

Land Use Consent

Under Section 104B of the Resource Management Act 1991, a resource consent is granted by the Southland Regional Council to **Capil Grove Limited** of **27 Capil Road, RD 2, Invercargill 9872** from **Date Consent Granted**.

Please read this Consent carefully, and ensure that any staff or contractors carrying out activities under this Consent on your behalf are aware of all the conditions of the Consent.

Details of Consent

Purpose for which permit is granted: Use of land on a farm as dairy farm land

Location - groundwater zone Makarewa
- FMU Oreti
- physiographic zone Gleyed, Bedrock/Hill Country, Peat Wetlands
- catchment Makarewa River

Expiry date: **30 December 2030**

Schedule of Conditions

1. This consent shall not be exercised until Land Use Consent AUTH-20211143-01 has been surrendered or expires.
2. Except as modified by conditions of resource consent, the activities authorised by this resource consent shall be carried out in general accordance with the application for resource consent (APP-20222055) and all subsequent information provided during the application and the Farm Environmental Management Plan required by this consent.
3. For the avoidance of doubt, in the event that any inconsistency between the conditions of resource consent and the information and plans, including the Farm Environmental Management Plan (FEMP), submitted as part of the application, the conditions of resource consent shall prevail.

4. This consent shall be exercised in conjunction with Discharge Permit AUTH-20222055-01, Water Permit AUTH-20222055-02, Land Use Consent AUTH-20222055-03, and Land Use Consent AUTH-20222554, or any subsequent replacement permits.

Advice Note: *Routine monitoring inspections of this consent may occur up to once a year. This number does not include any other required inspections.*

5. The use of land for farming shall occur on the landholding at 444 Springhills Tussock Creek Road, Springhills, as shown on the plan attached as Appendix 1, and comprising of Part Lot 2 DP 2005, Lot 1 DP 12811, Section 298 Forest Hill HUN, Lot 2 DP 13790, Lot 1 DP 4795, Section 517 Forest Hill HUN, Lot 3 DP 13790 and Lot 1 DP 13793, at or about map reference NZTM2000 1249823E 4872356N.

6. The farming activities shall be limited as follows:

- (a) a maximum milking herd of no more than 640 cows; and
- (b) a maximum winter milking herd of no more than 640 cows.

7. The Consent Holder shall notify the Consent Authority the identity of the Person in Charge of the dairy farming activity:

- (a) prior to the first exercise of this consent; and
- (b) no more than five working days following the appointment of any new Person in Charge.

Exclusions

8. The Consent Holder shall not graze any young dairy stock, defined as between 4 and 20 months old, on any part of the landholding.
9. Cultivation shall not occur on any part of the landholding over 10 degrees slope unless as part of a pasture renewal programme.
10. Intensive winter grazing shall not occur on any part of the landholding.

Advice note: *Intensive winter grazing is defined as the grazing of stock between May and September (inclusive) on forage crops (including brassica, beet and root vegetable crops), excluding pasture and cereal crops.*

Nutrient Management

11. The Consent Holder shall implement a soil testing regime to determine the soil fertility status over the landholding and to develop fertiliser recommendations based on the soil testing results.
12. The Consent Holder shall maintain a record of their soil testing regime, soil testing results and fertiliser recommendations required by Condition 11 within the Farm Environmental Management Plan.
13. The Consent Holder shall:
 - (a) manage the application of fertiliser in accordance with:
 - (i) The Code of Practice for Fertiliser Nutrient Management, Fertiliser Association of New Zealand, 2023; or
 - (ii) any subsequent updates;

- (b) not apply fertiliser:
 - (i) to land during the period 1 June - 31 July inclusive;
 - (ii) within 10 m of a surface water body;
 - (iii) within 10 m of any wetland boundary;
 - (iv) within 20 m of any bore;
 - (v) when soil temperature is at or below six degrees Celsius;
 - (vi) when soil moisture capacity is exceeded; and
 - (vii) directly to land within a riparian strip/margin.
- (c) not apply a combined loading of organic material and synthetic nitrogen fertiliser at a rate of more than 190 kg/ha/year on an individual hectare basis over the landholding.

14. The Consent Holder shall:

- (a) take representative soil samples at least once every two years and have those samples analysed for Olsen P by a laboratory with IANZ accreditation;
- (b) if Olsen P levels exceed a range of 24 - 30 the Consent Holder must reduce the amount of P fertiliser being applied to the landholding to ensure the risk of P loss is reduced; and
- (c) record the Olsen P results required by Condition 14(a) and any fertiliser reduction required by Condition 14(b) in their Farm Environmental Management Plan.

Nutrient Modelling

15. The Consent Holder must ensure that nitrogen and phosphorus losses to water from farming activities undertaken on the land are maintained at, or below the baseline contaminant loss rates of:

- (a) 28 kilograms per hectare per year nitrogen;
 - (i) as estimated by the four-year rolling average loss rates using OVERSEER FM[®] version 6.5.1 undertaken in accordance with the generally accepted best practice modelling including the applicable Best Practice Data Input Standards/Overseer FM User Guide.
- (b) 1.9 kilogram per hectare per year phosphorus;
 - (i) as estimated by the four-year rolling average loss rates using OVERSEERFM[®] version 6.5.1, undertaken in accordance with the generally accepted best practice modelling including the applicable Best Practice Data Input Standards/Overseer FM User Guide; and
 - (ii) information from published New Zealand and Overseas research to estimate the additional phosphorus loss mitigation, beyond that modelled in Overseer, that is likely to occur as a result of the mitigation being implemented in accordance with the FEMP required under this resource consent.

For the purposes of this resource consent, the four-year rolling average is defined as the average of the most recent four consecutive years' results starting from 1 July 2023.

16. Each and every year for the duration of this consent, using the current version of OverseerFM and in accordance with the generally accepted best practice modelling and the current Best Practice Data Input Standards, the Consent Holder shall:

- (a) model the nitrogen and phosphorus loss rates for the previous year from 1 July to 30 June inclusive;
 - (b) calculate the four-year rolling average of nitrogen and phosphorus loss rates; and
 - (c) re-model the baseline contaminant loss rates specified in Condition 15 in the current version of Overseer.
17. The re-modelled baseline contaminant loss rates, modelled in accordance with Condition 16(c) shall supersede and replace the baseline contaminant loss rates specified in Condition 15.
18. A report must be provided to the Consent Authority by 30 September each year summarising the results of Overseer nitrogen and phosphorus loss modelling required by Condition 16. The report must include:
- (a) a review of the Overseer input data to ensure that the annual nutrient budget reflects the farming system;
 - (b) an explanation of any differences between that nutrient budget and the annual nutrient budget of all previous years of farming undertaken under this consent;
 - (c) a comparison of the four-year rolling average nitrogen and phosphorus losses with the applicable baseline contaminant loss rates; and
 - (d) the names and summaries of the relevant qualifications and experience of the person(s) who prepared and (if relevant) reviewed the nutrient budget.
19. All nutrient loss modelling required by this consent must be undertaken by a person who is a Certified Nutrient Management Advisor (CNMA) under the Nutrient Management Advisor Certification Programme (NMACP).
20. The Consent Holder may use an alternative model that has been demonstrated to be equivalent to Overseer provided:
- (a) the evidence to demonstrate equivalence is provided to the Consent Authority at least six months prior to submitting the relevant annual report as required by Condition 18; and
 - (b) the use of the alternative model is approved by the Chief Executive of the Consent Authority.

Mitigation Measures

21. The Consent Holder shall undertake maintenance of the existing and any new dairy lanes to ensure they are contoured to ensure that any run-off occurs onto vegetated areas where it will not enter any surface water body.
22. The Consent Holder must manage animal excreta to ensure it does not:
- (a) accumulate on laneways
 - (b) accumulate in gateways;
 - (c) accumulate in paddocks; or
 - (d) result in the ponding, pooling, overland or lateral flow of any effluent or sludge beyond the dairy lane.

Management of critical source areas, including laneways and gateways shall be identified and described in the Farm Environmental Management Plan required by condition 38.

Advice note: *It is acknowledged that there will be excreta on laneways and around gates, and the consent holder must ensure there is no direct runoff to waterways.*

23. Except for crossings of surface waterways, the Consent Holder shall not construct any new dairy lanes that direct runoff towards or have a point of laneway runoff within 10 metres of a surface waterbody.
24. The Consent Holder shall inspect prior to the exercise of this consent, and then every 12 months, all bridges and culverts. Based on inspections, and where necessary, undertake improvements to the structures to ensure that there is no animal excreta runoff passing directly to surface water. Records of the inspections shall be kept and made available to the Council upon request. The methodology for inspections and record keeping shall be set out in the Farm Environmental Management Plan required by condition 38.
25. The Consent Holder shall install any new permanent fencing of any temporarily fenced surface waterbodies with a minimum 3-metre buffer and provide written confirmation, along with date stamped photos, of the new fencing provided to the Consent Authority (EScompliance@es.govt.nz) by 1 July 2023.
26. The Consent Holder shall:
 - (a) construct a new winter barn, as detailed in the application, at or about NZTM2000 1250289E 4872287N; and
 - (b) provide written confirmation, along with date stamped photos, of the fully operational winter barn to the Consent Authority (EScompliance@esgovt.nz) before accommodating any cows in the fully operational barn.
27. The Consent Holder shall not allow more than 330 milking cows on the property until the second winter barn is built, as detailed in condition 26 above.
28. Prior to the exercise of this consent the consent holder shall install and maintain telemetered soil moisture measuring equipment (Aquaflex or similar) in two locations. The location and installation details shall follow the Soil Water Measurement National Environmental Monitoring Standard (NEMS) best practice and be agreed with the Council (Manager Compliance), prior to its installation.

Records of the soil moisture from each location shall be kept and provided to the Council (Manager Compliance) upon request.

Should soil moisture at either of the farm's soil moisture monitoring sites be at saturation for a period of more than 72 hours, then cows shall be held in the barn(s) for a minimum of 18 hours per day.
29. Daily use of the winter barn must be monitored by recording the number of cows and the number of hours spent in the barn. The records of winter barn use must be maintained and supplied to the Consent Authority upon request.
30. The Consent holder shall prepare and implement a Riparian Planting Plan for the farm that is consistent with the details set out in Appendix 4. The Riparian Planting Plan shall include the use of native plants, the size of the plants used and planting methodology used. Where possible, plants shall be eco-sourced. This plan shall be prepared within six months, and begin being implemented within 12 months, of the consent being granted and be incorporated into the

Consent Holder's Farm Environmental Management Plan required by Condition 38. The plan required by this condition shall be provided to Te Ao Marama Inc. (office@tami.maori.nz).

31. The Riparian Planting Plan required by Condition 30 shall include, but not be limited to planting in the areas below:
 - (a) at or about NZTM2000 1251311E 4872533N as per Appendix 3;
 - (b) at or about NZTM2000 1251127E 4873123N as per Appendix 3;
 - (c) at or about NZTM2000 1250830E 4872648N as per Appendix 3; and
 - (d) at or about NZTM2000 1250402E 4872564N as per Appendix 3.

32. The Consent Holder shall establish the necessary infrastructure to enable a controlled grazing buffer to be developed, including:
 - (a) having fencing to achieve a minimum of a 3 m grazing setback along side 3,000 m of farm drains;
 - (b) allow grazing within the fencing established with (a) to within 1 m of the farm drain when:
 - i. soil moisture conditions at either of the farm's soil moisture monitoring sites is below saturation.
 - ii. There has been less than 25 mm of rain in the last 24 hours;
 - iii. There is less than 25 mm forecast in the next 48 hours.
 - (c) Consistency with information provided in Appendix 4.

33. The Consent Holder shall:
 - (a) design and install sediment detention bunds that are consistent with the locations shown in Appendix 3 and the details set out in Appendix 4;
 - (b) construct at least one sediment detention bund within 12 months of the granting of this consent;
 - (c) construct a second sediment detention bund within 24 months of the granting of this consent;
 - (d) construct the remaining three sediment detention bunds within 36 months of the granting of this consent.

34. The Consent Holder shall:
 - (a) design and install sediment traps that are consistent with the locations shown in Appendix 3 and the details set out in Appendix 4;
 - (b) construct at least one sediment trap within 12 months of the granting of this consent;
 - (c) construct a second sediment trap within 24 months of the granting of this consent;
 - (d) construct a third sediment trap within 36 months of the granting of this consent.

35. The Consent Holder shall:
 - (a) record the design and management of the sediment control structures required by conditions 32 and 33 in the Farm Environmental Management Plan required by Condition 38; and
 - (b) provide written confirmation, along with date stamped photos, of the fully operational sediment control structure to the Consent Authority (EScompliance@es.govt.nz) by the [DATE] 2024, [DATE] 2025 and [DATE] 2026.

36. Prior to commencing any discharge of FDE under permit AUTH-20222055-01 in the area referred to in the application as the 'gorse block' at NZTM2000 1251190E 4873343N, the Consent Holder must engage a suitably qualified wetland ecologist to assess the 'gorse block' area in accordance with the Pasture Exclusion Assessment Methodology under the National Policy Statement for

Freshwater Management 2020 (NPS-FM). If, having undertaken that assessment, any part of the 'gorse block' is determined by the expert to be 'natural inland wetland' under the NPS-FM, the Consent Holder must:

- (a) not discharge FDE within 100 m of any identified area of natural inland wetland, unless the necessary resource consents have been granted; and
- (b) cease grazing of any identified area of natural inland wetland unless the necessary resource consents have been granted.

37. The Consent Holder shall utilise pasture species and available technologies that assist to reduce nutrient losses to water. Analysis of the suitability of available technologies shall be detailed in the Farm Environmental Management Plan required by Condition 38.

38. The Consent Holder shall cultivate:

- (a) with the contour of the land being used for cultivation and shall not cultivate up and down the slope; and
- (b) no less than 5 metres from the outer edge of any surface water body or natural wetland unless for the purpose of renewing or establishing pasture in accordance with Rule 25(b) of the Proposed Southland Water and Land Plan (Decisions Version), or any subsequent replacement versions.

Farm Environmental Management Plan

39. The Consent Holder shall have and maintain a Farm Environmental Management Plan (FEMP) for the landholding. The FEMP shall, in accordance with Appendix N of (Decisions Version) the Southland Water and Land Plan (or any replacement Appendix in an updated version of the plan), demonstrate how the following outcomes are to be achieved:

- (a) nutrients are used efficiently and nutrient loss to water is minimised;
- (b) contaminant losses from critical source areas are reduced;
- (c) cultivation is undertaken in a manner that minimises the movement of sediment and phosphorus to waterways;
- (d) agricultural effluent and other discharges, including excreta, are managed in a way that first avoids the loss of contaminants to water and otherwise minimises loss of contaminants to water in situations where losses cannot be entirely avoided.

40. The FEMP required by Condition 38 shall also include, but not be limited to:

- (a) A purpose statement detailing the intent of the FEMP and an overarching farm specific statement of intent as to how the environment shall be managed;
- (b) a site map showing the location of critical source areas; physiographic zones; permanent or intermittent rivers, streams, lake, drains, ponds or wetlands; where known the location and depth of any subsurface drainage systems including outlets, riparian vegetation and fences adjacent to waterways and stock access points across waterways;
- (c) identification of soil moisture monitoring devices and how they are used to influence farm management, including the need for cows to be housed in the barn and restricted from grazing close to waterways;
- (d) identification of the location, design and management of mitigation devices, including:

- i) riparian planting, required by condition 31;
 - ii) sediment detention bunds, required by condition 32;
 - iii) sediment traps, required by condition 33.
- (e) A copy of the Riparian Planting Plan, required by condition 30, providing the location and management of riparian planting. Details on pest weed and animal controls and infill planting shall be included;
- (f) If a natural inland wetland is identified in accordance with condition 36, then the details of that wetland and management shall be provided, including stock exclusion, avoidance of effluent application and fencing proposed;
- (g) A methodology for identification of any tile drains on the property, and actions to:
 - i) avoid contaminants entering tile drains e.g. not applying wastewater over drains or grazing hard when wet;
 - ii) stop and capture discharges from tile drains should obvious signs of contamination develop e.g. plug the drain and pump out and return to a suitable discharge location such as the effluent ponds..
- (h) details of the implementation, inspections and maintenance of mitigation measures required by the conditions of this consent, including but not limited to the devices listed above, managing runoff around critical source areas such as races, gateways, bridges, culverts, water troughs and shelter planting;
- (i) the identification of cropping and planting regimes that have the potential to assist with reducing nutrient leaching and runoff. This should include the use of plant species such as plantain;
- (j) details of the implementation and maintenance of Good Management Practices, including adoption of changing industry good management practices. This includes where the implementation of these is to avoid, remedy or mitigate any farm specific environmental risks to water quality shown through any monitoring undertaken on the property voluntarily or as required by the conditions of this consent;
- (k) a review of the data obtained from the monitoring undertaken in accordance with the Farm Environmental Management Plan and any changes made, or to be made, as a consequence of that monitoring.

Advice Note: *Should the use of a Freshwater Farm Plan be required or available, on the basis that it is certified under Section 217G of the Resource Management Act 1991 (as amended from time to time in accordance with Section 217E(2) or (3)) and available for use, the Consent Holder may elect to use such plan.*

41. The FEMP shall be reviewed at least once each milking season and can be modified at any time by the Consent Holder; and either:
- (a) an updated version shall be provided to the Consent Authority by 31 May each year; **or**
 - (b) the Consent Holder must notify the Consent Authority in writing that no changes have been made by 30 September each year.

Advice Note: *The results from the review of the FEMP will be assessed by the Consent Authority to ensure that the FEMP will still achieve the objectives specified in the FEMP and the FEMP has been prepared in accordance with Appendix N of the Southland Water and Land Plan (Decisions Version) (or any updated version of the plan).*

42. The Consent Holder shall operate in accordance with the FEMP at all times. Where there is inconsistency between the FEMP and the conditions of the consent, the conditions of this consent shall prevail.

Auditing

43. The Consent Authority may require the Consent Holder to have the farming activity as authorised by this consent independently audited, in accordance with Appendix 2, by a person who is a Certified Nutrient Management Advisor or Farm Environmental Plan Auditor or a Suitably Qualified Person who has demonstrated an equivalent level of expertise.

Lapse and Review

44. The Consent Authority may, in accordance with Sections 128 and 129 of the Resource Management Act 1991, serve notice on the consent holder of its intention to review the conditions of this consent during the period 1 February to 30 September each year, or within two months of any enforcement action being taken by the Consent Authority in relation to the exercise of this consent, or on receiving monitoring results, for the purposes of:
- (a) determining whether the conditions of this permit are adequate to deal with any adverse effect on the environment, including cultural effects on the tangata whenua and/or cumulative effects, which may arise from the exercise of the permit, and which it is appropriate to deal with at a later stage, or which become evident after the date of commencement of the permit; or
 - (b) ensuring the conditions of this consent are consistent with any National Environmental Standards Regulations, relevant plans and/or the Environment Southland Regional Policy Statement;
 - (c) amending the auditing/monitoring/recording/reporting/modelling programme to be undertaken;
 - (d) adding or adjusting compliance limits;
 - (e) ensuring the Ōreti Freshwater Management Unit meets the freshwater objectives and freshwater quality limits set in an operative regional plan or National Policy Statement for Freshwater Management; and
 - (f) requiring the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment as a result of the exercise of this permit.

for the **Southland Regional Council**

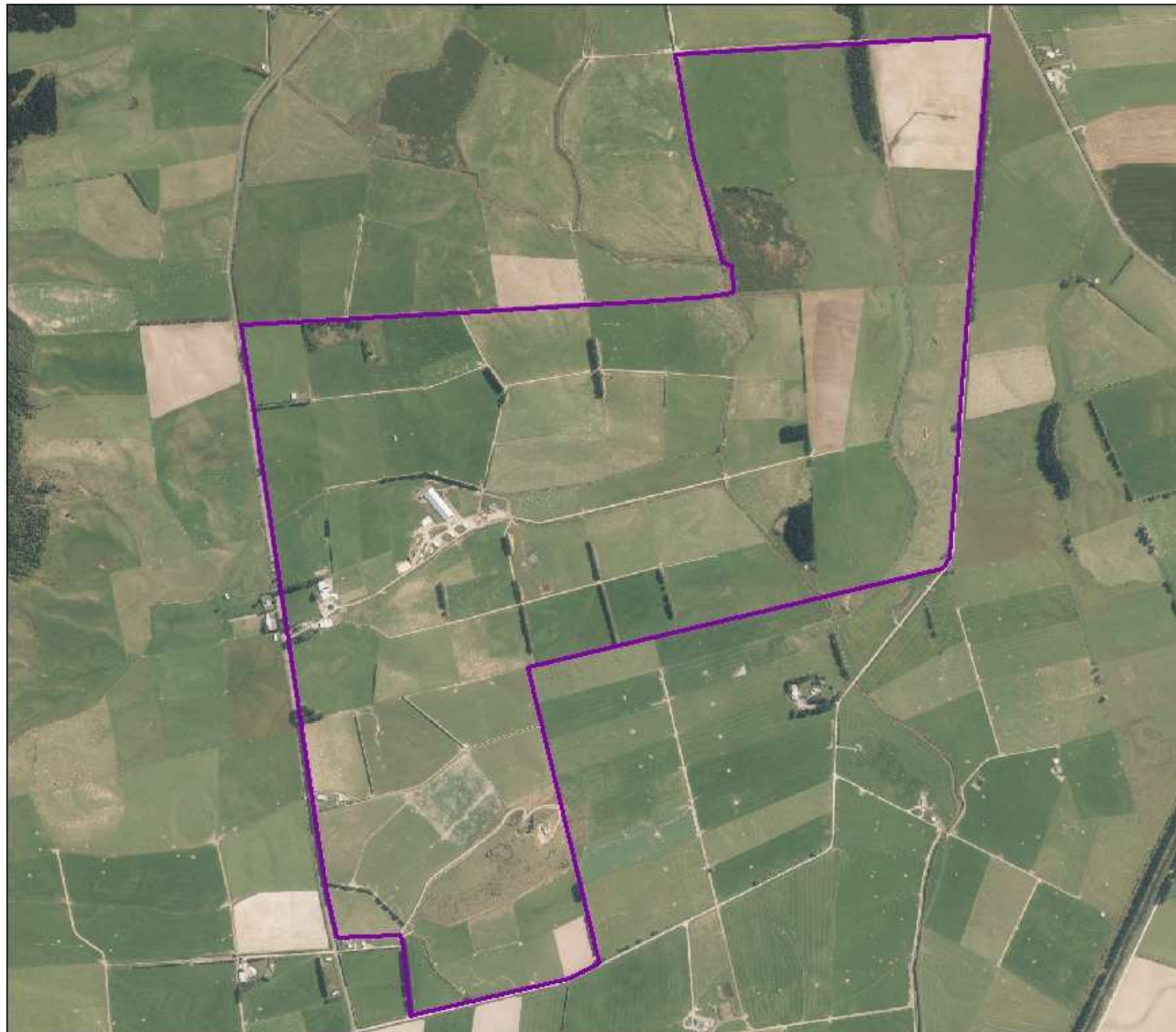
Signature
Decision maker

Notes:


1. Reporting to Council is required by conditions of your consent. The key dates for you to meet are listed below in Table 1:

Due date	Condition number	Requirement
Prior to exercise	7	Notify Council of Person in Charge of dairy farming activity
30 Sept each year	18	Report summarising results of Overseer modelling
1 June 2024	25	Confirm re-fenced surface waterways with 3 metre buffer
When complete	26	Confirm winter barn construction complete
[DATE] 2024	30	Provide Riparian Planting Plan to Te Ao Marama Inc.
[DATE] 2024 & [DATE] 2025 & [DATE] 2026	34	Confirm installation of sediment control structures
31 December 2025	35	Confirmation of wetland restoration
31 May each year	40(a)	Provide updated version of FEMP if changes were made due to review
30 Sept each year	40(b)	Confirm no changes were made to FEMP

2. In accordance with Section 125(1)(a) of the Resource Management Act, this consent shall lapse after a period of five years after the date of commencement unless it is given effect to or an application is made to extend the lapse period before the consent lapses.
3. In accordance with Section 138 of the Resource Management Act, this consent may be surrendered by providing written notice to the Consent Authority.
4. The Consent Holder shall pay an annual administration and monitoring charge to the Consent Authority, collected in accordance with Section 36 of the Resource Management Act, 1991, payable in advance on 1 July each year. This charge may include the costs of inspecting the site up to two times each year (or otherwise as set by the Consent Authority's Annual Plan).
5. The FEMP, supporting evidence and on-site practices may be audited by the Consent Authority at any time for compliance and enforcement purposes.



Appendix 1

 Landholding Boundaries



1:15,500



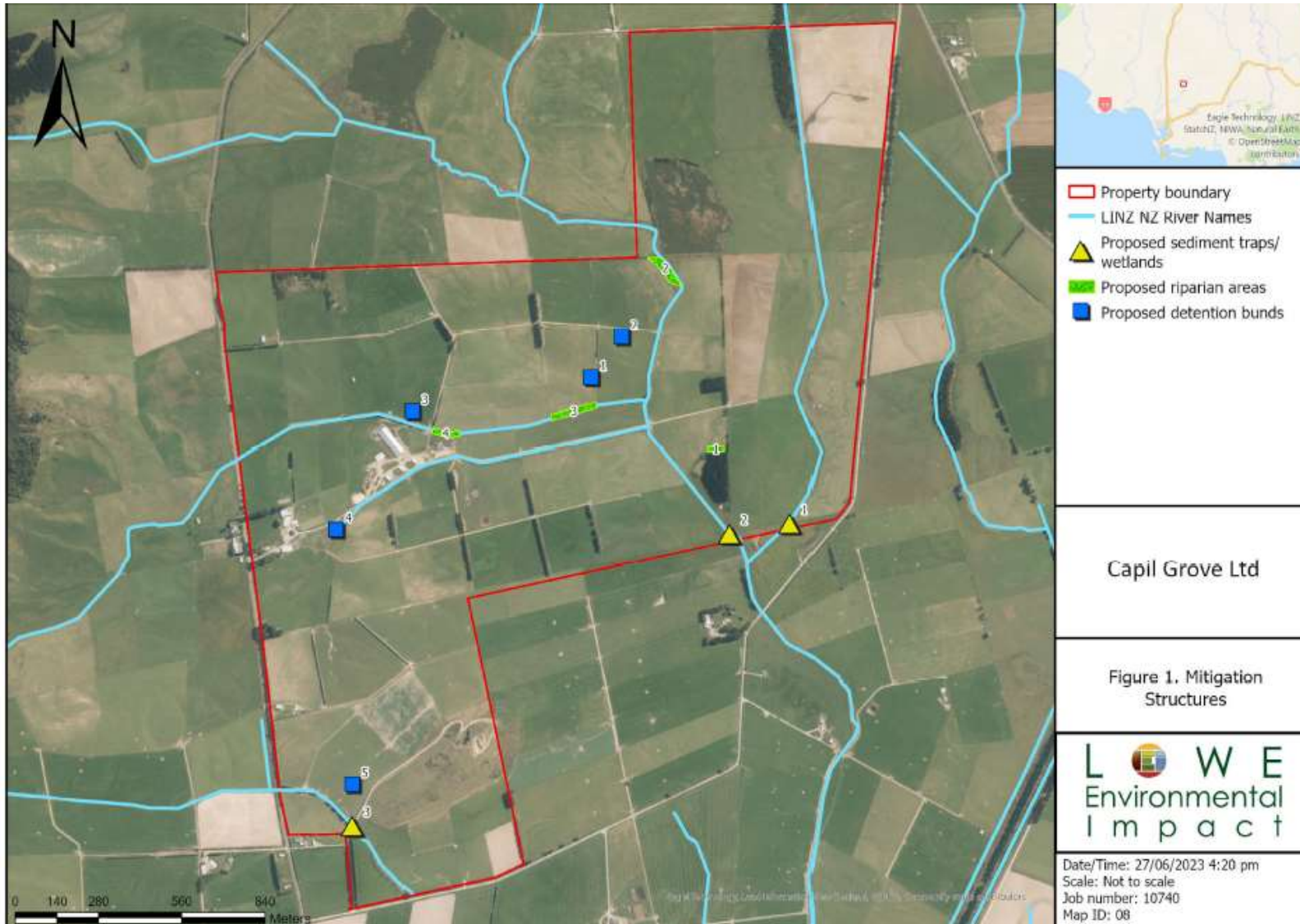
While every effort has been made to ensure the content is correct, Environment Southland cannot guarantee the accuracy of the data. This information should not be relied in any manner without consultation.

DATA SOURCE: ES GIS 2023

Appendix 2: Auditing criteria

1. The audit shall assess the performance of the farming activity occurring on the property against:
 - (a) the objectives and good management practices specified in the FEMP;
 - (b) any additional mitigation measures implemented on the property either voluntarily or as required by the conditions of this consent; and
 - (c) the baseline contaminant loss rates specified in Condition 15 and 17.
2. The audit must determine the level of confidence of achieving each objective set out in the FEMP. This level of confidence shall be categorised into the following:
 - **High** - the objective is probably being achieved
 - **Medium** - the objective is possibly being achieved
 - **Low** - it is unlikely that the objective is being achieved.
3. The audit shall record the justification for each level of confidence assessment, including noting the evidence, or lack of, used to make the determination.
4. Where an objective has received a Medium or Low level of confidence, the audit shall include the actions required for the farm to meet the objective and a timeframe whereby these actions need to be undertaken.
5. Where an objective has received a Medium level of confidence (and the farm has received no Lows), the audit shall also determine whether or not the farm is on-track to achieve the objectives.
6. The audit report shall be provided to the Consent Authority within three months of the date of the Consent Authority issuing a requirement to undertake the audit.
7. The frequency of audit requirements may be annually except where, for two consecutive years, an audit report has concluded that all objectives are probably being achieved (received a high level of confidence). In that situation no further audit will be required for at least three years.
8. Where the audit identifies actions required to be undertaken for the farm to meet the objective the Consent Holder must implement these actions within the timeframes stated in the audit.
9. Upon completion of any changes made and/or mitigations implemented as required by the audit, the Consent Holder shall confirm in writing, including photographs (date and time stamped) to the Consent Authority that these actions have been completed and implemented.
10. Upon completion of all the changes made and/or mitigations implemented as identified in the audit, the Consent Holder must ensure the measures are properly maintained, continue to function and are not removed or altered for the duration of this consent (and any subsequent variation versions).

Appendix 3: Sediment control structure locations



Appendix 4: *Sediment control structures details*

DRAFT

WATER QUALITY MITIGATIONS FOR FARM 444

General

Capil Grove Limited (CGL) has an intention to use proven mitigation methods and science to reduce their farm runoff, in particular phosphorus (P) losses on Farm 444.

Specifically the mitigation methods include:

- Detention structures;
- Riparian plantings; and
- Sediment traps.

Mitigation methods and how they might apply to Farm 444 are described below. Specific design will need to be completed for each structure.

Detainment Bund

For Farm 444's dairy conversion, proposed consent conditions have suggested the installation of four sediment detention structures. More structures could be used. Figure 1 suggests the location of possible structures along with the catchment areas up gradient of the structure.

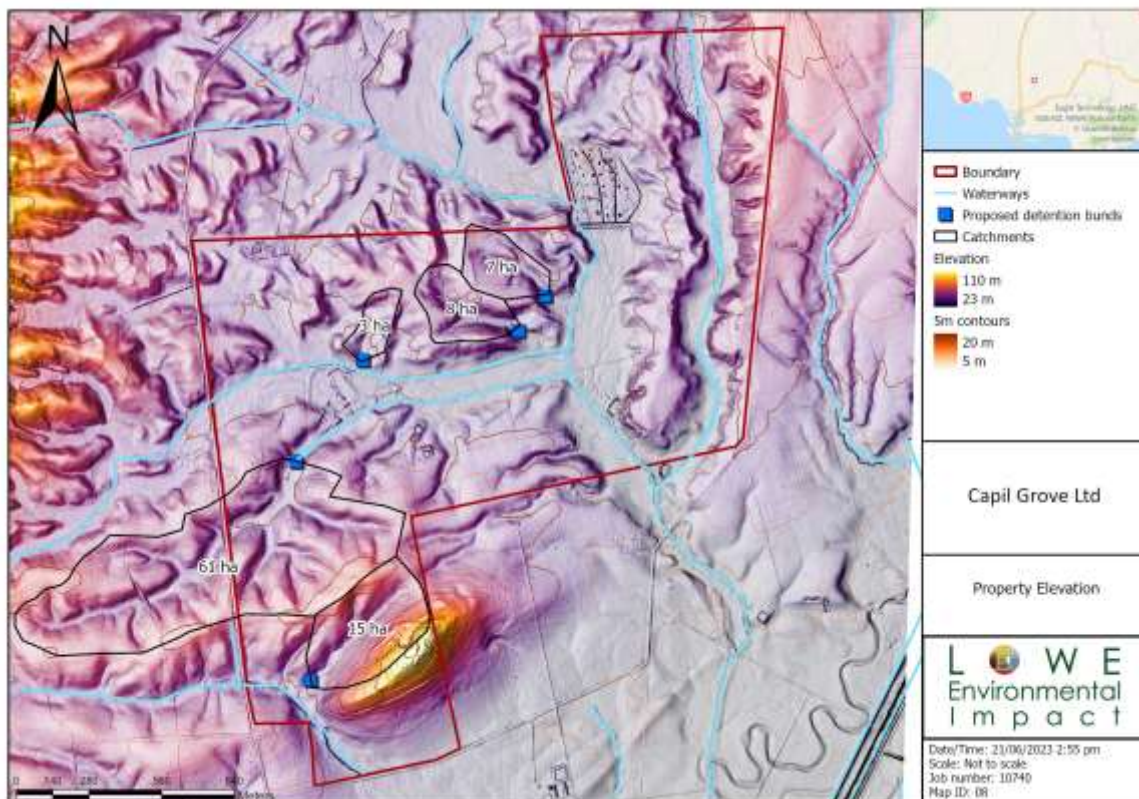


Figure 1: Proposed Detainment Bund Installation and Catchment Area

Photo 1 to Photo 5 show the general landscape of the proposed structures.



Photo 1: General landscape - 15 ha Proposed Detainment Bund



Photo 2: General landscape - 3 ha Proposed Detainment Bund



Photo 3: General landscape - 8 ha Proposed Detainment Bund



Photo 4: General landscape - 7 ha Proposed Detainment Bund



Photo 5: General landscape - 61 ha Proposed Detainment Bund

The specific details of the structures are yet to be developed, but they will essentially be a low earth bund that allows temporary ponding of water for several hours to no more than 4 days, depending on the rain event. The ponded water will gradually be released through the bund wall, but at a rate that provides for sediment settling within the ponded water.

Sediment Traps

Proposed sediment trap locations are outlined in Figure 2 and photos of these locations on farm are shown in Photos 6 to 8. Additional detailing of stream's characteristics will be required before installation.

Generic sizing of sediment traps is provided in Harding and Meijer (2021). This table guides the creation of a sediment trap that has the ability to retain approximately 50% of fine silt, until the trap is half-filled. To develop a specific system there is the need to measure the stream's width and flow velocity, and with this information the trap shape can be determined. In general, they should have a rectangular shape, with a width 1.5 times that of the channel. Depth needs to be from 0.5 to 2 m depending on water volume and sediment quantity (Environment Southland, 2020). It is important to provide for convenient access for diggers to excavate the trap when it reaches capacity.

To prevent erosion of the trap banks (especially if diggers need to clean them out), it may be necessary to stabilize the banks with rocks. This is because erosion of the stream bank would result in the trap becoming filled with eroded material and not sediment. Additionally, planting vegetation along the stream's edges adjacent to the sediment trap is advised to further stabilize the stream's banks (Hudson, 2005).



Figure 2: Proposed Sediment Traps Installation



Photo 6: Proposed Sediment Trap Location – Easternmost



Photo 7: Proposed Sediment Trap Location – East Side and South of Pine Tree Plantation



Photo 8: Proposed Sediment Trap Location – Southernmost

Riparian Planting and Buffer Strips

Farm 444 has made the conscious effort to fence all waterways on the farm. This is best practice and a dairy farming requirement. This fencing contributes to some degree by providing a small buffer strip that overland flow must pass through.

Simply fencing with minimal buffering is assumed in Overseer and is considered to be an inherent requirement of nutrient loss projections. The estimated Overseer loss of 1.9 kg P/ha has assumed that buffering is provided for. Therefore, to develop further reductions in nutrient losses, buffer strips need to be increased in size.

Localised Buffer Planting

Farm 444 are proposing to have isolated areas of more elaborate plantings with a wider buffer strip and larger permanent plantings. The locations of these areas are shown in Figure 3. To assist with planting, Environment Southland (2016) *Facts Sheets* provide guidance on planting. Potential plant species will include but are not limited to:

Lower bank

Toetoe
Pukio
Red Tussock

Upper bank

Flax
Manuka
Mingimingi
Koromiko
Cabbage tree

In sizing and developing the width of planting in the nominated areas, further guidance will be sought from *Getting Riparian Planting Right in Southland* (DairyNZ, 2014) which suggest that a wider setback is needed on steeper paddocks, longer paddocks and heavier soils. This is largely to increase the efficiency with faster flowing runoff. The DairyNZ guide also notes that on flat to undulating land, relatively small zones of 3-5 m are still capable of reducing nutrients, sediment and bacteria entering waterways.

Proposed riparian areas are outlined in Figure 3 below and photos of these locations on farm are shown in Photos 9 to 12.



Figure 3: Proposed Riparian Areas



Photo 9: Proposed Riparian Planting – Old Pine Tree Plantation



Photo 10: Proposed Riparian Planting – Northernmost Riparian Planting



Photo 11: Proposed Riparian Planting – Centre Planting



Photo 12: Proposed Riparian Planting – Western Planting

Main Stem Drains Controlled Grazing Buffers

It is noted that under the nation-wide stock exclusion rules, all dairy cattle need to be excluded from all waterways with a bed wider than 1 m. Further, all new fences erected after 3 August 2020 need to be a minimum of 3 m away from the waterway. Farm 444 has all waterways fenced, with buffers ranging from 1 m to more than 5 m in places.

Further to the localised buffer strips, Farm 444 are proposing to have controlled buffer grazing along their main drains. The location of these buffers are 3 m either side of the 'waterways' presented in blue in Figure 3.

The principle of the Controlled Grazing Buffers is to provide a parallel fence to the existing fence that typically excludes stock. However, when appropriate conditions exist, a gate can be opened to allow this buffer strip to be grazed. This essentially allows the same area to be used, but have stock excluded so the area that can be used to filter overland flow so that grass can assist to capture sediment (and phosphorus) when runoff conditions are likely. Suitable conditions for grazing will be during dry conditions when rain is not forecast.