

28 August 2024

Ryan Hodgson
Environment Southland

Via email

Dear Mr Hodgson

RE: Blue Sky Meats APP-20222295 Technical Meeting Response

Background

Following the receipt of the technical review completed by Stantec on behalf of Environment Southland on 6 March 2024, Blue Sky Meats Ltd (“**BSM**”) raised a number of issues with that review in an email to Environment Southland dated 26 March 2024. In response to those concerns a meeting was held between representatives of Stantec and PDP, who prepared the technical information in support of the BSM, on 16 May 2024. The meeting was also attended by representatives of Mitchell Daysh Ltd (“**MDL**”) and Environment Southland. To assist with resolving the issues, Stantec and Environment Southland also visited the BSM site to see key aspects of the operation being reconsented.

Following the meeting and site visit, Environment Southland prepared a ‘Summary of issues addressed and to be addressed by Blue Sky Meats’ (“**Summary of issues**”) which was provided to BSM via email on 11 June 2024. BSM generally agree with the “*matters that were addressed and should be included in an amended report*”¹ included in the Summary of issues, with one exception, as outlined below. BSM also generally agrees with the “*matters still to be addressed by BSM*” and has provided a response to those matters below.

¹ The report referred to here is the Stantec technical review report.

In addition to the above, there has been an amendment to the conditions which concerns the previously proposed nitrogen loading rates to ensure that conditions accurately reflect what is proposed. This is discussed towards the end of this letter.

Matters that were addressed and should be included in an amended report

As discussed above, BSM generally agrees with the matters to be included in an amended report identified by Environment Southland, including the comments on:

- The proposed reduction in loading rates;
- The use of Overseer as an analysis tool; and
- Soil field capacity verses soil saturation.

BSM also agrees with the comment on the slow moving nature of groundwater beneath the site and the resultant lag time in effects, including the expectant time to see improvements. When this slow moving groundwater discharges into surface water, as it does now, it flows to the New River Estuary in a relatively short timeframe and contributes to the water quality being experienced in the catchment. Because of this, BSM has undertaken and has committed to undertaking a series of improvements on site to improve water quality in the catchment. These improvements are proposed to be secured in the consent conditions proffered by BSM in **Appendix A**.

In addition to these points, BSM also requests that Stantec consider the comments from BSM provided on 26 March 2024 when amending the technical review report.

Matters still to be addressed by BSM

Matters identified by Environment Southland as still needing to be addressed by BSM are addressed below.

Confirmation of storage volumes

Details confirming the available wastewater storage volume and how it was derived were sent by PDP to Stantec via email on 24 June 2024. A copy of this email is included as **Appendix B**.

The need to provide for ongoing improvements

Given the current condition of the catchment and the length of the consent term sought by BSM, Environment Southland and Stantec would like to see mechanisms to drive improvements on a consistent basis throughout the consent term built into the consent conditions. Nitrogen and phosphorus have been identified as the two key matters of concern for the catchment. Therefore, it is proposed to undertake reviews every 12

years to determine whether the limits, mitigation and management measures related to nitrogen and phosphorus are appropriate to ensure that water quality is maintained and enhanced in the catchment.

The review condition requires BSM to:

- Evaluate the monitoring results in the receiving environment with regard to nitrogen and phosphorus limits;
- Review relevant guidelines and standards applicable to nitrogen and phosphorus at the time of the review, and other catchment wide improvements being undertaken relating to water quality; and
- Review mitigation and management measures being implemented to manage nitrogen and phosphorus discharges.

The review is to be provided to Environment Southland and if the review recommends amendments to the limits, mitigation or management measures are necessary, Environment Southland may initiate a formal review of these components on the consent relating to nitrogen and phosphorus.

It is considered that a 12 year timeframe between reviews is appropriate given the commitments BSM has already made to improving water quality through the proffered consent conditions, the relatively slow moving nature of groundwater beneath the site² and how regularly water quality targets are updated.

The nitrogen and phosphorus review condition is included as Condition 48 of the Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land consent. The Council review condition that can be initiated in response to the review required by Condition 48 is included as Condition 49.

Subsoil drains

The application included a consent condition that required BSM to permanently block or otherwise decommission the subsoil drainage underneath the irrigation areas that would receive year round discharges of treated wastewater and waste activated sludge. BSM identified and blocked the direct discharges from subsoil drains to surface water ahead of a new consent being granted to ensure they would be compliant at the commencement of the new consent. It also provided the opportunity to determine whether the mitigation could be practically managed. Blocking the subsoil drains has potentially made management of the treated wastewater irrigation difficult, with soil drainage not being as effective as anticipated.

² The Hydrogeological Investigations to Support Consent Application, dated 6 June 2023, identified that improvements to water quality could potentially take decades or more.

Due to issues potentially caused by blocking the subsoil drains, BSM is proposing to amend the proffered consent conditions so that they no longer require the blocking or decommissioning of the subsoil drains at the outset of the consent. Instead, BSM propose to assess mitigation options that intercept and reduce the nitrate in shallow groundwater prior to it entering surface water, and to minimise phosphorus loss at concentrated overland flow areas. BSM is proposing to undertake this mitigation investigation work over the first three years of the consent. Identified mitigation measures would then need to be implemented within three years of the completion of the mitigation options report. These commitments are detailed in Conditions 46 and 47 of the consent conditions included in **Appendix A**.

For completeness, PDP has updated the Overseer models to reflect the change in proposed mitigation of the discharge from the subsoil drains. The updated models are provided in **Appendix C**. These models show no change in total nitrogen losses, and an increase in phosphorus loss to water via subsoil drains of 0.1 kg p/ha/yr.

Phosphorus in soil

It has been identified that soil phosphorus concentrations are above optimal levels in areas where treated wastewater and solids are frequently discharged. It is proposed to address this by implementing a sustainable phosphorus limit³ where third-party land is available, and to provide riparian enhancement to mitigate additional phosphorus loss risk when third-party land is not available. When third-party land is available, the proposed consent conditions will require BSM to apply solids to land more evenly across the site so that phosphorus application rates match the agronomic requirements of the farming system. If this is undertaken, Overseer modelling of the proposal shows that phosphorus loss is consistent with surrounding sheep and beef land use (modelled as 0.3 kg P/ha/yr) and paddocks with elevated Olsen P will reduce over time as pastoral growth strips phosphorus from the soils⁴.

Stantec and Environment Southland are concerned about the elevated phosphorus in soils being mobilised at critical source areas where overland flow paths are concentrated.

Extensive riparian planting has already been completed with the intention of complying with the requirements of Condition 11(a) i-iii⁵ in the near future as a contingency measure should access to third party land not be available. In addition to this, in July 2024 BSM undertook additional planting to supplement the existing riparian planting with 2,650 harakeke/swamp flax (*phormium tenax*) planted along areas where riparian

³ Conditions 10 and 11 propose phosphorus loading limits.

⁴ Refer Section 5.1.1.2 of the Land Discharge of Wastewater and Biosolids – Technical Assessment of Environmental Effects, prepared by PDP, dated June 2022.

⁵ Condition 11 authorises a higher phosphorus loading rate if riparian planting is completed in accordance with Condition 11(a) i-iii.

planting has recently occurred. The harakeke have been planted in a single row at one metre spacings along the zones identified as green, pink and yellow in the Riparian Planting Plan shown in Attachment 1 – Figure 17 included with the proposed consent conditions. Proposed Condition 11b. has been amended to secure the planting that has already been completed at the commencement of the consent to help address any existing phosphorus issues.

BSM also considered planting in critical source areas⁶ early in the consent term to assist in addressing phosphorus losses, however a number of the subsoil drains are located in critical source areas. Because the critical sources areas may be modified as part of the subsoil drain mitigation work, e.g. by the installation of subsoil drain interception mitigation measures, and because there is potentially opportunity to tie overland flow mitigation work into subsoil drain discharge mitigation work, it is proposed to address overland flow in critical source areas at the same time as undertaking mitigation work on the subsoil drains. The requirements for this are detailed in Condition 46(a)(iii).

In the interim period, the introduction of a maximum phosphorus loading rate, securing the existing riparian planting in consent conditions and supplementing this with additional flax planting early in the consent term represents an improvement of the existing situation.

Solids stabilisation

Environment Southland and Stantec requested that stabilisation of solids applied to land be considered and addressed to reduce vector attraction. PDP has advised that solids stabilisation is one method to reduce vector attraction, but soil incorporation and exclusion periods are also suitable methods to address this issue.

PDP has also advised that applying these treatment measures to all waste solids is not necessary. PDP advises that the key issue associated with vector attraction is the fugitive losses of animal protein contained within the paunch solids. Therefore, it is agreed that the paunch material which contains animal protein should be stabilised, or incorporated into the soil with exclusion periods.

PDP advises that other solids can be applied directly to land in a manner that appropriately minimises adverse effects on the basis that:

- The wastewater is industrial, so the pathogen risk to human health is much lower than anticipated for sewage sludge in the Guidelines for the Safe Application of Biosolids to Land in New Zealand, 2003;

⁶ A critical source area is a landscape feature like a swale or a depression that accumulates runoff from adjacent flats and slopes, and delivers it to surface waterways.

- The waste activated sludge (“**WAS**”) comprises bacterial solids resulting from wastewater that is screened, and then anaerobic and aerobically treated. These processes reduce the pathogen content, meaning that the resulting biomass does not contain a significant amount of pathogens;
- The WAS does not encourage vector attraction like the paunch solids do and are commonly discharged to land around New Zealand without issue; and
- The stockyards are no different to solids contained in farm dairy effluent or feed pad effluent, which is directly spread on agricultural land without resulting in pathogen related adverse effects.

Based on the above, BSM is proposing a new condition to address vector attraction to paunch solids via stabilisation or incorporating it into soil in accordance with the Guidelines for the Safe Application of Biosolids to Land in New Zealand. This requirement is included as Condition 37-1.

Nitrogen loading rate amendment

It has been identified that the nitrogen limits included in Condition 9 of the conditions previously proffered are not as clear as intended in regard to the loading rates that are proposed to apply when there is a discharge to both BSM owned land and third party land. It is intended that when there is a discharge to both BSM owned land (referred to as cut and carry operations) and third party owned land (referred to as grazed pasture), that an average limit of 200 kg/N/ha/yr applies to both areas. When there is a discharge to BSM owned land only, the higher limit of 350 kgN/ha/yr is proposed. To address this, a total annual plant available nitrogen loading limit of 35,600 kg (i.e. 200 kg/N/ha/yr x 178 ha of available land) has been proposed in Condition 9-1 of the wastewater to land discharge consent included in **Appendix A**.

Concluding comment

We trust that the above suitably addresses the matters that were identified as still needing to be addressed by BSM, however BSM remains open to discussing any of these items further if needed. Otherwise we look forward to seeing the updated technical review report.

Yours sincerely,



Doyle Richardson
Mitchell Daysh Limited

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APPENDIX A

Consent Conditions Proffered by Blue Sky Meats

PROPOSED CONSENT CONDITIONS 27TH AUGUST 2024 – POST ON-SITE MEETING WITH STANTEC AND ENVIRONMENT SOUTHLAND

Deletions from the previous version (dated 18th August 2023) are shown in ~~red strikethrough~~ and additions in red underline.

Specific conditions that have been deleted, amended or added are Conditions 4, 9, 9-1, 11, 37-1 and 46 to 49 of the Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land consent.

Other minor amendments have also been made to improve flow and readability.

Proposed Conditions: Discharge of contaminants to air	
1	This resource consent authorises the discharge of contaminants to air from the applicant's industrial premises at Morton Mains from the following sources, as described in the application dated June 2022, subject to the conditions set out in this consent: a. a rendering plant processing up to 5,750 kg of raw material per hour; b. a blood processing and drying operation; c. a meat processing plant; d. collection and treatment of wastewater from rendering, meat processing and site wide washing processes; e. irrigation of treated wastewater onto land; f. one 4.3 MW coal-fired boiler (rendering steam boiler); g. one 1.9 MW coal-fired boiler (hot water boiler); and h. salting shed.
Boilers	
2	a. The maximum coal burning rate in the rendering steam boiler shall not exceed 1,400 kilograms of coal per hour; and b. The maximum coal burning rate in the hot water boiler shall not exceed 630 kilograms of coal per hour.
3	The opacity of emissions from the chimney stacks of the boilers shall not be darker than Ringelmann Shade 1 as described in New Zealand Standard 5201:1973 except: a. in the case of a cold start, for a period not exceeding 30 minutes in the first hour of operation; and

Proposed Conditions: Discharge of contaminants to air

	b. for a period not exceeding a total of four minutes in each succeeding hour of operation.
4	a. The discharge into air from the rendering steam boiler shall occur via a stack at a height of at least 20 metres above ground level and at least 9 metres above the roof ridgeline of any adjacent building; and b. the discharge into air from the hot water boiler shall occur via a stack at a height of at least 18.6 metres above ground level and at least 9.6 metres above the roof ridgeline of any adjacent building. c. the discharges from the boilers shall be directed vertically into air and shall not be impeded by any obstruction above the stack which decreases the vertical efflux velocity.
5	The sulphur content of a representative sample of the coal burned in the boilers shall not exceed 0.5 percent by weight. The ash content of that sample shall be less than 7 percent by weight. The sample shall contain less than 30 percent by weight of fine particles having a diameter of less than 3.35 millimetres.
6	a. The mass emission of total particulate matter discharged from the rendering steam boiler shall not exceed 2.30 kg/hr; and b. the mass emission of total particulate matter discharged from the hot water boiler shall not exceed 2.30 kg/hr.
7	The boiler stacks shall be fitted with source emission test ports and safe access for testing, to the satisfaction of the Environment Southland Compliance Manager.
8	a. The rendering steam boiler identified in Condition 1(f) shall be tested annually to confirm compliance with Condition 6(a) prior to the first, second and third anniversaries of the date of the commencement of this consent. b. Testing of the rendering steam boiler can reduce to once every three years if compliance with Condition 6(a) has always been achieved during the testing undertaken in accordance with Condition 8(a). c. If compliance with Condition 6(a) has not always been achieved during testing undertaken under Condition 8(a) then annual testing shall be undertaken until compliance with Condition 6(a) over three consecutive years of monitoring has been achieved.
9	The hot water boiler identified in Condition 1(g) shall be tested annually to confirm compliance with Condition 6(b) prior to the first and second anniversaries of the commencement of this consent.



Proposed Conditions: Discharge of contaminants to air

10	Testing to confirm compliance with the particulate mass emission limit shall occur when the tested boiler is operating at greater than 75 percent of the boiler heat output stated in Condition 1(f) for the rendering steam boiler and Condition 1(g) for the hot water boiler. The method of sampling and analysis shall be to stack testing industry standards such as USEPA, ASTM or ISO testing methods. All analyses shall be performed by an International Accreditation New Zealand (IANZ) registered laboratory or otherwise as specifically approved by the Environment Southland Compliance Manager.
11	Results of testing undertaken by Condition 8 and 9 shall be forwarded to the Environment Southland Compliance Manager within 30 working days of the results being made available to the Consent Holder.
12	The boilers shall be serviced and maintained to ensure compliance with Conditions 3 and 6 at all times. Service reports shall be prepared and retained for at least 7 years, and copies shall be provided to the Environment Southland Compliance Manager on request.
13	The Consent Holder shall cease using the hot water boiler identified in Condition 1(g) after August 2024.
14	At five yearly intervals, following the commencement of this consent, the Consent Holder shall conduct a review of low carbon alternatives for the rendering steam boiler identified in 1(f). The review shall detail: a. any changes in central or local government policies or rules regarding the burning of coal in that boiler; b. the availability of alternative fuel sources that provide the necessary energy output requirements; c. the availability of new technologies which could be used in place of the rendering steam boiler and the feasibility of those; and d. the financial implications and energy capacity of alternative fuel sources or technologies identified in Conditions 14(b) and 14(c).
15	A report detailing the findings of Condition 14 shall be provided to the Environment Southland Compliance Manager within 30 working days of the review being undertaken.

Rendering and meat processing

Proposed Conditions: Discharge of contaminants to air

16	The Consent Holder shall ensure that only fresh or suitably preserved raw material is processed in the rendering plant. Unpreserved raw material for rendering shall not be held on-site for more than 24 hours. Suitably preserved material shall be material that is chilled or frozen and is derived from cutting, boning or further processing of animal tissue that has been chilled or frozen within 24 hours of the time of slaughter.
17	The Consent Holder shall ensure that the ventilation system draws adequate negative pressure to ensure the effective capture of contaminants from the rendering plant building and all other areas from which air is extracted to minimise fugitive emissions. The ventilation air shall be discharged via the rendering plant biofilter, as described in Condition 18. The Consent Holder shall undertake an inspection of the ventilation and pre-treatment (condensers etc) equipment every 5 years from the commencement of this consent. A record of these inspections must be retained and be available to the Environment Southland Compliance Manager on request.
18	The rendering plant biofilter shall be capable of treating all air from the rendering building and the air volume from point sources within the rendering plant. The biofilter shall contain filter media to a depth of at least 1 metre over an area of at least 1024 m ² .
19	The Consent Holder shall measure and record the following biofilter parameters: - the air pressure of the biofilter inlet duct compared to atmospheric pressure by pressure gauge or U-tube manometer and the pH and moisture content of the biofilter media via a handheld soil tester on a monthly basis; - odour characteristic of the air discharged from the biofilter on the downwind edge of the biofilter on a weekly basis; - the temperature of the air entering the biofilter on a continuous basis; - observations of the air distribution through the biofilter media on a yearly basis to assess whether it is evenly distributed; and - air pressure within the following point source extraction ducts on a quarterly basis: - the two solids' presses; - the continuous cooker; and - the blood dryer.
20	The biofilter shall be operated in accordance with the following triggers:



Proposed Conditions: Discharge of contaminants to air

	a. the pressure drop measured at the biofilter inlet duct should not exceed 150 millimetres water gauge or 1.5 kilopascals; b. the moisture content of the biofilter media should be maintained between 40% and 60% on a wet weight basis; c. the target pH for the biofilter media is pH 6 to pH 8; d. the maximum inlet air temperature shall be 40 degrees Celsius; and e. negative air pressure shall be maintained within the following point source extraction ducts: i. the two solids' presses; ii. the continuous cooker; and iii. the blood dryer.
21	The Consent Holder shall maintain at least 12 months of records of all measurements undertaken in accordance with Condition 19. This record shall be provided to an Environment Southland Compliance Manager on request.
22	Processing areas, collection sumps and traps in the meat processing plant and rendering plant shall be cleaned at least daily to minimise odour emissions.

Wastewater treatment and irrigation

23	The Consent Holder shall ensure that biogases generated from the Wastewater Treatment Plant (WWTP) anaerobic pond are combusted via a flare or an energy recovery system at all times except under the following circumstances: a. in the event of a combustion equipment failure; or b. for combustion equipment maintenance purposes; or c. for periodic venting of biogases via the flare blower as part of the routine maintenance programme; or d. for the purposes of providing a small continuous supply of biogas from the covered anaerobic treatment facility to the WWTP biofilter to maintain the active bacteria population in the WWTP biofilter.
24	Under the circumstances where biogases are not flared and/or utilised for energy recovery as described in Condition 22, then biogases shall be vented to the WWTP biofilter. If use of the WWTP biofilter is required for more than 20 days in any calendar year ending 31 December, the Consent Holder shall within 60 days of the end of the year provide the Environment Southland Compliance



Proposed Conditions: Discharge of contaminants to air

	Manager with a report which details the reason for the use of the WWTP biofilter for treating biogas in excess of 20 days during the year.
25	The Consent Holder shall maintain treated wastewater in an aerobic condition using aerators to minimise odour in the irrigation lagoon. If irrigation of treated wastewater does not occur for more than two days, the irrigation lagoon shall be aerated to avoid the onset of anaerobic conditions.
26	a. Wastewater shall not be irrigated onto land within 20 metres of any property boundary. There shall be no spray drift of wastewater beyond that property boundary. b. If treated wastewater irrigation has not occurred for more than 48 hours, wastewater shall not be irrigated onto land within 40 metres of any property boundary on the first day that wastewater irrigation resumes.

Odour

27	The air discharges from the Consent Holder's processes shall not cause odour that is offensive or objectionable to such an extent that it has an adverse effect on the environment beyond the boundary of the property on which the consent is exercised.
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Complaints

28	The Consent Holder shall maintain a 24 hour contact number for the receipt of complaints and concerns from the public. This contact number shall be listed on the Consent Holder's website (https://bluesky.co.nz).
29	The Consent Holder shall maintain a diary of odour and spray drift complaints. The diary shall record: a. the effect observed by the complainant; b. the date and time the effect was detected, or the complaint was made; c. the location where the effect was detected by the complainant; d. weather conditions (such as wind direction, approximate wind speed, temperature) when the effect was detected by the complainant; e. nature and intensity of the odour or spray drift; f. the most likely cause of the effect detected; and g. the action taken by the Consent Holder in response to the complaint.



Proposed Conditions: Discharge of contaminants to air

	<i>Advice Note: This condition does not require the Consent Holder to take action over every complaint, but it does require that that decision is recorded.</i>
30	The complaint record required by Condition 29 shall be provided to the Environment Southland Compliance Manager annually by 31 July and otherwise on request.

Air Discharge Management Plan

31	No later than three months from this consent commencing the Consent Holder shall prepare and submit to the Environment Southland Compliance Manager an Air Discharge Management Plan for certification that it is in accordance with this condition. The objective of the Air Discharge Management Plan shall be to detail all actions to be taken to minimise odour and particulate matter emissions from the plant and to ensure compliance with the conditions of this consent. The Air Discharge Management Plan shall include: - a description of the contents and purpose of the Air Discharge Management Plan in accordance with this condition; - a summary of the plant purpose, location, layout, and production equipment with specific reference to contaminant discharge, extraction and treatment equipment, discharge stacks and processes; - responsibilities and contact details of key personnel; - operation, inspection and maintenance of the rendering plant equipment, boilers, WWTP (including wastewater irrigation procedures and set back distances) and the biofilters including the extraction and treatment equipment; - procedures adopted to ensure that the odour extraction equipment in the rendering plant is fully functional before operations commence; - procedures adopted to ensure that the plant complies with the conditions of this consent at all times; - measures to be implemented in the event that the trigger levels in Condition 20 are not met; - details of how emissions will be contained within the rendering building to minimise the potential for fugitive emissions.
32	The Consent Holder shall undertake all onsite activities in accordance with the Air Discharge Management Plan, and all other conditions of this consent. In the event of any inconsistencies between the conditions of consent and the

Proposed Conditions: Discharge of contaminants to air	
	provisions of the Air Discharge Management Plan, the conditions of this consent shall apply.
33	The Air Discharge Management shall be reviewed by the Consent Holder every three years. The purpose of this review shall be to confirm that the Air Discharge Management Plan accurately reflects current on-site activities and operations and to identify if changes to procedures contained within the Air Discharge Management Plan are required to achieve the objective of this condition. A written report detailing the results of the review shall be submitted to the Environment Southland Compliance Manager within 30 working days of the review being undertaken. If the review results in amendments to the Air Discharge Management Plan, the amended sections shall be provided to the Environment Southland Compliance Manager for certification at this time.



Proposed Conditions: Abstraction and use of groundwater

1	This permit authorises the abstraction of water from up to three bores. These bores are: a. F46/0517; b. F46/0561; and c. F46/1128.
2	The combined rate of abstraction from the three bores identified in Condition 1 shall not exceed: a. 1,500 cubic metres per day; b. 7,000 cubic metres per week, and; c. 365,000 cubic metres per year.
3	The Consent Holder shall install a backflow prevention device on the bores identified in Condition 1 or take other appropriate measures to ensure water and/or contaminants cannot return to the water source.
4	The bores identified in Condition 1 are to be maintained so that: a. there is a seal, made of concrete or similar material, placed at ground level around the outside of the casing. The seal will be sufficient to prevent foreign material, surface water, spillage or other leakage entering the space between the casing and the wall of the borehole; b. the top of the casing is sealed to prevent the entry of contaminants into the casing; and c. fencing is installed to prevent stock accessing the bores.

Monitoring and reporting

5	The Consent Holder shall: a. provide and maintain access to the heads of each bore to enable measurement of water level in each bore; b. monitor groundwater levels at each bore once each calendar month; and c. when monitoring groundwater levels, record whether or not the bore has been in use during the previous 24 hours and, if it has, the rate of abstraction from the bore during the previous 24 hour period.
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Proposed Conditions: Abstraction and use of groundwater

6	A system must measure on a continuous basis the volume taken via the bores identified in Condition 1. The system must have a reliable calibration and must be maintained to an accuracy of +/- 5 percent.
7	Within six months of the commencement of this consent the Consent Holder must provide the Environment Southland Compliance Manager: a. a copy of any relevant manufacturer calibration certificate; or b. evidence from a suitably qualified person showing that the system required by Condition 6 is verified as accurate to +/- 5 percent.
8	The consent holder must engage a suitably qualified person to undertake additional verification of the accuracy of the system required by Condition 6: a. at a frequency of no less than five yearly from the date of the first verification required by Condition 7; and b. to the satisfaction of the Environment Southland Compliance Manager. Evidence documenting each additional verification must be forwarded to the Environment Southland Compliance Manager within 30 working days of the verification being completed.
9	The Consent Holder must measure and record the volume of water taken on a cubic metre basis to confirm compliance with Condition 2. When no groundwater is being taken the data must specify the take volume as zero.
10	The Consent Holder must submit a report in electronic spreadsheet format to the Environment Southland Compliance Manager by 1 August each year that contains daily, weekly and annual volumes of groundwater for the immediately preceding year ending 30 June – of the volume of groundwater taken pursuant to this consent.



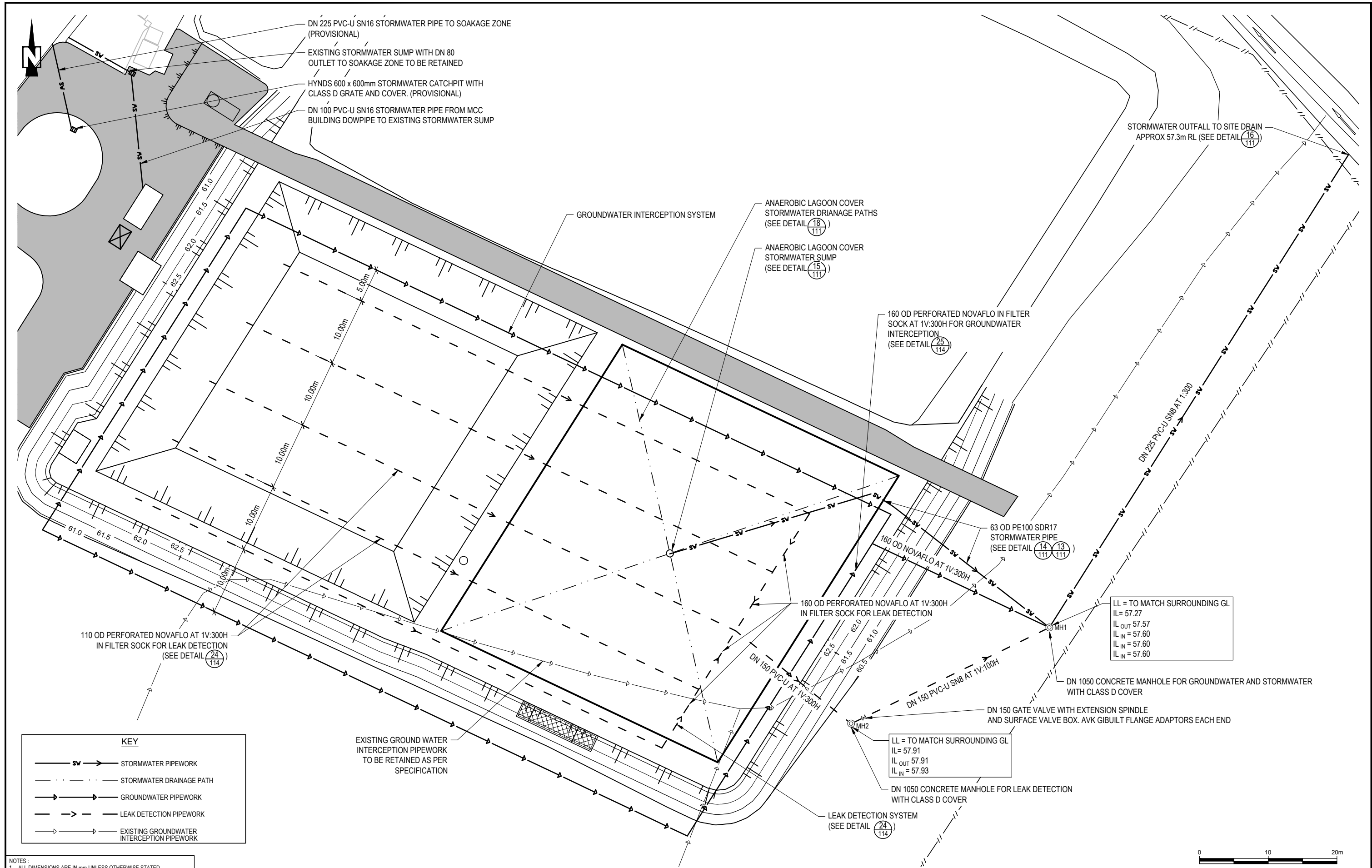
Proposed Conditions: Take groundwater for dewatering	
1	The permit authorises the passive taking of groundwater for dewatering the ground beneath the wastewater treatment plant via the subsoil drainage system shown in Attachment 1 - (A03220201 – Drawing No. 007) located at 729 Woodlands Morton Mains Road (1,265,070E 4,857,630 N).



Attachment 1

A03220201 – Drawing No. 007





KEY	
	STORMWATER PIPEWORK
	STORMWATER DRAINAGE PATH
	GROUNDWATER PIPEWORK
	LEAK DETECTION PIPEWORK
	EXISTING GROUNDWATER INTERCEPTION PIPEWORK

NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. SEE TO DWG 003 AND 004 FOR SETTING OUT DETAILS.
3. THE IDENTITY AND LOCATION OF ANY SERVICES SHOWN ON THIS DRAWING CANNOT BE GUARANTEED TO BE COMPLETE OR ACCURATE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL SERVICES PRIOR TO UNDERTAKING ANY EXCAVATION.

SOURCE:
1. SURVEY DATA SUPPLIED BY BONISCH CONSULTANTS LTD. 181102 6700 RevB, SURVEYED ON 08/08/2018 AND 26/10/2018
2. AERIAL IMAGERY (FLOWN 01/13/2018) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

0	FOR TENDER	DEC 18	
A	FOR REVIEW	NOV 18	
NO.	REVISION	DATE	APP.

	BY	CHECKED	DATE
DESIGNED	A.D.	D.G.	OCT 18
DRAWN	D.F.P.	D.R.	OCT 18
APPROVED ISSUE FOR :	TENDER		DEC 18
APPROVED :			
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			
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CLIENT:

BlueSkyMeats

PROJECT:		NEW WASTEWATER TREATMENT PLANT	
TITLE:		STORMWATER AND GROUNDWATER LAYOUT	
PROJECT NO. :	A03220201	SCALE	1:500 (A3)
SHEET :	OF :	DRAWING NO. :	007
REV :	0		

pdp solutions for your environment

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Proposed Conditions: Discharge of land drainage water and stormwater to water

1	This consent authorises the discharge of land drainage water taken in accordance with Consent [reference take of groundwater for dewatering consent], and the discharge of stormwater from the covered anaerobic lagoon to water in an open drain at the location shown in Attachment 1 - (A03220201 Drawing 007 Rev 0).
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Monitoring and reporting

2	a. The Consent Holder shall sample the land drainage water prior to the discharge point within three months of the commencement of this consent and quarterly thereafter and have it analysed for the following: i. biochemical oxygen demand ii. total ammonia nitrogen iii. total nitrate nitrogen iv. total nitrite nitrogen v. total nitrogen vi. E. coli b. the Consent Holder shall also sample water from the open drain at a minimum 20 metres upstream of the discharge point, and have the samples analysed for the same parameters as are listed in Condition 2(a); c. sampling in accordance with Condition 2(b) shall occur within 2 hours of samples taken in accordance with Condition 2(a); d. Stormwater discharged from the Covered Anaerobic Lagoon shall be sampled annually following a rain event that exceeds 10 mm/day, and analysed for: i. 5-day carbonaceous biochemical oxygen demand; ii. Total Kjeldahl nitrogen; iii. Total phosphorus; and iv. E. coli. If stormwater is not being discharged under this consent, then this sampling is not required. e. sample collection, preservation and analysis shall be carried out in accordance with the most recent edition of APHA “Standard Methods for the Examination of Water and Wastewater”; and f. the analysis is monitoring and analyses are to be carried out by a laboratory with IANZ registration or equivalent, or as agreed to in writing with the Environment Southland Compliance Manager.
3	a. The Consent Holder shall report the results of monitoring required by Condition 2 in writing to the Environment Southland Compliance Manager



	Proposed Conditions: Discharge of land drainage water and stormwater to water
	(email: escompliance@es.govt.nz) within 30 working days of receipt of the analysis sample results. b. If the concentration of contaminants in a sample of land drainage water collected in accordance with Condition 2(a) exceeds: i. a total ammonia concentration of 1 gram per cubic metre; and/or ii. a 5-day biological oxygen demand concentration of 2 grams per cubic metre; then the consent holder shall include in the written report required by Condition 3(a), the cause of the exceedance and if necessary, identify a preferred mitigation option for addressing the cause of the exceedance. c. If the concentration of contaminants in a sample of stormwater collected in accordance with Condition 2(d) exceeds: i. a total nitrogen concentration of 5 grams per cubic metre; and/or ii. a 5-day biological oxygen demand concentration of 2 grams per cubic metre; then the consent holder shall include in the written report required by Condition 3(a), the cause of the exceedance and if necessary, identify a preferred mitigation option for addressing the cause of the exceedance. d. The Consent Holder shall implement the preferred mitigation option identified in the report prepared in accordance with Condition 3(a) as soon as practicable. e. A copy of the report prepared in accordance with Condition 3(a) shall be provided to the Environment Southland Compliance Manager within 10 working days of the report being completed.
4	After reasonable mixing: a. the discharge shall not result in the following effects in the open drain: i. the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials; ii. any conspicuous plumes, change in colour or reduction of visual clarity; iii. any emission of objectionable odour; b. the discharge shall not result in the following effects in the tributary of the Waihopai River that the drain flows into: i. the production of conspicuous oil or grease films, scums or foams, or floatable or suspended materials; ii. any conspicuous plumes, change in colour or reduction of visual clarity iii. any emission of objectionable odour;



Proposed Conditions: Discharge of land drainage water and stormwater to water

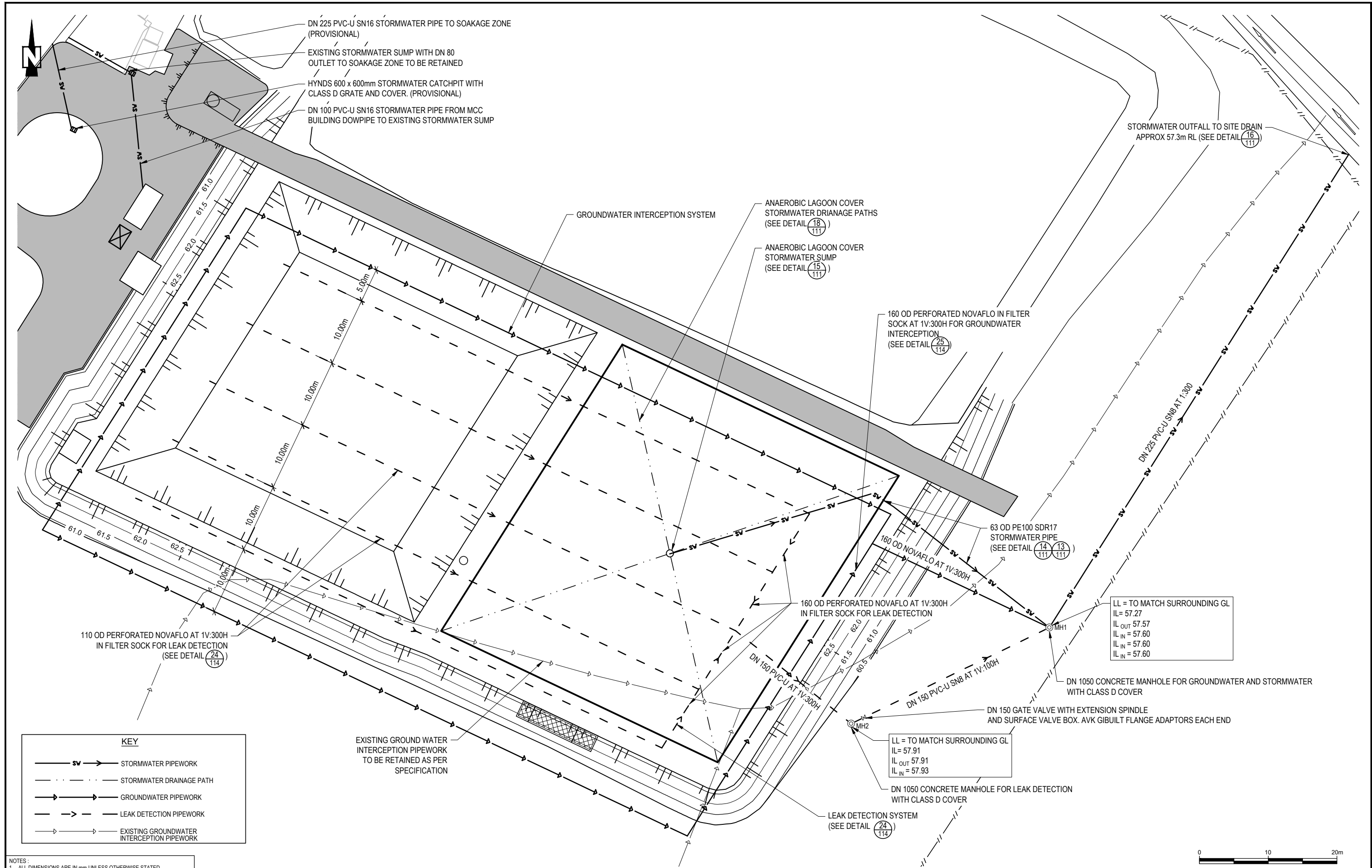
	iv. the rendering of fresh water as unsuitable for consumption by farm animals; v. any significant adverse effects on aquatic life; vi. exceedance of the water quality standards for “Lowland Hard Bed” water bodies (Attachment 2).
5	For the purposes of Condition 4, reasonable mixing shall have occurred: a. in the drain within 20 metres of the point of discharge to the drain, and b. in the tributary within 30 metres of the confluence of the drain with the tributary.
6	Prior to the first discharge of stormwater from the covered anaerobic lagoon authorised by this consent, the Consent Holder shall notify Environment Southland of its intention to discharge the stormwater. The notification shall include: a. a description of the measures implemented to prevent pest bird congregation on the covered anaerobic lagoon; b. evidence demonstrating the effectiveness of these measures over three months; and c. a minimum of two stormwater samples that meet the stormwater quality targets stated in Condition 3(c).



Attachment 1

A03220201 – Drawing No. 007





KEY	
	STORMWATER PIPEWORK
	STORMWATER DRAINAGE PATH
	GROUNDWATER PIPEWORK
	LEAK DETECTION PIPEWORK
	EXISTING GROUNDWATER INTERCEPTION PIPEWORK

NOTES:
1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE STATED.
2. SEE TO DWG 003 AND 004 FOR SETTING OUT DETAILS.
3. THE IDENTITY AND LOCATION OF ANY SERVICES SHOWN ON THIS DRAWING CANNOT BE GUARANTEED TO BE COMPLETE OR ACCURATE.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE LOCATION AND PROTECTION OF ALL SERVICES PRIOR TO UNDERTAKING ANY EXCAVATION.

SOURCE:
1. SURVEY DATA SUPPLIED BY BONISCH CONSULTANTS LTD. 181102 6700 RevB, SURVEYED ON 08/08/2018 AND 26/10/2018
2. AERIAL IMAGERY (FLOWN 01/13/2018) DERIVED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE)

0	FOR TENDER	DEC 18	
A	FOR REVIEW	NOV 18	
NO.	REVISION	DATE	APP.

	BY	CHECKED	DATE
DESIGNED	A.D.	D.G.	OCT 18
DRAWN	D.F.P.	D.R.	OCT 18
APPROVED ISSUE FOR :	TENDER		DEC 18
APPROVED :			
THIS DRAWING IS NOT FOR CONSTRUCTION UNLESS SIGNED AS APPROVED			
COPYRIGHT ON THIS DRAWING IS RESERVED			

CLIENT:

BlueSkyMeats

PROJECT:		NEW WASTEWATER TREATMENT PLANT	
TITLE:		STORMWATER AND GROUNDWATER LAYOUT	
PROJECT NO. :	A03220201	SCALE	1:500 (A3)
SHEET :	OF :	DRAWING NO. :	007
REV :	0		

pdp solutions for your environment

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Level 4, PDP House, 235 Broadway, Newmarket, Auckland
P.O. Box 9628, Auckland 1149, New Zealand.
Telephone : (09) 523 6900
Auckland Tauranga Wellington Christchurch

Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
1	This consent authorises the discharge of treated wastewater, stockyard solids, paunch, waste activated sludge, and stormwater from the covered anaerobic lagoon onto land at the following legal descriptions: Lot 1 DP 14802, Pt Lot 7 DP 159, Pt Lot 8 DP 159, Lot 1 DP 595, Lot 9 DP 159, Lot 12 DP 159, Lot 13 DP 159, Lot 292 DP 155, Lot 293 DP 155, Lot 1 DP 12194, and Lot 1 DP 8287.
2	Irrigation of wastewater, waste activated sludge, stormwater from the covered anaerobic lagoon, and land application of stockyard solids, paunch to third-party owned land shall only occur from October to March (inclusive). Third-party land is at the following legal descriptions: Lot 9 DP 159, Lot 12 DP 159, Lot 13 DP 159, Lot 292 DP 155, Lot 293 DP 155 Lot 1 DP 12194, and Lot 1 DP 8287.
3	No discharge shall occur onto land that is predominantly Paroa (formally Dacre) Silt Loam soils.
4	The Consent Holder shall permanently block or otherwise decommission the subsoil drainage underneath the irrigation areas which will receive year round discharges of treated wastewater, waste activated sludge and stormwater from the covered anaerobic lagoon prior to exercising this consent.
5	The treated wastewater, waste activated sludge, stormwater from the covered anaerobic lagoon, stockyard solids and paunch authorised to be applied to land under this consent shall be applied no closer than: 10 metres to any watercourse or open drain, whether flowing continuously or intermittently; 20 metres to any external property boundary or public road. The distance to a property boundary may be reduced with the written agreement of the adjacent property owner and occupier. A copy of this written agreement shall be provided to the Environment Southland Compliance Manager prior to disposal of treated wastewater, stockyard solids, paunch or waste activated sludge occurring; 100 metres to any residential dwelling, school, or marae (excluding any dwellings owned by the Consent Holder) unless the written agreement of the owner and occupier has been obtained. A copy of this written agreement shall be provided to the Environment Southland Compliance Manager prior disposal of wastewater, stockyard solids, paunch or waste activated sludge occurring; and 100 metres from any potable water abstraction point. <i>Advice note: The above setback distances shall be calculated from the edge of the spray wetted radius. For example, an operator placing a pod irrigation</i>



Proposed Conditions:	Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land
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system with a maximum spray radius of 15 metres should position the pods no closer than 25 metres to any watercourse.

Compliance limits

6	The combined depth of treated wastewater, waste activated sludge and covered anaerobic lagoon stormwater application onto any area of land shall not exceed: a. 35 mm for any individual application in the period 1 October to 31 March; b. 15 mm for any individual application in the period 1 April to 30 September. The combined rate of application of treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater to land must not exceed 6 mm per hour.
7	Following an individual application event discharge of treated wastewater, waste activated sludge and covered anaerobic lagoon stormwater must be withheld for a minimum period of 7 days before another individual application of that material can be applied onto the same area of land.
8	a. Stock must be withheld from accessing the land area subject to a discharge event for a minimum of 14 days following the completion of that event. b. Land used for treated wastewater, waste activated sludge and covered anaerobic lagoon stormwater disposal between 1 April and 30 September shall not be grazed by cattle or horses.
9	Plant available nitrogen loadings rate from all sources must not exceed a maximum of: a. 200 kgN/ha/yr on grazed pasture; b. 350 kgN/ha/yr on cut and carry operations; or c. A pro-rated nitrogen load, in the case of mixed land use <u>on the same piece of land throughout the year</u>. Plant available nitrogen shall be assessed as follows: a. nitrogen applied from treated wastewater, covered anaerobic lagoon stormwater, stockyard solids and paunch shall be considered as 100 % plant available; and



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	b. nitrogen applied from waste activated sludge shall be considered 58 % plant available.
9-1	<u>Plant available nitrogen loads from all sources must not exceed a maximum of 35,600 kgN/yr.</u>
10	The annual phosphorus loading rate from the irrigation of treated wastewater, covered anaerobic lagoon stormwater, stockyard solids, paunch, waste activated sludge and fertiliser applications shall not exceed 70 kgP/ha/yr.
11	The Consent Holder may apply plant available phosphorus up to 110 kgP/ha/yr on land owned by the Consent Holder and operated as cut and carry subject to: a. riparian planting as per the Riparian Planting Plan shown in Attachment 1 - Figure 17 Riparian Planting Plan for Mitigation of Higher Nutrient Loading (PDP Figure No. 17 A03220205) <u>being undertaken as follows:-</u> i. areas of new riparian planting shall be high density native grasses and sedges; and ii. achieve a minimum 80% ground cover; and iii. achieve a minimum of 5 m width as measured from the stream and/or drain bank. b. areas of existing riparian planting <u>completed at the date of consent commencement</u> are to be maintained wherever possible. If these need to be removed, the planting shall be replaced in accordance with Condition 11 (a) i-iii above. c. the riparian planting shall be carried out with the advice of a suitably qualified expert.
12	Plant available phosphorus shall be assessed in Conditions 10 and 11 as follows: a. phosphorus applied from treated wastewater, stockyard solids and paunch shall be considered 100 % plant available; and b. phosphorus applied from waste activated sludge shall be considered 85 % plant available.
12-1	The nitrogen loading rate shall not exceed 50 kgN/ha per irrigation application event.
13	The oil and grease concentration of the treated wastewater discharged shall not exceed 50 grams per cubic metre.



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land

Monitoring, record keeping and reporting

13-1	The Consent Holder shall maintain flowmeters at or downstream of the irrigation storage lagoon that monitor provide instantaneous flow monitoring and daily discharge volume monitoring of all treated wastewater, waste activated sludge and covered anaerobic lagoon stormwater discharged to land. The flowmeter shall be maintained and calibrated annually.
13-2	The Consent Holder shall maintain daily records of all stockyard solids, paunch and grit spread onto land. The records shall include: a. volume; and b. type (stockyard solids, paunch, grit).
14	The Consent Holder shall monitor the treated wastewater and covered anaerobic lagoon stormwater discharge by taking representative samples of the wastewater from the irrigation storage pond at least once per month, and analysing each sample for the following: a. field measurements of temperature, pH, electrical conductivity, and dissolved oxygen; b. sodium adsorption ratio including sodium, potassium, calcium and magnesium concentrations; c. chloride concentration; d. total nitrogen concentration; e. nitrate nitrogen concentration; f. nitrite nitrogen concentration; g. ammoniacal nitrogen concentration; h. <i>Escherichia coli</i> concentration; i. total phosphorus concentration; and j. dissolved reactive phosphorus.
14-1	In addition to the analysis required by Conditions 14, one treated wastewater and covered anaerobic lagoon sample shall also be analysed annually for: a. total arsenic; b. total cadmium;



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land

	c. total chromium; d. total copper; e. total lead; f. total nickel; and g. total zinc.
15	The Consent Holder shall monitor the waste activated sludge by taking a representative sample at least once per month, and analysing each sample for the following: a. total solids; b. total Kjeldahl nitrogen; c. ammoniacal nitrogen; d. total phosphorus; and e. dissolved reactive phosphorus.
16	In addition to the analysis required by Conditions 15, one waste activated sludge discharge sample shall also be analysed for: a. total arsenic; b. total cadmium; c. total chromium; d. total copper; e. total lead; f. total nickel; and g. total zinc.
17	The Consent Holder shall monitor the combined paunch, stockyard solids and all other solids (combined as wastewater solids) applied to land by taking representative samples of the solids at least once per month, and analysing each sample for the following: a. bulk density; b. total solids; c. total Kjeldahl nitrogen; d. ammoniacal nitrogen;



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	e. total phosphorus; and f. dissolved reactive phosphorus.
17-1	In addition to the analysis required by Conditions 17, one wastewater solids sample shall also be analysed annually for: a. total arsenic; b. total cadmium; c. total chromium; d. total copper; e. total lead; f. total nickel; and g. total zinc.
18	The Consent Holder shall monitor the unnamed tributary of the south branch of the Waihopai River that runs through the disposal area as follows: a. the unnamed tributary is to be monitored upstream and downstream of the land treatment site, at the locations shown in Attachment 2 - Figure 11 Surface Water Monitoring Locations – (PDP Figure No. 11 A03220205); b. samples are to be taken at least once every three months; c. the samples taken at the upstream and downstream sites on each monitoring occasion are to be taken at about the same time, within the period of 1 hour. The downstream sample should be taken first on each occasion; d. the samples are to be analysed for: i. pH; ii. electrical conductivity; iii. dissolved oxygen concentration; iv. ammoniacal nitrogen concentration; v. total nitrogen concentration; vi. dissolved reactive phosphorus concentration; vii. <i>Escherichia coli</i> concentration; viii. nitrate nitrogen; ix. nitrite nitrogen; x. temperature (field measurement); and xi. 5-day carbonaceous biochemical oxygen demand (cBOD₅).



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	e. In addition to the analysis required by Condition 18(d), one set of samples shall also be analysed in the first year of operation and every three years after that for: i. total arsenic; ii. total cadmium; iii. total chromium; iv. total copper; v. total lead; vi. total nickel; and vii. total zinc.
19	The Consent Holder shall maintain the conductivity meter at a site downstream of the land treatment area in the unnamed tributary. The conductivity meter shall be located in the position shown on Attachment 2 – Figure 11 Surface Water Monitoring Locations - (PDP Figure No. 11 A03220205). The conductivity meter shall continuously monitor and electronically record (at 15 minute intervals) electrical conductivity. a. The meter shall be calibrated periodically, and shall be maintained in accordance with the manufacturers guidelines; b. the conductivity readings are to be reported to the Environment Southland Compliance Manager via a system that can automatically send the data into Environment Southland's computer database in CSV format, Hilltop or Tideda format, or XML formatted or formatted as required by the Environment Southland Compliance Manager. The data is to be provided at least once per day; and c. if the electrical conductivity readings exceed 280 µS/cm (or other value agreed in writing by the Environment Southland Compliance Manager), the Consent Holder shall, without undue delay, inspect the unnamed tributary at the upstream and downstream sites identified in Attachment 2 - Figure 11 Surface Water Monitoring Locations (PDP Figure No. 11 A03220205). If the inspection shows a conspicuous change in the colour or clarity of the tributary, the Consent Holder shall advise the Environment Southland Compliance Manager (email: escompliance@es.govt.nz, or phone 0800 76 88 45) and shall immediately inspect the wastewater irrigation to ensure that wastewater is not causing the effect in the tributary.
20	Water, treated wastewater, waste activated sludge, stockyard solids and paunch quality monitoring shall comply with the following criteria:



Proposed Conditions:	Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land
	a. the results of the monitoring specified in Conditions 14 to 18 are to be supplied to the Environmental Southland Compliance Manager no later than 20 working days after the receipt of the laboratory analytical data; b. the results of the monitoring specified in Conditions 14 to 18 are to include reference to the method of analysis; c. the parameters specified in conditions 14 to 18 shall be analysed in accordance with the most recent edition of APHA "Standard Methods for the Examination of Water and Wastewater" or by the methods approved in writing by the Environment Southland Compliance Manager; and d. where the laboratories carrying out analyses required by this consent are not accredited to ISO7025, either by IANZ (formerly TELARC) or by an organisation with a mutual recognition agreement with the IANZ, for those analyses, then the Environment Southland Compliance Manager may once every 12 months audit the Consent Holder's monitoring methods and analyses by obtaining and analysing split samples of the samples taken in accordance with conditions 14 to 18 above. The cost of each audit is to be met by the Consent Holder.
21	The Consent Holder shall monitor soil on the site during the month of May each year as follows: a. Samples shall be taken from, and the measurements made in, at least seven treated wastewater, waste activated sludge, covered anaerobic lagoon stormwater, stockyard solids and paunch disposal sites: i. at least four sites on land operated as cut and carry; ii. at least two sites on land operated as grazed pasture; and iii. at least one control site (in an area where treated wastewater, waste activated sludge, stockyard solids and paunch are not discharged, and which is typically representative of the soil characteristic within the irrigated areas). b. to this end, the Consent Holder shall take no less than 10 representative subsamples to a minimum depth of 15 cm at each site to form one composite for each site; c. soil samples shall be analysed for the following: i. soil pH; ii. exchangeable calcium; iii. exchangeable magnesium; iv. exchangeable potassium; v. exchangeable sodium; vi. phosphorus (Olsen P); vii. cation exchange capacity; and



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land

	viii. total nitrogen concentration. d. analysis shall include the calculation of exchangeable sodium percentage (ESP) values for each sampling site; and e. at each site, at least one sample shall be taken and tested for soil infiltration. f. In addition to the analysis required by Condition 21(c.), one set of samples shall also be analysed in the first year of operation and every five years after that for: i. total arsenic; ii. total cadmium; iii. total chromium; iv. total copper; v. total lead; vi. total nickel; and vii. total zinc.
22	The Consent Holder shall maintain the soil's natural infiltration capacity by ensuring the exchangeable sodium percentage (ESP) of the soil at annual monitoring compliance sites does not exceed 5%, and that saturated soil infiltration rates are not less than 6 mm/hr.
23	If it is determined by monitoring required by Condition 21 that ESP exceeds 5%, action, such as fertilisation with gypsum or other suitable method, shall be undertaken such that the elevated ESP reduces to less than 5%.
24	If it is determined by monitoring required by Condition 21 that saturated soil infiltration rates are less than 6 mm/hr, the Consent Holder shall take appropriate remedial action by ripping the paddock, tilling the paddock and resowing, or other suitable mechanical method.
26	The Consent Holder shall maintain a minimum of seven groundwater monitoring bores on site. The bores shall comprise a minimum of three shallow upgradient, three shallow downgradient and one deep (approximately 40 metres deep) downgradient bores. The bores shall be positioned to achieve effective coverage of the operation. The consent Holder shall sample the seven groundwater monitoring bores quarterly each year and analyse each sample test for the following: a. field measurements of temperature, pH, electrical conductivity, and dissolved oxygen;



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land

	b. sodium adsorption ratio including sodium, potassium, calcium and magnesium concentrations; c. chloride concentration; d. total nitrogen concentration; e. nitrate nitrogen concentration; f. nitrite nitrogen concentration; g. ammoniacal nitrogen concentration; h. <i>Escherichia coli</i> concentration; i. total phosphorus concentration; and j. dissolved reactive phosphorus.
27	From the date that this consent commences, in addition to the monitoring requirements stipulated by Condition 26, the Consent Holder shall also sample bore water at the seven bores identified in Condition 26 for heavy metals total arsenic, total cadmium, total chromium, total copper, total lead, total nickel and total zinc in the first year of operation and at five yearly intervals after that.
28	The Consent Holder shall carry out, on-site soil moisture measurements within the wastewater irrigation areas as follows: a. the Consent Holder shall record soil-moisture measurements using a device as agreed by the Environment Southland Compliance Manager; b. unless otherwise agreed by the Environment Southland Compliance Manager the soil moisture data collected in accordance with this condition is to be recorded and provided to the Council with each annual monitoring report required by Condition 31 for the preceding period 1 July to 30 June; c. the Consent Holder shall, from the on-site monitoring record, determine the soil-moisture contents that are equivalent to field capacity at each of the monitoring sites and shall report this to the Environment Southland Compliance Manager.
29	The Consent Holder shall, unless otherwise agreed to in writing by the Environment Southland Compliance Manager, undertake ecological monitoring after the first full year of treated wastewater, waste activated sludge, covered anaerobic lagoon stormwater, stockyard solids and paunch disposal and at 5 yearly intervals after that. The ecological monitoring shall occur along approximately 50 m lengths of the two unnamed tributaries, upstream and downstream of the boundaries of the disposal area. These locations shall be monitored at the same time.



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	The ecological monitoring shall comprise of: a. macroinvertebrate community index for soft bottomed streams (MCI-sb); b. relative abundance of ephemeroptera, plecoptera and trichoptera (EPT); c. taxonomic richness; d. stream ecological evaluation (SEV); and e. periphyton sampling
30	The Consent Holder shall keep daily records on a per paddock basis of the following: a. the amount of: i. treated wastewater and covered anaerobic lagoon stormwater irrigation; and ii. waste activated sludge irrigation; and iii. paunch, stockyard solids, and all other solids applied to the land. b. the total nitrogen and phosphorus loadings applied to the disposal area from: i. treated wastewater and covered anaerobic lagoon stormwater irrigation; ii. waste activated sludge irrigation; and iii. paunch, stockyard solids, and all other solids applied to the land. c. the calculated available nitrogen and available phosphorus loading applied to the disposal area (in kilograms per hectare per year). The Consent Holder shall make these records available to the Environment Southland Compliance Manager upon request at any reasonable time.
31	The Consent Holder shall prepare and submit an Annual Monitoring Report to the Environment Southland Compliance Manager. The report shall include the <u>period from</u> 1 July to 30 June <u>period</u> and shall be provided to the Environment Southland Compliance Manager by 31 August each year. The report shall include, but not <u>necessarily</u> be limited to the following information: a. presentation and summary of all treated wastewater, waste activated sludge, covered anaerobic lagoon stormwater, stockyard solids, paunch, receiving environment, and biological monitoring results as required by this consent; including any recommendations for improved monitoring; b. the identification of any recorded non-compliances with consent limits and standards and the measures taken to ensure compliance is achieved;



Proposed Conditions:	Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land
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	c. analysis of all treated wastewater, wastewater activated sludge, stockyards solids, paunch, receiving environment and ecological monitoring results using: i. long-term monitoring trends (where sufficient data is available); ii. comparison of environmental monitoring data with relevant standards and guidelines, where available, including but not limited to National Policy Statement for Freshwater Management national bottom lines (for surface water), Environment Southland standards (various), Wilcox diagram (for groundwater; and d. any corrective actions undertaken as required by Conditions 23 and 24.
32	The Consent Holder shall provide to the Environment Southland Compliance Manager by 31 August each year a nutrient management budget for the irrigation area including the overall grazed-farm, that has been developed based on the outputs of either Overseer or any other nutrient management planning tool approved by the Environment Southland Compliance Manager.
33	The nutrient management budget required by Condition 32 shall as a minimum record the following information for at least nitrogen (N) and phosphorus (P) (in units of kilograms of N and P per hectare per year): a. Inputs from treated wastewater, covered anaerobic lagoon stormwater and waste activated sludge irrigation, other solids spreading, fertiliser, and any nutrient source; b. Outputs in product, including percentage dry matter; and c. Results of soil testing. The information recorded in accordance with this condition shall be separated by land used for cut and carry and land used for grazed pasture.

Management

34	The irrigation of treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater shall not cause significant prolonged ponding. For the purpose of this consent, significant prolonged ponding is deemed to occur if treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater remains on an area of more than ten square metres 24 hours after being irrigated.
35	The treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater irrigation shall not cause overland flow of treated wastewater and/or



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	waste activated sludge to any flowing watercourse, drainage ditch, permanent pond, or property outside the boundary of this Consent.
36	If treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater irrigation occurs when soils are at or above field capacity as determined by Condition 28, the Consent Holder shall take additional precautions, including but not limited to, minimum daily inspections of each of the irrigators while irrigating to check for conspicuous signs of wastewater ponding or run-off and the position of the irrigator relative to known drains. These inspections shall be noted, and the downstream conductivity recorded at the time of the inspection. A copy of this record shall be included with the Annual Monitoring Report specified in Condition 31.
37	Irrigation of wastewater and covered anaerobic lagoon stormwater shall be with equipment such that aerosols and spray drift are minimised, and there shall be no detectable spray drift beyond the property boundary.
37-1	<u>Land application of paunch solids shall be managed in accordance with the Guidelines for the Safe Application of Biosolids to Land in New Zealand, August 2003, to reduce vector attraction by:</u> a. <u>Applying it to forested areas of the farm; or</u> b. <u>Incorporated it into soil via tilling and providing soil cover; or</u> c. <u>Field storing or storing it in a stabilisation lagoon for at least one year prior to application; or</u> d. <u>Any other suitable method agreed with the Environment Southland Compliance Manager in writing.</u>
Complaints	
38	The Consent Holder shall maintain a diary of complaints for complaints received by the Consent Holder about all aspects of operations at the site. The diary shall record: a. The issue that observed by the complainant; b. The date and time the issue was detected, or the complaint was made; c. The location where the issue was detected by the complainant;



Proposed Conditions:	Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land
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	d. Weather conditions (such as wind direction, approximate wind speed, temperature and rain) when the issue was detected by the complainant; e. The most likely cause of the issue detected; f. The action taken by the Consent Holder in response to the complaint. <i>Advice Note: This condition does not require the Consent Holder to take action over every complaint, but it does require that that decision is recorded.</i>
39	The complaints register required by Condition 38 shall be available to the Environment Southland Compliance Manager on request. Complaints received by the Consent Holder which may indicate non-compliance with the conditions of this consent shall be forwarded to Environment Southland Compliance Manager within 5 days of the complaint being received. The complaint information provided to the Environment Southland Compliance Manager shall include all information recorded in Condition 38 above.
40	Details of all complaints received in accordance with Condition 38 shall be forwarded to the Environment Southland Compliance Manager on a monthly basis.

Incident management

41	The Consent Holder shall notify, in the event of any treatment system failure which may cause a public health nuisance or risk, or the discharge of wastes to areas other than the disposal field, without undue delay, both the Medical Officer of Health (or Health Protection Officer) and the Environment Southland Compliance Manager, as appropriate.
42	Should an adverse event occur that results in a non-compliance with the Conditions of this Consent, the Consent Colder shall notify the Environment Southland Compliance Manager immediately and shall provide a written report to the Environment Southland Compliance Manager within five working days of the Environment Southland Compliance Manager being notified. The report shall specify: - The cause or likely cause of the event and any factors that influenced its severity; - The nature and timing of any measures implemented by the Consent Holder to avoid, remedy, or mitigate adverse effects; and - the action to be taken in future to prevent recurrence of similar events.



Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land

Wastewater Farm Environmental Management Plan

43	No later than three months from the consent commencing the Consent Holder shall prepare and submit to the Environment Southland Compliance Manager an updated Wastewater Farm Environment Management Plan for certification that it is in accordance with this condition. The objective of the Wastewater Farm Environmental Management Plan shall be to detail all actions to be taken to minimise the impacts of the activities authorised by this consent and to ensure compliance with the conditions of this consent. The Wastewater Farm Environmental Management Plan shall include: a. a description of the contents and purpose of the Wastewater Farm Environmental Management Plan in accordance with this condition; b. responsibilities and contact details of key personnel; c. a summary of the plant purpose, location, layout, and wastewater management infrastructure with specific reference to the treated wastewater, waste activated sludge, covered anaerobic lagoon stormwater, stockyards solids and paunch discharge; d. a description of how the following will be managed to ensure compliance with the conditions of this consent: i. disposal buffer zones; ii. irrigation depths and nutrient loading rates; iii. withholding periods; iv. riparian planting; v. monitoring; vi. records of monitoring of treated wastewater and covered anaerobic lagoon stormwater, waste activated sludge, stockyard solids and paunch application; vii. reporting; and viii. complaints management. e. a description of how soil moisture monitoring, including restricting irrigation to time when soil moisture is below field capacity (where practical), will be used to assist in the management of irrigation, including the avoidance of significant ponding and overland flow; f. a description of how treated wastewater, waste activated sludge, and covered anaerobic lagoon stormwater irrigation will be managed to ensure there is no detectable spray drift beyond the property boundary; and
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Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	g. details of how incidents will be managed, including reporting requirements.
44	The Consent Holder shall undertake all onsite activities in accordance with the certified Wastewater Farm Environmental Management Plan, and all other conditions of this consent . In the event of any inconsistencies between the conditions of consent and the provisions of the Wastewater Farm Environmental Management Plan, the conditions of this consent shall apply.
45	The Wastewater Farm Environmental Management Plan shall be reviewed by the Consent Holder every three years. The purpose of this review shall be to confirm that the Wastewater Farm Environmental Management Plan accurately reflects current on-site activities and operations and to identify if changes to procedures contained within the Wastewater Farm Environmental Management Plan are required to achieve the objective of this condition. A written report detailing the results of the review shall be submitted to the Environment Southland Compliance Manager within 30 working days of the review being undertaken. If the review results in amendments to the Wastewater Farm Environmental Management Plan, the amended sections shall be provided to the Environment Southland Compliance Manager for certification at this time.

Subsoil Drain Management Review

46	<u>Within three years of the commencement of this consent, the Consent Holder shall submit a Subsurface Drain Outlet Mitigation Options Report to the Environment Southland Compliance Manager. This report shall:</u> a. <u>Consider and assess the technical feasibility and commercial viability of mitigation options that:</u> i. <u>Intercept shallow groundwater prior to it entering surface water via the subsoil drains; and</u> ii. <u>Improve nitrate concentrations of the shallow groundwater that is conveyed by the subsurface drains to onsite surface water bodies located on Blue Sky Meats owned land identified in Condition 1, and</u> iii. <u>Reduce the potential loss of phosphorus via overland flow in critical source areas.</u> b. <u>Recommend and provide a detailed description of mitigation options for each subsurface drain outlet located on the Blue Sky Meats owned land as identified in Condition 1 of this consent and is impacted by the discharge of treated wastewater, stockyards solids, paunch, waste activated sludge and stormwater to land.</u>
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Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	c. <u>Include a timeframe to implement the recommended mitigation options that is no later than three years following the submission of the subsurface drain outlet mitigation options report.</u> <i>Advice note: subsurface drains impacted by the discharge of treated wastewater, stockyards solids, paunch, waste activated sludge and stormwater to land includes the subsurface drain identified in [reference discharge of land drainage water and stormwater to water consent]</i>
47	<u>The recommendations of the Subsurface Drain Outlet Mitigation Options Report, required by Condition 46, shall be implemented in accordance with the implementation timeframe stated in the report.</u>

Nitrogen and Phosphorus Limits, Mitigation and Management Review

48	<u>Prior to the twelfth and twenty-fourth anniversaries of the date of commencement of this consent, the Consent Holder shall engage an appropriately qualified and independent expert, or experts, to review this consents nitrogen and phosphorus discharge limits and mitigation and management measures, and to provide a report of the findings (the "Review Report") to the Environment Southland Compliance Manager within 1 month of the review being completed.</u> <u>The purpose of this review is to determine whether the discharge limits for nitrogen and phosphorus, as set out in Conditions 9 to 11 and 12-1 and the mitigation measures and management measures as set out in Conditions 3, 5, 6, 22, 23, 24, and 34 to 36 are appropriate for the purposes of maintaining and enhancing water quality in the Waihopai River catchment and the wider New River Estuary catchment.</u> <u>The Review Report shall include:</u> a. <u>an evaluation of the monitoring results in the receiving environment with regard to these limits;</u> b. <u>an assessment of relevant guidelines or standards applicable at the date of the review, and other catchment wide improvements relating to water quality; and</u> c. <u>an assessment of existing mitigation and management practices to determine whether they continue to be appropriate to maintain and improve water quality; and</u> d. <u>recommendations.</u>
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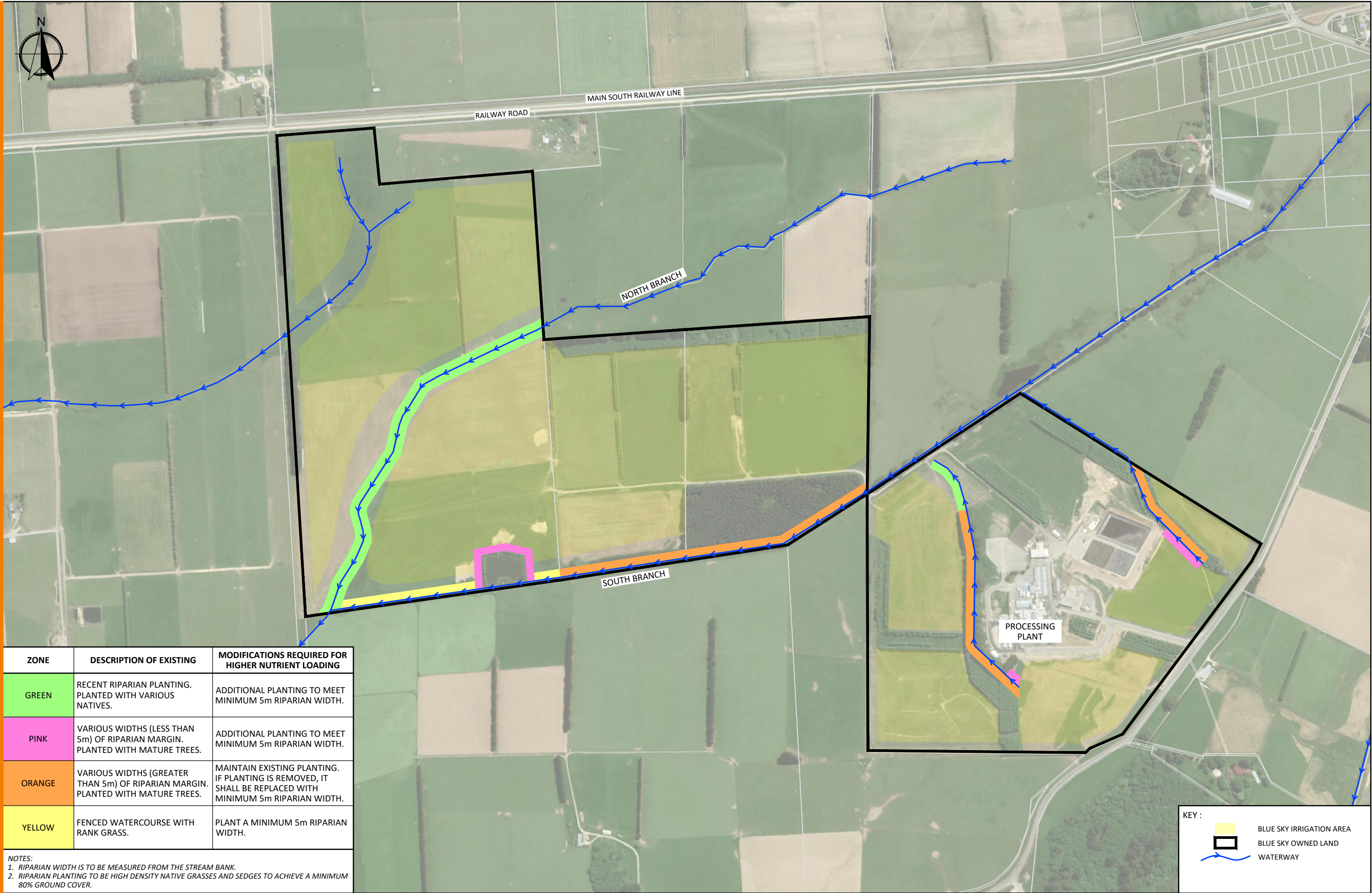
Proposed Conditions: Discharge of treated wastewater, stockyard solids, paunch, waste activated sludge and stormwater to land	
	<u>The Consent Holder's obligations to undertake this review and the associated reporting process shall be completed within six months after being initiated.</u>
<u>49</u>	<u>The consent Authority may, within three months of receiving any Review Report required by Condition 48, serve notice on the Consent Holder under section 128 of the Resource Management Act 1991 of its intention to review the conditions of this consent. The purpose of the review is for any of the following reasons:</u> a. <u>to assess the significance of any exceedance of the discharge limits set out in Conditions 9 to 11 and 12-1, and/or to determine whether the limits should be altered with particular regard had to the reporting undertaken in accordance with Condition 48, or whether the exceedance has resulted in significant adverse effects; or</u> b. <u>determining whether the conditions of this consent are adequate to address any adverse effects on the environment; or</u> c. <u>amending the monitoring programme to be undertaken; or</u> d. <u>adding or deleting any compliance parameters or limits; or</u> e. <u>requiring the Consent Holder to adopt the best practicable option to remove or reduce any adverse effects.</u>



Attachment 1

Figure 17 – Riparian Planting Plan for Mitigation of Higher Nutrient Loading (PDP Figure No. 17 A03220205)

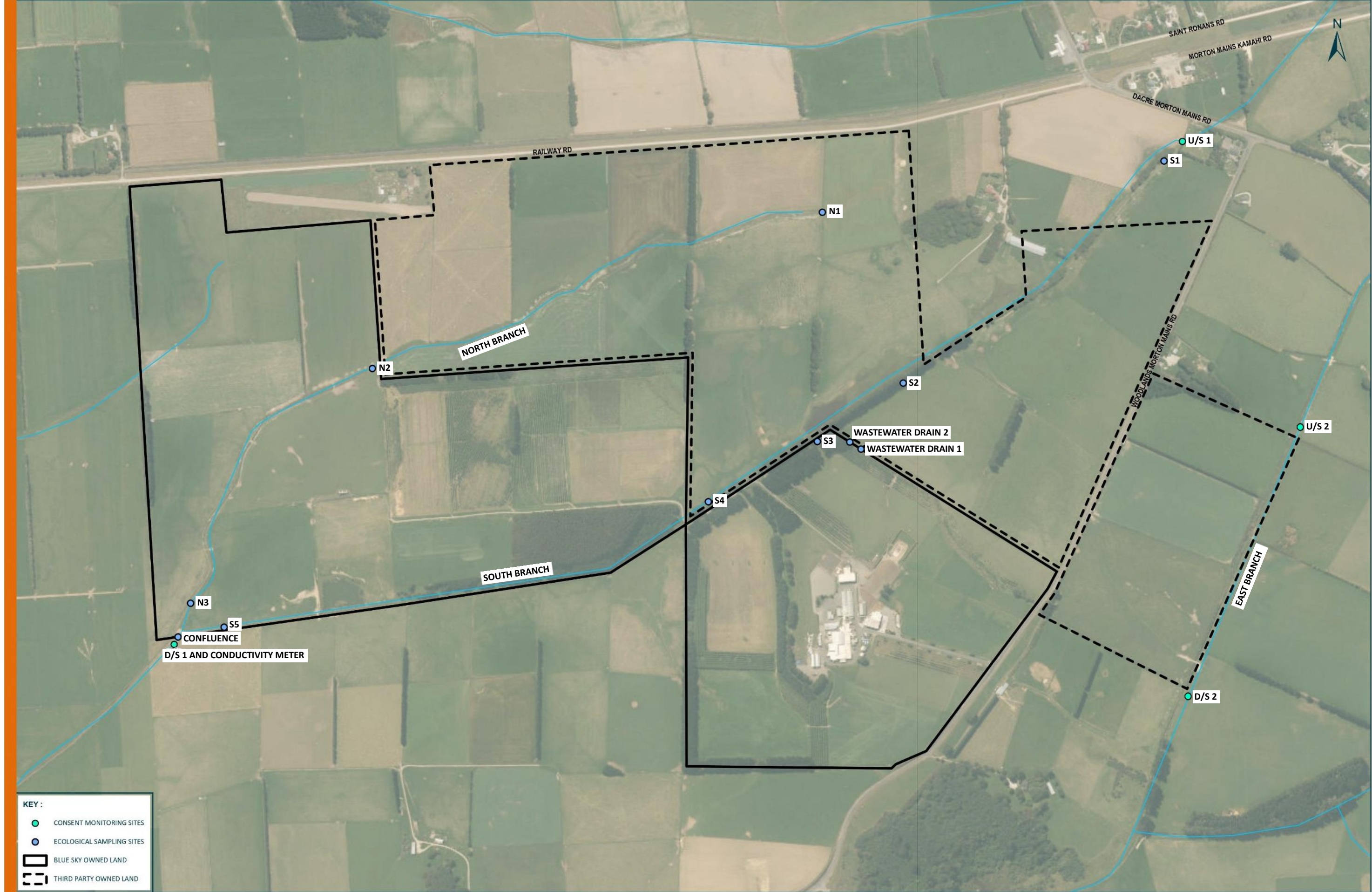




Attachment 2

Figure 11 Surface Water Monitoring Locations (PDP Figure No. 11 A03220205)





KEY :

- CONSENT MONITORING SITES
- ECOLOGICAL SAMPLING SITES
- BLUE SKY OWNED LAND
- THIRD PARTY OWNED LAND



0150300

METRES

SCALE : 1:8,000 (A3)

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SOURCE:
1. AERIAL IMAGERY (FLOWN 2017-2020) SOURCED FROM THE LINZ DATA SERVICE www.linz.govt.nz/about-linz/linz-data-service/help/using-linz-data/attributing-aerial-imagery-data AND LICENCED FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. WELL DATA SOURCED FROM SOUTHLAND REGIONAL COUNCIL REST SERVICES.

CLIENT



BLUESKY
PASTURES

FIGURE

FIG 11: SURFACE WATER MONITORING LOCATIONS

PROJECT

LAND DISCHARGE OF WASTEWATER AND BIOSOLIDS – TECHNICAL ASSESSMENT OF ENVIRONMENTAL EFFECTS



APPENDIX B

PDP e-mail to Stantec, 24 June 2024

From: Alana Bowmar <Alana.Bowmar@pdp.co.nz>
Sent: Monday, 24 June 2024 9:59 am
To: Sue.Bennett@stantec.com; Jessica.Grinter@stantec.com
Cc: Ryan Nicol; andrew.ritchie; Doyle Richardson; Azam Khan
Subject: FW: A03220205 Irrigation Storage Lagoon

Kia ora Jess, Sue,

Thanks for meeting with us last month.

One of my actions was to provide some direction to you on where information can be found relating to the irrigation storage lagoon.

- High level details of the irrigation storage lagoon, its capacity, and how it was included in the assessment of effects was provided in the Technical AEE Report No. A03220205R001 (30 June 2022) in Section 5.2.1 that outlines hydraulic loading effects, supported by Appendix D of the same document.

5.2.1 Hydraulic Loading Effects

Keeping the hydraulic application rates well within the measured capacity of site soils will ensure that saturated conditions, ponding, and runoff are minimised and occur only as a result of rainfall and not the irrigation activity. These application rates outlined below will also ensure that air filled soil pores are generally maintained within the soil as are required for soil structure and soil microbial health.

A daily water balance was used to determine the likely effect on the long-term water balance resulting from the activity, based on the following data:

- ✧ Proposed annual hydraulic loading based on a future processing regime determined by the increase in the number of stock processed by 10%, and a conservative water use per unit of stock. Refer to Appendix C for further technical details.
- ✧ An irrigation storage volume of 15,000 m³.
- ✧ The rainfall and PET depth, forecasted to capture the impacts of climate change.

- In our response to initial Environment Southland matters of clarification, memorandum A03220205M004 (13 September 2022), reiterated this, providing clarity on the number of days of storage at peak daily flow this allowed for.

The current site storage volume (15,000 m³) is available to for the purposes of deferring irrigation during large wet weather events, irrigation system maintenance and shut-down periods only (when irrigation staff are offsite) for the purposes of managing the land discharge system. The storage capacity provided allows for mitigating runoff and ponding risks that are elevated during large wet weather events. The provided irrigation storage provides for 10 days storage of peak wastewater flows.

- This was provided again, with some refinement relating to dead storage, based on weekly peak flow, in the response to Stantec request for clarification A03220205R003 (4 August 2023) Section 4.2, Issue ID 33.

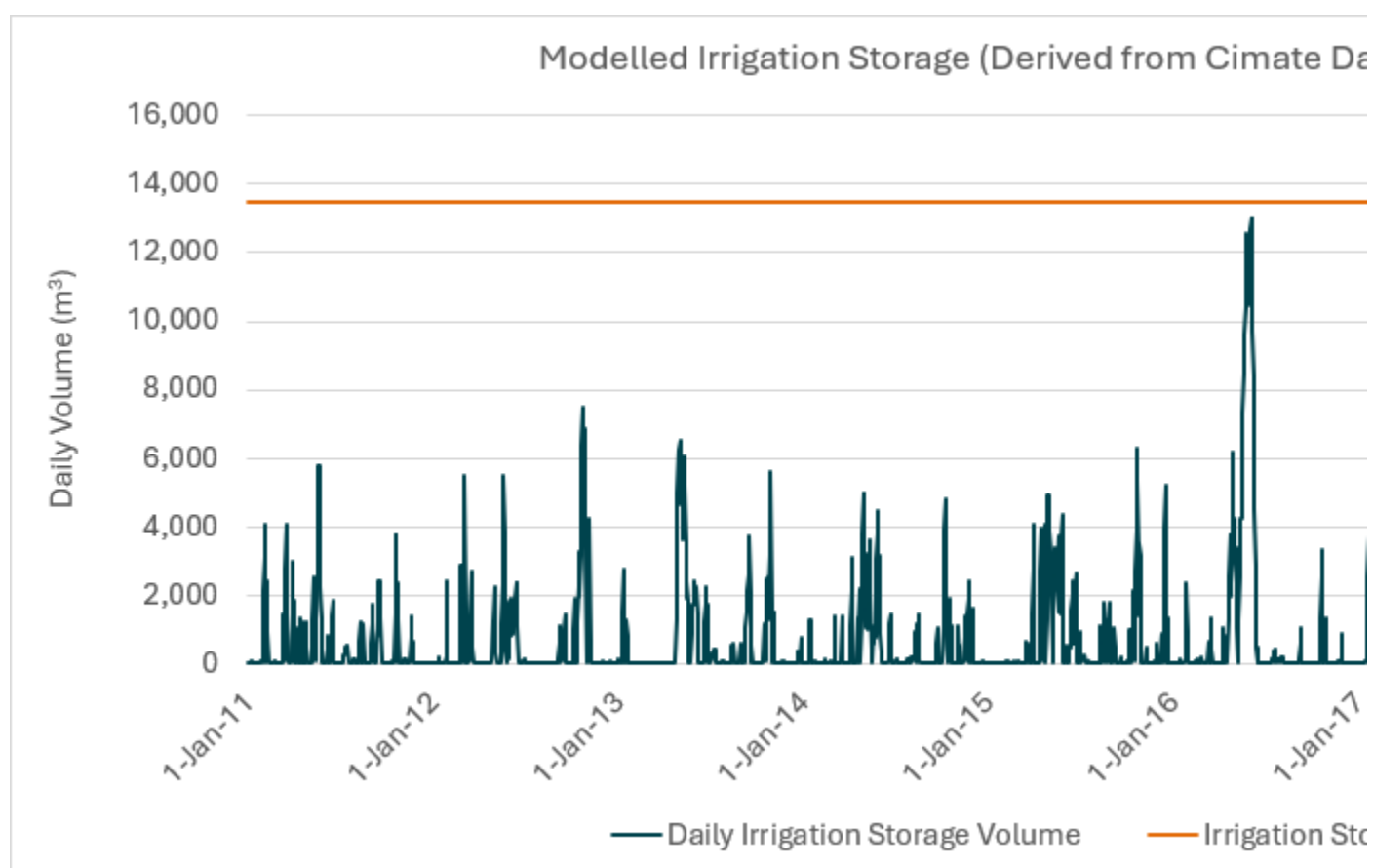
Table 5: Irrigation Lagoon Details		
Parameter	Description	Comment
Storage capacity	13,500 m ³ (15,000 m ³)	13,500 m ³ is the effective storage volume and allows for 500 mm to remain in the base of the lagoon to hold the liner in place.
Wall slope	1(v):3(h)	
Lagoon dimensions (existing)	60 m by 97 m by 4.0 m deep	Includes 500 mm min. freeboard
No. of days storage at peak daily flow	13.5 days	At future peak flow of 7,000 m ³ /week

Part of the soil moisture modelling, presented in the AEE (Section 5.2.1, and Appendix D), and used in the response to matters of clarification, calculates a water balance, and this includes a storage balance based on 10-years of climate data.

Below I have presented this output of our modelling. This was not presented in our original AEE as it is based on a soil moisture trigger just above field capacity. Whereas the site might irrigate some areas at higher soil moisture contents and may use the storage to manage operations at lower soil moisture contents. However, it indicates that there is sufficient capacity provide resiliency during wet conditions. The results are signalling that with the proposed irrigation rates for non-deficit application regime are such that there is an ability to irrigate at levels to just above field capacity to maintain storage within the soil structure. This we believe is a cautious irrigation management approach.

Key basis and assumptions for below are outlined in detail in the original AEE, however it is worth noting:

- This graph is based on having access to BSM owned land only (i.e., worst case hydraulic loading).
- This model is based on 55% maximum soil moisture content (field capacity is 52% and Saturation is 62%).



We are also working through some proposed updates to conditions to address other matters. We are expected to send these through later this week.

Ngā mihi,
Alana

Alana Bowmar – CPEng, CMEngNZ | Service Leader Water Infrastructure

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APPENDIX B

Updated Overseer modelling results

Proposed - 350 kgN/ha/yr (12-months, Drained)

Analysis type	Scenario
Is publication	No
Application version	5.18.0
Printed date	22 Jul 2024, 11:57AM
Model version	6.5.6

Farm details

N

24 kg/ha | 3,127 kg

P

0.4 kg/ha | 46 kg

GHG

2,406 kg/ha | 312.8 tonnes

NCE:

90

 v6.5.6

Total area	130 ha
Productive block area	101.70 ha
Nitrogen conversion efficiency (NCE)	90%
N surplus	20 kg/ha
Region	Southland

Blocks

Name	Type	Area (ha)	N loss	N loss/ha	N in drainage (ppm)	N surplus/ha	P loss	P loss/ha	Blocked area %	N farm loss %
 BSP Irrigated	Cut and carry	77	2,938	38	5	86	25	0.3	66	94
 BSP Non-irrigated	Cut and carry	24.7	124	5	1	-166	3	0.1	21	4
 Trees	Trees and scrub	15.8	40	2	0	0	2	0.1	13	1
 Other sources	Other	-	26	-	-	-	16	-	-	-

Farm soils

S-Map ref/name	Group/Order	Drainage class	Modi ed	Total area (ha)	% of prod. blocks	Blocks
Paro_4a.1	Sedimentary/Gley	Poor	No	10.1	9.9	1
Waiki_34a.1	Sedimentary/Brown	Well	No	54.9	54	2
Wood_29a.1	Sedimentary/Brown	Imperfect	No	36.7	36.1	2

Enterprises

Stock numbers

There are no animal enterprises on this farm.

RSU

There are no animal enterprises on this farm.

Irrigators

Name	Area covered	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Spraylines Wastewater Irrigator	77 ha												

Supplements

Category	Feed	Source	Dry weight	Amount	Destination
 Silage	-	BSP Irrigated (110), BSP Non-irrigated (35)	Yes	145 tonnes	Off farm (145)
 Baleage	-	BSP Irrigated (838.7), BSP Non-irrigated (265.3)	Yes	1104 tonnes	Off farm (1104)
 Silage	-	BSP Irrigated (58.1)	Yes	58.1 tonnes	Off farm (58.1)

Crops

Crop/Pasture	Area (ha)	Yield	Grown (t DM/yr)	Intake (t DM/yr)	Supplements (t DM/yr)
 Grass only	101.7	-	1307	-	1307

Fertiliser

Manufacturer/material	Name	Total applied (KG)	N	P	K	S	Ca	Mg	Na
 Custom soluble fertiliser	Dry Season Irrigation Nutrients	-	10,626	2,233	-	-	-	-	-
 Custom soluble fertiliser	Wet Season Irrigation Nutrients	-	4,334	1,811	-	-	-	-	-
 Custom organic fertiliser	WAS-Other organic material	44,814,000	9,859	4,033	-	-	-	-	-
Total		44,814,000	24,819	8,077	-	-	-	-	-

Farm nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	3,127	24
Phosphorus	46	0.4

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other ✓	191	62	0	0	0	0	0
Irrigation	4	0	3	4	16	4	16
Supplements ✓	0	0	0	0	0	0	0
Rain/clover fixation ✓	10	0	3	5	3	8	37

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses ✓	24	0.4	19	10	43	13	53
As product	0	0	0	0	0	0	0
As prunings	0	0	0	0	0	0	0
Transfer ✓	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere ✓	9	0	0	0	0	0	0
As supplements and crop residues ✓	185	26	197	16	40	9	24

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool ✓	-13	17	0	-16	0	0	0
Standing plant material	0	0	0	0	0	0	0
Inorganic mineral ✓	0	4	-18	0	-2	-2	-3
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	0	14	-192	0	-62	-9	-22
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	0	0	0	0	0	0	0

Blocks



BSP Irrigated

Cut and carry - Flat, 77 ha

N

38 kg/ha | 2,938 kg

P

0.3 kg/ha | 25 kg

Block details

Area	77 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

60% Waiki_34a.1
46.2 ha Brown

40% Wood_29a.1
30.8 ha Brown

Artificial drainage

Percentage drained 50%

Drainage method	Mole/tile system
-----------------	------------------

Supplements

Harvested (DM)1006.8000000000001 tonnes

Crop management

Block type	Pasture	Cultivated in last 5 years	No
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Topography	Flat	Animals present	No
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Pasture type	Grass only
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[illegible]

Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Waiki_34a.1	Wastewater Irrigator	46.2 ha (60%)	1,765 kg	38 kg/ha	5.3 ppm	86 kg/ha	323 kg/ha	14 kg	0.3 kg/ha	N/A	N/A	N/A
Wood_29a.1	Wastewater Irrigator	30.8 ha (40%)	1,173 kg	38 kg/ha	5.3 ppm	86 kg/ha	323 kg/ha	11 kg	0.3 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area	0cm to 60cm							0cm to 150cm			
			Drainage	Runoff	AET	Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Waiki_34a.1	Wastewater Irrigator	46.2 ha (60%)	438 mm	0 mm	706 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigator	30.8 ha (40%)	438 mm	0 mm	706 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

Estimated change in soil test values for samples taken to 7.5cm:

- Increase in Olsen P test of 8 units
- Decrease in QT K test of 5 units
- Decrease in QT Mg test of 1 units

The change in inorganic soil pool indicates that fertiliser nutrients can be reduced for P

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	2,938	38
Phosphorus	25	0.3

Nutrients added (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Effluent added	✓	0	0	0	0	0	0	0
Fertiliser, lime and other	✓	323	105	0	0	0	0	0
Irrigation		7	0	5	7	27	6	27
Supplements fed on blocks	✓	0	0	0	0	0	0	0
Rain/clover fixation	✓	2	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	✓	38	0.4	29	12	67	18	68
To atmosphere	✓	15	0	0	0	0	0	0
As Supplements		246	36	270	21	52	11	38

Change in pools (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Organic pool		32.6	24	0	-21	0	0	0
Inorganic mineral	✓	0	7	-15	0	-2	-3	-4
Inorganic soil pool		0	39	-277	0	-87	-12	-39



BSP Non-irrigated

Cut and carry - Flat, 24.7 ha

N

5 kg/ha | 124 kg

P

0.1 kg/ha | 3 kg

Block details

Area	24.7 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

41%	Paro_4a.1	35%	Waiki_34a.1	24%	Wood_29a.1
10.1 ha	Gley	8.7 ha	Brown	5.9 ha	Brown

Artificial drainage

Percentage drained	50%
Drainage method	Mole/tile system

Supplements

Harvested (DM)	300.3 tonnes
----------------	--------------

Crop management

Block type	Pasture	Cultivated in last 5 years	No
Topography	Flat	Animals present	No
Pasture type	Grass only		

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
--	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Paro_4a.1	-	10.1 ha (41%)	50 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	2 kg	0.2 kg/ha	N/A	N/A	N/A
Waiki_34a.1	-	8.6 ha (35%)	44 kg	5 kg/ha	1.1 ppm	-165 kg/ha	0 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Wood_29a.1	-	5.9 ha (24%)	30 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	0 kg	0.1 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area					0cm to 60cm				0cm to 150cm			
			Drainage	Runoff	AET		Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Paro_4a.1	-	10.1 ha (41%)	268 mm	0 mm	699 mm		246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	8.6 ha (35%)	276 mm	0 mm	685 mm		243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	5.9 ha (24%)	276 mm	0 mm	685 mm		237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for P, K, Ca

Wood_29a.1/No irrigation - 5.9 ha (24%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Waiki_34a.1/No irrigation - 8.6 ha (35%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 2 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Paro_4a.1/No irrigation - 10.1 ha (41%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, February, March, April, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	124	5
Phosphorus	3	0.1

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks	0	0	0	0	0	0	0
Rain/clover fixation	42	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	5	0.2	4	8.3	13	5	21.6
To atmosphere	0	0	0	0	0	0	0
As Supplements	208.3	28	195.9	18	47.6	14	8.6

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool	-171.3	16	0	-21.1	0	0	0
Inorganic mineral	0	3	-47.4	0	-2	-3	-4
Inorganic soil pool	0	-47	-150.2	0	-55.2	-8.6	9.4

Trees

Trees and scrub - 15.8 ha

N

2 kg/ha | 40 kg

P

0.1 kg/ha | 2 kg

Block details

Area	15.8 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						
Bush type	Pines						

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	40	2
Phosphorus	2	0.1

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Rain/clover fixation	2	0	3	5	4	8	38

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	2	0.1	3	5	4	8	38

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Inorganic mineral	0	0	0	0	0	0	0

Proposed - 200 kgN/ha/yr (Drained)

Analysis type	Scenario
Is publication	No
Application version	5.18.0
Printed date	22 Jul 2024, 11:58AM
Model version	6.5.6

Farm details

N

11 kg/ha | 2,680 kg

P

0.4 kg/ha | 104 kg

GHG

3,083 kg/ha | 776.9 tonnes

NCE:

81

 v6.5.6

Total area	252 ha
Productive block area	220.30 ha
Nitrogen conversion efficiency (NCE)	81%
N surplus	26 kg/ha
Region	Southland

Total liveweight brought (kg/ha grazed)	243	Percent male beef animals	59
Total liveweight reared (kg/ha grazed)	62	Beef / dairy grazing stock rate (RSU)	27
Total liveweight sold (kg/ha grazed)	400	Sheep stock rate (RSU)	1344

Blocks

Name	Type	Area (ha)	N loss	N loss/ha	N in drainage (ppm)	N surplus/ha	P loss	P loss/ha	Blocked area %	N farm loss %
 BSP Irrigated	Cut and carry	77	1,024	13	2	3	21	0.2	33	3
 BSP Non-irrigated	Cut and carry	24.7	124	5	1	-166	3	0.1	10	
 Third-party Irrigated	Pasture	101	1,101	11	2	89	44	0.4	43	4
 Third-party Non-irrigated	Pasture	17.6	173	10.2	2	76	7	0.4	7	
 Kale	Fodder crop	4	157	39	8	-10	2	0.4	-	
 Trees	Trees and scrub	13.1	33	2	0	0	2	0.1	6	
 Trees1	Trees and scrub	2.7	7	2	0	0	0	0.1	1	
 Other sources	Other	-	62	-	-	-	26	-	-	

Farm soils

S-Map ref/name	Group/Order	Drainage class	Modified	Total area (ha)	% of prod. blocks	Blocks
Paro_4a.1	Sedimentary/Gley	Poor	No	17	7.7	2
Waiki_34a.1	Sedimentary/Brown	Well	No	116.5	52.9	4
Wood_29a.1	Sedimentary/Brown	Imperfect	No	86.8	39.4	4
Ymai_25a.1	Sedimentary/Gley	Poor	No	0	0	0

Enterprises

Stock numbers

Name	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
 Beef	-	-	-	-	10	30	30	-	-	-	-	-
 Sheep	1580	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200	1200

RSU

Name	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
 Beef	0	0	0	0	4	12	12	0	0	0	0	0
 Sheep	100	137	224	196	205	90	63	89	78	58	47	56

Irrigators

Name	Area covered	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Spraylines Wastewater Irrigaor	174.8 ha												

Supplements

Category	Feed	Source	Dry weight	Amount	Destination
 Silage	-	BSP Irrigated (110), BSP Non-irrigated (35)	Yes	145 tonnes	Off farm (145)
 Baleage	-	BSP Irrigated (838.7), BSP Non-irrigated (265.3)	Yes	1104 tonnes	Off farm (1104)
 Baleage	-	Third-party Irrigated (340), Third-party Non-irrigated (60)	No	400 bales	Sheep (400)
 Hay	-	Third-party Irrigated (17), Third-party Non-irrigated (3)	No	20 bales	Sheep (20)
 Silage	-	Third-party Irrigated (169.7)	Yes	169.7 tonnes	Off farm (169.7)

Crops

Crop/Pasture	Area (ha)	Yield	Grown (t DM/yr)	Intake (t DM/yr)	Supplements (t DM/yr)
 Grass only	99.9	-	1226	-	1226
 Ryegrass/white clover	116.4	-	1231	735	181
 Kale	4.0	48 t DM	-	-	-

Fertiliser

Manufacturer/material	Name	Total applied (KG)	N	P	K	S	Ca	Mg	Na
 Ravensdown	10% Potash Super	3,192	-	259	160	316	575	-	3
 Custom soluble fertiliser	Dry Season Irrigation Nutrients	-	11,197	2,367	-	-	-	-	-
 Custom soluble fertiliser	Wet Season Irrigation Nutrients	-	3,810	1,699	-	-	-	-	-
 Custom organic fertiliser	WAS-Other organic material	44,816,000	9,860	4,033	-	-	-	-	-
Total		44,819,192	24,867	8,358	160	316	575	-	3

Farm nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	2,680	11
Phosphorus	104	0.4

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Foliar sprays	0	0	0	0	0	0	0
Fertiliser, lime and other ✓	99	34	1	1	2	0	0
Irrigation	0	0	0	0	0	0	0
Supplements ✓	0	0	0	0	0	0	0
Rain/clover fixation ✓	35	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses ✓	11	0.4	24	11	36	12	50
As product	4	1	0	1	1	0	0
As prunings	0	0	0	0	0	0	0
Transfer ✓	0	0	0	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere ✓	17	0	0	0	0	0	0
As supplements and crop residues ✓	104	15	112	9	22	5	14

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool ✓	-3	16	0	-15	0	0	0
Standing plant material	-3	0	-3	0	0	0	0
Inorganic mineral ✓	0	5	-17	0	-2	-3	-3
Crop framework	0	0	0	0	0	0	0
Inorganic soil pool	0	-3	-116	0	-53	-7	-24
Change in supplement storage	0	0	0	0	0	0	0
Root and stover residuals	4	0	3	1	1	0	0

Blocks



BSP Irrigated

Cut and carry - Flat, 77 ha

N

13 kg/ha | 1,024 kg

P

0.2 kg/ha | 21 kg

Block details

Area	77 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

60% Waiki_34a.1
46.2 ha Brown

40% Wood_29a.1
30.8 ha Brown

Fodder crop rotations

Kale

Artificial drainage

Percentage drained 50%

Drainage method	Mole/tile system
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Supplements

Harvested (DM)	948.7 tonnes
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Crop management

Block type	Pasture	Cultivated in last 5 years	No
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Topography	Flat	Animals present	No
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Pasture type	Grass only
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[illegible]

Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Waiki_34a.1	Wastewater Irrigaor	46.2 ha (60%)	616 kg	13 kg/ha	2.1 ppm	3 kg/ha	194 kg/ha	12 kg	0.2 kg/ha	N/A	N/A	N/A
Wood_29a.1	Wastewater Irrigaor	30.8 ha (40%)	408 kg	13 kg/ha	2.1 ppm	3 kg/ha	194 kg/ha	9 kg	0.3 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area	0cm to 60cm							0cm to 150cm			
			Drainage	Runoff	AET	Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Waiki_34a.1	Wastewater Irrigaor	46.2 ha (60%)	388 mm	0 mm	698 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigaor	30.8 ha (40%)	388 mm	0 mm	698 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

Estimated change in soil test values for samples taken to 7.5cm:

- Increase in Olsen P test of 1 units
- Decrease in QT K test of 4 units
- Decrease in QT Mg test of 2 units

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	1,024	13
Phosphorus	21	0.2

Nutrients added (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Effluent added	✓	0	0	0	0	0	0	0
Fertiliser, lime and other	✓	194	70	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Supplements fed on blocks	✓	0	0	0	0	0	0	0
Rain/clover fixation	✓	29	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	✓	13	0.4	29	9.2	47	16	63
To atmosphere	✓	5	0	0	0	0	0	0
As Supplements		221	33	254	19	49	10	36

Change in pools (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Organic pool		-16	24	0	-23.2	0	0	0
Inorganic mineral	✓	0	7	-15	0	-2	-3	-4
Inorganic soil pool		0	6	-265	0	-90	-16	-59

Block details

Area	24.7 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

41% 10.1 ha	Paro_4a.1 Gley	35% 8.7 ha	Waiki_34a.1 Brown	24% 5.9 ha	Wood_29a.1 Brown
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Fodder crop rotations

Kale

Artificial drainage

Percentage drained	50%
Drainage method	Mole/tile system

Supplements

Harvested (DM)	300.3 tonnes
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Crop management

Block type	Pasture	Cultivated in last 5 years	No
Topography	Flat	Animals present	No
Pasture type	Grass only		

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
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Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Paro_4a.1	-	10.1 ha (41%)	50 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	2 kg	0.2 kg/ha	N/A	N/A	N/A
Waiki_34a.1	-	8.6 ha (35%)	44 kg	5 kg/ha	1.1 ppm	-165 kg/ha	0 kg/ha	1 kg	0.1 kg/ha	N/A	N/A	N/A
Wood_29a.1	-	5.9 ha (24%)	30 kg	5 kg/ha	1.1 ppm	-167 kg/ha	0 kg/ha	0 kg	0.1 kg/ha	N/A	N/A	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area					0cm to 60cm				0cm to 150cm			
			Drainage	Runoff	AET		Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Paro_4a.1	-	10.1 ha (41%)	268 mm	0 mm	699 mm		246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	8.6 ha (35%)	276 mm	0 mm	685 mm		243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	5.9 ha (24%)	276 mm	0 mm	685 mm		237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for P, K, Ca

Wood_29a.1/No irrigation - 5.9 ha (24%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Waiki_34a.1/No irrigation - 8.6 ha (35%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 2 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, March, April, October, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Paro_4a.1/No irrigation - 10.1 ha (41%)

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 9 units
- Decrease in QT K test of 3 units
- Decrease in QT Mg test of 1 units

The predicted amount of soil N available for uptake was less than that required for plant uptake for the months January, February, March, April, November and December. This indicates that either fertiliser, organic or effluent N inputs have been omitted, or the model has not predicted accurately enough the rate of mineralisation of N from the soil organic pool or the timing of growth and N uptake. Review the results and use with caution.

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	124	5
Phosphorus	3	0.1

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Effluent added ✓	0	0	0	0	0	0	0
Fertiliser, lime and other ✓	0	0	0	0	0	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks ✓	0	0	0	0	0	0	0
Rain/clover fixation ✓	42	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses ✓	5	0.2	4	8.3	13	5	21.6
To atmosphere ✓	0	0	0	0	0	0	0
As Supplements	208.3	28	195.9	18	47.6	14	8.6

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool	-171.3	16	0	-21.1	0	0	0
Inorganic mineral ✓	0	3	-47.4	0	-2	-3	-4
Inorganic soil pool	0	-47	-150.2	0	-55.2	-8.6	9.4



Pasture - Flat, 101 ha

11 kg/ha | 1,101 kg

0.4 kg/ha | 44 kg

Block details

Area	101 ha	Average temp	10.1 °C	Average rainfall	1,147 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

55% Waiki_34a.1 | **45%** Wood_29a.1
 55.5 ha Brown | 45.5 ha Brown

Fodder crop rotations

Kale

Pasture

Pasture growth	10,516 kg DM/ha/yr	Removed	1810 kg DM/ha/yr
Utilisation	70 %	Sheep	10.74 rsu/ha
Intake	6,094 kg DM/ha/yr	Beef	0.25 rsu/ha

Artificial drainage

Percentage drained	50%
Drainage method	Mole/tile system

Supplements

Harvested (DM)	169.7 tonnes	Harvested	357 bales
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Crop management

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

[illegible]

Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Waiki_34a.1	Wastewater Irrigaor	55.6 ha (55%)	607 kg	11 kg/ha	2.1 ppm	89 kg/ha	103 kg/ha	24 kg	0.4 kg/ha	Low	Low	N/A
Wood_29a.1	Wastewater Irrigaor	45.4 ha (45%)	494 kg	11 kg/ha	2.1 ppm	89 kg/ha	103 kg/ha	20 kg	0.5 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area	0cm to 60cm							0cm to 150cm			
			Drainage	Runoff	AET	Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Waiki_34a.1	Wastewater Irrigaor	55.6 ha (55%)	321 mm	0 mm	695 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	Wastewater Irrigaor	45.4 ha (45%)	321 mm	0 mm	695 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

Olsen P (53) is above that required for near maximum pasture production (30). See a consultant about reducing fertiliser P inputs. Note that on high producing dairy farms, target Olsen P levels are higher.

Soil P loss status is high. Consider reducing Olsen P levels.

Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

The change in inorganic soil pool indicates that additional fertiliser nutrients may be required to maintain production for K, Ca, Na

Estimated change in soil test values for samples taken to 7.5cm:

- No change in Olsen P test
- Decrease in QT K test of 1 units
- Decrease in QT Mg test of 1 units

Soil Mg status is slowly declining. Mg containing fertiliser will eventually be needed to maintain current production.

Soil Na status is slowly declining. Check pasture Na status, especially on pumice soil, to ascertain need for Na supplementation.

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 130 kg/ha/yr pure lime. Review soil pH and lime requirement.

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	1,101	11
Phosphorus	44	0.4

Nutrients added (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Effluent added	✓	0	0	0	0	0	0	0
Fertiliser, lime and other	✓	103	30	0	0	0	0	0
Irrigation		0	0	0	0	0	0	0
Supplements fed on blocks	✓	1	0	1	0	0	0	0
Rain/clover fixation	✓	39.5	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	✓	11	0.4	35	12.6	45	14	56
As product		9	1	0	1	2	0	0
Transfer	✓	2	0	2	0	0	0	0
Effluent exported		0	0	0	0	0	0	0
To atmosphere	✓	32	0	0	0	0	0	0
As supplements and crop residues		44	5	41	3	8	2	6

Change in pools (kg/ha/yr)		N	P	K	S	Ca	Mg	Na
Organic pool		46	17	0	-11.6	0	0	0
Inorganic mineral	✓	0	7	-15	0	-2	-3	-4
Inorganic soil pool		0	-1	-60	0	-50	-5	-22



Third-party Non-irrigated

Pasture - Flat, 17.6 ha

N

10.2 kg/ha | 173 kg

P

0.4 kg/ha | 7 kg

Block details

Area	17.6 ha	Average temp	10.1 °C	Average rainfall	1,147 mm/yr	Annual PET	758 mm/yr
Distance from coast	24 km						

Soils

39% Paro_4a.1	35% Waiki_34a.1	26% Wood_29a.1
6.9 ha Gley	6.1 ha Brown	4.6 ha Brown

Fodder crop rotations

Kale

Pasture

Pasture growth	10,895 kg DM/ha/yr	Removed	74 kg DM/ha/yr
Utilisation	70 %	Sheep	13.4 rsu/ha
Intake	7,575 kg DM/ha/yr	Beef	0.25 rsu/ha

Artificial drainage

Percentage drained	50%
Drainage method	Mole/tile system

Supplements

Harvested	63 bales
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Crop management

Block type	Pasture	Hydrophobic condition	Use default
Topography	Flat	Susceptibility to pugging	Occasional
Pasture type	Ryegrass/white clover	Is compacted	No
Cultivated in last 5 years	No	Naturally high water table	No
Animals present	Yes		

	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
RSU/ha												
Sheep	0.83	1.16	2.35	2.06	2.15	0.95	0.66	0.93	0.81	0.61	0.46	0.43
Beef	-	-	-	-	0.03	0.11	0.11	-	-	-	-	-
Fertiliser applied (kg/ha)												
N	-	-	-	-	-	-	-	-	-	-	-	-
P	-	-	-	-	-	-	12	-	-	-	-	-
K	-	-	-	-	-	-	8	-	-	-	-	-
S	-	-	-	-	-	-	15	-	-	-	-	-

Soil/Irrigation - results

Soil	Irrigator	Area	Nitrogen					Phosphorus				
			Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk
Paro_4a.1	-	6.9 ha (39%)	60 kg	9 kg/ha	2 ppm	76 kg/ha	0 kg/ha	4 kg	0.6 kg/ha	Low	Low	N/A
Waiki_34a.1	-	6.2 ha (35%)	65 kg	11 kg/ha	2.4 ppm	76 kg/ha	0 kg/ha	2 kg	0.3 kg/ha	Low	Low	N/A
Wood_29a.1	-	4.6 ha (26%)	48 kg	11 kg/ha	2.4 ppm	76 kg/ha	0 kg/ha	1 kg	0.3 kg/ha	Low	Low	N/A

1 - N concentration due to leaching in drainage water at the bottom of the root zone.

2 - N added as fertiliser, effluent and organic only

Soil/Irrigation - other values

Soil	Irrigator	Area				0cm to 60cm				0cm to 150cm			
			Drainage	Runoff	AET	Field capacity	Wilting point	Saturation	PAW	Field capacity	Wilting point	Saturation	PAW
Paro_4a.1	-	6.9 ha (39%)	269 mm	0 mm	699 mm	246 mm	102 mm	312 mm	144 mm	-	-	-	-
Waiki_34a.1	-	6.2 ha (35%)	277 mm	0 mm	685 mm	243 mm	141 mm	315 mm	102 mm	-	-	-	-
Wood_29a.1	-	4.6 ha (26%)	277 mm	0 mm	685 mm	237 mm	135 mm	306 mm	102 mm	-	-	-	-

Model notes

Overview

Soil P loss status is high. Consider reducing Olsen P levels.

Potential P loss from fertiliser is high. Check fertiliser rates are not too high. If P is applied in high risk months consider alternative months of application or changing the form of P.

Estimated change in soil test values for samples taken to 7.5cm:

- Decrease in Olsen P test of 1 units
- No change in QT K test
- Increase in QT Mg test of 1 units

Wood_29a.1/No irrigation - 4.6 ha (26%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 50 kg/ha/yr pure lime. Review soil pH and lime requirement.

Waiki_34a.1/No irrigation - 6.2 ha (35%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 50 kg/ha/yr pure lime. Review soil pH and lime requirement.

Paro_4a.1/No irrigation - 6.9 ha (39%)

Soil is slowly acidifying and would be neutralised by a maintenance lime application of 40 kg/ha/yr pure lime. Review soil pH and lime requirement.

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	173	10.2
Phosphorus	7	0.4

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Effluent added ✓	0	0	0	0	0	0	0
Fertiliser, lime and other ✓	0	12	8	15	27	0	0
Irrigation	0	0	0	0	0	0	0
Supplements fed on blocks ✓	1	0	1	0	0	0	0
Rain/clover fixation ✓	89	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses ✓	10.2	0.4	8	27	16.2	5	21.6
As product	11	1	0.7	1	3	0	0
Transfer ✓	3	0	2	0	0	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere ✓	35.8	0	0	0	0	0	0
As supplements and crop residues	1	0	1	0	0	0	0

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool	30	12	0	-9	0	0	0
Inorganic mineral ✓	0	3	-20.4	0	-2	-3	-4
Inorganic soil pool	0	-5	19.7	0	12.8	5.4	17.4



Kale

Fodder crop – 4 ha (rotation)

N

39 kg/ha | 157 kg

P

0.4 kg/ha | 2 kg

Block details

Area

4 ha

Rotates through
BSP Irrigated, BSP Non-irrigated, Third-party Irrigated, Third-party Non-irrigated

Artificial drainage
Drainage methodNone

Crop management		
Block type	Fodder crop	Month resown in pastureSeptember
Rotation name	Kale	Months since fertiliser applied to pasture0
Area	4ha	

Crops

Kale

Category	Fodder
Crop type	Kale
Sown	October - Reporting year
Yield	48T
Cultivation practice at sowing	Conventional

Pasture

Category	Permanent pasture
Crop type	Pasture
Sown	September - Reporting year
Cultivation practice at sowing	Conventional
Defoliation management	Grazing only

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
	Kale											Pasture
Fertiliser applied (kg/ha)												
N	-	-	-	-	-	-	-	-	-	-	-	-
P	-	-	-	12	-	-	-	-	-	-	-	-
K	-	-	-	8	-	-	-	-	-	-	-	-
S	-	-	-	15	-	-	-	-	-	-	-	-

Soil/Irrigation - results

			Nitrogen					Phosphorus				
Soil	Irrigator	Area	Total lost	Lost	Drainage ¹	Surplus	Added ²	Total lost	Lost	Soil P loss risk	Fert P loss risk	Eff P loss risk

1 - N concentration due to leaching in drainage water at the bottom of the root zone.
2 - N added as fertiliser, effluent and organic only

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	157	39
Phosphorus	2	0.4

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Effluent added	0	0	0	0	0	0	0
Fertiliser, lime and other	0	12	8	15	27	0	0
Irrigation	0	0	0	0	0	0	0
Supplements	0	0	0	0	0	0	0
Rain/clover fixation	2	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	39	0.5	5	7	54	8	25
As product	10	1	0	1	2	0	0
Transfer	2	0	2	0	1	0	0
Effluent exported	0	0	0	0	0	0	0
To atmosphere	40	0	0	0	0	0	0
As supplements and crop residues	0	0	0	0	0	0	0

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Organic pool	-146	-23	0	-47	0	0	0
Standing plant material	-180	-21	-162	-11	-18	-12	-7
Inorganic mineral	0	4	-19	0	-2	-3	-4
Inorganic plant available	3	23	25	0	-97	0	3
Root and stover residuals	234	27	159	70	90	14	18

Trees

Trees and scrub - 13.1 ha

N

2 kg/ha | 33 kg

P

0.1 kg/ha | 2 kg

Block details

Area	13.1 ha	Average temp	10.1 °C	Average rainfall	1,145 mm/yr	Annual PET	759 mm/yr
Distance from coast	24 km						
Bush type	Pines						

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	33	2
Phosphorus	2	0.1

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Rain/clover fixation	2	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses	2	0.1	3	5	3	7	36

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Inorganic mineral	0	0	0	0	0	0	0

Block details

Area	2.7 ha	Average temp	10.1 °C	Average rainfall	1,144 mm/yr	Annual PET	757 mm/yr
Distance from coast	24 km						
Bush type	Pines						

Nutrient budget

Losses from root zone

	Total loss (kg/yr)	Loss per ha (kg/yr)
Nitrogen	7	2
Phosphorus	0	0.1

Nutrients added (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Rain/clover fixation ✓	2	0	3	5	3	7	36

Nutrients removed (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Leaching, runoff and direct losses ✓	2	0.1	3	5	3	7	36

Change in pools (kg/ha/yr)	N	P	K	S	Ca	Mg	Na
Inorganic mineral	0	0	0	0	0	0	0