

**BEFORE THE COMMISSIONERS APPOINTED ON BEHALF OF THE  
OTAGO REGIONAL COUNCIL**

**UNDER** the Resource Management  
Act 1991 (the **Act** or **RMA**)

**IN THE MATTER** of an original submission  
on the Proposed Regional  
Policy Statement for Otago  
2021 (**PRPS**)

**BETWEEN** **OTAGO WATER  
RESOURCE USER  
GROUP**

**Submitter OS00235 and  
FS00235**

**FEDERATED FARMERS  
NZ INC**

**OS00239 and FS00239**

**DAIRY NZ**

**Submitter FS00601**

**AND** **OTAGO REGIONAL  
COUNCIL**

**Local Authority**

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**EVIDENCE IN CHIEF OF LUKE MURRAY KANE**

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**GALLOWAY COOK ALLAN LAWYERS**

Phil Page/ Bridget Irving

Phil.Page@gallowaycookallan.co.nz

Bridget.Irving@gallowaycookallan.co.nz

P O Box 143

Dunedin 9054

Ph: (03) 477 7312

Fax: (03) 477 5564

## **EVIDENCE IN CHIEF OF LUKE MURRAY KANE**

### **Introduction**

1. My full name is Luke Murray Kane, I am a 4<sup>th</sup> generation farmer based in Waikoikoi, West Otago. My wife Nicole and I are dairy farmers. We are also shareholders and co-owners of Westholm Dairies Limited.
2. The purpose of this evidence is to explain our operations, the obstacles, and pressures we face in our sector and the actions we have taken to make our operation better align with the regulatory requirements and be more efficient generally.
3. It is also intended to help the panel understand the challenges and constraints that we face in adapting to new regulatory regimes and why it is important that these changes be able to occur over a sustainable time frame.

### **Our operations and community**

4. Our family farming operation is approximately 980 hectares comprising dairy, beef finishing, and a beef stud farm.
5. The breakdown of the components include:
  - (a) The beef operation comprises about 150 beef cows and some dairy grazing. Every year we rear 500 calves (including our own dairy replacements), and 150-200 Wagyu beef calves. The Wagyu beef calves are out of our farming system prior to their second winter.
  - (b) Westholm polled Hereford and Blue Mountain Angus studs. The stud operation includes 150 breeding Herefords and Angus cows where we focus on breeding a type of cattle with high calving ease, low birth weight with good growth and carcass suitable for the dairy beef or beef heifer market. We also run 660 crossbreed dairy cows which help to improve the accuracy of the selection (of key traits) of stud bulls.

- (c) The milking Platform comprises 235 hectares and includes 660 milking cows, and another 300 cows that are wintered (meaning that they are maintained on farm over the winter period).
6. Our family philosophy is that land can never be sold. It is a multigenerational view – planning for our future generations 100 years from now.
  7. As part of this philosophy, we have focused on environmental protection and enhancement, which includes the likes of planting native trees. Our mantra has been if you cut one tree down, you plant twenty to replace it.
  8. Our family farm was originally a 600-hectare sheep and beef property. The property was bought by my great-grandparents David and Nellie Kane in 1929 (Westholm) and run as a dairy and sheep farm. Hereford cattle were added in 1963.
  9. My parents, Robert and Mary-Anne Kane, and brother Peter Kane manage the beef and stud cattle operation. My father still helps on the farm. He is a Councillor on the Hereford Association Council. My mother is on the Rural Support Trust, and also Golf Otago.
  10. My wife Nicole and I are the dairy farmers in the family. We started out as managers of the dairy farm operation, then in 2009 changed to share-milkers. Five years later we purchased our first farm – an 86-hectare block, which gave us 45 ha of milking land.
  11. Following that, we purchased another 26 hectares and incorporated it into our dairy platform. Last year we went through a change in our wider family farming shareholding/ownership structure. We are now shareholders and co-owners of Westholm Dairies Limited.
  12. The change in the family farming operations was to bring my younger brother into the farming Company. The amalgamation has brought all parts of the family farming operation together – beef, stud cattle, and dairy farming - and enabled a new generation to take over.

13. We operate a highly technical operation, utilising modern technology to provide us with as many tools and insights as possible to assist with our day-to-day decision making.
14. In our local area there are 3 primary schools (Tapanui, Heriot, and Waikoikoi), and one high school (Blue Mountain College) not more than 10km apart. Our farm employs up to 11 staff at peak times of the year. Our staff have children in the three primary local schools. Locally there is also a sawmill which is a big employer.

### **Challenges**

#### *No two farms are the same*

15. Our farm is surrounded by a lot of rolling hill country areas known as Crookston, Heriot, and Kelso. The flatter land is being used for Dairy and Dairy Support. Dairy Support predominantly involves wintering cows, rearing calves, or growing supplementary feed (grain).
16. No two farms are identical, and no farmers identical in the way that they manage their farming system. Farming can be an expensive hobby. Farmers place different values on different things leading to many iterations of farm systems. An example would be the Nitrogen Cap under the current National Environmental Standards. With our farming system I could go up to that Nitrogen cap level, but my opinion is that it is not the right thing to do, it does not align with my farming philosophy, so I don't.
17. Other farming systems, (for example, organic dairy systems), utilise lower stocking rates, and generally have a lower production, but still the same dollar amount falls out of the bottom due to lower input costs.
18. Some dairy farmers have different farming systems, for example, we don't have a barn. Those that do will generally milk all year round (not every animal), and all feed is carted to them, and waste carted away. Around us, 1 in 15, or 1 in 20 properties have a facility like that. These systems have a high capital cost but maybe with increasing land prices and regulation it will become more common.

19. Our farming system is unique in the fact that we have a beef stud farming operation and Wagyu beef. We hold on to young stock and fatten them for sale. In terms of our overall farm system, we are likely to have benefited (from a profitability point of view) if we had converted another portion of our sheep and beef property to dairy. However, this option was not viable at the time due to capital constraints, timing and the preferences of our whole family.

*Product compliance*

20. Our dairy farm supplies milk to Open Country Dairy. The various milk companies all have environmental objectives that will be audited, for example, a riparian plan with a planting management plan.
21. Meat Production companies have different and separate compliance requirements. As a result, we face at least three audit processes each year – one from our dairy company, one for the regional Council, and one in relation to the meat production side. Thankfully, they occur at a similar time of year.
22. Dairy farms are a more recorded/consented farm system (compared with other farming systems in NZ). For dairy farming it is the structure of the industry and the requirement for optimal milk production. In comparison, sheep and beef are less formally recorded, but will still have a farm plan, that includes pastoral management, and animal production. This is also changing gradually as every sector is needing to respond to the increasing regulatory requirements and market expectations around transparency and environmental performance etc.
23. There is an increasing need to rely on technology to support and facilitate increased data recording and compliance requirements (for example telemetered water monitoring). To be able to meet these requirements robust internet connectivity is necessary. Many farming communities around Otago continue to struggle with poor internet connection creating a barrier for the sector.

**Some of the many small ways we farm to benefit the environment**

24. The nature of farming is highly dynamic and multifaceted. Whilst there are some circumstances where the 'best practice' is very clear cut, in many circumstances it is far more nuanced, with competing challenges needing to be balanced and/or risks managed. Below I describe some of the examples of the methods we use to manage our activities.

*Winter grazing*

25. Roughly 5km of the Pomahaka River runs through the middle of the farm. We farm on both sides of the river and as you might expect sometimes the river floods the flats.
26. We don't have any 'off paddock' facilities for grazing stock as part of our farming system. Instead, we use winter forage crops. As a result of this we tend to calve later in the year. We do this because calving is outdoors – so needs to be when the weather is more settled.
27. Whilst not prevented by the current rules for winter grazing, we could graze the river flats as a permitted activity without requiring consent. However, just grazing those flat paddocks continuously would be detrimental overall. We would lose our topsoil, and the topsoil is crucial for pasture growth and animal production. It is not in our best interest (environmentally or production wise) to do that.

*Short break fences versus long break fences*

28. For our farm system we are planting winter crops like swede turnips, kale/fodder beet. The swede turnips are ideal for our farm system (climate, geography, etc). We feed these crops out by break feeding them. Break feeding means sectioning off a part of a larger paddock a section at a time with temporary fencing.
29. Crops like kale will grow to up to 2m tall which creates some practical challenges. To put a break fence through it you have to push a line through the kale crop with the tractor. This line gets quite badly damaged and so you lose a portion of the crop, which is inefficient.

30. We use short break fences, that is, every day is a 'short' block that is fenced and is moved down the slope over a number of days. The generally accepted practice is to use long break fences. However, we have found that long break fences don't work well on our property predominantly due to soil type. In our case a shorter 'feed face' is more efficient for both us and the animals because there is less walking required. Reducing the amount of walking that the stock need to do helps minimise soil damage which is important on rolling country like ours. In addition, less walking reduces the maintenance feed burden of the animals because they use less energy.
31. The fact is we want to manage our winter crops to preserve soil because we need it to grow pasture. In September we were sowing grass, this was because of better management, i.e., there was little to no soil disturbance – which meant quicker drying. It was a month ahead of when most farmers locally are sowing. Every farm system is different, based on their geography, soil, climate, stock, people – and the decisions they make in terms of on farm production factor in multiple considerations.

#### *Other compliance*

32. As a dairy farm we have strict compliance processes. We have yearly shed inspections and a bi-annual water consent monitoring undertaken by the Council. Data loggers at our water takes collect information and feed it directly to the Council daily.
33. Within our own operations we complete monthly compliance checks for the shed, health and safety, animals (where they are grazing for the month, that is, where they have been), how many stock, how much fertiliser and where, and proof of the fertiliser usage. We monitor and record all our effluent applications including where, when and at what rate it is applied. We also report on our milk production including quality (protein level etc), cooling, and compliance. All our washing procedures are logged and recorded as are our usage of any sprays and medication for the animals. The farm must be certified to use medications and chemicals.

34. We use the Protrack drafting system at our dairy shed. Protrack is a RFID monitoring system that tracks and records the performance of each cow. It is also a part of our NAIT compliance. We can log if a cow has a health event such as testing positive for a strain of mastitis and it will automate when she needs doses of medication and the withholding timeframe (during which her milk cannot be included). It will also tell us when she is allowed back – that is, when her milk is allowed to be collected and included.
35. Our pasture management system also uses technology (FarmIQ). Our whole farm has been GPS mapped allowing us to manage it with high precision. For example, our agronomist will lodge a job to indicate that a paddock needs spraying, this uses the GPS information and an App to identify the paddock and log that it will be withheld from grazing for the necessary number of days. This is important to ensure that spray residue does not enter our milk supply which is a particular concern for some of our milk markets. This is particularly an issue for cereal crops for silage or fodder beet when using fungicide.
36. It is also crucial that this type of work gets recorded, completed, and in a timely way. For example, last year our agronomist went on holiday – and it cost us 2 tonne of yield as the spraying did not occur on time. Hence the importance of a live document and on farm recording. With the FarmIQ app there is no paper trail. The data goes directly into FarmIQ and is available to everybody in real time.<sup>1</sup>

#### *Disease Management*

37. For our farm we tend to have our intensive crops on a certain class of paddock. The more intensive the crop the lighter the stock we put on it. A lot of planning goes into determining what crop goes where – we think about the climate, soil, geography, altitude etc – i.e. what will best grow where. It is also necessary to factor in disease resistance when deciding where to plant a crop. For example, if you have had Dry Rot<sup>2</sup>

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<sup>1</sup> See Appendix 10 for an example from another farm.

<sup>2</sup> Dry Rot, also known as black leg, is caused by the fungus *Leptosphaeria maculans*. It can be extremely destructive in swede, rape and kale crops, and occurs throughout NZ, most commonly in the lower South Island



in turnip, you cannot use that paddock for turnips again for up to 25 years. The fungus can be air borne, and it is most prevalent in the lower South Island. One paddock of ours has been affected by it and as a result we won't be able to use it again for the same type of crop in my farming lifetime. The fungus can live in the soil for years and because it is an airborne fungus, it can also infect a neighbouring crop on farm or your neighbours. The disease typically doesn't rear its head until you have a dry year which puts additional stress on the plants. This is potentially an issue for winter grazing if you are restricted to a smaller grazing area.

38. The issue with a disease like dry rot is that with the Otago/Southland climate there are only specific crops that are suitable for the climate, soils, and environment. The planning and preparation for planting winter crops is complicated by a risk of disease that impacts animal food supply for that winter season, but the long-term implications of not being able to plant a specific crop limits the small pool of available crops. It also is not good for plant production or soil quality to keep planting the same species over and over in the same soil. Hence the reason it needs to be managed very carefully.

*Invasive species and pest management*

39. The Otago Regional Council is responsible for willow trees and pest species management. Fonterra farms do fencing for riparian planting. The fences are great for excluding stock, but the consideration is weeds, and in our case willows. As a pest species willows are fast growing and take a lot of water – a mature Crack Willow in summer can consume 400L of water per day. The Regional Council has not been able to maintain the level of work necessary to control them, so it is often up to landowners to try to manage them. Some of our neighbours are using helicopters and spray to control them. They are problematic not just because they consume water, but they also smother habitat and prevent access to the waterways that we are trying so hard to improve.

40. There are other pest species that we also must manage, for example we have feral deer, possums, hares, and occasionally geese. We have 12 ponds on the farm – and mallard duck shooting is a key part of the seasonal calendar in May.

### **Areas where we are improving our operations**

41. Whilst we focus on milk production, this requires us to concentrate on all areas of the farm (people, land, animals). For example, with winter grazing our plan is mapped out at least 18 months to 2 years ahead, in terms of crop type and paddocks. We soil test and prepare the paddocks in advance so that they are ready to grow the feed we need. This is one example of where we are improving. There are many others:

#### *Fencing and revegetation*

42. We are part of the Pomahaka Water Care Group<sup>3</sup> (catchment group). I have been on the Group's board for the last 2 years. It started in about 2014 after the Council shared concerning data about the water quality in the catchment. Poor results existing across the board triggered local farmer concern and resulted in the establishment of the catchment group - with the assistance of Janet Gregory of Landcare Trust.
43. The group has focussed on riparian management and information sharing regarding on-farm best practice techniques to avoid and mitigate adverse effects on catchment water quality. The group has approximately 190 farming members who pay an annual subscription fee of \$200.
44. Most sites across the catchment are now demonstrating an improving trend in water quality. There are still some sites that we are focussing on – but the general trend is improvement. The long-term vision of the group is to have the highest water quality possible so that future generations can enjoy the river.
45. A key focus of the group is fencing waterways. We got 4km of subsidised (\$7/metre) fencing as part of the catchment group's work.

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<sup>3</sup> [Pomahaka Water Care Group | Protecting your river \(pwcg.co.nz\)](http://Pomahaka Water Care Group | Protecting your river (pwcg.co.nz))

Because of our operational needs we needed to top up the value so we could include more wires and gates for stock control and management purposes. The catchment group also completed riparian planting and habitat restoration.

46. We have over 12km of tree lanes in the dairy farm alone – 90% of our dairy paddocks have at least one tree lane. The tree lanes are a key component in that they provide shelter and shade for stock during the height of winter and summer. For our farming systems, shelter in the paddocks is crucial – because of the climate, geographical location, and the fact that we do not have ‘off paddock’ shelter.
47. Part of our on-farm planting has included two big gullies that we chose not to develop but instead let revert to regenerating native bush. It started out with snow tussocks, but now we are getting pittosporums. We consistently attempt to find the deer in these areas, both as a form of pest control, recreation, and food supply. The farm has always had lots of tui, kererū (wood pigeon), kārearea (falcon), pūkeko, and korimako (bellbird).
48. We manage the pest species (flora/fauna) either ourselves or we bring in contractors. We manage all the gorse control on our farm. We also have rabbit cullers come on farm to manage the rabbit population.

*Fishing, recreation, and public access*

49. The Pomahaka has tuna (eel), brown trout, and sea run salmon at times. For that reason, it is a desirable river for use by recreational fishers.
50. We have opened up access to the river within our property for anglers. We have an ex-Fish and Game ranger who comes every year to fish. We also have someone who has been coming every year for the last 25 years. We have riparian fenced the river and excluded stock. We set the strip back 30 metres from the river and mow it for people. We see it as an amazing asset, and we are happy to provide people with access. We need to know who is on the property for health and safety purposes. They ask permission and we let them on

*Technology*

51. Animal production is key to our farm system. Our farm system like most dairy farms now is technologically focused. Every single cow is monitored remotely, every day. They each wear a collar that collects data on the animal (in terms of behaviour, eating, sleeping etc). Data recorded on the animals is shared with the local vet clinic. This is an important resource for proactively managing animal welfare.
52. Improved production is about efficiencies and improvement in the way that our farming systems operate – people, animals, land, and water. For improved animal production good genetics is crucial, which means good bulls and maternal stock. All the extra data that we are collecting with the improved technology translates to improved production.
53. We are herd testing the dairy cows daily. Currently the technology allows us to record data on 8 milk traits alone (volume, fat and protein, etc). Herd testing allows us to pin point traits to get specific data on an individual cow – and respond to that individuals needs with specific feed requirements. We can get performance data out of every cow that is milked.
54. The technology enables us to respond early to any health, wellbeing or welfare issues that arise. The technology can forecast a cow's wellbeing or a decline by about 2 months. We get a list of cows to monitor or watch. Often when we get this list and look at the cows we think, 'nah, there is nothing wrong with them', but we always do some more testing and almost invariably something is not right. Being able to pick these issues up before the animals starts to show symptoms has huge wellbeing implications in terms of animal welfare and production. The system allows us to be proactive with our animal management, intervening early before issues have set in and begun to impact production. Early detection is also a proactive method for disease control and monitoring.
55. The reality with farming is that there are never enough hours in the day. Particularly with the increased emphasis on compliance monitoring and reporting. All of it takes time. Technology like the collars

is helping in terms of time management. The collar technology is an advancement in on farm recording and data collection in that it saves time and effort – and improves efficiency in the whole farming operation. Collars are seen on some farms as an equivalent cost of a labour unit – but similar to a labour unit providing information and data to improve production through efficiency. The costs of the collar system we use amount to \$32 per year per cow. This is paid upfront each year so is no small investment. Other systems that incorporate more information are more expensive.

56. We are moving our whole farm onto FarmIQ. This system is a 'one stop shop' for us. All our animal, grazing, feed, fertiliser data etc can go into the same platform. It is a live platform that allows us to access the data in real time wherever we have an internet connection. This system gives us access to all sorts of management enhancements from simple things like being able to double check you are putting the cows back into the right paddock, to gathering an enormous amount of data about each individual animal that we can use to optimise their performance and the performance of the overall herd.
57. Every 10 days we have a grazing plan. This is uploaded on FarmIQ so that everyone on-farm knows what is going on. Everyone can see when stock have been moved.
58. The nature of our new technology means that we can move stock remotely. The benefits of this also include health and safety for staff. We can monitor an area for flooding and shift animals remotely. The collars remove the need for physical fencing. All employees have access to all the data on all animals – there is no risk of information not being available to inform on farm decisions.
59. The other benefit of the collar technology is that you can compare yourself to other farms in the area and look for areas of continuing improvement.

*Fenceless future*

60. In reality, we are not far off planning to be fenceless – this will involve establishing a plan for water trough locations and access. But without fences we expect to once again be able to improve the efficiency of our operation.
61. For example, I have a 3 ha paddock I am currently sowing, the next is 5 ha, and then 6ha. If I had no fences, I would be doing this sowing all in one go – so it would be a more efficient use of the land.

*He Waka Eke Noa*

62. We have been a test farm for Dairy NZ through the development of He Waka Eke Noa outcomes. Just prior to writing this evidence we received the calculation based on the Government's recently announced Farm Emissions policy which is currently being consulted on.
63. Overall, the result was 'good' in that it demonstrated that we are operating a relatively efficient operation from a carbon perspective, but also give us an insight into the size of the burden that this regime will place on our business. When we applied the initial pricing expectation the cost to purchase the credits necessary to offset our emissions would be an estimated \$25,000 per annum. This is significant and will have an impact on where we can continue invest in other initiatives.
64. To put the cost into perspective – it would be put towards riparian fencing, or the annual costs associated with our cow collars. Or, at a more personal level it could be put towards the costs associated with our grandmother's rest home, which the family business pays for. Our operation continues to support 4 generations.
65. I don't begrudge the need to address emissions, but it is important to be aware of the cumulative impact of the suite of regulatory requirements that we are having to contend with at the same time. The fact they coincide makes it difficult for us to respond as quickly as we might if there were just one or two regulatory issues to comply with.

*Constant improvement*

66. As you can see from above, our farming operation is not stuck in the past. We are constantly improving our operations to make them better for the environment and for our community as well as being more economical. This is despite the many challenges that we face.

*On farm decision making*

67. Our farm system is a complex operation that involves our wider family. The decision-making process for the farm is tiered from the simple day to day decisions, to the larger decisions that require board and shareholder approval.
68. Every morning my brother and I have a morning briefing session with staff to go over the activities for the day. We use Facebook Messenger and Snapchat a lot – as tools to record information and share videos and images of situations on farm quickly and easily.
69. The bi-monthly board meetings involve all shareholders and include our bank, the accountant, and farm advisors. The alternate month is a directors only meeting that involves family and allows us to discuss our family shared values and vision for the future of our farm planning, and allows us to ensure that our strategy is aligned when it comes to the bi-monthly board meeting with all parties.
70. All big decisions require a break down of all the elements – financial, social, environmental etc, and for us to tie that decision making into our long-term strategy and shared vision. All aspects of our operation are subject to scrutiny to ensure that they are pulling their weight in terms of the business – if not, different scenarios of what we could do with that land as an alternative are explored.
71. Our family goal is to own more farms and grow the business. We are very aware of the risk of over capitalising – for example, our approach to a wintering barn, which would be upwards of \$3M investment would have to be weighed up in terms of the cost and benefit to the whole operation. We have no doubt in the future that with ongoing regulations we may well have to invest in a wintering barn and our

animals will all be indoors – but we are not there yet. The irony is that currently pig and poultry farming is now all moving out of being indoors.

72. A recent decision has been to purchase a new tractor and mower. The decision was aimed to reduce the number of staff hours mowing by purchasing a mower that increased the area mown from 3.8 metres wide to 6.8 metres. The purchase has not changed the fuel per hectare but has increased the number of hectares mown per hour. When you are mowing 2500 ha per year – and that is being mown up to 5 times per year, any improvement in efficiency is important in terms of reducing staff time on a tractor. For context, the amount we have spent on the new tractor and mower is the same amount that my father spent on purchasing 600 acres in the 1960s.
73. I would consider us to be early adopters of technology. Sometimes we have been burnt – for example, we purchased a heat recovery system when they were first introduced. It is effectively operating like an air conditioning unit that is used to cool milk from 37 degrees to 4 degrees instantly. This was a new technology 12 years ago, they are more common place now. The new one we have just put in is more reliable and efficient. The key part of all our decisions is efficiency plus reliability.

### **Conclusion**

74. I know I have talked about a lot, but the general message is that there are a lot of challenges for farmers like us at the moment. We are all trying to improve our operations to keep them in line with the new rules but these things take time.
75. It is a tough moment to be in the farming sector. We are not arguing with the direction that the new rules and regulations are heading. We just need time to be able to implement them and avoid unintended consequences. For an example of an unintended consequence, riparian planting involves fencing areas of land off. The land is no longer available to be grazed, and is also harder to access for weed management. Willow trees are an ongoing pest management problem as they spread quickly, and consume large volumes of water.



76. As you can see from what I have said, we are always keen to improve our operations but there are a lot of things to consider at any one time. We have to be able to maintain profitability to be able to roll out new advancements because they all come at a cost (albeit to get a gain, in most cases anyway).
77. What is important to me is that the consequences of these new rules on us are recognised, because there are many like us who are facing similar issues. The farming sector should be given time and space to prepare itself for the many things being asked of us at this moment in time.

Date: 23 November 2022

Luke Kane

Westholm Dairies Limited

**Appendix 1**

*New tractor with mowers and full AutoStart.*

## Appendix 2

Cow ID	Year Born	Fresh since	DIM	Heat Alert Value	Heat Alert Duration
94	2020	29/Jul/2022	84	6.3	15h/20d
103	2020	07/Aug/2022	75	5.0	17h/20d
113	2020	30/Sep/2022	21	6.7	12h
136	2020	01/Aug/2022	81	5.0	16h/19d

*A screenshot of cows on heat for a day that automatically goes to the shed and drafts off at the next milking.*

**Appendix 3**



*1960s technology that still gets the odd outing.*

**Appendix 4**



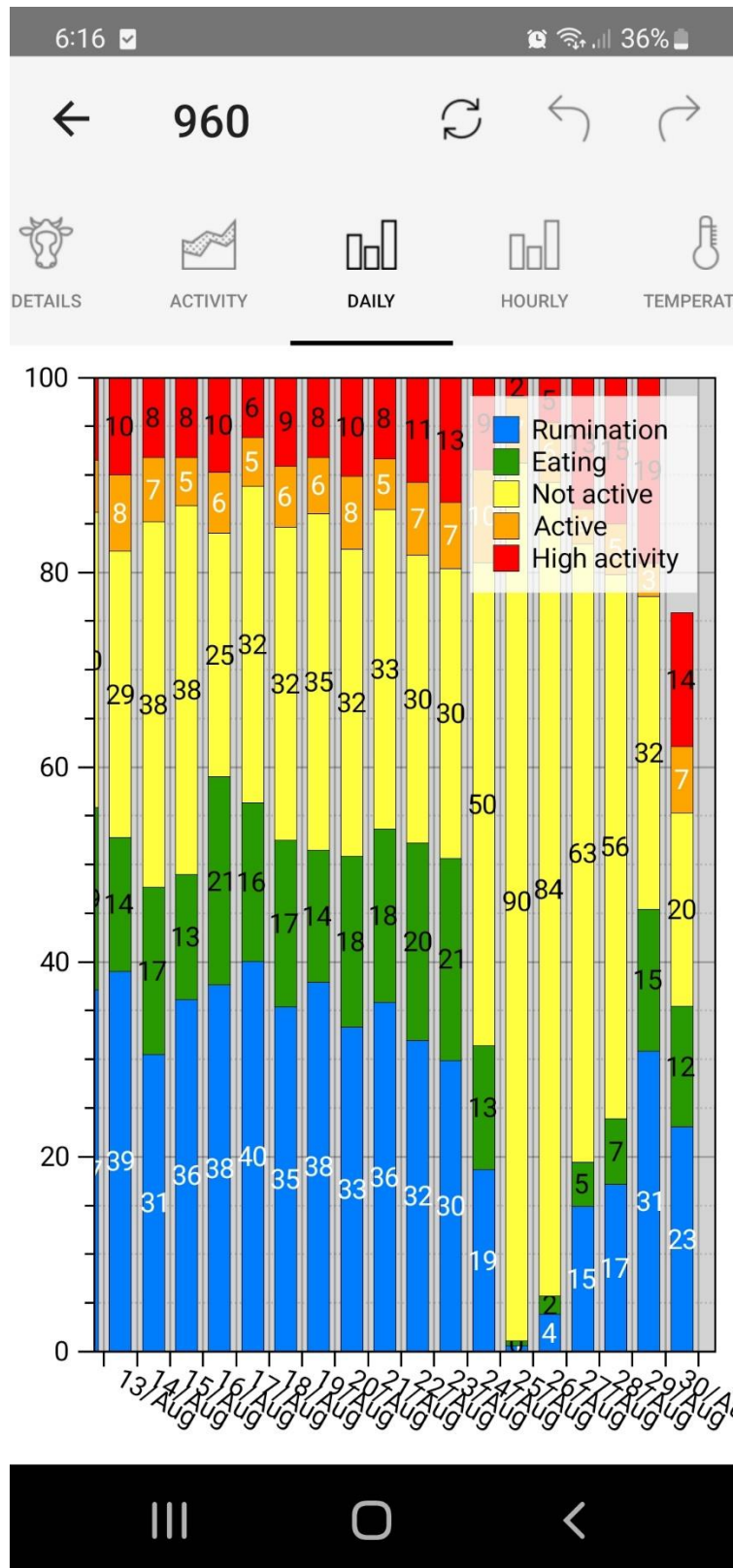
*Typical snowfall in Spring.*

**Appendix 5**



*My nana holding my daughter.*

Appendix 6



An example of a cow that required major surgery and cow manager had to pick it up.

## Appendix 7

The screenshot shows a mobile application interface with a status bar at the top displaying the time 1:15, signal strength, Wi-Fi, and 68% battery. The app header includes a menu icon, the text 'We...', a cow icon, a list icon, a search icon, and a settings icon. The main section is titled 'Health Alerts (22)'. Below this, five lactation records are listed, each with a 'Lactation nr' field and a corresponding alert button. The alert buttons are color-coded: red for 'Very sick' and yellow for 'Suspicious'. Each alert includes a timestamp, an icon (thermometer or cross), and a duration.

Lactation nr	Alert	Timestamp	Icon	Duration
38	Very sick	19/Aug 11:00 a.m.	Thermometer	14h
771	Suspicious	19/Aug 09:00 a.m.	Thermometer	11h
168	Suspicious	19/Aug 07:00 a.m.	Cross	8h
12	Very sick	19/Aug 12:00 p.m.	Thermometer	78h

Additional details for each lactation record:

- 38:** Fresh since 09/Aug/2022, DIM 10
- 771:** Fresh since 06/Aug/2022, DIM 13
- 168:** 2020 born, Fresh since 01/Aug/2022, DIM 18
- 12:** Fresh since 11/Jul/2022, DIM 39

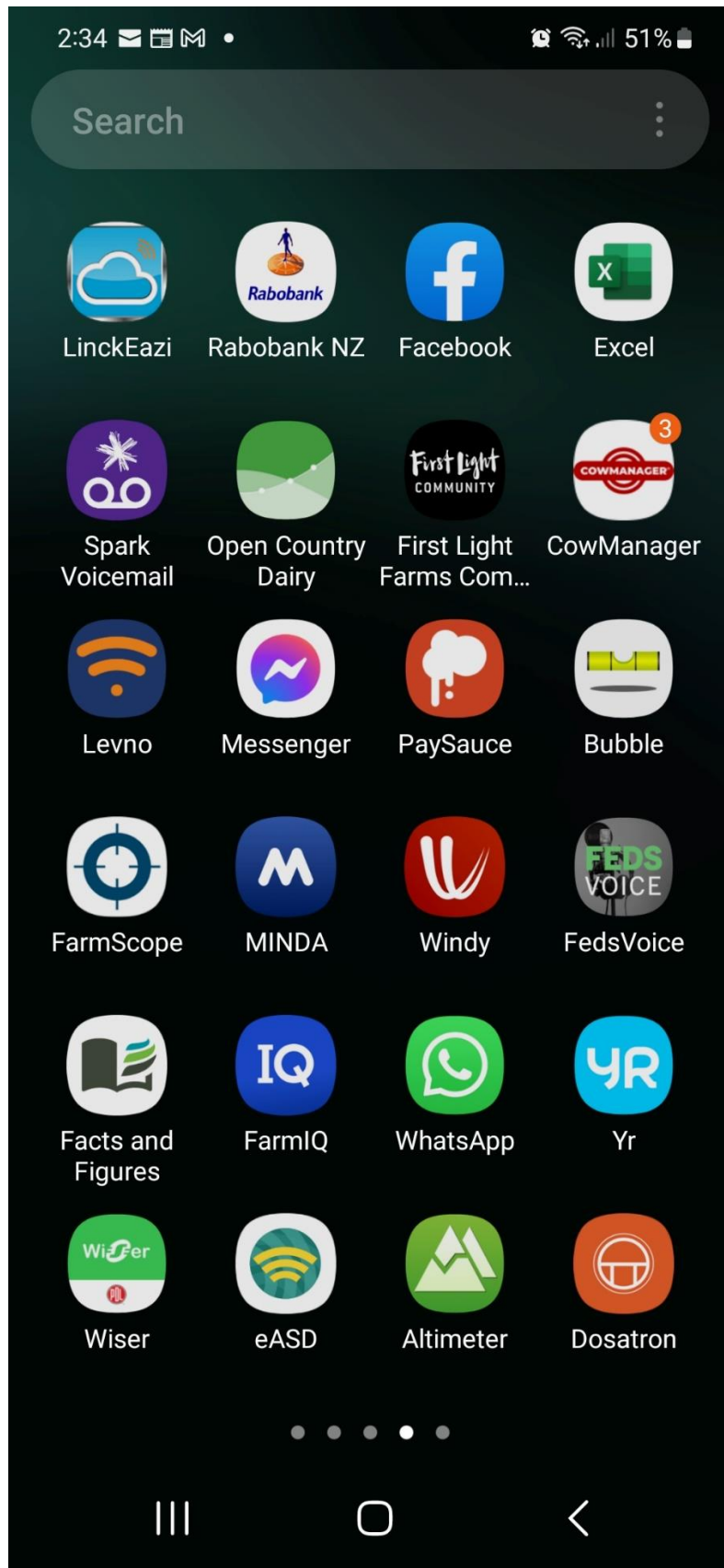
*Morning alerts on a snow day at calving.*

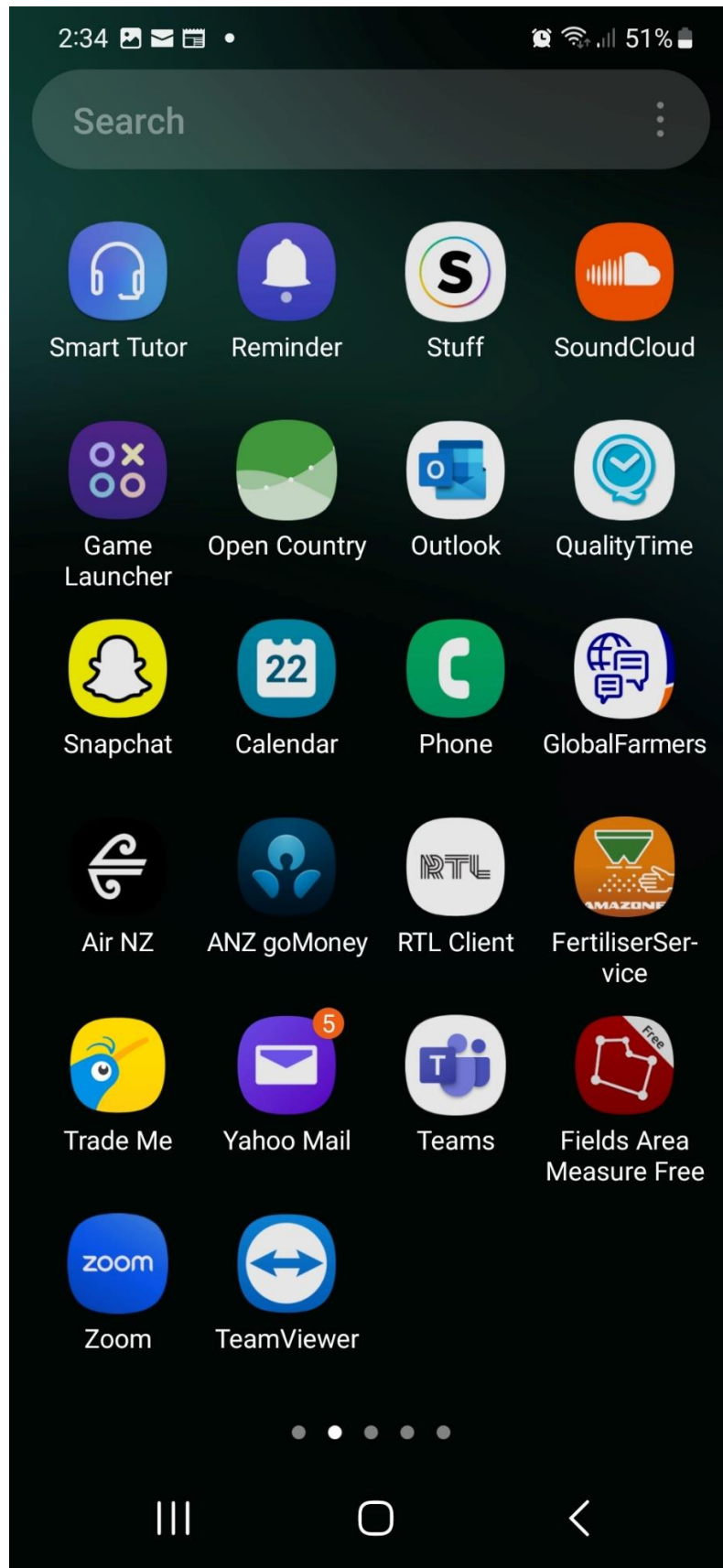


**Appendix 8**

*Happy cow with the river in the background.*

Appendix 9





*An indication of the applications required to run the farm*

## Appendix 10



A demonstration of the FarmIQ map tool taken from another farm