

IN THE MATTER

of the Resource Management Act 1991

AND

IN THE MATTER

of appeals lodged against proposed Plan Change 2
to the Manawatu-Whanganui One Plan

JOINT WITNESS STATEMENT OF PLANNING EXPERTS

16 May 2023

INTRODUCTION

1. This joint expert witness statement relates to the appeals lodged against proposed Plan Change 2 (**PC2**) of the Manawatu-Whanganui One Plan which focuses on existing intensive farming land use activities within targeted water catchments in the region.
2. The planning experts' joint witness statement number 2 (JWS2 dated 17 April 2023) sought further advice from the pastoral farm systems experts about some matters. The pastoral farm systems experts met on 21 April 2023 and provided their response by email dated 4 May 2023. The pastoral farm systems experts' response is contained in **Annexure 'A'**.
3. The planning experts held a third expert conference on Wednesday 10 May 2023 at 11.30 am via Teams AVL to consider the farm experts' response and finalise the content of the draft PC2 provisions. The planning experts attending the conference were:
 - (a) Sue Ruston (**SR**) for Horticulture New Zealand;
 - (b) Gerard Willis (**GW**) for Federated Farmers New Zealand;
 - (c) Greg Carlyon (**GC**) for Ngāti Turanga and Wellington Fish and Game Council; and
 - (d) Christine Foster (**CF**) for Horizons.

CODE OF CONDUCT

4. This joint witness statement is prepared in accordance with section 9.5 of the Environment Court Practice Note 2023.
5. We confirm that we have read and complied with the Code of Conduct for Expert Witnesses.

PURPOSE AND SCOPE OF CONFERENCING

6. The purpose of this conferencing session is to:
 - (a) Consider the further clarification provided by the farm systems experts;
 - (b) Finalise and agree on any amendments to the draft PC2 provisions or One Plan Schedules arising from that clarification.
7. In addition, the planning experts also considered a question about implementation of PC2 raised by GC in an email dated 9 May 2023.

AGREED MATTERS

8. The pastoral farm systems experts recommended a replacement table defining stock units be included in Schedule [X]. To accommodate the replacement table, the planning experts recommend the amendments to draft PC2 Schedule [X] shown as tracked changes to Schedule [X] in **Annexure 'B'**. A clean copy of Schedule [X], incorporating those amendments, is included in **Annexure 'C'**.
9. The farm experts' advice in relation to irrigation is (summarised) that:
 - (a) the risks associated with increased pasture production under irrigation, and any mitigation practices, are reflected in the other 'Farm Management Factors' already in the draft Nitrogen Risk Scorecard;
 - (b) in addition to the risks associated with increased production, the aspects of irrigation management that create risk of N leaching and which are addressed in the Fonterra Risk Scorecard are such basic aspects of irrigation management that they should be mandatory requirements on irrigated farms, including that:
 - i. there be no border dyke or wild flooding irrigation (and the farm experts understand that this is not common practice anyway in the Horizons region);
 - ii. irrigation must be scheduled using soil moisture tapes/probes/sensors or a soil water balance/budget or a better method; and
 - iii. irrigation shall not be applied using a 'fixed depth and return' protocol.
10. The planning experts do not consider that there is any need to include additional standards restricting the method of irrigation because these matters will be addressed by the rules and consent requirements of Chapter 16 of the One Plan (take and use of water). The planners are not aware of any examples of border dyke or wild flooding irrigation methods in use in the Manawatū-Whanganui region.
11. The planning experts recommend the insertion of an additional matter over which control is reserved to explicitly address irrigation method. This should be inserted as '(b)' in the fifth column of Rule 14-1 (under the heading 'control/discretion non-notification') as follows (noting that deletion of the original (b) has already been agreed at mediation):

'Control is reserved over:

- (a) the contents, implementation and review of the *nutrient management plan** for the land[^]
- (b) irrigation method (where the existing intensive farming land[^] use involves irrigation) compliance with the cumulative nitrogen leaching maximum* specified in Table 14.2 the nitrogen leaching loss from the land[^] and the good management practices* and best management practices* (and additional measures where necessary) to limit

~~nitrogen leaching loss from the land^ to the rate specified in condition (d) and to avoid, remedy or mitigate nutrient leaching and run-off, faecal contamination and sediment losses from the land^~~

(c) ...'

12. The planning experts agree that:

(a) An implementation plan is good practice where a plan change introduces material changes in requirements; and

(b) An implementation plan should be in place when the Council begins implementing the plan change provisions.

13. CF, GW, SR agree that inserting a method into the One Plan (requiring an implementation plan for PC2) will not of itself have any greater weight than the commitment already recorded in the 15 March 2023 mediation agreement. However, CF,GW,SR would support such a method if there is scope within the PC2 appeals to do so. GC identifies merit in the transparency and accountability associated with the method, in the event the implementation plan is not concluded prior to resolution of matters before the Court. He holds the view that there is scope to provide for this outcome, noting his preference for a concluded implementation plan addressing the matters raised in communication dated 10 May 2023 (attached)

14. The planning experts are aware that counsel for Horizons has circulated (10 May 2023) a memorandum responding to questions from counsel for Wellington Fish and Game Council and Ngāti Turanga about implementation of PC2. The planning experts agree to review the 10 May 2023 memorandum and confirm their opinions (by close of business Friday 12 May 2023) as to whether the implementation plan content proposed in the memorandum addresses the relevant matters. The planning experts agree that determination of whether an implementation plan is referenced in a One Plan method or in a side agreement is a question for the parties and will require consideration of scope.

DISAGREEMENTS

SR, GW, CF agree that it should be assumed that a council will implement its plan provisions, including any plan change provisions. GC agrees that councils are required to do what the law requires them to do however his opinion is influenced by the clear benefits associated with a concluded implementation plan, Environment Court decisions associated with the One Plan, and the reflection of the Environment Court in respect of Horizons planning and compliance practices. GC acknowledges that Horizons has now prepared a framework for consideration by the parties.

Date: 16 May 2023



Sue Ruston



Gerard Willis



Greg Carlyon



Christine Foster

ANNEXURE A

HORIZONS ONE PLAN PC2

**PASTORAL FARMING SYSTEMS EXPERTS' RESPONSES TO PLANNING EXPERTS'
REQUESTS FOR CLARIFICATION (21 APRIL 2023)**

Meeting of Pastoral Systems Experts on Wednesday 21 April, 2023

The Pastoral Systems experts met to formulate responses to four questions posed by the Planning experts.

Paragraph 8(c)

The Pastoral Systems experts are of the opinion that Schedule [X], Topic 1 (Stock Management) sub practice (d) (Wintering Practices) does not require further explanation or a worked example. The relationship noted in the Schedule between the magnitude of risk and the percentage of time that animals spend on the 'stand-off' facility/area is widely and well understood. The pro-rata rating of risk according to time in a linear fashion is a logical and straightforward approach. There is a worked example in the Fonterra Risk Scorecard that can be consulted should anyone require clarification. Furthermore, if the Risk Matrix is online, the calculation of the risk associated with wintering practices will be calculated automatically using the relevant input data including the time animals spend on the 'stand-off' facility.

Paragraph 8(d)

Irrigation on pastoral farms is likely to increase the risk of nitrogen (N) leaching. Irrigation will almost certainly result in a substantial increase in pasture production. This in turn, will result in animals ingesting greater quantities of N, the deposition of more urine-N onto soils, and therefore, an increased risk in N leaching. Indeed, in most cases, the use of irrigation will result in an increase in stocking rate on farms. It should also be noted that there are numerous ways to mitigate the impact of irrigation on N leaching. The Nitrogen Risk Scorecard (NRS) captures the risk posed to N leaching by both the increase in pasture production under irrigation and the effect of related mitigation measures. The 'Farm Management Factors' in the NRS that reflect the impact of irrigation on pasture production are; 'Stock Management', 'Nitrogen Fertiliser' and 'Imported Feed'.

The 'Irrigation' factor in the NRS does not address any of the risks associated with the increase in pasture growth under irrigation.

While it is argued that the 'Irrigation' factor in the NRS does not directly capture the increased risks associated with irrigation, it does address some fundamental aspects of irrigation infrastructure and its management. These are such basic aspects of irrigation management that they should be mandatory requirements on irrigated farms. The essence of the 'Irrigation' factor and its influence on the risk of N leaching can be distilled into the following requirements.

- 1) There will be no border dyke or wild flooding irrigation.
- 2) Irrigation must be scheduled using soil moisture tapes/probes/sensors or a soil water balance/budget or a better method.
- 3) Irrigation shall not be applied using a 'fixed depth and return' protocol.

Given the above, we believe that it will be more straightforward to remove the 'Irrigation' factor from the NRS score of irrigated farms. This is advantageous in that there will be only one version of the matrix for all pastoral farms.

Accordingly, we propose that requirements for irrigation management (identified in 1-3 above) be specified in a Rule or otherwise appropriate planning provision. As noted above the risks associated with increased pasture production under irrigation, and any mitigation practices, are reflected in the other 'Farm Management Factors' in the NRS.

Paragraph 8(g)

The Pastoral Systems experts recommend the inclusion of the following Table in Schedule X.

	Breed	SU
Milking	FxJ Cross*	8
Milking	Ayrshire*	6.7
Milking	Friesian	8.5
Milking	Jersey	6.5
Milking	Other*	8
Replacements	FxJ Cross*	4.2
Replacements	Ayrshire*	3.6
Replacements	Friesian*	4.5
Replacements	Jersey*	3.5
Replacements	Other*	4.3
Calves_to_Weaning		2
Breeding_Bulls		5.5
Sheep - Ewe		1
Sheep - Ram		0.8
Sheep - Lamb		0.7
Deer - Fawn		1.2
Deer - Yearling		1.8
Deer - Stag		2.2
Deer - Hind		2
Dairy - Carryover		5.5
Beef - Bull		5.5
Beef - Cow		5.5
Beef - Calf		3.5
Beef - Yearling		3.5
Goat - Kids		0.6
Goat - Adult		0.8
Horse		11
Pony		7
Alpaca - Adult		0.7
Alpaca - Cria		0.4
Llama - Adult		1.8
Llama - Cria		1
Pig		1.6

*Sourced from Fonterra. All other values are from the 'beef + lamb' benchmarking tool (<https://beeflambnz.com/data-tools/benchmarking-tool>).

Paragraph 8(j)

Securing access to PAW and Rainfall data as GIS layers is now in the hands of Dr. Elizabeth Daly, Science Manager at Horizons Regional Council.

David Horne

Paul Le Miere

Elizabeth Parlato

ANNEXURE B

HORIZONS ONE PLAN PC2

DRAFT ONE PLAN SCHEDULE [X]

**PASTORAL FARMING NITROGEN LEACHING RISK ASSESSMENT METHOD INCLUDING
AMENDMENTS RECOMMENDED BY PASTORAL FARMING EXPERTS**

Schedule [X]: How to determine the *nitrogen leaching risk**
of existing *intensive farming land uses**
(Pastoral farming)

Applying the Nitrogen Leaching Risk Scorecard

A pastoral farm's *nitrogen leaching risk** shall be determined by:

1. Using the Nitrogen Leaching Risk Scorecard set out below, and in accordance with the explanations and definitions provided, assigning points for the sub practices under the each of the six topics listed, to the extent they are relevant to the farming system; and
2. In the case of Topic 1 Stock Management, adjusting the Sub practice (a) points by the applicable percentage in Sub practice (c);
3. Summing the total number of Sub practice positive points and deducting the sub practice negative points for each Topic to generate 6 Topic scores; and
4. Summing all ~~16~~1 Topic scores to provide a Part A aggregate Topics score; and
5. Determining what, if any, mitigations under Part B are applicable and applying the points and/or percentage adjustments applicable to the Part A aggregate Topic Score to generate the score that is *nitrogen leaching risk**.

Commented [c1]: Whether this is 6 or five depends on the farm systems experts' recommendation on Irrigation management.

Commented [c2R1]: The Farm Experts recommend deletion of the 6th (Irrigation).

PART A: Nitrogen Leaching Risk Scorecard - Pastoral land management practices

Topic 1: Stock Management

(a) Stock Management: Stocking Rate	Points
This sub practice addresses the number of grazed animals on the land, recognising that a high stocking rate is a key driver for increased nitrogen leaching on farm. The area (hectares) used in the calculation of the stocking rate is the effective area of the dairy farm. For the purpose of this Scorecard the effective area is the area of land used for grazing livestock (including the milking platform), cropping or as sacrifice paddocks. Dairy farm is the area of land used for <i>dairy farming*</i> . The stocking rate used for the calculation shall be the peak stocking rate . The peak stocking rate is the highest stocking rate on the farm over the 12-month period. The stock unit (su) values for farmed animals are as listed in Part C of this Schedule.	
≤ 16 su/ha	0
>16 - ≤20 su/ha	20
>20 - ≤28 su/ha	30
>28 - ≤32 su/ha	40
>32 su/ha	50

(b) Stock Management: Pasture Eaten	Points
The Scorecard moderates the stocking rate risk by assessing the total amount of dry matter eaten. It is acknowledged that stocking rate alone as a method of assessing nitrogen loss risk does not account for differences in size and age of animals, both of which will contribute to differences in total dry matter eaten. This sub practice accounts for differences in amount of dry matter eaten and therefore the amount of nitrogen ingested and returned to pasture as urinary N and N in excreta.	
The expression T DM/ha used below refers to tonnes of dry matter per hectare.	
≤ 10 T DM/ha	5
>10 – ≤12 T DM/ha	10
>12 – ≤14 T DM/ha	20
>14 – ≤16 T DM/ha	40
>16 – ≤18 T DM/ha	60
>18 T DM/ha	80

(c) Stock Management: Wintering Off the Milking Platform	Reduction of peak stocking rate points
This sub practice moderates the stocking rate risk (sub practice (a)) by reducing the points attributed to that Sub practice. This is calculated using the percentage of time animals spend off farm between the months of May – August.	
For the purpose of this Scorecard, milking platform (MP) means that part of any dairy farm that is used for grazing lactating dairy cows during the milking season and includes the animal effluent disposal area. For the avoidance of doubt, it excludes land used for grazing heifers or the wintering-off of dairy cows.	
>80 - ≤100% animals off MP	-50%
>60 - ≤ 80% animals off MP	-40%
>40 - ≤60% animals off MP	-30%
> 20 - ≤40% animals off MP	-20%
> 0 - ≤ 20% animals off MP	-10%

(d) Stock Management: Wintering Practices:	Points
This sub practice considers that extent of time stock are fed using different winter grazing practices. The risk is determined by allocating points on a pro rata basis according to the percentage of time (total hours) animals are kept on, and/or fed, using the listed systems.	
For the purpose of this Scorecard break feed fodder crop means feeding of stock within an area of pasture or crop-	
(a) within a paddock in which the fence is moved regularly to allow the stock to graze another area of pasture or crop within the paddock; or	
(b) within a paddock that is subdivided into cells or grid using temporary fencing; and where the stock as moved regularly.	
An extensive fodder crop means a form of grazing on crop that is not break feed fodder crop.	

Commented [c3]: The planning experts have a question for the farm systems experts about whether further explanation is required here to make it clear that the risk score requires calculation of the percentage of time the practices are employed. And a question about whether the -20 and +20 points rows are relevant.

Commented [c4R3]: No change recommended by the Farm Experts.

Barn or wintering pad means any hard structure used for feeding livestock from which effluent is captured and directed to an authorised effluent management system.	
Off pasture (barn or wintering pad)	-40
On pasture	0
Extensive fodder crop	20
Break feed fodder crop	40

Topic 2: Nitrogen Fertiliser:

(a) Nitrogen Fertiliser: Total N	Points
This sub practice assesses the level of risk associated with nitrogen fertiliser application. The total amount of nitrogen used per annum is the main driver for the nitrogen management risk factor. This is calculated by summing the total amount of nitrogen fertiliser applied annually (kg / ha) across the effective area .	
N Fertiliser applied ≤ 50 kg/ha	0
N Fertiliser applied $>50 - \leq 100$ kg/ha	10
N Fertiliser applied $>100 - \leq 150$ kg/ha	30
N Fertiliser applied $>150 - \leq 175$ kg/ha	50
N Fertiliser applied $>175 - \leq 200$ kg/ha	60
N Fertiliser applied $>200 - \leq 225$ kg/ha	70
N Fertiliser applied $>225 - \leq 250$ kg/ha	90
N Fertiliser applied $>250 - \leq 300$ kg/ha	150
N Fertiliser applied >300 kg/ha	200

(b) Nitrogen Fertiliser: Conversion Efficiency	Points
The conversion efficiency calculates how many kilograms of milk solids are produced per kilogram of nitrogen (N) applied. This sub factor is calculated by simply dividing the total amount of milk solids (kg MS) produced by the total kilograms of nitrogen applied via fertiliser.	
kgMS/kgN Fertiliser >25	-40
kgMS/kgN Fertiliser $>13 - \leq 25$	-20
kgMS/kgN Fertiliser $>9 - \leq 13$	0
kgMS/kgN Fertiliser $>5 - \leq 9$	20
kgMS/kgN Fertiliser ≤ 4.5	40

(c) Nitrogen Fertiliser: Timing of Application:	Points
This sub practice assesses the timing of application of nitrogen fertilisers (which influences nitrogen leaching). The scoring of this sub practice works by grouping each of the farm's nitrogen (N) fertiliser applications into one of the three time periods and recording the highest score of those time periods. (That is, if fertiliser is applied in May -June and in September to April, then this sub practice will attract 40 points).	
N Fertiliser applied September – April	-10
N Fertiliser applied July - August	20
N Fertiliser applied May - June	40

(d) Nitrogen Fertiliser: Average Monthly Application Rates	Points
This sub practice calculates the average amount of N applied in any given month to a block by summing all monthly fertiliser applications. Total nitrogen applied is then divided across the block(s) it was applied to. For example, where an N fertiliser application is applied to multiple blocks in a month, the application is to be pro-rata across the blocks it was applied to. This is necessary because Product A (20% Nitrogen) could be applied every month across Block 1 and Block 2 but Product B (46% Nitrogen) was applied every month across Block 1 only.	
Highest N fertiliser applied is $\leq$ 25 kg/ha	-20
Highest N fertiliser applied is $>$ 25 kg/ha	0

Topic 3: Effluent Management

(a) Effluent Management: Storage	Points
This sub practice is scored according to the extent to which the recommend effluent storage capacity is installed. It is expressed as percentage of the storage calculated using the Dairy Effluent Storage Calculator (DESC).	
Although the scoring scale provided below in increments 10%, scores should be allocated in accordance with a sliding scale from 0 to 100 based on the percentage of required storage that is provided. That is, if a farm has 95% of the required storage it will attract 5 risk points.	
The DESC may be accessed at: https://www.dairynzdesc.co.nz	
100% storage	0
90% storage	10
80% storage	20
70% storage	30
60% storage	40
50% storage	50
40% storage	60
30% storage	70
20% storage	80

10% storage	90
No storage	100

(b) Effluent Management: Discharge Application Depth:	Points
The application depth is the volume of effluent discharged to soil. It is measured as the depth following a single effluent irrigation cycle. For the purpose of this scorecard High risk soils and Low risk soils are as described at: https://www.horizons.govt.nz/HRC/media/Media/Soil-Risk-list.pdf	
High risk soils + ≤ 10mm	0
High risk soils + >10mm	20
Low risk soils + ≤ 24mm	0
Low risk soils + >24mm	20

(c) Effluent Management: Disposal Area Without a Feed Pad	Points
The sub practice is scored according to the sufficiency of the effluent disposal area for the farm system. It is calculated simply as the area (hectares) of effluent disposal area per hundred cows, or part thereof. For the purpose of this Scorecard, a feed pad is an area of hard surface used for the regular supplementary feeding and loafing of cattle where the animal effluent is collected for disposal to land in accordance with the rules of this regional plan.	
Disposal area > 4 ha/100 cows (no feed pad)	0
Disposal area >3 – ≤4 ha/100 cows (no feed pad)	10
Disposal area >2 – ≤3 ha/100 cows (no feed pad)	20
Disposal area ≥1 – ≤2 ha/100 cows (no feed pad)	30
Disposal area <1 ha/100 cows (no feed pad)	40

(d) Effluent Management: Disposal Area With a Feed Pad	Points
Disposal area >7ha/100 cows (with feed pad)	0
Disposal area >5 – ≤7 ha/100 cows (with feed pad)	10
Disposal area >3 – ≤5 ha/100 cows (with feed pad)	20
Disposal area ≥1 – ≤3 ha/100 cows (with feed pad)	30
Disposal area <1 ha/100 cows (with feed pad)	40

Topic 4: Imported Feed

(a) Imported N: Total Imported N	Points
This sub practice is scored according to the total amount of nitrogen (N) introduced to the farm via all imported supplementary feed divided by the effective area of the farm. The N content of feed can be found at: https://www.dairynz.co.nz/feed/supplements/feed-values/	

For the purpose of this Scorecard, imported supplementary feed means any animal feed supplied to animals on a dairy farm that is not grown on that dairy farm.	
Total imported N from feed ≤ 40 kg/ha	0
Total imported N from feed $>40 - \leq 80$ kg/ha	20
Total imported N from feed $>80 - \leq 120$ kg/ha	40
Total imported N from feed $>120 - \leq 160$ kg/ha	60
Total imported N from feed > 160 kg/ha	80

(b) Imported N: Average N Content of Imported Supplements	Points
This sub practice is scored according to the average N content of the imported supplementary feed. The average % of nitrogen in the total amount of imported supplementary feed is calculated on a pro rata basis.	
Imported Feed with average N % ≤ 1.0	0
Imported Feed with average N % $>1.0 - \leq 1.5$	3
Imported Feed with average N % $>1.5 - \leq 1.75$	6
Imported Feed with average N % $>1.75 - \leq 2.0$	9
Imported Feed with average N % $>2.0 - \leq 2.25$	12
Imported Feed with average N % $>2.25 - \leq 2.5$	15
Imported Feed with average N % $>2.5 - \leq 3.0$	18
Imported Feed with average N % > 3.0	20

(c) Imported N: Conversion Efficiency	Points
This sub practice calculates the conversion efficiency of nitrogen (N) introduced via imported supplementary feed to product. This measures the efficiency of nitrogen from imported supplementary feed converted into kilograms of milk solids (kg MS).	
Kg MS / Kg N from supplements: >50	-40
Kg MS / Kg N from supplements: $>30 - \leq 50$	-20
Kg MS / Kg N from supplements: $>20 - \leq 30$	0
Kg MS / Kg N from supplements: $>10 - \leq 20$	20
Kg MS / Kg N from supplements: ≤ 10	40

Topic 5: Cropping and Cultivation

(a) Cropping and Cultivation: Minimum Tillage	Points
This sub practice assesses the risk of release of mineral nitrogen resulting from cultivation. The total percentage of the farm cultivated using minimum tillage is calculated as the area of minimum tillage divided by the total effective area of the farm.	
$\leq 2\%$ of farm cultivated annually	0
$>2\% - \leq 4\%$ of farm cultivated annually	5
$>4\% - \leq 6\%$ of farm cultivated annually	10
$>6\% - \leq 8\%$ of farm cultivated annually	15

>8% – ≤10% of farm cultivated annually	20
>10% – ≤15% of farm cultivated annually	30
>15% – ≤20% of farm cultivated annually	40
>20% of farm cultivated annually	50

(b) Cropping and Cultivation: Conventional Cultivation	Points
This sub practice assesses the risk of nitrogen leaching associated with conventional cultivation. The total percentage of the farm cultivated using conventional cultivation is calculated as the conventionally cultivated area divided by the total effective area of the farm.	
>0 - 2% of farm cultivated annually	10
>2% – ≤4% of farm cultivated annually	20
>4% – ≤6% of farm cultivated annually	30
>6% – ≤8% of farm cultivated annually	40
>8% – ≤10% of farm cultivated annually	50
>10% – ≤15% of farm cultivated annually	70
>15% – ≤20% of farm cultivated annually	90
>20% of farm cultivated annually	120

(c) Cropping and Cultivation: Season of Forage Crop Grazing	Points
This sub practice considers the higher risk of leaching associated with winter harvesting. The season of grazing is taken directly from the harvest date recorded for each crop.	
Crop grazing (summer) 1 October – 31 March	-30
Crop grazing (winter) 1 April – 30 September	30

(d) Cropping and Cultivation: Fertiliser Applied in Winter	Points
This sub practice considers whether nitrogen fertiliser is applied to crops during high-risk winter months.	
No fertiliser applied during 1 May to 31 August	0
Fertiliser applied during 1 May to 31 August	30

Topic 6: Irrigation Management

(a) Irrigation: Irrigation Method	Points
This is scored on a pro rata basis calculated by the percentage of each irrigation method in use on the farm based on the area of land irrigated.	
Pivot or linear	40
Rotary boom, gun or K-line	60
Border dyke or wild flood	90

Commented [c5]: The planning experts are awaiting confirmation from the farm systems experts as to whether the irrigation management topic is to be included in Schedule [X].

Commented [c6R5]: The pastoral farm systems experts recommend deletion of Topic 6, with irrigation addressed in the rule framework.

(b) Irrigation: Irrigation Scheduling Method	Points
If a farm has multiple irrigation scheduling methods, points are to be allocated on a pro-rata basis based on the area of land subject to each method.	
Soil moisture tapes/soil moisture budget	-15
Visual assessment or when water is available	30

(c) Irrigation: Irrigation Application Method	Points
If a farm has multiple methods of irrigation, points are to be allocated on a pro-rata basis based on the area of land subject to each method.	
Variable rate irrigation	-10
Deficit irrigation	0
Fixed depth & return	30

PART B - Pastoral Farming Mitigations

(a) Constructed Wetlands	Reduction in overall risk score
Points are deducted based on the catchment area that drains to any constructed wetland on a dairy farm. A constructed wetland is a wetland that has been deliberately constructed to intercept surface and/or subsurface contaminant flows. The reference to 'catchment area' below is to the area of the farm that drains to the constructed wetland	
0.5% of the catchment area	-5
1% of the catchment area	-12.5
2% of the catchment area	-18
3% of the catchment area	-21
4% of the catchment area	-24.5
5% of the catchment area	-26

(b) Plantain: % of dry matter in diet (by mass over summer and autumn)	Reduction in overall risk score
≤10% of feed	0
>10 – ≤20% of feed	-10%
>20 – ≤30% of feed	-20%
>30% of feed	-30%

PART C: Stock unit equivalents

	Breed	Stock Unit Equivalent (SU)
Milking	<u>Friesian/Jersey</u> ~~Ex~~ Cross	8
Milking	Ayrshire	6.7
Milking	Friesian	8.5
Milking	Jersey	6.5
Milking	Other	8
Replacements	~~Ex~~ <u>Friesian/Jersey</u> Cross	4.2
Replacements	Ayrshire	3.6
Replacements	Friesian	4.5
Replacements	Jersey	3.5
Replacements	Other	4.3
Calves_to_Weaning		2
Breeding_Bulls		5.5
Sheep - Ewe		1
Sheep - Ram		0.8
Sheep - Lamb		0.7
Deer - Fawn		1.2
Deer - Yearling		1.8
Deer - Stag		2.2
Deer - Hind		2
Dairy - Carryover		5.5
Beef - Bull		5.5
Beef - Cow		5.5
Beef - Calf		3.5

Commented [c7]: The planning experts will check with the farm systems experts whether this table is the appropriate table.

Commented [c8R7]: The pastoral farm systems experts recommend replacing the earlier table of stock units with this table. The planning experts recommend minor editorial amendments to improve clarity.

Beef - Yearling		3.5
Goat - Kids		0.6
Goat - Adult		0.8
Horse		11
Pony		7
Alpaca - Adult		0.7
Alpaca - Cria		0.4
Llama - Adult		1.8
Llama - Cria		1
Pig		1.6

This following table is sourced from Beef+Lamb NZ's benching tool which can be found at: <https://beeflambnz.com/data-tools/benchmarking-tool>

SHEEP		STOCK UNITS
Ewes		1.0
Hoggets		0.7
Wethers		0.7
Rams		0.8
BEEF CATTLE		STOCK UNITS
Mixed Age Cows		5.5
Heifers 2.5 Yr		5.5
Heifers 1.5 Yr		4.4
Heifers Weaner		3.5
Bulls Weaner		4.5
Steers Weaner		4.5
Steers 1.5 Yr		5.0
Steers 2.5 Yr		5.5

Bull Beef 1.5 Yr+	5.5
Bulls-Breeding	5.5
GRAZING DAIRY CATTLE	STOCK UNITS
Grazing Dairy Cattle	4.5
DAIRY CATTLE	STOCK UNITS
Jersey Cows	6.5
Friesian Cows	8.5
Other Jersey Stock	3.5
Other Friesian Stock	4.5
Calves	2.0
Bulls	5.0
DEER	STOCK UNITS
Hinds, breeding	1.0
Hinds, 1.5 year	1.8
Hinds, weaner	1.2
Stags, weaner	1.4
Stags, 1.5 year	1.8
Stags 2.5 year +	2.2
Stags, master	2.2
GOATS	STOCK UNITS
Female 1 year +	0.8
Female to 1 year	0.5
Male to 1 year	0.5
Male 1 year +	0.5
Buck	0.8

ANNEXURE C

HORIZONS ONE PLAN PC2

DRAFT ONE PLAN SCHEDULE [X]

**PASTORAL FARMING NITROGEN LEACHING RISK ASSESSMENT METHOD INCLUDING
AMENDMENTS RECOMMENDED BY PASTORAL FARMING EXPERTS**

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Schedule [X]: How to determine the *nitrogen leaching risk
of existing *intensive farming land uses**
(Pastoral farming)**

Applying the Nitrogen Leaching Risk Scorecard

A pastoral farm's *nitrogen leaching risk** shall be determined by:

1. Using the Nitrogen Leaching Risk Scorecard set out below, and in accordance with the explanations and definitions provided, assigning points for the sub practices under the each of the six topics listed, to the extent they are relevant to the farming system; and
2. In the case of Topic 1 Stock Management, adjusting the Sub practice (a) points by the applicable percentage in Sub practice (c);
3. Summing the total number of Sub practice positive points and deducting the sub practice negative points for each Topic to generate 6 Topic scores; and
4. Summing all 5 Topic scores to provide a Part A aggregate Topics score; and
5. Determining what, if any, mitigations under Part B are applicable and applying the points and/or percentage adjustments applicable to the Part A aggregate Topic Score to generate the score that is *nitrogen leaching risk**.

PART A: Nitrogen Leaching Risk Scorecard - Pastoral land management practices

Topic 1: Stock Management

(a) Stock Management: Stocking Rate	Points
This sub practice addresses the number of grazed animals on the land, recognising that a high stocking rate is a key driver for increased nitrogen leaching on farm. The area (hectares) used in the calculation of the stocking rate is the effective area of the dairy farm. For the purpose of this Scorecard the effective area is the area of land used for grazing livestock (including the milking platform), cropping or as sacrifice paddocks. Dairy farm is the area of land used for <i>dairy farming*</i>. The stocking rate used for the calculation shall be the peak stocking rate. The peak stocking rate is the highest stocking rate on the farm over the 12-month period. The stock unit (su) values for farmed animals are as listed in Part C of this Schedule.	
≤ 16 su/ha	0
>16 - ≤20 su/ha	20
>20 - ≤28 su/ha	30
>28 - ≤32 su/ha	40
>32 su/ha	50

(b) Stock Management: Pasture Eaten	Points
The Scorecard moderates the stocking rate risk by assessing the total amount of dry matter eaten. It is acknowledged that stocking rate alone as a method of assessing nitrogen loss risk does not account for differences in size and age of animals, both of which will contribute to differences in total dry matter eaten. This sub practice accounts for differences in amount of dry matter eaten and therefore the amount of nitrogen ingested and returned to pasture as urinary N and N in excreta. The expression T DM/ha used below refers to tonnes of dry matter per hectare.	
≤ 10 T DM/ha	5
>10 – ≤12 T DM/ha	10
>12 – ≤14 T DM/ha	20
>14 – ≤16 T DM/ha	40
>16 – ≤18 T DM/ha	60
>18 T DM/ha	80

(c) Stock Management: Wintering Off the Milking Platform	Reduction of peak stocking rate points
This sub practice moderates the stocking rate risk (sub practice (a)) by reducing the points attributed to that Sub practice. This is calculated using the percentage of time animals spend off farm between the months of May – August. For the purpose of this Scorecard, milking platform (MP) means that part of any dairy farm that is used for grazing lactating dairy cows during the milking season and includes the animal effluent disposal area. For the avoidance of doubt, it excludes land used for grazing heifers or the wintering-off of dairy cows.	
>80 - ≤100% animals off MP	-50%
>60 - ≤ 80% animals off MP	-40%
>40 - ≤60% animals off MP	-30%
> 20 - ≤40% animals off MP	-20%
> 0 - ≤ 20% animals off MP	-10%

(d) Stock Management: Wintering Practices:	Points
This sub practice considers that extent of time stock are fed using different winter grazing practices. The risk is determined by allocating points on a pro rata basis according to the percentage of time (total hours) animals are kept on, and/or fed, using the listed systems. For the purpose of this Scorecard break feed fodder crop means feeding of stock within an area of pasture or crop- (a) within a paddock in which the fence is moved regularly to allow the stock to graze another area of pasture or crop within the paddock; or (b) within a paddock that is subdivided into cells or grid using temporary fencing; and where the stock as moved regularly. An extensive fodder crop means a form of grazing on crop that is not break feed fodder crop.	

Barn or wintering pad means any hard structure used for feeding livestock from which effluent is captured and directed to an authorised effluent management system.	
Off pasture (barn or wintering pad)	-40
On pasture	0
Extensive fodder crop	20
Break feed fodder crop	40

Topic 2: Nitrogen Fertiliser:

(a) Nitrogen Fertiliser: Total N	Points
This sub practice assesses the level of risk associated with nitrogen fertiliser application. The total amount of nitrogen used per annum is the main driver for the nitrogen management risk factor. This is calculated by summing the total amount of nitrogen fertiliser applied annually (kg / ha) across the effective area .	
N Fertiliser applied ≤ 50 kg/ha	0
N Fertiliser applied $>50 - \leq 100$ kg/ha	10
N Fertiliser applied $>100 - \leq 150$ kg/ha	30
N Fertiliser applied $>150 - \leq 175$ kg/ha	50
N Fertiliser applied $>175 - \leq 200$ kg/ha	60
N Fertiliser applied $>200 - \leq 225$ kg/ha	70
N Fertiliser applied $>225 - \leq 250$ kg/ha	90
N Fertiliser applied $>250 - \leq 300$ kg/ha	150
N Fertiliser applied >300 kg/ha	200

(b) Nitrogen Fertiliser: Conversion Efficiency	Points
The conversion efficiency calculates how many kilograms of milk solids are produced per kilogram of nitrogen (N) applied. This sub factor is calculated by simply dividing the total amount of milk solids (kg MS) produced by the total kilograms of nitrogen applied via fertiliser.	
kgMS/kgN Fertiliser >25	-40
kgMS/kgN Fertiliser $>13 - \leq 25$	-20
kgMS/kgN Fertiliser $>9 - \leq 13$	0
kgMS/kgN Fertiliser $>5 - \leq 9$	20
kgMS/kgN Fertiliser ≤ 4.5	40

(c) Nitrogen Fertiliser: Timing of Application:	Points
This sub practice assesses the timing of application of nitrogen fertilisers (which influences nitrogen leaching). The scoring of this sub practice works by grouping each of the farm's nitrogen (N) fertiliser applications into one of the three time periods and recording the highest score of those time periods. (That is, if fertiliser is applied in May -June and in September to April, then this sub practice will attract 40 points).	
N Fertiliser applied September – April	-10
N Fertiliser applied July - August	20
N Fertiliser applied May - June	40

(d) Nitrogen Fertiliser: Average Monthly Application Rates	Points
This sub practice calculates the average amount of N applied in any given month to a block by summing all monthly fertiliser applications. Total nitrogen applied is then divided across the block(s) it was applied to. For example, where an N fertiliser application is applied to multiple blocks in a month, the application is to be pro-rata across the blocks it was applied to. This is necessary because Product A (20% Nitrogen) could be applied every month across Block 1 and Block 2 but Product B (46% Nitrogen) was applied every month across Block 1 only.	
Highest N fertiliser applied is ≤ 25 kg/ha	-20
Highest N fertiliser applied is > 25 kg/ha	0

Topic 3: Effluent Management

(a) Effluent Management: Storage	Points
This sub practice is scored according to the extent to which the recommend effluent storage capacity is installed. It is expressed as percentage of the storage calculated using the Dairy Effluent Storage Calculator (DESC). Although the scoring scale provided below in increments 10%, scores should be allocated in accordance with a sliding scale from 0 to 100 based on the percentage of required storage that is provided. That is, if a farm has 95% of the required storage it will attract 5 risk points. The DESC may be accessed at: https://www.dairynzdesc.co.nz	
100% storage	0
90% storage	10
80% storage	20
70% storage	30
60% storage	40
50% storage	50
40% storage	60
30% storage	70
20% storage	80

10% storage	90
No storage	100

(b) Effluent Management: Discharge Application Depth:	Points
The application depth is the volume of effluent discharged to soil. It is measured as the depth following a single effluent irrigation cycle. For the purpose of this scorecard High risk soils and Low risk soils are as described at: https://www.horizons.govt.nz/HRC/media/Media/Soil-Risk-list.pdf	
High risk soils + $\leq 10\text{mm}$	0
High risk soils + $>10\text{mm}$	20
Low risk soils + $\leq 24\text{mm}$	0
Low risk soils + $>24\text{mm}$	20

(c) Effluent Management: Disposal Area Without a Feed Pad	Points
The sub practice is scored according to the sufficiency of the effluent disposal area for the farm system. It is calculated simply as the area (hectares) of effluent disposal area per hundred cows, or part thereof. For the purpose of this Scorecard, a feed pad is an area of hard surface used for the regular supplementary feeding and loafing of cattle where the animal effluent is collected for disposal to land in accordance with the rules of this regional plan.	
Disposal area > 4 ha/100 cows (no feed pad)	0
Disposal area $>3 - \leq 4$ ha/100 cows (no feed pad)	10
Disposal area $>2 - \leq 3$ ha/100 cows (no feed pad)	20
Disposal area $\geq 1 - \leq 2$ ha/100 cows (no feed pad)	30
Disposal area <1 ha/100 cows (no feed pad)	40

(d) Effluent Management: Disposal Area With a Feed Pad	Points
Disposal area $>7\text{ha}/100$ cows (with feed pad)	0
Disposal area $>5 - \leq 7$ ha/100 cows (with feed pad)	10
Disposal area $>3 - \leq 5$ ha/100 cows (with feed pad)	20
Disposal area $\geq 1 - \leq 3$ ha/100 cows (with feed pad)	30
Disposal area <1 ha/100 cows (with feed pad)	40

Topic 4: Imported Feed

(a) Imported N: Total Imported N	Points
This sub practice is scored according to the total amount of nitrogen (N) introduced to the farm via all imported supplementary feed divided by the effective area of the farm. The N content of feed can be found at: https://www.dairynz.co.nz/feed/supplements/feed-values/	

For the purpose of this Scorecard, imported supplementary feed means any animal feed supplied to animals on a dairy farm that is not grown on that dairy farm.	
Total imported N from feed ≤ 40 kg/ha	0
Total imported N from feed $>40 - \leq 80$ kg/ha	20
Total imported N from feed $>80 - \leq 120$ kg/ha	40
Total imported N from feed $>120 - \leq 160$ kg/ha	60
Total imported N from feed > 160 kg/ha	80

(b) Imported N: Average N Content of Imported Supplements	Points
This sub practice is scored according to the average N content of the imported supplementary feed. The average % of nitrogen in the total amount of imported supplementary feed is calculated on a pro rata basis.	
Imported Feed with average N % ≤ 1.0	0
Imported Feed with average N % $>1.0 - \leq 1.5$	3
Imported Feed with average N % $>1.5 - \leq 1.75$	6
Imported Feed with average N % $>1.75 - \leq 2.0$	9
Imported Feed with average N % $>2.0 - \leq 2.25$	12
Imported Feed with average N % $>2.25 - \leq 2.5$	15
Imported Feed with average N % $>2.5 - \leq 3.0$	18
Imported Feed with average N % > 3.0	20

(c) Imported N: Conversion Efficiency	Points
This sub practice calculates the conversion efficiency of nitrogen (N) introduced via imported supplementary feed to product. This measures the efficiency of nitrogen from imported supplementary feed converted into kilograms of milk solids (kg MS).	
Kg MS / Kg N from supplements: >50	-40
Kg MS / Kg N from supplements: $>30 - \leq 50$	-20
Kg MS / Kg N from supplements: $>20 - \leq 30$	0
Kg MS / Kg N from supplements: $>10 - \leq 20$	20
Kg MS / Kg N from supplements: ≤ 10	40

Topic 5: Cropping and Cultivation

(a) Cropping and Cultivation: Minimum Tillage	Points
This sub practice assesses the risk of release of mineral nitrogen resulting from cultivation. The total percentage of the farm cultivated using minimum tillage is calculated as the area of minimum tillage divided by the total effective area of the farm.	
$\leq 2\%$ of farm cultivated annually	0
$>2\% - \leq 4\%$ of farm cultivated annually	5
$>4\% - \leq 6\%$ of farm cultivated annually	10
$>6\% - \leq 8\%$ of farm cultivated annually	15

>8% – ≤10% of farm cultivated annually	20
>10% – ≤15% of farm cultivated annually	30
>15% – ≤20% of farm cultivated annually	40
>20% of farm cultivated annually	50

(b) Cropping and Cultivation: Conventional Cultivation	Points
This sub practice assesses the risk of nitrogen leaching associated with conventional cultivation. The total percentage of the farm cultivated using conventional cultivation is calculated as the conventionally cultivated area divided by the total effective area of the farm.	
>0 - 2% of farm cultivated annually	10
>2% – ≤4% of farm cultivated annually	20
>4% – ≤6% of farm cultivated annually	30
>6% – ≤8% of farm cultivated annually	40
>8% – ≤10% of farm cultivated annually	50
>10% – ≤15% of farm cultivated annually	70
>15% – ≤20% of farm cultivated annually	90
>20% of farm cultivated annually	120

(c) Cropping and Cultivation: Season of Forage Crop Grazing	Points
This sub practice considers the higher risk of leaching associated with winter harvesting. The season of grazing is taken directly from the harvest date recorded for each crop.	
Crop grazing (summer) 1 October – 31 March	-30
Crop grazing (winter) 1 April – 30 September	30

(d) Cropping and Cultivation: Fertiliser Applied in Winter	Points
This sub practice considers whether nitrogen fertiliser is applied to crops during high-risk winter months.	
No fertiliser applied during 1 May to 31 August	0
Fertiliser applied during 1 May to 31 August	30

PART B - Pastoral Farming Mitigations

(a) Constructed Wetlands	Reduction in overall risk score
Points are deducted based on the catchment area that drains to any constructed wetland on a dairy farm. A constructed wetland is a wetland that has been deliberately constructed to intercept surface and/or subsurface contaminant flows. The reference to 'catchment area' below is to the area of the farm that drains to the constructed wetland	
0.5% of the catchment area	-5
1% of the catchment area	-12.5
2% of the catchment area	-18
3% of the catchment area	-21
4% of the catchment area	-24.5
5% of the catchment area	-26

(b) Plantain: % of dry matter in diet (by mass over summer and autumn)	Reduction in overall risk score
≤10% of feed	0
>10 – ≤20% of feed	-10%
>20 – ≤30% of feed	-20%
>30% of feed	-30%

PART C: Stock unit equivalents

	Breed	Stock Unit Equivalent (SU)
Milking	Friesian/Jersey Cross	8
Milking	Ayrshire	6.7
Milking	Friesian	8.5
Milking	Jersey	6.5
Milking	Other	8
Replacements	Friesian/Jersey Cross	4.2
Replacements	Ayrshire	3.6
Replacements	Friesian	4.5

	Breed	Stock Unit Equivalent (SU)
Replacements	Jersey	3.5
Replacements	Other	4.3
Calves_to_Weaning		2
Breeding_Bulls		5.5
Sheep - Ewe		1
Sheep - Ram		0.8
Sheep - Lamb		0.7
Deer - Fawn		1.2
Deer - Yearling		1.8
Deer - Stag		2.2
Deer - Hind		2
Dairy - Carryover		5.5
Beef - Bull		5.5
Beef - Cow		5.5
Beef - Calf		3.5
Beef - Yearling		3.5
Goat - Kids		0.6
Goat - Adult		0.8
Horse		11
Pony		7
Alpaca - Adult		0.7
Alpaca - Cria		0.4
Llama - Adult		1.8
Llama - Cria		1

	Breed	Stock Unit Equivalent (SU)
Pig		1.6