BEFORE THE FRESHWATER COMMISSION

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 FPI043** **FEDERATED FARMERS NZ INC** **Submitter FPI026 and FSFPI026** **DAIRY NZ** **Submitter FPI024 and FSFPI024**
AND	**OTAGO REGIONAL COUNCIL** **Local Authority**

EVIDENCE IN CHIEF OF LOGAN JAMES WALLACE: ADDITIONAL EVIDENCE FOR FRESHWATER PARTS

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EVIDENCE IN CHIEF OF LOGAN JAMES WALLACE: ADDITIONAL EVIDENCE FOR FRESHWATER PARTS

1. This brief of evidence is the same as the brief filed in relation to the Otago Regional Policy Statement 2021 - non freshwater parts. New evidence not previously provided to the non-freshwater panel is added in text that is shaded grey for ease of identification.

Introduction

2. My full name is Logan James Wallace, I live on our family farm (Beacon Hill Farming) in Waipahi, South Otago, with my wife Penny and daughter Isabel (11 months).

3. I have a certificate in Agriculture and a diploma in rural business from Telford Rural Polytech. Agricultural students from Telford undertake regular work experience on our farm.

4. After attending Telford I worked overseas on farms, cropping in Australia, and grain and potatoes in the UK.

5. My parents bought Beacon Hill farm in 1988. My family have farmed in the district for over 70 years.

6. We set up Beacon Hill Farming Ltd in 2013. It is owned in equal shareholding between my parents and me. I am the sole director of the company. The company bought the stock and plant and leases the farm from the family trust that owns the land.

7. I took over operating the farm in 2013 and in 2018 took full ownership of Beacon Hill Farming Ltd.

8. The farm is 290 hectares used for intensive sheep breeding/finishing. We have 240 hectares of cultivated pasture and 30 ha of tussock. The farm carries 2600 Romney Texel ewes, and 670 breeding hoggets. We used to provide some dairy grazing to other farmers but now the farm is solely our own stock.

9. We farm Romney Texel cross sheep for their meat yield and production efficiency (in terms of fertility and growth).

10. In 2018 myself, along with my parents (Ross and Alexa Wallace), were the Otago-Southland Ballance Farm Environment Award Regional Supreme winners. Along with this, we also won the Beef and Lamb New Zealand Livestock Farm Award, and the Massey University Innovation Award.[1]

11. The Ballance Farm Environment Awards objective is to promote sustainable land management on New Zealand farms – believing that role models and education are effective tools to improving farming practices. The awards programme is run in 11 regions throughout New Zealand.[2]

12. The judges for the Ballance Environmental award noted the impressive production gains and the strong environmental focus ("land and environmental plan, nutrient budgeting, wetland construction, retention of biodiversity and water quality emphasis as well as an outstanding commitment to community and industry").[3]

13. I have been the Otago/Southland FMG Young Farmer of the year twice. In 2016 I reached the national finals and in 2018 I won the national award - the 50th FMG Young Farmer of the Year.

14. I am also the Meat and Wool Chair on the Otago Federated Farmers Executive and was on the South Otago Downlands Farm Discussion Group.

15. I was part of the mediation process for Plan Change 8 in Otago, and helped parties understand the on-farm complexities of sediment traps at a practical level which was an important dimension to ensure that the rule framework would work as intended. Appendix 1 includes information I prepared for mediation on Plan Change 8 outlining the complexity of sediment traps for our farm system.

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[1] 2018 Otago Regional Supreme Winners - New Zealand Farm Environment Trust (nzfetrust.org.nz)
[2] www.bfea.org.nz
[3] Otago_Winners_Brochure_2018.pdf (beeflambnz.com)

16. Our farm is home to a range of indigenous fauna and flora species including kōtare, korimako, tauhou, kererū, tui and skinks. These species particularly enjoy the habitat available in our tussock block.

17. I am part of the Pomahaka Water Care Group and was on the executive committee for 4 years. In the water ways that run through our property we have identified tuna, koura and *Pomahaka galaxias*. Galaxias 'Pomahaka' is the name given to an undescribed yet genetically distinct galaxiid species found only in the Pomahaka River of Southern Otago. The Pomahaka galaxiid is classified as nationally threatened-vulnerable.

18. I am also team leader of the Eastern Southland Land Search and Rescue, and I was a youth group leader for the Calvin Church for 10 years.

Scope of evidence

19. The purpose of this evidence is to assist the panel in understanding:

    (a) The 'on the ground' process that we follow when making decisions;

    (b) The complexity and unique nature of each individual farm system and the pace at which changes to farm systems can be implemented.

    (c) The freshwater visions process as it relates to the Pomahaka Catchment Group, located in the Lower Clutha rohe.

20. The reason it is important to understand this is because the outcomes (in terms of the actual changes that will be required) sought through the Otago Regional Policy Statement are currently unclear, and therefore it is not possible to know the extent to which we will need to alter our farm systems. Until we have this clarity we cannot start mapping our pathway forward, or figure out how long we will need to implement the changes.

How we make decisions

21. Farming is inherently complex. We are obviously working with a dynamic biological system, both in terms of the land itself and the stock we run

on it. Very little about the system is consistently the same and each aspect is affected by the behaviour of the other parts. For example, the soil is affected by type of pasture/crop we use, which is in turn affected by climatic factors each season and the soil reaction to that.

22. There is a mix of farm types around us, sheep and beef, cropping and dairy. Our landscape is rolling hills. Our neighbours are beef farmers, some have beef finishing (in that they buy young stock to fatten up or "finish" before selling), some have their beef on lowland hill country. Beef is managed in a similar seasonal way to sheep in terms of feed management and timing. The beef cattle are also a tool for pasture quality for pasture that you cannot crop due to steepness. Cows eat the rougher poorer quality pasture (based on the physical way that they graze) – whereas sheep are more selective and prefer the higher quality grass.

23. To ensure we understand as much as we can about our own farm system, we gather quite a lot of detailed information, that is factored into our decision making and planning process. For example, we conduct soils tests every year across 3-6 of our paddocks and then complete a whole of farm test every 4 years. This information tells us how the soil is looking from a nutrient point of view and what fertilisers/crops should be used to optimise soil health. After each whole-farm test we develop a whole farm fertiliser plan for the following 4 years. The purpose of this exercise is to minimise fertiliser inputs whilst optimising soil health. The whole farm plan is then optimised during its life using the information we gather from the yearly individual paddock tests.

24. The cost of this testing is in the order of $80 per site. A whole farm test suite is $60 per paddock total of around $3300.

25. In years where we are not testing, we use frequent visual assessments of pasture quality, focussing particularly on those paddocks that may not have been cropped recently. Cropping provides an opportunity to enhance soil health and reduce disease risk in your pastures. Equally, you cannot crop too frequently in the same paddock, as this increases disease risk for the crops. For example, if brassica crops are planted in

too shorter rotation the risk of powdery mildew and dry rot increases. All of these are important considerations, that need to sit alongside other considerations including feed demands etc. If done well it allows us to keep our use of pesticides, herbicides and fungicides to a minimum. We are highly motivated to do this because spraying is expensive.

26. We use GPS tracking for our fertiliser placement to ensure it is going where it needs to. This is very common now – that is, a lot of farm systems would be using this approach. Every fertiliser contractor I am aware of does this and most farmers I know utilise the technology.

27. It is a valuable tool, and since using it we have seen an increase in production as a result of targeted fertiliser application. Once again, we are highly motivated to achieve this as fertiliser comes at a significant expense. We don't want to waste any of it!

28. For most of the year the stock are rotationally grazed. Rotational grazing is a pasture management tool where stock is grazed in paddocks according to a planned "rotation" schedule, taking into account pasture growth, pasture available, the stock units (i.e., number of stock grazing the paddock), the feed requirements of the stock (i.e., depending on the time of year, and type of stock. For example, pregnant ewes will have different feed requirements from other stock), and the number of grazing days. The number of grazing days is based on the amount of pasture feed available, and the feed required.[4]

29. This would be typical of operations like ours, but particularly so for intensive pastoral farms. Rotational grazing is a method of feed planning that helps us align pasture supply and animal feed demands on our farm during the year. For sheep and beef farmers, rotational grazing is the best for pasture and animal performance. It is a structured approach that enables targeted pasture feeding to help maximise production and achieve livestock target weights.

30. Our stock will generally be on rotation for 10 months of the year. We don't continue the rotation during lambing because it is too unsettling for

[4] https://beeflambnz.com/knowledge-hub/PDF/guide-feed-planning-sheep-farmers

the stock. It can be unsettling because pre lambing ewes like to settle into an area a couple of days before they give birth. This behaviour enables the ewes to identify suitable areas for birthing (e.g., shelter). During lambing we use a method known as set stocking. This means that the stock are spread out at 12 stock units per hectare across the whole farm. This gives adequate space for the natural maternal behaviour during lambing, reducing stress for the animals and optimising survival rates.[5] Hill country farms will take a similar approach.

31. To manage the property like this requires careful planning to ensure that there is adequate feed available for the set stocking period. The critical feed budget point is April/May because it is at this point that we know whether we have enough feed to carry us through the winter and enough for the subsequent set stock lambing period.[6] It is a balance between feeding ewes enough (particularly the ewes carrying multiple lambs) to promote lamb survival and lamb growth. Well planned feed budgeting is crucial for this.

32. Timing of crop plant is also critical and is targeted so that the crops will reach maturity when we require them. Swede turnips have a time to maturity of 170-250 days so we aim to plant them in early December for stock to go on in June/July.

33. Our summer turnip has a maturity date of 60-70 days and loses some quality if left too long so we stagger planting of these paddocks about a week apart over 4 weeks from mid-October, so they reach optimal maturity as we require the feed.

34. The transition of stock onto forage crops is important to allow the rumen to adjust to dietary changes so to not affect the animals' health. This can make it difficult to put stock straight on or remove stock straight off crops without causing animal health issues.

35. The set stock period does rely to a degree on sufficient grass growth over Winter. Generally, the average cover that you head into Winter with

[5] https://beeflambnz.com/knowledge-hub/PDF/growing-great-lambs
[6] Ibid.

will dictate your Spring cover. We budget on 100 days of no grass growth over Winter. Otago and South Canterbury budget on a 100–120 day winter – even hill country will budget on a 120 day winter. Effectively there will be no growth when soil temperatures reduce to 6 degrees or below. The growth will not start again until ground temperatures reach 9-10 degrees. If we have a sluggish spring, or a particularly hard Winter soil temperatures can be slow to recover, and along with that our grass growth.

36. Our insurance policy against this are our crops which are selected to efficiently grow and stock high quality bulk feed. Crops are also a key insurance policy against winter snowstorms. Animals will continue to eat a swede crop if they are moved onto it before the snow starts to fall. We always think carefully about our crop mix to give us options in how we can respond to Winter weather conditions.

37. As a result of the various factors influencing food availability, we have to plan for the worst and hope for the best. By way of example last season was very dry reducing our cover heading into to Autumn. To respond to this, we sold off all our lambs at lighter weights before the start of April to enable more grass cover to build up prior to Winter. Normally we would hold some of our non-breeding lambs until about mid-May to enable them to put on extra weight and obtain a higher sale price. We also had to carry out a small strategic Nitrogen application in Autumn to give us a growth boost as there was not enough grass and growth rates were lower because of the drought. We have encountered a similar situation this season, effectively we have had to contend with back-to-back drought seasons.

38. Another example of the type of thing that we had to adapt to was the shortage of meat processing capacity in 2021. Due to staff shortages and interruptions caused by Covid-19 stock processors were hugely constrained. Most farmers were not able to get stock off farm in a timely way which prevented them from being able to build up sufficient feed supplies for the winter. To address this, it was necessary to buy in supplementary feed, or send stock off to other sites further away to

reduce the feed demand. It is these types of situations that require us to plan for the worst and hope for the best.

39. Sometimes our planning has not been for a ‘bad enough’ scenario and you can get caught out and must pull extra levers to get through. These things can affect your operation to multiple seasons, if for example you have to sell off capital stock production is affected in subsequent seasons while you build the flock back up.

40. Therefore, you always try to retain a little fat in the system to get you through. This requires a lot of flexibility and constant diligence with respect to your current situation. In this respect I always monitor grass growth. This is by eye all year round when I am out in the paddocks, and then during autumn I use a rising plate meter to make sure my visual estimates are correct.

41. We have to be flexible in terms of our stocking so that the priority stock class at any point in time gets the best quality feed. From about December to March, the lambs have feed priority whilst we focus on growing and fattening them up. From mid-March to April, our focus is the breeding ewes having priority to ensure they have the best body condition for mating. Improved body condition in ewes increases lambing percentage and lamb production performance – meaning a higher lambing percentage and faster weight gain for the lambs. What we are aiming for is an ability to get lambs away earlier and heavier. This has several advantages:

    (i) It is more efficient in terms of carbon (less time on farm); and

    (ii) Requires less time in terms of maintenance (daily energy requirements).

    Together this reduces our overall methane emissions and preserves feed for other purposes.

42. We are also constantly refining our genetics to optimise the quality of our flock. We do this by buying rams that assist us in achieving the performance targets that we are aiming for. The key targets we use are:

    (a) 150% lambing percentage.

    (b) 30% of lambs killed at weaning (90 days), meaning that they met a target weight within that time.

    (c) Good maternal traits and meat yield.

43. We run a terminal flock with our poorer quality ewes (production wise) that we do not want to retain breeding stock from. Ewes retained in the flock for 5-6 years and about 40% of the flock is the terminal flock. All of the progeny from the terminal flock gets sold off – that is, no progeny are retained to become part of the next generation of breeding ewes. For the maternal flock, ewe lamb progeny are retained to become of the future breeding ewes.

44. As I outlined in paragraph 8, the sheep genetics we use is Romney Texel. If we wanted to change the genetics of our entire sheep flock, it would take several years and careful planning. We currently select our rams for traits like improving lambing percentage (i.e., number of lambs born), fertility and production. If we wanted to change our farm system genetics to a new breed or traits, it would involve identifying and selecting new rams that have those new traits. Then over several years of using those rams slowly replace the maternal ewe flock with the new genetics – as new lambs are born with those traits and become part of the main flock. These changes take many years as the genetics are only expressed through breeding cycles.

45. We time our lambing so that it occurs around when we expect grass growth to start in Spring. We split up the lambing flock, with the terminal flock starting 12 days before the rest of the maternal flock to reduce risk of major losses due to severe weather events, particularly of our replacement lambs.

46. Most sheep farmers chase lambing percentage improvement. Lambing percentage is a measure of the number of lambs born relative to the number of ewes. Most sheep farmers will be pushing for ewes to be producing twins – as it is an efficiency of production for a ewe to produce twins rather than one single lamb. This trait does differ amongst different breeds and there are other trade-offs. For example, some breeds known for higher lambing percentages have lower growth rates. This can create issues if you have a dry Autumn but are still needing to carry a lot of you lambs to fatten them adequately. With faster growing lambs they are sold off farm sooner: reducing pressure during Autumn if feed supplies are a bit tight. The last 2 years we have had a dry Autumn and with La Niña conditions prevailing again we are expecting another one this season.

47. Over winter, we budget for 20 days of lost feed – where I will feed sheep more, to keep them settled and calm and help reduce soil damage. This extra budget is for unpredictable weather events that might occur or other events that mean we need to have extra feed available.

48. Droughts are managed through de-stocking (i.e., selling off animals) or buying in extra supplementary feed, or buying in Nitrogen if there is grass growth (when drought is broken). As described above at paragraph 37, Covid and drought put extra unforeseen pressure on farms during the pandemic. Farmers that made early decisions were better off. We have to be flexible to be able to make decisions about the number of stock you have on the property to protect animal welfare.

49. The other critical thing for us is access to stock drinking water. We have access to a bore which provides us with a reliable supply of water as well as some natural surface water sources (creeks). Many farmers rely on surface water sources. Throughout the Clutha District there are a range of rural water schemes operated by the District Council or landowner groups. These schemes often provide a mixture of uses including drinking water for people. We differ from other parts of Otago in that we don't rely on water for irrigation purposes. Whilst this has its advantages, it also has some disadvantages as it means we are in some respect more exposed to the vagaries of the climate. We can't turn on the tap to germinate a crop for example.

Options for reducing environment footprint

50. The Pomahaka Catchment group has been proactive and instrumental in improving water quality in the catchment. Involvement in catchment groups helps landowners understand the land use issues on farm and the effects on water quality. A half hectare wetland has been fenced off and ongoing planting with natives is occurring – along with clearance of willows. Two more wetlands are planned. We also have a propagation nursery with a large variety of mostly native shrubs and trees (locally sourced from cuttings). Although with a toddler in the house at the present time we have taken a temporary hiatus from using it. My parents and I planted thousands of metres of shelter belts to improve the shelter on the farm for the stock. The shelter belts include a variety of trees. This has the added benefit of creating habitat for birds.

51. We are starting to fence off some of the farm waterways and we are about halfway through this process. We would love to do more but it is expensive to fence to exclude sheep ($15-20 per metre) so we would be looking at more than $40,000 just to achieve fencing. We also need to upgrade the water scheme before we can fence off the last of the waterways - requiring a $50,000 investment.

52. Winter grazing is of concern nationwide, and the new regulations will impact many farmers. Part of the planning for winter grazing is having a grazing management plan that covers how intensive winter grazing will be managed on farm, how issues will be identified early, and proactive mitigations planned. Beacon Hill Farming Ltd has developed a Winter Grazing Management Plan (attached as Appendix 2). Our Winter Grazing Management Plan covers our farm details, our farm waterways and critical source areas, and our plan in response to the requirements of the Intensive Winter Grazing regulations.

Freshwater visions and the Pomahaka Catchment Group

53. In November 2020 I went along to the afternoon/evening Regional Council consultation on the Freshwater visions at Tapanui. Tapanui and Pomahaka are part of the Clutha Mata-Au FMU - Lower Clutha rohe.

54. There were other members of the community and farmers there from our district. We talked as a group before the Council staff arrived and discussed the importance of a thriving rural community and the importance of agriculture to the community. Everyone in the room put something down recording the importance of thriving agriculture – but none of these words were included in the visions that were released. We want thriving rural communities and to achieve that we need thriving agriculture. The visions that have resulted from this consultation do not reflect what our thoughts were.

55. We are part of the lower Pomahaka catchment, one of the 'problem' catchments because the creeks have historically been so highly modified. They are now all mostly mechanically straightened waterways with an impervious clay bottom. There were all straightened by the original Catchment Boards in 1960's-1970s with the aim of improving drainage in the catchment. The intention of the Catchment Boards at the time was to improve production – and at the time, straightening the waterways was deemed best practice.

56. The section 42A report provisions lists the LF-VM-O2- Clutha Mata -au FMU vision (7A) in the lower Clutha rohe, and says "opportunities to restore the natural form and function of water bodies are promoted wherever possible". Although the work that the catchment group is doing is focused on long term improvement of water quality, I'm not sure that we would be able to return those water bodies to their natural form and function.

57. Because of the modified waterways, there have been ongoing issues of bank slumping and high sediment load. The creek in our property was originally meandering. The straightening has meant that the creeks have faster flow in a flood event which can cut banks and lead to erosion. The banks are also steep because they have been dug. There was also a build-up of large amount of sediment as a consequence of the exposed clay base.

58. These water ways were traditionally cleaned every few years to keep water flowing. This was what was viewed as best farming practice at

time - but now this practice is a discretionary activity – but you would be highly unlikely to get a consent because it is work in a waterway.

59. We still must deal with historic sediment and new sediment from mostly natural sources before we will see water quality improve. This process to improve the water quality takes time. The issues we have to deal with include Turbidity and DRP[7] levels. This will not improve quickly unless we have some sort of intervention like (for example) sediment traps. We are dealing with the historic sediment on my property by way of a sediment trap 'loophole', on the advice of the Council (**see Appendix 1**). Dealing with the historic sediment will take time. We need access to rules to enable us to use some of the tools at our disposal (for example, sediment traps for our modified waterways) to speed up the natural process (natural sediment removal process). Other tools could include gravel removal – but approaches are specific to each river.

60. As outlined above, the historic sediment is impacting and increasing the water levels in the waterways and creating negative outcomes. There are not any proposed tools to respond to this as we are not permitted to do any work in a flowing waterway, and the small flowing modified waterways are where our problems are. Therefore, tools enabling intervention must be allowed to improve water quality outcomes.

61. We intend to undertake a sediment trap trial further down the catchment. The trial will be fully monitored to see how effective it is as a tool for dealing with historic sediment. This is a Catchment Group initiative with an educational focus to provide farmers with real data from our catchment. Local engagement and adoption will be driven by real data and practical local examples.

62. Some of the waterways in the catchment have not improved with respect to Turbidity and Phosphate (for example the Wairuna). The Waipahi and the Pomahaka have elements of natural Turbidity. It is hard for us to have to deal with historic sediment issues but also potentially have unrealistic measures of water quality – that is, our creek is never going

[7] Dissolved Reactive Phosphorous.

to be at a pure crystal-clear level for Turbidity, based on the nature of the water body and the surrounding environment. It is an unrealistic standard.

63. The described baselines will not work for all waterways because the waterways themselves are all different - due to their location and where their main water source is (geology, soil type etc). For example, for the Catlins river, most of it is in native bush and its attributes reflect that. You cannot compare our creek with waterways in Central Otago (for example) or Canterbury spring fed braided rivers. The Shotover River is fed from step mountains, erodible country, compared with the Pomahaka which originates in high country tussock land.

Plan Change 6A

64. The Pomahaka Catchment group history started with ORC Plan Change 6A. In the absence of guidance for what we could do to meet the new Plan rules, a lot of local farmers got together to work on how to meet rules. At that stage the council focus was not on education and information. Proactive farmers were getting together to see what the issues were in waterways. Schools and the wider community became involved with planting days. The original catchment group was set up with broad community involvement including iwi, Fish and Game, DOC, and farmers.

65. State of the Environment monitoring from the time did not give enough specific information and detail to enable landowners to make proactive change. The Catchment Group allowed farmers to collect data themselves and figure out where the issues were and create solutions in response.

66. Farming best management practice is now all about improving water quality – and looking at all the impacts, not just about improving production, but looking at the whole environment, including the wider community. Our catchment visions for water quality are interrelated to the catchment groups and the work that they do. This is not a short-term game, and the risk of getting it wrong impacts all of us. External visions and rules mean less engagement and buy in from a local level, less

participation in the local catchment group, meaning less sharing of ideas and innovations that are improving water quality at a local level. The bigger picture risk of getting it wrong is that we do not have a profitable primary industry and we are not supporting the rural sector. That impacts the social framework of the rural communities.

67. We are already dealing with regulations that if enacted will result in animal welfare issues and the Government potentially having to step in. For example, in the NPSFW, Te Mana o te Wai, at minimum flow, water-takes are supposed to stop, but that does not consider animal welfare. Farmers cannot do that with stock – we must have water for stock to drink. Therefore, we cannot fence off waterways unless we have secure water sources that are not going to be cut off.

68. We also have the conflict between the NPS for Stock Exclusion, which will require farmers to put in reticulated water schemes, but under the NPSFW these water takes could be cut off at minimum flow.

69. Since Plan Change 6A the catchment group has worked hard collectively to record, measure and make positive changes in freshwater management practices. Our catchment visions and goals are more reflective of our local needs than what is prescribed by Government.

Conclusion

70. Work and cost is required to implement changes, and it takes time for the effect of the changes to be seen. We need to make sure that what is created will achieve the desired outcomes without the negative outcomes that have previously been seen.

Logan Wallace

Beacon Hill Farming Limited

Appendix 1:

Here are photos and research I found when trying to figure out a sustainable way to deal with the historic sediment issues on the small waterways on my farm that were originally straightened by the catchment board to improve drainage. Then historically maintained through longitudinal excavation every 3 to 5 years to remove sediment build up. The change in farming practices over the last 10 years has led to a reduction in sediment getting into the waterways from farming practice, but the build-up over that time is starting to destabilise the banks and lead to slumping and more sediment ending up in the waterways. The reason I started to look into sediment traps is we have a healthy population of Pomahaka galaxiids living in our waterways and I want to protect that population. I have put some sediment traps in on my place under a loophole suggested by council staff.

Sediment trap in one of my streams that is working really well catching the fine sediment

Another sediment trap that is now due for cleaning as it caught a lot of sediment during the February floods as they blew out the weed in places that was holding the sediment in the bed. Plant growth in a sediment trap seems to increase its efficiency at catching fine sediment as it slows down the water velocity and binds up the sediment in the base of the sediment trap.

This photo shows a section where the weed and sediment moved down into the sediment trap cutting back down to the stream bed. The tile is 30cm long to give you an idea of the amount of sediment that is sitting in the bed.

Another interesting thing I have observed is that the Pomahaka galaxiids and eels have made the sediment traps their homes during periods of low flow.

This photo was of a crop paddock where a 3 m buffer was left along the stream and grass was left in the last 20m of the critical source area. The rest of the critical source was planted. The paddock was grazed to leave the last bit of the critical source area until last but as you can see the water coming off the paddock is far cleaner than the waterway.

Straw bale sediment fence on a crop paddock where the whole paddock was grazed along good management guidelines with critical source areas grazed last. This critical source area flows over after heavy rainfall events for about 24 hours a time but as you can see the water is clear below the sediment containment. It flows through another 300m of grass paddock before the waterway

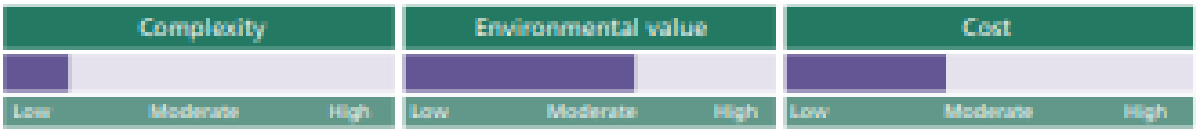
Below is the guideline I used to construct the sediment traps

Sustainable drainage management

Best management practice

By Henry R Hudson

4 Coarse sediment trap



Definition & purpose

Sediment traps are relatively wide, short and deep excavations in the stream bed. Trapped sediment does not progress downstream where deposition would reduce channel capacity. The trap itself has to be excavated when it fills up (after major storms) rather than a much greater length of the stream. Sediment traps confine sediment deposition to a small reach of channel and reduce excavation costs. They are used as the upstream control in sediment detention wetlands for fine sediment trapping.

Location

- A long relatively straight channel reach with good access, room to operate an excavator, room to stockpile or dispose of sand and gravel, and suitable ground conditions are required.
- Sediment traps should not cause channel instability and endanger infrastructure (e.g. bridges), and public health and safety.
- A convenient location to trap and excavate bed material.
- Upstream of reaches where habitat is degraded because of excessive sediment deposition (e.g. sand covering riffles; loss of pools and riffles).

Work window

- If birds are nesting along the channel margin, avoid excavation in that area.
- Do not disturb the bed and banks during trout spawning (riffles in gravel beds in May, June and July).

Treatment objectives

1. Maintain downstream channel capacity by trapping sand and gravel at a convenient location before it moves downstream.
2. Confine channel excavation to a short reach of channel.
3. The bed and banks are stable (i.e. no channel erosion caused by the trap).
4. After a period of adjustment downstream habitat should improve.
5. Sediment traps should be well signposted and secured from inadvertent access (e.g. the access track to the trap is gated and locked).

Before you start

- ☐ Consult with experts at the regional or district council regarding the location and design of in-channel sediment traps, paying particular attention to channel stability and public health and safety.
- ☐ Develop a construction, operational and maintenance plan, and obtain the necessary resource consent and access agreements.

Procedures

These procedures are not a substitute for expert advice on the particular conditions prevailing at the site. Get expert advice on the design requirements (e.g. the river engineers at the Regional Council); and review the more detailed design guidelines.

Construction:

Excavate a pit in the channel. As a rule of thumb make the pit 1.5 times wider than the channel; with a length from 4 to 10 times the width; about 1.5 m deeper than the average bed level. For a 5 m wide channel, the trap width is 7.5 m, and the trap length 30 m to 75 m long.

The upstream edge of the pit probably has to be stabilised with rock to prevent erosion. (If the bed erodes the trap will fill up with this material). Make sure that fish passage can still occur.

Excavation would preferably be undertaken with a dragline or hydraulic excavator from the bank.

The cross section of the trap should be uniform, to limit flow separation, and gradually get wider downstream. Channel side slopes should be 1 vertical: 3 horizontal, or more gentle if possible.

Suitable vegetation should be planted to stabilise the banks and berms, and provide food and habitat for fish and wildlife.

Maintenance:

- Regular inspections should be carried out to determine when the trap should be re-excavated; and after floods to detect problems (e.g. scour; bank failure).
- Bank vegetation should be maintained in good condition.

Sediment removal and stockpiles:

- Excavate the trap when it is filled, otherwise there will be no more trapping.
- Follow the guidelines for channel excavations to remove material.

Decommissioning:

- In many cases a trap can be de-commissioned simply by not removing sediment. The bed will build up, and the edges will infill as vegetation encroaches and traps more sediment. The channel will eventually be indistinguishable from the adjacent channel.
- Once stockpiles have been removed, the site should be levelled and re-vegetated. Unless agreements have been made to retain access tracks, tracks should be covered in soil and re-vegetated.

Additional reading

Hudson, H.R. 2002. *Development of an in-channel coarse sediment trap best management practice.* Environmental Management Associates Report 2002-10 for Ministry of Agriculture and Forestry Project FRM 500.

Appendix 2

Beacon Hill Farming Winter Grazing Management Guidelines

Beacon Hill Farming Winter Grazing Management plan

Contents

Farm Details

Farm Name: Beacon Hill

Lease Holder: Logan Wallace

Ph: 0272136360

Email loganwallace@windowslive.com

Address: 182 Beacon Hill Road, RD1 Gore, 9771

Water catchment: Wairuna, Pomahaka, Lower Clutha

Total farm area: 290ha

Total area suitable for winter grazing: 240ha

Annual area in winter grazing: up to 18ha planted

Stock classes and approximate number generally grazed on crop

-Ewe Hoggets: 700 for approximately 100 days

-2ths ewes: 680 for approximately 75 days

-Mixed aged ewes: 1,300 for approximately 50 days

Currently we have no cattle on the property but during the index period we have had up to 100 dairy cattle on the farm for the winter grazing period on May-to-May contracts.

Farm waterways

The waterways on Beacon Hill have mostly been straightened pre 1980 and are clay/ mud bottomed waterways. They generally flow all year round but parts can dry up during droughts.

The waterways have historic sediment issues that were caused by what was previously seen as good management practice. We have seen improvement over the last 10 years through better winter grazing management and the installation of sediment traps. There is still some sediment making its way into the water through natural causes; mainly bank slumping.

The farm waterways contain a known healthy population of Pomahaka Galaxiids. It has been observed that the galaxiids breed in the constructed sediment traps and pools at the ends of culverts, so best endeavours will be made to make sure no sediment makes it into the waterways.

Kōura (fresh water crayfish) have also been found occasionally in the waterways and it is presumed that they are present throughout.

Tuna(eels) have been seen in the lower part of the waterways.

There are no Trout present in the farm waterways and no spawning habitat due to there being no gravel present and the size of the waterways.

MY MAP

Date	Property Number	Map Title
September 23, 2022	4005484	Map

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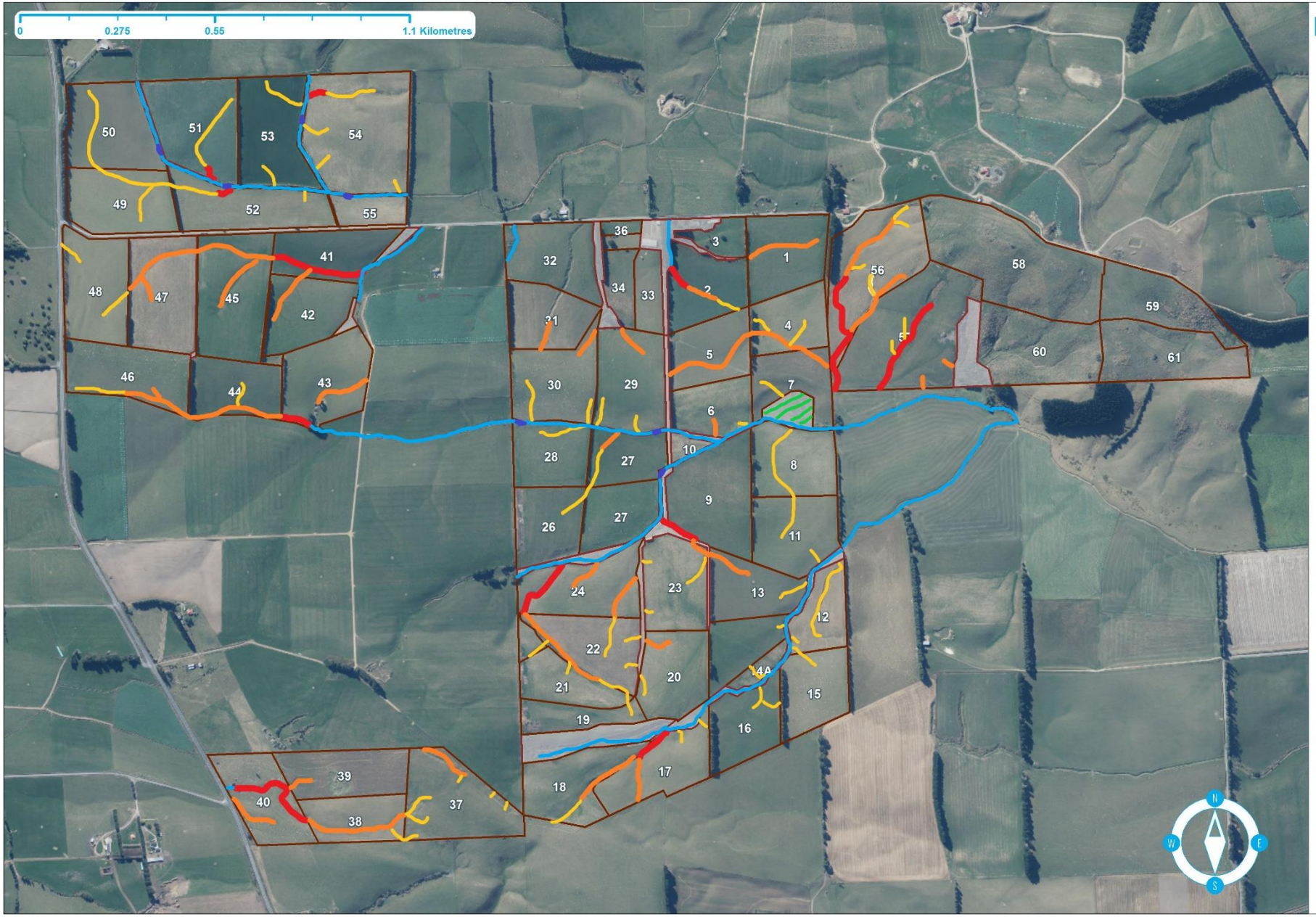

Legend

- Productive Paddocks
- Non-Productive Paddocks
- Management Block
- Exclusion Zone
- Proof of Application
- Building
- Dam / Pond
- Effluent Pond
- Hazard
- Yards
- Degraded Land
- Trees / Plantings
- Feed
- Overseer Block
- Transect Line
- Electric Fence
- Hazard
- Waterline / Pipe
- Open Drain
- Powerlines
- Stream
- **wetland**
- **medium risk CSA**
- **High risk CSA**
- **low risk CSA**
- **in sream sediment traps**

This map is a user generated static output from MyBallance and is for reference only.

Winter grazing management guidelines

General principles

- Winter feed crops will generally be established through direct drilling. Direct drilling through an unsprayed out CSA will not result in crop establishment.
- Where a winter crop paddock is established through cultivation, high and medium CSA must not be cultivated.
- Paddocks will be grazed strategically (generally in 4-day blocks).
- Where possible, grazing will start at the opposite side of the paddock to a waterway.
- Grazing will be planned to enable exclusion from grazed crop areas of paddocks once 3-6 breaks have been established.
- Stock will be shifted to a new break early if the weather is poor and ground is wet to minimise pugging/surface disturbance.
- Previously grazed and back fenced areas can be opened to provide more area if wet. This may also be done if trying to reduce stock density when opening a new break.
- An emergency paddock will be available to shift stock off crop in the event that early shifting of breaks will not control surface damage.
- Where possible, neighbouring paddocks that share a CSA will not be cropped at the same time.
- The tussock block paddocks 58,59,60 and 61 are not to be winter cropped.
- A grass strip of 3 metres from permanently fenced waterways and 5m from un-fenced waterways will be left and grazed last if the paddock and CSA are dry and firm and contain no loose sediment (and no further rain). The purpose of this grazing is to remove old grass and encourage new growth/nutrient uptake.
- The highest risk for CSA in the cropped paddock is the last break grazed. Providing the ground is stable above this break and there is no rainfall predicted, so there is minimal chance of soil disturbance.
- If a slope of greater than 10 degrees closer than 20m from a water way is to be cropped, a wider buffer will be employed, and it is to be treated like a CSA for grazing management purposes.
- Generally, only 1 paddock a year will be winter cropped form paddocks 41-48 and 1 from paddocks 49-55.

Additional management guidelines if we have cattle grazing winter crops (please note, we are limited to 100 dairy cattle under the freshwater NES):

- Cattle will not be permitted to graze any high or medium risk CSA
- A portable trough will be used for Cattle
- Cattle will be shifted daily
- Balage will be placed out on crop before winter

High risk CSA

These CSA will generally have overland flows more than 5 times during the grazing period and if not managed correctly would most likely result in poor environmental outcomes. They have the potential for overland flows in a rainfall event of 10-15mm.

High risk CSA management:

- CSA will be left unsprayed.
- Straw bales will be placed across the CSA at the bottom of the paddock before grazing.
- CSA will be grazed as the last break of the paddock if the paddock is dry and firm and it is only grazed to remove excess vegetation to encourage new growth. This is to enable more nutrient up take. Grazing should not be carried out if ground is wet/going to break the surface.

Medium risk CSA

It would be expected that they will have overland flows 2-3 times a year and have a risk if they are not managed properly that they could carry contaminants to a waterway. Generally, if the soil is wet it will take a rainfall event of 15-25 mm to create overland flow.

Medium risk CSA management:

- At a minimum of 24 metres at the bottom of the CSA will be left unsprayed in grass or a minimum of 1200kgdm/ha grass will be maintained in the CSA in the paddock below the crop if not directly next to a waterway
- Straw bales will be placed across the bottom of the CSA
- Where possible CSA will be grazed last and when the ground is dry to minimise the chance of soil disturbance
- Bottom of CSA is only to be grazed if the top part of the CSA is dry and stable

Low risk CSA

These require a larger rainfall event generally greater than 20mm to create an overland flow that would have the potential water velocity and volume to carry containments from the CSA

- The bottom 20m will be grazed last if next to a waterway and only grazed if the top part of the CSA is stable
- Straw bales should be available to be placed at the bottom of the CSA before grazing is carried out if the weather is predicting rain to provide a safety measure on the possibility there is sufficient rainfall to create overland flow
- Where possible will be grazed last unless they are connected to higher risk CSA’s
- As possible stock will be excluded from the grazed part of the CSA before the lower part of the CSA is grazed

Appendix 1 2021 and 2022 winter grazing plans

Farm cropping winter management plan 2022

Contact details

Farm name Beacon Hill

Lease holder Logan Wallace

Ph 0272136360

Email loganwallace@windowslive.com

Address 182 Beacon Hill Road, RD1 Gore, 9771

Water catchment Wairuna, Pomahaka, Lower Clutha

Total farm area 290ha

Total area suitable for winter grazing 240ha

Annual area in winter grazing up to 18ha planted

My Ballance

MY MAP

Date	Property Number	Map Title	Customer Services
June 14, 2022	4005484	Map 3 winter22	0800 222 090
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MY MAP

Date	Property Number	Map Title
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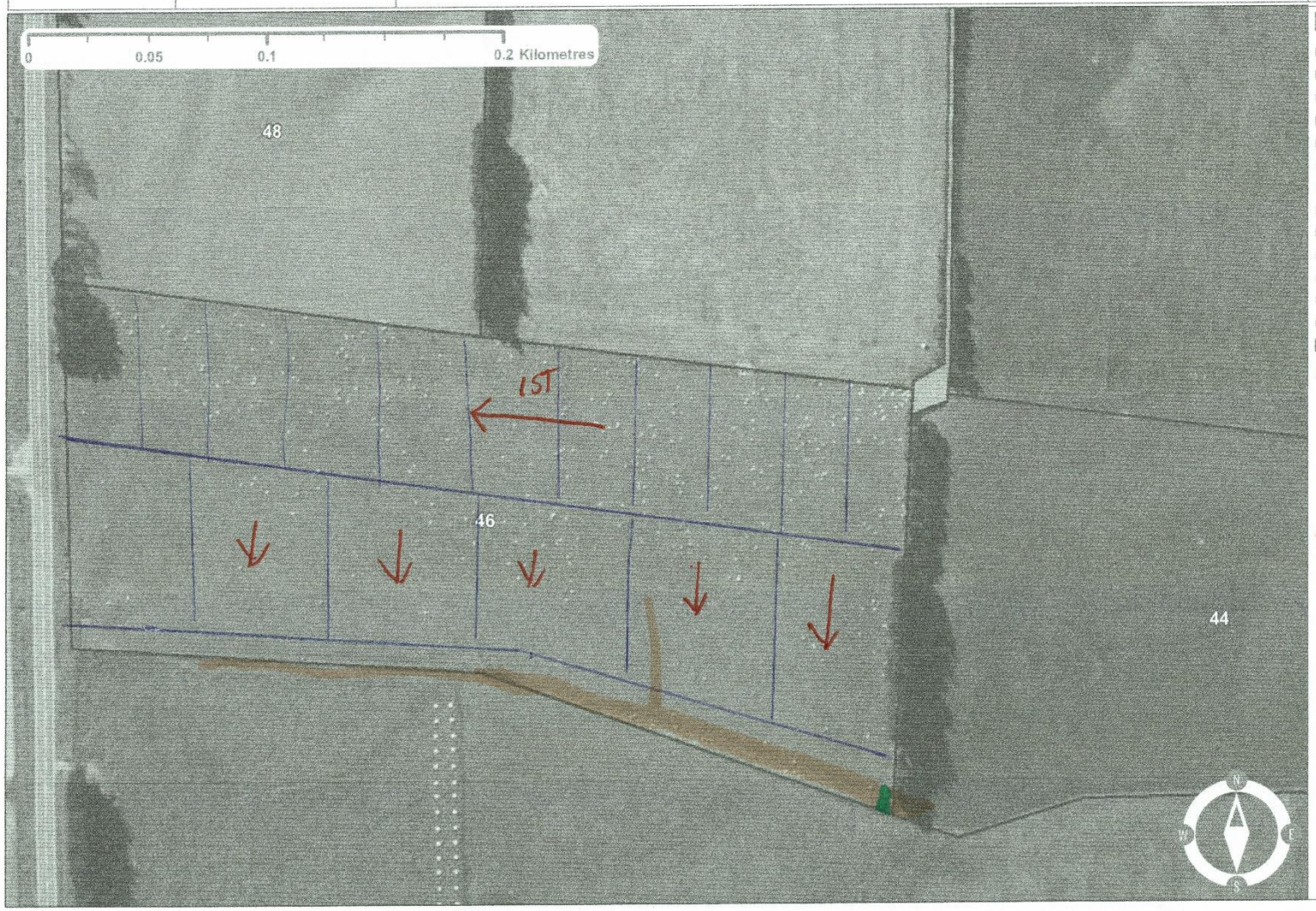

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- Electric Fence
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- Waterline / Pipe
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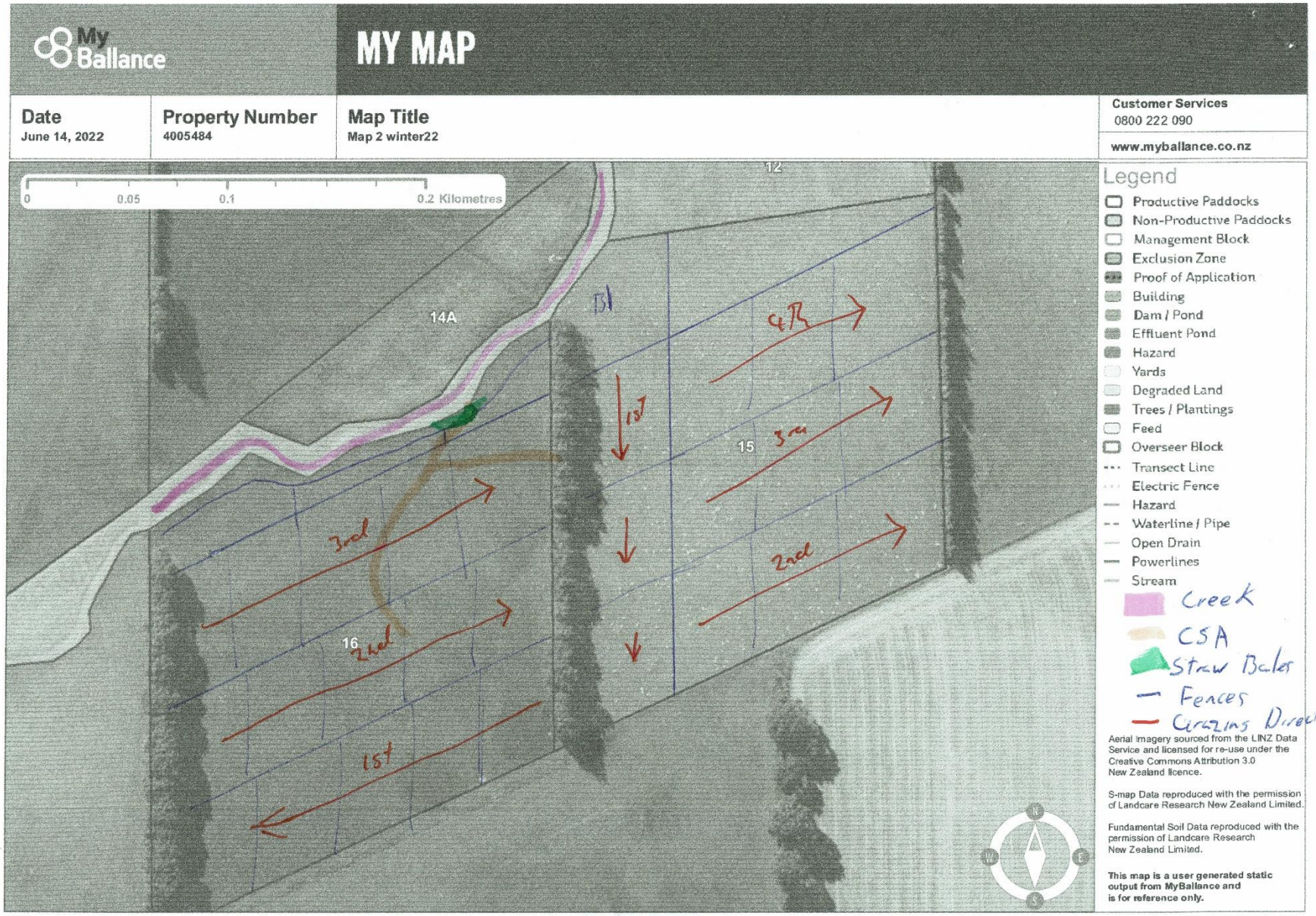
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Creek
CSA
Straw Bales
Fences
Grazing Direction
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Catchment values

Pomahaka Galaxids

Kōura (freshwater crayfish)

Tuna (eels)

Risk assessment

Paddock 15 creek at bottom corner

Paddock 16 creek that runs along bottom of the paddock

CSA that runs north south in centre of paddock

Paddock 46 CSA that runs along southern boundary small CSA that runs north south fine to graze bottom break if dry

Paddock 40 gully that runs the length of the paddock from paddock 38

Mitigations

Paddock 16 graze along southern fence then graze according to plan. leave grass buffer at bottom of the paddock and graze only if dry, straw bales placed at bottom of CSA

Paddock 15 graze up the tree line on western and put in a back fence to keep away from bottom end near creek then follow grazing plan, monitor for any points were run off could happen and adjust management. May need to make sure do not drive tractor straight to crossing and create a CSA

Paddock 46 grazed according to map bottom CSA on boundary only lightly grazed a end if dry, straw bales set up on CSA at 46-44 fence line, north south CSA grazed when dry or wider crop buffer left

Paddock 40 Grazed according to map gulley to be lightly grazed last if paddock is dry and straw bales are set up at narrow point 10m from bottom

Adverse weather plan

Offer more food as likely to cause damage to grass paddocks when shifted off and have a feed transition which is not ideal

Shifting stock off if starting to cause soil damage not just surface slop and extra feed is not improving the situation

Paddock 16 shift stock break early, remove stock onto paddock 17

Paddock 15 shift stock break early, shift off onto lane and to paddock 12

Paddock 46 shift stock break early, shift off onto paddock 47

Paddock 40 shift stock break early shift off to paddock 39

Farm cropping winter management plan 2021

Contact details

Farm name Beacon Hill

Lease holder Logan Wallace

Ph 0272136360

Email loganwallace@windowslive.com

Address 182 Beacon Hill Road, RD1 Gore, 9771

Water catchment Wairuna, Pomahaka, Lower Clutha

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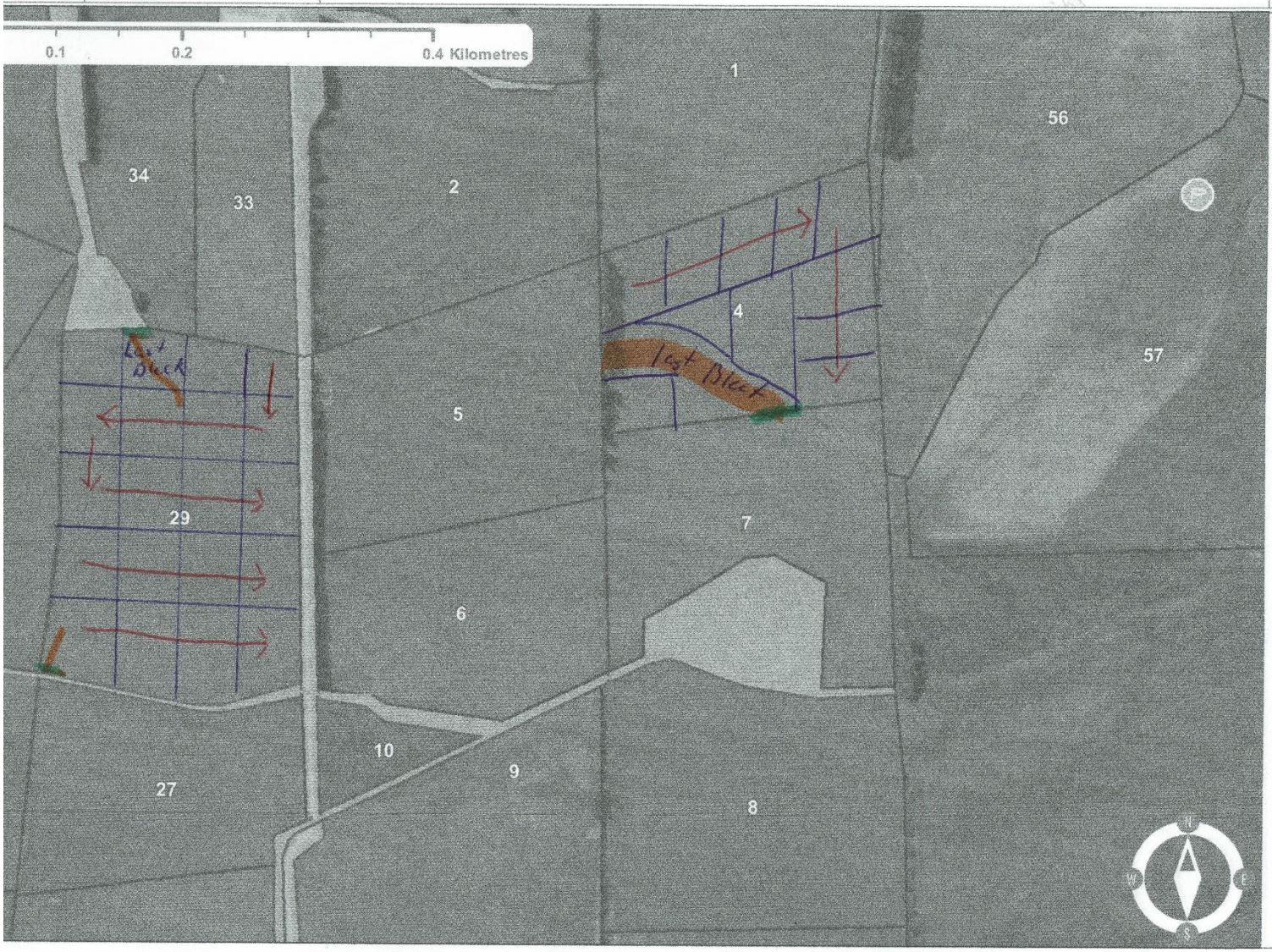

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CSA
Stravbale
Fences
Grazing Directe

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Catchment values

Pomahaka Galaxids

Kura (fresh water crayfish)

Tuna (eels)

Risk assessment

Paddock 4 main critical source area

Paddock 29 creek along the south end of the paddock and back face critical source areas behind bee hives swale in south west corner

Paddock 37 head of CSA in middle of western end gulley in north west corner northerly faces below tank

Paddock 38 gulley that runs the length of the paddock from paddock 37

Mitigations

Paddock 4 bottom end of CSA was left in grass this is only to be grazed on the last day in the paddock if the paddock is stable and dry. straw bales to be put along the fence at the bottom of the CSA as soon as water movement is observed to prevent bales rotting early, grass cover of 1200 minimum to be kept in paddock 7 CSA. paddock to be grazed according to map

Paddock 29 paddock to be grazed according to map with the grass buffer left along the creek and only grazed if dry and paddock stable south face monitored and straw bales put out if any sign of overland flow beehive critical source areas grazed when it is dry and straw bales put in hollow above sediment trap

Paddock 37 grazed according to map sheep to be fenced above track on north face western CSA grazed last and only if dry. north grass track and gulley only lightly grazed if dry at end of winter

Paddock 38 Grazed according to map gulley to be lightly grazed last if paddock is dry and straw bales are set up in paddock 40 at narrow point 10m from fence and 1200kg/ha grass cover in paddock 40

Adverse weather

Paddock 4 shift stock break early, remove stock onto paddock 1

Paddock 29 shift stock break early, shift off onto lane and to paddock 24

Paddock 37 shift stock break early, shift off onto paddock 18

Paddock 38 shift stock break early shift off to paddock 40