2021 Annual Environmental Report

Peel Feedlot, 848 Mundijong Road Mardella WA

Rural Export and Trading (WA) Pty Ltd

Reference: 754-PEREN283020_R02

14 February 2022

2021 ANNUAL ENVIRONMENTAL REPORT

Peel Feedlot, 848 Mundijong Road Mardella WA

Report reference number: 754-PEREN283020_R02

14 February 2022

PREPARED FOR

Rural Export and Trading (WA) Pty Ltd
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QUALITY INFORMATION

Revision history

Revision	Description	Date	Author	Reviewer	Approver
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1. INTRODUCTION

1.1 BACKGROUND

Rural Export & Trading (WA) Pty Ltd (RETWA) has been operating a feedlot at 848 Mundijong Road, Mardella (the 'site') since 1978 and is known as the Peel Feedlot (See Figure 1). The feedlot activities are prescribed under the Environmental Protection Act (1986). RETWA hold a licence (L5200/1988/11) to operate the feedlot from the Department of Water and Environment Regulation (DWER, formally Department of Environment - DER) since 1988.

The Western Australian sheep feedlot industry has been principally focused on supplying the international market with live sheep. Animals are transported to the site to become accustomed to pellet feed, whilst awaiting transhipment to the international market.

The majority of sheep that are kept at the site are held in raised holding sheds located in the north eastern portion of the site, as illustrated by Figure 2. Solid waste falls through the mesh floor of the holding sheds and is stored below the floor prior to sale off site to the horticultural and nursery industry. Urine is generally absorbed into the faecal pellets. On occasion, additional sheep are held on a rotational basis in paddocks that make up the balance of the property.

1.2 OBJECTIVES

The primary objective of this report is to act as an Annual Audit Compliance Report (AACR) as per Licence condition 4.1.3 and to provide an assessment of the environmental performance of RETWA at the site against DWER Licence L5200/1988/11 dated 9 October 2015 (Appendix A). An amendment to the licence was issued on the 15 December 2016 (Appendix B).

1.3 SCOPE OF WORK

This report has been prepared to address Condition 4.1.3 and 4.2.1 of the Licence (5200/1988/11) dated 9 October 2015 and Amendment Notice 1. As required by the Conditions of the DWER Licence, the report provides a summary of operations and annual monitoring results undertaken at the Peel Feedlot.

2. DETAILS OF COMPLIANCE WITH LICENCE L5200/1988/11

This section provides a summary of compliance, i.e. an AACR, with each of the conditions contained in the DWER Licence L5200/1988/11 (Category No 55) operated by RETWA at the site. A summary of compliance to each of the Conditions of Licence is provided in Table A (below), including specific comments in relation to each condition.

A signed AACR Performa (AACRP) is included within Appendix A.

2.1 LICENCE L5200/1988/11

Table A: Compliance to Licence Conditions for the period 1 January 2021 - 31 December 2021 – Licence L5200/1988/11

Condition No.	Compliance Date	Degree of Compliance	Comments	Further Action / Targets
General Conditions				
1.2.1	Ongoing	Fully compliant	Equipment on site is maintained to be kept in good condition. Water sampling equipment is decontaminated between sampling events and the water quality meter is calibrated before each event by the supplier. Calibration certificates can be found in Appendix C.	Ongoing maintenance and record keeping of calibration certifications / maintenance logs
1.2.2	Ongoing	Fully compliant	No spills to report in 2021.	No further action warranted
Premise Operation				
1.3.1	Ongoing	Fully compliant	Wastewater, manure and carcasses stored/treated as required and detailed in Table 1.3.1.	No further action warranted
1.3.2	Ongoing	Fully compliant	Wastewater, carcasses and manure were managed in accordance with the process requirements.	No further action warranted
General Monitoring				
2.1.1	Ongoing	Fully compliant	Water monitoring was completed in accordance to relevant Australian Standards. Samples were sent to a NATA accredited laboratories.	No further action warranted
Monitoring of Inputs and Outputs				
2.2.1	Ongoing	Fully compliant	The number of individual animals is included Section 2.1.1 of this report. The numbers of individual sheep are recorded through truck loads entering and exiting the site and are provided as monthly totals.	No further action warranted, continue to record individual sheep numbers.
Ambient Environmental Quality Monitoring				
2.3.1	Ongoing	Non-compliant (inability to comply)	Following the installation of groundwater monitoring wells in February 2017, the monitoring program was altered to the program included in Amendment Notice 1. All sampling was conducted in line with that stipulated in Amendment Notice 1 with the exception of a second sample of perched monitoring wells MW4S and MW5S. Further details are provided in Section 2.2.2 below. Details have been included on Section B of the attached AACR Performa (AACRP) included within Appendix A.	Continue attempts to sample perched wells twice in 2022 as per licence requirements.
Improvement Program				

3.1.1	Ongoing	IR1 – Fully compliant IR2 – Fully compliant	IR1 and IR2 were completed within the specified time frame and have previously been reported.	No further action warranted.
Records				
4.1.1	Ongoing	Fully compliant	No comment	No further action warranted
4.1.2	Ongoing	Fully compliant	No comment	No further action warranted
4.1.3	Ongoing	Fully compliant	This report (AACR) fulfils this licence condition.	No further action warranted
4.1.4	Ongoing	Fully compliant	The complaints table can be found in Section 2.2.8 below, no complaints were made in 2021.	No further action warranted
Reporting				
4.2.1	Submit by 14/02/2022	Fully compliant (pending DWER review)	Reports provided in specified format.	No further action warranted
4.2.2	Ongoing	Fully compliant	Historic monitoring results have been included in the attached Surface Water and Groundwater Monitoring Report (Appendix D).	No further action warranted
4.2.3	On request	Fully compliant	No additional reporting has been requested	No further action warranted

2.2 COMPLIANCE NOTES

2.2.1 Inputs and Outputs

The number of individual sheep are recorded through truck loads entering and exiting the site, and are provided as monthly totals in Table B.

The property only caters for sheep no other stock animals are held on site.

Sheep are kept on the property on behalf of other traders or exporters. All animals are for export, apart from a small number that are rejected and accordingly removed by the supplier.

Table B: Monthly Stock Number – January 2021 to December 2021

Month	Number of Individual Sheep
January	63,092
February	67,857
March	58,929
April	39,362
May	85,763
June	12,116
July	11,334
August	0
September	58,759
October	54,406
November	61,706
December	6,577
TOTAL	**519,901**

A total of 519,901 sheep were held on the site in 2021 (1 January 2021 – 31 December 2021), less than 2020. The number of sheep held on site was less than the licenced allocation of 2,000,000 per annum.

All matters in relation to the monitoring of animal numbers were deemed as fully compliant with the required licence conditions.

2.2.2 Water Quality Analytical Results

As part of Amendment Notice 1 (dated 15 December 2016), replacement monitoring bores were required to be installed by 30 April 2017 before any further compliance monitoring took place. The Amendment Notice was issued due to the water table elevation (in the perched aquifer) at the site slowly descending, overtime, resulting in a number of monitoring bores being dry and hence unable to be sampled, even during periods of significant rainfall.

Monitoring in 2021 was undertaken from the ten on site groundwater wells, on-site drainage channels and off-site surface water samples located on the northern boundary fence along Mundijong Road. All sampling locations are illustrated on Figure 2.

Samples were collected on 15 March 2021, 22 June 2021, 13 July 2021 (by RETWA feedlot personnel) and 28 September 2021 and analysed at a National Association of Testing Authorities (NATA) registered laboratories ALS and Eurofins. Results are summarised in the 2021 Surface Water and Groundwater Monitoring Report included as Appendix D. Historical data is also provided, and the results discussed relative to groundwater and receiving environment criteria, as per condition 4.2.2.

All sample locations where sampled in line with licence conditions with the exception of the following:

- MW4S and MW5S were only able to be sampled once in September. Non-compliant with licence condition *"Two sample events between April and October, separated by at least one month"*

  Coffey attempted to sample MW4S and MW5S at the end of June 2021 when the other perched wells and surface locations were reported to have water, however both wells were dry in addition to the surface water locations. The surface water locations were able to be resampled in mid-July 2021 by RETWA feedlot personnel at the time surface water was identified onsite. However, due to the site being waterlogged in the later part of July and August from heavy rainfall, July dip data was not able to be obtained by RETWA feedlot personnel and provided to Coffey until mid to late August, whereby it was identified MW4S and MW5S had sufficient water for sampling. All locations were subsequently sampled in September when site could be safely accessed. Due to the requirement for perched wells to be sampled at least a month apart prior to the end of October, a second sample for MW4S and MW5S was not able to be obtained for 2021.

  Therefore MW4S and MW5S were overall non-compliant with the licence condition "*two sample events between April and October, separated by at least one month"* as they were only sampled once in September. This is considered an inability to comply.

2.2.3 Disposal of waste

In accordance with accepted best practice in the industry, the majority of sheep awaiting trans-shipment are housed in purpose-built enclosures that allow for the collection of urine and faecal material. Sheep stand on a mesh floor with faecal material and urine passing through to temporary storage beneath the holding sheds. Urine is largely absorbed into the faecal pellets, with no identifiable flow of urine to the surrounding area.

Drafting yards were covered and roof run-off was directed to the existing drainage system.

Faecal material and the entrained urine are removed off site for sale to use in the horticultural industry. Manure sales to the public ceased as of 1 May 2002 and were replaced with contract sales. Contractors collecting, and bagging manure have been requested to confine manure to the area under the eaves of the sheds in order to meet the conditions of the Licence.

2.2.4 Disposal of animal carcasses

A small number of sheep die as a result of injuries or stress during transportation to the feedlot or subsequently in the sheds and surrounding yards. Carcasses are collected daily (when required) and stored in a freezer container for collection by a contractor, daily Monday to Friday. They are removed from the property and processed. In the event that dead animals cannot be removed from the site within 24 hours, carcasses are stored in an on-site chiller prior to dispatch at the first available opportunity.

Notwithstanding, a high level of cleanliness is maintained at all times to reduce the possibility of the spread of disease. The premises is registered, licenced and audited by Department of Agriculture, Water and Environment (DAWE).

2.2.5 Dust management plan

A Dust Management Plan (DMP) prepared by ATA Environmental (2000) has been implemented and is consistent with the then Department of Environmental Protection (DEP) published guidelines for the prevention of dust (and smoke) from land development sites (DEP, 1996).

2.2.6 Tree planting

No new trees were planted during the 2021 calendar year.

2.2.7 Photographic record

A series of photos have previously been taken from set locations on the site and in accordance with a verbal agreement with the DWER, copies will be held at the Premises and made available for inspection on request.

2.2.8 Complaints

A complaints management system is required as part of the site licence, and at a minimum will record the number and details of complaints received concerning the environmental impact of the activities of the site and any action taken.

Table C below address this requirement, no complaints have been made during the 2021 calendar year.

Table C: Complaints Summary for the 2021 Calendar Year

Complaint	Complainants details (name, number)	Date of complaint and who received the complaint	Actions undertaken
None			

3. WATER POLLUTION CONTROL CONDITIONS

3.1 WATER MANAGEMENT

Rainwater runoff that comes into contact with animal waste is considered to be the main potential source of contamination at the site. As the animal waste inherently contains elevated nutrient concentrations. Water that comes into contact with the waste is considered a liquid waste stream.

Holding sheds are designed to exclude rainwater from animal wastes and are surrounded by a hardstand area in an elevated portion of the subject land. At the site, the stormwater from the hardstand and roofed areas is directed by a perimeter drainage system to a large detention and evaporation clay-lined dam located on the north-eastern corner of the property.

Analytical results from surface water and groundwater sampling events are compared to water assessment criteria and background concentrations (Appendix D). A number of the sample locations continue to exceed the adopted ANZG (2018) criteria for forms of nitrogen and phosphorus. Sample locations are illustrated on Figure 2.

Management practices implemented at the site which aid in reducing the mass of nutrients leaving the property include:

- Improved pasture management practices;
- Drainage system;
- Fencing keeping stock away from the stream area;
- Retention of tree belts;
- Covered areas; and
- Improved housekeeping.

4. CONCLUSIONS

Following the completion of this report it is understood that RETWA have met their licence conditions and all requirements of Licence L5200-1988-11 with the exception of the below.

All sample locations where sampled in line with licence conditions with the exception of the following:

- MW4S and MW5S were only able to be sampled once in September. Non-compliant with licence condition "Two sample events between April and October, separated by at least one month"

  Coffey attempted to sample MW4S and MW5S at the end of June 2021 when the other perched wells and surface locations were reported to have water, however both wells were dry in addition to the surface water locations. The surface water locations were able to be resampled in mid-July 2021 by RETWA feedlot personnel at the time surface water was identified onsite. However, due to the site being waterlogged in the later part of July and August from heavy rainfall, July dip data was not able to be obtained by RETWA feedlot personnel and provided to Coffey until mid to late August, whereby it was identified MW4S and MW5S had sufficient water for sampling. All locations were subsequently sampled in September when site could be safely accessed. Due to the requirement for perched wells to be sampled at least a month apart prior to the end of October, a second sample for MW4S and MW5S was not able to be obtained for 2021.

  Therefore MW4S and MW5S were overall non-compliant with the licence condition "two sample events between April and October, separated by at least one month" as they were only sampled once in September. This is considered an inability to comply.

5. REFERENCES

Agriculture Western Australia (1999) Revegetation and Drainage Management Plan Lot 2 Mundijong Road, Mundijong. Reference 9900062.

ANZECC & ARMCANZ (2000) National Water Quality Management Strategy Australia and New Zealand Guidelines for Fresh and Marine Water Quality – Southwest Australian Aquatic Ecosystems – Wetlands.

ANZG (2018) Australia and New Zealand Guidelines for Fresh and Marine Water Quality.

ATA Environmental (2000) Dust Management Plan for the sheep feed lot at Lot 2 Mundijong Road, Mundijong. ATA Report No 2000-74.

Department of Environment and Conservation (DEC) (2010) Licence: L5200/1988/10. Issue date 01/10/2010.

Department of Environmental Protection (1996) Guidelines for the prevention of dust (and smoke) from land development sites.

Department of Environment Regulation (DER) (2015) Licence: L5200/1988/11. Issue date 01/10/2015.

STATEMENT OF LIMITATIONS

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY ENVIRONMENTAL REPORT

Introduction

This report has been prepared by Tetra Tech Coffey for you, as Tetra Tech Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice.

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Tetra Tech Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Tetra Tech Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Tetra Tech Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Tetra Tech Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Tetra Tech Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Tetra Tech Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Tetra Tech Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Tetra Tech Coffey prepared the report and has familiarity with the site, Tetra Tech Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Tetra Tech Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

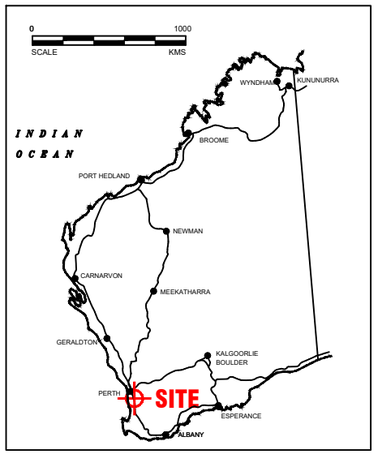
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

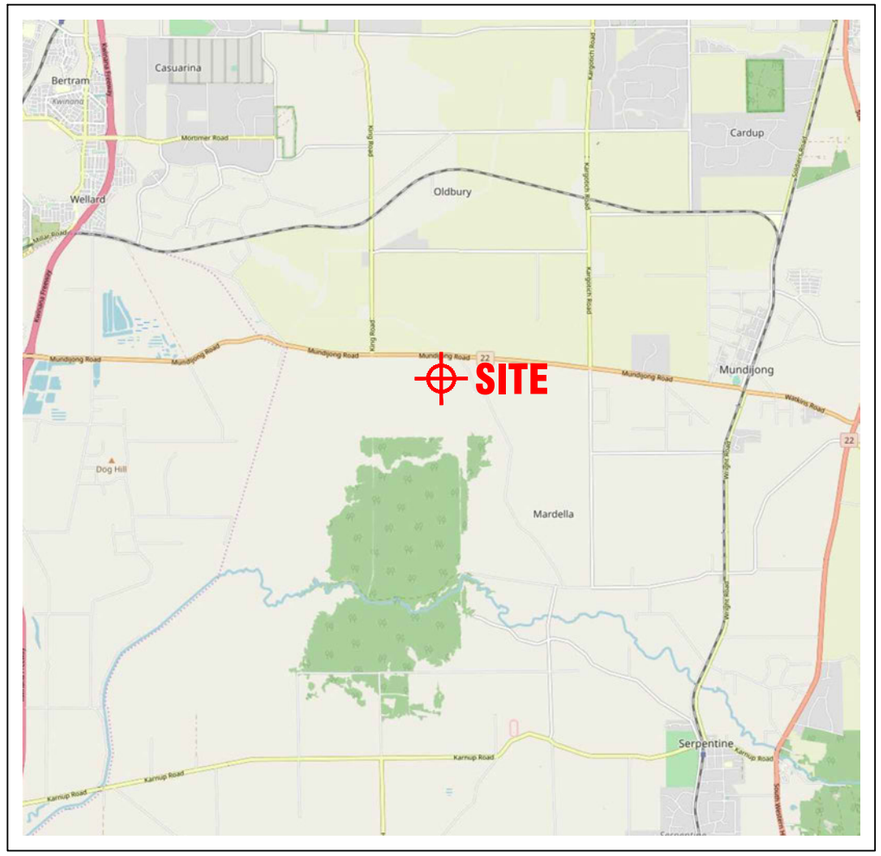
Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

FIGURES

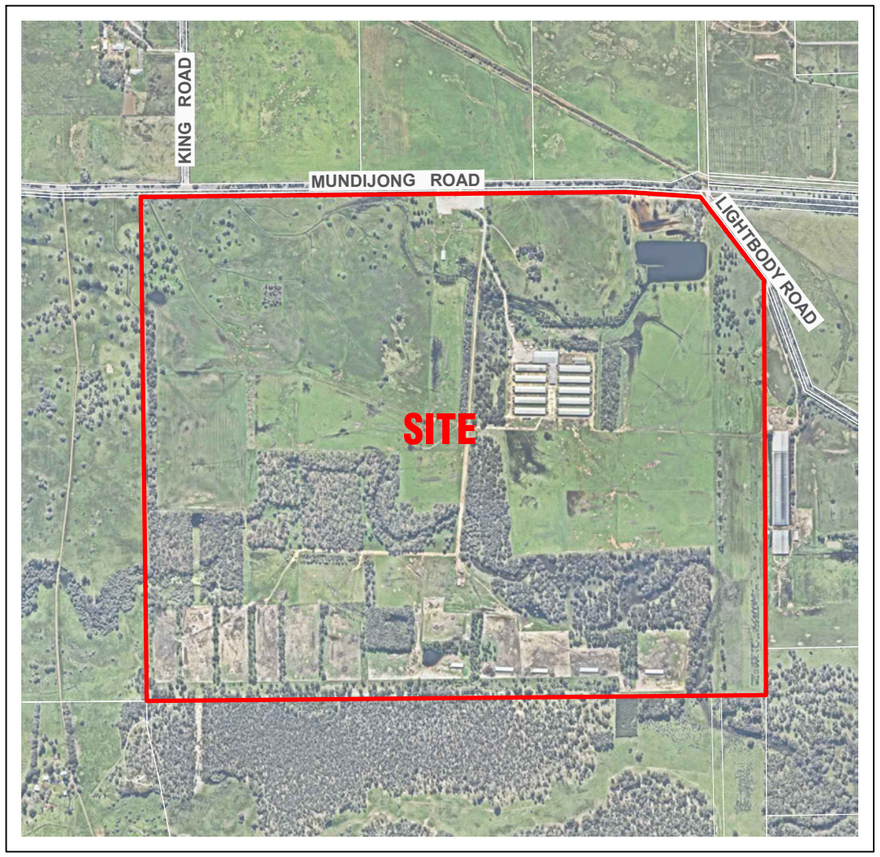


GENERAL AREA MAP



REGIONAL AREA MAP

IMAGE © OPENSTREETMAP (DOWNLOADED 16.01.20)



LOCAL AREA MAP

IMAGE © NEARMAP (FLOWN 20.07.18)

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SCALE
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revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	JO	CV	18/01/22

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approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

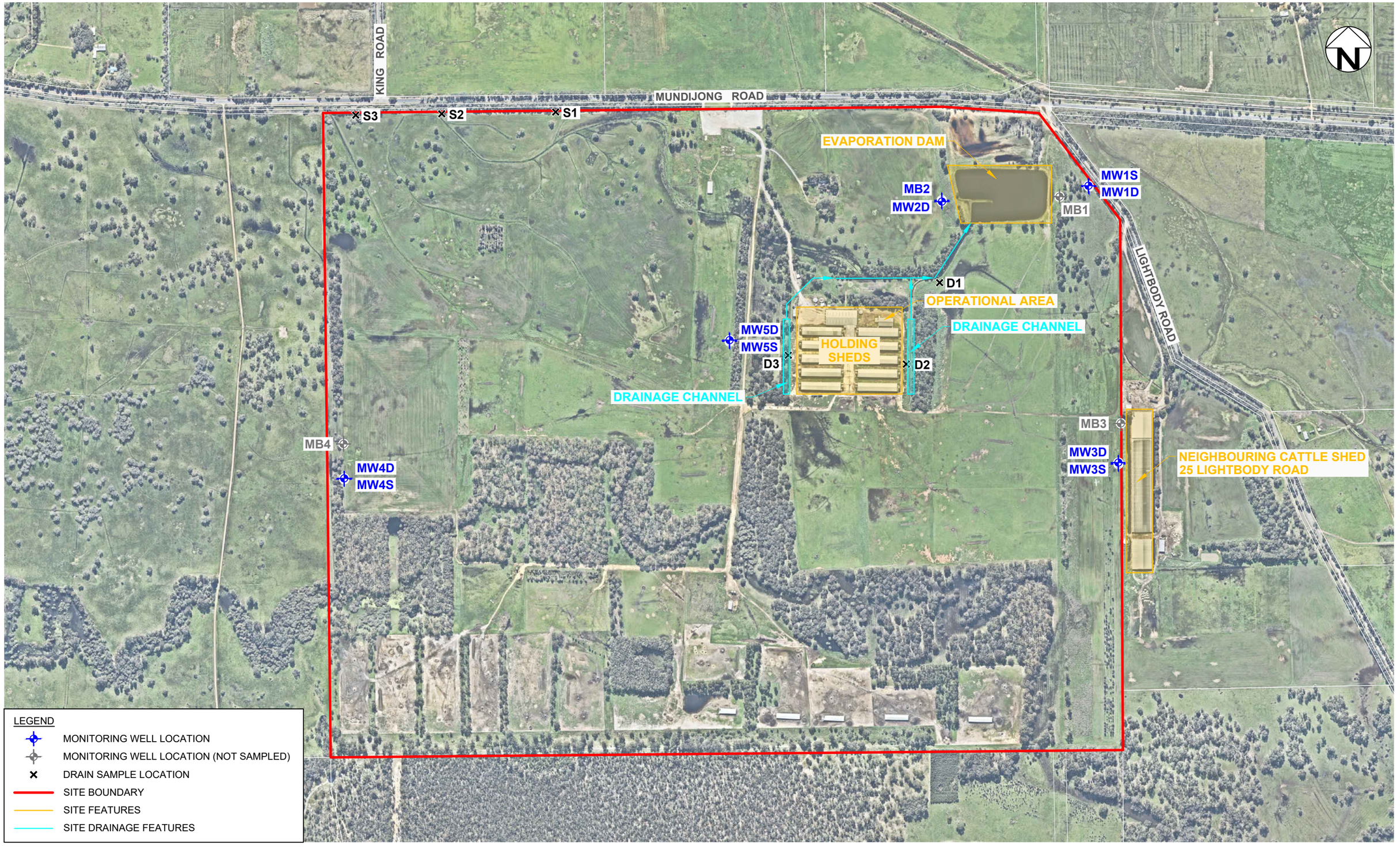
TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: SITE LOCALITY PLAN

project no: 754-PEREN283020-R01 | figure no: FIGURE 1 | rev: A



LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (NOT SAMPLED)
- DRAIN SAMPLE LOCATION
- SITE BOUNDARY
- SITE FEATURES
- SITE DRAINAGE FEATURES

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	JO	CV	18/01/22

AERIAL IMAGE SOURCE: NEARMAP, 20.07.18

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drawn	JO
approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: SITE FEATURES PLAN

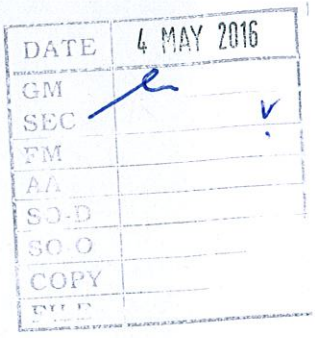
project no: 754-PEREN283020-R01 | figure no: FIGURE 2 | rev: A

PLOT DATE: 18/01/2022 4:23:27 PM DWG FILE: \\TTS406FS1.TT.LOCAL\DATA\PROJECTS\ OCT 2016 ONWARDS\RETWA\754-PEREN283020 - 2021 MONITORING\DRAFTING\754-PEREN283020-R01-D01.DWG

APPENDIX A: COPY OF LICENCE L5200/1988/11

Government of **Western Australia**
Department of **Environment Regulation**

Our ref: L5200/1988/11
Enquiries: Agnes Tay
Email: strategyandreform@der.wa.gov.au



Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

Dear Mr Gordon

AMENDMENT OF LICENCE EXPIRY DATES

Further to our correspondence of 22 March 2016; the Department of Environment Regulation (DER) has now given effect to an extension of your expiry date through an administrative notice. The amendment has been made pursuant to section 59(1)(k) of the *Environmental Protection Act 1986* (EP Act).

Written notice of the amendment is given by administrative notice in accordance with section 59B(9) of the EP Act. Please note that a copy of the administrative notice is on DER's webpage at
https://www.der.wa.gov.au/our-work/licences-and-works-approvals/publications

Please be advised that the expiry date of your licence is as follows:

Licence Number	L5200/1988/11
Premises	Rural Export & Trading (WA) Pty Ltd - Peel Feedlot Lot 123, 848 Mundijong Road, Mardella, WA, 6125
Amended Expiry	08 October 2026

If you are concerned about, or object to any aspect of the amendment, you may lodge an appeal with the Minister for the Environment within 21 days from the date on which this notification is received. The Office of the Appeals Convenor can be contacted on 6467 5190 to find out the procedure and fee.

Members of the public may also appeal the amendment. The Appeals Registrar at the Office of the Appeals Convenor can be contacted after the closing date of appeals to check whether any appeals were received.

Should you wish to discuss any of the above please contact strategyandreform@der.wa.gov.au.

Yours sincerely

Agnes Tay
ACTING DIRECTOR STRATEGY AND REFORM

officer delegated under section 20
of the *Environmental Protection Act 1986*
29 April 2016

Government of **Western Australia**
Department of **Environment Regulation**

Our ref: L5200/1988/11
Enquiries: Agnes Tay
Email: strategyandreform@der.wa.gov.au

DATE	24 MAR 2016
GM	
SEC	✓
FM	
AA	
SO-D	
SO O	
COPY	

Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

Dear Michael Gordon

NOTICE OF AMENDMENT OF LICENCE EXPIRY DATES
SECTION 59(1)(k) *ENVIRONMENTAL PROTECTION ACT 1986*

The Department of Environment Regulation (DER) is writing to you to advise of its intention to amend your licence duration under section 59(1)(k) of the *Environmental Protection Act 1986* (EP Act).

DER's *Guidance Statement on Licence Duration* provides for the granting of licences for up to 20 years duration. DER is implementing this guidance statement by extending the durations for all licensed prescribed premises. DER has given consideration to the matters in the *Guidance Statement on Licence Duration* as follows:

- confirmation from licensees and local government authorities have been requested to ensure that amended expiry dates do not exceed the duration of any relevant planning approvals and mining tenements;
- risk-based reviews for the assessment of licensed prescribed premises will be undertaken in accordance with DER's regulatory framework;
- licensed prescribed premises will be subject to ongoing compliance inspections and investigations following incidences and complaints, in accordance with the EP Act;
- in the event that risk issues arise in relation to licensed prescribed premises, the CEO may, depending on the circumstances:
    - amend the conditions of licensed prescribed premises at any time;
    - in the event of an alleged offence, exercise enforcement powers under the EP Act, including an environmental protection notice; and
    - in the event of breach of licence conditions, revoke the licence;
- to ensure the efficient operation of the licensing regime, the regulatory burden of frequent renewals in the absence of full assessment has been removed; and
- the extension of expiry dates will enable both DER and affected licensees to undertake an ordered and structured implementation of DER's risk-based regulatory framework to existing premises.

Your licence will be amended to extend the expiry date as follows:

Licence Number	L5200/1988/11
Premises	Rural Export & Trading (WA) Pty Ltd - Peel Feedlot Lot 123, 848 Mundijong Road, Mardella, WA, 6125
Current Expiry	08 October 2020
Amended Expiry	08 October 2026

In accordance with section 59A of the EP Act, you are invited to make representations to show why the amendments should not proceed by no later than 15 April 2016. Representations must be submitted to the Chief Executive Officer at the address below or to info@der.wa.gov.au.

The Atrium, 168 St Georges Terrace, Perth WA 6000
Postal address: Locked Bag 33, Cloisters Square, Western Australia 6850
Phone: (08) 6467 5000 Fax (08) 6467 5562
www.der.wa.gov.au

In the absence of any response, the amendment will take effect on 29 April 2016.

Please complete the attached form regarding relevant planning approvals or tenure arrangements expiring prior to the extended expiry date and whether you object to the amendment. Please note that DER is separately confirming planning approval expiry dates with relevant local government authorities.

Your amendment will be given effect through an administrative notice. Please note that a draft copy of this notice is on DER's webpage at
https://www.der.wa.gov.au/our-work/licences-and-works-approvals/publications
.

Should you wish to discuss any of the above please contact strategyandreform@der.wa.gov.au.

Yours sincerely

Agnes Tay
ACTING DIRECTOR STRATEGY AND REFORM

21 March 2016

Government of **Western Australia**
Department of **Environment Regulation**

21 DAY CONSULTATION PERIOD WAIVER FORM

Michael Gordon
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

ENVIRONMENTAL PROTECTION ACT 1986 **– PROPOSED AMENDMENT TO**
LICENCE: L5200/1988/11
PREMISES: Rural Export & Trading (WA) Pty Ltd - Peel Feedlot
Lot 123, 848 Mundijong Road, Mardella, WA, 6125

I do not object to the duration of licence **L5200/1988/11** being amended in accordance with the correspondence provided on 21 March 2016.

I confirm that relevant planning, tenure and lease approvals are held for the proposed licence duration.

I waive the 21 day consultation period and I would like the Licence duration to be amended as soon as possible.

Signed: _____

Name: _____

Date:

Scan and email to:
info@der.wa.gov.au and strategyandreform@der.wa.gov.au.

Postal Address:
Locked Bag 33
CLOISTERS SQUARE WA 6850

Government of **Western Australia**
Department of **Environment Regulation**

Licence

Environmental Protection Act 1986, Part V

Licensee: Rural Export & Trading (W.A.) Pty Ltd

Licence: L5200/1988/11

Registered office: 43 Ventnor Avenue
WEST PERTH WA 6005

ACN: 008 781 664

Premises address: Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot
848 Mundijong Road
MARDELLA WA 6125
Being Lot 123 on Diagram 7171 as depicted in Schedule 1

Issue date: Thursday, 01 October 2015

Commencement date: Friday, 09 October 2015

Expiry date: Thursday, 08 October 2020

Prescribed premises category
Schedule 1 of the *Environmental Protection Regulations 1987*

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
55	Livestock saleyard or holding pen: premises on which live animals are held pending their sale, shipment or slaughter.	10,000 animals or more per year	2,000,000 animals per annual period

Conditions
This Licence is subject to the conditions set out in the attached pages.

.....
Ed Schuller
Senior Manager - Industry Regulation (Process Industries)
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Contents

Introduction

This Introduction is not part of the Licence conditions.

DER's industry licensing role
The Department of Environment Regulation (DER) is a government department for the state of Western Australia in the portfolio of the Minister for Environment. DER's purpose is to advise on and implement strategies for a healthy environment for the benefit of all current and future Western Australians.

DER has responsibilities under Part V of the *Environmental Protection Act 1986* (the Act) for the licensing of prescribed premises. Through this process DER regulates to prevent, control and abate pollution and environmental harm to conserve and protect the environment. DER also monitors and audits compliance with works approvals and licence conditions, takes enforcement action as appropriate and develops and implements licensing and industry regulation policy.

Licence requirements
This Licence is issued under Part V of the Act. Conditions contained within the Licence relate to the prevention, reduction or control of emissions and discharges to the environment and to the monitoring and reporting of them.

Where other statutory instruments impose obligations on the Premises/Licensee the intention is not to replicate them in the licence conditions. You should therefore ensure that you are aware of all your statutory obligations under the Act and any other statutory instrument. Legislation can be accessed through the State Law Publisher website using the following link:
http://www.slp.wa.gov.au/legislation/statutes.nsf/default.html

For your Premises relevant statutory instruments include but are not limited to obligations under the:

- *Environmental Protection (Unauthorised Discharges) Regulations 2004* – these Regulations make it an offence to discharge certain materials such as contaminated stormwater into the environment other than in the circumstances set out in the Regulations.

- *Environmental Protection (Controlled Waste) Regulations 2004* - these Regulations place obligations on you if you produce, accept, transport or dispose of controlled waste.

- *Environmental Protection (Noise) Regulations 1997* – these Regulations require noise emissions from the Premises to comply with the assigned noise levels set out in the Regulations.

You must comply with your licence. Non-compliance with your licence is an offence and strict penalties exist for those who do not comply.

Licence holders are also reminded of the requirements of section 53 of the Act which places restrictions on making certain changes to prescribed premises unless the changes are in accordance with a works approval, licence, closure notice or environmental protection notice.

Licence fees
If you have a licence that is issued for more than one year, you are required to pay an annual licence fee prior to the anniversary date of issue of your licence. Non payment of annual licence fees will result in your licence ceasing to have effect meaning that it will no longer be valid and you will need to apply for a new licence for your Premises.

Ministerial conditions
If your Premises has been assessed under Part IV of the Act you may have had conditions imposed by the Minister for Environment. You are required to comply with any conditions imposed by the Minister.

Premises description and Licence summary
Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot has operated a sheep feedlot at the premises since 1978 and held a licence since 1988. Sheep are transported to the site to become accustomed to pellet feed whilst awaiting short-haul transhipment to Fremantle Port for overseas shipment. The majority of sheep are held in raised holding sheds with the ability to rotate small numbers within paddocks on the remainder of the premises. Solid waste falls through the mesh floor of holding sheds and is stored below on hardstand prior to sale off-site to the horticultural and nursery industry.

Liquid waste is generated on site primarily from contaminated stormwater run-off from operational hardstand areas of the premises. Contaminated stormwater is directed by perimeter drains system to a clay-lined evaporation dam on the north-eastern corner of the property. The main environmental risk factors associated with the site are the potential to impact soil, surface water and groundwater with nutrient rich waste and potential emissions of odour, fugitive dust and noise.

The nearest residence to the holding sheds is approximately 1km to the west with further premises 1.9 km to the northeast and 2 km to the southwest. The site is located within the *Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992* area meaning the management of nutrient rich wastes is important to minimise runoff into surface waters and infiltration to groundwater.

This Licence is the successor to licence L5200/1988/10 and includes conversion to new format including the addition of improvement requirements.

The licences and works approvals issued for the Premises since 2010 are:

Instrument log		
Instrument	**Issued**	**Description**
L5200/1988/10	07/10/2010	Licence reissue
L5200/1988/11	draft	Licence re-issue including conversion to new format and addition of improvement requirements.

Severance
It is the intent of these Licence conditions that they shall operate so that, if a condition or a part of a condition is beyond the power of this Licence to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the power of this Licence to impose and are not otherwise *ultra vires* or invalid.

END OF INTRODUCTION

Licence conditions

1 General

1.1 Interpretation

1.1.1 In the Licence, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 For the purposes of this Licence, unless the contrary intention appears:

'Act' means the *Environmental Protection Act 1986;*

'AHD' means the Australian height datum;

'annual period' means the inclusive period from 1 January until 31 December;

'AS/NZS 5667.1' means the Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of samples;*

'AS/NZS 5667.6' means the Australian Standard AS/NZS 5667.6 *Water Quality – Sampling – Guidance on sampling of rivers and streams;*

'AS/NZS 5667.10' means the Australian Standard AS/NZS 5667.10 *Water Quality – Sampling – Guidance on sampling of waste waters;*

'AS/NZS 5667.11' means the Australian Standard AS/NZS 5667.11 *Water Quality – Sampling – Guidance on sampling of groundwaters;*

'averaging period' means the time over which a limit is measured or a monitoring result is obtained;

'CEO' means Chief Executive Officer of the Department of Environment Regulation;

'CEO' for the purpose of correspondence means;

Chief Executive Officer
Department Administering the Environmental Protection Act 1986
Locked Bag 33
CLOISTERS SQUARE WA 6850
Email: info@der.wa.gov.au;

'Licence' means this Licence numbered L5200/1988/11 and issued under the Act;

'Licensee' means the person or organisation named as Licensee on page 1 of the Licence;

'NATA' means the National Association of Testing Authorities, Australia;

'NATA accredited' means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis;

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Licence;

'Schedule 1' means Schedule 1 of this Licence unless otherwise stated;

'Schedule 2' means Schedule 2 of this Licence unless otherwise stated;

'six monthly' means the 2 inclusive periods from 1 January to 30 June and 1 July to 31 December; and

'spot sample' means a discrete sample representative at the time and place at which the sample is taken.

1.1.3 Any reference to an Australian or other standard in the Licence means the relevant parts of the standard in force from time to time during the term of this Licence.

1.1.4 Any reference to a guideline or code of practice in the Licence means the version of that guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guideline or code of practice made during the term of this Licence.

1.1.5 Nothing in the Licence shall be taken to authorise any emission that is not mentioned in the Licence, where the emission amounts to:
(a) pollution;
(b) unreasonable emission;
(c) discharge of waste in circumstances likely to cause pollution; or
(d) being contrary to any written law.

1.2 General conditions

1.2.1 The Licensee shall operate and maintain all pollution control and monitoring equipment to the manufacturer's specification or any relevant and effective internal management system.

1.2.2 The Licensee shall immediately recover, or remove and dispose of spills of environmentally hazardous materials outside an engineered containment system.

1.3 Premises operation

1.3.1 The Licensee must ensure that material specified in Table 1.3.1 is only stored and/or treated within vessels or compounds provided with the infrastructure detailed in Table 1.3.1.

Table 1.3.1: Containment infrastructure

Containment point reference	Material	Infrastructure requirements
Evaporation pond	Wastewater	Clay-lined
Holding sheds	Manure	Raised sheds with a compacted limestone sub-floor for the collection of manure
Carcass cold storage area	Carcasses	Sealed cold storage

1.3.2 The Licensee shall ensure that where wastes produced on the Premises are not taken off-site for lawful use or disposal, they are managed in accordance with the process requirements in Table 1.3.2.

Table 1.3.2: Management of Waste		
Waste type	**Process**	**Process requirements**
Wastewater	Evaporation	Wastewater run-off from livestock holding areas shall be directed to the evaporation pond via concrete or clay-lined catch drains
Carcasses	Storage	Carcasses stored beyond 24 hours of the animals death shall be stored within cold storage
Manure	Stockpiling	Contained beneath livestock holding sheds where water from rain, sprinklers or surface drainage cannot access the manure, pending its removal offsite.

2 Monitoring

2.1 General monitoring

2.1.1 The licensee shall ensure that:

(a) all water samples are collected and preserved in accordance with AS/NZS 5667.1;
(b) all wastewater sampling is conducted in accordance with AS/NZS 5667.10;
(c) all surface water sampling is conducted in accordance with AS/NZS 5667.6;
(d) all groundwater sampling is conducted in accordance with AS/NZS 5667.11; and
(e) all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured.

2.2 Monitoring of inputs and outputs

2.2.1 The Licensee shall undertake the monitoring in Table 2.2.1 according to the specifications in that table.

Table 2.2.1: Monitoring of inputs and outputs		
Input/Output	**Units**	**Frequency**
Sheep	Number of animals	Each truck load of animals entering and exiting the premises

2.3 Ambient environmental quality monitoring

2.3.1 The Licensee shall undertake the monitoring in Tables 2.3.1 and 2.3.2 according to the specifications in those tables and record and investigate results that do not meet any limit specified.

Table 2.3.1: Monitoring of ambient surface water quality				
Monitoring point reference and location	**Parameter**	**Units**	**Averaging period**	**Frequency**
S1, S2 and S3 (Surface water monitoring points as shown on map of monitoring points in Schedule 1)	pH	-	Instantaneous[1] or spot sample	Two sample events between the months of April and October separated by at least one month
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	
D1, D2 and D3 (Drain monitoring points as shown on map of monitoring points in Schedule 1)	pH	-	Instantaneous[1] or spot sample	
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	

1. In-field non-NATA accredited analysis permitted.

Table 2.3.2: Monitoring of ambient groundwater quality				
Monitoring point reference and location	**Parameter**	**Units**	**Averaging period**	**Frequency**
MB1, MB2, MB3 and MB4 (Groundwater monitoring boreholes as shown on the map of monitoring locations in Schedule 1)	Standing water level[1]	m(AHD)	Instantaneous[2]	Six monthly[3]
	pH	-	Instantaneous[2] or spot sample	
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	

1. SWL shall be determined prior to collection of water samples.
2. In-field non-NATA accredited analysis permitted.
3. Six monthly monitoring is to be undertaken at least 5 months apart.

3 Improvements

3.1 Improvement program

3.1.1 The Licensee shall complete the improvements in Table 3.1.1 by the date of completion in Table 3.1.1.

Table 3.1.1: Improvement program

Improvement reference	Improvement	Date of completion
IR1	The Licensee shall conduct a hydrogeological review of the Premises and submit to the CEO a report that details: (i) a summary of the hydrogeological context of the site; (ii) an assessment of groundwater levels and flow direction; (iii) an assessment of existing groundwater monitoring bores; (iv) an assessment of groundwater monitoring requirements based on identified sources and pathways of all potential solid and liquid waste discharges; and (v) proposals to replace and install upgradient and downgradient groundwater monitoring bores including timeframes and proposed bore specifications.	30 April 2016
IR2	The Licensee shall submit to the CEO a report containing an assessment of the design capacity of the existing wastewater collection system including the livestock holding areas, catch drains and the evaporation pond to confirm run-off generated from a 1 in 20 year storm event (20 year average recurrence internal) of 72 hours duration can be adequately contained.	30 April 2016

4 Information

4.1 Records

4.1.1 All information and records required by the Licence shall:
(a) be legible;
(b) if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval;
(c) except for records listed in 4.1.1(d) be retained for at least 6 years from the date the records were made or until the expiry of the Licence or any subsequent licence; and
(d) for those following records, be retained until the expiry of the Licence and any subsequent licence:
(i) off-site environmental effects; or
(ii) matters which affect the condition of the land or waters.

4.1.2 The Licensee shall ensure that:
(a) any person left in charge of the Premises is aware of the conditions of the Licence and has access at all times to the Licence or copies thereof; and
(b) any person who performs tasks on the Premises is informed of all of the conditions of the Licence that relate to the tasks which that person is performing.

4.1.3 The Licensee shall complete an Annual Audit Compliance Report indicating the extent to which the Licensee has complied with the conditions of the Licence, and any previous licence issued under Part V of the Act for the Premises for the previous annual period.

4.1.4 The Licensee shall implement a complaints management system that as a minimum records the number and details of complaints received concerning the environmental impact of the activities undertaken at the Premises and any action taken in response to the complaint.

4.2 Reporting

4.2.1 The Licensee shall submit to the CEO an Annual Environmental Report within 45 calendar days after the end of the annual period. The report shall contain the information listed in Table 4.2.1 in the format or form specified in that table.

Table 4.2.1: Annual Environmental Report

Condition or table (if relevant)	Parameter	Format or form[1]
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Table 2.2.1	Monthly total of animals held	Tabular format
Table 2.3.1	Ambient surface water quality monitoring - pH, electrical conductivity, total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	
Table 2.3.2	Ambient groundwater quality monitoring – Standing water level, pH, electrical conductivity, total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	
4.1.3	Compliance	Annual Audit Compliance Report (AACR)
4.1.4	Complaints summary	None specified

Note 1: Forms are in Schedule 2

4.2.2 The Licensee shall ensure that the Annual Environmental Report also contains an assessment of the information contained within the report against previous monitoring results and Licence limits.

4.2.3 The Licensee shall submit the information in Table 4.2.2 to the CEO according to the specifications in that table.

Table 4.2.2: Non-annual reporting requirements

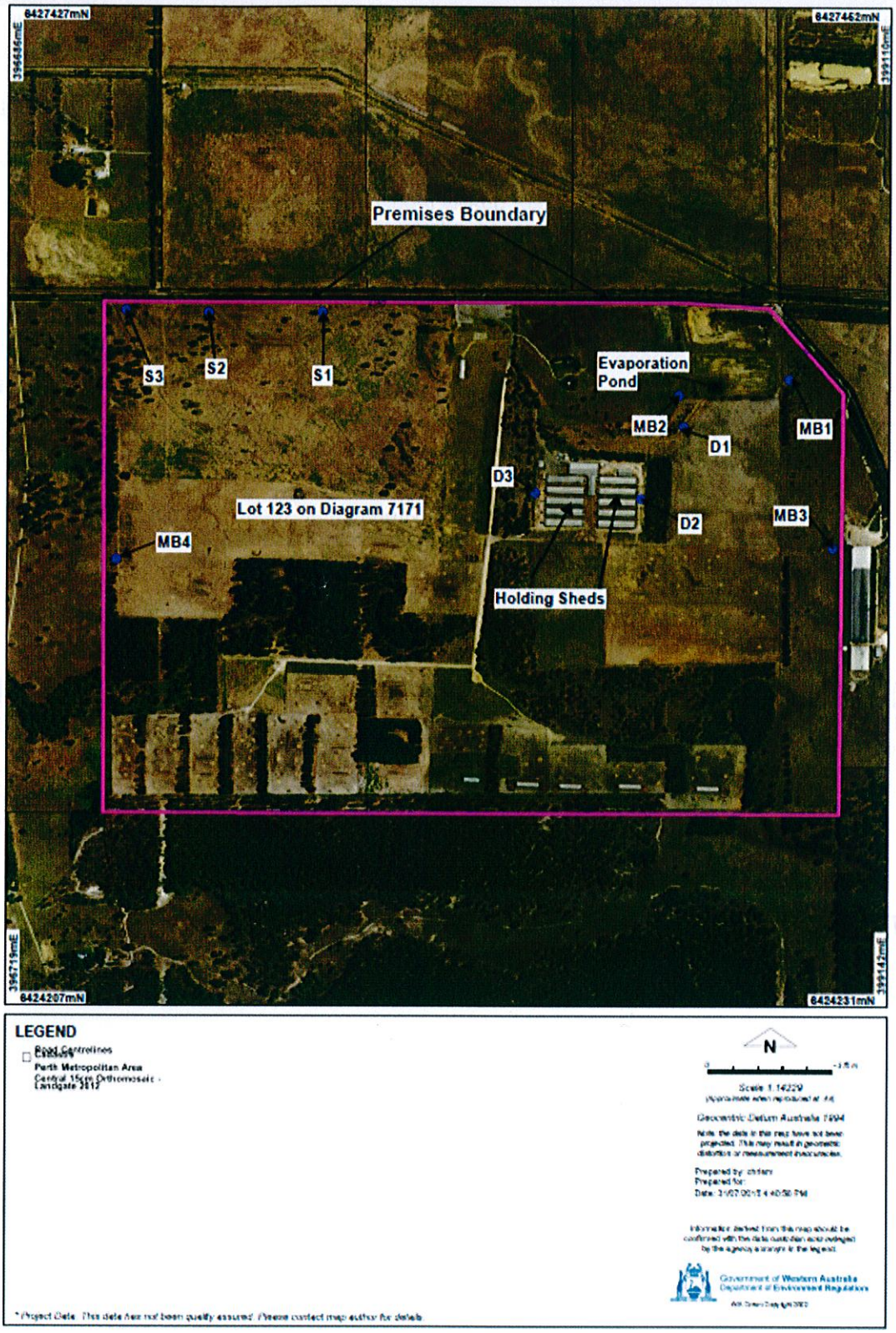
Condition or table (if relevant)	Parameter	Reporting period	Reporting date (after end of the reporting period)	Format or form[1]
-	Copies of original monitoring reports submitted to the Licensee by third parties	Not Applicable	Within 14 days of the CEOs request	As received by the Licensee from third parties

Note 1: Forms are in Schedule 2

Schedule 1: Maps

Premises map

The Premises is shown in the map below. The pink line depicts the Premises boundary. The locations of the monitoring points defined in Tables 2.3.1 and 2.3.2 are also shown below.



Schedule 2: Reporting & notification forms

These forms are provided for the proponent to report monitoring and other data required by the Licence. They can be requested in an electronic format.

ANNUAL AUDIT COMPLIANCE REPORT PROFORMA

SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name: Trading as:	ABN:
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of the Licence complied with within the reporting period? (please tick the appropriate box)

Yes ☐ Please proceed to Section C

No ☐ Please proceed to Section B

Each page must be initialled by the person(s) who signs Section C of this Annual Audit Compliance Report (AACR).

Initial:

SECTION B

DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each Licence condition that was not complied with.

a) Licence condition not complied with:	
b) Date(s) when the non compliance occurred, if applicable:	
c) Was this non compliance reported to DER?:	
☐ Yes ☐ Reported to DER verbally Date _____ ☐ Reported to DER in writing Date _____	☐ No
d) Has DER taken, or finalised any action in relation to the non compliance?:	
e) Summary of particulars of the non compliance, and what was the environmental impact:	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram):	
g) Cause of non compliance:	
h) Action taken, or that will be taken to mitigate any adverse effects of the non compliance:	
i) Action taken or that will be taken to prevent recurrence of the non compliance:	

Each page must be initialled by the person(s) who signs Section C of this AACR

Initial:

SECTION C

SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report (AACR) may only be signed by a person(s) with legal authority to sign it. The ways in which the AACR must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this AACR is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		**The Annual Audit Compliance Report must be signed and certified:**
An individual	□	by the individual licence holder, or
	□	by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	□	by affixing the common seal of the licensee in accordance with the *Corporations Act 2001*; or
	□	by two directors of the licensee; or
	□	by a director and a company secretary of the licensee, or
	□	if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	□	by the chief executive officer of the licensee; or
	□	by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of $50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

NAME:
(printed) _____

POSITION: _____

DATE: _____/_____/_____

SIGNATURE: _____

NAME:
(printed) _____

POSITION: _____

DATE: _____/_____/_____

SEAL (if signing under seal)

Schedule 2: Reporting & notification forms

These forms are provided for the proponent to report monitoring and other data required by the Licence. They can be requested in an electronic format.

ANNUAL AUDIT COMPLIANCE REPORT PROFORMA

SECTION A

LICENCE DETAILS

Licence Number: L5200/1988/11	Licence File Number: 2010 1006294
Company Name: RURAL EXPORT + TRADING (WA) PTY LTD Trading as:	ABN: 56 008 781 664
Reporting period: 1ST JANUARY 2021 to 31ST DECEMBER 2021	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of the Licence complied with within the reporting period? (please tick the appropriate box)

Yes ☐ Please proceed to Section C

No ☑ Please proceed to Section B

Each page must be initialled by the person(s) who signs Section C of this Annual Audit Compliance Report (AACR).

Initial: MPL &

SECTION B
DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each Licence condition that was not complied with.

a) Licence condition not complied with:
b) Date(s) when the non compliance occurred, if applicable:
c) Was this non compliance reported to DER?:
☐ Yes ☐ Reported to DER verbally Date _____ ☐ Reported to DER in writing Date _____ ☐ No
d) Has DER taken, or finalised any action in relation to the non compliance?:
e) Summary of particulars of the non compliance, and what was the environmental impact:
f) If relevant, the precise location where the non compliance occurred (attach map or diagram):
g) Cause of non compliance:
h) Action taken, or that will be taken to mitigate any adverse effects of the non compliance:
i) Action taken or that will be taken to prevent recurrence of the non compliance:

Each page must be initialled by the person(s) who signs Section C of this AACR

Initial:

NOTE : PLEASE REFER TO ATTACH TETRA TECH LETTER REF : 754-PERENZ83020_L01.

SECTION C

SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report (AACR) may only be signed by a person(s) with legal authority to sign it. The ways in which the AACR must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this AACR is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		The Annual Audit Compliance Report must be signed and certified:
An individual	☐	by the individual licence holder, or
	☐	by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	☐	by affixing the common seal of the licensee in accordance with the *Corporations Act 2001*; or
	☐	by two directors of the licensee; or
	☑	by a director and a company secretary of the licensee, or
	☐	if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	☐	by the principal executive officer of the licensee; or
	☐	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	☐	by the chief executive officer of the licensee; or
	☐	by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of $50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

NAME: (printed) M. P. GORDON

POSITION: DIRECTOR

DATE: 14 / 02 / 2022

SIGNATURE: _____

NAME: (printed) XIAO LAN YAP

POSITION: FINANCIAL MANAGER & COMPANY SECRETARY

DATE: 14 / 02 / 2022

SEAL (if signing under seal)

TETRA TECH COFFEY

Level 1, Bishops See, 235 St Georges Terrace
Perth
WA 6000 Australia

t: +61 8 6218 2100
f: +61 8 6218 2222
tetratechcoffey.com

14 February 2022

Our ref: 754-PEREN283020_L01_Rev0.IFU

Rural Export and Trading (WA) Pty Ltd
43 Ventnor Avenue
West Perth
WA 6005 Australia

Attention: Anna Maier

Dear Anna

DWER Licence L5200/1988/11 Rural Export and Trading (WA) Pty Ltd – Schedule 2 / Section B

a) Licence condition not complied with:
2.3.1 The licensee shall undertake monitoring in tables 2.3.1 and 2.3.2 according to the specifications in those tables and record and investigate results that do not meet any limit specified.
b) Date(s) when the non compliance occurred, if applicable:
During 2021, between April and October.
c) Was this non-compliance reported to DWER?
RETWA attempted to notify Shaun Huxtable, Licencing Officer, via phone call on 09/02/2022, however was advised Shaun was no longer with the Department. RETWA is currently awaiting a call back from DWER from Mr Chris Malley, Senior Licensing Officer, Process Industries, Regulatory Services (Environment). This was followed up in an email addressed to Mr Chris Malley.
d) Has DWER taken, or finalised any action in relation to the non-compliance?
Unknown.
e) Summary of particulars of the non compliance, and what was the environmental impact:
Sample frequency of sample locations MW4S and MW5S was non-compliant as per Tables 2.3.1 and 2.3.2. Unable to attain the required second sample during 2021.
f) If relevant, the precise location where the non compliance occurred (attach map or diagram)
Refer to Figure 2, attached to the AER report.
g) Cause of non compliance
MW4S and MW5S were only able to be sampled once in September. Non-compliant with licence condition *"Two sample events between April and October, separated by at least one month"* Coffey attempted to sample MW4S and MW5S at the end of June 2021 when the other perched wells and surface locations were reported to have water, however both wells were dry in addition to the surface water locations. The surface water locations were able to be resampled in mid-July 2021 by RETWA feedlot personnel at the time surface water was identified onsite. However, due to the site being waterlogged in the later part of July and August from heavy rainfall, July dip data was not able to be obtained by RETWA feedlot personnel and provided to Coffey until mid to late August, whereby it was identified MW4S and MW5S had sufficient water for sampling. All locations were subsequently sampled in September when site could be safely

accessed. Due to the requirement for perched wells to be sampled at least a month apart prior to the end of October, a second sample for MW4S and MW5S was not able to be obtained for 2021. Therefore MW4S and MW5S were overall non-compliant with the licence condition “two sample events between April and October, separated by at least one month” as they were only sampled once in September. This is considered an inability to comply.
h) Action taken, or that will be taken to mitigate any adverse effects of the non compliance
Not applicable.
i) Action taken or that will be taken to prevent reoccurrence of the non compliance
• Continue attempts to sample perched wells twice in 2022 as per licence requirements. Regular communication between RETWA feedlot staff and Coffey will continue to be maintained throughout 2022.

For and on behalf of Coffey

Courtney Vlahos
Senior Environmental Scientist

APPENDIX B: AMENDMENT NOTICE 1

Government of **Western Australia**
Department of **Environment Regulation**

Your ref: L5200/1988/11
Our ref: 2010/006294
Enquiries: Chris Malley
Phone: 9333 7484
Email: info@der.wa.gov.au

Mr Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362
WEST PERTH WA 6872

Dear Mr Gordon

SECTION 59B(9) OF THE *ENVIRONMENTAL PROTECTION ACT 1986* – NOTICE OF AMENDMENT TO LICENCE L5200/1988/11

Further to the notice of proposed amendment dated sent to you on 30 November 2016, please find enclosed the Amendment Notice issued in accordance with section 59B(9) of the *Environmental Protection Act 1986* (EP Act).

If you are concerned about or object to any aspect of the amendment, you may lodge an appeal with the Minister for the Environment within 21 days from the date on which this notice is received. The appeal form can be obtained from the Office of the Appeals Convenor (www.appealsconvenor.wa.gov.au or phone 6467 5190). Members of the public may also appeal the amendments. The Office of the Appeals Convenor will contact you if any appeals are received].

If you have any queries, please contact Licensing Officer Mr Chris Malley on phone 9333 7484.

Yours sincerely

Jonathan Bailes
A/SENIOR MANAGER - INDUSTRY REGULATION
LICENSING AND APPROVALS

Officer delegated under Section 20
of the Environmental Protection Act 1986

15 December 2016

Att

Copy to: Shire of Serpentine-Jarrahdale

Government of Western Australia
Department of Environment Regulation

Amendment Notice 1

Licence Number	L5200/1988/11
Licence Holder	Rural Export & Trading (W.A.) Pty Ltd
ACN	008 781 664
Registered business address	43 Ventnor Avenue West Perth WA 6005
Date of amendment	15 December 2016
Prescribed Premises	Category 55: Livestock saleyard or holding pen
Premises	Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot 848 Mundijong Road Mardella WA 6125 Lot 123 on Diagram 7171

Amendment

The Chief Executive Officer (CEO) of the Department of Environment Regulation (DER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* as set out in this Amendment Notice.

Jonathan Bailes

A/Senior Manager - Industry Regulation (Process Industries)

an officer delegated under section 20 of the Environmental Protection Act 1986 (WA)

Amendment Notice

This notice is issued under section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

Amendment Description

Licence L5200/1988/11 was granted to Rural Export & Trading (W.A.) Pty Ltd (Licence Holder) on 1 October 2015 and included two improvement requirements in condition 3.1.1. Improvement Requirement 1 (IR1) required the submission of a hydrogeological review report to the CEO. Along with establishing the hydrogeological context of the premises, the report was to include a proposal to replace and install groundwater monitoring bores. The published decision document attached to the licence made note that *"Once the licensee has completed this improvement requirement, DER will further reassess the regulatory approach"* (Section 4 Decision Table: Improvements).

The Licence Holder submitted the report *Improvement Condition IR1 – Hydrogeological Review,* Coffey, dated 24 March 2016 (the Report) on 1 April 2016 to satisfy the requirements of IR1. The Report made recommendations for the installation of new groundwater monitoring bore locations. Groundwater monitoring bore alterations from the Report are summarised in Tables 1 and 2.

Table 1: New groundwater monitoring bore locations as proposed by the Licence Holder

Well ID	Proposed Location	Rationale
MW1	Replace existing MB1, further to the north or east if possible.	Provide background conditions, move away from dam to avoid proximity effects.
MW2	Replace existing MB2.	Down gradient of the dam. Identify potential impacts associated with the dam.
MW3	Move to the south of existing MB3. Immediately west of the neighbouring cattle holding shed on 25 Lightbody Road.	Identify potential impacts moving off *or* on site.
MW4	Replace existing MB4.	Identify potential impacts moving off site / provide background concentrations.
MW5	To the west (down gradient) of the holding sheds.	Immediately down gradient of the holding sheds and drainage channel which receive runoff. Will also provide a comparison to new MW4 which is further down gradient.

(*Source: Table 3 in section 7.2 of the Report*)

Table 2: New groundwater monitoring bore construction details as proposed by the Licence Holder

Depth	Well material	Construction material	Rationale
7m – 4m	Slotted screen	Gravel pack	Assuming depth to groundwater is 5m bgl, the slotted screen will extend 2m below and 1m above the encountered groundwater.
4m – surface	Solid screen	Bentonite seal	By sealing the remaining length of the well column, groundwater from the perched aquifer will not be able to flow into the monitoring well.

(*Source: Table 2 in section 7.2 of the Report*)

The amendments to Licence L5200/1988/11 outlined in this Amendment Notice have been initiated by DER.

Review of the Report

The Delegated Officer sought advice from DER's Contaminated Sites function regarding the Report submitted. The written advice dated 21 June 2016 concluded that:

- the review of the hydrogeology of the site as provided in the Report is technically sound; and
- the proposed locations of the monitoring bores are acceptable, but it is recommended that additional shallow bores be constructed at each site to monitor seasonal groundwater flow in the perched aquifer.

It is noted that the perched aquifer beneath the premises is only likely to contain significant amounts of groundwater during the winter months. However, it is likely to provide a seasonal pathway to transmit nutrients and other soluble contaminants into nearby drains and waterways.

Risk Assessment

The Report findings do not alter the assessed risk profile within the decision document attached to Licence L5200/1988/11 which justifies the inclusion of groundwater monitoring requirements (Section 4 - Decision Table). The installation and subsequent monitoring of groundwater bores as outlined in Tables 1 and 2 above will replace existing groundwater monitoring requirements in the licence.

The review of the Report has identified an additional contaminant pathway (a seasonally perched aquifer) that could result in transport of contaminants to environmental receptors (nearby drains and waterways) that are within the *Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992* area.

The installation of new bores in both the seasonal perched aquifer and the superficial aquifer is consistent with the previous risk assessment and addresses updated source, pathway and receptor information.

Decision

The Delegated Officer had regard to:

- the Report submitted by the Licence Holder;
- advice from DER's Contaminated Sites function dated 21 June 2016; and
- the decision document attached to Licence L5200/1988/11 granted 1 October 2015.

The Delegated Officer is satisfied that the requirement for groundwater monitoring has been justified through a risk-based assessment in the existing decision document. The Report and DER technical advice provide the basis for specific alterations to the existing groundwater monitoring program to ensure the monitoring addresses identified sources, pathways, and receptors.

Amendments to the licence include:

- Installation of new groundwater monitoring bores at locations indicated in Table 1;
- Construction of new groundwater monitoring bores consistent with the design specifications in Table 2;
- Installation of an additional groundwater monitoring bore at each new location within the seasonally perched aquifer; and
- Changes to the monitoring program in condition 2.3.1 which take effect upon installation of the new groundwater monitoring bores.

The licence amendments are consistent with DER's published *Guidance Statement: Regulatory principles* and *Guidance Statement: Setting conditions.*

Amendment History

Instrument	Issued	Amendment
L5200/1988/11	15/12/2016	Amendment Notice 1 Improvement program and groundwater monitoring requirements amended.
L5200/1988/11	29/04/2016	Amendment by notice to extend the licence duration
L5200/1998/11	01/10/2015	Licence renewal

Consultation

The Licence Holder was provided with a draft Amendment Notice on 30 November 2016 for comment. The Licence Holder waived the 21 day consultation period on 13 December 2016 and requested the amendment notice to be issued.

Amendment

1. Table 2.3.2 of condition 2.3.1 of the licence is amended by the deletion of the text shown in strikethrough below and the insertion of the red text shown in underline below:

2.3.1 The Licensee shall undertake the monitoring and analysis in Tables 2.3.1 and 2.3.2 according to the specifications in those tables ~~and record and investigate results that do not meet any limit specified~~.

Table 2.3.2: Monitoring of ambient groundwater quality				
Monitoring point reference and location	***Parameter***	***Units***	***Averaging period***	***Frequency***
MB1, MB2, MB3 and MB4 *(Groundwater monitoring boreholes as shown on the map of monitoring locations in Schedule 1)*	*Standing water level[1]*	*m(AHD)*	*Instantaneous[2]*	*Six monthly[3] until groundwater monitoring bores are installed and commissioned in accordance with condition 3.1.1*
	pH	*-*	*Instantaneous[2] or spot sample*	
	Electrical conductivity	*µS/cm*		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	*mg/L*	*Spot sample*	
MW1, MW2, MW3, MW4 and MW5 *(as depicted in the Schedule 1: Map of groundwater monitoring locations)*	*Standing water level[1]*	*m(AHD)*	*Instantaneous[2]*	*Commencing upon installation of groundwater monitoring bores in accordance with condition 3.1.1:* *(a) Six monthly[3] sampling of groundwater monitoring bores within the superficial aquifer; and* *(b) Two sampling events separated by at least one month of groundwater monitoring bores within the seasonally perched aquifer between April and October.*
	pH	*-*	*Instantaneous[2] or spot sample*	
	Electrical conductivity	*µS/cm*		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	*mg/L*	*Spot sample*	

1. *SWL shall be determined prior to collection of water samples.*
2. *In-field non-NATA accredited analysis permitted.*
3. *Six monthly monitoring is to be undertaken at least 5 months apart.*

2. Table 3.1.1 of the licence is amended by the deletion of text shown in strikethrough below and the insertion of the red text shown in underline below:

Table 3.1.1: Improvement program		
Improvement reference	***Improvement***	***Date of completion***
~~*IR1*~~	~~*The Licensee shall conduct a hydrogeological review of the Premises and submit to the CEO a report that details:*~~ ~~*(i) a summary of the hydrogeological context of the site;*~~ ~~*(ii) an assessment of groundwater levels and flow direction;*~~ ~~*(iii) an assessment of existing groundwater monitoring bores;*~~ ~~*(iv) an assessment of groundwater monitoring requirements based on identified sources and pathways of all potential solid and liquid waste discharges; and*~~ ~~*(v) proposals to replace and install upgradient and downgradient groundwater monitoring bores including timeframes and proposed bore specifications.*~~	~~*30 April 2016*~~
~~*IR2*~~	~~*The Licensee shall submit to the CEO a report containing an assessment of the design capacity of the existing wastewater collection system including the livestock holding areas, catch drains and the evaporation pond to confirm run-off generated from a 1 in 20 year storm event (20 year average recurrence internal) of 72 hours duration can be adequately contained.*~~	~~*30 April 2016*~~
IR1	*The Licensee shall install new groundwater monitoring bores in accordance with the following:* *(a) Two groundwater monitoring bores are installed at each of the five locations (MW1, MW2, MW3, MW4 and MW5), depicted in the Schedule 1: Map of groundwater monitoring locations.* *(b) At each of the locations specified in part (a):* *(i) one bore is installed within the seasonally perched aquifer; and* *(ii) one bore is installed in the superficial aquifer.* *(c) Groundwater monitoring bores installed within the superficial aquifer include a bentonite seal extending from the top of the screened interval to the surface to prevent the flow of water from the seasonally perched aquifer into the monitoring bore.* *(d) All groundwater monitoring bores are:* *(i) installed to meet the requirements of Minimum Construction requirements for Water Bores in Australia (AIH 2012);* *(ii) sited in accordance with the Department of Water Water Quality Protection Note 30 Groundwater Monitoring Bores (DoW 2009); and* *(iii) surveyed to allow the ground level (to Australian Height Datum) at each location to be accurately determined.*	*30 April 2017*

3. The licence is amended by the insertion of the following map in Schedule 1:

Map of groundwater monitoring locations

The locations of groundwater monitoring points to be installed in accordance with condition 3.1.1 and subsequently monitored in accordance with condition 2.3.1 are shown below.

APPENDIX C: CALIBRATION CERTIFICATES

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus

Serial No. **18G 103 114**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	22.5 ^{o}C
pH	pH 7	358580	Calibrated	7.01
pH	pH 4	357330	Calibrated	4.00
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	354263	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	234.5 mV
DO Zero	Zero	10640	*Checked*	0.00 %
DO 100%	100%	Water saturated air	Calibrated	100 %

Calibrated by: **Sebastian Moran**

Calibration date: **12-Mar-21**

Next calibration due 12-Apr-21

Multi Parameter Water Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. **18J 104 336**

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	15.8 °C
pH	pH 7	363895	Calibrated	7.00
pH	pH 4	363894	Calibrated	4.01
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	354263	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	249.2 mV
DO Zero	Zero	Sodium Sulphite Sol 10640	*Checked*	0.0 %
DO 100%	100%	Water saturated air	Calibrated	100 %

Calibrated by: **Bianca Mcnair**

Calibration date: **18-Jun-21**

Next calibration due 19-Jul-21

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus

Serial No. **18L 101 816**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	18.6 °C
pH	pH 7	363895	Calibrated	7.01
pH	pH 4	363894	Calibrated	4.00
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	362912	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	294.1 mV
DO Zero	Zero	10959	*Checked*	0.0 %
DO 100%	100%	Water saturated air	Calibrated	100.0 %

Calibrated by: **Adam Cutting**

Calibration date: **16-Sep-21**

Next calibration due 17-Oct-21

APPENDIX D: 2021 SURFACE WATER AND GROUNDWATER REPORT

2021 Surface Water and Groundwater Monitoring Report

Peel Feedlot, 848 Mundijong Road Mardella WA

Rural Export and Trading (WA) Pty Ltd

Reference: 754-PEREN283020_R01

14 February 2022

2021 SURFACE WATER AND GROUNDWATER MONITORING REPORT

Peel Feedlot, 848 Mundijong Road Mardella WA

Report reference number: 754-PEREN283020_R01

14 February 2022

PREPARED FOR

Rural Export and Trading (WA) Pty Ltd
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PREPARED BY

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QUALITY INFORMATION

Revision history

Revision	Description	Date	Author	Reviewer	Approver
DraftA.IFR	For internal review	30/01/2022	CV	CB	-
DraftB.IFR	For internal review	09/02/2022	CV	CB	CB
Rev0.IFU	Final for issue	14/02/2022	CV	CB	CB

Distribution

Report Status	No. of copies	Format	Distributed to	Date
DraftB.IFR	1	PDF	RETWA	09/02/2022
Rev0.IFU	1	PDF	RETWA	14/02/2022
Rev0.IFU	1	PDF	Department of Water and Environmental Regulation (DWER)	14/02/2022

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LIST OF FIGURES (ATTACHED)

LIST OF CHARTS

APPENDICES

1. INTRODUCTION

Coffey Services Australia Pty Ltd (Coffey) was engaged by Rural Export & Trading (WA) Pty Ltd (RETWA) to complete an annual report pertaining to the surface water and groundwater monitoring conducted at the Peel Feedlot at 848 Mundijong Road, Mardella, Western Australia (WA) (the site), as illustrated in Figure 1.

The following report provides an annual review of water quality at the site for the 2021 calendar year and completes the reporting requirements of DWER Licence L5200/1988/11.

1.1 BACKGROUND

RETWA has been operating a feedlot at the site since 1978. The activity has been designated as prescribed under the Environmental Protection Act 1986. As such, the property has held a licence to operate from the Department of Water and Environmental Regulation (DWER, formally Department of Environment Regulation, DER) since 1988 (L5200/1988/11) (Appendix A).

An amendment to the licence was issued on the 15 December 2016 (Appendix B). The amendment included requirements for installation of new monitoring wells, to allow better assessment of the perched aquifer and the superficial aquifer directly below. The well installation was undertaken during the 2017 calendar year and the additional requirements of their ongoing monitoring was undertaken.

As part of the site's operation, sheep are transported to the site to become accustomed to pellet feed, whilst awaiting transhipment to the international market. The majority of sheep are kept in raised holding sheds. Solid waste falls through the mesh floor of the holding sheds and is stored below the floor prior to sale off-site to the horticultural and nursery industry. Urine is generally absorbed into the faecal pellets. On occasion, additional sheep are held on a rotational basis in a number of surrounding paddocks that make up the balance of the property. The concentration of sheep in small areas or purpose-specific holding sheds introduces the need for waste management and requires the application of suitable management practices.

Both liquid and solid wastes are generated at the feedlot. Liquid wastes result primarily from stormwater run-off, and solid wastes are mainly comprised of faecal pellets as each feedlot animal produces approximately 7.2 g of manure per kg live weight per day. Stormwater run-off from uncovered feedlots has significant potential to pollute surface water and groundwater, due to elevated nutrient concentrations. In addition, feedlots can become dusty during summer and have the potential to cause a nuisance to neighbouring properties if not controlled. Further dust problems can result from the movement of stock trucks on unsealed roads. A spray irrigation system is installed around the holding sheds to reduce dust.

The site's stormwater runoff from the hardstand and roofed areas is directed by a perimeter drainage system to a large detention and evaporation dam situated on the north-eastern corner of the property. The entry road to the weighbridge and stock handling yards/sheds is sealed.

1.2 LOCATION

The site is located approximately 38 kilometres (km) south of the Perth Central Business District in the Shire of Serpentine Jarrahdale. The regional location is shown in Figure 1.

1.3 LAND USE

The site has been extensively cleared for agricultural purposes and the surrounding area continues to be used predominantly for agricultural activities. The nearest residence to the holding sheds is approximately 1 km to the west with further dust sensitive premises 1.9 km to the northeast and 2 km to the southwest. Historical overstocking has led to the degradation of the property which was addressed by an Agriculture WA Report (Agriculture WA, 1999).

1.4 LAND RESOURCES

The site is located in the northern section of the Peel-Harvey Catchment on the Swan Coastal Plain. Landform has been predominantly part of the Pinjarra Plain group, described by Van Gool (1990) as broad low relief plain comprising predominantly Pleistocene fluvial sediments and some Holocene alluvium associated with major current drainage systems. Major soils are naturally poorly drained and many swamps occur. The main soil types are as follows:

- P3 – Imperfect to poorly drained acidic gradational yellow or grey brown earth and mottled yellow duplex soils, with loam to clay loam surfaces.

  These soils have a fair land capability for agriculture (grazing) with limitations associated with water logging/inundation and salinity and occur on the north margins of the site.
- P1d – Shallow pale sand to sandy loam over clay; imperfect to poorly drained with moderate susceptibility to salinity which occur over the central and south portions of the site and include identified dust susceptible areas.

  These soils (P1d) have a fair land capability for agriculture (grazing) with limitations associated with water logging /inundation, topsoil nutrient retention ability and salinity risk.

Other soil types on the premise include an area of soils in the north of the site associated with alluvial deposits (P4 and P6b soils) and Bassendean Dune Sands (B1a) on the southern boundary of the site. Importantly, Bassendean Dune Sands have a low land capability for agriculture (grazing) with limitations associated with wind erosion (Van Gool, 1990). Dust management measures, related to these sands have previously been described in ATA Environmental (2000).

1.5 CLIMATE DATA – 2021

All available rainfall data was sourced from BOM station number 009039 (Serpentine) due to its proximity to the site (approximately 10km east-southeast). Total rainfall for the reporting year at the Serpentine weather station was 939.2 mm which is higher than the long term average of circa 750 mm, and the highest volume of rain the feedlot has received in over 10 years, particularly in comparison to the last two years which reported 714.2mm (2020) and 605mm (2019).

Chart A below illustrates the total rainfall volumes for the last 10 years, 2011-2021 in Serpentine and long-term average represented by the dashed line.

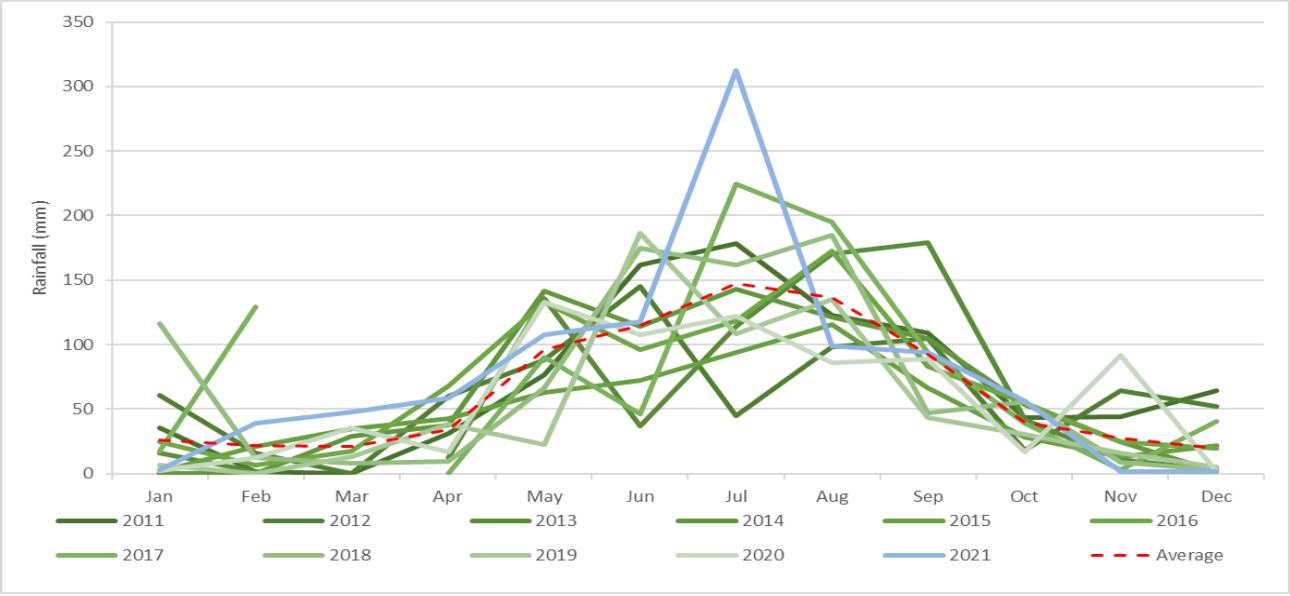

Chart A: Serpentine Weather Station (009039) Rainfall data 2012 – 2021

As illustrated in Chart A above, the rainfall received across 2021 was generally higher in early 2021 from around February to May compared to previous years. In addition, the total for July (312.4mm) was the highest recorded for any month in at least the last 10 years by circa 100mm. Rainfall dropped off from around September through December.

In comparison to the past two years in particular which have had relatively dry winters, where the occurrence of rainfall was generally over heavy isolated and sporadic rain events lasting between a day to a couple days, followed by days and weeks of warmer dry conditions even through winter and spring, rainfall appeared to be more steady across the autumn, winter and spring months which is more typical of Perth conditions.

Daily rainfall for 2021 is shown on Chart B below.

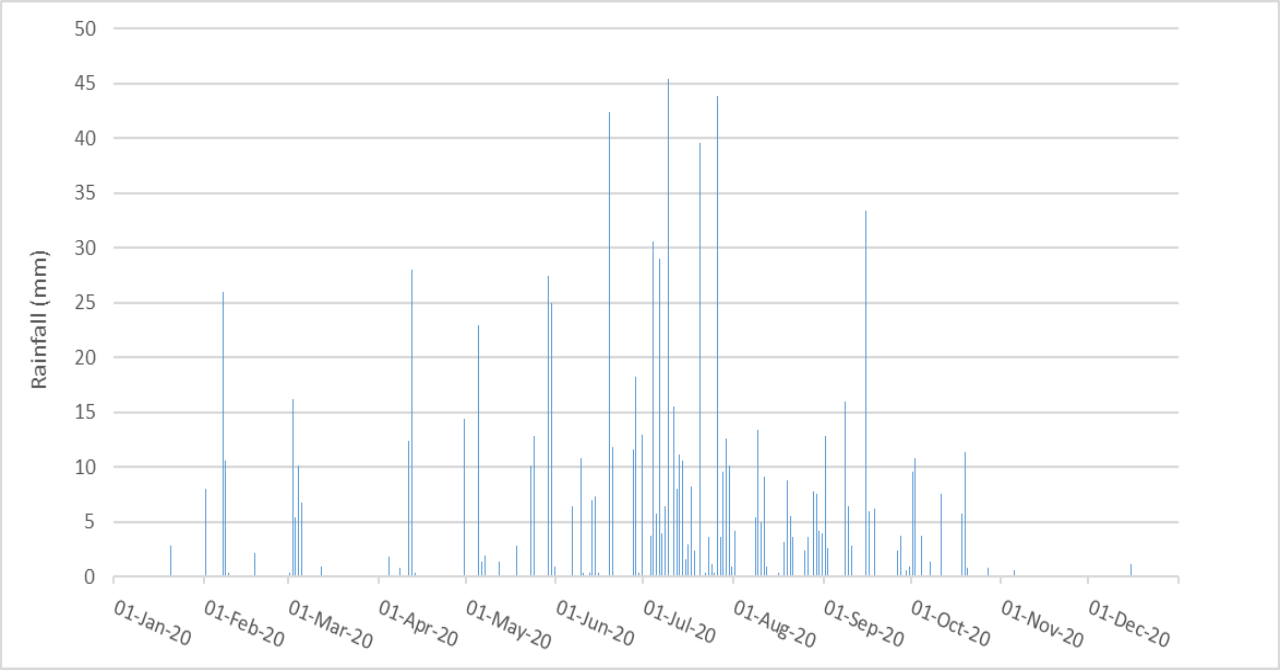

Chart B: Serpentine Weather Station (009039) Daily rainfall 2021

1.6 PURPOSE OF MONITORING REPORT

This report tabulates and graphs the groundwater monitoring results collected under Licence L5200/1988/11, Section 2.3, and interprets these results against relevant criteria and historic trends.

The sampling methodology, sample analysis and assessment criteria against which the monitoring data are compared have been outlined in Section 2. Sampling frequency and associated parameters have been provided in Table A. Sampling locations are summarised in Table B and illustrated in Figure 2.

Table A: Licence Water Monitoring Requirements

Monitoring Sites	Sampling Frequency	Parameter to be measured
Surface Drainage S1, S2 and S3	• Two sample events between April and October, separated by at least one month	pH, EC, Total Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen, Total Phosphorus.
Drainage Channel D1, D2 and D3		
Monitoring Wells MW1D, MW2D, MW3D, MW4D, MW5D and MW1S, MB2, MW3S, MW4S, MW5S	• Six monthly sampling of groundwater monitoring bores within the superficial aquifer, separated by at least 5 months apart; and	pH, EC, SWL, Total Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen, Total Phosphorus.

	• Two sampling events separated by at least one month of groundwater monitoring bores within the seasonally perched aquifer between April and October.	

Table B: Summary of Sample Locations

Sample Type	Location Identification	Description
Groundwater	MW1S, MB2, MW3S, MW4S, MW5S	Monitoring wells screened through the perched aquifer to the base of the confining layer and spread across the site.
Groundwater	MW1D, MW2D, MW3D, MW4D, MW5D	Monitoring wells screened through the superficial aquifer and spread across the site.
Surface Water	S1, S2 and S3	Surface Drainage. Located just outside the northern boundary of the site along a drainage trench that runs along Mundijong Road. The trench is aged and eroded and regularly does not contain water.
	D1, D2 and D3	Drainage Channel. Water from the hardstand areas around the holding sheds is directed to a clay-lined retention basins. The channels form part of the greater drainage system which leads to an evaporation pond in the north of the site.

2. DATA QUALITY OBJECTIVES

The scope of works associated with surface water and groundwater monitoring at the site was undertaken to comply with the DQO methodology outlined in the National Environment Protection Council (NEPC) document (NEPC, 2013a). The DQO process provides a systematic planning approach to developing sampling designs for data collection activities that will ultimately support the conclusions and recommendations provided in this report. This process has seven steps, which have been followed in the planning and execution of this investigation, as summarised in Table C below.

Table C: DQO Method Compliance

Step 1: State the Problem	
The problem	The site has been operating a feedlot at the site since 1978. The activity has been prescribed under the Environmental Protection Act 1986, and accordingly the property has held a licence to operate. Due to the waste generated from animals present on the site any stormwater run-off from uncovered feedlots has significant potential to pollute surface water and groundwater, due to elevated nutrient concentrations. These potential issues require monitoring and assessment under the site's current licence.
Step 2: Identify the goal of the study	
Objective	The objective of the study is to understand the surface water and groundwater conditions present at the site, whether they meet licence conditions and to understand if site activities are impacting groundwater and to what extent.
Step 3: Identify the information inputs	
Media Requiring Assessment	Surface water present onsite and groundwater beneath the site, within the site boundary.
Environmental Parameters to be Measured in Each Media	COPCs identified at the site are summarised in Table A above.
Assessment Criteria	Assessment Criteria are defined in Section 3.
Analytical Methods	Samples were sent to NATA accredited laboratories. A laboratory quality assurance assessment is provided in Section 5.
Step 4: Define the boundaries of the study	
Investigation Boundary	The boundary of the investigation area was defined as the site property, as identified in Figure 1.
Constraints That May Affect the Assessment	Identified constraints which may have impeded the investigation included: • Site and weather / rainfall conditions prior and at the time of sampling. • Absence of water within the perched aquifer. • Absence of water within surface water sampling locations. • Accuracy of samples based on known limitations associated with the selected sampling methodology. • Accuracy of sample locations based on the inferred nutrient impacts in groundwater and of the inferred location of the source.
Step 5: Develop the analytical approach	
Decision Rules	The decision rules for the project have been based on an analysis of current and future land uses, potential receptors and waste classification which in turn led to the selection of assessment criteria for the site. If the adopted assessment criteria are exceeded, the need for further action will be reviewed, including the following actions: • Assessment of the requirement for further investigations and/or management. • Assessment of the requirement for a site-specific environmental and/ or health risk assessment.

Step 6: Specify performance or acceptance criteria	
Baseline Condition	The baseline condition for the assessment assumes that conditions are suitable for the proposed land use and are not impacting identified receptors. The baseline condition will remain true unless data is presented to indicate otherwise.
Decision Errors	The following specifies the decision errors in which incorrect decisions can be made based on data that is not representative of site conditions. As outlined in NEPC (2013a) NEPM Schedule B2 there are two types of decision errors as follows. • An insufficient sampling program resulting in the inability to satisfactorily characterise the presence of contaminants across the site. • Errors occurring during the collection, handling, preparation and analysis of samples. Consequences of these decision errors will include the following. • Concluding that the site is contributing to nutrients into the groundwater aquifer when it is not. • Concluding that the site is not contributing to nutrients into the groundwater aquifer when it is. • Incorrect risk assessment of the site. In order to ensure the results are suitably accurate and reproducible for use in the decision-making process, the quality assurance and quality control QA/QC procedures documented in Section 5 have been followed.
Step 7: Develop the plan for obtaining data	
Optimisation of Data	To optimise the data collected during sampling, this investigation was conducted in accordance with NEPC (2013a). Furthermore, to ensure the data collected was suitable for interpretation during sample collection the following were adhered to. • Optimisation of laboratory limit of reporting (LOR) to be at or less than the environmental assessment criteria where practicable. • Samples collected using dedicated sampling containers. • QA/QC protocols adhered to. • Collection of duplicate samples to assess the reproducibility of the field sampling program.

3. METHODOLOGY

Standing Water Levels (SWL's) were measured monthly by RETWA staff using a water level meter and reported to Coffey staff monthly as an input to the decision to undertake sampling. In conjunction with this, rainfall events are also taken into consideration as the surface water samples S1-S3 located along Mundijong Road heavily rely on recent rainfall.

The sampling schedule according to the licence L5200/1988/11 is as follows:

- Six monthly sampling of the superficial aquifer wells (MW1D to MW5D), which must be undertaken at least 5 months apart.

  Two sampling events a year of the perched aquifer wells (MW1S, MB2, MW3S, MW4S and MW5S), to be conducted between April and October with at least one month separating the sampling events.
- Two sampling events a year of the surface sampling locations, to be conducted between April and October with at least one month separating the sampling events.

3.1 GROUNDWATER AND SURFACE WATER SAMPLING METHODOLOGY

Field activities were conducted at the site in accordance with Coffey's Standard Operating Procedures (SOPs) and with reference to the following Australian Standards:

- AS5667.1:1998 Water quality - Sampling - Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.
- AS5667.11:1998 Water quality - Sampling - Guidance on sampling of groundwaters.
- DoW, Field Sampling Guidelines: A guideline for field sampling for surface water quality monitoring programs. January 2009.

Sample locations are presented in Figure 2.

Table D: Sampling Methodology

Activity	Details
Surface Water	
Date of field activities	22 June 2021 and 28 September 2021. 13 July 2021 – by RETWA feedlot personnel (three surface water samples only)
Field surface water quality monitoring	Water quality at the allocated surface water sampling locations was analysed by a multi parameter water meter (YSI) for water quality parameters (pH, oxidative/reduction potential, DO, temperature and electrical conductivity). Field surface water quality data sheets are contained in Appendix C and field data is presented in Tables 2 and 3. For the three surface water samples collected by RETWA feedlot personnel in July, no infield water quality parameters were obtained. However, pH and EC were analysed by the laboratory.
Sample methodology	Surface water samples were collected using a grab-pole with an attached sampling vessel which is lowered to 15cm below surface water level. The mouth of the vessel was submerged into the water until it filled. The samples were collected with consideration to relevant guidelines such as Department of Water (DoW) (2009) 'Field Sampling Guidelines, A guideline for Field Sampling for Surface Water Quality Monitoring Programs'. Surface water samples were transferred into the laboratory supplied sample container for the respective COPC. Samples were stored in laboratory provided bottles prepared according to AS/NZS 5667.1:1998 (Standards Australia, 1998).
Sample preservation	Samples were stored on ice, in an insulated esky whilst on site and during freight transportation to the laboratory. Samples were stored in laboratory provided bottles prepared according to AS/NZS 5667.1:1998 (Standards Australia, 1998).
Decontamination procedure	Water monitoring equipment such as the multi parameter water meter (YSI) was rinsed with DI water between sample locations. The sample containers used with the sample pole were

Activity	Details
	replaced between sampling locations to prevent cross contamination. Dedicated disposable nitrile gloves were used during the collection of each sample.
Groundwater	
Date of field activities	Superficial: 15 March 2021 and 28 September 2021 Perched: 22 June 2021 and 28 September 2021
Well gauging	The groundwater monitoring wells were gauged using an oil/water interface probe (IP) to measure the static water level (SWL), End of Hole (EoH) and presence of any light non-aqueous hydrocarbons (LNAPL). The IP was decontaminated between each monitoring well. All well gauging was undertaken prior to purging and sampling. Field gauging sheets are contained in Appendix C and data presented in Tables 1-3.
Well purging and field parameters	Groundwater wells were purged using a submersible 12volt pump, with the volume purged measured using an appropriately marked bucket. Groundwater samples were collected and the following water quality parameters were recorded using a YSI water quality meter. This unit was calibrated by the supplier prior to use: • pH - ±0.05; • Temperature° - ±10%; • Electrical Conductivity (µs/cm) - ±3%; • Dissolved Oxygen (mg/L) - ±10%; and • Redox Potential (mV) - ±10%. Field groundwater quality data sheets are contained in Appendix C and data presented in Tables 1-3. Calibration certificates are contained in Appendix C.
Disposal of purged groundwater	Given the relatively low volume of purge water to be removed and the nature of the known contaminants at the site, groundwater recovered during purging of monitoring wells was returned to ground. No gross impacts were encountered which would warrant offsite disposal.
Sample acquisition	Following purging, sample collection occurred once parameters have stabilised. Care was taken when filling sample containers to ensure that the rim of the sample container is not touched by fingers, gloves, or the tubing. Aeration of the sample was also avoided during transfer – i.e. gently and carefully pour the sample into the sample container in a steady stream. Where appropriate the flow rate was adjusted to minimise aeration during sample collection.
Sample preservation	Samples were stored on ice, in an insulated esky whilst on site and during freight transportation to the laboratory. Samples were stored in laboratory provided bottles prepared according to AS/NZS 5667.1:1998 (Standards Australia, 1998).
Decontamination procedure	The interface probe (IP) and water quality meter were rinsed with scheme water between wells. Dedicated disposable nitrile gloves were used for each sample location.

3.2 WATER ANALYSIS

Laboratory analysis of all primary and duplicate samples was undertaken by ALS, with triplicate samples sent to Eurofins laboratory. All laboratories are NATA accredited laboratories for the analyses undertaken. Samples from each location were analysed for the parameters outlined in Table E below consistent with Licence L5200/1988/11 Tables 2.3.1 and 2.3.2. In addition to the laboratory analysis pH and electrical conductivity were recorded in the field.

Table E: Water Analysis

Media	Required Analytes
Surface Water	pH, EC, Total Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen and Total Phosphorous
Groundwater	pH, EC, Total Nitrogen, Nitrate Nitrogen, Ammonia Nitrogen and Total Phosphorous

3.3 ADOPTED WATER ASSESSMENT CRITERIA

The DWER publication: Assessment and Management of Contaminated Sites – Contaminated Sites Guidelines (DWER, 2021) is the primary guidance on the assessment and management of contaminated sites in Western Australia. The document works within the legislative framework provided by the CS Act and the Contaminated Sites Regulations; as well as the revised national site assessment framework provided in NEPM (2013).

3.3.1 Water Level Criteria

The general trend over the last 20 years has been a reduction in annual rainfall throughout the Perth Metropolitan Area that has resulted in the gradual decrease of groundwater levels.

Accordingly, extra care is taken to ensure water is present in the wells before conducting the sampling events. Coffey monitor the dipping data received by RETWA in addition to verbal contact with site personnel to confirm drain and surface water flow is present following a rainfall event, and sufficient water is available in the monitoring wells.

3.3.2 Water Quality Criteria

The adopted water quality criteria used to assess the groundwater conditions beneath the site is based on the highest beneficial use for groundwater i.e. for irrigation (based on TDS values and most likely use). It is also understood that the area has supplied scheme water and as such has no need to abstract groundwater for potable purposes. Similarly, stock drinking water is sourced from two fresh water bores which are sampled annually and reported to RETWA separately. The nearest surface water body is Tamworth Wetlands, Rockingham Lakes and Leda Nature Reserve (approximately 10kms) to the west of the site followed by Lake Cooloongup and Lake Walyungup (approximately 11kms).

On that basis, the adopted water quality criteria used to assess the groundwater conditions beneath the site is as follows:

- Superficial background concentrations from Hydrogeology and Groundwater Resources of the Perth Region, Western Australia (Davidson, 1995).

  In respect to nitrate concentrations, Davidson, 1995 states that *"… in the rural grazing areas, low nitrate concentrations of the groundwater reflect the low nitrate input to the groundwater from animal faeces. Along the coast, in the limestone belt where Acacia vegetation is abundant, nitrate concentrations tend to be slightly higher (1-7 mg/L) reflecting rapid passage of enriched water derived from the nitrogen-fixing vegetation".*

  As the feedlot doesn't specifically identify as one of the above descriptions, for the purposes of this assessment, background levels of nitrate are identified to be 4 mg/L, the median of the 1-7 mg/L range.
- Australia and New Zealand Environment Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000). Water Quality Guidelines for Fresh and Marine Waters and Long-term or Short-term irrigation water quality – Short and Long Term Irrigation.
- Australia and New Zealand Guidelines (2018) Water Quality Guidelines – Freshwater Quality 95% Species Protection

Whilst the updated ANZG, 2018 Water Quality Guidelines provide a number of default guidelines for freshwater ecosystems, it emphasises the use of site-derived criteria or using a suitable nearby reference site. However, no suitable reference site or site-derived criteria have been derived for the feedlot. Values for ammonia and nitrate have been obtained from ANZG (2018), however in the absence of specific ANZG, 2018 pH, TDS, total nitrogen and total phosphorus criteria, the superseded ANZECC & ARMCANZ (2000) Southwest Australian Aquatic Ecosystems – Wetlands (Table 3.3.6) criteria have been adopted. It is noted

however, that values for total phosphorus and total nitrogen are an order of magnitude lower then ANZG, 2018 ammonia and nitrate concentrations and are therefore considered overly conservative.

Table F: Summary of Adopted Water Quality Criteria

Adopted Water Quality Criteria							
Guideline	**pH**	**EC**	**TDS**	**Total N**	**Total P**	**Ammonia**	**Nitrate**
ANZECC & ARMCANZ (2000) Irrigation [a]	6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE
ANZG (2018) Protection of Aquatic Ecosystems [b]	7.0-8.5 [2]	NE	192-960 [2]	1.5 [2]	0.06 [2]	2.57	2.4 [3]
Davidson (1995) Range Superficial Background [c]	6.5-8.5	NE	2000	NR	0.2	NE	4

a. ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
b. ANZECC & ARMCANZ (2000) Southwest Australian Aquatic Ecosystems – Wetlands
c. Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.1.
1 site specific
2 In the absence of ANGZ (2018), refer Table 3.3.6 Southwest Australian Aquatic Ecosystems – Wetlands, ANZECC & ARMCANZ (2000)
3 Obtained from NIWA (2013) as referred to by ANZG (2018)
4 Median of 1 – 7 mg/L for rural grazing areas as outlined in Davidson (1995)
NE. criteria not established

3.4 CONTAMINANTS

Nutrients have the potential to reach water systems through various sources. These include sewerage, plant matter, organic animal wastes, fertilisers and kitchen wastes (including detergents). In the case of the site, nutrient from animal wastes (e.g. droppings) are the primary contaminant of concern. High levels of nutrients in the form of nitrogen and phosphorus from animal wastes can result in the accumulation of nutrients and excessive growth of algae in wetlands and waterways to which they discharge. It has been noted that parameters such as Biochemical Oxygen Demand (BOD), turbidity, and suspended solids are relevant to surface water systems and are not as relevant to groundwater.

4. RESULTS

4.1 GENERAL

All field activities at the site were undertaken in line with Table A (Section 1.6 of this report).

All sampling locations (monitoring wells and surface water sampling points) were able to be sampled during the 2021 monitoring period with the exception of a 2nd sampling event for MW4S and MW5S, which were not reported to have water until the end of July. Details are provided below.

Field data has been tabulated in Tables 1 to 3 and laboratory data screened against relevant criteria can be found in Table 4 to 6, with a historic data tabulated in Table 7. A reference table for results charts is presented in Table G below.

Table G: Summary of Ground and Surface Water Presentation

Parameter (abbreviation)	Location	Report Section
Rainfall	Chart A & B	Section 1.5
Static Water Levels (SWL)	Chart C & D	Section 4.2
pH	Chart E, F, G & H	Section 4.3
Nitrate Nitrogen (NO_2)	Chart I, J, K & L	Section 4.4
Ammonia Nitrogen (NH_4)	Chart M, N, O & P	Section 4.5
Total Nitrogen (TN)	Chart Q, R, S & T	Section 4.6
Total Phosphorus (TP)	Chart U, V, W & X	Section 4.7

4.1.1 Sampling limitations / non-compliances

Perched groundwater wells MW4S and MW5S

Coffey attempted to sample MW4S and MW5S at the end of June 2021 when the other perched wells and surface locations were reported to have water, however both wells were dry in addition to the surface water locations. The surface water locations were able to be resampled in mid-July 2021 by RETWA feedlot personnel at the time surface water was identified onsite. However, due to the site being waterlogged in the later part of July and August from heavy rainfall, July dip data was not able to be obtained by RETWA feedlot personnel and provided to Coffey until mid to late August, whereby it was identified MW4S and MW5S had sufficient water for sampling. All locations were subsequently sampled in September when site could be safely accessed. Due to the requirement for perched wells to be sampled at least a month apart prior to the end of October, a second sample for MW4S and MW5S was not able to be obtained for 2021.

Therefore MW4S and MW5S were overall non-compliant with the licence condition "*two sample events between April and October, separated by at least one month"* as they were only sampled once in September. This is considered an inability to comply.

4.2 GROUNDWATER STATIC WATER LEVEL

The static groundwater water level (SWL) was measured by RETWA staff using a water level meter on a monthly basis, generally the last day of the month and then reported to Coffey, this data has been adopted to assess seasonal groundwater patterns at the site.

Chart C below illustrates the groundwater SWL corrected into metres Australian Height Datum (AHD) which was measured by RETWA staff using a water level meter on a monthly basis of the monitoring wells within the

superficial aquifer. Chart D below illustrates the groundwater SWL corrected into metres Australian Height Datum (AHD) which was measured by RETWA staff using a water level meter on a monthly basis of the monitoring wells within the perched aquifer.

Chart C: Monthly Groundwater Levels (m AHD) – <u>Superficial</u> Aquifer

Chart D: Monthly Groundwater Levels (m AHD) – <u>Perched</u> Aquifer

Groundwater levels within the superficial aquifer generally followed a seasonal trend related to rainfall patterns. Peak groundwater levels were recorded after winter, in July, while the lowest groundwater levels were recorded in early winter, May / June. This was similar to the perched aquifer. However, all perched monitoring wells recorded low groundwater levels in the summer and autumn months, most remaining dry until water levels increased in June or July, where water levels then dropped off from August onwards.

This seasonal trend observed within both the superficial and perched aquifers indicates that the aquifers are likely hydraulically connected, which is supported by the rapid infiltration of rainfall within MB2, MW4S and MW5S which are historically drier for more periods of the year.

SWL data taken during the monitoring events, corrected for metres Australian Height Datum (AHD) where used to create hydrological plans of the groundwater for both the perched and superficial aquifer (Figures 3 to 5). The overall generalised direction of groundwater flow onsite, for both the perched and superficial aquifers, indicates flow from east to west, which is consistent with previous investigations.

However, in 2018, 2019 and to an extent 2020, minor mounding was noted near the dam within the superficial aquifer which affected the groundwater flow around the MW1D and MW2D locations and was likely due to low water levels within the dam from decreased rainfall. There appears to be a more pronounced groundwater flow around the dam and MW1D and MW2D extending offsite to the north-east within 2021, localised to that portion of the site, which may suggest that offsite activies on neighbouring lots are potentially influencing local groundwater flow. Furthermore, an additional investigation (Coffey, 2020) undertaken on the feedlot at the east boundary near MW3S/MW3D in 2020 to assess the potential cause of acidification in groudnwater near MW3 indicated that flow direction was north-westerly in that immediate area with slight mounding evident at MW3 further supporting the potential for an offsite influence in that portion of the site.

Overall, it is also noted that flow direction of the perched aquifer may be variable during the summer and autumn months.

As will be noted in the following sections, a seasonal pattern is evident in monitoring wells whereby nutrient concentrations are higher during the winter months as compared to later in the year when nutrient concentrations are lower. The seasonal increase during the winter months are likely a result of increased rainfall resulting in vertical migration of water through the surface geology dissolving any available nutrient compounds on the surface.

4.3 PH

pH is a measure of hydrogen ion concentration on a scale of 0 to 14, and is used to specify the acidity or basicity of an aqueous solution. A pH of 7 is considered to be neutral, less than 7 is considered to be acidic and greater than 7 is considered to be alkaline. The background pH values of the groundwater conditions range from 4.0 to 6.3 (Davidson, 1995), marginally acidic.

4.3.1 Monitoring Bores

Perched Aquifer

The pH ranged from 5.08 – 5.81 within MW1S, MB2 and MW3S in June 2021. MW4S and MW5S were dry and unable to be sampled. pH ranged from 4.61 (MW3S) – 6.93 (MW4S) in September 2021, indicating that pH concentrations in monitoring wells is considered to be marginally acidic to acidic. pH is illustrated in Chart E below (over page).

All monitoring well pH measurements in 2020 were below the lower pH limit for Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) of 7.0. Additionally, all monitoring bores with the exception of MW2, MW4S and MW5S in September 2021, exceeded the lower pH limit of the long-term or short-term irrigation water (ANZECC & ARMCANZ, 2000) of 6.0.

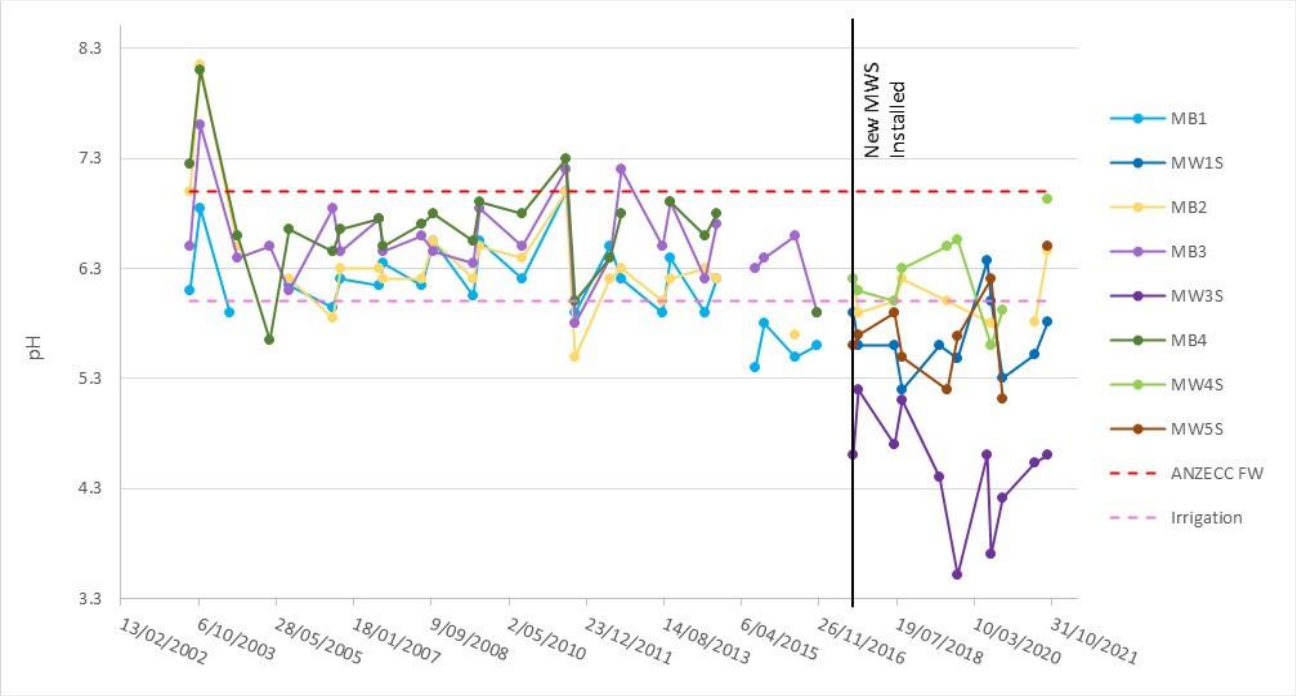

Chart E: pH - Perched Aquifer

pH within all wells are observed to be slowly decreasing over time since 2022, becoming more acidic. Since 2016 however, pH has generally remained within similar ranges. It is observed that pH within MW3S is consistently lower than other monitoring bores, and had decreased to the lowest levels encounted in 2019 and 2020 (circa pH of 3.5). pH levels within 2021 have increased to circa 4.5 within both sampling rounds.

The consistently lower (acidic) pH values at MW3S is likely to be as a result of the revised location, which is slightly further south of the original MB3 location. MW3S is now located down-hydraulic gradient of the neighbouring cattle yard, rather than a shed. Furthermore, based on the additional investigation undertaken in 2020 (Coffey, 2020), it was concluded that the likely cause of acidification in groundwater was from the nitrification process, as the result of an inorganic input causing acidification of groundwater, as opposed to the presence of acid sulfate soils (ASS) beneath the site and it was assumed that based on the results that the main source in this area most likely to be contributing nitrate into groundwater is the upgradient neighbouring cattle yard and shed.

Superficial Aquifer

pH ranged from 3.81 (MW3D) to 6.76 (MW2D) in March 2021, and 3.64 (MW3D) to 6.42 (MW4D) in September 2021. The pH concentrations observed in the monitoring wells are considered to be acidic to slightly acidic.

As illustrated by Chart F pH readings for all wells were below the lower pH limit for Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) of 7.0. Additionally, all monitoring bores with the exception of MW2D and MB4D exceeded pH concentrations below the lower pH limit of the Long-term or Short-term irrigation water (ANZECC & ARMCANZ, 2000) of 6.0 throughout 2021.

Chart F illustrates the pH data obtained since 2016. The chart indicates that with the exception of MW5D, pH in the superficial aquifer are generally consistent during both 2021 monitoring rounds. pH within MW5D, which is located down hydraulic gradient of the onsite cattle sheds dropped from 5.73 in March 2021 to 4.65 in September 2021, however pH is still higher in comparison to 2020 when it dropped abnormally low at this location.

pH does appear to have slightly increased within MW2D and MW4D, and to a lesser degree MW1D, over time. Conversely, pH within MW3D, and MW5D appears to be decreasing. pH within MW5D, which decreased significantly in 2020, was reported more within historical ranges in 2021. pH within MW3D continues to decrease. The average pH of the monitoring wells in the perched aquifer is consistently higher than those installed in the superficial aquifer (which are more acidic).

Chart F:pH - Superficial Aquifer

4.3.2 Surface Waters

Onsite Drainage Channels

The results are illustrated by Chart G below. pH ranged from 7.77 – 7.85 in June 2021, and 7.47-7.60 in September 2021. The pH concentrations observed in the drainage channels are considered to be neutral, likely to be as a result of rainwater being the largest component of the water. All results obtained were within the range of the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria and are comparable to historical results. No overall trend is evident in that data.

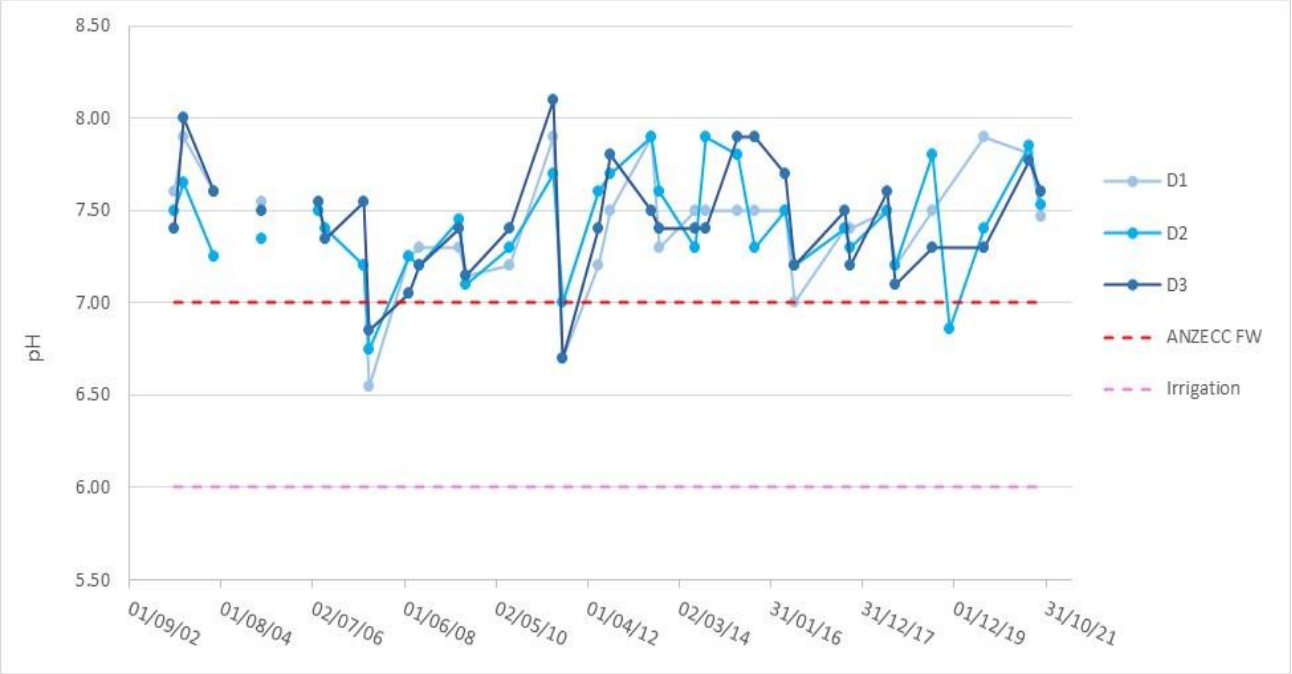

Chart G: pH – Drainage Channels pH

Front Property Surface Water Monitoring Points

The results are illustrated by Chart H below. pH ranged from 7.10-7.12 in June 2021, and 7.19-7.47 in September 2021. The reported pH values are considered neutral and are comparable to historic results. It should be noted that there is typically limited surface water available to sample at these locations and given their location, may not be representative of site surface water runoff. All of the surface samples reported pH concentrations within the range of the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria. No overall trend if evident in the data.

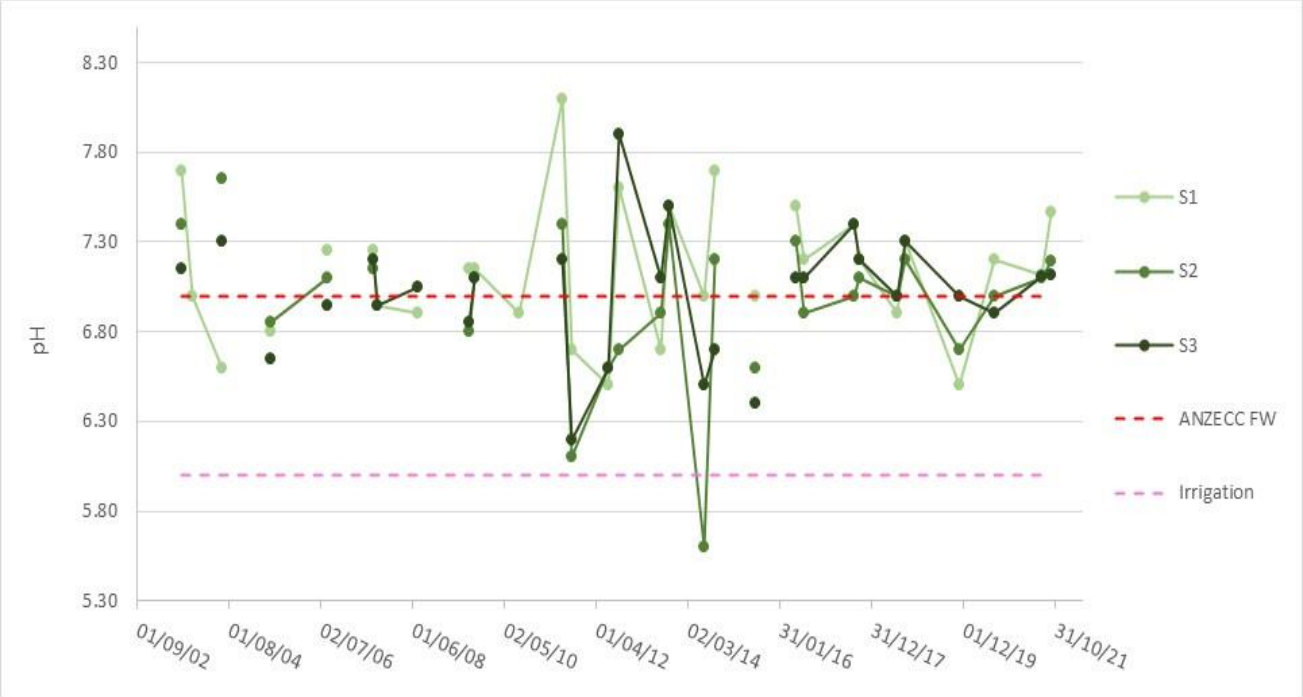

Chart H: Surface Water pH

4.4 TOTAL NITROGEN (TN)

The most likely sensitive receptor which may be impacted will be the wetlands to the west receiving either superficial groundwater flows or drainage discharges. The guideline criteria from the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) is 1.5 mg/l, but no natural ranges for TN are identified in ANZECC & ARMCANZ (2000), nor are any criteria or mass loadings for TN indicated in Licence 5200/1998/11.

As noted within Section 3.3.2, in relation to the discussion below, the superseded TN criteria of 1.5 mg/L (ANZECC & ARMCANZ, 2000) is adopted in the absence of ANZG (2018) and is considered highly conservative.

4.4.1 Monitoring Bores

Perched Aquifer

Concentrations ranged from 83 mg/l (MW1S) to 25.6 mg/L (MB2) in June 2021, and from 1.2 mg/L (MW1S) to 9.5 mg/L (MW3S) in September 2021. All groundwater wells with the exception of MW1S in September 2021 reported concentrations of total nitrogen above the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria. Total nitrogen concentrations recorded during the 2021 period where generally comparable to historical levels, although it is noted that MW2 reported higher concentrations in March 2021 which haven't been observed since 2011-2015. Concentrations did subsequently decrease in September 2021 to those levels observed in recent years.

The highest concentrations of total nitrogen were reported in MW3S, located up gradient of site activities, which consistently reports concentrations an order of magnitude higher than other onsite monitoring wells. Results suggest that the neighbouring cattle sheds are likely the main source of nitrogen migrating onsite. However, concentrations of total nitrogen within MW5S, located down gradient of the onsite holding sheds, are higher than those reported within MW4S (located down gradient of site activities) indicating that the site may also be contributing to a source of nitrogen, although to a localised and lesser degree.

Concentrations are shown in Chart I below.

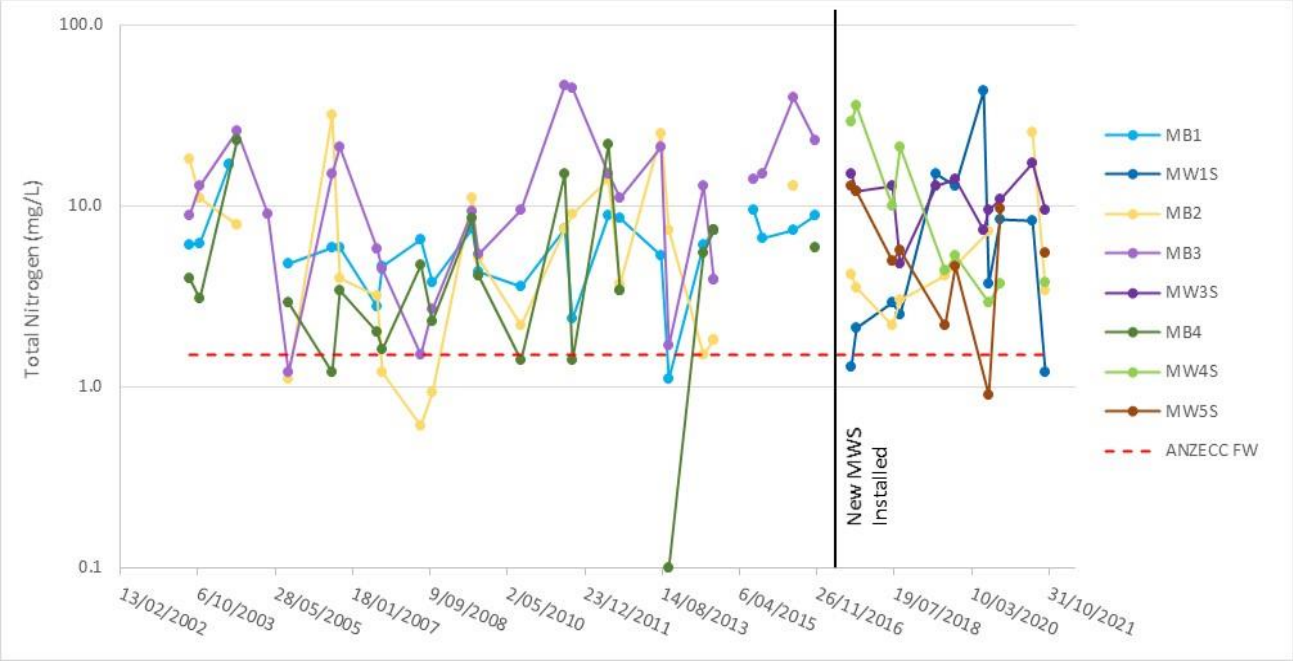

Chart I: Perched Aquifer – Total Nitrogen

Superficial Aquifer

Concentrations ranged from below the LOR, <0.01 mg/L (MW4S) to 31.3 mg/L (MW2D) in March 2021 and from below the LOR, <0.01 mg/L (MW4S) to 16.7 mg/L (MW2D) in September 2021. Total nitrogen was reported above the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria within MW2D and MW3D in 2021, and MW1D in September 2021 only.

Concentrations are shown in Chart J below.

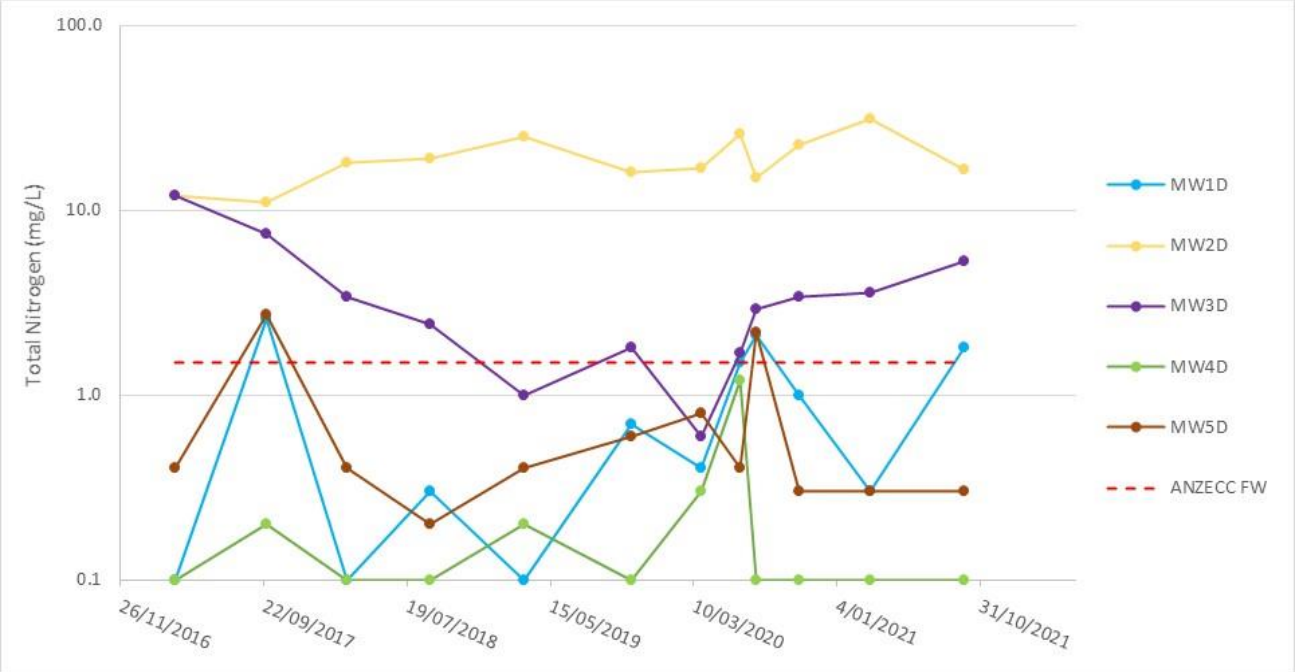

Chart J: Superficial Aquifer – Total Nitrogen

MW2D, which consistently reports concentrations an order of magnitude higher than other monitoring wells, is located immediately down gradient of the onsite evaporation dam which receives drainage water from within the vicinity of the holdings sheds (in addition to surface runoff and rainfall). MW3D, which reported elevated concentrations however less than MW2D, is located up gradient of any site activities immediately down hydraulic gradient of the neighbouring cattle sheds.

Results indicate that due to the elevated concentrations within MW2D, the evaporation pond is likely the main source of organic nitrogen onsite. Additionally, the neighbouring cattle sheds are likely to be the source of nitrogen within MW3D. Concentrations within both MW5D, located down gradient of the holding sheds, and furthermore MW4D, located down gradient of the site, report much lower concentrations, well below adopted criteria indicating that total nitrogen onsite does not appear to pose a risk to down hydraulic gradient receptors.

Concentrations within MW3D were historically decreasing until 2019 (from 2016) where they have slowly increased. Continual monitoring is required to determine if increasing concentrations are a longer term trend.

Concentrations are shown in Chart J below.

4.4.2 Surface Water

Drainage Channels

Concentrations ranged from 5.2 mg/L (D2) to 9 mg/L (D3) in June 2021, and from 3.2 mg/L (D3) to 7.3 mg/L (D2) in September 2021. All samples were reported above the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria.

Total nitrogen concentrations within the drains are highly variable and do not appear to have any obvious trend, however are comparable to historical levels. It is noted that concentrations are slightly lower than those reported in recent years, are more comparable to those observed in 2017. On average, drain samples are consistently higher in concentration than surface water samples (detailed further below).

Concentrations are shown in Chart K below.

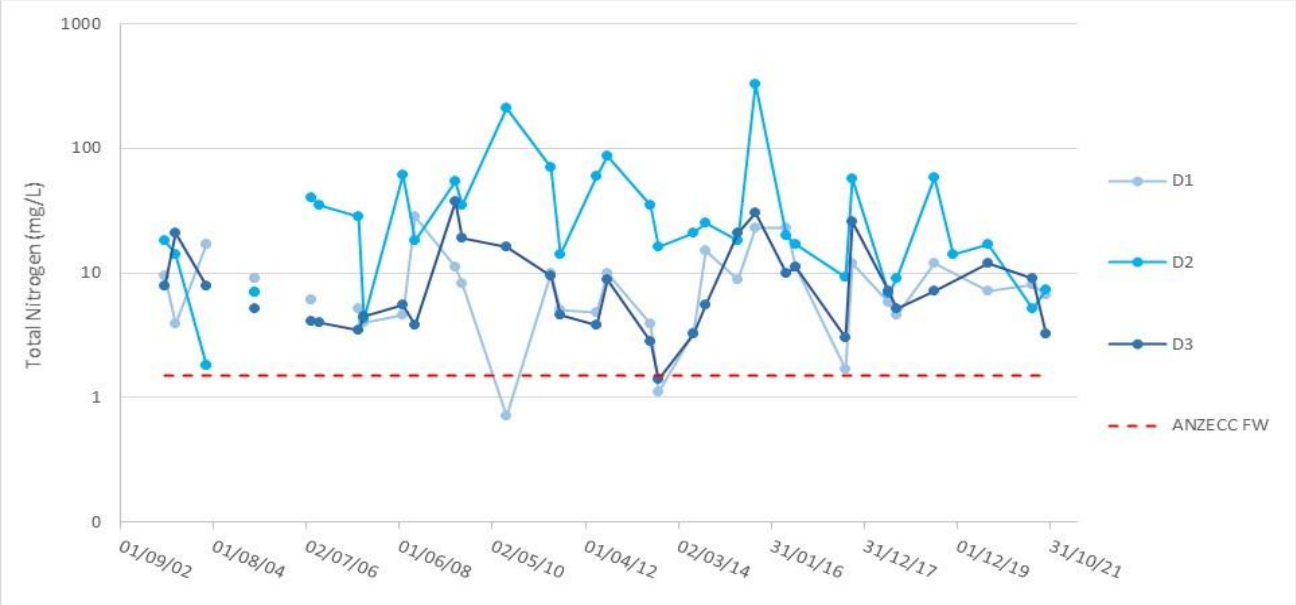

Chart K: Drainage Channels – Total Nitrogen

Front Property Surface Water Monitoring Points

Concentrations ranged from 1.8 mg/L (D1) to 1.9 mg/L (S2/S3) in July 2021, and from 2.1 mg/L (S1) to 3.9 mg/L (S3) in September 2021. All samples were reported below the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria in September 2021, however were all marginally above in July 2021.

Similarly to the drain samples, total nitrogen concentrations within the surface water points are highly variable and do not appear to have any obvious trend, however are comparable to historical levels.

Concentrations are shown in Chart L (over page).

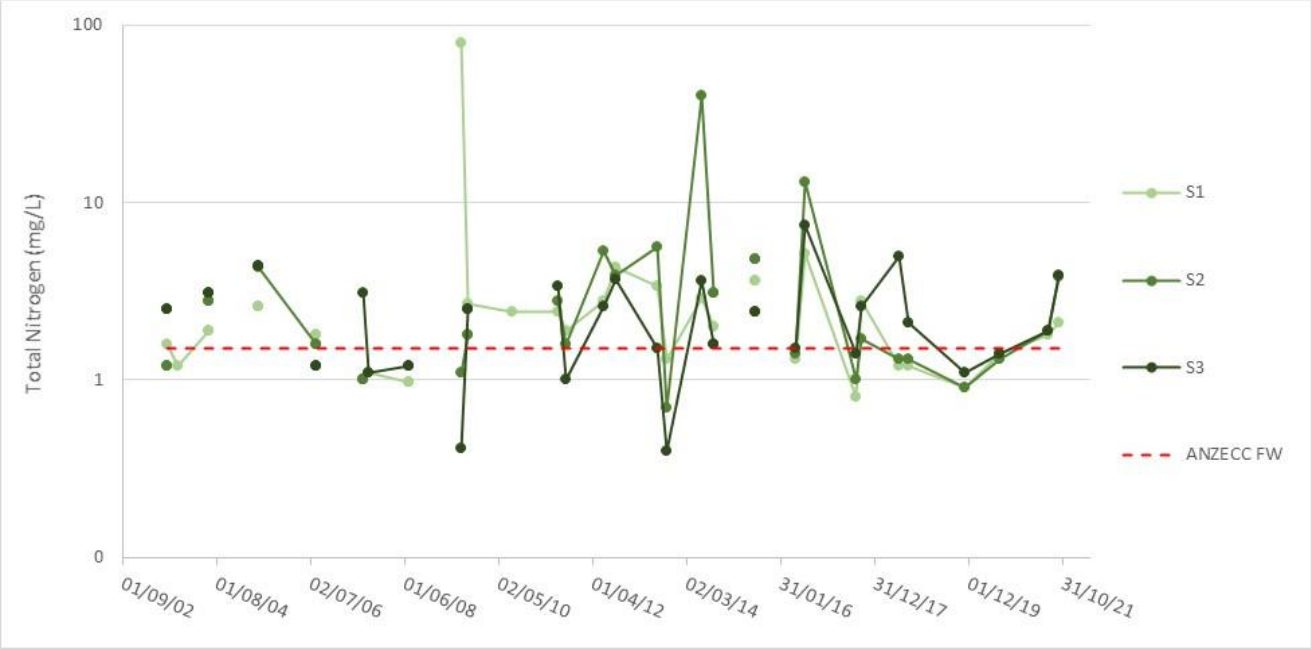

Chart L: Surface Waters – Total Nitrogen

4.5 AMMONIA

The most likely sensitive receptor impacted by ammonia would be wetlands located to the west of the site receiving either superficial groundwater flows or drainage discharges. The guideline criteria from the Water Quality Guidelines for Freshwater (ANZG, 2018), 2.57 mg/L, is applied. No concentrations or mass loadings for ammonia nitrogen are indicated in Licence 5200/1988/11.

4.5.1 Monitoring Bores

Perched Aquifer

Ammonia was reported well below the adopted assessment criteria at all locations in 2021. Ammonia ranged from 0.02 mg/L (MW2 and MW3S) to 0.35 mg/L (MW1S) in June 2021, and 0.04 mg/L (MW3S and MW4S) to 0.11 mg/L (MW2) in September 2021.

Ammonia concentrations in groundwater were comparable to historical levels, however are highly variable and do not appear to have obvious trends.

Given the variable concentrations of ammonia within all wells, which are located over the site both up and down gradient of site operations and infrastructure, this indicates that both onsite and offsite activities are likely to be contributing to ammonia concentrations within the perched aquifer, however generally remain below the adopted criteria.

It was observed in 2020 that ammonia within down-gradient MW4S had been significantly increasing since 2016, and that further monitoring was required long term. Based on the results from 2021 ammonia has decreased, although only one monitoring round in September 2021 was able to be undertaken and therefore monitoring should continue in the future.

Ammonia is shown below in Chart M (over page).

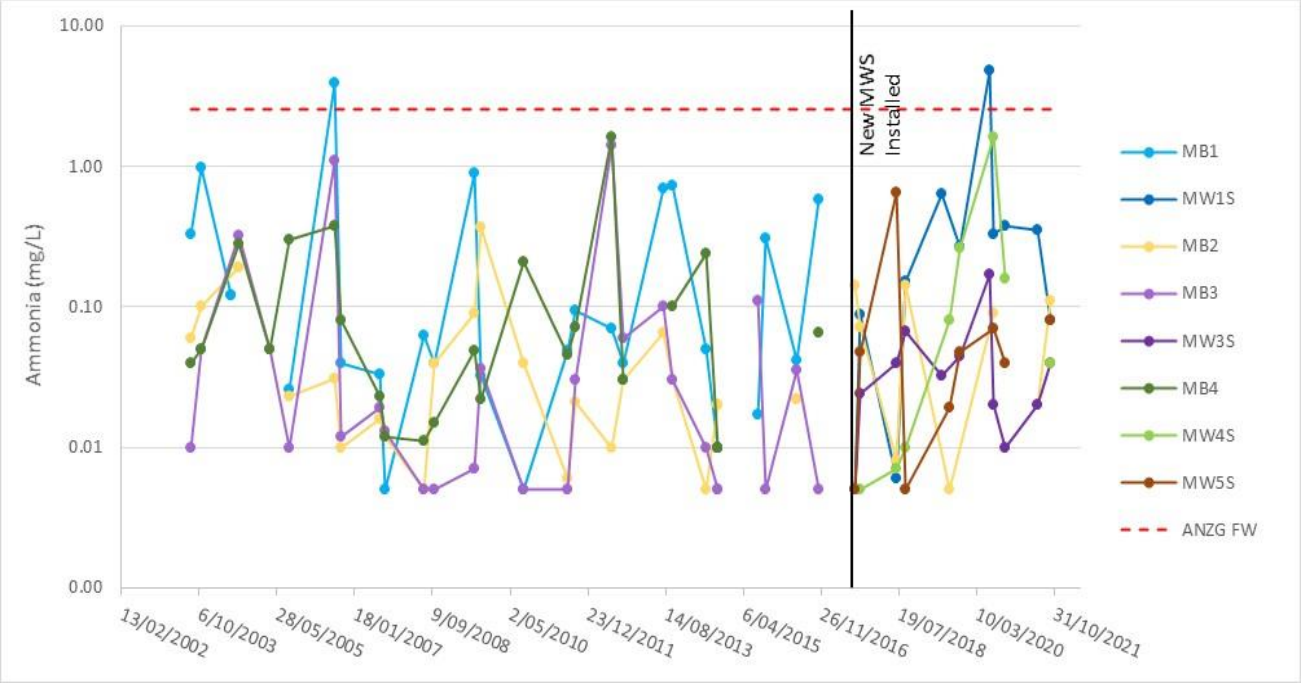

Chart M: Perched Aquifer – Ammonia

Superficial Aquifer

Concentrations of ammonia were reported below the adopted criteria within all locations in 2021. Concentrations are shown on Chart N below.

Chart N: Superficial Aquifer - Ammonia

The highest concentrations were both reported in MW3D (0.15 and 0.18 mg/L respectively) in both March and September, which is located up gradient of any site activities, immediately down gradient of the neighbouring cattle shed. Concentrations appear to be relatively stable at this location since 2016.

Ammonia concentrations in groundwater at MW5D (located immediately down gradient of the holding shed) and MW4D, located down gradient of site activies, appear to be steadily increasing although have plateaued within both 2020 and 2021, and appear to have decreased in September 2021.

The results obtained suggest that the neighbouring cattle feed property is likely the main contributor to ammonia concentrations in the superficial aquifer, and to a smaller extent the onsite holding sheds.

4.5.2 Surface Water

Drainage Channels

Ammonia concentrations ranged from 0.98 mg/L (D2) to 4.66 mg/L (D1) in June 2021, and from 0.48 mg/L (D3) to 1.35 mg/L (D2) in September 2021. Ammonia was reported above the adopted assessment criteria at D1 and D3 within June 2021 only.

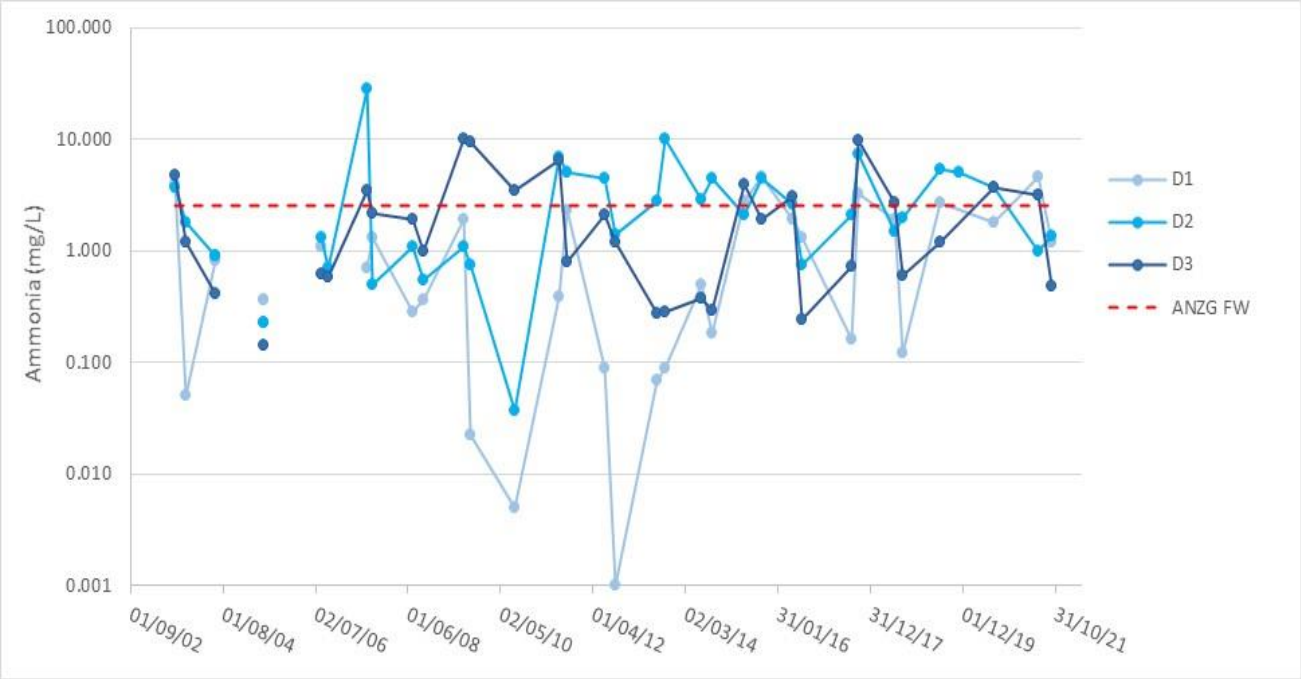

Chart O: Drainage Channels – Ammonia

Ammonia concentrations within the drains are highly variable and do not appear to have any obvious trend, however are comparable to historical levels. On average, drain samples are consistently higher in concentration than surface water samples (detailed further below).

Concentrations are shown within Chart O below. Although concentrations in drains are generally below assessment criteria, as drain waters are contained on the site within the evaporation pond, there is limited potential to impact the surrounding catchment.

Front Property Surface Water Monitoring Points

Ammonia concentrations ranged from below the LOR (<0.01 mg/L) in July 2021, and from 0.07 mg/L (S1) to 0.91 mg/L (S3) in September 2021. No samples exceeded the adopted assessment criteria, consistent with data back to 2008.

Ammonia concentrations in the front property surface drains were comparable to historical levels, although are noted to be higher than average, closer to those concentrations reported in 2012, shown in Chart P (over page).

Ammonia concentrations in the streams are considerably lower than that of the onsite drains, indicating that the front property surface drains are unlikely to be affected by site activities in regards to ammonia presence.

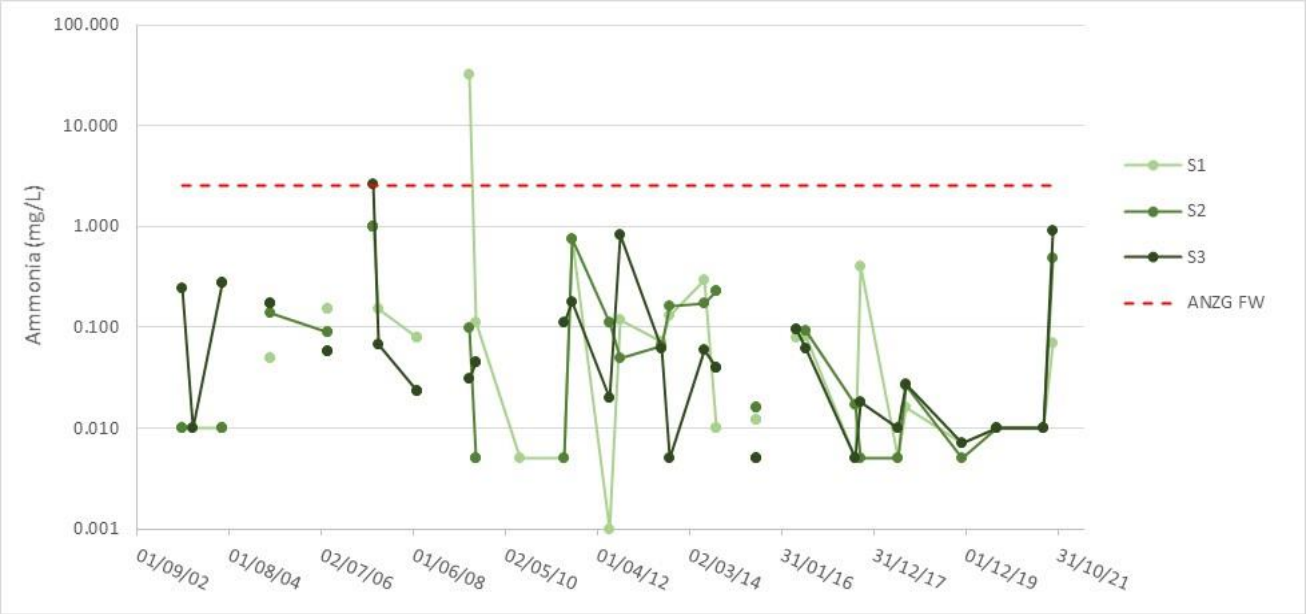

Chart P: Surface Waters – Ammonia

4.6 NITRATE

In groundwater, nitrate is typically the most common form of nitrogen and is often the major contributor to nutrient impact on surface water receptors. The occurrence of high nitrogen concentrations in shallow groundwater is a common occurrence in areas used for intensive animal husbandry such as feedlots and can affect drinking water quality as well as other beneficial uses.

The most likely sensitive receptor associated with surface water runoff from the site would be the wetlands to the west receiving either perched groundwater flows or drainage discharges. Accordingly, the guideline criteria from the Water Quality Guidelines for Freshwater (ANZG, 2018), 2.4 mg/L, is applied. No natural ranges for nitrate are identified for the Long-term or Short-term irrigation water (ANZECC & ARMCANZ, 2000) guidelines, nor are any concentrations or mass loadings for nitrate indicated in Licence 5200/1988/11.

4.6.1 Monitoring Bores

Perched Aquifer

Concentrations ranged from 0.09 mg/L (MW2) to 11.1 mg/L (MW3S) in June 2021, and from 0.01 mg/L (MW2S) to 8.27 mg/L (MW3S) in September 2021. All wells, except for MW1S and MW2S exceeded the adopted ANZG (2018) criteria. Additionally, only MW3S reported nitrate above the natural background values.

Nitrate concentrations are shown on Chart Q (over page).

All wells have concentrations that vary over time, however generally concentrations are greater during winter months when there is increased rainfall which allows for higher concentrations of soluble nitrate compounds on the surface to be mobilised and infiltrate the soil into groundwater.

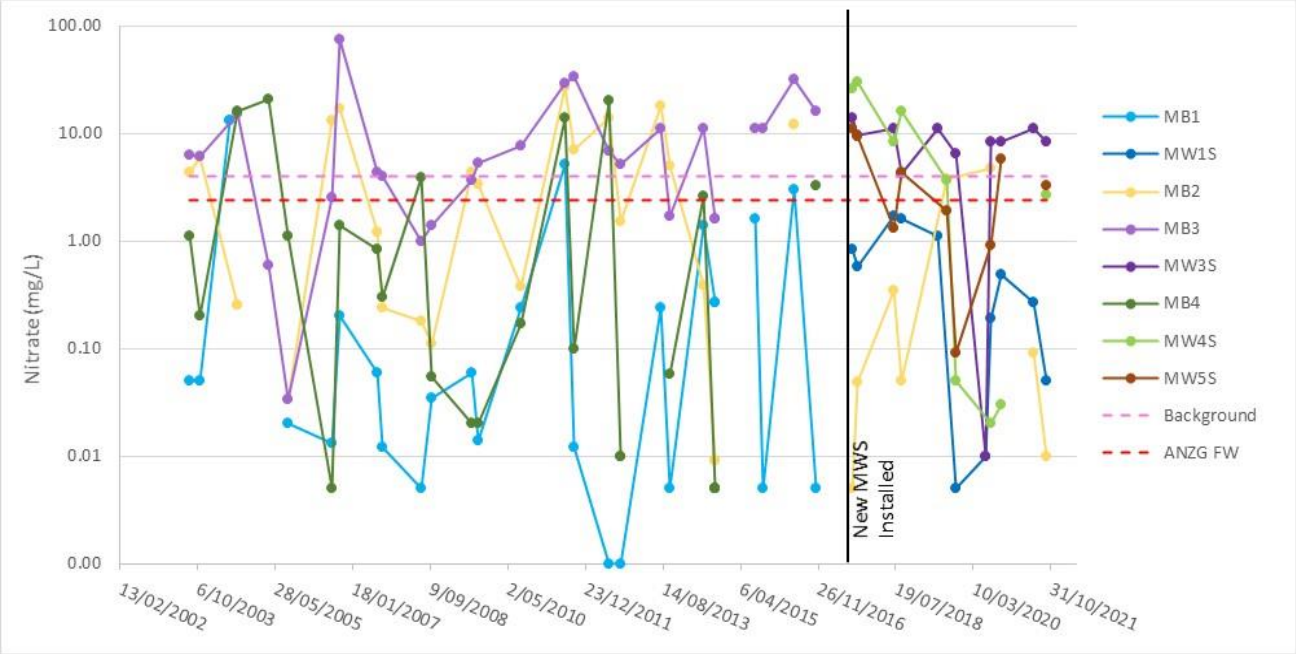

Chart Q: Perched Aquifer - Nitrate

Concentrations reported within up hydraulic gradient MW3S were an order of magnitude higher than other monitoring wells which suggests that nitrate from the neighbouring cattle yard is likely to be the main contributor to the nitrate concentrations at this location. However, MW5S also consistently reports elevated nitrate, just to a lesser degree than MW3S. MW4S in September 2021 also reported elevated nitrate at similar concentrations to MW5S.

Monitoring well MW5S was strategically placed down hydraulic gradient of the sites holding sheds to assess concentrations coming from the sites sheep holding sheds. MW4S is located on the most western portion of the site boundary, strategically placed to assess concentrations leaving the site and what may have contributed from the feedlot itself. Results suggest that both offsite and onsite sources are contributing to the nitrate concentrations under the site.

It is considered likely that increased rainfall will increase leaching and infiltration of nutrients through the soil profile and promote migration of these impacts in the perched aquifer groundwater system.

Superficial Aquifer

Nitrate concentrations ranged from below the LOR, <0.01 mg/L (MW4D/MW5D) to 28.2 mg/L (MW2D) in March 2021, and from below the LOR, <0.01 mg/L (MW4D/MW5D) to 14.7 mg/L (MW2D) in September 2021. Both MW2D and MW3D in 2021 exceeded the adopted ANZG (2018) criteria, with all others below. Only MW2D was reported above the natural background values for nitrate, which is located up hydraulic gradient of the site adjacent to the evaporation dam.

Concentrations are shown in Chart R over page.

Based on the data obtained since 2016, nitrate concentrations within MW1D in particular do generally undergo seasonal variation, decreasing during post summer months, increasing post-winter. Concentrations of nitrate are consistently greater in MW2D and MW3D, both of which are located immediately down gradient of the onsite dam and up hydraulic gradient of the site, respectively. Concentrations within MW1D, which is also located up hydraulic gradient although further north of MW3D, are also elevated although to a lesser degree. Nitrate concentrations are generally lower in comparison within MW5D and MW4D, which are located immediately down gradient of the onsite holding sheds, and down hydraulic gradient of the site respectively, in

comparison to upgradient locations such as MB1D, MB2D and MB3D indicating nitrate concentrations decrease as the groundwater moves laterally across the site.

It is commented, that as ammonia within MW5S is elevated (Chart N above), the absence of nitrate which is formed by the oxidation of ammonia within both MW5S and subsequently MW4D indicates that ammonia is not undergoing oxidation over the western side of the side. In contrast, the elevated nitrate concentrations in the vicinity of the onsite evaporation dam (eastern side of the site) would be expected given the large footprint of the dam surface and interaction with oxygen, this is supported by the absence of ammonia at this location suggesting ammonia has been fully oxidised.

Therefore, it can be assumed based on the results that there are two main sources currently contributing to the nitrate in groundwater. The sources considered most likely to be contributing nitrate into groundwater is the onsite evaporation dam and the neighbouring cattle yard. It is commented that concentrations of both nitrate and ammonia within MW3D are elevated, which suggests that there is likely a source of ammonia in groundwater close to the upgradient RETWA boundary which has not undergone oxidation prior to migrating onto the feedlot, in addition to, ammonia in groundwater on the cattle yard site which has undergone extensive oxidation, and then migrated onto the feedlot in the form of nitrate. However, without knowing what activities are undertaken on the cattle yard site further conclusions cannot currently be made with respect to up-gradient off-site sources of impacts.

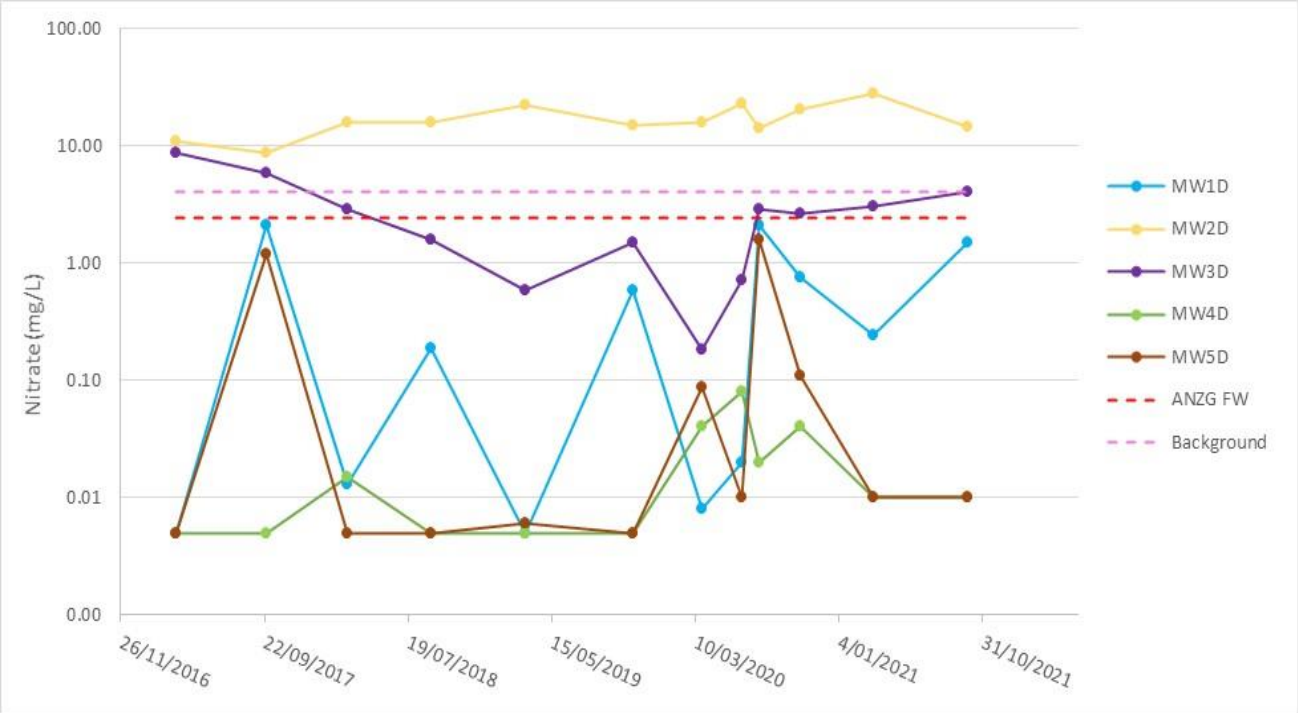

Chart R: Superficial Aquifer - Nitrate

4.6.2 Surface Water

Onsite Drainage Channels

Concentrations ranged from 0.08 mg/L (D1) to 0.3 mg/L (D3) in June 2021, and to below the LOR, <0.01 mg/L (all drains) in September 2021. All samples were well below the adopted ANZG (2018) criteria.

Nitrate concentrations at the drainage channels present a similar trend to the monitoring wells sampled, whereby concentrations are higher during winter when the “first rains” occur, although the variance in

concentrations is highly variable. Concentrations are comparable to historical levels, and are noted to be generally lower across 2021 than in recent years.

Concentrations are shown in Chart S below.

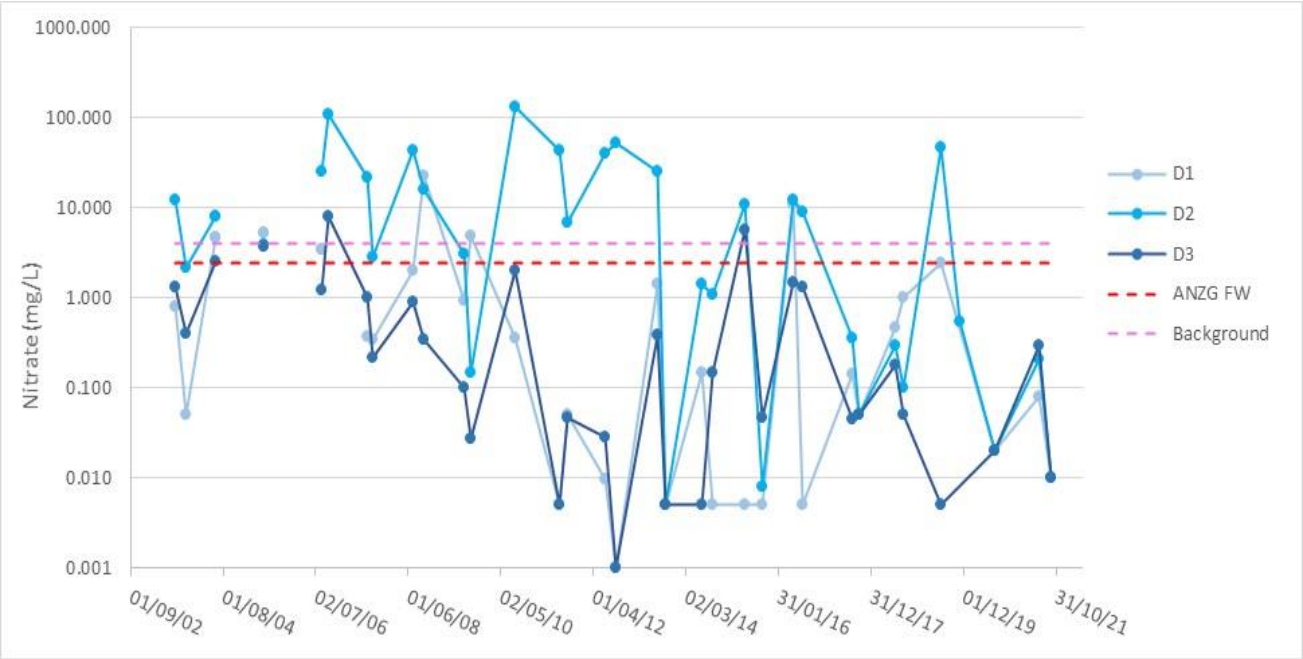

Chart S: Drainage Channels – Nitrate

Front Property Surface Water Monitoring Points

Concentrations ranged from 0.19 mg/L (S2) to 0.24 mg/L (S3) in July 2021, and to below the LOR, <0.01 mg/L (all surface water locations) in September 2021. All samples were well below the adopted ANZG (2018) criteria.

Concentrations are shown in Chart T below.

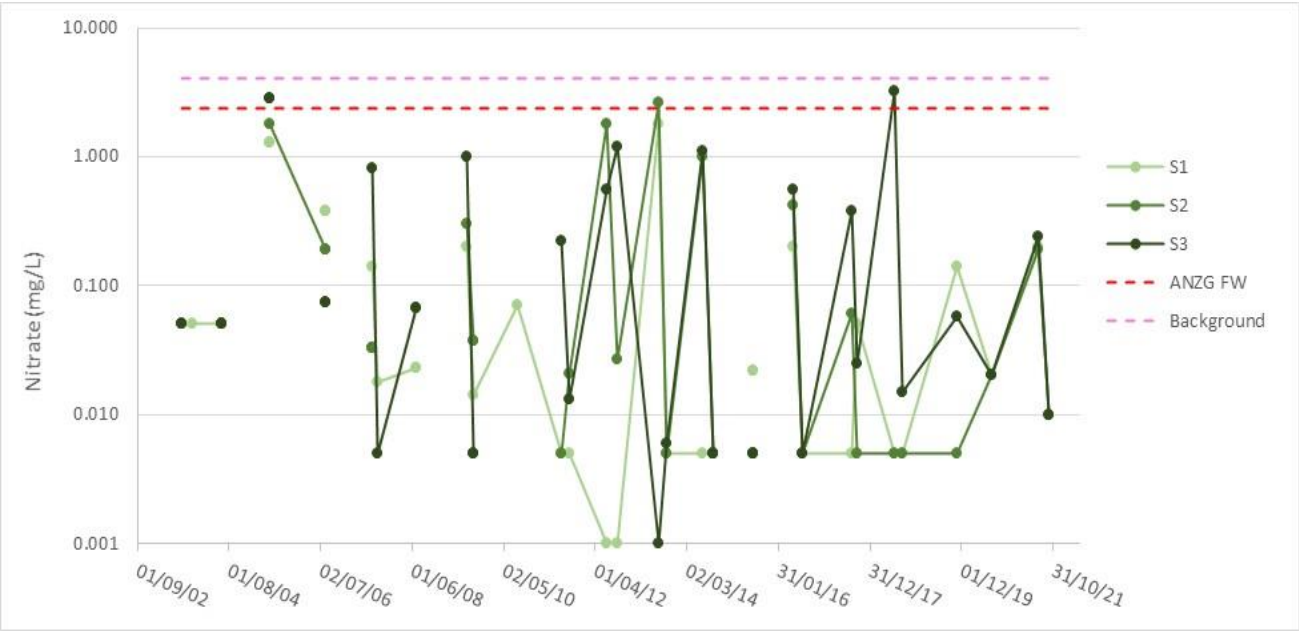

Chart T: Surface Waters – Nitrate

Nitrate concentrations at the surface water channels present a similar trend to the drains, whereby concentrations are higher during winter when the “first rains” occur, although the variance in concentrations is highly variable. Concentrations are comparable to historical levels.

4.7 TOTAL PHOSPHORUS (TP)

Although considered unlikely due to distance (10km away), the most likely sensitive receptor which could be affected by TP is the wetlands located to the west, receiving either superficial groundwater flows or drainage discharges from the site. The guideline criteria from the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) is 0.06 mg/l, however a natural background value of 0.2 mg/l is referenced for South West waters (Davidson, 1995).

As noted within Section 3.3.2, in relation to the discussion below, the superseded TP criteria of 0.06 mg/L (ANZECC & ARMCANZ, 2000) adopted in the absence of ANZG (2018) is considered highly conservative.

4.7.1 Monitoring Bores

Perched Aquifer

Concentrations of total phosphorus ranged from 0.44 mg/L (MW3S) to 2.75 mg/L (MW2) in March 2021, and from 0.1 mg/L (MW4S) to 0.23 mg/L (MW2S) in September 2021. All wells exceeded the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria in 2021. In addition, all wells within March 2021, and MW2 in September 2021 exceeded the natural background values (Davidson, 1995).

Concentrations are within historical ranges within all wells and have concentrations that vary over time, with no obvious trend (i.e. it is neither trending an increase or decrease but appears to fluctuate). Total phosphorus does appear to be higher within MW1S and MW2 in recent years compared to other wells which is potentially due to its location adjacent of the evaporation dam.

Total phosphorus concentrations are shown on Chart U below.

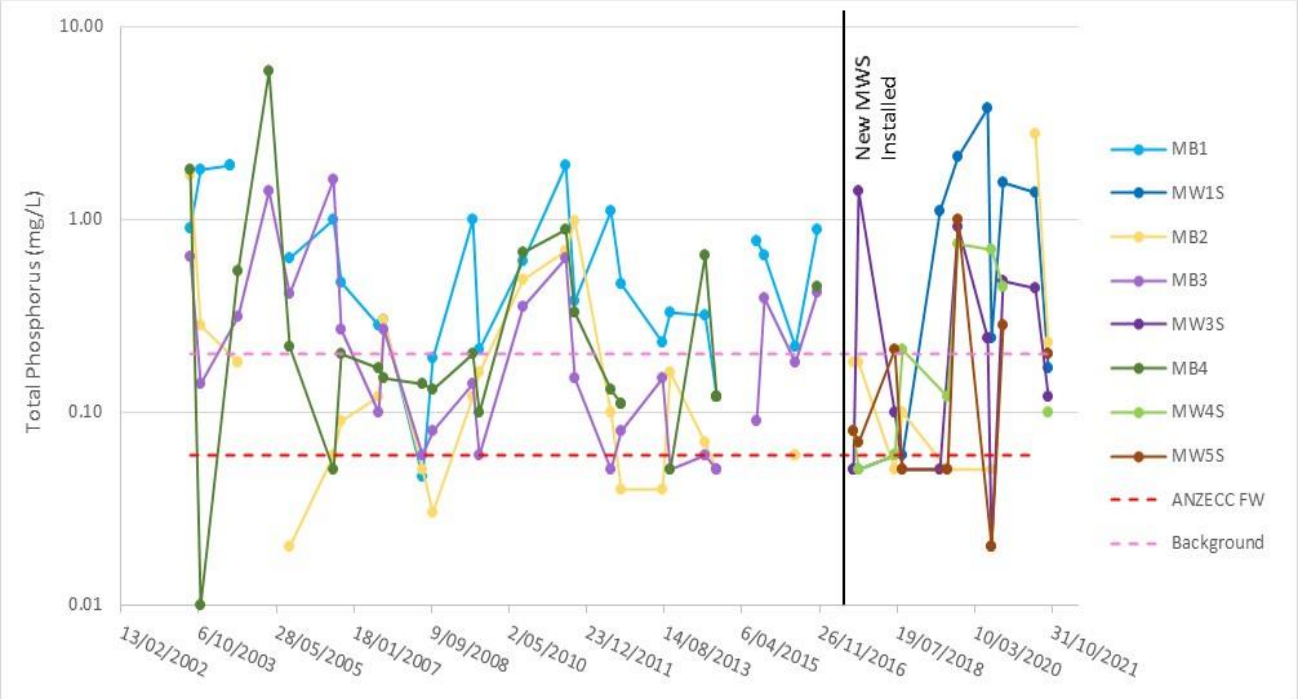

Chart U: Perched Aquifer – Total Phosphorous

Superficial Aquifer

Total phosphorus ranged from 0.02 mg/L (MW1D/MW4D) to 0.09 mg/L (MW2D) in March 2021, and from below the LOR, <0.02 mg/L (MW2D) to 0.14 mg/L (MW5D) in September 2021.

With the exception of MW5D in both March and September 2021, and MW2D in March 2021 only, all other wells wee reported below the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria of 0.06 mg/L. MW5D is located onsite down gradient of the holdings sheds, which indicates the source of phosphorus is generally from the feedlot. However, it is noted that concentrations are considered low.

All wells reported concentrations below the natural background value, generally consistent with historical results. With the exception of a spike in total phosphorus in 2019 and 2020 within MW4S and MW5S, which subsequently decreased to below the laboratory detection limits in later 2020, total phosphorus concentrations within the superficial aquifer have generally been low historically.

Total phosphorus concentrations are shown on Chart W (below).

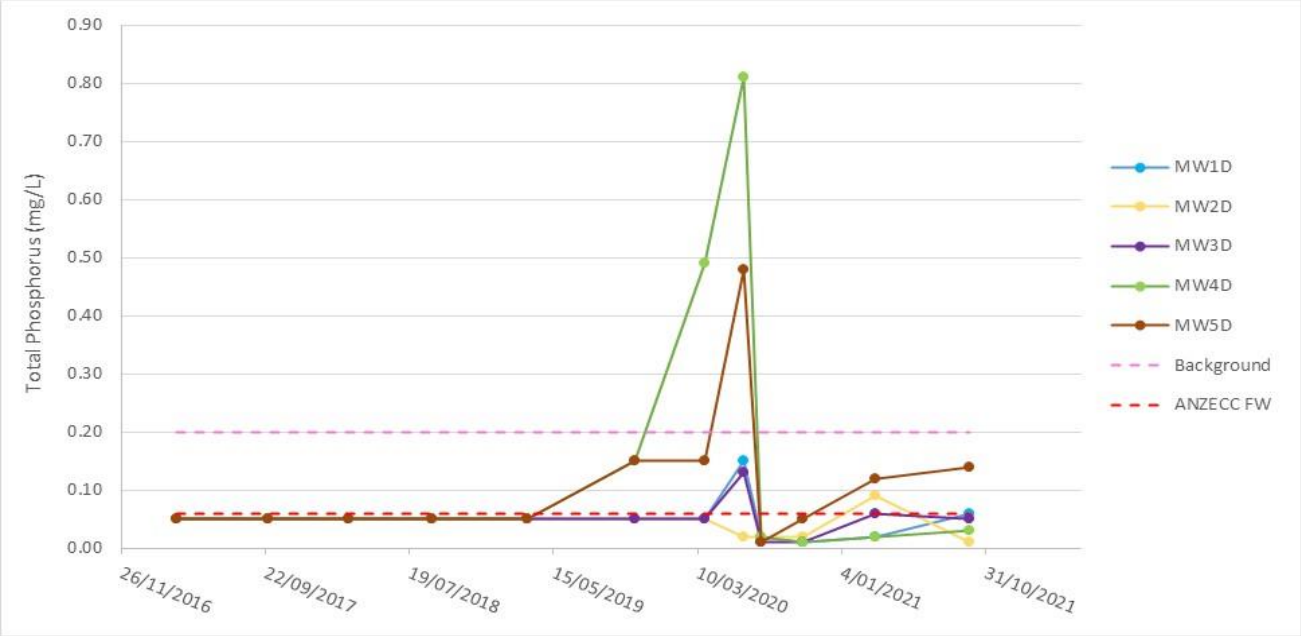

Chart V: Superficial Aquifer – Total Phosphorous

4.7.2 Surface Water

Drainage Channels

In June 2021, total phosphorus concentrations ranged from 3.14 mg/L (D2) to 6.07 mg/L (D3), and from 1.45 mg/L (D3) to 5.1 mg/L (D1) in September 2021.

All drain samples exceeded both the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ, 2000) criteria, short/ long term irrigation (ANZECC & ARMCANZ, 2000) criteria and also the natural background values (Davidson, 1995). Concentrations reported within 2021 however were consistent with historical results, and do not appear to be demonstrating an either increasing or decreasing trend (highly variable).

Total phosphorus concentrations are shown on Chart W (over page).

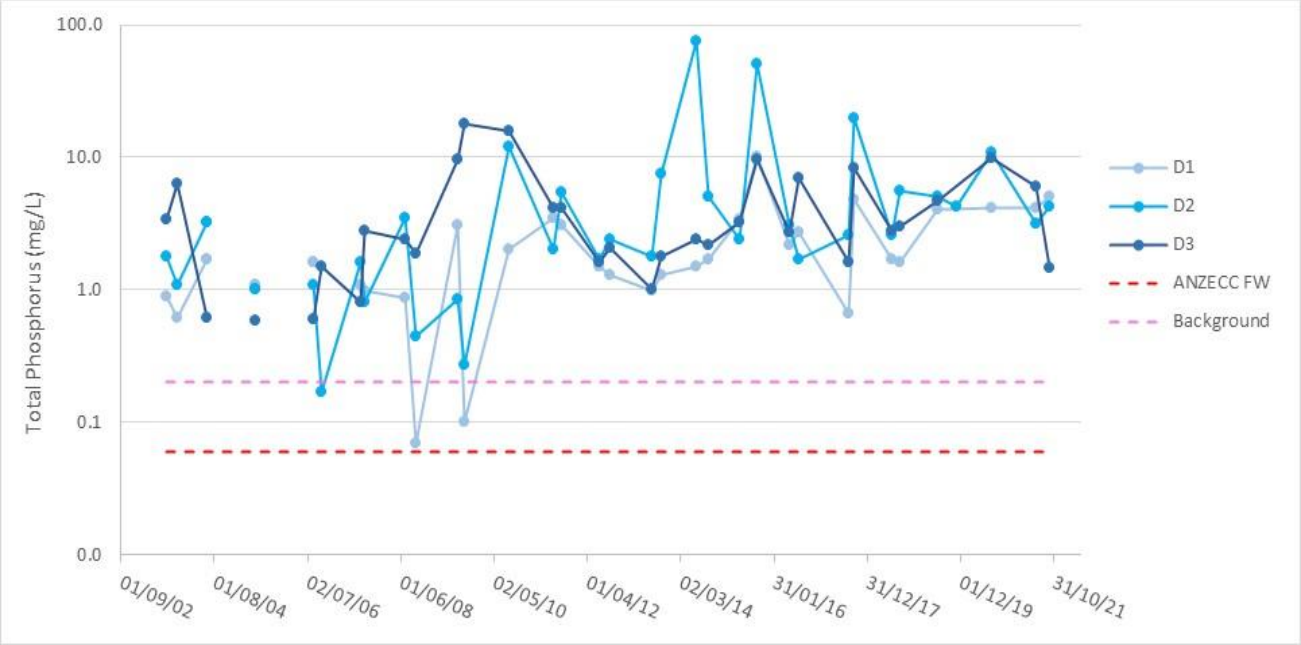

Chart W: Drainage Channels – Total Phosphorous

Front Property Surface Water Monitoring Points

In June 2021, total phosphorus concentrations ranged from 0.12 mg/L (S2) to 0.13 mg/L (S1/S3) and from 0.25 mg/L (S1) to 2.07 mg/L (S2) in September 2021. All surface water samples exceeded the Southwest Australian Aquatic Ecosystems – Wetlands (ANZECC & ARMCANZ) criteria in 2021, and the natural background levels in September 2021.

Concentrations reported within 2021 however were consistent with historical results, and do not appear to be demonstrating an either increasing or decreasing trend (highly variable). It was noted that that S2 and S3 in September were higher, and more comparable to those concentrations reported in 2014 and 2016. Further monitoring within 2022 is required to determine if concentrations are consistently on the higher end.

Total phosphorus concentrations are shown on Chart X (over page).

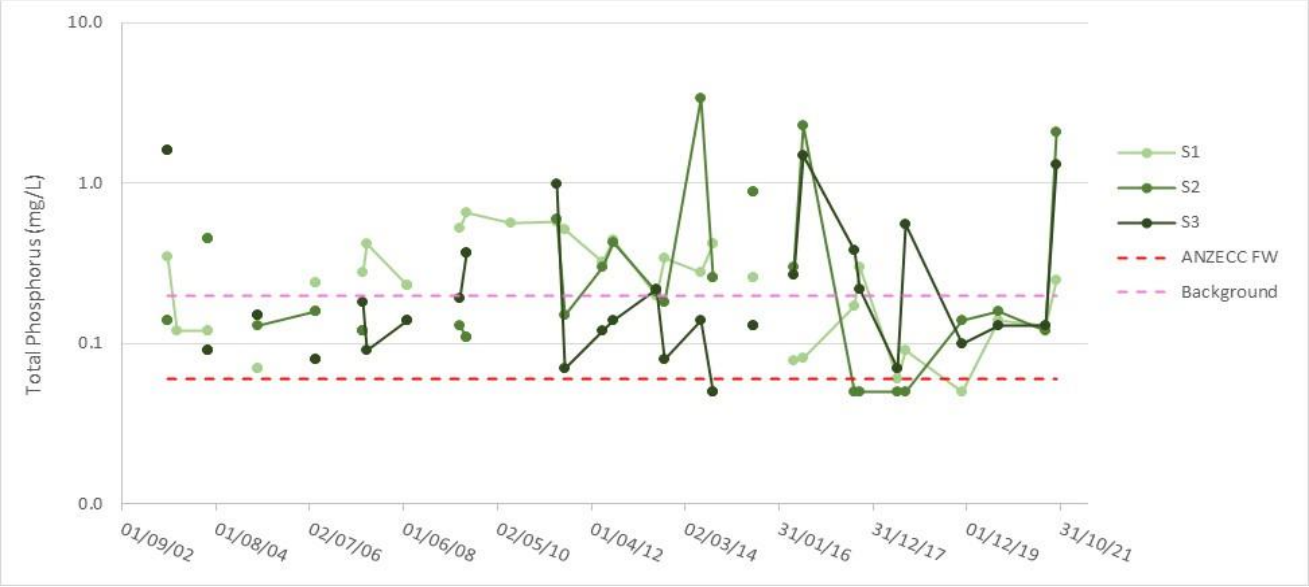

Chart X: Surface Waters – Total Phosphorous

5. FIELD AND LABORATORY ANALYTICAL DATA VALIDATION

5.1 FIELD METHOD VALIDATION

A summary of field method validation undertaken during the investigation is detailed in Table H below.

Table H: Field Method Validation

Requirement	Yes/No	Comments
All samples were submitted to NATA accredited laboratories.	Yes	Both ALS Laboratory and MGT Eurofins are NATA accredited laboratories.
Sample collection	Yes	Together with decontaminated sampling equipment, dedicated nitrile gloves, and new laboratory supplied containers were used during sampling.
Sample preservation	Yes	All samples were preserved correctly and stored in insulated coolers prior to arrival at the laboratory. Sample receipt notice (SRN) indicate that all samples were on a 'cool-down-cycle' via ice bricks upon receipt.
Water sample holding times within acceptable range (collection to extraction)	Yes, with exceptions	Total Nitrogen – 28 days Total Phosphorus – 28 days Nitrate as N – 2 days Ammonia as N – 28 days pH – 6 hours All analytes were within the holding time for the samples collected during the monitoring period with the exception of pH. Although all samples were extracted the same day as sampling it is likely that the pH for some of the samples analysed exceeded the holding time, however cannot be accurately determined as there is no extraction time on the laboratory reports.

5.2 FIELD AND LABORATORY QA/QC DATA ASSESSMENT

Primary and duplicate water samples (including field QC samples) were submitted to ALS with triplicate samples sent to Eurofins, which are NATA accredited for the laboratory analyses performed. Certified laboratory reports and laboratory Quality Assurance QA/QC data are included in Appendix D. An analytical quality control assessment of results is summarised in Table I.

Table I: Analytical Quality Control Validation

Requirement	Yes/No	Comments
All samples were submitted to NATA accredited laboratories.	Yes	
Percentage recovery results were all within the acceptable range (70-130%) for all matrix spikes (MS), MS duplicates, laboratory control samples and surrogates for all analytes.	Yes, with exceptions	**Matrix Spikes** EP107069 and EP2102771 - Nitrite and Nitrate "MS recovery not determined, background level greater than or equal to 4x spike level"
Laboratory internal standards, calibration blanks and mid-range calibration verifications were acceptable.	Yes	
Laboratory internal duplicates conducted at a rate of 1 in 20 and inside an acceptable range of 0 – 50%.	Yes	

All laboratory quality control frequency parameters were compliant.	Yes	

5.2.1 Field QA/QC assessment

The precision of analytical techniques is measured by the RPD between primary and duplicate and triplicate results. RPD calculations are presented along with the analytical results in Tables 4 to 6 were found to be within the acceptable RPD range of 0-30% (Standards Australia, 2005) except for those detailed in Table J below.

Table J: RPDs Outside Acceptable Range

Primary Sample	Date	Duplicate/ Triplicate Sample	Analyte	RPD %	Explanation Code
MW2D	15 March 2021	QC1 (duplicate)	TKN	100	4
		QC2 (triplicate)	Phosphorus	105	2
		QC2 (triplicate)	Phosphorus	160	4
MW1S	22 June 2021	QC1 (duplicate)	TKN	39	2
		QC1 (duplicate)	Total Nitrogen	37	1
		QC2 (triplicate)	Total Nitrogen	186	5
		QC2 (triplicate)	Phosphorus	95	1
MW5D	28 Sept 2021	QC1 (duplicate)	TKN	40	2
		QC1 (duplicate)	Total Nitrogen	40	2
		QC1 (duplicate)	Phosphorus	55	1
		QC2 (triplicate)	TKN	40	3
		QC2 (triplicate)	Total Nitrogen	40	3
		QC2 (triplicate)	Phosphorus	55	3

Where RPDs were outside the acceptable range, sampling procedures, laboratory analytical methods and laboratory results were investigated. A detailed review of analytical results with RPD exceedances indicates that all unacceptable results can be attributed to one or more explanations listed below and are not considered to compromise the integrity of the analytical results.

1. Low analyte concentrations are likely to exaggerate the percentage RPD. However, the elevated RPD is unlikely to affect the integrity of the results or conclusions drawn from the investigation as both results are above adopted criteria.
2. Low analyte concentrations are likely to exaggerate the percentage RPD. However, the elevated RPD is unlikely to affect the integrity of the results or conclusions drawn from the investigation as both results are below adopted criteria, where one is established.
3. One constituent analyte was reported below the laboratory LOR. As a conservative measure half the LOR is used in the calculation of RPD values therefore low analyte concentrations will exaggerate the percentage RPD.
4. Concentrations for the duplicate or triplicate sample, or both, are reported below the assessment criteria, whereas the primary sample is reported above the assessment criteria. Whilst concentrations are still low, and have exaggerated the RPD results, conservatively the highest concentration will be adopted and used in assessment.

5. Triplicate sample concentrations are well below the reported primary and duplicate sample. Triplicate results were inconsistent with historical data for the primary monitoring well and have therefore been discounted. The highest concentration from the primary or duplicate sample will be conservatively used.

5.3 QA/QC SUMMARY

The field method validation and laboratory QA/QC measures employed throughout the assessment have enabled the quality of field sample collection and laboratory analysis procedures to be examined. Based on the above, the data is considered of acceptable quality to be used as a basis for interpretation and environmental assessment of the site.

6. CONCLUSIONS

The following conclusions were based on data obtained through the 2021 calendar year:

General

- Total rainfall for the reporting year at the Serpentine weather station was 939.2 mm which is higher than the long term average of 750 mm, and the highest volume of rain the feedlot has received in over 10 years, particularly in comparison to the last two years which reported 714.2mm (2020) and 605mm (2019).
- All sample locations where sampled in line with licence conditions with the exception of the following:
  - MW4S and MW5S were only able to be sampled once in September. Non-compliant with licence condition *"Two sample events between April and October, separated by at least one month"*

    This was a reflection of both perched wells being reported as having water much later in the year, July, and which was delayed being provided to Coffey (in August) due to the site being heavily waterlogged from above average July rainfall and SWLs unable to be collected by RETWA feedlot personnel due to site access.

    In consideration the above non-compliance is considered an *"inability to comply".*

Water Levels

- Groundwater levels in both the perched and superficial aquifer followed a seasonal trend related to rainfall patterns. Peak groundwater levels were recorded after winter, in July, while the lowest groundwater levels were recorded in early winter, June. Groundwater high is usually seen earlier in June / July, and groundwater low within autumn, March / April, after summer. This indicates that the aquifers may be hydraulically connected.
- The overall generalised direction of groundwater flow onsite, for both the perched and superficial aquifers, indicates flow from east to west, which is consistent with previous investigations.

  However, in 2018, 2019 and to an extent 2020, minor mounding was noted near the dam within the superficial aquifer which affected the groundwater flow around the MW1D and MW2D locations and was likely due to low water levels within the dam from decreased rainfall. There appears to be a more pronounced groundwater flow around the dam and MW1D and MW2D extending offsite to the north-east within 2021, localised to that portion of the site, which may suggest that offsite activies on neighbouring lots are potentially influencing local groundwater flow. Furthermore, an additional investigation (Coffey, 2020) undertaken on the feedlot at the east boundary near MW3S/MW3D in 2020 indicated that flow direction was north-westerly in the eastern portion of the site with slight mounding evident at MW3 further supporting the potential for an offsite influence in that portion of the site.

Water Quality

- Groundwater pH in both the superficial and perched aquifer can be considered moderately acidic to acidic, with the superficial aquifer typically producing lower pH values than the perched aquifer. MW3S and MW3D produced the lowest pH values for the site, consistent with previous years. Based on the additional investigation undertaken in 2020 (Coffey, 2020), it was concluded that the likely cause of acidification in groundwater within the area of MW3S and MW3D was from the nitrification process, as the result of an inorganic input causing acidification of groundwater, as opposed to the presence of acid sulfate soils (ASS) beneath the site. It was assumed that based on the results that the main source in this area most likely to be contributing nitrate into groundwater is the upgradient neighbouring cattle yard and shed.

  The pH concentrations observed in the drain and surface channels are considered to be generally neutral likely due to being composed largely of rainwater.
- Total nitrogen concentrations were generally comparable to historical levels within both the superficial and perched aquifers. Generally, total nitrogen concentrations were greater in the perched aquifer then within the superfial aquifer. It is likely that the neighbouring cattle yard is the main contributing source of nitrogen in the perched aquifer, and onsite holding sheds to a lesser degree, while site activities such as the evaporation dam is contributing to nitrogen impact in the superficial aquifer, and the neighbouring cattle yard to a lesser degree. Concentration of nitrogen within MW3D, which is located on the upgradient site

boundary adjacent to the neighbouring cattle yard, appear to be increasing, with concentrations currently consistent with those reported in 2016/2017.

Total nitrogen concentrations within the drains and surface water locations appear to be consistent with historical concentrations.

- Ammonia concentrations were detected in both the perched aquifer and superficial aquifer. The neighbouring cattle yard is considered to be the main contributor to ammonia in the superficial aquifer as impacts within up gradient MW3D are consistently higher compared to other monitoring wells onsite. However, site activities such as the holding sheds and evaporation pond seem to be contributing to impact in both the perched and superficial aquifers, although to a lesser degree.

  Ammonia impact down gradient of the holding sheds within the perched aquifer appears to be increasing within 2020 and 2021. However, within 2020 it was also noted that ammonia within the down gradient site boundary within the perched aquifer was also increasing. Concentrations are observed to have decreased at the down gradient site boundary within 2021 to levels more consistent with 2018.

  Ammonia concentrations within the drains and surface water locations appear to be consistent with historical concentrations, although concentrations in the surface water locations were noted to be higher than recent years.

- Nitrate concentrations where detected in both the perched and superficial aquifer wells, with the perched aquifer generally returning higher nitrate concentrations (particularly within MW3S). The exception to this is superficial monitoring well MW2D which reports the highest nitrate concentrations, consistent with previous years.

  The neighbouring cattle yard is considered to be the main contributor to the nitrate concentrations in both the perched and superficial aquifer. This is in addition to onsite activities particularly located near the evaporation dam (superficial aquifer) and near the holding sheds (perched aquifer) although to a lesser degree. Nitrate concentrations within the superficial aquifer decrease as groundwater moves laterally across the site to the west, as down gradient bores report the absence of nitrate. However, as ammonia concentrations (mentioned above) are elevated within onsite MW3D (east upgradient boundary), this indicates that ammonia isn't being oxidised to form nitrate in down gradient locations, likely a result of the absence of oxidising activities in this area.

  Generally, an overall decrease in nitrate was reported at the drainage and surface water sites during 2021.

- Total phosphorus concentrations within the superficial aquifer were low, with the exception for wells located down gradient of the holding sheds. Additonally, total phosphorus was elevated within the perched aquifer more prominently within the up gradient monitoring wells MW1S and MW2 located near the evaporation pond.

  Total phosphorus concentrations within the drains and surface water locations appear to be consistent with historical concentrations, although concentrations in the surface water locations were noted to be higher than recent years.

Overall

- Overall, based on the data obtained, the upgradient neighbouring cattle yard is considered to be the main contributing source of nutrients in both the perched and superficial aquifers. However, this is in addition to site activities such as the holding sheds and evaporation ponds which contribute nutrients to a lesser degree.
- Generally, drain samples contain higher nutrient concentrations than surface water samples, which is to be expected given the location of upgradient site boundary surface water locations.
- Most nutrients exhibit a seasonal increase during the winter months which are likely a result of increased rainfall resulting in vertical infiltration of water through the surface geology dissolving and mobilising any available nutrient compounds.
- Taking into consideration the distance to the closest wetland (approximately 10km west of the site), together with dilution and dispersion it is considered unlikely that the elevated nutrients within groundwater beneath the site would have a negative impact on the wetlands. In addition to this, taking into considering the highest beneficial use of groundwater (irrigation purposes), it is considered unlikely that concentrations reported in groundwater beneath the site would adversely impact on either environmental or human health either onsite or offsite.

Additionally, given the discontinuous and seasonal nature of the perched aquifer (dry during summer) this system is unlikely to have any long-term beneficial use.

7. RECOMMENDATIONS

Coffey makes the following recommendations based on the data collected during the 2021 monitoring period:

- The water monitoring in 2022 to be undertaken in compliance with the updated licence L5200/1988/11 and Amendment Notice 1.
- Submission of this report to DWER to meet the licence condition of L5200/1988/11 and Amendment Notice 1.
- RETWA continue to conduct monthly depth to groundwater measurements of the monitoring wells at the end of each month and report these to Coffey as soon as possible.
- Bottles, laboratory chain of custodies and eskies will remain at the RETWA feedlot in 2022 so that site personnel can collect surface and drain samples at the time water is present if Coffey is unable to attend site immediately.

These conclusions and recommendations are made within the limitations of the work which has been undertaken; a statement of these limitations is attached.

8. REFERENCES

Agriculture Western Australia (1999) Revegetation and Drainage Management Plan Lot 2 Mundijong Road, Mundijong. Reference 9900062.

ANZECC & ARMCANZ (2000) National Water Quality Management Strategy Australia and New Zealand Guidelines for Fresh and Marine Water Quality – Southwest Australian Aquatic Ecosystems – Wetlands.

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ATA Environmental (2000) Dust Management Plan for the Sheep Feed Lot at Lot 2 Mundijong Road, Mundijong, ATA Environmental Report dated 29 June 2000.

BOM (2021) Past Climate Data for the Perth Region, downloaded January 2022 from: http://www.bom.gov.au/climate/data/

Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142

Department of Environment and Conservation (DEC) (2010) Licence: L5200/1988/10. Issue date 01/10/2010.

Department of Environment Regulation (DER) (2015) Licence: L5200/1988/11. Issue date 01/10/2015.

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STATEMENT OF LIMITATIONS

IMPORTANT INFORMATION ABOUT YOUR TETRA TECH COFFEY ENVIRONMENTAL REPORT

Introduction

This report has been prepared by Tetra Tech Coffey for you, as Tetra Tech Coffey's client, in accordance with our agreed purpose, scope, schedule and budget.

The report has been prepared using accepted procedures and practices of the consulting profession at the time it was prepared, and the opinions, recommendations and conclusions set out in the report are made in accordance with generally accepted principles and practices of that profession.

The report is based on information gained from environmental conditions (including assessment of some or all of soil, groundwater, vapour and surface water) and supplemented by reported data of the local area and professional experience. Assessment has been scoped with consideration to industry standards, regulations, guidelines and your specific requirements, including budget and timing. The characterisation of site conditions is an interpretation of information collected during assessment, in accordance with industry practice.

This interpretation is not a complete description of all material on or in the vicinity of the site, due to the inherent variation in spatial and temporal patterns of contaminant presence and impact in the natural environment. Tetra Tech Coffey may have also relied on data and other information provided by you and other qualified individuals in preparing this report. Tetra Tech Coffey has not verified the accuracy or completeness of such data or information except as otherwise stated in the report. For these reasons the report must be regarded as interpretative, in accordance with industry standards and practice, rather than being a definitive record.

Your report has been written for a specific purpose

Your report has been developed for a specific purpose as agreed by us and applies only to the site or area investigated. Unless otherwise stated in the report, this report cannot be applied to an adjacent site or area, nor can it be used when the nature of the specific purpose changes from that which we agreed.

For each purpose, a tailored approach to the assessment of potential soil and groundwater contamination is required. In most cases, a key objective is to identify, and if possible quantify, risks that both recognised and potential contamination pose in the context of the agreed purpose. Such risks may be financial (for example, clean up costs or constraints on site use) and/or physical (for example, potential health risks to users of the site or the general public).

Limitations of the Report

The work was conducted, and the report has been prepared, in response to an agreed purpose and scope, within time and budgetary constraints, and in reliance on certain data and information made available to Tetra Tech Coffey.

The analyses, evaluations, opinions and conclusions presented in this report are based on that purpose and scope, requirements, data or information, and they could change if such requirements or data are inaccurate or incomplete.

This report is valid as of the date of preparation. The condition of the site (including subsurface conditions) and extent or nature of contamination or other environmental hazards can change over time, as a result of either natural processes or human influence. Tetra Tech Coffey should be kept appraised of any such events and should be consulted for further investigations if any changes are noted, particularly during construction activities where excavations often reveal subsurface conditions.

In addition, advancements in professional practice regarding contaminated land and changes in applicable statues and/or guidelines may affect the validity of this report. Consequently, the currency of conclusions and recommendations in this report should be verified if you propose to use this report more than 6 months after its date of issue.

The report does not include the evaluation or assessment of potential geotechnical engineering constraints of the site.

Interpretation of factual data

Environmental site assessments identify actual conditions only at those points where samples are taken and on the date collected. Data derived from indirect field measurements, and sometimes other reports on the site, are interpreted by geologists, engineers or scientists to provide an opinion about overall site conditions, their likely impact with respect to the report purpose and recommended actions.

Variations in soil and groundwater conditions may occur between test or sample locations and actual conditions may differ from those inferred to exist. No environmental assessment program, no matter how comprehensive, can reveal all subsurface details and anomalies. Similarly, no professional, no matter how well qualified, can reveal what is hidden by earth, rock or changed through time.

The actual interface between different materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions.

For this reason, parties involved with land acquisition, management and/or redevelopment should retain the services of a suitably qualified and experienced environmental consultant through the development and use of the site to identify variances, conduct additional tests if required, and recommend solutions to unexpected conditions or other unrecognised features encountered on site. Tetra Tech Coffey would be pleased to assist with any investigation or advice in such circumstances.

Recommendations in this report

This report assumes, in accordance with industry practice, that the site conditions recognised through discrete sampling are representative of actual conditions throughout the investigation area. Recommendations are based on the resulting interpretation.

Should further data be obtained that differs from the data on which the report recommendations are based (such as through excavation or other additional assessment), then the recommendations would need to be reviewed and may need to be revised.

Report for benefit of client

Unless otherwise agreed between us, the report has been prepared for your benefit and no other party. Other parties should not rely upon the report or the accuracy or completeness of any recommendation and should make their own enquiries and obtain independent advice in relation to such matters.

Tetra Tech Coffey assumes no responsibility and will not be liable to any other person or organisation for, or in relation to, any matter dealt with or conclusions expressed in the report, or for any loss or damage suffered by any other person or organisation arising from matters dealt with or conclusions expressed in the report.

To avoid misuse of the information presented in your report, we recommend that Tetra Tech Coffey be consulted before the report is provided to another party who may not be familiar with the background and the purpose of the report. In particular, an environmental disclosure report for a property vendor may not be suitable for satisfying the needs of that property's purchaser. This report should not be applied for any purpose other than that stated in the report.

Interpretation by other professionals

Costly problems can occur when other professionals develop their plans based on misinterpretations of a report. To help avoid misinterpretations, a suitably qualified and experienced environmental consultant should be retained to explain the implications of the report to other professionals referring to the report and then review plans and specifications produced to see how other professionals have incorporated the report findings.

Given Tetra Tech Coffey prepared the report and has familiarity with the site, Tetra Tech Coffey is well placed to provide such assistance. If another party is engaged to interpret the recommendations of the report, there is a risk that the contents of the report may be misinterpreted and Tetra Tech Coffey disowns any responsibility for such misinterpretation.

Data should not be separated from the report

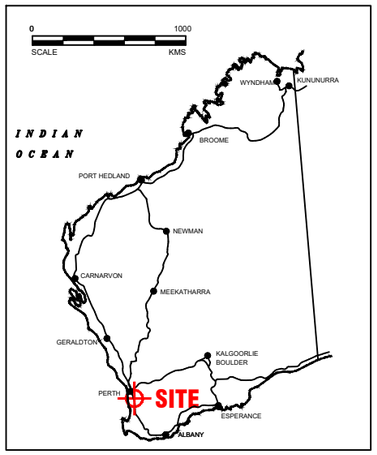
The report as a whole presents the findings of the site assessment and the report should not be copied in part or altered in any way. Logs, figures, laboratory data, drawings, etc. are customarily included in our reports and are developed by scientists or engineers based on their interpretation of field logs, field testing and laboratory evaluation of samples. This information should not under any circumstances be redrawn for inclusion in other documents or separated from the report in any way.

This report should be reproduced in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

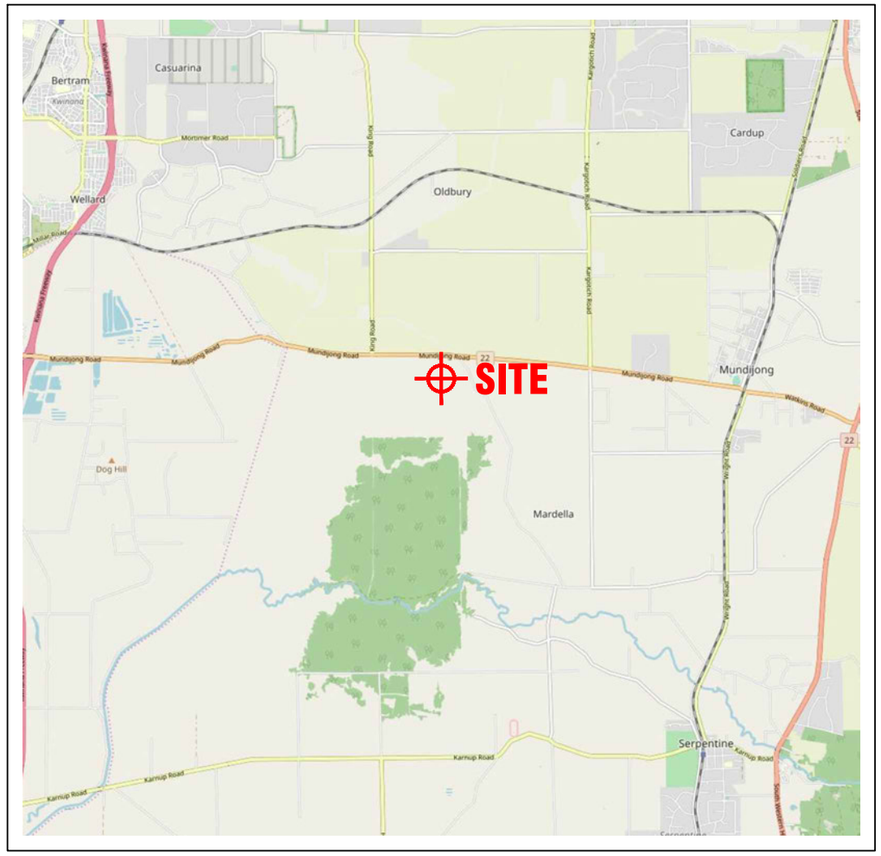
Responsibility

Environmental reporting relies on interpretation of factual information using professional judgement and opinion and has a level of uncertainty attached to it, which is much less exact than other design disciplines. This has often resulted in claims being lodged against consultants, which are unfounded. As noted earlier, the recommendations and findings set out in this report should only be regarded as interpretive and should not be taken as accurate and complete information about all environmental media at all depths and locations across the site.

FIGURES

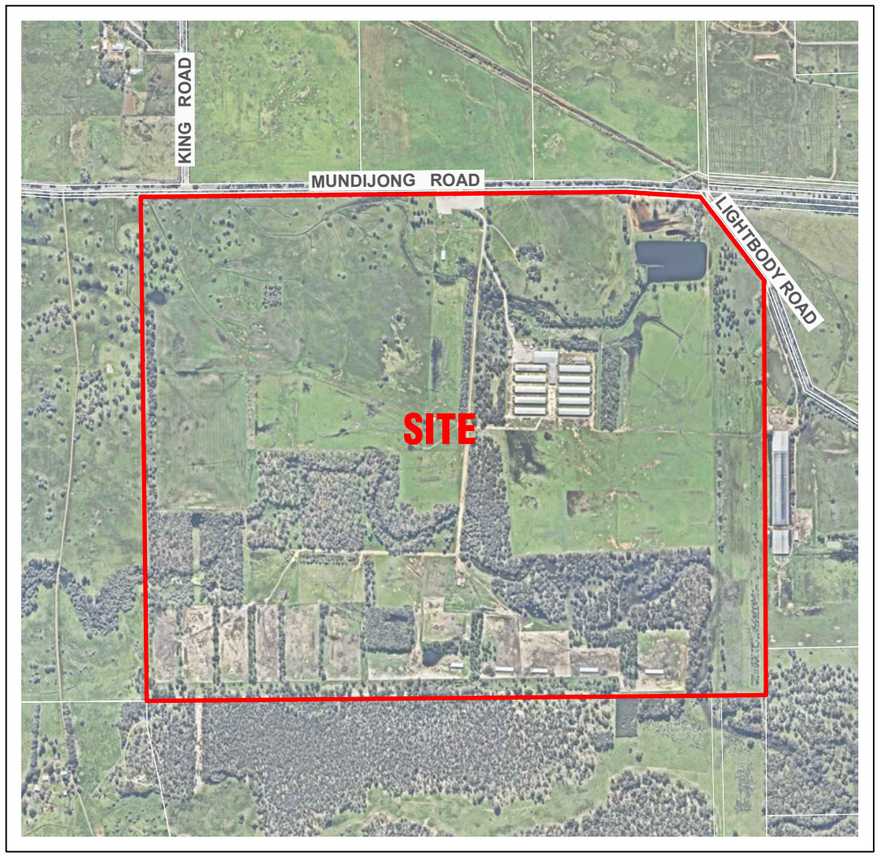


GENERAL AREA MAP



REGIONAL AREA MAP

IMAGE © OPENSTREETMAP (DOWNLOADED 16.01.20)



LOCAL AREA MAP

IMAGE © NEARMAP (FLOWN 20.07.18)

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revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	JO	CV	18/01/22

drawn	JO
approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

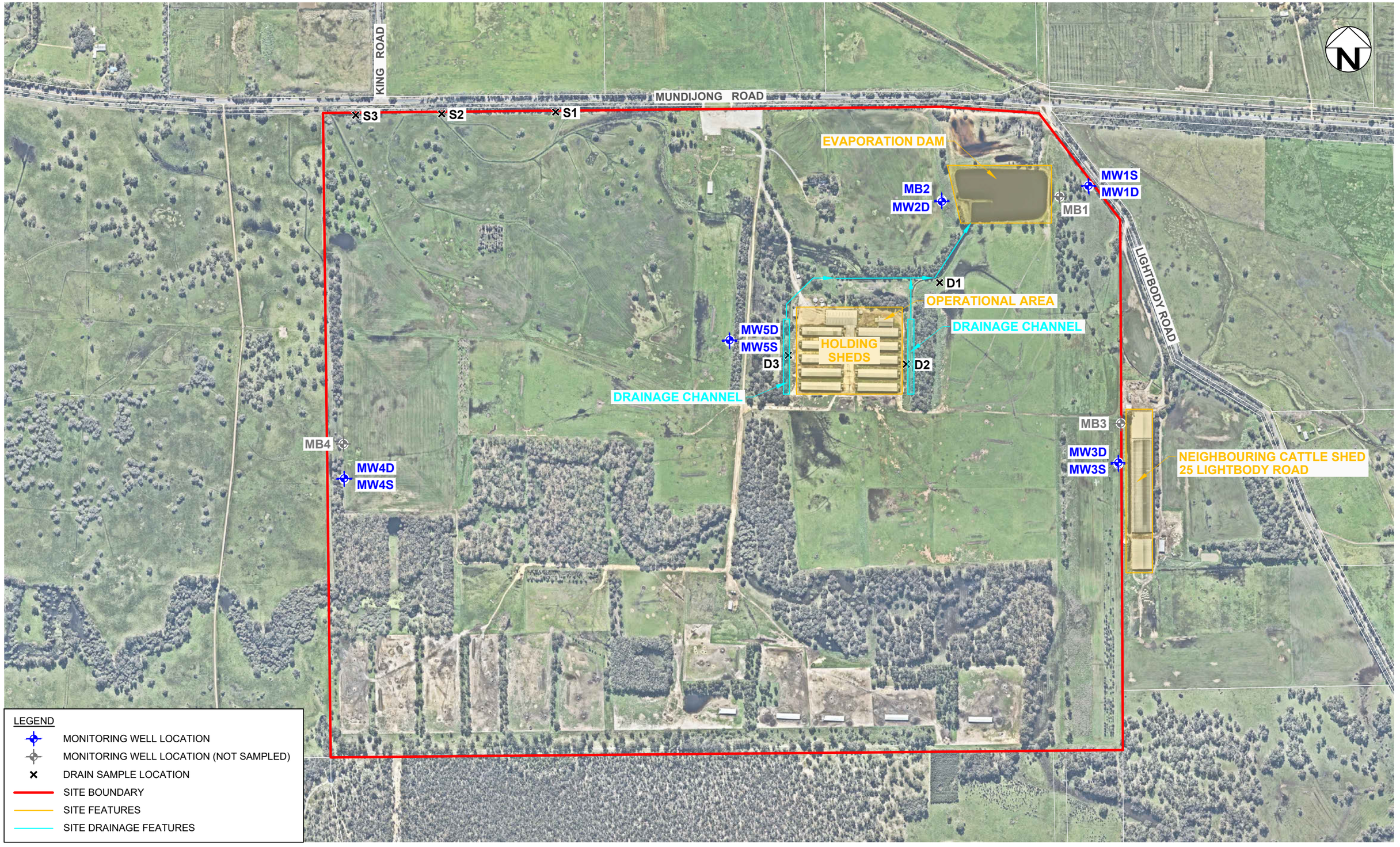
TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: SITE LOCALITY PLAN

project no: 754-PEREN283020-R01 | figure no: FIGURE 1 | rev: A



LEGEND

- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (NOT SAMPLED)
- DRAIN SAMPLE LOCATION
- SITE BOUNDARY
- SITE FEATURES
- SITE DRAINAGE FEATURES

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	JO	CV	18/01/22

AERIAL IMAGE SOURCE: NEARMAP, 20.07.18

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approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: SITE FEATURES PLAN

project no: 754-PEREN283020-R01 | figure no: FIGURE 2 | rev: A

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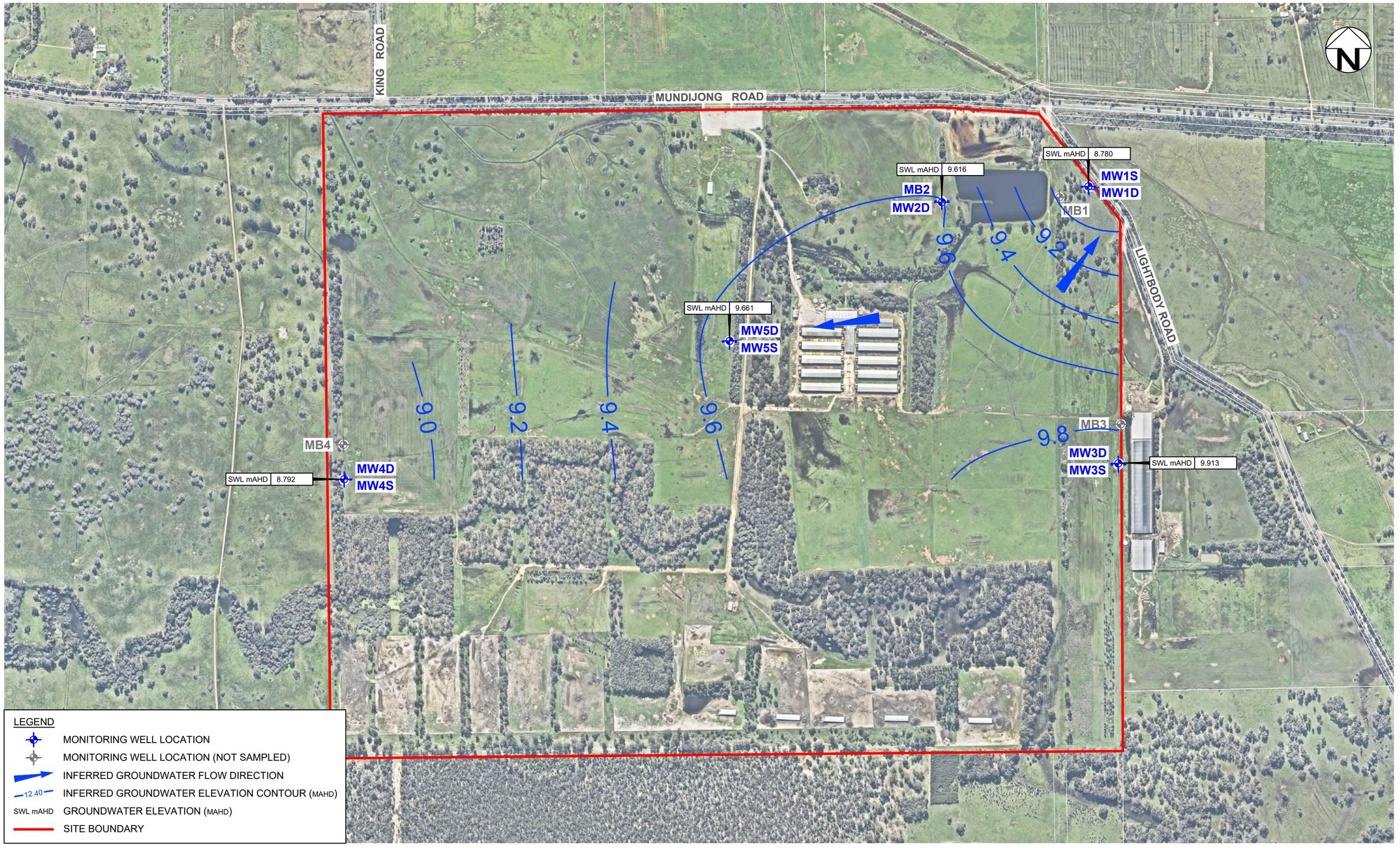

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AERIAL IMAGE SOURCE: NEARMAP, 20.07.18

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date	18/01/22
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: HYDROGEOLOGICAL PLAN - MARCH 2021 -
SUPERFICIAL AQUIFER

project no: 754-PEREN283020-R01 | figure no: FIGURE 3 | rev: A

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revision no.	description	drawn	approved	date
A	ORIGINAL ISSUE	JO	CV	18/01/22

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approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: HYDROGEOLOGICAL PLAN - JUNE 2021 - PERCHED AQUIFER

project no: 754-PEREN283020-R01 | figure no: FIGURE 4 | rev: A

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SUPERFICIAL AQUIFER

KING ROAD
MUNDIJONG ROAD
LIGHTBODY ROAD

SWL mAHD 12.790 — MB2 / MW2D
SWL mAHD 12.214 — MW1S / MW1D / MB1
SWL mAHD 12.854 — MW5D / MW5S
MB3 / MW3D / MW3S — SWL mAHD 13.563
MB4 / MW4D / MW4S — SWL mAHD 11.742

12.0 12.2 12.4 12.6 12.8 13.0 13.2

LEGEND
- MONITORING WELL LOCATION
- MONITORING WELL LOCATION (NOT SAMPLED)
- INFERRED GROUNDWATER FLOW DIRECTION
- 12.40 INFERRED GROUNDWATER ELEVATION CONTOUR (MAHD)
- SWL mAHD GROUNDWATER ELEVATION (MAHD)
- SITE BOUNDARY

PERCHED AQUIFER

N

KING ROAD
MUNDIJONG ROAD
LIGHTBODY ROAD

SWL mAHD 13.084 — MB2 / MW2D
SWL mAHD 13.446 — MW1S / MW1D / MB1
SWL mAHD 12.709 — MW5D / MW5S
MB3 / MW3D / MW3S — SWL mAHD 14.154
MB4 / MW4D / MW4S — SWL mAHD 11.844

12.0 12.2 12.4 12.6 12.8 13.0 13.2 13.4 13.6 13.8

revision	no.	description	drawn	approved	date
	A	ORIGINAL ISSUE	JO	CV	18/01/22

AERIAL IMAGE SOURCE: NEARMAP, 20.07.18

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drawn	JO
approved	CV
date	18/01/22
scale	AS SHOWN
original size	A3

TETRA TECH COFFEY

client: RURAL EXPORT AND TRADE WESTERN AUSTRALIA (RETWA)

project: 2021 ANNUAL ENVIRONMENTAL REPORT
848 MUNDIJONG ROAD, MARDELLA,
WESTERN AUSTRALIA

title: HYDROGEOLOGICAL PLAN - SEPTEMBER 2021 -
SUPERFICIAL AQUIFER AND PERCHED AQUIFER

project no: 754-PEREN283020-R01 | figure no: FIGURE 5 | rev: A

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TABLES

Table 1
Groundwater Gauging and Water Quality Results - Event 1
RETWA
March 2021
754-PEREN283020

Sample ID	Date Measured	Event	Total Depth (m)	Depth to Water (mbtoc)	TOC Elevation (mAHD)	SWL Elevation (mAHD)	Event	pH	EC (µS/cm)	TDS* (mg/L)	Redox mV	Temperature (°C)	Comments
MW1D	15/03/2021	Pre	7.840	5.885	14.665	8.780	Post	4.71	930	605	155.8	24.1	No colour, Clear, No odour, Pumped dry
MW2D	15/03/2021	Pre	6.820	4.560	14.176	9.616	Post	5.12	600	390	134.2	24.4	No colour, Clear, No odour, Pumped dry
MW3D	15/03/2021	Pre	7.520	5.340	15.253	9.913	Post	4.21	1580	1,027	129.1	24.4	No Colour, Clear, No odour
MW4D	15/03/2021	Pre	7.520	4.085	12.877	8.792	Post	5.41	900	585	89.7	23.0	No Colour, Clear, No odour
MW5D	15/03/2021	Pre	7.290	4.305	13.966	9.661	Post	5.00	5540	3,601	130	23.0	Cloudy, Pale brown, No odour

Notes:
ID = identification
Pre = pre-purge
Post = post-purge
mbtoc = metres below top of casing
mAHD = metres Australian Height Datum
SWL = surface water level
MW = Monitoring well
mg/L = milligrams per litre
L = litres
mS/cm = millisiemens per centimetre
°C = degrees Celsius
S = shallow
D = deep
TDS = Total Dissolved Solids
EC = Electrical Conductivity
MW = Monitoring Well
* TDS calcuated

Field Equipment Used:
Interface Probe Meter
YSI Pro

Table 2
Groundwater Gauging and Water Quality Results - Event 2
RETWA
June 2021
754-PEREN283020

Sample ID	Date Measured	Event	Total Depth (m)	Depth to Water (mbtoc)	TOC Elevation (mAHD)	SWL Elevation (mAHD)	Event	pH	Electrical Conductivity (µS/cm)	TDS (mg/L)	Temperature (°C)	Comments
MW1S	22/06/2021	Pre	4.100	1.315	14.591	13.276	Post	5.45	620.00	481.00	16.50	Purged dry, sampled recharge
MB2S	22/06/2021	Pre	2.950	1.605	14.252	12.647	Post	5.62	239.00	181.00	17.50	Purged dry, sampled recharge
MW3S	22/06/2021	Pre	4.280	1.965	15.250	13.285	Post	5.46	800	656	13.9	Purged dry, sampled recharge
MW4S	22/06/2021	Pre	3.995	-	-	-	Dry					
MW5S	22/06/2021	Pre	4.100	-	-	-	Dry					
MW1D	22/06/2021	Pre	7.830	3.885	14.665	10.780	Post	Gauged only, sampling not required.				
MW2D	22/06/2021	Pre	6.800	4.560	14.176	9.616	Post	Gauged only, sampling not required.				
MW3D	22/06/2021	Pre	7.510	5.340	15.253	9.913	Post	Gauged only, sampling not required.				
MW4D	22/06/2021	Pre	7.520	4.085	12.877	8.792	Post	Gauged only, sampling not required.				
MW5D	22/06/2021	Pre	7.390	4.305	13.966	9.661	Post	Gauged only, sampling not required.				
S1	22/06/2021						Dry (collected by feedlot personnel 13 July 2021 - lab analysed only)					
S2	22/06/2021						Dry (collected by feedlot personnel 13 July 2021 - lab analysed only)					
S3	22/06/2021						Dry (collected by feedlot personnel 13 July 2021 - lab analysed only)					
D1	22/06/2021						Post	6.77	700	617	11.3	Yellow, no flow
D2	22/06/2021						Post	6.02	409	362	11	Yellow, no flow
D3	22/06/2021						Post	7.18	560	468	12.9	Yellow, no flow

Notes:
ID = identification
Pre = pre-purge
Post = post-purge
mbtoc = metres below top of casing
mAHD = metres Australian Height Datum
SWL = surface water level
MW = Monitoring well
mg/L = milligrams per litre
L = litres
mS/cm = millisiemens per centimetre
°C = degrees Celsius
S = shallow
D = deep
TDS = Total Dissolved Solids
EC = Electrical Conductivity
MW = Monitoring Well
* TDS calcuated

Field Equipment Used:
Coffey Interface Probe Meter
Eco Environmental YSI (YSIPP9)

Table 3
Groundwater Gauging and Water Quality Results - Event 3
RETWA
September 2021
754-PEREN283020

Sample ID	Date Measured	Event	Total Depth (m)	Depth to Water (mbtoc)	TOC Elevation (mAHD)	SWL Elevation (mAHD)	Event	pH	Electrical Conductivity (µS/cm)	TDS (mg/L)	Temperature (°C)	Comments
MW1D	28/09/2021	Pre	7.830	2.451	14.665	12.214	Post	4.9	417	298	20.3	Clear, no odour
MW2D	28/09/2021	Pre	6.830	1.386	14.176	12.790	Post	5.5	5	680	19.7	Clear, no odour
MW3D	28/09/2021	Pre	7.520	1.690	15.253	13.563	Post	3.9	1550	1072	22.0	Clear, no odour
MW4D	28/09/2021	Pre	7.530	1.135	12.877	11.742	Post	5.9	950	676	20.5	Clear, no odour
MW5D	28/09/2021	Pre	7.340	1.112	13.966	12.854	Post	5.0	5840	431	11.4	Clear, no odour
MW1S	28/09/2021	Pre	4.025	1.145	14.591	13.446	Post	5.1	580	385	24.1	Purged dry, sampled recharge
MB2	28/09/2021	Pre	2.950	1.168	14.252	13.084	Post	5.9	403	293	19.400	Brown, purged dry, sampled recharge
MW3S	28/09/2021	Pre	4.280	1.096	15.250	14.154	Post	4.3	960	702	19.2	Clear, no odour
MW4S	28/09/2021	Pre	3.980	1.121	12.965	11.844	Post	6.0	620	416	23.2	Purged dry, sampled recharge
MW5S	28/09/2021	Pre	4.110	1.251	13.960	12.709	Post	5.6	640	448	21.5	No odour, cloudy, purged dry, sampled recharge
S1	28/09/2021						Post	7.3	670	435	24.9	Yellow, no odour
S2	28/09/2021						Post	7.2	650	435	23.3	Cloudy, sediment, no odour
S3	28/09/2021						Post	6.9	1560	1137	19.6	Sediment, no odour
D1	28/09/2021						Post	7.2	1100	793	20.8	Clear, odour
D2	28/09/2021						Post	7.4	1020	721	21.2	Yellow, odour
D3	28/09/2021						Post	6.2	650	442	23.9	Cloudy, odour

Notes:
ID = identification
Pre = pre-purge
Post = post-purge
mbtoc = metres below top of casing
mAHD = metres Australian Height Datum
SWL = surface water level
MW = Monitoring well
mg/L = milligrams per litre
L = litres
mS/cm = millisiemens per centimetre
°C = degrees Celsius
S = shallow
D = deep
TDS = Total Dissolved Solids
EC = Electrical Conductivity
MW = Monitoring Well
* TDS calcuated

Field Equipment Used:
Coffey Interface Probe Meter
Eco Environmental YSI (YSIPP9)

Table 4
Water Analytical Results - Event 1
RETWA
March 2021
754-PEREN283020

TETRA TECH COFFEY

					Field_ID	MW1D	MW2D	QC1	RPD%	QC2	RPD%	MW3D	MW4D	MW5D	QC3
					Sampled_Date	15-Mar-21	15-Mar-21	15-Mar-21		15-Mar-21		15-Mar-21	15-Mar-21	15-Mar-21	15-Mar-21
					SampleCode	EP2102771001	EP2102771002	EP2102771006		M21-Ma31558		EP2102771003	EP2102771004	EP2102771005	EP2102771007
ChemName	**Units**	**LOR**	ANZECC 2000 Short or Long Irrigation	ANZG (2018) Freshwater 95%	Davidson (1995) Range Superficial Background				**Duplicate of MW2D**		**Triplicate of MW2D**				**Field Blank**
Inorganics															
Nitrite + Nitrate as N	mg/L	**0.01**	NE	NE	NE	**0.24**	**28.2**	**26.8**	**5**	-	-	**3.01**	<0.01	<0.01	<0.01
Ammonia as N	mg/L	**0.01**	NE	**2.57**	NE	<0.01	<0.01	<0.01	**-**	**0.02**	-	**0.15**	**0.05**	**0.11**	<0.01
Kjeldahl Nitrogen Total	mg/L	**0.1**	NE	NE	NE	0.1	**3.1**	**3**	**3**	**10**	**105**	**0.6**	<0.1	**0.3**	<0.1
Nitrate (as N)	mg/L	**0.01**	NE	**2.4#**	**4**	**0.24**	**28.2**	**26.8**	**5**	**29**	**3**	**3.01**	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	**0.01**	NE	NE	NE	<0.01	<0.01	<0.01	**-**	<0.02	**-**	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	**0.1**	**25-125^**	**1.5***	NE	**0.3**	**31.3**	**29.8**	**5**	**26**	**18**	**3.6**	<0.1	**0.3**	<0.1
Phosphorus	mg/L	**0.01**	**0.8-12^**	**0.06***	**0.2**	**0.02**	**0.09**	**0.03**	**100**	**0.01**	**160**	**0.06**	**0.02**	**0.12**	<0.01
Electrical Conductivity	µS/cm	**1**	NE	NE	NE	**639**	**563**	**572**	**2**	-	-	**1470**	**882**	**5450**	<1
TDS	mg/L	**-**	**416**	**192-960***	**2000**	**415**	**366**	**372**	**2**	**-**	-	**956**	**573**	**3543**	-
pH (Lab)	pH_Units	**0.01**	**6.0-9.0**	**7.0-8.5***	**6.5-8.5**	**5.7**	**6.4**	**6.76**	**5**	-	-	**3.81**	**6.62**	**5.73**	**5.78**

Notes:
NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

Result	Result exceeds laboratory LOR
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)
^ obtained from ANZECC & ARMCANZ (2000) – Long-term and Short-term irrigation water

Table 5
Water Analytical Results - Event 2
RETWA
June and July 2021
754-PEREN283020

						Field_ID	MW1S	QC1	RPD%	QC2	RPD%	MB2	MW3S	S1	S2	S3	D1	D2	D3	QC3
						Sampled_Date	22-Jun-21	22-Jun-21		22-Jun-21		22-Jun-21	22-Jun-21	13-Jul-21	13-Jul-21	13-Jul-21	22-Jun-21	22-Jun-21	22-Jun-21	22-Jun-21
						SampleCode	EP2107069004	EP2107069007		P21-Jn44436		EP2107069005	EP2107069006	EP2108025001	EP2108025002	EP2108025003	EP2107069001	EP2107069002	EP2107069003	EP2107069008
			ANZECC 2000 Irrigation	ANZG (2018) Freshwater 95%	Davidson (1995) Range Superficial Background				Duplicate of MW1S		Triplicate of MW1S									Field Blank
ChemName	**Units**	**LOR**																		
Inorganics																				
Nitrite + Nitrate as N	mg/L	**0.01**	NE	NE	NE	**0.28**	**0.26**	**7**	**0.3**	**7**	**0.09**	**11.1**	**0.2**	**0.19**	**0.24**	**0.1**	**0.25**	**0.34**	<0.01
Ammonia as N	mg/L	**0.01**	NE	**2.57**	NE	**0.35**	**0.3**	**15**	**0.34**	**3**	**0.02**	**0.02**	<0.01	<0.01	<0.01	**4.66**	**0.98**	**3.15**	<0.01
Kjeldahl Nitrogen Total	mg/L	**0.1**	NE	NE	NE	**8**	**5.4**	**39**	<0.2	-	**25.5**	**6.1**	**1.6**	**1.7**	**1.7**	**8**	**5**	**8.7**	<0.1
Nitrate (as N)	mg/L	**0.01**	NE	**2.4#**	**4**	**0.27**	**0.26**	**4**	**0.29**	**7**	**0.09**	**11.1**	**0.2**	**0.19**	**0.24**	**0.08**	**0.21**	**0.3**	<0.01
Nitrite (as N)	mg/L	**0.01**	NE	NE	NE	0.01	<0.01	-	<0.02	-	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	**0.04**	**0.04**	<0.01
Nitrogen (Total)	mg/L	**0.1**	**25-125^**	**1.5***	NE	**8.3**	**5.7**	**37**	**0.3**	**186**	**25.6**	**17.2**	**1.8**	**1.9**	**1.9**	**8.1**	**5.2**	**9**	<0.1
Phosphorus	mg/L	**0.01**	**0.8-12^**	**0.06***	**0.2**	**1.38**	**1.14**	**19**	**0.49**	**95**	**2.75**	**0.44**	**0.13**	**0.12**	**0.13**	**4.16**	**3.14**	**6.07**	<0.01
Electrical Conductivity	µS/cm	**1**	NE	NE	NE	**466**	**462**	**1**	-	-	**248**	**894**	**240**	**240**	**238**	**912**	**546**	**687**	<1
TDS	mg/L	-	**416**	**192-960***	**2000**	**303**	**300**	**1**	-	-	**161**	**581**	**156**	**156**	**155**	**593**	**355**	**447**	-
pH (Lab)	pH_Units	**0.01**	**6.0-9.0**	**7.0-8.5***	**6.5-8.5**	**5.52**	**5.08**	**8**	-	-	**5.81**	**4.54**	**7.12**	**7.1**	**7.11**	**7.81**	**7.85**	**7.77**	**6.02**

Notes:

NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

Result	Result exceeds laboratory LOR
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)
^ obtained from ANZECC & ARMCANZ (2000) – Long-term and Short-term irrigation water

Table 6
Water Analytical Results - Event 3
RETWA
September 2021
754-PEREN283020

					Field_ID	MW1S	MW2S	MW3S	MW4S	MW5S	MW1D	MW2D	MW3D	MW4D	MW5D	QC1	RPD%	QC2	RPD%
					Sampled_Date	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21		28-Sep-21	
					SampleCode	EP2111546007	EP2111546008	EP2111546009	EP2111546010	EP2111546011	EP2111546012	EP2111546013	EP2111546014	EP2111546015	EP2111546016	EP2111546019		L21-Se58476	
			ANZECC 2000 Irrigation	ANZG (2018) Freshwater 95%	Davidson (1995) Range Superficial Background												Duplicate of MW5D		Triplicate of MW5D
ChemName	**Units**	**LOR**																	
Inorganics																			
Nitrite + Nitrate as N	mg/L	**0.01**	NE	NE	NE	**0.05**	0.01	**8.27**	**2.7**	**3.23**	**1.53**	**14.7**	**4.03**	<0.01	<0.01	<0.01	-	<0.05	-
Ammonia as N	mg/L	**0.01**	NE	**2.57**	NE	**0.08**	**0.11**	**0.04**	**0.04**	**0.08**	<0.01	<0.01	**0.18**	**0.04**	**0.07**	**0.07**	**0**	**0.07**	**0**
Kjeldahl Nitrogen Total	mg/L	**0.1**	NE	NE	NE	**1.1**	**3.4**	**1.2**	**1.1**	**2.3**	**0.3**	**2**	**1.3**	<0.1	**0.3**	**0.2**	**40**	<0.2	**100**
Nitrate (as N)	mg/L	**0.01**	NE	**2.4#**	**4**	**0.05**	0.01	**8.27**	**2.7**	**3.23**	**1.51**	**14.7**	**4.02**	<0.01	<0.01	<0.01	-	<0.02	-
Nitrite (as N)	mg/L	**0.01**	NE	NE	NE	<0.01	<0.01	<0.01	<0.01	<0.01	**0.02**	<0.01	0.01	<0.01	<0.01	<0.01	-	<0.02	-
Nitrogen (Total)	mg/L	**0.1**	**25-125^**	**1.5***	NE	**1.2**	**3.4**	**9.5**	**3.8**	**5.5**	**1.8**	**16.7**	**5.3**	<0.1	**0.3**	**0.2**	**40**	<0.2	**100**
Phosphorus	mg/L	**0.01**	**0.8-12^**	**0.06***	**0.2**	**0.17**	**0.23**	**0.12**	**0.1**	**0.2**	**0.06**	<0.02	**0.05**	**0.03**	**0.14**	**0.08**	**55**	<0.01	**95**
Electrical Conductivity	µS/cm	**1**	NE	NE	NE	**411**	**314**	**793**	**494**	**428**	**338**	**582**	**1370**	**833**	**5610**	**5690**	**1**	-	**1**
TDS	mg/L	-	**416**	**192-960***	**2000**	**267**	**204**	**515**	**321**	**278**	**220**	**378**	**891**	**541**	**3647**	**3699**	**1**	-	**1**
pH (Lab)	pH_Units	**0.01**	**6.0-9.0**	**7.0-8.5***	**6.5-8.5**	**5.81**	**6.47**	**4.61**	**6.93**	**6.5**	**5.48**	**6.26**	**3.64**	**6.42**	**4.54**	**4.65**	**2**	-	**2**

					Field_ID	S1	S2	S3	D1	D2	D3	QC3
					Sampled_Date	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21	28-Sep-21
					SampleCode	EP2111546001	EP2111546002	EP2111546003	EP2111546004	EP2111546005	EP2111546006	EP2111546021
			ANZECC 2000 Irrigation	ANZG (2018) Freshwater 95%	Davidson (1995) Range Superficial							Field Blank
ChemName	**Units**	**LOR**										
Inorganics												
Nitrite + Nitrate as N	mg/L	**0.01**	NE	NE	NE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Ammonia as N	mg/L	**0.01**	NE	**2.57**	NE	**0.07**	**0.49**	**0.91**	**1.2**	**1.35**	**0.48**	<0.01
Kjeldahl Nitrogen Total	mg/L	**0.1**	NE	NE	NE	**2.1**	**3.8**	**3.9**	**6.7**	**7.3**	**3.2**	<0.1
Nitrate (as N)	mg/L	**0.01**	NE	**2.4#**	**4**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrite (as N)	mg/L	**0.01**	NE	NE	NE	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrogen (Total)	mg/L	**0.1**	**25-125^**	**1.5***	NE	**2.1**	**3.8**	**3.9**	**6.7**	**7.3**	**3.2**	<0.1
Phosphorus	mg/L	**0.01**	**0.8-12^**	**0.06***	**0.2**	**0.25**	**2.07**	**1.31**	**5.1**	**4.23**	**1.45**	<0.01
Electrical Conductivity	µS/cm	**1**	NE	NE	NE	**490**	**474**	**1430**	**904**	**842**	**484**	<1
TDS	mg/L	-	**416**	**192-960***	**2000**	**319**	**308**	**930**	**588**	**547**	**315**	-
pH (Lab)	pH_Units	**0.01**	**6.0-9.0**	**7.0-8.5***	**6.5-8.5**	**7.47**	**7.19**	**7.12**	**7.47**	**7.53**	**7.6**	**5.62**

Notes:

NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

Result	Result exceeds laboratory LOR
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)
^ obtained from ANZECC & ARMCANZ (2000) – Long-term and Short-term irrigation water

Table 7a
Monitoring Wells - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 [#]	NE		
Davidson (1995) Range Superficial Bac		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
MB1	6/8/2003	6.10	-	-	6.1	0.90	0.33	0.05	6.1	13.650	0.960
	23/10/2003	6.85	-	-	6.2	1.80	0.97	0.05	6.2	13.140	1.470
	8/6/2004	5.90	-	-	17.0	1.90	0.12	13	4.2	12.710	1.900
	6/4/2005	-	-	-	-	-	-	-	-	14.610	-
	5/9/2005	6.15	-	-	4.8	0.63	0.026	0.02	-	12.650	1.960
	15/8/2006	5.95	190	124	5.9	1.00	3.9	0.013	-	13.510	1.100
	10/10/2006	6.20	-	-	5.9	0.47	0.04	0.2	-	12.690	1.924
	31/7/2007	6.15	-	-	2.8	0.28	0.033	0.059	2.7	13.410	1.200
	7/9/2007	6.35	180	117	4.6	0.30	0.005	0.012	4.6	12.620	1.990
	3/7/2008	6.15	160	104	6.5	0.05	0.062	0.005	6.5	13.680	0.934
	24/9/2008	6.55	-	-	3.8	0.19	0.04	0.035	3.7	13.290	1.323
	29/7/2009	6.05	-	-	7.5	1.00	0.9	0.06	6.5	13.620	0.994
	17/9/2009	6.55	160	104	4.3	0.21	0.032	0.014	4.3	13.200	1.413
	17/8/2010	6.20	160	104	3.6	0.61	0.005	0.24	3.4	11.700	2.910
	19/7/2011	7.00	-	-	7.5	1.90	0.049	5.2	2.3	13.454	1.156
	22/9/2011	5.90	-	-	2.4	0.38	0.095	0.012	2.4	13.901	0.709
	26/6/2012	6.50	-	-	8.8	1.10	0.07	0.001	8.8	13.632	0.978
	18/9/2012	6.20	-	-	8.5	0.46	0.04	0.001	8.5	13.274	1.336
	2/8/2013	5.90	-	-	5.3	0.23	0.69	0.24	5.1	13.660	0.950
	4/10/2013	6.40	-	-	1.1	0.33	0.73	0.005	1.1	13.810	0.800
	27/6/2014	5.90	-	-	6.1	0.32	0.05	1.4	4.7	13.570	1.044
	23/9/2014	6.20	-	-	7.4	0.12	0.01	0.27	7.2	13.180	1.426
	20/5/2015	-	-	-	-	-	-	-	-	12.610	2.004
	27/7/2015	5.40	-	-	9.5	0.77	0.017	1.6	7.9	13.180	1.430
	30/9/2015	5.80	-	-	6.6	0.65	0.31	0.005	6.6	12.770	1.839
	24/5/2016	5.50	140	91	7.4	0.22	0.041	3	-	13.230	1.377
	10/11/2016	5.60	170	111	8.8	0.89	0.58	0.005	-	12.720	1.890
	Well decommissioned										
MW1S	15/08/17	5.90	340	221	1.3	<0.05	<0.005	0.83	-	13.906	0.685
	27/09/17	5.60	520	338	2.1	<0.05	0.087	0.57	-	12.846	1.745
	05/07/18	5.60	280	182	2.9	0.06	0.006	1.7	-	12.337	0.901
	05/09/18	5.20	470	305.5	2.5	0.06	0.15	1.6	-	13.806	0.785
	13/06/19	5.60	410	267	15	1.1	0.63	1.1	-	11.692	2.899
	31/10/19	5.48	450	293	13	2.1	0.27	<0.005	-	11.218	3.373
	15/06/20	6.37	657	427	43.1	3.76	4.76	<0.01	-	11.416	3.175
	20/07/20	6.00	240	156	3.69	0.24	0.33	0.19	-	13.244	1.347
	16/10/20	-	-	-	8.4	1.54	0.38	0.48	-	11.971	2.620
	22/06/21	5.52	466	303	8.3	1.38	0.35	0.27	8	13.276	1.315
	28/09/21	5.81	411	267	1.2	0.17	0.08	0.05	1.1	13.446	1.145
MW1D	21/03/17	5.80	820	533	<0.1	<0.05	0.018	<0.005	-	9.939	4.726
	27/09/17	5.20	520	338	2.6	<0.05	0.012	2.1	-	11.936	2.729
	14/03/18	5.50	810	526.5	<0.1	<0.05	0.043	0.013	-	9.814	4.851
	05/09/18	5.50	670	436	0.3	<0.05	0.009	0.19	-	12.697	1.968
	22/03/19	5.40	390	254	<0.1	<0.05	0.008	<0.005	-	9.458	5.207
	31/10/19	4.86	530	345	0.7	<0.05	<0.005	0.59	-	10.524	4.141
	25/03/20	5.70	790	514	0.4	<0.05	0.013	0.008	-	8.783	5.882
	15/06/20	5.64	1120	728	1.5	0.15	0.75	0.02	-	8.480	6.185
	20/07/20	5.40	280	182	2.1	0.02	0.05	2.1	-	9.621	5.044
	16/10/20	-	-	-	1	0.01	0.07	0.76	-	10.400	4.265
	15/03/21	5.7	639	415	0.3	0.02	<0.01	0.24	0.1	8.780	5.885
	28/09/21	5.48	338	220	1.8	0.06	<0.01	1.51	0.3	12.214	2.451
MB2	06/08/03	7.00	-	-	18	1.7	0.06	4.3	14	13.392	0.860
	23/10/03	8.15	-	-	11	0.28	0.1	5.9	5.4	12.752	1.500
	06/08/04	6.50	-	-	7.9	0.18	0.19	0.25	7.7	13.342	0.910
	06/04/05	-	-	-	-	-	-	-	-	-	-
	05/09/05	6.20	-	-	1.1	0.02	0.023	0.034	-	13.252	1.000
	15/08/06	5.85	280	182	32	0.06	0.031	13	-	12.008	2.244
	10/10/06	6.30	-	-	4	0.09	0.01	17	-	11.956	2.296
	31/07/07	6.30	-	-	3.2	0.12	0.016	1.2	2.1	12.382	1.870
	07/09/07	6.20	200	130	1.2	0.3	0.012	0.24	1	12.220	2.032
	03/07/08	6.20	230	150	0.6	0.05	0.005	0.18	0.4	12.966	1.286
	24/09/08	6.55	-	-	0.9	0.03	0.04	0.11	0.8	12.765	1.487
	29/07/09	6.20	-	-	11	0.12	0.09	4.3	1.2	12.916	1.336
	17/09/09	6.50	210	137	5.1	0.16	0.37	3.4	1.7	12.735	1.517
	17/08/10	6.40	220	143	2.2	0.49	0.04	0.38	1.8	11.292	2.960
	19/07/11	7.00	-	-	7.5	0.68	0.006	27	4.1	11.590	2.662
	22/09/11	5.50	-	-	9	0.98	0.021	7	1.9	13.360	0.892
	26/06/12	6.20	-	-	14	0.1	0.01	14	0.5	12.976	1.276
	18/09/12	6.30	-	-	3.7	0.04	0.03	1.5	2.2	12.593	1.659
	02/08/13	6.00	-	-	25	0.04	0.066	18	7.2	12.962	1.290
	04/10/13	6.20	-	-	7.3	0.16	0.03	5	2.2	13.372	0.880
	27/06/14	6.30	-	-	1.5	0.07	0.005	0.39	1.2	12.683	1.569
	23/09/14	6.20	-	-	1.8	0.05	0.02	0.009	1.8	12.451	1.801
	20/05/15	-	-	-	-	-	-	-	-	11.374	2.878
	27/07/15	-	-	-	-	-	-	-	-	11.362	2.890
	30/09/15	-	-	-	-	-	-	-	-	11.377	2.875
	24/05/16	5.70	360	234	13	0.06	0.022	12	-	11.867	2.385
	10/11/16	-	-	-	-	-	-	-	-	11.401	2.851
	15/08/17	6.20	290	189	4.2	0.18	0.140	<0.005	-	13.497	0.755
	27/09/17	5.90	290	189	3.5	0.18	0.071	0.048	-	13.179	1.073
	05/07/18	6.00	190	124	2.2	<0.05	0.008	0.35	-	13.487	0.765
	05/09/18	6.20	310	202	3	0.1	0.14	<0.05	-	13.466	0.786
	16/08/19	6.00	310	202	4.1	<0.05	<0.005	3.8	-	11.960	2.292
	20/07/20	5.80	250	162.5	7.2	0.05	0.09	4.7	-	13.033	1.219
	16/10/20	Dry									
	22/06/21	5.81	248	161	25.6	2.75	0.02	0.09	25.5	12.647	1.605
	28/09/21	6.47	314	204	3.4	0.23	0.11	0.01	3.4	13.084	1.168

Notes:
NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)

Table 7a
Monitoring Wells - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 [#]	NE		
Davidson (1995) Range Superficial Bac		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
MW2D	21/3/2017	6.00	610	397	12	<0.05	<0.005	11	-	10.955	3.221
	27/9/2017	5.90	640	416	11	<0.05	0.074	8.7	-	12.790	1.386
	14/3/2018	6.00	550	358	18	<0.05	0.011	16	-	10.901	3.275
	5/9/2018	5.80	570	371	19	<0.05	0.04	16	-	13.180	0.996
	22/3/2019	6.00	250	163	25.0	<0.05	<0.005	22	-	10.277	3.899
	31/10/2019	5.49	540	351	16	<0.05	<0.005	15	-	11.335	2.841
	25/3/2020	6.20	470	306	17	<0.05	<0.005	16	-	9.575	4.601
	15/6/2020	5.81	807	524.6	25.7	0.02	0.03	23	-	9.186	4.990
	20/7/2020	6.10	620	403	15.1	0.02	0.05	14	-	10.380	3.796
	16/10/2020	-	-	-	22.6	0.02	0.03	20.6	-	11.266	2.910
	15/3/2021	6.4	563	366	31.3	0.09	<0.01	28.2	3.1	9.616	4.560
	28/9/2021	6.26	582	378	16.7	<0.02	<0.01	14.7	2	12.790	1.386
MB3	6/8/2003	6.50	-	-	8.9	0.64	0.01	6.3	2.6	13.840	0.670
	23/10/2003	7.60	-	-	13	0.14	0.05	6.1	6.7	12.730	1.780
	6/8/2004	6.40	-	-	26	0.31	0.32	15	11	13.720	0.790
	6/4/2005	6.50	-	-	9	1.40	0.05	0.6	8.9	11.960	2.550
	5/9/2005	6.10	-	-	1.2	0.41	0.01	0.034	-	13.250	1.260
	15/8/2006	6.85	1039	675	15	1.60	1.1	2.5	11.4	11.920	2.590
	10/10/2006	6.45	-	-	21	0.27	0.012	75	-	12.480	2.032
	31/7/2007	6.75	-	-	5.8	0.10	0.019	4.4	1.4	11.910	2.600
	7/9/2007	6.45	590	384	4.5	0.27	0.013	4	0.5	12.430	2.080
	3/7/2008	6.60	670	436	1.5	0.06	0.005	0.99	0.5	13.910	0.598
	24/9/2008	6.45	-	-	2.7	0.08	0.005	1.4	1.3	13.100	1.409
	29/7/2009	6.35	-	-	9.4	0.14	0.007	3.7	1	13.860	0.648
	17/9/2009	6.85	630	410	5.4	0.06	0.036	5.3	0.1	13.020	1.489
	17/8/2010	6.50	630	410	9.5	0.35	0.005	7.6	1.9	11.710	2.800
	19/7/2011	7.20	-	-	46	0.63	0.005	29	18	13.670	0.837
	22/9/2011	5.80	-	-	45	0.15	0.03	34	11	14.030	0.476
	26/6/2012	6.40	-	-	15	0.05	1.4	6.8	8	13.820	0.690
	18/9/2012	7.20	-	-	11	0.08	0.06	5.2	5.5	13.520	0.991
	2/8/2013	6.50	-	-	21	0.15	0.1	11	9.1	11.710	2.800
	4/10/2013	6.90	-	-	1.7	0.05	0.03	1.7	0.1	13.990	0.520
	27/6/2014	6.20	-	-	13	0.06	0.01	11	2.8	12.887	1.623
	23/9/2014	6.70	-	-	3.9	0.05	0.005	1.6	2.3	13.479	1.031
	20/5/2015	-	-	-	-	-	-	-	-	12.065	2.445
	27/7/2015	6.30	-	-	14	0.09	0.11	11	3.0	12.744	1.766
	30/9/2015	6.40	-	-	15	0.39	0.005	11	3.4	12.532	1.978
	24/5/2016	6.60	600	390	40	0.18	0.035	32	-	12.278	2.232
	10/11/2016	5.90	1100	715	23	0.42	0.005	16	-	12.261	2.249
	Well decommissioned										
MW3S	15/8/2017	4.60	750	488	15	<0.05	<0.005	14	-	14.660	0.590
	27/9/2017	5.20	760	494	12	1.4	0.024	9.6	-	14.514	0.736
	5/7/2018	4.70	710	462	13	0.1	0.04	11	-	14.679	0.571
	5/9/2018	5.10	920	598	4.8	<0.05	0.067	4.2	-	14.665	0.585
	13/6/2019	4.40	490	319	13	<0.05	0.032	11	-	12.595	2.655
	31/10/2019	3.52	1490	969	14	0.91	0.044	6.5	-	12.676	2.574
	15/6/2020	4.61	1126	732	7.3	0.24	0.17	0.01	-	12.260	2.990
	20/7/2020	3.70	840	546	9.5	0.02	0.02	8.4	-	14.357	0.893
	16/10/2020	-	-	-	10.8	0.48	<0.01	8.4	-	12.780	2.470
	22/6/2021	4.54	894	581	17.2	0.44	0.02	11.1	6.1	13.285	1.965
	28/9/2021	4.61	793	515	9.5	0.12	0.04	8.27	1.2	14.154	1.096
MW3D	21/3/2017	4.50	1200	780	12	<0.05	0.15	8.7	-	11.045	4.208
	27/9/2017	3.80	1400	910	7.4	<0.05	0.14	5.8	-	13.542	1.711
	14/3/2018	4.00	1300	845	3.4	<0.05	0.1	2.9	-	11.102	4.151
	5/9/2018	3.90	1500	975	2.4	<0.05	0.21	1.6	-	14.185	1.068
	22/3/2019	4.00	720	468	1	<0.05	0.12	0.59	-	10.660	4.593
	31/10/2019	4.37	780	507	1.8	<0.05	0.14	1.5	-	11.766	3.487
	25/3/2020	4.00	1500	975	0.6	<0.05	0.14	0.18	-	9.975	5.278
	15/6/2020	4.26	1942	1262.3	1.7	0.13	0.2	0.71	-	9.537	5.716
	20/7/2020	3.70	1300	845	2.9	0.01	0.16	2.9	-	10.766	4.487
	16/10/2020	-	-	-	3.4	<0.01	0.21	2.64	-	11.533	3.720
	15/3/2021	3.81	1470	956	3.6	0.06	0.15	3.01	0.6	9.913	5.340
	28/9/2021	3.64	1370	891	5.3	0.05	0.18	4.02	1.3	13.563	1.690
MB4	6/8/2003	7.25	-	-	4	1.80	0.04	1.1	2.9	11.590	0.760
	23/10/2003	8.10	-	-	3.1	0.01	0.05	0.2	2.9	10.980	1.370
	6/8/2004	6.60	-	-	23	0.54	0.28	16	6.8	11.490	0.860
	6/4/2005	5.65	-	-		5.9	0.05	21	1.2	9.760	2.590
	5/9/2005	6.65	-	-	2.9	0.22	0.3	1.1	-	11.380	0.970
	15/8/2006	6.45	997	648	1.2	0.05	0.38	0.005	0.8	9.950	2.400
	10/10/2006	6.65	-	-	3.4	0.2	0.08	1.4	-	10.340	2.011
	31/7/2007	6.75	-	-	2	0.17	0.023	0.84	1.2	10.150	2.200
	7/9/2007	6.50	250	163	1.6	0.15	0.012	0.3	1.3	10.440	1.912
	3/7/2008	6.70	370	241	4.7	0.14	0.011	3.9	0.7	11.160	1.195
	24/9/2008	6.80	-	-	2.3	0.13	0.015	0.054	2.3	10.910	1.444
	29/7/2009	6.55	-	-	8.5	0.2	0.049	0.02	4.6	11.110	1.245
	17/9/2009	6.90	190	124	4.1	0.1	0.022	0.02	1.1	10.860	1.494
	17/8/2010	6.80	200	130	1.4	0.67	0.21	0.17	1.2	9.410	2.940
	19/7/2011	7.30	-	-	15	0.88	0.045	14	0.6	10.770	1.582
	22/9/2011	6.00	-	-	1.4	0.33	0.072	0.1	1.3	11.620	0.735
	26/6/2012	6.40	-	-	22	0.13	1.6	20	1.9	11.040	1.310
	18/9/2012	6.80	-	-	3.4	0.11	0.03	0.01	3.4	11.049	1.301
	2/8/2013	-	-	-	-	-	-	-	-	9.430	2.920
	4/10/2013	6.90	-	-	0.1	0.05	0.1	0.057	0.1	11.470	0.880
	27/6/2014	6.60	-	-	5.5	0.65	0.24	2.6	2.9	10.709	1.641
	23/9/2014	6.80	-	-	7.4	0.12	0.01	0.005	7.2	10.985	1.365
	20/5/2015	-	-	-	-	-	-	-	-	10.379	1.971
	27/7/2015	-	-	-	-	-	-	-	-	9.450	2.900
	30/9/2015	-	-	-	-	-	-	-	-	9.605	2.745
	24/5/2016	-	-	-	-	-	-	-	-	9.440	2.910
	10/11/2016	5.90	1400	910	5.9	0.45	0.065	3.3	-	10.039	2.311
	Well decommissioned										

Notes:
NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep
* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)

Investigation Levels

Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

Table 7a
Monitoring Wells - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 [#]	NE		
Davidson (1995) Range Superficial Bac		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
MW4S	15/8/2017	6.20	400	260	29.0	0.08	<0.005	26	-	12.255	0.710
	27/9/2017	6.10	450	293	36.0	<0.05	<0.005	30	-	11.877	1.088
	5/7/2018	6.00	400	260	10	0.06	0.007	8.3	-	11.269	1.696
	5/9/2018	6.30	380	247	21	0.21	0.01	16	-	-	0.680
	16/8/2019	6.50	530	345	4.4	0.12	0.08	3.7	-	11.219	1.746
	31/10/2019	6.56	148	96	5.3	0.74	0.26	<0.05	-	10.455	2.510
	20/7/2020	5.60	3400	2210	2.9	0.7	1.6	0.02	-	9.760	3.205
	16/10/2020	-	-	-	3.7	0.45	0.16	0.03	-	10.165	2.800
	15/3/2021	-	-	-	-	-	-	-	-	-	-
	28/9/2021	6.93	494	321	3.8	0.1	0.04	2.7	1.1	11.844	1.121
MW4D	21/3/2017	6.10	1000	650	0.1	<0.05	0.024	<0.005	-	9.816	3.061
	27/9/2017	5.90	970	631	0.2	<0.05	0.032	0.005	-	11.836	1.041
	14/3/2018	6.00	980	637	<0.1	<0.05	0.039	0.015	-	9.581	3.296
	5/9/2018	6.00	1000	650	<0.1	<0.05	0.026	<0.005	-	12.148	0.729
	22/3/2019	5.90	460	299	0.2	<0.05	0.041	<0.005	-	9.100	3.777
	31/10/2019	5.66	100	65	0.1	0.15	0.016	<0.005	-	10.576	2.301
	25/3/2020	6.10	890	579	0.3	0.49	0.035	0.041	-	8.772	4.105
	15/6/2020	5.74	1077	700.1	1.2	0.81	0.07	0.08	-	8.702	4.175
	20/7/2020	6.20	760	494	<0.2	0.02	0.08	<0.02	-	10.441	2.436
	16/10/2020	-	-	-	0.1	0.01	0.04	0.04	-	10.647	2.230
	15/3/2021	6.62	882	573	<0.1	0.02	0.05	<0.01	<0.1	8.792	4.085
	28/9/2021	6.42	833	541	<0.1	0.03	0.04	<0.01	<0.1	11.742	1.135
MW5S	15/8/2017	5.60	1100	715	13	0.08	<0.005	11	-	13.308	0.652
	27/9/2017	5.70	830	540	12	0.07	0.047	9.4	-	12.945	1.015
	5/7/2018	5.90	3900	2535	5	0.21	0.65	1.3	-	11.469	2.491
	5/9/2018	5.50	860	559	5.7	<0.05	<0.005	4.3	-	13.158	0.802
	16/8/2019	5.20	1200	780	2.2	<0.05	0.019	1.9	-	11.393	2.567
	31/10/2019	5.68	1320	858	4.6	1	0.048	0.092	-	10.829	3.131
	20/7/2020	6.20	670	435.5	0.9	0.02	0.07	0.9		12.018	1.942
	16/10/2020	-	-	-	9.6	0.28	0.04	5.79		11.220	2.740
	15/3/2021	-	-	-	-	-	-	-	-	-	-
	28/9/2021	6.5	428	278	5.5	0.2	0.08	3.23	2.3	12.709	1.251
MW5D	21/3/2017	4.90	10000	6500	0.4	<0.05	0.030	<0.005	-	10.558	3.408
	27/9/2017	5.50	8900	5785	2.7	<0.05	0.038	1.2	-	12.841	1.125
	14/3/2018	5.60	4,800	3120	0.4	<0.05	0.071	<0.005	-	10.337	3.629
	5/9/2018	5.70	4200	2730	0.2	<0.05	0.098	<0.005	-	13.202	0.764
	22/3/2019	5.70	2000	1300	0.4	<0.05	0.097	0.006	-	9.950	4.016
	31/10/2019	5.33	3710	2411.5	0.6	0.15	0.085	<0.005	-	11.358	2.608
	25/3/2020	5.80	3800	2470	0.8	0.15	0.120	0.086	-	9.616	4.350
	15/6/2020	5.43	4072	2646.8	0.4	0.48	0.06	<0.01	-	9.601	4.365
	20/7/2020	3.80	4700	3055	2.2	0.01	0.15	1.6	-	11.447	2.519
	16/10/2020	-	-	-	0.3	0.05	0.1	0.11	-	11.396	2.570
	15/3/2021	5.73	5450	3543	0.3	0.12	0.11	<0.01	0.3	9.661	4.305
	28/9/2021	4.54	5610	3647	0.3	0.14	0.07	<0.01	0.3	12.854	1.112

Notes:
NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)

TETRA TECH COFFEY

Table 7b
Drains and Streams - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 #	NE		
Davidson (1995) Range Superficial Back		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
D1	6/08/2003	7.60	-	300	9.4	0.9	4	0.8	4.5	-	-
	23/10/2003	7.90	-	600	3.9	0.62	0.05	0.05	3.9	-	-
	8/06/2004	7.60	-	400	17.0	1.7	0.82	4.7	3.5	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	7.55	-	190	9.1	1.1	0.36	5.3	-	-	-
	1/08/2005	-	-	-	-	-	-	-	-	-	-
	15/08/2006	7.50	-	210	6.0	1.6	1.1	3.4	-	-	-
	10/10/2006	-	-	-	-	-	-	-	-	-	-
	31/07/2007	7.20	-	220	5.1	1.1	0.71	0.37	4.7	-	-
	7/09/2007	6.55	-	270	4	0.98	1.3	0.35	3.7	-	-
	3/07/2008	7.25	-	340	4.6	0.88	0.28	2	2.7	-	-
	24/09/2008	7.30	-	790	28	0.07	0.36	23	4.7	-	-
	29/07/2009	7.30	-	440	11	3.1	1.9	0.92	8.8	-	-
	17/09/2009	7.15	-	540	8.2	0.1	0.022	4.9	3.3	-	-
	17/08/2010	7.20	-	450	0.7	2	0.005	0.36	0.4	-	-
	19/07/2011	7.90	-	670	10	3.5	0.39	0.005	10	-	-
	22/09/2011	6.70	-	210	5	3.1	2.3	0.051	4.9	-	-
	26/06/2012	7.20	-	460	4.8	1.5	0.09	0.01	4.8	-	-
	18/09/2012	7.50	-	460	9.9	1.3	0.001	0.001	9.9	-	-
	2/08/2013	7.90	-	290	3.9	0.98	0.069	1.4	2.1	-	-
	4/10/2013	7.30	-	240	1.1	1.3	0.09	0.005	1.1	-	-
	27/06/2014	7.50	-	450	3.3	1.5	0.5	0.15	3.1	-	-
	23/09/2014	7.50	-	430	15	1.7	0.18	0.005	15	-	-
	20/05/2015	7.50	-	230	8.7	3.4	2.8	0.005	8.7	-	-
	30/09/2015	7.50	-	440	23	10	4.6	0.005	23	-	-
	24/05/2016	7.50	600	390	23	2.2	1.9	11	-	-	-
	2/08/2016	7.00	460	299	11	2.7	1.3	0.005	-	-	-
	15/08/2017	7.40	230	150	1.7	0.67	0.16	0.14	-	-	-
	27/09/2017	7.40	650	423	12.0	4.8	3.3	0.05	-	-	-
	5/07/2018	7.50	390	254	5.8	1.7	1.9	0.46	-	-	-
	5/09/2018	7.20	440	286	4.6	1.6	0.12	1	-	-	-
	13/06/2019	7.50	930	605	12	4	2.7	2.4	-	-	-
	20/07/2020	7.90	590	384	7.1	4.2	1.8	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	22-Jun-21	7.81	912	593	8.1	4.16	4.66	0.08	8	-	-
	28-Sep-21	7.47	904	588	6.7	5.1	1.2	<0.01	6.7	-	-
D2	6/08/2003	7.50	-	630	18.0	1.80	3.7	12	18	-	-
	23/10/2003	7.65	-	760	14.0	1.10	1.8	2.2	11	-	-
	8/06/2004	7.25	-	340	1.8	3.20	0.9	8.1	8.9	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	7.35	-	160	7	1	0.23	3.9	-	-	-
	1/08/2005	-	-	-	-	-	-	-	-	-	-
	15/08/2006	7.50	-	390	40	1.1	1.3	25	-	-	-
	10/10/2006	7.40	-	760	35	0.17	0.71	110	-	-	-
	31/07/2007	7.20	-	470	28	1.6	28	22	6.2	-	-
	7/09/2007	6.75	-	460	4.3	0.81	0.49	2.8	1.5	-	-
	3/07/2008	7.25	-	1300	61	3.5	1.1	44	17	-	-
	24/09/2008	7.20	-	750	18	0.45	0.55	16	1.9	-	-
	29/07/2009	7.45	-	650	54	0.84	1.1	3.1	28	-	-
	17/09/2009	7.10	-	720	35	0.27	0.75	0.15	35	-	-
	17/08/2010	7.30	-	1800	210	12	0.037	130	74	-	-
	19/07/2011	7.70	-	1800	70	2	7	43	27	-	-
	22/09/2011	7.00	-	340	14	5.5	5	6.9	6	-	-
	26/06/2012	7.60	-	1100	59	1.7	4.5	40	19	-	-
	18/09/2012	7.70	-	1300	87	2.4	1.4	52	36	-	-
	2/08/2013	7.90	-	800	35	1.8	2.8	25	10	-	-
	4/10/2013	7.60	-	680	16	7.5	10	0.005	16	-	-
	27/06/2014	7.30	-	600	21	76	2.9	1.4	19	-	-
	23/09/2014	7.90	-	1200	25	5	4.4	1.1	24	-	-
	20/05/2015	7.80	-	770	18	2.4	2.1	11	6.8	-	-
	30/09/2015	7.30	-	760	330	51	4.5	0.008	330	-	-
	24/05/2016	7.50	540	351	20	3.1	2.6	12	-	-	-
	2/08/2016	7.20	990	644	17	1.7	0.7	9.1	-	-	-
	15/08/2017	7.40	440	286	9.2	2.6	2.1	0.36	-	-	-
	27/09/2017	7.30	930	605	57.0	20	7.3	0.05	-	-	-
	5/07/2018	7.50	400	260	6.8	2.6	1.5	0.29	-	-	-
	5/09/2018	7.20	700	455	9	5.6	2	0.1	-	-	-
	13/06/2019	7.80	2200	1430	58	5.1	5.4	46	-	-	-
	31/10/2019	6.86	1230	800	14	4.3	5	0.55	-	-	-
	20/07/2020	7.40	1600	1040	17	11	3.7	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	22-Jun-21	7.85	546	355	5.2	3.14	0.98	0.21	5	-	-
	28-Sep-21	7.53	842	547	7.3	4.23	1.35	<0.01	7.3	-	-

Notes:

NE = Guideline not established

LOR = Limit of reporting

MW = Monitoring Well

S = shallow

D = deep

Investigation Levels

Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)

obtained from NIWA (2013) as referred to by ANZG (2018)

Table 7b
Drains and Streams - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 [#]	NE		
Davidson (1995) Range Superficial Back		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
D3	6/08/2003	7.40	-	440	7.9	3.4	4.8	1.3	6.4	-	-
	23/10/2003	8.00	-	640	21	6.3	1.2	0.4	20	-	-
	8/06/2004	7.60	-	170	7.9	0.61	0.41	2.5	4.7	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	7.50	-	350	5.2	0.58	0.14	3.7	-	-	-
	1/08/2005	-	-	-	-	-	-	-	-	-	-
	15/08/2006	7.55	-	190	4.1	0.6	0.61	1.2	-	-	-
	10/10/2006	7.35	-	540	4	1.5	0.58	8	-	-	-
	31/07/2007	7.55	-	170	3.5	0.8	3.5	1	2.5	-	-
	7/09/2007	6.85	-	470	4.5	2.8	2.20	0.22	4.3	-	-
	3/07/2008	7.05	-	370	5.5	2.4	1.9	0.89	4.6	-	-
	24/09/2008	7.20	-	550	3.8	1.9	1	0.34	3.5	-	-
	29/07/2009	7.40	-	810	37	9.6	10	0.1	-	-	-
	17/09/2009	7.15	-	710	19	18	9.4	0.027	19	-	-
	17/08/2010	7.40	-	400	16	16	3.5	2	14	-	-
	19/07/2011	8.10	-	860	9.5	4.2	6.5	0.005	9.5	-	-
	22/09/2011	6.70	-	190	4.6	4.1	0.8	0.046	4.5	-	-
	26/06/2012	7.40	-	610	3.8	1.6	2.1	0.029	3.7	-	-
	18/09/2012	7.80	-	650	8.9	2.1	1.2	0.001	8.8	-	-
	2/08/2013	7.50	-	190	2.8	1	0.27	0.38	2.4	-	-
	4/10/2013	7.40	-	293	1.4	1.8	0.28	0.005	1.4	-	-
	27/06/2014	7.40	-	310	3.2	2.4	0.38	0.005	3.2	-	-
	23/09/2014	7.40	-	310	5.5	2.2	0.29	0.15	5.3	-	-
	20/05/2015	7.90	-	560	21	3.2	3.9	5.7	15	-	-
	30/09/2015	7.90	-	520	30	9.6	1.9	0.046	30	-	-
	24/05/2016	7.70	270	176	10	2.7	3.1	1.5	-	-	-
	2/08/2016	7.20	590	384	11	7	0.24	1.3	-	-	-
	15/08/2017	7.50	300	195	3	1.6	0.73	0.045	-	-	-
	27/09/2017	7.20	800	520	26	8.3	9.8	0.05	-	-	-
	5/07/2018	7.60	430	279.5	7.2	2.8	2.7	0.18	-	-	-
	5/09/2018	7.10	440	286	5.1	3	0.6	<0.05	-	-	-
	13/06/2019	7.30	480	312	7.1	4.7	1.2	<0.005	-	-	-
	20/07/2020	7.30	830	540	12	9.8	3.7	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	22-Jun-21	7.77	687	447	9	6.07	3.15	0.3	8.7	-	-
	28-Sep-21	7.6	484	315	3.2	1.45	0.48	<0.01	3.2	-	-
S1	6/08/2003	7.70	-	330	1.6	0.35	0.01	0.05	1.5	-	-
	23/10/2003	7.00	-	600	1.2	0.12	0.01	0.05	1.2	-	-
	8/06/2004	6.60	-	1900	1.9	0.12	0.01	0.05	1.9	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	6.80	-	300	2.6	0.07	0.05	1.3	-	-	-
	1/08/2005	-	-	-	-	-	-	-	-	-	-
	15/08/2006	7.25	-	160	1.8	0.24	0.15	0.38	-	-	-
	10/10/2006	-	-	-	-	-	-	-	-	-	-
	31/07/2007	7.25	-	240	1	0.28	1	0.14	0.3	-	-
	7/09/2007	6.95	-	490	1.1	0.42	0.15	0.018	2.2	-	-
	3/07/2008	6.90	-	230	1	0.23	0.079	0.023	1	-	-
	24/09/2008	-	-	-	-	-	-	-	-	-	-
	29/07/2009	7.15	-	420	79.0	0.52	32	0.2	79	-	-
	17/09/2009	7.15	-	380	2.7	0.66	0.11	0.014	2.6	-	-
	17/08/2010	6.90	-	180	2.4	0.56	0.005	0.07	2.3	-	-
	19/07/2011	8.10	-	260	2.4	0.58	0.005	0.005	2.4	-	-
	22/09/2011	6.70	-	190	1.9	0.51	0.74	0.005	1.9	-	-
	26/06/2012	6.50	-	180	2.8	0.32	0.001	0.001	2.8	-	-
	18/09/2012	7.60	-	410	4.3	0.44	0.12	0.001	4.3	-	-
	2/08/2013	6.70	-	440	3.4	0.20	0.071	1.8	1.7	-	-
	4/10/2013	7.50	-	350	1.3	0.34	0.13	0.005	1.3	-	-
	27/06/2014	7.00	-	160	2.9	0.28	0.29	0.005	2.9	-	-
	23/09/2014	7.70	-	230	2.0	0.42	0.01	0.005	2	-	-
	20/05/2015	-	-	-	-	-	-	-	-	-	-
	27/07/2015	7.00	-	150	3.6	0.26	0.012	0.022	3.6	-	-
	30/09/2015	-	-	-	-	-	-	-	-	-	-
	24/05/2016	7.50	180	12	1.3	0.08	0.078	0.2	-	-	-
	2/08/2016	7.20	430	28	5.1	0.08	0.081	0.005	-	-	-
	15/08/2017	7.40	530	345	0.8	0.17	0.005	0.005	-	-	-
	27/09/2017	7.20	580	377	2.8	0.30	0.4	0.05	-	-	-
	5/07/2018	6.90	240	164	1.2	0.06	<0.005	<0.005	-	-	-
	5/09/2018	7.30	500	325	1.2	0.09	0.016	<0.005	-	-	-
	31/10/2019	6.50	710	462	0.9	<0.05	0.007	0.14	-	-	-
	20/07/2020	7.20	220	143	1.4	0.14	<0.01	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	13-Jul-21	7.12	240	156	1.8	0.13	<0.01	0.2	1.6	-	-
	28-Sep-21	7.47	490	319	2.1	0.25	0.07	<0.01	2.1	-	-

Notes:

NE = Guideline not established

LOR = Limit of reporting

MW = Monitoring Well

S = shallow

D = deep

Investigation Levels

Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)

obtained from NIWA (2013) as referred to by ANZG (2018)

Table 7b
Drains and Streams - Historical Laboratory Groundwater Monitoring Results 2003 to 2021
RETWA
754-PEREN283020

		pH	EC	TDS	Total N	Total P	Ammonia	Nitrate N	TKN	mAHD	SWL
		pH units	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
ANZECC & ARMCANZ (2000) Irrigation		6.0-9.0	NE	416	25-125 [1]	0.8-12 [1]	NE	NE	NE		
ANZG (2018) Freshwater 95%		7.0-8.5 *	NE	192-960 *	1.5 *	0.06 *	2.57	2.4 [#]	NE		
Davidson (1995) Range Superficial Back		6.5-8.5	NE	2000	NE	0.2	NE	4	NE		
		LOR									
Sample ID	Date	-	1	-	0.1	0.05	0.005	0.005	0.1	-	-
S2	6/08/2003	7.40	-	390	1.2	0.14	0.01	0.05	1.2	-	-
	23/10/2003	-	-	-	-	-	-	-	-	-	-
	8/06/2004	7.65	-	350	2.8	0.45	0.01	0.05	2.8	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	6.85	-	210	4.3	0.13	0.14	1.8	-	-	-
	15/08/2006	7.10	-	180	1.6	0.16	0.09	0.19	-	-	-
	10/10/2006	-	-	-	-	-	-	-	-	-	-
	31/07/2007	7.15	-	190	1	0.12	1	0.033	0.1	-	-
	7/09/2007	-	-	-	-	-	-	-	-	-	-
	3/07/2008	-	-	-	-	-	-	-	-	-	-
	24/09/2008	-	-	-	-	-	-	-	-	-	-
	29/07/2009	6.80	-	370	1.1	0.13	0.099	0.3	1.1	-	-
	17/09/2009	7.10	-	690	1.8	0.11	0.005	0.037	1.8	-	-
	17/08/2010	-	-	-	-	-	-	-	-	-	-
	19/07/2011	7.40	-	410	2.8	0.6	0.005	0.005	2.8	-	-
	22/09/2011	6.10	-	200	1.6	0.15	0.75	0.021	1.6	-	-
	26/06/2012	6.60	-	380	5.3	0.30	0.11	1.8	3.6	-	-
	18/09/2012	6.70	-	390	3.9	0.43	0.05	0.027	3.8	-	-
	2/08/2013	6.90	-	280	5.6	0.21	0.066	2.6	3.1	-	-
	4/10/2013	7.40	-	820	0.7	0.18	0.16	0.005	0.7	-	-
	27/06/2014	5.60	-	470	40	3.40	0.17	1	39.0	-	-
	23/09/2014	7.20	-	300	3.1	0.26	0.23	0.005	3.1	-	-
	20/05/2015	-	-	-	-	-	-	-	-	-	-
	27/07/2015	6.60	-	450	4.8	0.89	0.016	0.005	4.8	-	-
	30/09/2015	-	-	-	-	-	-	-	-	-	-
	24/05/2016	7.30	110	72	1.4	0.30	0.096	0.42	-	-	-
	2/08/2016	6.90	420	273	13.0	2.30	0.092	0.005	-	-	-
	15/08/2017	7.00	560	364	1	0.05	0.017	0.06	-	-	-
	27/09/2017	7.10	780	507	1.7	0.05	0.005	0.005	-	-	-
	5/07/2018	7.00	190	124	1.3	<0.05	<0.005	<0.005	-	-	-
	5/09/2018	7.20	710	461.5	1.3	<0.05	0.026	<0.005	-	-	-
	31/10/2019	6.70	630	410	0.9	0.14	<0.005	<0.005	-	-	-
	20/07/2020	7.00	160	104	1.3	0.16	<0.01	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	13-Jul-21	7.1	240	156	1.9	0.12	<0.01	0.19	1.7	-	-
	28-Sep-21	7.19	474	308	3.8	2.07	0.49	<0.01	3.8	-	-
S3	6/08/2003	7.15	-	400	2.5	1.60	0.24	0.05	-	-	-
	23/10/2003	-	-	-	-	-	0.01	-	-	-	-
	8/06/2004	7.30	-	410	3.1	0.09	0.28	0.05	3.1	-	-
	3/08/2004	-	-	-	-	-	-	-	-	-	-
	7/06/2005	6.65	-	140	4.4	0.15	0.17	2.8	-	-	-
	1/08/2005	-	-	-	-	-	-	-	-	-	-
	15/08/2006	6.95	-	110	1.2	0.08	0.057	0.075	-	-	-
	10/10/2006	-	-	-	-	-	-	-	-	-	-
	31/07/2007	7.20	-	310	3.1	0.18	2.6	0.82	0.2	-	-
	7/09/2007	6.95	-	640	1.1	0.09	0.068	0.005	1.1	-	-
	3/07/2008	7.05	-	400	1.2	0.14	0.023	0.067	1.1	-	-
	24/09/2008	-	-	-	-	-	-	-	-	-	-
	29/07/2009	6.85	-	330	0.4	0.19	0.031	1	0.2	-	-
	17/09/2009	7.10	-	430	2.5	0.37	0.045	0.005	2.5	-	-
	17/08/2010	-	-	-	-	-	-	-	-	-	-
	19/07/2011	7.20	-	470	3.4	0.99	0.11	0.22	3.2	-	-
	22/09/2011	6.20	-	230	1.0	0.07	0.18	0.013	1.0	-	-
	26/06/2012	6.60	-	200	2.6	0.12	0.02	0.56	2.1	-	-
	18/09/2012	7.90	-	1100	3.7	0.14	0.83	1.20	2.4	-	-
	2/08/2013	7.10	-	81	1.5	0.22	0.062	0.001	1.5	-	-
	4/10/2013	7.50	-	730	0.4	0.08	0.005	0.006	0.4	-	-
	27/06/2014	6.50	-	220	3.6	0.14	0.06	1.1	2.5	-	-
	23/09/2014	6.70	-	600	1.6	0.05	0.04	0.005	1.6	-	-
	20/05/2015	-	-	-	-	-	-	-	-	-	-
	27/07/2015	6.40	-	240	2.4	0.13	0.005	0.005	2.4	-	-
	30/09/2015	-	-	-	-	-	-	-	-	-	-
	24/05/2016	7.10	100	65	1.5	0.27	0.096	0.56	-	-	-
	2/08/2016	7.10	410	267	7.4	1.50	0.061	0.005	-	-	-
	15/08/2017	7.40	240	156	1.4	0.38	0.005	0.38	-	-	-
	27/09/2017	7.20	550	358	2.6	0.22	0.018	0.025	-	-	-
	5/07/2018	7.00	470	305.5	5	0.07	0.01	3.2	-	-	-
	5/09/2018	7.30	370	241	2.1	0.55	0.027	0.015	-	-	-
	31/10/2019	7.00	560	364	1.1	0.1	0.007	0.058	-	-	-
	20/07/2020	6.90	150	98	1.4	0.13	<0.01	<0.02	-	-	-
	16/10/2020	-	-	-	-	-	-	-	-	-	-
	13-Jul-21	7.11	238	155	1.9	0.13	<0.01	0.24	1.7	-	-
	28-Sep-21	7.12	1430	930	3.9	1.31	0.91	<0.01	3.9	-	-

Notes:
NE = Guideline not established
LOR = Limit of reporting
MW = Monitoring Well
S = shallow
D = deep

Investigation Levels

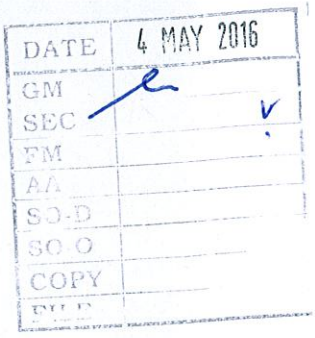
Result	Result exceeds laboratory LOR.
Result	Result exceeds ANZECC & ARMCANZ (2000) – Long-term or Short-term irrigation water
Result	Result exceeds ANGZ (2018) Water Quality Guidelines - Fershwater 95%
Result	Result exceeds Davidson (1995) Hydrogeology and Groundwater Resources of the Perth Region, Western Australia, Bulletin 142.
Result	Result above acceptable criteria

* In the absence of ANGZ (2018), refer Table 3.3.6, south-west Australia, ANZECC & ARMCANZ (2000)
# obtained from NIWA (2013) as referred to by ANZG (2018)

APPENDIX A: LICENCE L5200-1988-11

Government of **Western Australia**
Department of **Environment Regulation**

Our ref: L5200/1988/11
Enquiries: Agnes Tay
Email: strategyandreform@der.wa.gov.au



Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

Dear Mr Gordon

AMENDMENT OF LICENCE EXPIRY DATES

Further to our correspondence of 22 March 2016; the Department of Environment Regulation (DER) has now given effect to an extension of your expiry date through an administrative notice. The amendment has been made pursuant to section 59(1)(k) of the *Environmental Protection Act 1986* (EP Act).

Written notice of the amendment is given by administrative notice in accordance with section 59B(9) of the EP Act. Please note that a copy of the administrative notice is on DER's webpage at
https://www.der.wa.gov.au/our-work/licences-and-works-approvals/publications

Please be advised that the expiry date of your licence is as follows:

Licence Number	L5200/1988/11
Premises	Rural Export & Trading (WA) Pty Ltd - Peel Feedlot Lot 123, 848 Mundijong Road, Mardella, WA, 6125
Amended Expiry	08 October 2026

If you are concerned about, or object to any aspect of the amendment, you may lodge an appeal with the Minister for the Environment within 21 days from the date on which this notification is received. The Office of the Appeals Convenor can be contacted on 6467 5190 to find out the procedure and fee.

Members of the public may also appeal the amendment. The Appeals Registrar at the Office of the Appeals Convenor can be contacted after the closing date of appeals to check whether any appeals were received.

Should you wish to discuss any of the above please contact strategyandreform@der.wa.gov.au.

Yours sincerely

Agnes Tay
ACTING DIRECTOR STRATEGY AND REFORM

officer delegated under section 20
of the *Environmental Protection Act 1986*
29 April 2016

Government of **Western Australia**
Department of **Environment Regulation**

Our ref: L5200/1988/11
Enquiries: Agnes Tay
Email: strategyandreform@der.wa.gov.au

DATE	24 MAR 2016
GM	
SEC	✓
FM	
AA	
SO-D	
SO O	
COPY	

Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

Dear Michael Gordon

NOTICE OF AMENDMENT OF LICENCE EXPIRY DATES
SECTION 59(1)(k) *ENVIRONMENTAL PROTECTION ACT 1986*

The Department of Environment Regulation (DER) is writing to you to advise of its intention to amend your licence duration under section 59(1)(k) of the *Environmental Protection Act 1986* (EP Act).

DER's *Guidance Statement on Licence Duration* provides for the granting of licences for up to 20 years duration. DER is implementing this guidance statement by extending the durations for all licensed prescribed premises. DER has given consideration to the matters in the *Guidance Statement on Licence Duration* as follows:

- confirmation from licensees and local government authorities have been requested to ensure that amended expiry dates do not exceed the duration of any relevant planning approvals and mining tenements;
- risk-based reviews for the assessment of licensed prescribed premises will be undertaken in accordance with DER's regulatory framework;
- licensed prescribed premises will be subject to ongoing compliance inspections and investigations following incidences and complaints, in accordance with the EP Act;
- in the event that risk issues arise in relation to licensed prescribed premises, the CEO may, depending on the circumstances:
    - amend the conditions of licensed prescribed premises at any time;
    - in the event of an alleged offence, exercise enforcement powers under the EP Act, including an environmental protection notice; and
    - in the event of breach of licence conditions, revoke the licence;
- to ensure the efficient operation of the licensing regime, the regulatory burden of frequent renewals in the absence of full assessment has been removed; and
- the extension of expiry dates will enable both DER and affected licensees to undertake an ordered and structured implementation of DER's risk-based regulatory framework to existing premises.

Your licence will be amended to extend the expiry date as follows:

Licence Number	L5200/1988/11
Premises	Rural Export & Trading (WA) Pty Ltd - Peel Feedlot Lot 123, 848 Mundijong Road, Mardella, WA, 6125
Current Expiry	08 October 2020
Amended Expiry	08 October 2026

In accordance with section 59A of the EP Act, you are invited to make representations to show why the amendments should not proceed by no later than 15 April 2016. Representations must be submitted to the Chief Executive Officer at the address below or to info@der.wa.gov.au.

The Atrium, 168 St Georges Terrace, Perth WA 6000
Postal address: Locked Bag 33, Cloisters Square, Western Australia 6850
Phone: (08) 6467 5000 Fax (08) 6467 5562
www.der.wa.gov.au

In the absence of any response, the amendment will take effect on 29 April 2016.

Please complete the attached form regarding relevant planning approvals or tenure arrangements expiring prior to the extended expiry date and whether you object to the amendment. Please note that DER is separately confirming planning approval expiry dates with relevant local government authorities.

Your amendment will be given effect through an administrative notice. Please note that a draft copy of this notice is on DER's webpage at
https://www.der.wa.gov.au/our-work/licences-and-works-approvals/publications
.

Should you wish to discuss any of the above please contact strategyandreform@der.wa.gov.au.

Yours sincerely

Agnes Tay
ACTING DIRECTOR STRATEGY AND REFORM

21 March 2016

Government of **Western Australia**
Department of **Environment Regulation**

21 DAY CONSULTATION PERIOD WAIVER FORM

Michael Gordon
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362,
West Perth WA 6872

ENVIRONMENTAL PROTECTION ACT 1986 **– PROPOSED AMENDMENT TO**
LICENCE: L5200/1988/11
PREMISES: Rural Export & Trading (WA) Pty Ltd - Peel Feedlot
Lot 123, 848 Mundijong Road, Mardella, WA, 6125

I do not object to the duration of licence **L5200/1988/11** being amended in accordance with the correspondence provided on 21 March 2016.

I confirm that relevant planning, tenure and lease approvals are held for the proposed licence duration.

I waive the 21 day consultation period and I would like the Licence duration to be amended as soon as possible.

Signed: _____

Name: _____

Date:

Scan and email to:
info@der.wa.gov.au and strategyandreform@der.wa.gov.au.

Postal Address:
Locked Bag 33
CLOISTERS SQUARE WA 6850

Government of **Western Australia**
Department of **Environment Regulation**

Licence

Environmental Protection Act 1986, Part V

Licensee: Rural Export & Trading (W.A.) Pty Ltd

Licence: L5200/1988/11

Registered office: 43 Ventnor Avenue
WEST PERTH WA 6005

ACN: 008 781 664

Premises address: Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot
848 Mundijong Road
MARDELLA WA 6125
Being Lot 123 on Diagram 7171 as depicted in Schedule 1

Issue date: Thursday, 01 October 2015

Commencement date: Friday, 09 October 2015

Expiry date: Thursday, 08 October 2020

Prescribed premises category
Schedule 1 of the *Environmental Protection Regulations 1987*

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
55	Livestock saleyard or holding pen: premises on which live animals are held pending their sale, shipment or slaughter.	10,000 animals or more per year	2,000,000 animals per annual period

Conditions
This Licence is subject to the conditions set out in the attached pages.

.....
Ed Schuller
Senior Manager - Industry Regulation (Process Industries)
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Contents

Introduction

This Introduction is not part of the Licence conditions.

DER's industry licensing role
The Department of Environment Regulation (DER) is a government department for the state of Western Australia in the portfolio of the Minister for Environment. DER's purpose is to advise on and implement strategies for a healthy environment for the benefit of all current and future Western Australians.

DER has responsibilities under Part V of the *Environmental Protection Act 1986* (the Act) for the licensing of prescribed premises. Through this process DER regulates to prevent, control and abate pollution and environmental harm to conserve and protect the environment. DER also monitors and audits compliance with works approvals and licence conditions, takes enforcement action as appropriate and develops and implements licensing and industry regulation policy.

Licence requirements
This Licence is issued under Part V of the Act. Conditions contained within the Licence relate to the prevention, reduction or control of emissions and discharges to the environment and to the monitoring and reporting of them.

Where other statutory instruments impose obligations on the Premises/Licensee the intention is not to replicate them in the licence conditions. You should therefore ensure that you are aware of all your statutory obligations under the Act and any other statutory instrument. Legislation can be accessed through the State Law Publisher website using the following link:
http://www.slp.wa.gov.au/legislation/statutes.nsf/default.html

For your Premises relevant statutory instruments include but are not limited to obligations under the:

- *Environmental Protection (Unauthorised Discharges) Regulations 2004* – these Regulations make it an offence to discharge certain materials such as contaminated stormwater into the environment other than in the circumstances set out in the Regulations.

- *Environmental Protection (Controlled Waste) Regulations 2004* - these Regulations place obligations on you if you produce, accept, transport or dispose of controlled waste.

- *Environmental Protection (Noise) Regulations 1997* – these Regulations require noise emissions from the Premises to comply with the assigned noise levels set out in the Regulations.

You must comply with your licence. Non-compliance with your licence is an offence and strict penalties exist for those who do not comply.

Licence holders are also reminded of the requirements of section 53 of the Act which places restrictions on making certain changes to prescribed premises unless the changes are in accordance with a works approval, licence, closure notice or environmental protection notice.

Licence fees
If you have a licence that is issued for more than one year, you are required to pay an annual licence fee prior to the anniversary date of issue of your licence. Non payment of annual licence fees will result in your licence ceasing to have effect meaning that it will no longer be valid and you will need to apply for a new licence for your Premises.

Ministerial conditions
If your Premises has been assessed under Part IV of the Act you may have had conditions imposed by the Minister for Environment. You are required to comply with any conditions imposed by the Minister.

Premises description and Licence summary
Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot has operated a sheep feedlot at the premises since 1978 and held a licence since 1988. Sheep are transported to the site to become accustomed to pellet feed whilst awaiting short-haul transhipment to Fremantle Port for overseas shipment. The majority of sheep are held in raised holding sheds with the ability to rotate small numbers within paddocks on the remainder of the premises. Solid waste falls through the mesh floor of holding sheds and is stored below on hardstand prior to sale off-site to the horticultural and nursery industry.

Liquid waste is generated on site primarily from contaminated stormwater run-off from operational hardstand areas of the premises. Contaminated stormwater is directed by perimeter drains system to a clay-lined evaporation dam on the north-eastern corner of the property. The main environmental risk factors associated with the site are the potential to impact soil, surface water and groundwater with nutrient rich waste and potential emissions of odour, fugitive dust and noise.

The nearest residence to the holding sheds is approximately 1km to the west with further premises 1.9 km to the northeast and 2 km to the southwest. The site is located within the *Environmental Protection (Peel Inlet – Harvey Estuary) Policy 1992* area meaning the management of nutrient rich wastes is important to minimise runoff into surface waters and infiltration to groundwater.

This Licence is the successor to licence L5200/1988/10 and includes conversion to new format including the addition of improvement requirements.

The licences and works approvals issued for the Premises since 2010 are:

Instrument log		
Instrument	**Issued**	**Description**
L5200/1988/10	07/10/2010	Licence reissue
L5200/1988/11	draft	Licence re-issue including conversion to new format and addition of improvement requirements.

Severance
It is the intent of these Licence conditions that they shall operate so that, if a condition or a part of a condition is beyond the power of this Licence to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the power of this Licence to impose and are not otherwise *ultra vires* or invalid.

END OF INTRODUCTION

Licence conditions

1 General

1.1 Interpretation

1.1.1 In the Licence, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 For the purposes of this Licence, unless the contrary intention appears:

'Act' means the *Environmental Protection Act 1986;*

'AHD' means the Australian height datum;

'annual period' means the inclusive period from 1 January until 31 December;

'AS/NZS 5667.1' means the Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance of the Design of sampling programs, sampling techniques and the preservation and handling of samples;*

'AS/NZS 5667.6' means the Australian Standard AS/NZS 5667.6 *Water Quality – Sampling – Guidance on sampling of rivers and streams;*

'AS/NZS 5667.10' means the Australian Standard AS/NZS 5667.10 *Water Quality – Sampling – Guidance on sampling of waste waters;*

'AS/NZS 5667.11' means the Australian Standard AS/NZS 5667.11 *Water Quality – Sampling – Guidance on sampling of groundwaters;*

'averaging period' means the time over which a limit is measured or a monitoring result is obtained;

'CEO' means Chief Executive Officer of the Department of Environment Regulation;

'CEO' for the purpose of correspondence means;

Chief Executive Officer
Department Administering the Environmental Protection Act 1986
Locked Bag 33
CLOISTERS SQUARE WA 6850
Email: info@der.wa.gov.au;

'Licence' means this Licence numbered L5200/1988/11 and issued under the Act;

'Licensee' means the person or organisation named as Licensee on page 1 of the Licence;

'NATA' means the National Association of Testing Authorities, Australia;

'NATA accredited' means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis;

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Licence;

'Schedule 1' means Schedule 1 of this Licence unless otherwise stated;

'Schedule 2' means Schedule 2 of this Licence unless otherwise stated;

'six monthly' means the 2 inclusive periods from 1 January to 30 June and 1 July to 31 December; and

'spot sample' means a discrete sample representative at the time and place at which the sample is taken.

1.1.3 Any reference to an Australian or other standard in the Licence means the relevant parts of the standard in force from time to time during the term of this Licence.

1.1.4 Any reference to a guideline or code of practice in the Licence means the version of that guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guideline or code of practice made during the term of this Licence.

1.1.5 Nothing in the Licence shall be taken to authorise any emission that is not mentioned in the Licence, where the emission amounts to:
(a) pollution;
(b) unreasonable emission;
(c) discharge of waste in circumstances likely to cause pollution; or
(d) being contrary to any written law.

1.2 General conditions

1.2.1 The Licensee shall operate and maintain all pollution control and monitoring equipment to the manufacturer's specification or any relevant and effective internal management system.

1.2.2 The Licensee shall immediately recover, or remove and dispose of spills of environmentally hazardous materials outside an engineered containment system.

1.3 Premises operation

1.3.1 The Licensee must ensure that material specified in Table 1.3.1 is only stored and/or treated within vessels or compounds provided with the infrastructure detailed in Table 1.3.1.

Table 1.3.1: Containment infrastructure

Containment point reference	Material	Infrastructure requirements
Evaporation pond	Wastewater	Clay-lined
Holding sheds	Manure	Raised sheds with a compacted limestone sub-floor for the collection of manure
Carcass cold storage area	Carcasses	Sealed cold storage

1.3.2 The Licensee shall ensure that where wastes produced on the Premises are not taken off-site for lawful use or disposal, they are managed in accordance with the process requirements in Table 1.3.2.

Table 1.3.2: Management of Waste		
Waste type	**Process**	**Process requirements**
Wastewater	Evaporation	Wastewater run-off from livestock holding areas shall be directed to the evaporation pond via concrete or clay-lined catch drains
Carcasses	Storage	Carcasses stored beyond 24 hours of the animals death shall be stored within cold storage
Manure	Stockpiling	Contained beneath livestock holding sheds where water from rain, sprinklers or surface drainage cannot access the manure, pending its removal offsite.

2 Monitoring

2.1 General monitoring

2.1.1 The licensee shall ensure that:

(a) all water samples are collected and preserved in accordance with AS/NZS 5667.1;
(b) all wastewater sampling is conducted in accordance with AS/NZS 5667.10;
(c) all surface water sampling is conducted in accordance with AS/NZS 5667.6;
(d) all groundwater sampling is conducted in accordance with AS/NZS 5667.11; and
(e) all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured.

2.2 Monitoring of inputs and outputs

2.2.1 The Licensee shall undertake the monitoring in Table 2.2.1 according to the specifications in that table.

Table 2.2.1: Monitoring of inputs and outputs		
Input/Output	**Units**	**Frequency**
Sheep	Number of animals	Each truck load of animals entering and exiting the premises

2.3 Ambient environmental quality monitoring

2.3.1 The Licensee shall undertake the monitoring in Tables 2.3.1 and 2.3.2 according to the specifications in those tables and record and investigate results that do not meet any limit specified.

Table 2.3.1: Monitoring of ambient surface water quality				
Monitoring point reference and location	**Parameter**	**Units**	**Averaging period**	**Frequency**
S1, S2 and S3 (Surface water monitoring points as shown on map of monitoring points in Schedule 1)	pH	-	Instantaneous[1] or spot sample	Two sample events between the months of April and October separated by at least one month
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	
D1, D2 and D3 (Drain monitoring points as shown on map of monitoring points in Schedule 1)	pH	-	Instantaneous[1] or spot sample	
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	

1. In-field non-NATA accredited analysis permitted.

Table 2.3.2: Monitoring of ambient groundwater quality				
Monitoring point reference and location	**Parameter**	**Units**	**Averaging period**	**Frequency**
MB1, MB2, MB3 and MB4 (Groundwater monitoring boreholes as shown on the map of monitoring locations in Schedule 1)	Standing water level[1]	m(AHD)	Instantaneous[2]	Six monthly[3]
	pH	-	Instantaneous[2] or spot sample	
	Electrical conductivity	µS/cm		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	mg/L	Spot sample	

1. SWL shall be determined prior to collection of water samples.
2. In-field non-NATA accredited analysis permitted.
3. Six monthly monitoring is to be undertaken at least 5 months apart.

3 Improvements

3.1 Improvement program

3.1.1 The Licensee shall complete the improvements in Table 3.1.1 by the date of completion in Table 3.1.1.

Table 3.1.1: Improvement program

Improvement reference	Improvement	Date of completion
IR1	The Licensee shall conduct a hydrogeological review of the Premises and submit to the CEO a report that details: (i) a summary of the hydrogeological context of the site; (ii) an assessment of groundwater levels and flow direction; (iii) an assessment of existing groundwater monitoring bores; (iv) an assessment of groundwater monitoring requirements based on identified sources and pathways of all potential solid and liquid waste discharges; and (v) proposals to replace and install upgradient and downgradient groundwater monitoring bores including timeframes and proposed bore specifications.	30 April 2016
IR2	The Licensee shall submit to the CEO a report containing an assessment of the design capacity of the existing wastewater collection system including the livestock holding areas, catch drains and the evaporation pond to confirm run-off generated from a 1 in 20 year storm event (20 year average recurrence internal) of 72 hours duration can be adequately contained.	30 April 2016

4 Information

4.1 Records

4.1.1 All information and records required by the Licence shall:
(a) be legible;
(b) if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval;
(c) except for records listed in 4.1.1(d) be retained for at least 6 years from the date the records were made or until the expiry of the Licence or any subsequent licence; and
(d) for those following records, be retained until the expiry of the Licence and any subsequent licence:
(i) off-site environmental effects; or
(ii) matters which affect the condition of the land or waters.

4.1.2 The Licensee shall ensure that:
(a) any person left in charge of the Premises is aware of the conditions of the Licence and has access at all times to the Licence or copies thereof; and
(b) any person who performs tasks on the Premises is informed of all of the conditions of the Licence that relate to the tasks which that person is performing.

4.1.3 The Licensee shall complete an Annual Audit Compliance Report indicating the extent to which the Licensee has complied with the conditions of the Licence, and any previous licence issued under Part V of the Act for the Premises for the previous annual period.

4.1.4 The Licensee shall implement a complaints management system that as a minimum records the number and details of complaints received concerning the environmental impact of the activities undertaken at the Premises and any action taken in response to the complaint.

4.2 Reporting

4.2.1 The Licensee shall submit to the CEO an Annual Environmental Report within 45 calendar days after the end of the annual period. The report shall contain the information listed in Table 4.2.1 in the format or form specified in that table.

Table 4.2.1: Annual Environmental Report

Condition or table (if relevant)	Parameter	Format or form[1]
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Table 2.2.1	Monthly total of animals held	Tabular format
Table 2.3.1	Ambient surface water quality monitoring - pH, electrical conductivity, total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	
Table 2.3.2	Ambient groundwater quality monitoring – Standing water level, pH, electrical conductivity, total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	
4.1.3	Compliance	Annual Audit Compliance Report (AACR)
4.1.4	Complaints summary	None specified

Note 1: Forms are in Schedule 2

4.2.2 The Licensee shall ensure that the Annual Environmental Report also contains an assessment of the information contained within the report against previous monitoring results and Licence limits.

4.2.3 The Licensee shall submit the information in Table 4.2.2 to the CEO according to the specifications in that table.

Table 4.2.2: Non-annual reporting requirements

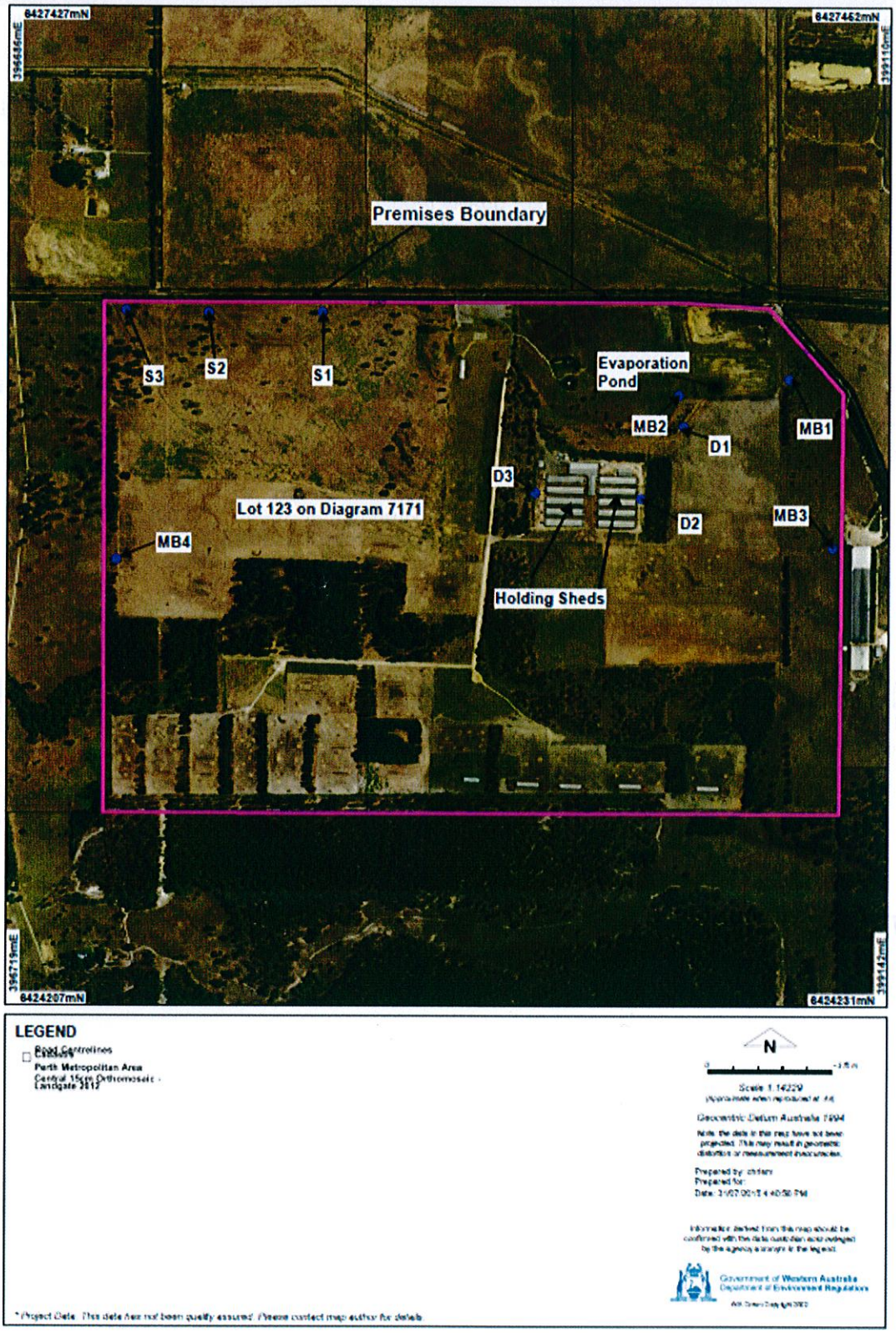
Condition or table (if relevant)	Parameter	Reporting period	Reporting date (after end of the reporting period)	Format or form[1]
-	Copies of original monitoring reports submitted to the Licensee by third parties	Not Applicable	Within 14 days of the CEOs request	As received by the Licensee from third parties

Note 1: Forms are in Schedule 2

Schedule 1: Maps

Premises map

The Premises is shown in the map below. The pink line depicts the Premises boundary. The locations of the monitoring points defined in Tables 2.3.1 and 2.3.2 are also shown below.



Schedule 2: Reporting & notification forms

These forms are provided for the proponent to report monitoring and other data required by the Licence. They can be requested in an electronic format.

ANNUAL AUDIT COMPLIANCE REPORT PROFORMA

SECTION A

LICENCE DETAILS

Licence Number:	Licence File Number:
Company Name: Trading as:	ABN:
Reporting period: _____ to _____	

STATEMENT OF COMPLIANCE WITH LICENCE CONDITIONS

1. Were all conditions of the Licence complied with within the reporting period? (please tick the appropriate box)

Yes ☐ Please proceed to Section C

No ☐ Please proceed to Section B

Each page must be initialled by the person(s) who signs Section C of this Annual Audit Compliance Report (AACR).

Initial:

SECTION B

DETAILS OF NON-COMPLIANCE WITH LICENCE CONDITION.

Please use a separate page for each Licence condition that was not complied with.

a) Licence condition not complied with:	
b) Date(s) when the non compliance occurred, if applicable:	
c) Was this non compliance reported to DER?:	
☐ Yes ☐ Reported to DER verbally Date _____ ☐ Reported to DER in writing Date _____	☐ No
d) Has DER taken, or finalised any action in relation to the non compliance?:	
e) Summary of particulars of the non compliance, and what was the environmental impact:	
f) If relevant, the precise location where the non compliance occurred (attach map or diagram):	
g) Cause of non compliance:	
h) Action taken, or that will be taken to mitigate any adverse effects of the non compliance:	
i) Action taken or that will be taken to prevent recurrence of the non compliance:	

Each page must be initialled by the person(s) who signs Section C of this AACR

Initial:

SECTION C

SIGNATURE AND CERTIFICATION

This Annual Audit Compliance Report (AACR) may only be signed by a person(s) with legal authority to sign it. The ways in which the AACR must be signed and certified, and the people who may sign the statement, are set out below.

Please tick the box next to the category that describes how this AACR is being signed. If you are uncertain about who is entitled to sign or which category to tick, please contact the licensing officer for your premises.

If the licence holder is		**The Annual Audit Compliance Report must be signed and certified:**
An individual	□	by the individual licence holder, or
	□	by a person approved in writing by the Chief Executive Officer of the Department of Environment Regulation to sign on the licensee's behalf.
A firm or other unincorporated company	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A corporation	□	by affixing the common seal of the licensee in accordance with the *Corporations Act 2001*; or
	□	by two directors of the licensee; or
	□	by a director and a company secretary of the licensee, or
	□	if the licensee is a proprietary company that has a sole director who is also the sole company secretary – by that director, or
	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
A public authority (other than a local government)	□	by the principal executive officer of the licensee; or
	□	by a person with authority to sign on the licensee's behalf who is approved in writing by the Chief Executive Officer of the Department of Environment Regulation.
a local government	□	by the chief executive officer of the licensee; or
	□	by affixing the seal of the local government.

It is an offence under section 112 of the *Environmental Protection Act 1986* for a person to give information on this form that to their knowledge is false or misleading in a material particular. There is a maximum penalty of $50,000 for an individual or body corporate.

I/We declare that the information in this annual audit compliance report is correct and not false or misleading in a material particular.

SIGNATURE: _____

NAME:
(printed) _____

POSITION: _____

DATE: _____/_____/_____

SIGNATURE: _____

NAME:
(printed) _____

POSITION: _____

DATE: _____/_____/_____

SEAL (if signing under seal)

APPENDIX B: LICENCE AMENDMENT

Government of **Western Australia**
Department of **Environment Regulation**

Your ref: L5200/1988/11
Our ref: 2010/006294
Enquiries: Chris Malley
Phone: 9333 7484
Email: info@der.wa.gov.au

Mr Michael Gordon
Director & General Manager
Rural Export & Trading (W.A.) Pty Ltd
PO Box 1362
WEST PERTH WA 6872

Dear Mr Gordon

SECTION 59B(9) OF THE *ENVIRONMENTAL PROTECTION ACT 1986* – NOTICE OF AMENDMENT TO LICENCE L5200/1988/11

Further to the notice of proposed amendment dated sent to you on 30 November 2016, please find enclosed the Amendment Notice issued in accordance with section 59B(9) of the *Environmental Protection Act 1986* (EP Act).

If you are concerned about or object to any aspect of the amendment, you may lodge an appeal with the Minister for the Environment within 21 days from the date on which this notice is received. The appeal form can be obtained from the Office of the Appeals Convenor (www.appealsconvenor.wa.gov.au or phone 6467 5190). Members of the public may also appeal the amendments. The Office of the Appeals Convenor will contact you if any appeals are received].

If you have any queries, please contact Licensing Officer Mr Chris Malley on phone 9333 7484.

Yours sincerely

Jonathan Bailes
A/SENIOR MANAGER - INDUSTRY REGULATION
LICENSING AND APPROVALS

Officer delegated under Section 20
of the Environmental Protection Act 1986

15 December 2016

Att

Copy to: Shire of Serpentine-Jarrahdale

Government of Western Australia
Department of Environment Regulation

Amendment Notice 1

Licence Number	L5200/1988/11
Licence Holder	Rural Export & Trading (W.A.) Pty Ltd
ACN	008 781 664
Registered business address	43 Ventnor Avenue West Perth WA 6005
Date of amendment	15 December 2016
Prescribed Premises	Category 55: Livestock saleyard or holding pen
Premises	Rural Export & Trading (W.A.) Pty Ltd – Peel Feedlot 848 Mundijong Road Mardella WA 6125 Lot 123 on Diagram 7171

Amendment

The Chief Executive Officer (CEO) of the Department of Environment Regulation (DER) has amended the above licence in accordance with section 59 of the *Environmental Protection Act 1986* as set out in this Amendment Notice.

Jonathan Bailes

A/Senior Manager - Industry Regulation (Process Industries)

an officer delegated under section 20 of the Environmental Protection Act 1986 (WA)

Amendment Notice

This notice is issued under section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the licence issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

Amendment Description

Licence L5200/1988/11 was granted to Rural Export & Trading (W.A.) Pty Ltd (Licence Holder) on 1 October 2015 and included two improvement requirements in condition 3.1.1. Improvement Requirement 1 (IR1) required the submission of a hydrogeological review report to the CEO. Along with establishing the hydrogeological context of the premises, the report was to include a proposal to replace and install groundwater monitoring bores. The published decision document attached to the licence made note that *"Once the licensee has completed this improvement requirement, DER will further reassess the regulatory approach"* (Section 4 Decision Table: Improvements).

The Licence Holder submitted the report *Improvement Condition IR1 – Hydrogeological Review,* Coffey, dated 24 March 2016 (the Report) on 1 April 2016 to satisfy the requirements of IR1. The Report made recommendations for the installation of new groundwater monitoring bore locations. Groundwater monitoring bore alterations from the Report are summarised in Tables 1 and 2.

Table 1: New groundwater monitoring bore locations as proposed by the Licence Holder

Well ID	Proposed Location	Rationale
MW1	Replace existing MB1, further to the north or east if possible.	Provide background conditions, move away from dam to avoid proximity effects.
MW2	Replace existing MB2.	Down gradient of the dam. Identify potential impacts associated with the dam.
MW3	Move to the south of existing MB3. Immediately west of the neighbouring cattle holding shed on 25 Lightbody Road.	Identify potential impacts moving off *or* on site.
MW4	Replace existing MB4.	Identify potential impacts moving off site / provide background concentrations.
MW5	To the west (down gradient) of the holding sheds.	Immediately down gradient of the holding sheds and drainage channel which receive runoff. Will also provide a comparison to new MW4 which is further down gradient.

(*Source: Table 3 in section 7.2 of the Report*)

Table 2: New groundwater monitoring bore construction details as proposed by the Licence Holder

Depth	Well material	Construction material	Rationale
7m – 4m	Slotted screen	Gravel pack	Assuming depth to groundwater is 5m bgl, the slotted screen will extend 2m below and 1m above the encountered groundwater.
4m – surface	Solid screen	Bentonite seal	By sealing the remaining length of the well column, groundwater from the perched aquifer will not be able to flow into the monitoring well.

(*Source: Table 2 in section 7.2 of the Report*)

The amendments to Licence L5200/1988/11 outlined in this Amendment Notice have been initiated by DER.

Review of the Report

The Delegated Officer sought advice from DER's Contaminated Sites function regarding the Report submitted. The written advice dated 21 June 2016 concluded that:

- the review of the hydrogeology of the site as provided in the Report is technically sound; and
- the proposed locations of the monitoring bores are acceptable, but it is recommended that additional shallow bores be constructed at each site to monitor seasonal groundwater flow in the perched aquifer.

It is noted that the perched aquifer beneath the premises is only likely to contain significant amounts of groundwater during the winter months. However, it is likely to provide a seasonal pathway to transmit nutrients and other soluble contaminants into nearby drains and waterways.

Risk Assessment

The Report findings do not alter the assessed risk profile within the decision document attached to Licence L5200/1988/11 which justifies the inclusion of groundwater monitoring requirements (Section 4 - Decision Table). The installation and subsequent monitoring of groundwater bores as outlined in Tables 1 and 2 above will replace existing groundwater monitoring requirements in the licence.

The review of the Report has identified an additional contaminant pathway (a seasonally perched aquifer) that could result in transport of contaminants to environmental receptors (nearby drains and waterways) that are within the *Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992* area.

The installation of new bores in both the seasonal perched aquifer and the superficial aquifer is consistent with the previous risk assessment and addresses updated source, pathway and receptor information.

Decision

The Delegated Officer had regard to:

- the Report submitted by the Licence Holder;
- advice from DER's Contaminated Sites function dated 21 June 2016; and
- the decision document attached to Licence L5200/1988/11 granted 1 October 2015.

The Delegated Officer is satisfied that the requirement for groundwater monitoring has been justified through a risk-based assessment in the existing decision document. The Report and DER technical advice provide the basis for specific alterations to the existing groundwater monitoring program to ensure the monitoring addresses identified sources, pathways, and receptors.

Amendments to the licence include:

- Installation of new groundwater monitoring bores at locations indicated in Table 1;
- Construction of new groundwater monitoring bores consistent with the design specifications in Table 2;
- Installation of an additional groundwater monitoring bore at each new location within the seasonally perched aquifer; and
- Changes to the monitoring program in condition 2.3.1 which take effect upon installation of the new groundwater monitoring bores.

The licence amendments are consistent with DER's published *Guidance Statement: Regulatory principles* and *Guidance Statement: Setting conditions.*

Amendment History

Instrument	Issued	Amendment
L5200/1988/11	15/12/2016	Amendment Notice 1 Improvement program and groundwater monitoring requirements amended.
L5200/1988/11	29/04/2016	Amendment by notice to extend the licence duration
L5200/1998/11	01/10/2015	Licence renewal

Consultation

The Licence Holder was provided with a draft Amendment Notice on 30 November 2016 for comment. The Licence Holder waived the 21 day consultation period on 13 December 2016 and requested the amendment notice to be issued.

Amendment

1. Table 2.3.2 of condition 2.3.1 of the licence is amended by the deletion of the text shown in strikethrough below and the insertion of the red text shown in underline below:

2.3.1 The Licensee shall undertake the monitoring and analysis in Tables 2.3.1 and 2.3.2 according to the specifications in those tables ~~and record and investigate results that do not meet any limit specified~~.

Table 2.3.2: Monitoring of ambient groundwater quality				
Monitoring point reference and location	***Parameter***	***Units***	***Averaging period***	***Frequency***
MB1, MB2, MB3 and MB4 *(Groundwater monitoring boreholes as shown on the map of monitoring locations in Schedule 1)*	*Standing water level[1]*	*m(AHD)*	*Instantaneous[2]*	*Six monthly[3] until groundwater monitoring bores are installed and commissioned in accordance with condition 3.1.1*
	pH	*-*	*Instantaneous[2] or spot sample*	
	Electrical conductivity	*µS/cm*		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	*mg/L*	*Spot sample*	
MW1, MW2, MW3, MW4 and MW5 *(as depicted in the Schedule 1: Map of groundwater monitoring locations)*	*Standing water level[1]*	*m(AHD)*	*Instantaneous[2]*	*Commencing upon installation of groundwater monitoring bores in accordance with condition 3.1.1:* *(a) Six monthly[3] sampling of groundwater monitoring bores within the superficial aquifer; and* *(b) Two sampling events separated by at least one month of groundwater monitoring bores within the seasonally perched aquifer between April and October.*
	pH	*-*	*Instantaneous[2] or spot sample*	
	Electrical conductivity	*µS/cm*		
	Total nitrogen, nitrate nitrogen, ammonia nitrogen and total phosphorus	*mg/L*	*Spot sample*	

1. *SWL shall be determined prior to collection of water samples.*
2. *In-field non-NATA accredited analysis permitted.*
3. *Six monthly monitoring is to be undertaken at least 5 months apart.*

2. Table 3.1.1 of the licence is amended by the deletion of text shown in strikethrough below and the insertion of the red text shown in underline below:

Table 3.1.1: Improvement program		
Improvement reference	***Improvement***	***Date of completion***
~~*IR1*~~	~~*The Licensee shall conduct a hydrogeological review of the Premises and submit to the CEO a report that details:*~~ ~~*(i) a summary of the hydrogeological context of the site;*~~ ~~*(ii) an assessment of groundwater levels and flow direction;*~~ ~~*(iii) an assessment of existing groundwater monitoring bores;*~~ ~~*(iv) an assessment of groundwater monitoring requirements based on identified sources and pathways of all potential solid and liquid waste discharges; and*~~ ~~*(v) proposals to replace and install upgradient and downgradient groundwater monitoring bores including timeframes and proposed bore specifications.*~~	~~*30 April 2016*~~
~~*IR2*~~	~~*The Licensee shall submit to the CEO a report containing an assessment of the design capacity of the existing wastewater collection system including the livestock holding areas, catch drains and the evaporation pond to confirm run-off generated from a 1 in 20 year storm event (20 year average recurrence internal) of 72 hours duration can be adequately contained.*~~	~~*30 April 2016*~~
IR1	*The Licensee shall install new groundwater monitoring bores in accordance with the following:* *(a) Two groundwater monitoring bores are installed at each of the five locations (MW1, MW2, MW3, MW4 and MW5), depicted in the Schedule 1: Map of groundwater monitoring locations.* *(b) At each of the locations specified in part (a):* *(i) one bore is installed within the seasonally perched aquifer; and* *(ii) one bore is installed in the superficial aquifer.* *(c) Groundwater monitoring bores installed within the superficial aquifer include a bentonite seal extending from the top of the screened interval to the surface to prevent the flow of water from the seasonally perched aquifer into the monitoring bore.* *(d) All groundwater monitoring bores are:* *(i) installed to meet the requirements of Minimum Construction requirements for Water Bores in Australia (AIH 2012);* *(ii) sited in accordance with the Department of Water Water Quality Protection Note 30 Groundwater Monitoring Bores (DoW 2009); and* *(iii) surveyed to allow the ground level (to Australian Height Datum) at each location to be accurately determined.*	*30 April 2017*

3. The licence is amended by the insertion of the following map in Schedule 1:

Map of groundwater monitoring locations

The locations of groundwater monitoring points to be installed in accordance with condition 3.1.1 and subsequently monitored in accordance with condition 2.3.1 are shown below.

APPENDIX C: FIELD SHEETS & CALIBRATION CERTIFICATES

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus

Serial No. **18G 103 114**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	22.5 ^{o}C
pH	pH 7	358580	Calibrated	7.01
pH	pH 4	357330	Calibrated	4.00
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	354263	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	234.5 mV
DO Zero	Zero	10640	*Checked*	0.00 %
DO 100%	100%	Water saturated air	Calibrated	100 %

Calibrated by: **Sebastian Moran**

Calibration date: **12-Mar-21**

Next calibration due 12-Apr-21

Multi Parameter Water Meter

airmet
Air-Met Scientific Pty Ltd
1300 137 067

Instrument YSI Quatro Pro Plus
Serial No. **18J 104 336**

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	15.8 °C
pH	pH 7	363895	Calibrated	7.00
pH	pH 4	363894	Calibrated	4.01
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	354263	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	249.2 mV
DO Zero	Zero	Sodium Sulphite Sol 10640	*Checked*	0.0 %
DO 100%	100%	Water saturated air	Calibrated	100 %

Calibrated by: **Bianca Mcnair**

Calibration date: **18-Jun-21**

Next calibration due 19-Jul-21

Event 2.

Peel Feedlot 848 Mundijong Rd.

Groundwater Sampling Field Work Sheet

coffey
A TETRA TECH COMPANY

Contact: Jim Tillett 0419 908948 Sampled by: REGAN MACDONALD Date sampled: 22/06/21

Bore#	Depth (m)	SWL (m)	Column (Depth-SWL)	Factor	1 x Well Volume (L) (Factor*Column)	Time Collected	pH	EC (mS/cm)	TDS (mg/L)	Temp (°C)	Redox mV	DO mg/L	Comments
~~MW1d~~	7.82	6.770		12									
~~MW2d~~	4.99	6.82											
~~MW3d~~													
~~MW4d~~	7.505	4.210											
~~MW5d~~	7.230	4.405											
MW1s	4.10	1.315	2.785		33.42	1020	5.45	0.62	481.0	16.5	168.1	7.60	
MB2	~~6~~ 2.98	1.605	1.345		16.14	1100	~~6~~ 5.62	0.239	181.35	17.5	136.3	4.95	Purged 0.5 10L Sampled Recharge DRY Twisken
MW3s	4.280	1.965	2.315		27.78	930	5.46	0.80	656.5	13.9	257.1	5.53	Purged 18L Sampled Recharge. Baker.
MW4s	3.995	DRY	—		—	1140	DRY	—	—	—	—	—	
MW5s	4.10	DRY.	—		—	1200	DRY	—	—	—	—	—	
S1						1245	DRY	—	—	—	—	—	
S2						1250	DRY	—	—	—	—	—	
S3						1255	DRY	—	—	—	—	—	
D1						1225	6.77	0.70	617.5	11.3	52.6	2.41	No flow, yellow brown, sl odour.
D2						1215	6.02	0.409	362.7	11.0	123.5	2.57	Yellow, No flow sl odour.
D3						1240	7.18	0.56	468.0	12.9	81.9	4.22	No flow, ~~Wood~~ sl odour. clear
~~FWB1~~													
~~FWB2~~													

Duplicate (QC1)/ Triplicate (QC2) sample taken @ MW1S sulphur odour, brown, Sediment.

Field Blank = QC3

MW2S - purged 15L total sampled Recharge. DRY Cloudy, Sediment, NO Odour

Multi Parameter Water Meter

Instrument YSI Quatro Pro Plus

Serial No. **18L 101 816**

Air-Met Scientific Pty Ltd
1300 137 067

Item	Test	Pass	Comments
Battery	Capacity	✓	
Switch/keypad	Operation	✓	
Display	Intensity	✓	
	Operation (segments)	✓	
	Seal		
Connectors	Condition	✓	
Sensor	1. pH	✓	
	2. ORP in mV	✓	
	3. EC/Temp.	✓	
	4. D.O.	✓	
Alarms	Beeper		
Software	Version		
Data logger	Operation		
Download	Operation		
Other tests:			

Certificate of Calibration

This is to certify that the above instrument has been calibrated to the following specifications:

Sensor	Value	Standard		Instrument Reading
Temperature			*Checked*	18.6 °C
pH	pH 7	363895	Calibrated	7.01
pH	pH 4	363894	Calibrated	4.00
EC	Zero	Air	*Checked*	0.001 mS/cm
EC	2.76mS/cm	362912	Calibrated	2.76 mS/cm
ORP (mV)	240mV at 20°C	358011 / 358822	Calibrated	294.1 mV
DO Zero	Zero	10959	*Checked*	0.0 %
DO 100%	100%	Water saturated air	Calibrated	100.0 %

Calibrated by: **Adam Cutting**

Calibration date: **16-Sep-21**

Next calibration due 17-Oct-21

Peel Feedlot 848 Mundijong Rd.

Groundwater Sampling Field Work Sheet

coffey
A TETRA TECH COMPANY

Contact: Jim Tillett 0419 908948 Sampled by: REGINA. Date sampled: 15/03/21.

Bore#	Depth (m)	SWL (m)	Column (Depth-SWL)	Factor	1 x Well Volume (L) (Factor*Column)	Time Collected	pH	EC (mS/cm)	TDS (mg/L)	Temp (°C)	Redox mV	DO mg/L	Comments
MW1d	7.84	3.885	3.955	12	47.46	10:35	4.71	0.93	513.50	24.1	155.8	2.74	No colour, clear No odour pumped dry
MW5D	~~MW2d~~ 7.29 7.52	4.305	2.985		35.82	13:30	5.00	5.54	3744.0	23.0	129.5	4.37	cloudy, pale brown No odour
MW3d	~~7.86~~	5.340	2.18		26.16	10:35	4.21	1.58	1033.5	24.4	129.1	0.72	No colour, clear No odour
MW4d	7.520	4.085	3.435		41.22	1245	5.41	0.90	604.5	23.0	89.7	0.87	no colour, no odour clear
MW2D	~~MW5d~~ 6.82	4.56	2.26		27.12	12:00	5.12	0.60	396.5	24.4	134.2	3.92	No colour, clear No odour, pumped DRY DUP TRIP
MW1s	4.095	DRY	—										
MW5S	~~MW2~~ 4.115	~~3.685~~	DRY										
MW3s	4.28	~~3.685~~	3.685										
MW4s	3.99	DRY.	—										
MW2S	~~MW5s~~ 4.56	DRY.	—										
S1													
S2													
S3													
D1													
D2													
D3													
FWB1													
FWB2													

Duplicate (QC1)/ Triplicate (QC2) sample taken @ ~~MW5D~~ 2D

Field Blank = QC3

Peel Feedlot 848 Mundijong Rd.

Groundwater Sampling Field Work Sheet

coffey
A TETRA TECH COMPANY

Contact: Jim Tillett 0419 908948 Sampled by: REGAN MACDONALD Date sampled: 28/09/21.

Bore#	Depth (m)	SWL (m)	Column (Depth-SWL)	Factor	1 x Well Volume (L) (Factor*Column)	Time Collected	pH	EC (uS/cm)	TDS (mg/L)	Temp (°C)	Redox mV	DO mg/L	Comments
MW1d	7.845	2.451	5.394	12	64.728	10:40	4.87	0.417	298.35	20.3	51.7	0.26	clear, No odour
MW2d	6.839	1.386	5.453		65.436	11:55	5.49	0.68	494.0	19.7	42.3	4.67	clear, No odour
MW3d	7.590	1.690	5.89		70.680	9:30	3.87	1.55	1072.5	22.0	57.9	2.34	clear, No odour
MW3s	4.295	1.096	3.199		38.388	9:44	4.26	0.96	702.0	19.2	60.4	2.64	clear, No odour
MW5d	7.241	1.112	6.129		73.548	13:48	5.00	5.84	4231.0	11.4	80.7	1.69	clear, No odour.
MW1s	4.10	1.145	2.955		35.460	10:53	5.13	0.58	385.50	24.1	37.9	24.0	Purged dry 15L waited for recharge.
MB2	2.960	1.168	1.792		21.504	12:05	5.87	0.403	293.8	19.4	19.1	1.06	Brown tannin Purged dry 10L
MW5D	7.50	1.135	6.365		76.380	12:50	5.92	0.98	696.0	20.5	46.3	0.6	clear, No odour.
MW4s	4.0	1.121	2.879		34.548	13:00	6.01	0.62	416.0	23.2	44.0	2.28	purged dry 15L.
MW5s	4.125	1.251	2.874		34.488	14:04	5.60	0.64	448.0	21.5	51.6	2.36	clear, No odour. Sl cloudy. purged dry
S1						14:58	7.32	0.67	435.5	24.9	104.9	0.03	clear, No odour, yellow sl.
S2						15:06	7.20	0.65	435.5	23.3	64.5	0.02	Sl cloudy, sed no odour.
S3						15:12	6.94	1.56	1157.50	19.6	43.1	0.03	sediment, No odour.
D1						14:27	7.19	1.10	793.0	20.8	76.3	6.65	Clear, Sl odour.
D2						14:35	7.36	1.02	721.50	21.2	36.7	0.13	Clear, yellowish Sl odour.
D3						14:16	6.18	0.65	442.0	23.9	63.3	7.24	Sl cloudy, Sl odour.
FWB1						14:50	7.69	0.256	196.30	17.0	94.1	0.41	Clear, No odour.
FWB2						14:42	7.88	0.266	203.45	17.1	11.9	0.69	Clear, No odour.

Duplicate (QC1)/ Triplicate (QC2) sample taken @ MW5D.

Field Blank = QC3

APPENDIX D: LABORATORY CERTIFICATES

Reference No. _____

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

coffey
A TETRA TECH COMPANY

Consigning Office: Level 1, 235 St Georges Tce, Perth, WA

Report Results to: NICK TAYLOR. Mobile: 0408574873 Email: Nich.Taylor@coffey.com.

Invoices to: Accounts.Perth@coffey.com Phone: Email:

Project Number: 754-PERENZ83020 Order Number (project task):

Project Name: RETWA 2021 MONITORING Laboratory: EUROFINS

Sampler's Name: REGAN MACDONALD Project Manager: NICK TAYLOR

Special Instructions:

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)	Analysis Request Section: NITRATE, NITRITE	TOTAL NITROGEN	TKN	TOTAL P	AMMONIA.					NOTES
	QC2	15/03/21	AM	WATER	BOTTLE	STD	X	X	X	X	X					

Date/Time: 16/3/21 11am Chilled: Yes / No Temp: 22.7c Correction: Final temp:

RELINQUISHED BY

Name: REGAN MACDONALD Date: 15/03/21
Coffey Services Time: 1550

Name: Date:
Company: Time:

RECEIVED BY

Name: Monique Jackson Date: 16/3/21
Company: Eurofins perth Time: 11 am

Name: Date:
Company: Time:

Sample Receipt Advice: (Lab Use Only)

All Samples Recieved in Good Condition ☑
All Documentation is in Proper Order ☑
Samples Received Properly Chilled ☑
Lab. Ref/Batch No. 781021

*Container Type & Preservation Codes: P - Plastic, G- Glass Bottle, J - Glass Jar, V- Vial, Z - Ziplock bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative

Nik M.

eurofins | Environment Testing

ABN: 50 005 085 521 www.eurofins.com.au EnviroSales@eurofins.com

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
Phone : +61 3 8564 5000
NATA # 1261
Site # 1254 & 14271

Sydney
Unit F3, Building F
16 Mars Road
Lane Cove West NSW 2066
Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
2/91 Leach Highway
Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland
35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name:	Coffey Environments Pty Ltd VIC
Contact name:	Nick Taylor
Project name:	RETWA 2021 MONITORING
Project ID:	754-PEREN283020
Turnaround time:	5 Day
Date/Time received	Mar 16, 2021 11:00 AM
Eurofins reference	781021

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
X	Split sample sent to requested external lab.
X	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Harry Bacalis on phone : or by email: HarryBacalis@eurofins.com

Results will be delivered electronically via email to Nick Taylor - nick.taylor@coffey.com.

Note: A copy of these results will also be delivered to the general Coffey Environments Pty Ltd VIC email address.

Coffey Services Australia Pty Ltd
Bishops See Level 1, 235 St Georges Terrace
Perth
WA 6000

Attention: **Nick Taylor**

Report **781021-W**
Project name RETWA 2021 MONITORING
Project ID 754-PEREN283020
Received Date Mar 16, 2021

Client Sample ID			**QC2**
Sample Matrix			**Water**
Eurofins Sample No.			**M21-Ma31558**
Date Sampled			**Mar 15, 2021**
Test/Reference	LOR	Unit	
Ammonia (as N)	0.01	mg/L	0.02
Nitrate (as N)	0.02	mg/L	29
Nitrite (as N)	0.02	mg/L	< 0.02
Phosphate total (as P)	0.01	mg/L	0.01
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	10.0
Total Nitrogen (as N)	0.2	mg/L	26

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Ammonia (as N)	Melbourne	Mar 17, 2021	28 Days
- Method: APHA 4500-NH3 Ammonia Nitrogen by FIA			
Nitrate (as N)	Melbourne	Mar 17, 2021	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrite (as N)	Melbourne	Mar 17, 2021	2 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Phosphate total (as P)	Melbourne	Mar 17, 2021	28 Days
- Method: LTM-INO-4040 Phosphate by CFA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Mar 17, 2021	7 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			

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ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

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Phone : +64 9 526 45 51
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Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name: Coffey Services Australia Pty Ltd
Address: Bishops See Level 1, 235 St Georges Terrace
Perth
WA 6000

Project Name: RETWA 2021 MONITORING
Project ID: 754-PEREN283020

Order No.:
Report #: 781021
Phone: 08 9355 7100
Fax: 08 9470 8601

Received: Mar 16, 2021 11:00 AM
Due: Mar 22, 2021
Priority: 5 Day
Contact Name: Ed Holgate -SHELL INV

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Ammonia (as N)	Nitrate (as N)	Nitrite (as N)	Phosphate total (as P)	Total Kjeldahl Nitrogen (as N)	Total Nitrogen (as N)
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217											
Brisbane Laboratory - NATA Site # 20794											
Perth Laboratory - NATA Site # 23736											
Mayfield Laboratory											
External Laboratory											
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**						
1	QC2	Mar 15, 2021		Water	M21-Ma31558	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1

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Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
Total Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
LCS - % Recovery							
Ammonia (as N)	%	98			70-130	Pass	
Nitrate (as N)	%	95			70-130	Pass	
Nitrite (as N)	%	104			70-130	Pass	
Phosphate total (as P)	%	105			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	120			70-130	Pass	
Total Nitrogen (as N)	%	104			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S21-Ma35757	NCP	%	95			70-130	Pass	
Nitrate (as N)	S21-Ma35757	NCP	%	91			70-130	Pass	
Nitrite (as N)	S21-Ma35757	NCP	%	109			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M21-Ma27693	NCP	%	121			70-130	Pass	
Total Nitrogen (as N)	B21-Ma31296	NCP	%	103			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	M21-Ma31558	CP	mg/L	0.02	0.02	3.0	30%	Pass	
Nitrate (as N)	S21-Ma35761	NCP	mg/L	4.0	4.0	1.0	30%	Pass	
Nitrite (as N)	M21-Ma31558	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Phosphate total (as P)	B21-Ma24277	NCP	mg/L	17	16	7.0	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M21-Ma27692	NCP	mg/L	1.4	2.1	37	30%	Fail	Q15
Total Nitrogen (as N)	M21-Ma31742	NCP	mg/L	12	11	2.0	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Rhys Thomas	Analytical Services Manager
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Reference No. _____

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

coffey
A TETRA TECH COMPANY

Consigning Office: Level 1, 235 St Georges Tce, Perth, WA

Report Results to: KATIE HANNAH Mobile: +61 062182066 Email: Katie.Hannah@coffey.com.

Invoices to: Accounts.Perth@coffey.com Phone: Email:

Project Number: 754-PERENZ83020 Order Number (project task):

Project Name: RETWA. Laboratory: EUROFINS

Sampler's Name: REGAN MACDONALD Project Manager: KATIE HANNAH

Special Instructions:

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)	TOTAL NITROGEN	NITRATE	TOTAL KJELDAHL NITROGEN	AMMONIA	TOTAL PHOSPHORUS	NOTES
	QC2	22/06		W	BOTTLE	STD	X	X	X	X	X	

Analysis Request Section

Date/Time: 22/6/2 10:26

Chilled Yes / No

Temp: 18.5 18.5 18.5 18.6 18.6°C

Correction:

Final Temp:

RELINQUISHED BY

Name: Regan MacDonald Date: 22/06

Coffey Services Time:

Name: Date:

Company: Time:

RECEIVED BY

Name: Rob Johnston Date: 22/6/2

Company: Eurofins Time: 10:26

Name: Date:

Company: Time:

Sample Receipt Advice: (Lab Use Only)

All Samples Recieved in Good Condition ☑

All Documentation is in Proper Order ☑

Samples Received Properly Chilled ☑

Lab. Ref/Batch No. 804960

*Container Type & Preservation Codes: P - Plastic, G- Glass Bottle, J - Glass Jar, V- Vial, Z - Ziplock bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative

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Certificate of Analysis

Tetra Tech Coffey Pty Ltd
Bishops See Level 1, 235 St Georges Terrace
Perth
WA 6000

NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Katie Hannah**

Report **804960-W**
Project name RETWA
Project ID 754-PEREN283020
Received Date Jun 23, 2021

Client Sample ID			**QC2**
Sample Matrix			**Water**
Eurofins Sample No.			**P21-Jn44436**
Date Sampled			**Jun 22, 2021**
Test/Reference	LOR	Unit	
Ammonia (as N)	0.01	mg/L	0.34
Nitrate & Nitrite (as N)	0.05	mg/L	0.30
Nitrate (as N)	0.02	mg/L	0.29
Nitrite (as N)	0.02	mg/L	< 0.02
Phosphate total (as P)	0.01	mg/L	0.49
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2
Total Nitrogen (as N)*	0.2	mg/L	0.3

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, Total P			
Ammonia (as N)	Perth	Jun 23, 2021	28 Days
- Method: LTM-INO-4200 Ammonia by Discrete Analyser			
Nitrate & Nitrite (as N)	Perth	Jun 23, 2021	28 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Nitrate (as N)	Perth	Jun 23, 2021	2 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Nitrite (as N)	Perth	Jun 23, 2021	2 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Phosphate total (as P)	Melbourne	Jun 24, 2021	28 Days
- Method: LTM-INO-4040 Phosphate by CFA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Jun 24, 2021	7 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			

eurofins | Environment Testing

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IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Company Name:	Tetra Tech Coffey Pty Ltd	**Order No.:**		**Received:**	Jun 23, 2021 10:26 AM
Address:	Bishops See Level 1, 235 St Georges Terrace Perth WA 6000	**Report #:**	804960	**Due:**	Jun 30, 2021
		Phone:	08 9355 7100	**Priority:**	5 Day
		Fax:	08 9470 8601	**Contact Name:**	Katie Hannah
Project Name:	RETWA				
Project ID:	754-PEREN283020				

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, Total P
Melbourne Laboratory - NATA Site # 1254						X
Sydney Laboratory - NATA Site # 18217						
Brisbane Laboratory - NATA Site # 20794						
Perth Laboratory - NATA Site # 23736						X
Mayfield Laboratory - NATA Site # 25079						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QC2	Jun 22, 2021		Water	P21-Jn44436	X
Test Counts						1

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Internal Quality Control Review and Glossary

General

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2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling.Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " -" in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/L	< 0.01			0.01	Pass	
Nitrate & Nitrite (as N)	mg/L	< 0.05			0.05	Pass	
Nitrate (as N)	mg/L	< 0.02			0.02	Pass	
Nitrite (as N)	mg/L	< 0.02			0.02	Pass	
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
LCS - % Recovery							
Ammonia (as N)	%	107			70-130	Pass	
Nitrate & Nitrite (as N)	%	110			70-130	Pass	
Nitrate (as N)	%	110			70-130	Pass	
Nitrite (as N)	%	103			70-130	Pass	
Phosphate total (as P)	%	91			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	104			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	P21-Jn44383	NCP	%	98			70-130	Pass	
Nitrate & Nitrite (as N)	P21-Jn44436	CP	%	97			70-130	Pass	
Nitrate (as N)	P21-Jn44436	CP	%	97			70-130	Pass	
Nitrite (as N)	P21-Jn44383	NCP	%	73			70-130	Pass	
Phosphate total (as P)	P21-Jn44854	NCP	%	119			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	S21-Jn45543	NCP	%	89			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	P21-Jn44436	CP	mg/L	0.34	0.34	<1	30%	Pass	
Nitrate & Nitrite (as N)	P21-Jn44436	CP	mg/L	0.30	0.30	1.0	30%	Pass	
Nitrate (as N)	P21-Jn44436	CP	mg/L	0.29	0.29	1.0	30%	Pass	
Nitrite (as N)	P21-Jn44436	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
Phosphate total (as P)	M21-Jn45445	NCP	mg/L	0.47	0.47	1.0	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M21-Jn48501	NCP	mg/L	< 0.2	< 0.2	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Rhys Thomas	Analytical Services Manager
Rhys Thomas	Senior Analyst-Inorganic (WA)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

Tetra Tech Coffey Pty Ltd
Bishops See Level 1, 235 St Georges Terrace
Perth
WA 6000

NATA Accredited
Accreditation Number 2377
Site Number 2370

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Attention: **Katie Hannah**

Report **828278-W**
Project name RETWA
Project ID 754-PEREN283020
Received Date Sep 29, 2021

Client Sample ID			**QC2**
Sample Matrix			**Water**
Eurofins Sample No.			**L21-Se58476**
Date Sampled			**Sep 28, 2021**
Test/Reference	LOR	Unit	
Ammonia (as N)	0.01	mg/L	0.07
Nitrate & Nitrite (as N)	0.05	mg/L	< 0.05
Nitrate (as N)	0.02	mg/L	< 0.02
Nitrite (as N)	0.02	mg/L	< 0.02
Phosphate total (as P)	0.01	mg/L	< 0.01
Total Kjeldahl Nitrogen (as N)	0.2	mg/L	< 0.2
Total Nitrogen (as N)*	0.2	mg/L	< 0.2

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, Total P			
Ammonia (as N)	Welshpool	Sep 29, 2021	28 Days
- Method: LTM-INO-4200 Ammonia by Discrete Analyser			
Nitrate & Nitrite (as N)	Welshpool	Sep 29, 2021	28 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Nitrate (as N)	Welshpool	Sep 29, 2021	2 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Nitrite (as N)	Welshpool	Sep 29, 2021	2 Days
- Method: LTM-INO-4350 Aqueous Inorganic Analytes by Discrete Analyser			
Phosphate total (as P)	Melbourne	Oct 01, 2021	28 Days
- Method: LTM-INO-4040 Phosphate by CFA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Oct 06, 2021	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			

eurofins | ARL

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43 Detroit Drive
Rolleston, Christchurch 7675
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IANZ # 1290

Company Name:	Tetra Tech Coffey Pty Ltd	**Order No.:**		**Received:**	Sep 29, 2021 12:16 PM
Address:	Bishops See Level 1, 235 St Georges Terrace Perth WA 6000	**Report #:**	828278	**Due:**	Oct 6, 2021
		Phone:	08 9355 7100	**Priority:**	5 Day
		Fax:	08 9470 8601	**Contact Name:**	Katie Hannah
Project Name:	RETWA				
Project ID:	754-PEREN283020				

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, Total P
Perth Laboratory - NATA # 2377 Site # 2370						X
Melbourne Laboratory - NATA # 1261 Site # 1254						X
Sydney Laboratory - NATA # 1261 Site # 18217						
Brisbane Laboratory - NATA # 1261 Site # 20794						
Mayfield Laboratory - NATA # 1261 Site # 25079						
External Laboratory						
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**	
1	QC2	Sep 28, 2021		Water	L21-Se58476	X
Test Counts						1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
ug/L: micrograms per litre
ppm: Parts per million
ppb: Parts per billion
%: Percentage
org/100mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version
CP	Client Parent - QC was performed on samples pertaining to this report
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs..

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Phosphate total (as P)	mg/L	< 0.01			0.01	Pass	
Total Kjeldahl Nitrogen (as N)	mg/L	< 0.2			0.2	Pass	
LCS - % Recovery							
Phosphate total (as P)	%	108			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	80			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	L21-Se55606	NCP	%	91			70-130	Pass	
Nitrite (as N)	L21-Se55606	NCP	%	102			70-130	Pass	
Phosphate total (as P)	L21-Se58554	NCP	%	115			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	M21-Se62867	NCP	%	81			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	L21-Oc19751	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Phosphate total (as P)	M21-Se62868	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Total Kjeldahl Nitrogen (as N)	B21-Se59587	NCP	mg/L	< 0.2	< 0.2	<1	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	N/A
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Authorised by:

Robert Johnston	Analytical Services Manager
Sam Becker	Senior Analyst-Inorganic (WA)
Scott Beddoes	Senior Analyst-Inorganic (VIC)

Kim Rodgers
Business Unit Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2102771**	Page	: 1 of 4
Client	: **COFFEY ENVIRONMENTS PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: Nick Taylor	Contact	: Lauren Biagioni
Address	: Level 1, Bishop See 235 St Georges Terrace Perth WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1307
Project	: RETWA 2021 MONITORING	Date Samples Received	: 15-Mar-2021 18:10
Order number	: ----	Date Analysis Commenced	: 15-Mar-2021
C-O-C number	: ----	Issue Date	: 22-Mar-2021 17:08
Sampler	: Regan MacDonald		
Site	: ----		
Quote number	: EP/103/21_V2		
No. of samples received	: 7		
No. of samples analysed	: 7		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW1D	MW2D	MW3D	MW4D	MW5D
			Sampling date / time	15-Mar-2021 00:00	15-Mar-2021 00:00	15-Mar-2021 00:00	15-Mar-2021 00:00	15-Mar-2021 00:00
Compound	CAS Number	LOR	Unit	EP2102771-001	EP2102771-002	EP2102771-003	EP2102771-004	EP2102771-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.70**	**6.40**	**3.81**	**6.62**	**5.73**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**639**	**563**	**1470**	**882**	**5450**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	**0.15**	**0.05**	**0.11**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.24**	**28.2**	**3.01**	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.24**	**28.2**	**3.01**	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.1**	**3.1**	**0.6**	<0.1	**0.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**0.3**	**31.3**	**3.6**	<0.1	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	**0.09**	**0.06**	**0.02**	**0.12**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	QC1	QC3	----	----	----
			Sampling date / time	15-Mar-2021 00:00	15-Mar-2021 00:00	----	----	----
Compound	CAS Number	LOR	Unit	EP2102771-006	EP2102771-007	--------	--------	--------
				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**6.76**	**5.78**	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**572**	<1	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**26.8**	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**26.8**	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**3.0**	<0.1	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**29.8**	<0.1	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.03**	<0.01	----	----	----

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2102771**	Page	: 1 of 5
Client	: **COFFEY ENVIRONMENTS PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: Nick Taylor	Telephone	: 08 9406 1307
Project	: RETWA 2021 MONITORING	Date Samples Received	: 15-Mar-2021
Site	: ----	Issue Date	: 22-Mar-2021
Sampler	: Regan MacDonald	No. of samples received	: 7
Order number	: ----	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EP2102715--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	----	----	----	17-Mar-2021	15-Mar-2021	**2**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**----**	----	----	**17-Mar-2021**	15-Mar-2021	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**----**	----	----	**17-Mar-2021**	12-Apr-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**----**	----	----	**15-Mar-2021**	12-Apr-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**----**	----	----	**15-Mar-2021**	17-Mar-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**----**	----	----	**15-Mar-2021**	12-Apr-2021	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**17-Mar-2021**	12-Apr-2021	✓	**17-Mar-2021**	12-Apr-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
MW1D, MW2D, MW3D, MW4D, MW5D, QC1, QC3	**15-Mar-2021**	**17-Mar-2021**	12-Apr-2021	✓	**17-Mar-2021**	12-Apr-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	12	**16.67**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	11	**18.18**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	19	**15.79**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	25	**12.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	22	**13.64**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	12	**8.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	11	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	25	**8.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	22	**9.09**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

Reference No. _____

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

coffey
A TETRA TECH COMPANY

Consigning Office: Level 1, 235 St Georges Tce, Perth, WA

Report Results to: NICK TAYLOR Mobile: 0408574873 Email: Nick.Taylor@Coffey.com

Invoices to: Accounts.Perth@coffey.com Phone: Email:

Project Number: **Order Number (project task):**

Project Name: RETWA 2021 MONITORING **Laboratory:** ALS

Sampler's Name: REGAN MACDONALD. **Project Manager:** NICK TAYLOR

Special Instructions: QUOTE EP/103/21

Analysis Request Section

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)	EVENT1								NOTES
1	MW1D	15/10/21	AM	WATER	BOTTLE	STD	X								
2	MW2D	↓	↓	↓	↓	↓	X								
3	MW3D						X								
4	MW4D						X								
5	MW5D						X								
6	QC1						X								
7	QC3						X								

Environmental Division
Perth
Work Order Reference
EP2102771

Telephone : 61-8-9406 1301

RELINQUISHED BY

Name: REGAN MACDONALD Date: 15/03/21
Coffey Services Time: 1600.

Name: Date:
Company: Time:

RECEIVED BY

Name: SI Date: 15.3.21
Company: ALS Time: 1810

Name: Date:
Company: Time:

Sample Receipt Advice: (Lab Use Only)

All Samples Recieved in Good Condition ☐
All Documentation is in Proper Order ☐
Samples Received Properly Chilled ☐
Lab. Ref/Batch No.

***Container Type & Preservation Codes:** P - Plastic, G- Glass Bottle, J - Glass Jar, V- Vial, Z - Ziplock bag, N - Nitric Acid Preserved, C - Hydrochloric Acid Preserved, S - Sulphuric Acid Preserved, I - Ice, ST - Sodium Thiosulfate, NP - No Preservative

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2107069**	Page	: 1 of 5
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Paul Meyer	Contact	: Lauren Biagioni
Address	: Level 1, Bishop See 235 St Georges Terrace Perth WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1307
Project	: RETWA GME	Date Samples Received	: 22-Jun-2021 17:00
Order number	: -	Date Analysis Commenced	: 23-Jun-2021
C-O-C number	: 24259	Issue Date	: 30-Jun-2021 12:46
Sampler	: Regan MacDonald, Steven Middleton		
Site	: RETWA event 2/ 754-PEREN283020		
Quote number	: EP/103/21_V2		
No. of samples received	: 8		
No. of samples analysed	: 8		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK061G (TKN)/EK067G (Total Phosphorus): Results for sample #4 and 7 have been confirmed by re-digestion and re-analysis.

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW1S	MB2	MW3S	QC1	----
			Sampling date / time	22-Jun-2021 10:28	22-Jun-2021 10:56	22-Jun-2021 09:45	22-Jun-2021 10:30	----
Compound	CAS Number	LOR	Unit	EP2107069-004	EP2107069-005	EP2107069-006	EP2107069-007	--------
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.52**	**5.81**	**4.54**	**5.08**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**466**	**248**	**894**	**462**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.35**	**0.02**	**0.02**	**0.30**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.01**	<0.01	<0.01	<0.01	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.27**	**0.09**	**11.1**	**0.26**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.28**	**0.09**	**11.1**	**0.26**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**8.0**	**25.5**	**6.1**	**5.4**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**8.3**	**25.6**	**17.2**	**5.7**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**1.38**	**2.75**	**0.44**	**1.14**	**----**

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)				Sample ID	QC3	----	----	----	----
				Sampling date / time	22-Jun-2021 14:04	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*		**EP2107069-008**	--------	--------	--------	--------
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**6.02**	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		<1	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ **Total Nitrogen as N**	----	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	D1	D2	D3	----	----
			Sampling date / time	22-Jun-2021 12:23	22-Jun-2021 12:11	22-Jun-2021 12:38	----	----
Compound	CAS Number	LOR	Unit	EP2107069-001	EP2107069-002	EP2107069-003	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.81**	**7.85**	**7.77**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**912**	**546**	**687**	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**4.66**	**0.98**	**3.15**	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.02**	**0.04**	**0.04**	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.08**	**0.21**	**0.30**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.10**	**0.25**	**0.34**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**8.0**	**5.0**	**8.7**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**8.1**	**5.2**	**9.0**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**4.16**	**3.14**	**6.07**	**----**	**----**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2107069**	Page	: 1 of 5
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Paul Meyer	Telephone	: 08 9406 1307
Project	: RETWA GME	Date Samples Received	: 22-Jun-2021
Site	: RETWA event 2/ 754-PEREN283020	Issue Date	: 30-Jun-2021
Sampler	: Regan MacDonald, Steven Middleton	No. of samples received	: 8
Order number	: -	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Ar	EP2107138--001	Anonymous	**Nitrite + Nitrate as N**	----	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Days overdue	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
D1,	D2,	----	----	----	28-Jun-2021	22-Jun-2021	**6**
D3,	MW1S,						
MB2,	MW3S,						
QC1,	QC3						

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation: Date extracted	Extraction / Preparation: Due for extraction	Extraction / Preparation: Evaluation	Analysis: Date analysed	Analysis: Due for analysis	Analysis: Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
D1,	D2,	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	22-Jun-2021	×
D3,	MW1S,							
MB2,	MW3S,							
QC1,	QC3							
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
D1,	D2,	**22-Jun-2021**	**----**	----	----	**28-Jun-2021**	20-Jul-2021	✓
D3,	MW1S,							
MB2,	MW3S,							
QC1,	QC3							

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
D1, D2, D3, MW1S, MB2, MW3S, QC1, QC3	**22-Jun-2021**	**----**	----	----	**23-Jun-2021**	20-Jul-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
D1, D2, D3, MW1S, MB2, MW3S, QC1, QC3	**22-Jun-2021**	**----**	----	----	**23-Jun-2021**	24-Jun-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
D1, D2, D3, MW1S, MB2, MW3S, QC1, QC3	**22-Jun-2021**	**----**	----	----	**23-Jun-2021**	20-Jul-2021	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
D1, D2, D3, MW1S, MB2, MW3S, QC1, QC3	**22-Jun-2021**	**25-Jun-2021**	20-Jul-2021	✓	**25-Jun-2021**	20-Jul-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
D1, D2, D3, MW1S, MB2, MW3S, QC1, QC3	**22-Jun-2021**	**25-Jun-2021**	20-Jul-2021	✓	**25-Jun-2021**	20-Jul-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	15	**13.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	4	19	**21.05**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	4	35	**11.43**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	15	**6.67**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	19	**10.53**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	35	**5.71**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

ALSCompass
SAMPLING *Intelligence*

Environmental Division
Perth
Work Order Reference
EP2107069

Telephone : -- 61-8-9406 1301

Custody Document for Submissions via ALS Compass App

Project: RETWA **Client:** RETWA **Project Manager:** KATLE ~~CROSS~~ HANNAH

ALS Compass COC Reference: FSY-PERE283020 **# Samples:** 12 **Phone:** (@+61062182066)

Sampler: REGAN MACDONALD. **Phone:** (0407111746)

Turnaround Requirements: Standard ✓ Urgent

Special Instructions:

Custody:

Relinquished by:	Received by:	Relinquished by:	Received by:
REGAN MACDONALD	SP		
Date / Time: 22/06/21	**Date / Time:** 1700 22/6/21	**Date / Time:**	**Date / Time:**

CHAIN OF CUSTODY

ALS COC#: **24259** *ALS Laboratory:* EP Perth

CLIENT: COFENVWA - COFFEY ENVIRONMENTS PTY LTD

PROJECT: RETWA GME

SITE: RETWA event 2/ 754-PEREN283020

ORDER NO:

PROJECT MANAGER: Paul Meyer

PRIMARY SAMPLER: Regan Macdonald

CONTACT PH: 0410 591 753

QUOTE NO: EP/103/21

SAMPLER MOBILE:

/ EP2021COFENVWA0010

EMAIL REPORTS TO: paul.meyer1@tetratech.com, katie.hannah@tetratech.com

EMAIL INVOICES TO:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS							ANALYSIS REQUIRED		
SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Event 2 GROUNDWATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	D1		22/06/2021 12:23 PM	Water	ALS: 2 Non ALS: 0	No	X		
002	D2		22/06/2021 12:11 PM	Water	ALS: 2 Non ALS: 0	No	X		
003	D3		22/06/2021 12:38 PM	Water	ALS: 2 Non ALS: 0	No	X		
004	MW1S		22/06/2021 10:28 AM	Water	ALS: 2 Non ALS: 0	No	X		
005	MB2		22/06/2021 10:56 AM	Water	ALS: 2 Non ALS: 0	No	X		
006	MW3S		22/06/2021 09:45 AM	Water	ALS: 2 Non ALS: 0	No	X		
007	QC1		22/06/2021 10:30 AM	Water	ALS: 2 Non ALS: 0	No	X		
008	QC3		22/06/2021 02:04 PM	Water	ALS: 2 Non ALS: 0	No	X		

CHAIN OF CUSTODY

(ALS) COC#: **24259** *ALS Laboratory:* EP Perth

CLIENT: COFENVWA - COFFEY ENVIRONMENTS PTY LTD

PROJECT: RETWA GME

SITE: RETWA event 2/ 754-PEREN283020

ORDER NO:

PROJECT MANAGER: Paul Meyer

PRIMARY SAMPLER: Regan Macdonald

CONTACT PH: 0410 591 753

QUOTE NO: EP/103/21

SAMPLER MOBILE: / EP2021COFENVWA0010

EMAIL REPORTS TO: paul.meyer1@tetratech.com, katie.hannah@tetratech.com

EMAIL INVOICES TO:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE TIME:	DATE TIME:	DATE TIME:	DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	D1	Clear Plastic Bottle - Natural	125 mL	00070220143193	Green	No	
001	D1	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046119	Purple	No	
002	D2	Clear Plastic Bottle - Natural	125 mL	00070220143001	Green	No	
002	D2	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121045919	Purple	No	
003	D3	Clear Plastic Bottle - Natural	125 mL	00070220143187	Green	No	
003	D3	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046083	Purple	No	
004	MW1S	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046080	Purple	No	
004	MW1S	Clear Plastic Bottle - Natural	125 mL	00070220143150	Green	No	
005	MB2	Clear Plastic Bottle - Natural	125 mL	00070220143008	Green	No	
005	MB2	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046155	Purple	No	
006	MW3S	Clear Plastic Bottle - Natural	125 mL	00070220143030	Green	No	
006	MW3S	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046125	Purple	No	
007	QC1	Clear Plastic Bottle - Natural	125 mL	00070220143054	Green	No	
007	QC1	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046123	Purple	No	
008	QC3	Clear Plastic Bottle - Natural	125 mL	00070220142932	Green	No	
008	QC3	Clear Plastic Bottle - Sulfuric Acid	60 mL	00100121046193	Purple	No	

Total Bottle Count: ALS: 16, Non ALS: 0

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2108025**	Page	: 1 of 3
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Katie Hannah	Contact	: Lauren Biagioni
Address	: Level 1, Bishop See 235 St Georges Terrace Perth WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1307
Project	: 754-PEREN283020 RETWA 20-21 Monitoring	Date Samples Received	: 14-Jul-2021 15:35
Order number	: ----	Date Analysis Commenced	: 15-Jul-2021
C-O-C number	: ----	Issue Date	: 20-Jul-2021 20:49
Sampler	: Regan MacDonald		
Site	: ----		
Quote number	: EP/103/21_V2		
No. of samples received	: 3		
No. of samples analysed	: 3		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	S1	S2	S3	----	----
			Sampling date / time	13-Jul-2021 00:00	13-Jul-2021 00:00	13-Jul-2021 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2108025-001**	**EP2108025-002**	**EP2108025-003**	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.12**	**7.10**	**7.11**	**----**	**----**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**240**	**240**	**238**	**----**	**----**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	**----**	**----**
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.20**	**0.19**	**0.24**	**----**	**----**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.20**	**0.19**	**0.24**	**----**	**----**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.6**	**1.7**	**1.7**	**----**	**----**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.8**	**1.9**	**1.9**	**----**	**----**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.13**	**0.12**	**0.13**	**----**	**----**

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2108025**	Page	: 1 of 5
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Katie Hannah	Telephone	: 08 9406 1307
Project	: 754-PEREN283020 RETWA 20-21 Monitoring	Date Samples Received	: 14-Jul-2021
Site	: ----	Issue Date	: 20-Jul-2021
Sampler	: Regan MacDonald	No. of samples received	: 3
Order number	: ----	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **NO Quality Control Sample Frequency Outliers exist.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
S1, S2, S3	----	----	----	15-Jul-2021	13-Jul-2021	**2**

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
S1, S2, S3	**13-Jul-2021**	**----**	----	----	**15-Jul-2021**	13-Jul-2021	×
EA010P: Conductivity by PC Titrator							
Clear Plastic Bottle - Natural (EA010-P)							
S1, S2, S3	**13-Jul-2021**	**----**	----	----	**15-Jul-2021**	10-Aug-2021	✓
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
S1, S2, S3	**13-Jul-2021**	**----**	----	----	**15-Jul-2021**	10-Aug-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
S1, S2, S3	**13-Jul-2021**	**----**	----	----	**15-Jul-2021**	15-Jul-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
S1, S2, S3	**13-Jul-2021**	**----**	----	----	**15-Jul-2021**	10-Aug-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
S1, S2, S3	**13-Jul-2021**	**19-Jul-2021**	10-Aug-2021	✓	**19-Jul-2021**	10-Aug-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
S1, S2, S3	**13-Jul-2021**	**19-Jul-2021**	10-Aug-2021	✓	**19-Jul-2021**	10-Aug-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	3	16	**18.75**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	16	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	19	**10.53**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	16	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	16	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	19	**5.26**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)

Reference No. _____

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

coffey
A TETRA TECH COMPANY

Consigning Office: Level 1, 235 St Georges Tce, Perth, WA
Report Results to: Katie Hannah Mobile: Email: katie.hannah@coffey.com
Invoices to: Accounts.Perth@coffey.com Phone: Email:

Project Number: 754-PEREN283020 Order Number (project task):
Project Name: RETWA 20-21 Monitoring Laboratory: ALS
Sampler's Name: Regan MacDonald Project Manager: KATIE HANNAH
Special Instructions:
Lab Quote : EP-103-21-02

Lab No.	Sample ID	Sample Date	Time	Matrix (Soil...etc)	Container Type & Preservative*	T-A-T (specify)
1	S1	13/07		WATER	BOTTLE	STD
2	S2	↓		↓	↓	↓
3	S3					

Analysis Request Section

EVENT 2 GW*

NOTES

Environmental Division
Perth
Work Order Reference
EP2108025

Telephone : +61-8-9406 1301

RELINQUISHED BY		RECEIVED BY	
Name: Regan MacDonald	Date: 14/07/21.	Name: NP	Date: 14/7/21
Coffey Services	Time: 1330	Company: AMJ	Time: 1535
Name:	Date:	Name:	Date:
Company:	Time:	Company:	Time:

Container Type & Preservation Codes: P - Plastic, **G**- Glass Bottle, **J** - Glass Jar, **V**- Vial, **Z** - Ziplock bag, **N** - Nitric Acid Preserved, **C** - Hydrochloric Acid Preserved, **S** - Sulphuric Acid Preserved, **I** - Ice, **ST** - Sodium Thiosulfate, **NP** - No Preservative

Sample Receipt Advice: (Lab Use Only)
All Samples Recieved in Good Condition ☐
All Documentation is in Proper Order ☐
Samples Received Properly Chilled ☐
Lab. Ref/Batch No.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EP2111546**	Page	: 1 of 8
Amendment	: **1**		
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Paul Meyer	Contact	: Lauren Biagioni
Address	: Level 1, Bishop See 235 St Georges Terrace Perth WA, AUSTRALIA 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: 08 9406 1307
Project	: RETWA GME	Date Samples Received	: 29-Sep-2021 11:35
Order number	: -	Date Analysis Commenced	: 29-Sep-2021
C-O-C number	: 28170	Issue Date	: 28-Jan-2022 16:14
Sampler	: Regan MacDonald, Steven Middleton		
Site	: Retwa		
Quote number	: EP/103/21_V2		
No. of samples received	: 20		
No. of samples analysed	: 20		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EK067G: Total Phosphorus LOR raised for sample #13 due to possible sample matrix interference.
- EK067G: Total Phosphorus result for sample #16 confirmed by re-digestion and re-analysis.
- Amendment (28/01/2022): This report has been amended in order to update the sample date for EP2111546_013. All analysis results are as per the previous report.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

Analytical Results

Sub-Matrix: COOLING TOWER WATER (Matrix: WATER)			Sample ID	D1	----	----	----	----
			Sampling date / time	28-Sep-2021 14:24	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2111546-004	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.47**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**904**	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**1.20**	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**6.7**	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**6.7**	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**5.10**	----	----	----	----

Analytical Results

Sub-Matrix: **GROUNDWATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Sample ID	MW1S	MW2S	MW3S	MW4S	MW5S
				Sampling date / time	28-Sep-2021 10:25	28-Sep-2021 11:32	28-Sep-2021 10:11	28-Sep-2021 12:40	28-Sep-2021 13:35
					EP2111546-007	EP2111546-008	EP2111546-009	EP2111546-010	EP2111546-011
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		**5.81**	**6.47**	**4.61**	**6.93**	**6.50**
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		**411**	**314**	**793**	**494**	**428**
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		**0.08**	**0.11**	**0.04**	**0.04**	**0.08**
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	14797-65-0	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		**0.05**	**0.01**	**8.27**	**2.70**	**3.23**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		**0.05**	**0.01**	**8.27**	**2.70**	**3.23**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		**1.1**	**3.4**	**1.2**	**1.1**	**2.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		**1.2**	**3.4**	**9.5**	**3.8**	**5.5**
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.17**	**0.23**	**0.12**	**0.10**	**0.20**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	MW1D	MW2D	MW3D	MW4D	MW5D
			Sampling date / time	28-Sep-2021 10:26	28-Sep-2021 10:16	28-Sep-2021 10:14	28-Sep-2021 12:39	28-Sep-2021 13:30
Compound	CAS Number	LOR	Unit	EP2111546-012	EP2111546-013	EP2111546-014	EP2111546-015	EP2111546-016
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.48**	**6.26**	**3.64**	**6.42**	**4.54**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**338**	**582**	**1370**	**833**	**5610**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	**0.18**	**0.04**	**0.07**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.02**	<0.01	**0.01**	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**1.51**	**14.7**	**4.02**	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**1.53**	**14.7**	**4.03**	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.3**	**2.0**	**1.3**	<0.1	**0.3**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**1.8**	**16.7**	**5.3**	<0.1	**0.3**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.06**	<0.02	**0.05**	**0.03**	**0.14**

Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	FWB1	FWB2	QC1	----	----
			Sampling date / time	28-Sep-2021 14:48	28-Sep-2021 14:40	28-Sep-2021 13:32	----	----
Compound	CAS Number	LOR	Unit	EP2111546-017	EP2111546-018	EP2111546-019	--------	--------
				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.68**	**7.72**	**4.65**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**216**	**217**	**5690**	----	----
ED040T: Total Major Anions								
Silicon	7440-21-3	0.05	mg/L	**0.77**	**0.78**	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**19**	**19**	----	----	----
Magnesium	7439-95-4	1	mg/L	**1**	**1**	----	----	----
Sodium	7440-23-5	1	mg/L	**22**	**22**	----	----	----
Potassium	7440-09-7	1	mg/L	**1**	**1**	----	----	----
EG020T: Total Metals by ICP-MS								
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	----	----	----
Copper	7440-50-8	0.001	mg/L	**0.027**	**0.023**	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.001	**0.002**	----	----	----
Manganese	7439-96-5	0.001	mg/L	<0.001	<0.001	----	----	----
Iron	7439-89-6	0.05	mg/L	<0.05	<0.05	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	<0.01	**0.07**	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	**0.2**	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	<0.1	**0.2**	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.02**	<0.01	**0.08**	----	----

Analytical Results

Sub-Matrix: **RINSATE** (Matrix: **WATER**)			Sample ID	QC3	----	----	----	----
			Sampling date / time	28-Sep-2021 13:41	----	----	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2111546-021**	--------	--------	--------	--------
				Result	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**5.62**	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	<1	----	----	----	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	<0.01	----	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	----	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.01	----	----	----	----

Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	S1	S2	S3	D2	D3
			Sampling date / time	28-Sep-2021 14:56	28-Sep-2021 15:04	28-Sep-2021 15:09	28-Sep-2021 14:35	28-Sep-2021 14:13
Compound	CAS Number	LOR	Unit	EP2111546-001	EP2111546-002	EP2111546-003	EP2111546-005	EP2111546-006
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.47**	**7.19**	**7.12**	**7.53**	**7.60**
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**490**	**474**	**1430**	**842**	**484**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.07**	**0.49**	**0.91**	**1.35**	**0.48**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**2.1**	**3.8**	**3.9**	**7.3**	**3.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	**2.1**	**3.8**	**3.9**	**7.3**	**3.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	**0.25**	**2.07**	**1.31**	**4.23**	**1.45**

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2111546**	Page	: 1 of 9
Amendment	: **1**		
Client	: **Tetra Tech Coffey Pty Ltd**	Laboratory	: Environmental Division Perth
Contact	: Paul Meyer	Telephone	: 08 9406 1307
Project	: RETWA GME	Date Samples Received	: 29-Sep-2021
Site	: Retwa	Issue Date	: 28-Jan-2022
Sampler	: Regan MacDonald, Steven Middleton	No. of samples received	: 20
Order number	: -	No. of samples analysed	: 20

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method / Container / Client Sample ID(s)		Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
S1,	S2,	----	----	----	04-Oct-2021	28-Sep-2021	**6**
S3,	D1,						
D2,	D3,						
MW1S,	MW2S,						
MW3S,	MW4S,						
MW5S,	MW1D,						
MW2D,	MW3D,						
MW4D,	MW5D,						
FWB1,	FWB2,						
QC1,	QC3						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type / Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Major Anions - Total	0	3	0.00	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
S1,	S2,	**28-Sep-2021**	**----**	----	----	**04-Oct-2021**	28-Sep-2021	×
S3,	D1,							
D2,	D3,							
MW1S,	MW2S,							
MW3S,	MW4S,							
MW5S,	MW1D,							
MW2D,	MW3D,							
MW4D,	MW5D,							
FWB1,	FWB2,							
QC1,	QC3							
EA010P: Conductivity by PC Titrator								
Clear Plastic Bottle - Natural (EA010-P)								
S1,	S2,	**28-Sep-2021**	**----**	----	----	**04-Oct-2021**	26-Oct-2021	✓
S3,	D1,							
D2,	D3,							
MW1S,	MW2S,							
MW3S,	MW4S,							
MW5S,	MW1D,							
MW2D,	MW3D,							
MW4D,	MW5D,							
FWB1,	FWB2,							
QC1,	QC3							
ED040T: Total Major Anions								
Clear Plastic Bottle - Unfiltered; Lab-acidified (ED040T)								
FWB1,	FWB2	**28-Sep-2021**	**04-Oct-2021**	26-Oct-2021	✓	**04-Oct-2021**	26-Oct-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
FWB1,	FWB2	**28-Sep-2021**	**----**	----	----	**02-Oct-2021**	05-Oct-2021	✓
EG020T: Total Metals by ICP-MS								
Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020A-T)								
FWB1,	FWB2	**28-Sep-2021**	**04-Oct-2021**	27-Mar-2022	✓	**04-Oct-2021**	27-Mar-2022	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G)							
S1, S2, S3, D1, D2, D3, MW1S, MW2S, MW3S, MW4S, MW5S, MW1D, MW2D, MW3D, MW4D, MW5D, FWB1, FWB2, QC1, QC3	**28-Sep-2021**	**----**	----	----	**29-Sep-2021**	26-Oct-2021	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G)							
S1, S2, S3, D1, D2, D3, MW1S, MW2S, MW3S, MW4S, MW5S, MW1D, MW2D, MW3D, MW4D, MW5D, FWB1, FWB2, QC1, QC3	**28-Sep-2021**	**----**	----	----	**29-Sep-2021**	30-Sep-2021	✓
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G)							
S1, S2, S3, D1, D2, D3, MW1S, MW2S, MW3S, MW4S, MW5S, MW1D, MW2D, MW3D, MW4D, MW5D, FWB1, FWB2, QC1, QC3	**28-Sep-2021**	**----**	----	----	**29-Sep-2021**	26-Oct-2021	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G)							
S1, S2, S3, D1, D2, D3, MW1S, MW2S, MW3S, MW4S, MW5S, MW1D, MW2D, MW3D, MW4D, MW5D, FWB1, FWB2, QC1, QC3	**28-Sep-2021**	**05-Oct-2021**	26-Oct-2021	✓	**05-Oct-2021**	26-Oct-2021	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G)							
S1, S2, S3, D1, D2, D3, MW1S, MW2S, MW3S, MW4S, MW5S, MW1D, MW2D, MW3D, MW4D, MW5D, FWB1, FWB2, QC1, QC3	**28-Sep-2021**	**05-Oct-2021**	26-Oct-2021	✓	**05-Oct-2021**	26-Oct-2021	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Ammonia as N by Discrete analyser	EK055G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Total	ED040T	0	3	**0.00**	**10.00**	×	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	29	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	3	28	**10.71**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Total	ED040T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Conductivity by PC Titrator	EA010-P	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Anions - Total	ED040T	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Matrix Spikes (MS) - Continued							
Total Metals by ICP-MS - Suite A	EG020A-T	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	28	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Conductivity by PC Titrator	EA010-P	WATER	In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM Schedule B(3)
Major Anions - Total	ED040T	WATER	In house: Referenced to APHA 3120 Samples are digested by USEPA 3005 prior to analysis. Sulfur and/or Silicon content is determined by ICP/AES and reported as Sulfate and/or Silica after conversion by gravimetric factor.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Total Metals by ICP-MS - Suite A	EG020A-T	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions

Preparation Methods	Method	Matrix	Method Descriptions
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Digestion for Total Recoverable Metals	EN25	WATER	In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM Schedule B(3)