencing is complete

FEMP stage	Measure	Monitoring	Auditing
3	20 metre layback from any water way when applying fertiliser by land based application e.g. bulk spreader	Field Records	Annual auditing report
3	Maintain a 5-11 metre irrigation buffer from any water ways (Grays River)	Photos	Annual auditing visits
3	Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin as detailed in map below/	Water quality monitoring continued quarterly, and photos in the audit report	Annual audit report and visit
3	Upgrade areas of the track leading to the proposed irrigation area that is not up to a sufficient standard. The track should not have any runoff into the swampy area, and in places it may need to be built up more if larger numbers of stock will be accessing the area	Photos in the report	Annual auditing report and visit



Area along a small stream leading into the swamp that is not fenced, notice the erosion from stock



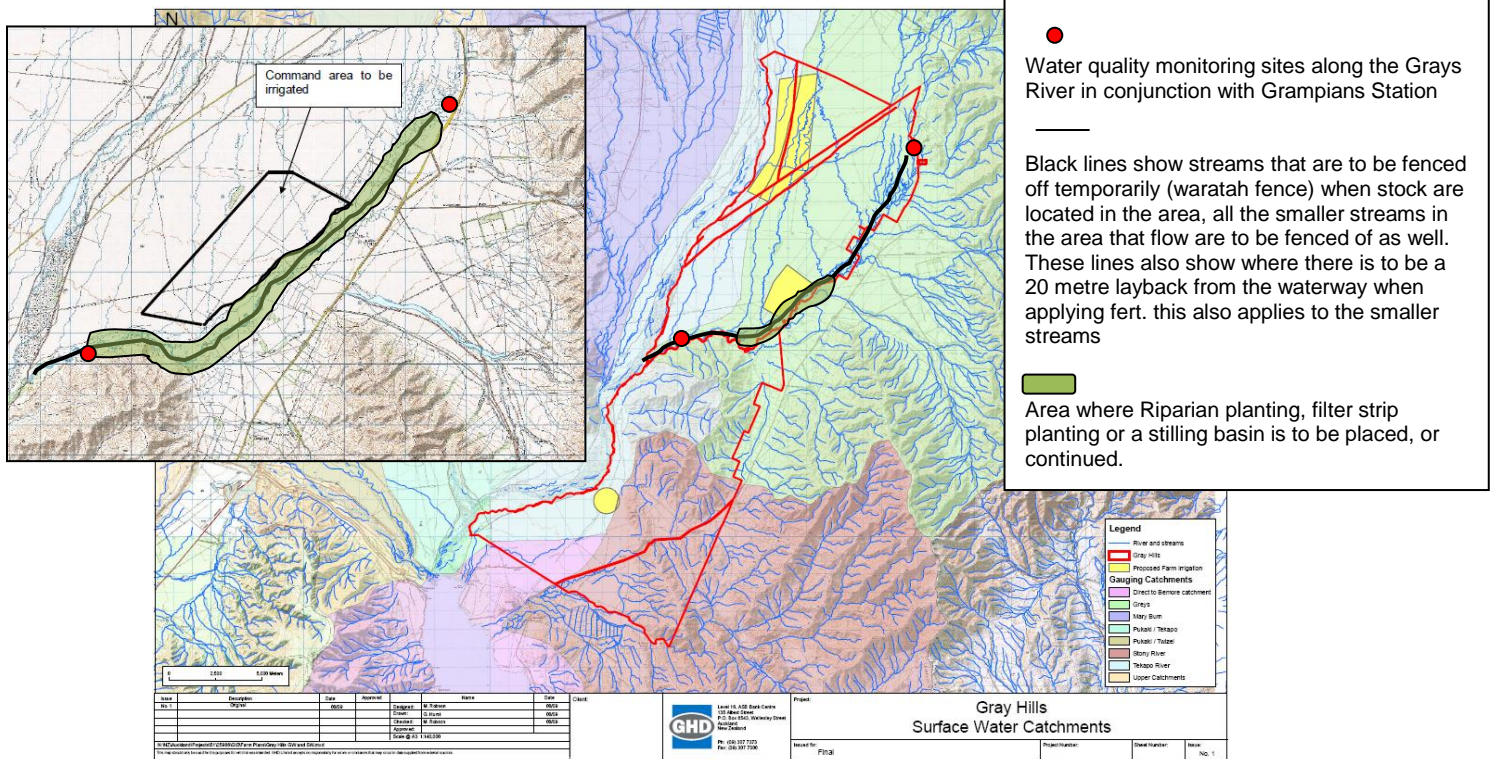
Culvert over stream but the stream is not fenced so stock have access, not a lot of erosion evident though



Area of swamp that is not fenced to allow stock to have access for drinking, small amount of erosion was evident



Same area of swamp that is unfenced



5.2 Monitoring and Auditing

5.2.1 Baseline monitoring

Baseline monitoring is already underway on Gray Hill

Table 7. Baseline monitoring on Gray Hills

		Location	Frequency	Measured parameters to include
Soil	Soil nutrient testing	Some strategic blocks in rotation	1 in 5 years	Standard suite of soil nutrients
Pasture	Ground cover and species	All blocks	Annually	% Ground cover, species

5.2.2 On-going monitoring

On going monitoring and auditing of FEMP are as important as the plan itself.

Table 7 above shows the monitoring suggested for the mitigation and management options chosen for Gray Hills and Table 8 below shows the frequency and parameters for the monitoring. The triggers and contingency plans will be finalised in consultation with farm consultants once the FERA has been completed and all the mitigation measures identified.

Additional monitoring will be carried out on a sub-catchment basis on the Gray River.

Table 8. Example monitoring plan for Gray Hills showing location, frequency and parameters for monitoring

		Location	Frequency	Measured parameters to include	Triggers	Contingency plan if triggers are exceeded
Soil	To include: Soil nutrient testing	All irrigation paddocks and intensive	1 in 3 years for soil nutrient	Standard suite of soil nutrients	Olsen P >30	Reduce or stop the application of P fertiliser

		Location	Frequency	Measured parameters to include	Triggers	Contingency plan if triggers are exceeded
		areas in rotation	status			to the area and monitor
Soil	Soil compaction testing	All irrigation blocks in rotation	Annually for soil compaction testing.	Soil compaction	Compaction, surface capping	Remove compaction with the appropriate tool
Runoff	Wet weather survey	All blocks and tracks	Annually	Runoff	Runoff occurring	Introduce runoff removal infrastructure where appropriate.
Water	Surface water quality	Exact locations to be confirmed but will be on the Grays River, one site before the river enters the neighbouring property and then prior to the confluence with the Tekapo River	Quarterly to be consistent with ECAN for the first 5 years and then reviewed	Total Nitrogen, nitrate, ammonia, total Kjeldahl nitrogen, total phosphorus, dissolved reactive phosphorus, suspended solids.	No significant decrease in water quality	If comparative surface water analysis indicates a decrease in surface water quality then the particular contaminant should be identified while a full root cause analysis is undertaken
Water	Irrigation application	Irrigation area	Annually in house and 1 in 5 years by an independent	Application uniformity	>80 %	Optimisation of the irrigator performance will be performed at the time of testing
Tracks that cross waterways	Visual assessment of bank/track erosion	All tracks that cross creek/stream within extensively farmed areas	Annually	Visual assessment of bank/stream erosion caused by vehicle crossing or stock	Any sign of extensive visual erosion	Restrict vehicle and stock access until an assessment of the damage and cause can be made
Fertiliser	Fertiliser application	All Farm	Annually in house and 1 in 5 years by an independent	Application uniformity	>80 %	Optimisation of the spreader performance will be performed at the time of testing
Weed and pest pressures	Weed and pest populations	Relevant blocks	Annually	% or magnitude of infestation	ECAN monitor and communicate if their triggers have been exceeded	Legislative compliance with notice of direction issued by ECAN

Where triggers are exceeded, the immediate contingency plans in Table 9 should be implemented while a 'root cause' analysis is carried out. Any further mitigation measures to be adopted as a result of monitoring should be added to Tables 7, 8 and 9.

1) Is the current mitigation option implemented correctly?

No – Implement and monitor

Yes – to 2)

2) Has anything changed in the farm system?

Yes – remodel and monitor

No – to 3)

3) Have there been abnormal conditions at the time of trigger breach?

Yes – continue monitoring to see if trigger breach continues

No – Seek advice if suitably qualified person to investigate root cause and suggest appropriate mitigation.

If emergency conditions occur that risk a pollution event, such as a catastrophic failure of the irrigation system that is resulting in overland flow to a watercourse, seek immediate guidance from you regional council:

Environment Canterbury 0800 76 55 88

5.2.3 Auditing

The auditing process allows both the farm operator to illustrate, and other interested parties to have confidence that the management practices and mitigations planned for the farm are being implemented. In addition, the audit shows that there is a mechanism for the adaptive management of the property should the chosen mitigation or management not perform to expectations.

An annual audit is proposed, and requires both external and in-house input. The annual audit should be completed and submitted to ECan by end of July each year.

The audit measures and actions in case of non-compliance will be finalised once the FERA is completed. Those pertaining to FEMP stages 1 and 2 are included here.

Table 9 below shows an example of an annual audit report for Gray Hills.

Table 9. Table showing proposed contents of an annual audit report for Gray Hills

Mitigation Measure	Audit Measures	Action in case of non compliance
	Annual audit of OVERSEER nutrient budget and report based on previous 3 years. Submission of compliance with thresholds	Should the OVERSEER report show losses exceeding the threshold, further mitigations should be adopted to effect a reduction in nutrient loss to below thresholds.
	Submission and brief interpretation of water quality analysis	Where triggers have been exceeded, immediate contingency plans should have been carried out and a root cause analysis conducted. The results of which should be presented here.
	Submission and brief of annual wet weather survey	Any remedial actions proposed after the annual survey should be undertaken.
	Submission and brief of annual tracks that cross waterways survey	Any remedial actions proposed after the annual survey should be undertaken
	Submission and brief of annual compaction survey of the irrigation area	Any remedial actions proposed after the annual survey should be undertaken
	Annual pest and weed survey undertaken by Ecan should be submitted	Legislative compliance

Even irrigation application	Calibrate and optimise irrigators annually in house and every 5 years by an external auditor	Submission of testing and calibration
Record crop, cultivation, nutrient inputs and yields per farm management unit	Verification of records	If records have not been produced then this should be rectified for next audit
Good design of irrigation systems by a certified professional and audited every 5 years	Irrigation system audited by a certified auditor every 5 years and any changes recommended should be implemented	If changes recommended not implemented then this should be rectified by next audit
Robust irrigation scheduling	Verification of records	If records not received then this should be rectified by next audit
No June/July application of fertiliser on the irrigated area	Field records	If records not received this should be rectified for next audit.
N fertiliser applications split to under 50 kg N/application	Field records	If records not received this should be rectified for next audit
No P fertiliser within three weeks of irrigation	Field records	If records not received this should be rectified for next audit
Olsen P of below 30 maintained	Submission and brief interpretation of soil test results	Where triggers have been exceeded, immediate contingency plans should have been carried out and a root cause analysis conducted. The results of which should be presented here.
Fence off any streams that may run through any green feed areas, if stock are not in these paddocks for large periods of the year then a temporary fence will be adequate	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
Fence off the Grays River as much as possible to restrict stock access to the river	Check fenced area is present. Photos	Areas of fencing damage should be repaired.
20 metre layback from any water way when applying fertiliser by land based application e.g. bulk spreader	Field records and maps	If maps not received with annual audit this should be rectified by the next audit.
Maintain a 5-11 metre irrigation buffer from any water ways (Grays River)	Check setback area is present. Photos	Areas of less than 5m setback should be extended to ensure the minimum is 5m.
Either plant a riparian margin, a filtration zone, or look at putting in a stilling basin as detailed in the map above in section 5.1.1	Water quality monitoring continued quarterly, and photos in the audit report	Areas of riparian vegetation failure or damage should be replaced prior to the next audit. Settling ponds should be constructed and in use before next audit
Upgrade areas of the track leading to the proposed irrigation area that is not up to a sufficient standard. The track should not have any runoff into the swampy area, and in places it may need to be built up more if larger numbers of stock will be accessing the area	Photos	Areas of track damage should be rectified prior to the next audit

6 Summary

This FEMP has been written to serve two purposes; to ensure the existing farm system can meet the nutrient mitigation requirements set out by the MWRL Water Quality Study, and to set out the process for identification of farm specific environmental risks that arise from the inherent characteristics of the farm and from the existing farm system and its management.

The WQS thresholds and modelled outputs from OVERSEER detailed in Section 4.2 illustrate that this proposed system meets the WQS thresholds identified.

A full on-farm risk assessment was completed in December 2009 with a commitment to address the risks identified. Section 4.3 sets out the risks identified for this property and those issues common to all high country farming systems, along with existing mitigation measures.

The mitigation and management measures detailed in Table 6 set out the measures that have been adopted to mitigate and manage the risks that were identified in the risk assessment along with mandatory good agricultural practices and those measures that have been modelled in OVERSEER.

Baseline monitoring and any additional monitoring proposed for this property are identified and set out in Section 5.2, Tables 7 and 8 allows the performance of the measures chosen to be monitored and where they are performing sub-optimally, these can be addressed through the root cause analysis process.

The auditing of this plan, addressed in Section 5.2.3, Table 9 ensures that the relevant mitigation measures outlined in Table 6 are audited annually either internally or externally and communicated to ECAN by the end of July each year.