MEDLI Assessment Report

SGP North Temporary Mobile Drilling Camps (MDCs)

Arrow Energy

12 July 2024

→ **The Power of Commitment**

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Executive Summary

MEDLI (the Model for Effluent Disposal Using Land Irrigation) is a computer-based model for designing and analysing effluent disposal systems for sewage treatment plants using land irrigation as a reuse option. It is the tool recommended by the Department of Environment, Science and Innovation (DESI), the primary environmental regulator in Queensland for assessing the viability of long term treated effluent irrigation.

Arrow Energy engaged GHD Pty Ltd to conduct MEDLI modelling across several mining camp facilities in the Western Downs region to assess the sites' suitability to receive irrigated treated effluent from onsite sewage treatment plants. These plants are associated with one or more of the following: mobile drilling camps (MDC), accommodation camps, warehouses, and other facilities, being predominately temporary in nature.

This report presents the modelling of the five Girrahween Temporary MDC camps exclusively (MDC sites).

Girrahween Temporary MDC #1-5

GHD sourced and developed MEDLI model inputs from data supplied by Arrow Energy, such as hydraulic loading and locality information, as well as from our desktop environmental review of the general site and sewage treatment plant characteristics. A total of 16 scenarios were subsequently modelled, including across a range of hydraulic loadings cases (detailed in section 3.3.3):

– The saturation point of the nominated land application area and potential for recycled water runoff.
– The uptake of nutrients by selected site vegetation, and movement of nutrients to groundwater.
– The incidence of overtopping.

Thereafter, the following irrigation scheme aspects were determined:

– Sustainable **application rates (mm/d)** of recycled water over the selected vegetation type
– Minimum required **land application area (ha)**
– **Storage volumes (kL)** required to mitigate incidents of overtopping / over-irrigation.

The irrigation rate, application areas, and storage volume outcomes for both modelled scenarios are provided in the following tables (Tables A,B and C) which are sourced from the guidance tables of Section 5.3 in this report for each MDC. The camps have consistent characteristics so could be grouped according to the key variable of soil type, limiting assessment to three results tables across the five sites.

Table A: Summary of MDCs #1, #3& #4 MEDLI outputs for modelled scenarios (SODOSOL soils)

EP	Load scenario			
	30 EP	**60 EP**	**90 EP**	**120 EP ****
Hydraulic loading (L/day)	6,000	12,000	18,000	24,000 **
Maximum Irrigation Rate (mm/day) ˜	3.7	3.7	3.7	3.7 **
Wet Weather Storage (kL) ^	18	36	54	72**
Irrigation Area (m^2) – Minimum required ^*	1,900	3,800	5,675	7,575**

Notes:
^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer Section 4.2).
* Rounded up to the nearest 25 m^2
** 120 EP loading is only applicable to MDC #3
˜ Actual irrigation rate averaged over the year may differ from this value (lower)

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Table B ***Summary of MDC #2 MEDLI outputs for modelled scenarios (VERTOSOL soils)***

EP	Load scenario		
	30 EP	60 EP	90 EP
Hydraulic loading (L/day)	6,000	12,000	18,000
Maximum Irrigation Rate (mm/day) ~	3.7	3.7	3.7
Wet Weather Storage (kL) ^	18	36	54
Irrigation Area (m^2) – Minimum required ^*	1,900	3,800	5,675

Notes:

^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer Section 4.2).

* Rounded up to the nearest 25 m^2

~ Actual irrigation rate averaged over the year may differ from this value (lower)

Table C ***Summary of MDC #5 MEDLI outputs for modelled scenarios (SODOSOL soils)***

EP	Load scenario
	32 EP
Hydraulic loading (L/day)	6,400
Maximum Irrigation Rate (mm/day) ~	3.7
Wet Weather Storage (kL) ^	19.2
Irrigation Area (m^2) – Minimum required ^*	2,025

Notes:

^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer section 4.2), OR alternatively, at least 3 days minimum storage capacity, whichever is greater.

* Rounded up to the nearest 25 m^2

~ Based on Net Evaporation. Actual irrigation rate averaged over the year may differ from this value (lower)

Key findings of the modelling are as follows:

– A maximum effluent irrigation rate of **3.7 mm/d** via fixed sprinklers could be applied to the modelled soil profiles, assuming Kikuyu crop cover (salt tolerant grass) is lain within the sized land application area (LAA)
  - MDC #2 and 3 encompass Category B remnant vegetation (being endangered or of concern)
  - GHD's scope of works included identification of environmentally sensitive areas only. Review of the permissible activities under Arrow Energy's Environmental Authority EA0001399 (EA) as it pertains to effluent irrigation of remnant vegetation or clearing for establishment of crop cover, is outside of GHD's scope
  - The area of LAAs are all less than the inferred MDC footprints (refer Table 26).
  - Out of the MDCS, MDC #2 (Bellevue Part 2) consumes the largest fraction of available MDC area being 57% of 1 ha.
– The annual average daily irrigation depth over the LAAs is 3.2 mm (ranging from 3.1 to 3.7 mm), noting:
  - Often the full irrigation depth of 3.7 mm was not applied on a given day during the model run period due to insufficient treated wastewater being available. This would typically present operational alternatives regarding irrigation triggers (e.g., allowance for non-irrigation days and/or only triggering irrigation when full paddock demand is available). For simplicity however, and in favour of a low-maintenance scheme operation, daily application of *"up to 3.7 mm/d"* within the sized LAA has been modelled herein.
– A wet weather storage with 3 days' storage volume is required to mitigate incidents of overtopping, compliant with the minimum (see the Queensland Technical Guideline for Disposal of Effluent using Irrigation (2020)).

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– The assumed effluent quality limits (average) for nutrients and electrical conductivity (i.e., TN=30 mg/L, TP=20 mg/L, EC=1600 µS/cm) are suitable to achieve longevity in the soil lifespan of up to 38 years. This soil lifespan extends beyond the anticipated lifespan of the facility (i.e., 3-10 years).

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1. Introduction

GHD understand that Arrow Energy have obtained approval to construct semi-permanent drillers at various sites across PL's 491, 305, 267 & 492, under EA0001399. Ancillary to these petroleum activities are sewage treatment operations. The sites as termed by Arrow Energy are listed below:

– Temporary MDC #1 Bellevue Part 1 (PL492)
– Temporary MDC #2 Bellevue Part 2 (PL492)
– Temporary MDC #3 Bellevue Part 3 (PL305)
– Temporary MDC #4 Girrahween Central (PL305)
– Temporary MDC #5 Girrahween Central (PL305).

Arrow Energy has engaged GHD Pty Ltd (GHD) to conduct MEDLI (Model for Effluent Disposal Using Land Irrigation) modelling at the above sites, with the objective of identifying how the proposed wastewater generated and subsequently treated at each facility can be irrigated sustainably and at the same time, assist with the sizing of the onsite wastewater treatment, storage, and disposal infrastructure. Specifically, the irrigation rate to dispose of the treated effluent, the land application area, and wet weather storage required in reflection of each site's climate, paddock and irrigation regime conditions should be evaluated.

1.1 Purpose of this report

The purpose of this report is to outline the outcomes of the MEDLI assessment, which was undertaken using predicted values for onsite wastewater infrastructure and proposed practices pertaining to treated effluent management.

The objective of this MEDLI assessment was to establish a sustainable effluent irrigation rate, minimum wet weather storage and land application area for the five Girrahween Temporary MDC Camps, to inform their pending design and construction.

1.2 Scope of works

The scope of work addressed in this report is as follows:

– Desktop review of available climate, soil, topography, geology, groundwater, and environmental values for the proposed project area
– Consolidate project area-specific MEDLI input data (climate, anticipated nutrient loading and daily hydraulic loadings etc.)
– Completion of a MEDLI assessment using the MEDLI Version 2.1.0.0 for flows associated with the following loading for each soil type identified in each project area:
    - 30 EP, 60 EP and 90 EP for MDC #1, 2 and #4
    - 30 EP, 60 EP, 90 EP and 120 EP for MDC #3 (Bellevue Part 3)
    - 32 EP for MDC #5 (Girrahween Central)
– Conduct several modelling iterations for the project area utilising area specific information to gain an appreciation of the minimum wastewater infrastructure required onsite and gain an understanding of potential adverse long-term impacts of treated effluent irrigation (if any)
– Preparation of a report (this document) outlining the scope of work, model inputs, model outcomes and general conclusions in accordance with the current Department of Environment, Science and Innovation (DESI) recommendations and guidelines for land based treated effluent irrigation schemes in Queensland (DESI, 2019).

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1.3 Document review

GHD was not provided with any site-specific reports to source data and develop inputs to the MEDLI modelling, besides the hydraulic information given below, and siting figures given as Figure 2 through Figure 6 for temporary MDC's 1 through 5 respectively.

Table 1 Client-supplied information (hydraulic loading)

Name	Lease	V=Volume/day Maximum	Equivalent Persons (EP) EP=V/200
Temporary MDC #1 Bellevue Part 1	PL492	18,000	90
Temporary MDC #2 Bellevue Part 2	PL492	18,000	90
Temporary MDC #3 Bellevue Part 3	PL305	24,000	120
Temporary MDC #4 Girrahween Central	PL305	18,000	90
Temporary MDC #5 Girrahween Central	PL305	6,400	32

1.4 Limitations

This report has been prepared by GHD for Arrow Energy and may only be used and relied on by Arrow Energy for the purpose agreed between GHD and Arrow Energy as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Arrow Energy arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section 1.5 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Arrow Energy and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

GHD has prepared the Girrahween MEDLI model for, and for the benefit and sole use of, Arrow Energy to support design of the effluent irrigation scheme and must not be used for any other purpose or by any other person.

The Model is a representation only and does not reflect reality in every aspect. The Model contains simplified assumptions to derive a modelled outcome. The actual variables will inevitably be different to those used to prepare the Model. Accordingly, the outputs of the Model cannot be relied upon to represent actual conditions without due consideration of the inherent and expected inaccuracies. Such considerations are beyond GHD's scope.

The information, data and assumptions ("Inputs") used as inputs into the Model are from publicly available sources or provided by or on behalf of the Arrow Energy, (including possibly through stakeholder engagements). GHD has not independently verified or checked Inputs beyond its agreed scope of work. GHD's scope of work does not include review or update of the Model as further Inputs becomes available.

Irrigation of regulated vegetation with treated effluent, or its clearing/removal to establish a crop cover is only permitted by exception by relevant authorities. GHD's scope of works included identification of environmentally sensitive areas only and excluded a review of the permissible activities under Arrow Energy's EA (EA0001399)

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(e.g., “low impact petroleum activities”) as it pertains to treated effluent irrigation. MEDLI lacks robustness for the modelling of tree crops or a series of crops within the same scenario (i.e., woodlands) given that the software does not provide an estimate of nutrient removal as part of the dynamic plant model. For this project assessment, the MEDLI models that adopt Kikuyu crop cover would indicate different environmental outcomes for the MDC land application areas than what may occur under regulated vegetation cover.

The Model is limited by the mathematical rules and assumptions that are set out in the Report or included in the Model and by the software environment in which the Model is developed.

1.5 Assumptions

This report is based on the following assumptions:

– Environmental values as established through readily available desktop information are correct and reflect current site conditions. Note: MEDLI’s default soil profile library should only be used for scoping or preliminary work before better estimates or site-specific soil data becomes available
– Final model input parameters described in Section 3.3 are representative of site conditions
– Future treated effluent management onsite reflect the MEDLI assessment as presented in this report
– Arrow Energy provided GHD with JPEG images of land application area (LAA) footprints for all five (5) of the MDC Camps, however, no KMZ/KML files of the extents were provided.

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2. Site summary

In planning for the disposal of treated effluent by land irrigation, the environmental regulator in Queensland (DES) recommends MEDLI modelling to make decisions and assess proposed/current practices on how to dispose of treated effluent by land irrigation. As part of MEDLI modelling, site specific information should be used to inform the model relevant to geoclimatic conditions specific to the project areas. The following section describes the relevant environmental characteristics within the project area.

2.1 Locality

The Girrahween Temporary MDC Camps are part of a wider mobile drilling camp proposed for construction in Kowguran, Western Downs Region, QLD. Key information pertaining to the camp's siting are given in Table 2 and an overview of the locality of the five MDC Camps is presented in Figure 1.

Figure 2 through Figure 6, provided by Arrow Energy, convey the extent and boundary coordinates of the five facilities. GHD understand that the effluent irrigation area is to be accommodated within the highlighted boundaries. GHD inferred MDC areas from these images (in lieu of shapefile provision by Arrow Energy) are given in Table 2. These were adopted as maximum land application areas (LAAs) in the MEDLI model.

Table 2 Summary of Girrahween Temporary MDC Camps siting details

Camp Name	Petroleum Lease	Lot Plan	Lot Area (QLD Globe) (ha)	GHD inferred total MDC area (ha)*
Temporary MDC #1 – Bellevue Part 1	PL247	Lot 671 RP897022	187.3	1.3
Temporary MDC #2 – Bellevue Part 2	PL247	Lot 19 BWR293	129.8	1.0
Temporary MDC #3 – Bellevue Part 3	PL305	Lot 27 AU49	1,004.0	2.0
Temporary MDC #4 – Girrahween Central	PL305	Lot 16 AU38	621.0	1.2
Temporary MDC #5 – Girrahween Central	PL491	Lot 17 AU199	491.2	0.5
Notes: *GHD have inferred MDC footprints directly from images (jpeg) provided by Arrow Energy. GHD does not accept responsibility for errors in these values, which were chosen to provide a high-level judgement on the footprint's capacity to fit the LAAs.				

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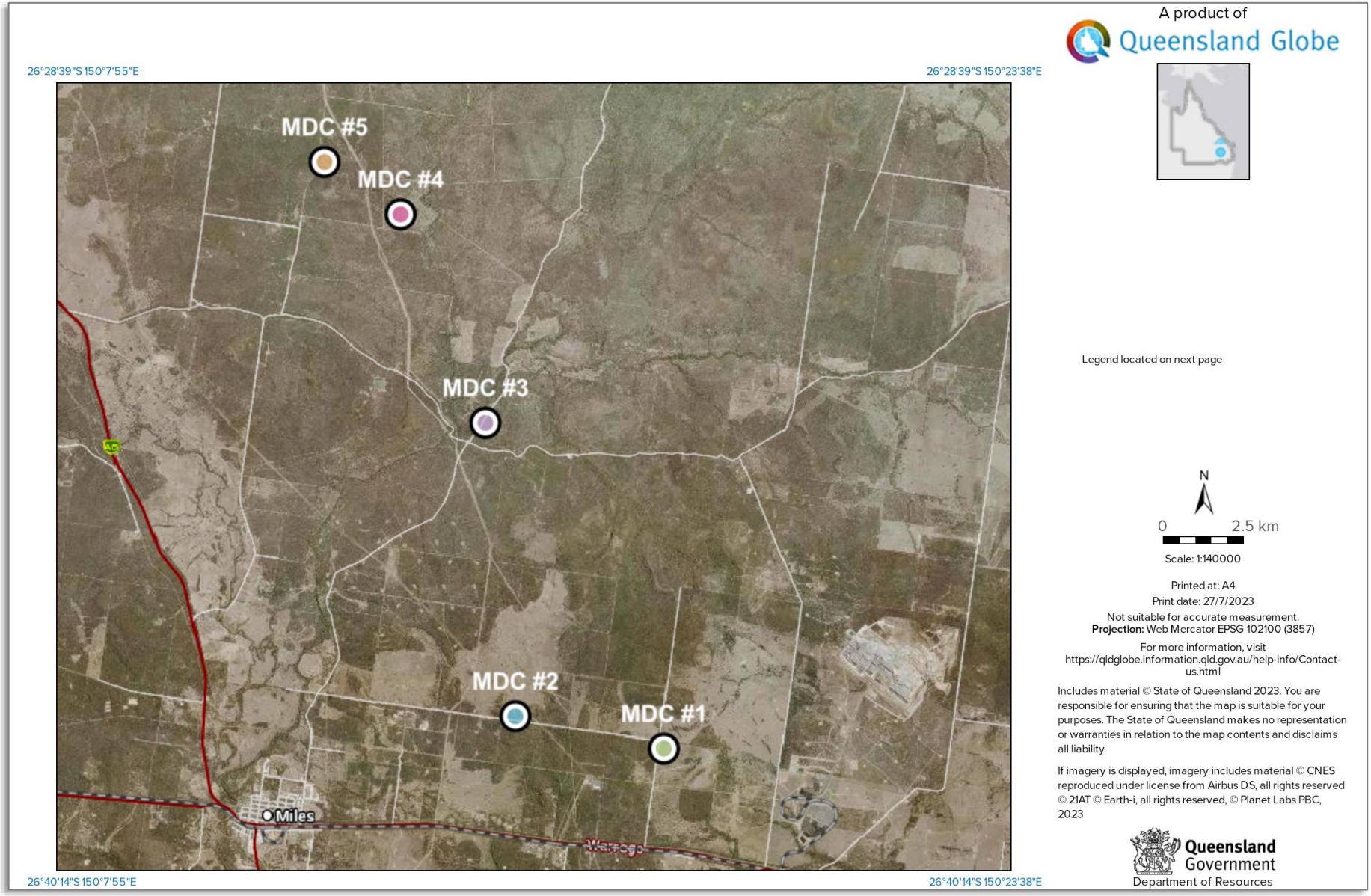

Figure 1 Locality of the five MDCs to one another and the town of Miles (Source: Queensland Globe)

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Figure 2 *Nominated irrigation area for MDC #1 (yellow fill area) (Image provided by Arrow Energy)*

Figure 3 *Nominated irrigation area for MDC #2, outlined as yellow fill (Image provided by Arrow Energy)*

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Figure 4 *Nominated irrigation area for MDC #3, outlined as yellow fill (Image provided by Arrow Energy)*

Figure 5 *Nominated irrigation area for MDC #4, outlined as red rectangle at left (Image provided by Arrow Energy)*

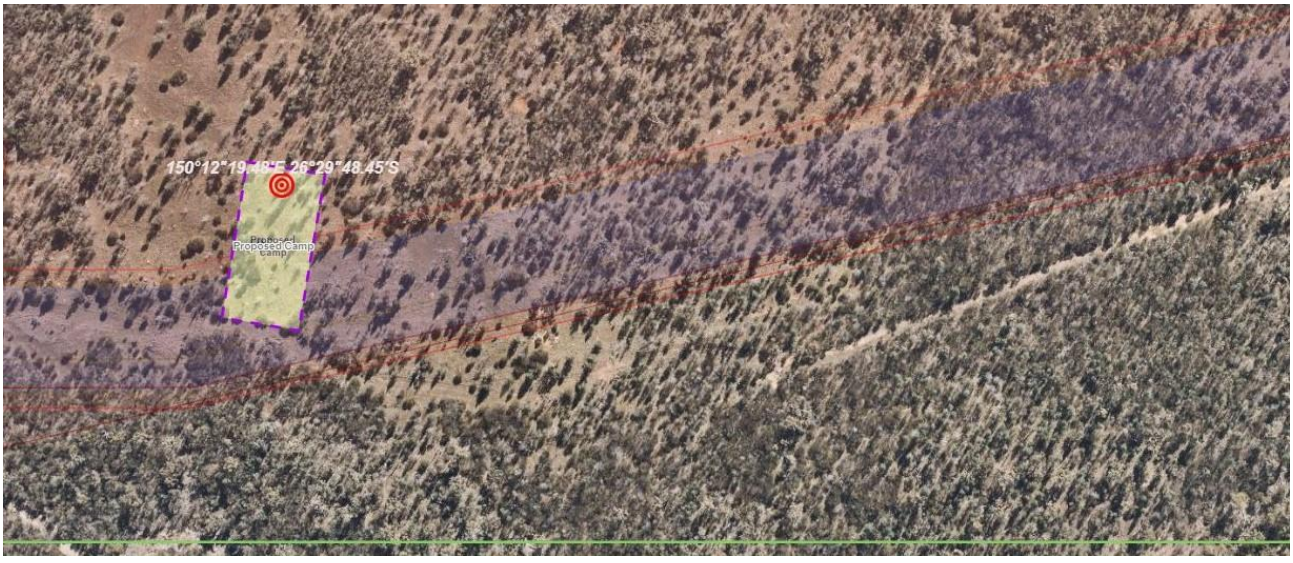

Figure 6 *Nominated irrigation area for MDC #5, outlined in purple (- - -) (Image provided by Arrow Energy)*

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The proposed Temporary MDC Camps are situated between approximately 6-11 km ENE and 16-18 km north of Miles, as shown in Figure 7.

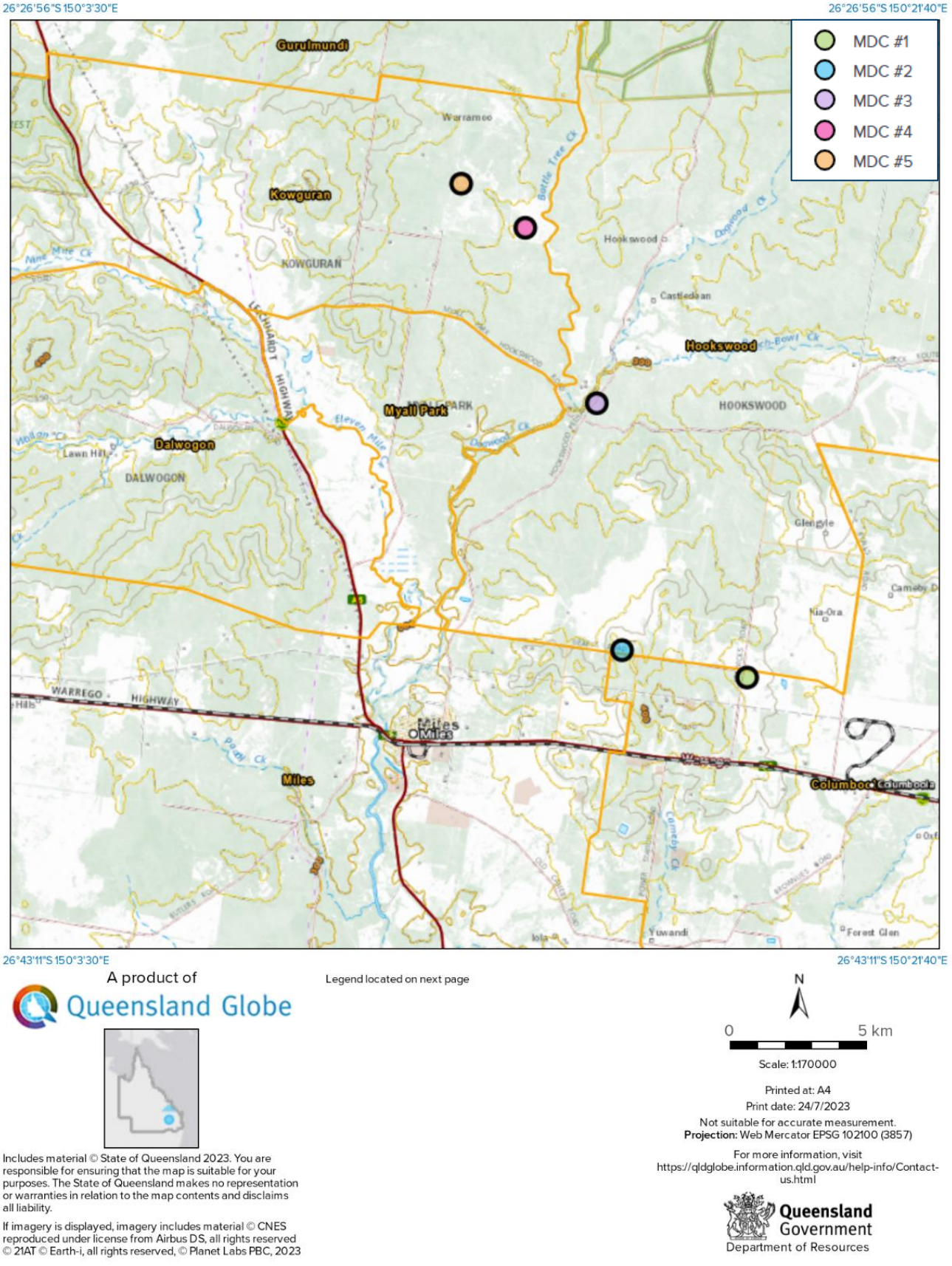

Figure 7 ***Locality, contour, and topography plot of Girrahween Temporary MDC Camps (Source: Qld Globe, 2023)***

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2.2 Camp longevity and hydraulic loading

GHD understand that the camps are planned to be temporary, with a lifespan of approximately 3 years.

Hydraulic loading forecast by Arrow Energy is provided below. The EP values were adopted as the maximum load scenarios in the MEDLI modelling sensitivity analysis.

Table 3 Hydraulic loading and cap permanence

Camp Name	Operational period	V=Volume/day^ Maximum	Equivalent Persons (EP) EP=V/200
Temporary MDC #1 – Bellevue Part 1	Temporary (≤3 years)	18,000 L/day	90
Temporary MDC #2 – Bellevue Part 2		18,000 L/day	90
Temporary MDC #3 – Bellevue Part 3		24,000 L/day	120
Temporary MDC #4 – Girrahween Central		18,000 L/day	90
Temporary MDC #5 – Girrahween Central		6,400 L/day	32
Notes: ^ *Volume in litres of the average dry weather flow of sewage that can be treated at the works in a day*			

2.3 Climate

Climate data for the site was downloaded from the Scientific Information for Land Owners (SILO) LongPaddock database. SILO is hosted by the Science Division of the Queensland Government (DES). Using datasets constructed from Australian Bureau of Meteorology (BOM) observational data, SILO interpolates infills for missing data, which allows the user to focus on sites located between discrete weather stations. An example of this "Gridded Data" is given in Figure 8.

Due to the proximity of MDCs to one another, as shown in Figure 1, a singular climate grid point has been adopted for all MDC MEDLI models (midpoint Lat: -26.55, Long: 150.25).

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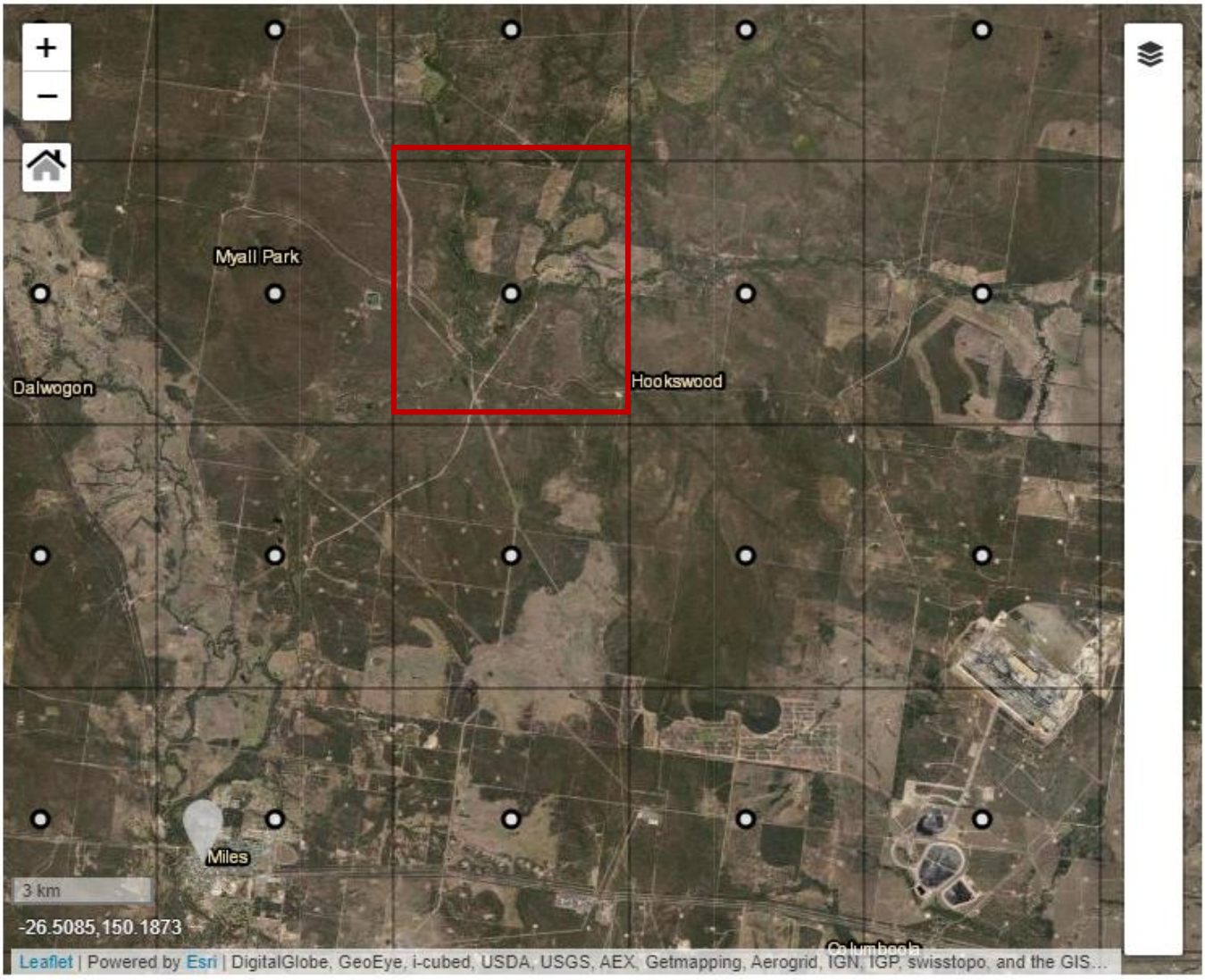

Figure 8 ***Gridded datapoint (enclosed in red) indicating the midpoint between Girrahween MDCs, adopted for this MEDLI assessment (Lat: -26.55, Long: 150.25) (Source: SILO)***

Monthly average climate data from the Girrahween Temporary MDC Camps grid point is summarised in Table 4. The annual rainfall in the area is relatively low (569 mm/year). Factoring the pan evaporation (1979 mm/year), the project site exhibits a net evaporation of 1410 mm/year (see Table 4).

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Table 4 Climate data for Girrahween Temporary MDC #1, for a 10-year period (January 2013 – December 2022)

Month	Average Rainfall (mm)	Average Pan Evaporation (mm)	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)	Average Radiation (MJ/m^2/year)	Net Evaporation (mm)^
January	83.2	244.1	34.3	20.7	22.9	160.9
February	79.5	201.2	33.1	19.7	21.5	121.7
March	77.3	179.0	31.5	18.5	18.5	101.7
April	10.6	135.5	28.0	13.1	16.7	124.9
May	27.7	96.9	23.9	8.9	13.2	69.2
June	22.4	71.9	20.8	5.8	11.5	49.5
July	30.1	81.1	20.8	4.8	13.1	51.0
August	18.9	117.6	23.0	5.2	16.8	98.8
September	37.8	161.1	26.7	9.6	19.6	123.4
October	55.1	203.3	29.8	14.1	21.9	148.1
November	61.9	238.2	32.2	16.6	24.1	176.3
December	64.4	248.8	33.6	18.9	23.8	184.5
Annual	**568.8**	**1978.7**	**28.1**	**12.9**	**18.6**	**1409.9**

Notes:
Data exported from MEDLI for the 10-year run period
Net evaporation equates to the difference between average rainfall and average pan evaporation on a monthly basis.

2.4 Topography

The topography and contour of each of the Girrahween Temporary MDC camps are shown in the environmental Desktop Searches of Appendix A. The elevation of the sites resides between 300 - 380 mAHD across all five MDCs.

Survey data specific to the site has not been provided. Therefore, site gradients have not been reviewed in detail. As such the sites' slope is inferred to be negligible for the purposes of MEDLI modelling.

2.5 Vegetation

Arrow Energy's 'Treated Sewage Effluent and Greywater Management Guide' specifies that vegetative cover must be present across a site where irrigation is proposed to occur. The presence of established vegetative groundcover across the site has not been confirmed by Arrow Energy.

Desktop searches of the five MDC sites and immediate vicinity reveal MSES regulated vegetation [Category B] occurring across MDC sites #2 & #3, with MSES regulated vegetation [Category C] & [Essential Habitat] occurring within 100 m from the points marked for each of the two sites. Whilst non-remnant vegetation occurs across MDC sites #1, #4 & #5, MSES regulated vegetation [Category B], [Category C] & [Essential Habitat] does occur within 0.25 – 1.5 km from the points marked for these sites.

Within the inferred site boundaries, Queensland Globe's Regulated vegetation management mapping (RVM) indicates the vegetation as being Category B – remnant vegetation at MDC sites #2 & #3 and Category X – areas not generally regulated by the vegetation management laws, at MDC sites #1, #4 & #5. Remnant broad vegetation groups 25a (Open forests to woodlands dominated by *Acacia*) & 16c (Woodlands and open woodlands dominated by *Eucalyptus*) are listed for MDCs #2 & #3.

The results of these searches are included at Appendix A, and a summary of the findings are presented in Table 5.

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Table 5 MSES Regulated Vegetation summary for all five MDCs

MDC	Nearest proximity of MSES Regulated Vegetation (from provided GPS coordinate^)			
	Category B – remnant vegetation endangered or of concern	Category C – high value regrowth	Essential Habitat – A or B category regulated vegetation	Category X - Exempt
Temporary MDC #1 – Bellevue Part 1	150 m west	1.5 km east	1.2 km south southeast	Encompasses site
Temporary MDC #2 – Bellevue Part 2	Encompasses site	NP	Encompasses site	NA
Temporary MDC #3 – Bellevue Part 3	Encompasses site	350 m northwest	1.6 km northeast	NA
Temporary MDC #4 – Girrahween Central	500 m south & west	900 m southeast	500 m south & west	Encompasses site
Temporary MDC #5 – Girrahween Central	100 m south	200 m east	200 m east	Encompasses site

Notes:

NP – not proximal (>2 km offset)

NA – not applicable

^ As shown in Figure 2 through Figure 6, for MDCs 1 - 5 inclusive.

2.6 Geology

Figure 9 identifies the dominant lithology of the project area as mapped by the Department of Natural Resources and Mines digital geological mapping (DNRM, 2018), accessed via Queensland Globe. All lithologies are summarised in Table 6 - Table 10.

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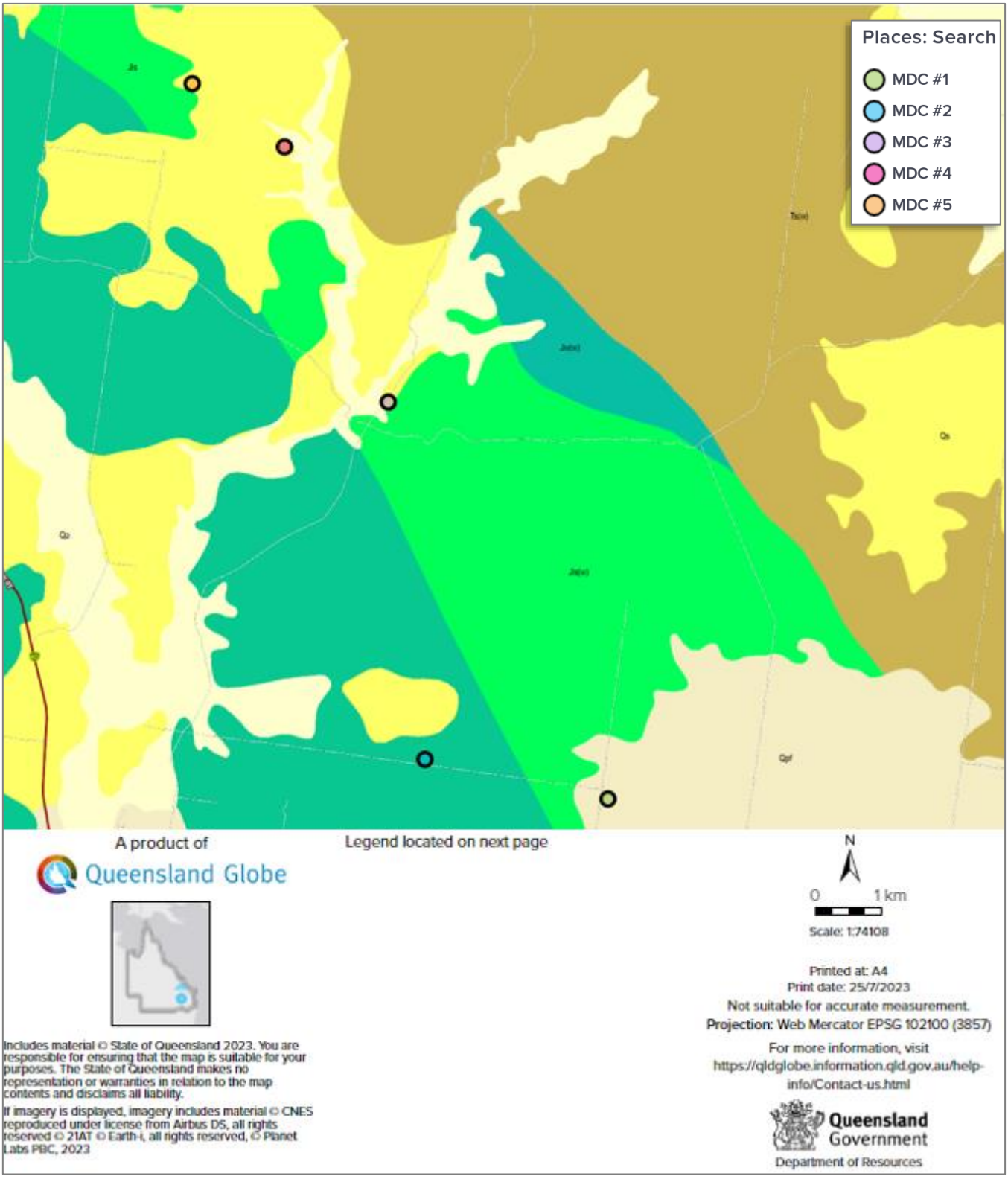

Figure 9 ***Detailed surface geology 1:100k intersecting the MDC sites. Refer to Table 9 for lithology labels (Source: Queensland Globe)***

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Table 6 MDC #1 Detailed surface geology (1:100k)

Aspect	Description
Rock unit name	Qpf
Lithological Summary	Sandy alluvium of Condamine River; contains vertebrate fossils
Dominant Rock / Age	Alluvium (Quaternary)

Table 7 MDC #2 Detailed surface geology (1:100k)

Aspect	Description
Rock unit name	JKk(w)
Lithological Summary	Sandstone, siltstone, mudstone, conglomerate - kaolinized deeply weathered sediments
Dominant Rock / Age	Arenite-Mudrock (Late Jurassic – Early Cretaceous)

Table 8 MDC #3 Detailed surface geology (1:100k)

Aspect	Description
Rock unit name	1. Qs 2. Qa 3. Jis(w)
Lithological Summary	1. Sand, red sandy soil, silt and some gravel; floodout and sheet sand with some alluvium 2. Clay, silt, sand and gravel; flood-plain alluvium 3. Deeply weathered labile sandstone, siltstone, mudstone, some coal
Dominant Rock / Age	1. Miscellaneous unconsolidated sediments (Quaternary) 2. Alluvium (Quaternary) 3. Arenite-Mudrock (Late Jurrasic)

Table 9 MDC #4 Detailed surface geology (1:100k)

Aspect	Description
Rock unit name	1. Qs 2. Qa
Lithological Summary	1. Sand, red sandy soil, silt and some gravel; floodout and sheet sand with some alluvium 2. Clay, silt, sand and gravel; flood-plain alluvium
Dominant Rock / Age	1. Miscellaneous unconsolidated sediments (Quaternary) 2. Alluvium (Quaternary)

Table 10 MDC #5 Detailed surface geology (1:100k)

Aspect	Description
Rock unit name	1. Qs 2. Jis(w)
Lithological Summary	1. Sand, red sandy soil, silt and some gravel; floodout and sheet sand with some alluvium 2. Deeply weathered labile sandstone, siltstone, mudstone, some coal
Dominant Rock / Age	1. Miscellaneous unconsolidated sediments (Quaternary) 2. Arenite-Mudrock (Late Jurrasic)

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2.7 Soil

To determine typical soil profiles to apply in the model, a desktop review was completed. Queensland Globe mapping produced by the Department of Environment, Science and Innovation (DESI) was used to identify the soil. Results are provided in Table 11.

MDCs #1, #3, #4 & #5 were mapped as sodosols, (map unit Va24) and MDC #2 as by Soil Atlas QLD.

Table 11 Description of soil type present within the project area

Aspect	Description	
	Soil Type 1 (SODOSOLS)	**Soil Type 2 (VERTOSOLS)**
MDCs	#1, #3, #4 & #5	#2
Soil types	Sodosols (map code Va24)	Vertosols (map code CC20)
General description	Sodosols are texture-contrast soils with impermeable subsoils due to the concentration of sodium. These soils occupy a large area of inland Queensland. Generally, Sodosols have a low-nutrient status and are very vulnerable to erosion and dryland salinity when vegetation is removed.	Vertosols are the most common soil in Queensland—characteristics include: - brown, grey or black soils which crack open when dry - they commonly form hummocky relief called gilgai - very high-soil fertility—ability to supply plant nutrients - large water-holding capacity. These soils are the cracking clay soils of the Darling Downs and Central Highlands. A large belt of grey and brown Vertosols also run from the New South Wales border to Charters Towers—corresponding with Brigalow forests.
Dominant soil description	Duplex yellow-grey, hard setting A horizon, A2 horizon conspic bleached, alk pedal mottled B horizon.	Uniform fine cracking, smooth faced peds, grey clay horizon underlain by grey/mottled clay.
Dominant soil PPF	Dy3.43	Ug5.24

Nearby soil monitoring sites form part of both the Western Downs Land Management Manual - MWD and Soil characterisation project for the Queensland Murray Darling Committee (QMDC) projects. These sites occur between 1.5 – 12 km from their nearest MDC site, as shown on Figure 10. A description of each soil monitoring site and the soils contained is provided in Table 12.

2.7.1 Soil adsorptivity properties and long-term irrigation potential impacts

Sodosols

Sodosols show strong texture contrast with highly sodic B horizon but they are not highly acidic (pH > 5.5). Parent materials of Sodosols range from highly siliceous, siliceous to intermediate in composition. Sodosols are only found in poorly drained sites with rainfall between 50 mm and 1,100 mm. Generally, Sodosols have very low agricultural potential with high sodicity leading to high erodibility, poor structure, and low permeability and water infiltration properties. These soils have low to moderate chemical fertility and can be associated with soil salinity. Sodicity is one of the major risks in land disposal schemes and the adverse impact of sodicity on soils structural stability needs to be assessed outside of MEDLI.

Long-term irrigation with treated effluent can exacerbate these effects if the effluent has a relatively high sodium adsorption ratio (SAR), which has the potential to further deteriorating soil structure.

In terms of nutrients absorptivity, Sodosols can absorb and retain nitrogen, but the extent depends on the soil's organic matter content and microbial activity. Over time, the nitrogen in the effluent can contribute to nitrogen

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leaching, especially if the soil's permeability is compromised. Additionally, phosphorus mobility in Sodosols is generally low due to strong adsorption to soil particles and fixation by calcium, aluminium, and iron compounds. However, the high pH typical of sodic soils can reduce phosphorus availability to plants.

However, while Sodosols have limited absorptivity properties due to their inherent sodicity, careful management of treated effluent irrigation, including monitoring nutrient levels and employing soil amendments, can help mitigate adverse effects and improve soil structure and nutrient retention over the long term.

Vertosols

Vertosols, also known as Vertisols, are clay-rich soils that shrink and swell significantly with moisture changes. Their absorptivity properties, particularly with respect to long-term irrigation with treated effluent, can be influenced by several factors, including their high clay content, cation exchange capacity (CEC), and soil structure.

Vertosols are characterised by a high percentage of clay (usually smectite), which contributes to their high water-holding capacity. The clay minerals can expand when wet, reducing pore space and slowing down water infiltration and drainage. This can lead to prolonged water retention in the soil.

Vertosols have a high Cation Exchange Capacity (CEC) due to their clay content and organic matter. This allows such soils to retain and exchange cations, including nutrient ions such as ammonium (NH_4^+) and phosphate (PO_4^{3-}), which are components of total nitrogen (N) and total phosphorus (P) in the treated effluent.

The structure of Vertosols, with their tendency to form deep cracks when dry, can influence water movement. During irrigation, these cracks can facilitate rapid initial infiltration, but once the soil swells and the cracks close, infiltration rates decrease significantly. The cyclic wetting and drying can lead to the formation of stable soil aggregates, which can affect the distribution and retention of water and nutrients.

Vertosols have a high capacity to absorb and retain water and nutrients from treated effluent, but careful management is required to avoid issues such as waterlogging, nutrient leaching, and soil degradation. Regular monitoring and appropriate soil management practices are essential to sustain long-term soil health and productivity.

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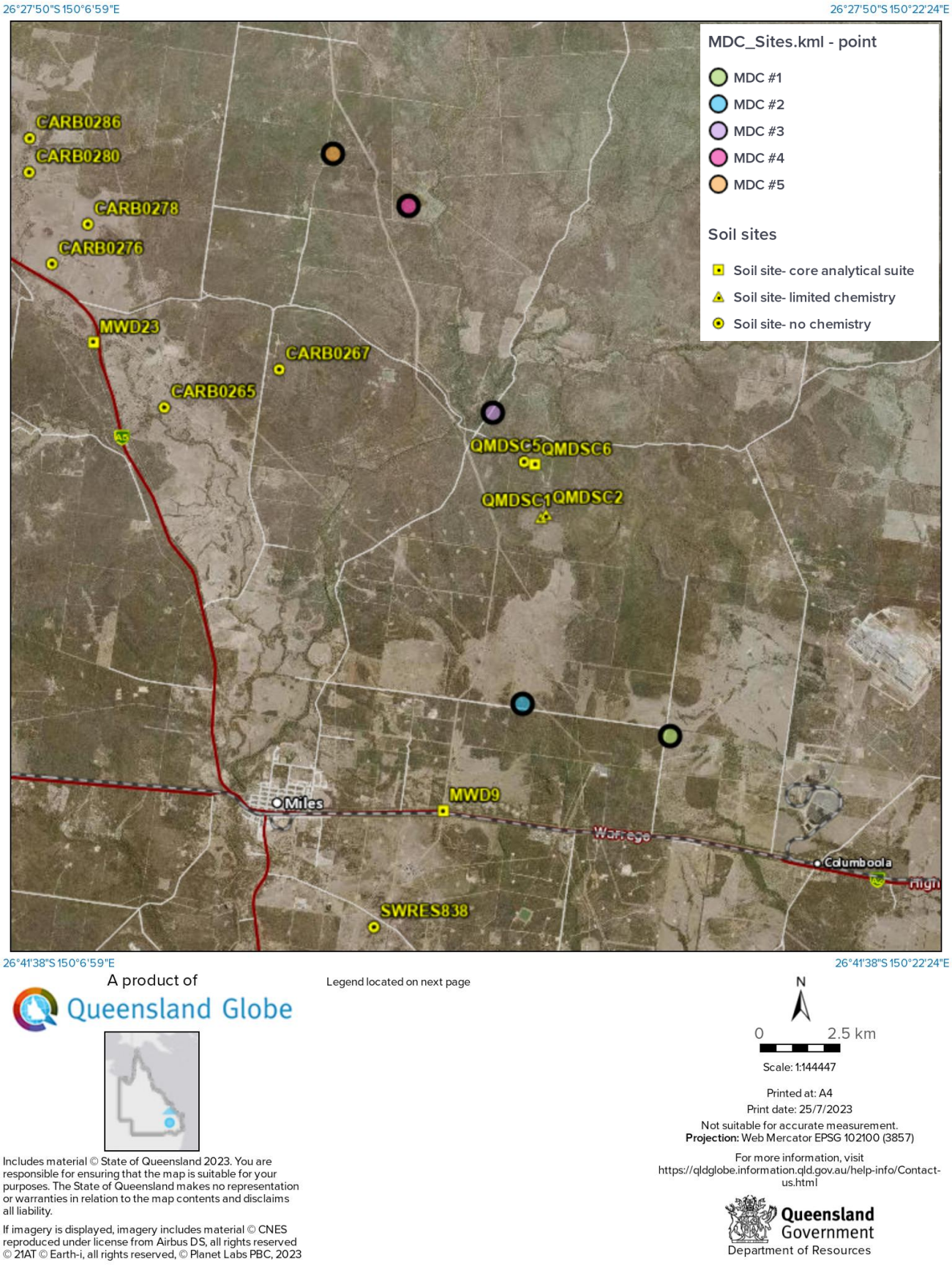

Figure 10 Soil mapping sites occurring near the project area (Source: Queensland Globe)

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Table 12 Description of soil characteristics recorded across soil sites (Source: State of Queensland)

Aspect	Description
QMDC1	
Australian Soil Classification	Grey Dermosol
Clay loams	n/a
Profile morphology	Medium clay to 1.55 mbgl
QMDC2	
Australian Soil Classification	Leptic Tenosol
Clay loams	Sandy lay loam recorded for top 0.3 m
Profile morphology	Sandy clay loam to 0.3 mbgl
QMDC5	
Australian Soil Classification	Grey Sodosol
Clay loams	Sandy loam recorded for top 0.25 m
Profile morphology	Medium clay to 0.6 mbgl
QMDC6	
Australian Soil Classification	Grey Sodosol
Clay loams	Fine sandy loam recorded for top 0.18 m
Profile morphology	Light sandy clay to 0.55 mbgl, light-medium clay to 1.15 mbgl
MWD23	
Australian Soil Classification	Grey Chromosol
Clay loams	Clay loam recorded for top 0.45 m
Profile morphology	Medium clay to 1.5 mbgl
MWD9	
Australian Soil Classification	Red Kurosol
Clay loams	Sandy loam recorded for top 0.15 m
Profile morphology	Medium clay recorded to 1.2 mbgl
Notes: Refer Figure 10 for localities of soil sites.	

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2.8 Environmental values (waters)

The MDC sites are situated within the ***Maranoa and Balonne Rivers Basin***. Under the *Environmental Protection (Water) Policy 2009* (EPP Water), locally relevant water quality objectives (WQOs) have been established in the region to protect or enhance Environmental Values (EVs) for waters. Both EVs and WQOs are used to help set development conditions, influence local government planning schemes, and underpin report card grades for ecosystem health monitoring programs.

The Basin Plan (WQ4222), indicating the EVs relevant to this region, is included at Appendix A (Environmental Desktop Searches). An extract of this plan is shown below. The Girrahween Temporary MDC Camp site may be seen to reside within Dogwood Creek waters, being north to northeast of the Dogwood Creek Weir.

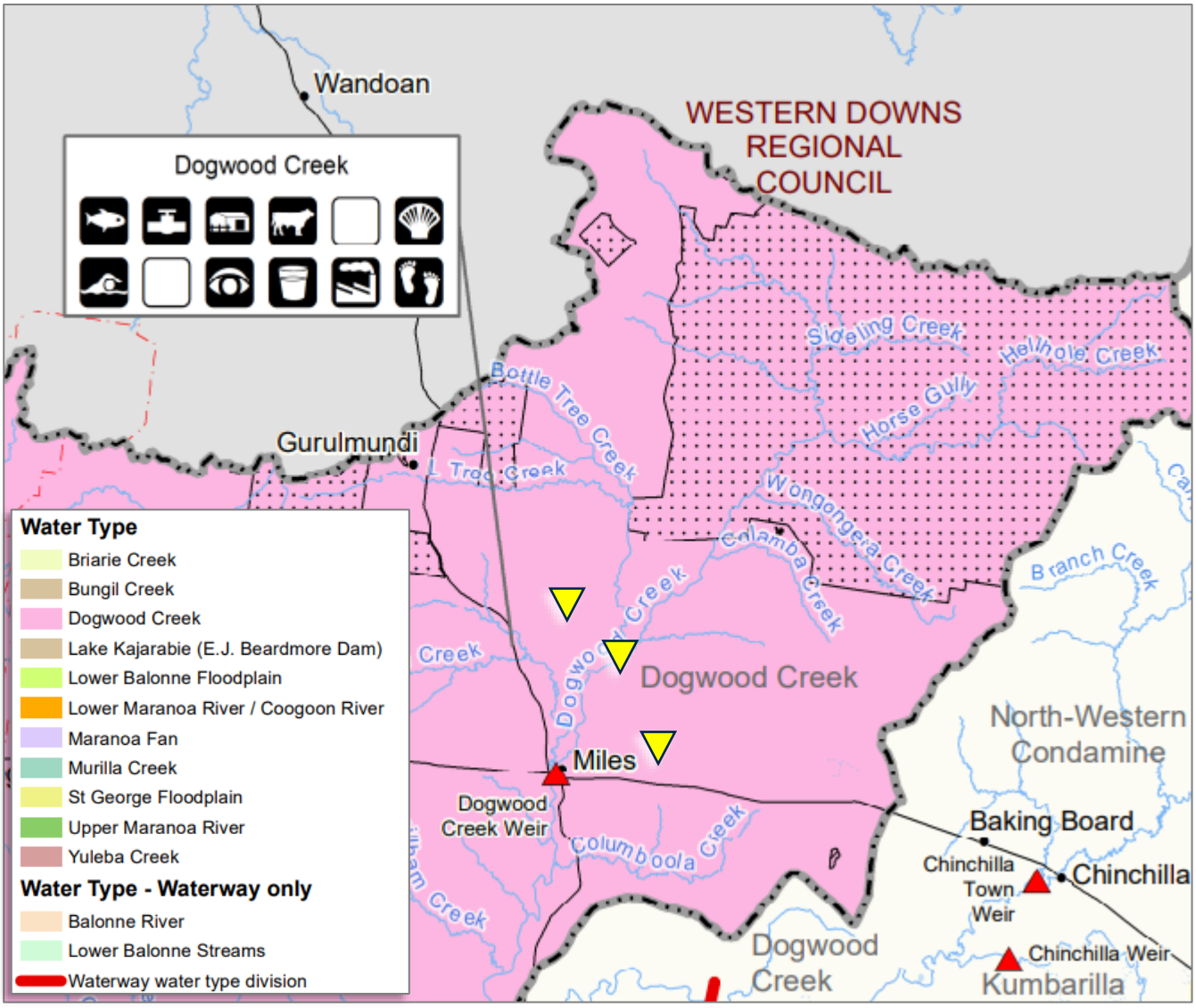

Figure 11 ***Basin Plan WQ4222 – Maranoa-Balonne Rivers Basin extract; MDC sites indicated on the plan (▽), source: State of Queensland ©***

In 2019 under the EPP Water, a Healthy Waters Management Plan (HWMP) for the Maranoa and Balonne River basin was prepared, presenting ways to improve the quality of water for this region. Maps contained within the HWMP that demonstrate the boundaries for both surface water and groundwater zones in the region are included at Appendix A. These maps indicate that the Dogwood Creek is the most appropriate zone for applicable surface WQOs, whilst the Lower Condamine sub-catchments / sub-aquifers is most appropriate for finding which groundwater environmental values may apply to the locality of the Girrahween MDC sites. EVs stipulated in the HWMP for relevant zones across both surface and groundwaters are presented in Table 13. Specific WQOs (i.e., threshold limits), as they pertain to surface and groundwaters, are described in more detail in sections 2.9 & 2.10.

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Table 13 EVs for relevant zones and waters of Maranoa and Balonne Rivers Basin

Water type	SURFACE WATERS	GROUNDWATER	
EVs	**Dogwood Creek**	**ALLUVIAL ZONE: Lower Condamine**	**Fractured Rock Zones: Lower Condamine basalts**
Aquatic ecosystems	✓	✓	✓
Irrigation	✓	✓	✓
Farm supply / use	✓	✓	✓
Stock water	✓	✓	✓
Aquaculture		✓	
Human consumer	✓		
Primary recreation	✓		
Secondary recreation			
Visual recreation	✓		
Drinking water	✓	✓	✓
Industrial use	✓		✓
Cultural and spiritual values	✓	✓	✓

2.9 Groundwater

2.9.1 DRDMW bore log database

A review of DRDMW's bore log database was conducted using Queensland Globe. Three registered bores shown in Figure 12 - Figure 14 were identified within 2 km of each MDC site. Details for these are summarised in Table 14. Available data suggests no bores in proximity are used for drinking water consumption (only mine monitoring), and that the groundwater table resides more than 20.0 m below the ground surface. The attributed aquifers of all bores shown below are given as Condamine Alluvium.

Table 14 Summary of existing registered groundwater bores within 1 km of irrigation area

ID	Proximity to irrigation area	Description	Depth (mbgl)	Screened interval (mbgl)	Relevant water quality or level data (if available)
RN 160575	<2 km	Sub-Artesian Facility, for mine monitoring	88	46.0 – 88.0	NS
RN 160841	<2 km	Sub-Artesian Facility, for Coal Seam Gas (CSG) Monitoring	42	24.0 – 42.0	NS
RN 168216	<2 km	Sub-Artesian Facility	NS	NS	NS
Notes: NS – indicates not specified					

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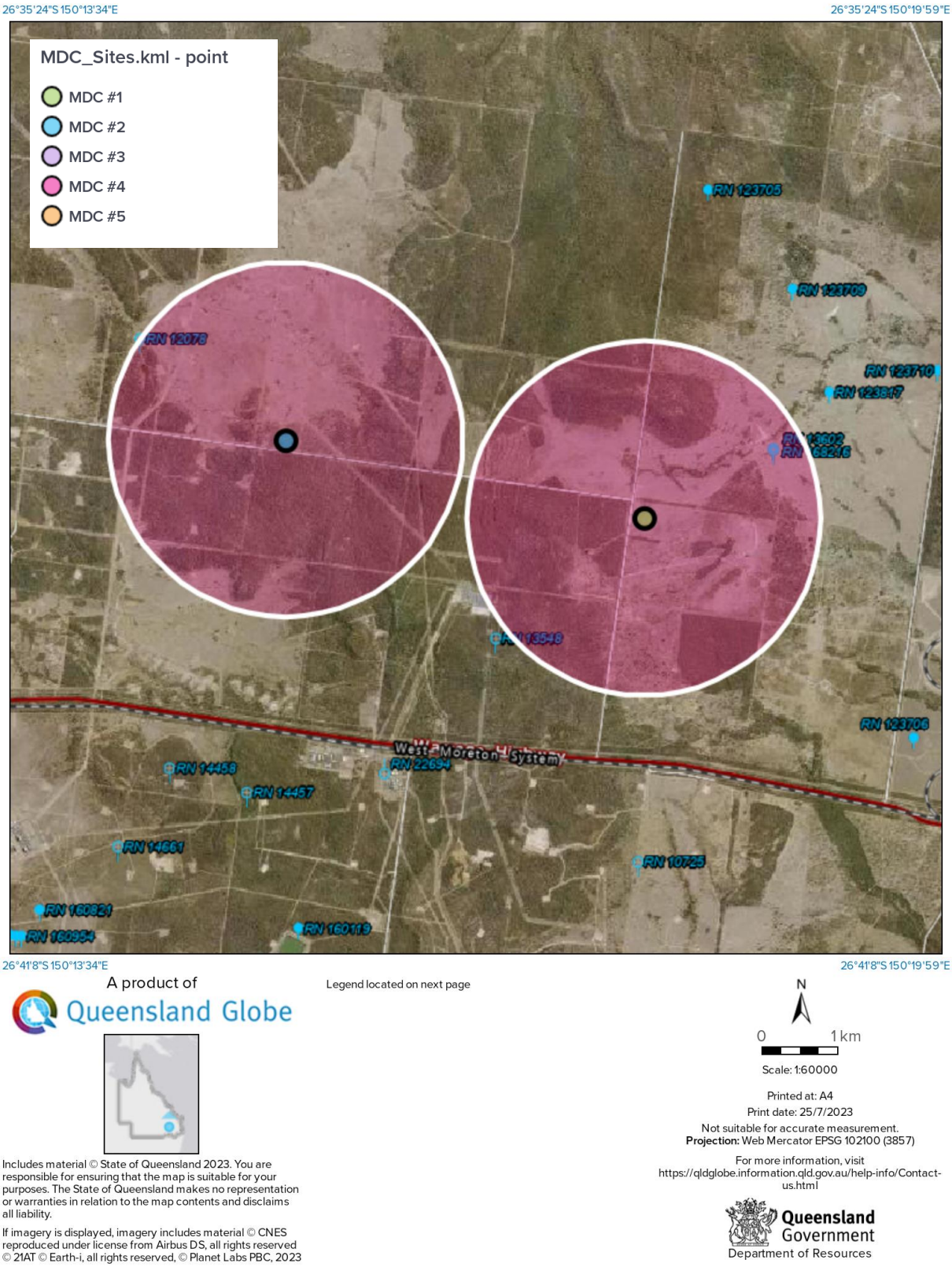

Figure 12 ***Registered DRDMW groundwater bores within 2 km of the Girrahween Temporary MDC Camps #1 & #2 (Source: Queensland Globe)***

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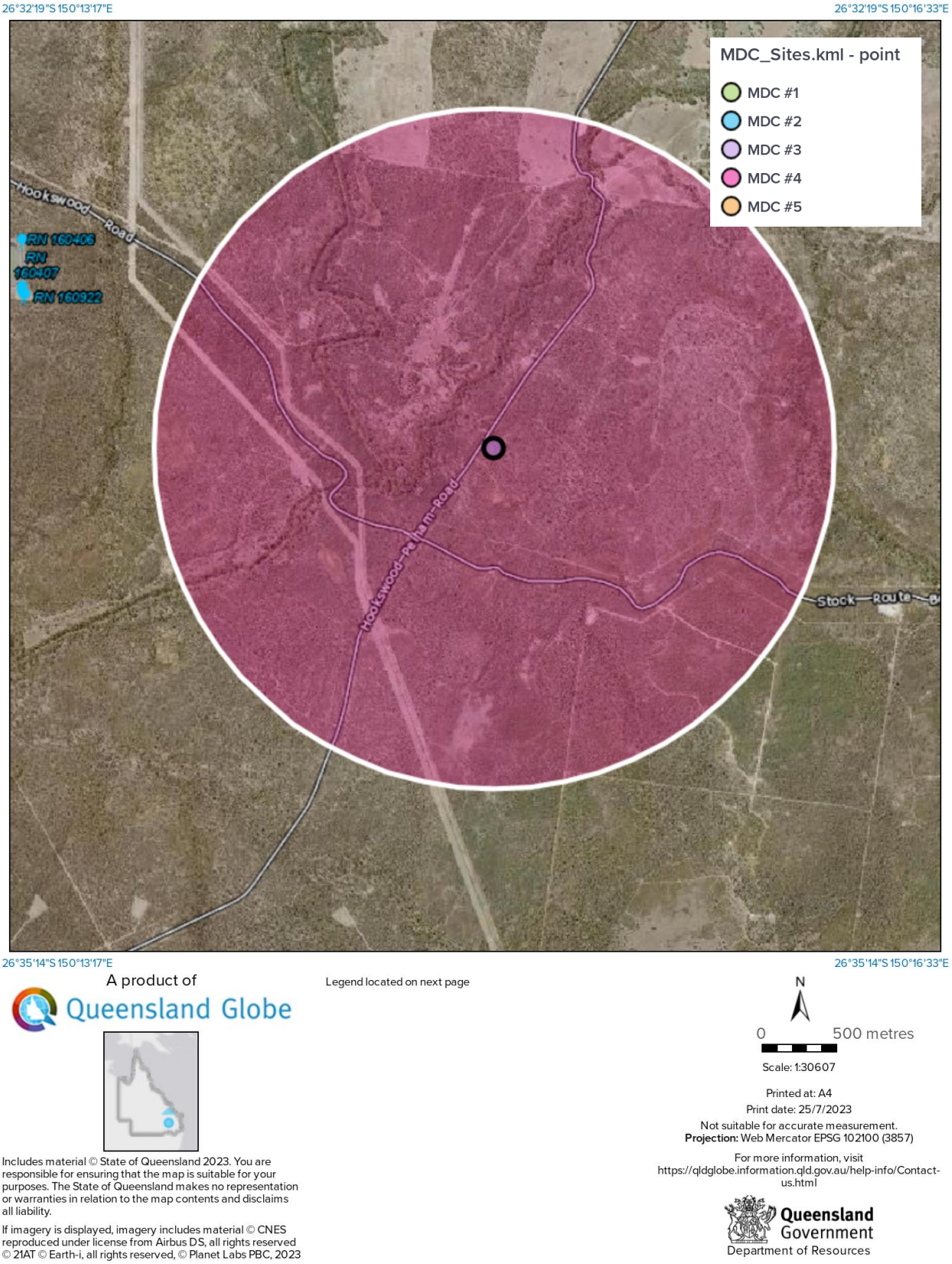

Figure 13 Registered DRDMW groundwater bores within 2 km of the Girrahween Temporary MDC Camp #3

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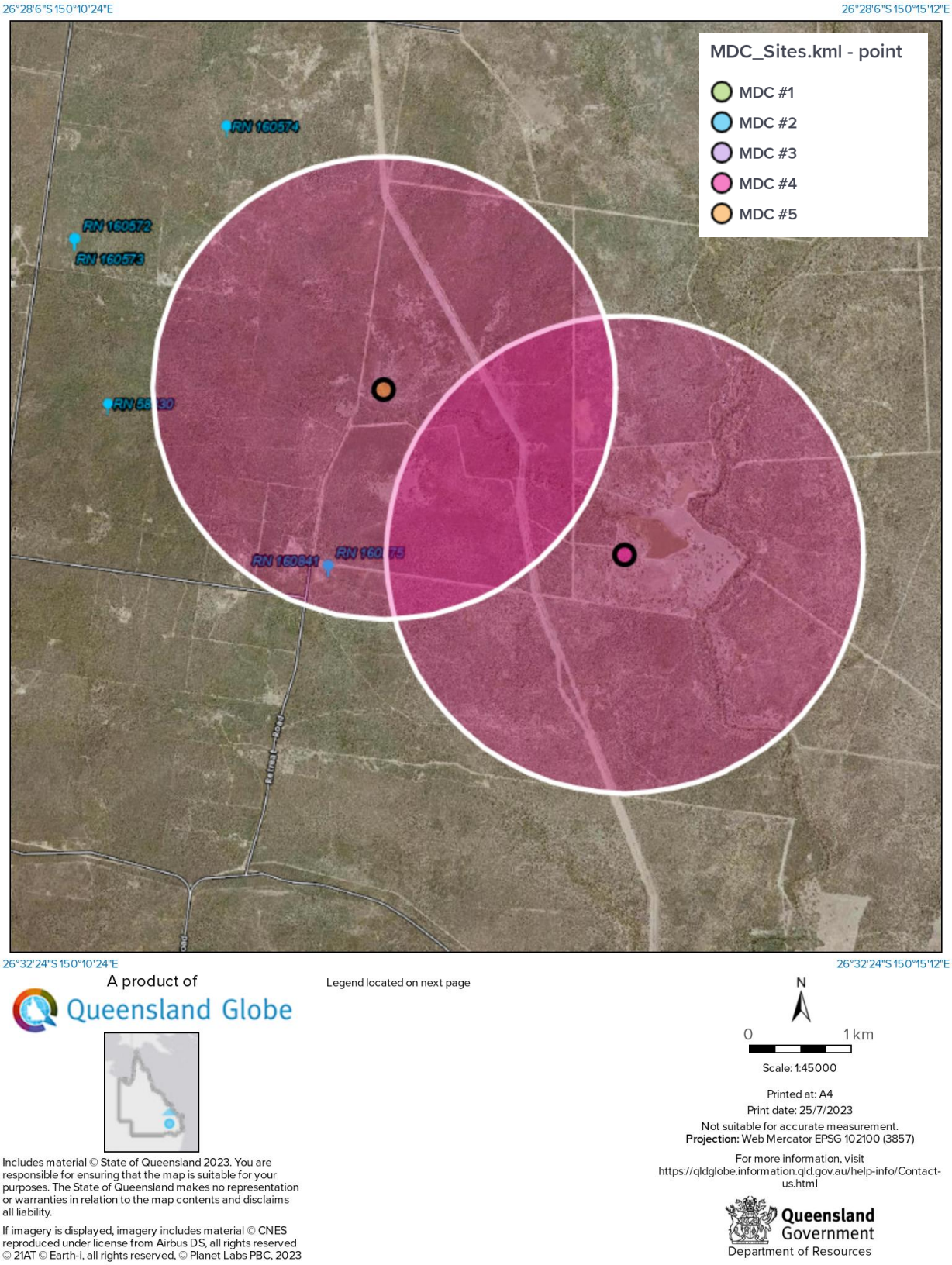

Figure 14 ***Registered DRDMW groundwater bores within 2 km of the Girrahween Temporary MDC Camps #4 & #5 (Source: Queensland Globe)***

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2.9.2 Groundwater WQOs

It is important to consider the groundwater chemistry of the region in which the Girrahween MDC camps will be located to understand the sensitivity of the groundwater, and subsequently ascertain a suitable irrigation area and flow rate that will not impede groundwater resources. As described in Environmental Values section 2.8, EVs for Aquatic Ecosystem, Irrigation, Farm supply, Stock Water, Aquaculture, Drinking Water, Industrial Uses, and Cultural and Spiritual Values may apply to the groundwaters of the Girrahween Temporary MDC Camps area.

Groundwater nutrient WQOs for **Aquatic Ecosystems** are the most conservative assessment criteria for the acceptability of deep drainage nutrient concentrations in the MEDLI assessment. Of the WQOs for aquatic ecosystem protection described in the HWMP (2019) applicable to the project area (refer section 2.8), the most conservative total nitrogen (TN) and electrical conductivity (EC) values belonged to the Lower Maranoa Zone. The nutrient WQO objectives for this zone are described in Table 15 below.

Table 15 ***Nutrient and EC WQOs (aquatic ecosystem) for the Lower Maranoa Alluvial Groundwater Zone (Maranoa and Balonne River Basin)***

Waters	Percentile	TN (mg/L)	TP (mg/L)	EC (mg/L)
Alluvial groundwaters	20th	0.016	ID	528
	50th	0.054	ID	1528
	*80th**	0.543	ID	4403

Notes:
ID = Insufficient Data
* Reference value for MEDLI average nitrate concentration of deep drainage

It is noted that although groundwater WQOs within the project area have been outlined above, for the purposes of this assessment, deep drainage nutrient concentrations are not the focus. This assessment is to provide Arrow Energy with a guide for estimating the size of the land application area required for the MDC camps, depending on the anticipated hydraulic flow, associated STP capacity, and the soil type present within the disposal area. During detailed design of the facility, a comparison between the groundwater nutrient concentrations WQOs and proposed STP nutrient outputs will need to be considered in greater detail.

2.10 Surface waters

The planned Girrahween MDC camps are situated between 8 km north and 10 km south of Dogwood Creek. MDC sites #4 & #5 are located within 200 -300 m of a non-perennial watercourse which runs eastward into Bottle Tree Creek, which runs 6.5 km south before feeding into Dogwood Creek.

As described in Environmental Values section 2.8, all EVs except for Aquaculture and Secondary recreation apply to surface waters at the Girrahween MDC sites. Generally, EV WQOs default to targets as per the ANZECC guidelines (ANZECC/ARMCANZ, 2000), or Australia New Zealand Food Standards Code, Food Standards Australia New Zealand (FSANZ, 2007 & updates) for the protection of human use EVs.

As per the MEDLI model Assessment Criteria (section 5), it is considered that no irrigated effluent should translate to runoff. That is, any runoff would comprise solely of rainfall. WQOs were therefore not considered further for this assessment.

MSES defined watercourses do occur within 1 km of each site. It can be assumed from the topography outlined in section 2.4 that the watercourses near sites #2-5 are draining towards Dogwood Creek, whilst the watercourses near MDC site #1 drain further eastward.

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3. MEDLI Modelling Inputs

3.1 General

The assessment was undertaken using the computer-based MEDLI (Version 2.1.0.0) program developed by the former Department of Science Information Technology, Innovation, and the Arts (DSITIA) (currently referred to as DES). The MEDLI program is used for designing and analysing effluent disposal systems for intensive and rural industries, agri-industrial processors and STPs via land irrigation. It models the discharge of the effluent stream from the STP as irrigation and predicts changes in the soil water balance and associated nutrients, nitrogen and phosphorus concentrations as well as soluble salts over a daily time step.

3.2 Modelling Objectives

The objectives of the modelling were as follows:

– To assist in determining the size of the land application area required to accommodate each of the proposed flows/loads per MDC generated by the five camps over a ten-year period without resulting in adverse environmental impacts.
– To assist in understanding potential impacts of wastewater discharge and associated concentration of total dissolved salts, nitrogen, and phosphorus in the final effluent to groundwater, the soil profile and plant yield.
– To assess the minimum size of the wet weather storage facility and land application area required for the STP to minimise environmental risks for each flow scenario.

3.3 Model Inputs and Assumptions

3.3.1 Climate data

The Girrahween Temporary MDC Camps is understood to be utilised for a minimum of three consecutive years and up to a maximum of 10 consecutive years.

For MEDLI modelling however, a ten-year run period is required to mitigate any influence of model stabilisation periods on the model outcomes. In this regard, the assessment period will be extended to a 10-year period of consecutive climate data which was obtained for the period from 1 January 2013 to 31 December 2022 (as described in section 2.3).

3.3.2 Soils

The soil types identified as likely to be encountered within the five proposed MDC areas are described in Section 2.7.

Two soil types were identified in the desktop assessment, therefore two different soil profiles were chosen for input to the MEDLI to represent the different camps' siting. These were:

– Soil Profile #1: "Sodosols", identified at MDCs #1, #3, #4 and #5.
– Soil Profile #2: "Vertosols", identified at MDC #2.

The specific soil parameters applied in MEDLI for each soil type are given in Table 16.

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Table 16 Soil profiles #1 and #2 adopted for MEDLI modelling

Soil Profile #1: Sodosols (MDCs #1, #3, #4 & #5)				
Parameter	**Horizon 1**	**Horizon 2**	**Horizon 3**	**-**
Soil Layer Thickness (mm)	100	500	1500	-
Air Dry (% v/v)	2.9			-
Lower Storage Limit (%v/v)	7.5	7.5	14.3	-
Drained Upper Limit (%v/v)	17.0	17.0	32.4	-
Plant Available Water Capacity (mm)	9.5	47.5	271.5	-
Saturated Water Content (%v/v)	43.9	43.9	48.8	-
Bulk Density (g/cc)	1.48	1.48	1.34	-
Porosity (% v/v)	44.15	44.15	49.43	-
Saturated Hydraulic Conductivity (mm/hr)	7.5	7.5	0.5	-
Initial Soil Phosphorous (mg/kg)	54.6	84.4	191.1	-
Adsorption Coefficient	114	150	310	-
Adsorption Exponent	0.32	0.25	0.21	-
Desorption Exponent	0.13	0.1	0.06	-
Nitrate Nitrogen (Topsoil Only) (mg/kg) – Initial	2.5			
Soil profile #2: Vertosols (i.e., 'Black Earth') (MDCs #2)				
Parameter	**Horizon 1**	**Horizon 2**	**Horizon 3**	**Horizon 4**
Soil Layer Thickness (mm)	100	500	600	300
Air Dry (% v/v)	3.2			
Lower Storage Limit (%v/v)	25.7	30.1	34.1	38.4
Drained Upper Limit (%v/v)	41.2	46.5	46.7	46.7
Plant Available Water Capacity (mm)	15.5	82	75.6	24.9
Saturated Water Content (%v/v)	59.6	51.9	49.5	48.9
Bulk Density (g/cc)	1.02	1.25	1.31	1.33
Porosity (% v/v)	61.5	52.8	50.6	49.8
Saturated Hydraulic Conductivity (mm/hr)	1	1	0.5	0.5
Initial Soil Phosphorous (mg/kg)	171.5	180.7	180.7	180.7
Adsorption Coefficient	312	314	314	314
Adsorption Exponent	0.26	0.24	0.24	0.24
Desorption Exponent	0.21	0.13	0.13	0.13
Nitrate Nitrogen (Topsoil Only) (mg/kg) - Initial	10			

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3.3.3 Volume of effluent

As per hydraulic loading rates provided by Arrow Energy (18 May 2023), the Girrahween Temporary MDC Camps will accommodate the maximum number persons stipulated in Table 17. The MEDLI modelling assessment includes a sensitivity analysis (i.e., iterations of hydraulic loads) which are incorporated into the MEDLI output guidance tables of section 5.2. The sensitivity analysis will be of benefit to Arrow Energy should hydraulic loadings at the camp fluctuate.

As per communications with Arrow Energy (19 July 2023) no seasonality has been adopted for hydraulic loading, as the camp is anticipated to be occupied at a similar frequency throughout the year (factoring day and night shifts). A conservative allowance of *LOW* infiltration in the MEDLI model has been selected, which results in some additional wastewater volume requiring irrigation following wet weather events.

Table 17 Modelled effluent volumes for each MDC (Source: Arrow Energy)

Name	Maximum volume (L / day)	Equivalent Persons (EP) EP=V/200	Hydraulic loading (EP) scenarios for MEDLI model
Temporary MDC #1 Bellevue Part 1	18,000	90	30, 60, 90
Temporary MDC #2 Bellevue Part 2	18,000	90	30, 60, 90
Temporary MDC #3 Bellevue Part 3	24,000	120	30, 60, 90, 120
Temporary MDC #4 Girrahween Central	18,000	90	30, 60, 90
Temporary MDC #5 Girrahween Central	6,400	32	32
Notes: One EP equivalent to 200 L/EP/day			

3.3.4 Irrigation regime

The adopted method of irrigation in the model is fixed sprinklers. These are triggered to irrigate daily up to a fixed depth, irrespective of the needs of the plants or the weather condition. This simplistic operational philosophy best reflects the probable irrigation scheme design.

Irrigation of at least the daily effluent volume occurs each day, with the addition of low levels of system infiltration on wet weather days.

The maximum allowable irrigation depth was initially fixed to be 3.7 mm/day. As per the climate section 2.3, the pan evaporation would suggest upon face value that the water balance would provide for irrigation of up to 3.9 mm/day of treated effluent. However, due to the rates of deep drainage observed in the MEDLI modelled, a conservative maximum irrigation rate of 3.7 mm/day was adopted. As required, this rate was reduced to achieve the MEDLI assessment criteria listed in section 4.2.

3.3.5 Effluent quality

Following previous assessments completed by GHD for mobile drilling camps using onsite sewage treatment plants, effluent nutrient concentrations typically vary between 30-50 mg/L for total nitrogen (TN) and 15-20 mg/L for total phosphorus (TP), for average and maximum concentrations respectively. A low-risk conductivity (1,600 µS/cm) as adopted in reflection of the soils probable sodicity described in section 2.7.

Average effluent nutrient concentrations adopted in the modelling are given below.

Table 18 Adopted MEDLI average effluent quality conditions for all scenarios.

TN (mg/L)	TP (mg/L)	EC (µS/cm)
30.0	20.0	1,600

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3.3.6 Vegetation type

As per comms with Arrow Energy (19 July 2023), existing native grasses should be able to facilitate nutrient uptake across the site where available. Aerial imagery for the site suggests groundcover is minimal, aligning with the vegetation desktop assessment of open woodlands (section 2.5).

In the absence of site-level species identification survey data and noting that groundcover must be established to facilitate the modelling and appropriate nutrient uptake for effluent disposal, Kikuyu 1 grass (salt tolerant) has been adopted for the purposes of MEDLI modelling. This species has a moderate waterlogging tolerance and high tolerance of acid soils. Sodic clay subsoils can resist root penetration, limiting plant root growth of annual crops and pastures. Perennial plants are more suited to these soils as root growth is not limited to one season.

Importantly, the desktop assessment in section 2.5 identified that two MDCs' footprints encompass Category B remnant vegetation (being endangered or of concern), specifically MDC #2 and 3. On this matter, due to MEDLI's limitations (refer section 1.4) Kikuyu grass has been adopted to facilitate the modelling.

3.3.7 Wet Weather Storage Tanks

The minimum wet weather storage (presumed to be a closed tank) required for each flow scenario has been adopted for this assessment. This is variable depending on daily flow. For MEDLI assessment, the wet weather storage tank is assumed to be closed and hence the volume of treated effluent inside is immune to rainfall and evaporation.

As per the Queensland technical guideline for disposal of effluent using irrigation (Tennakoon and Ramsay, 2020), the regulatory authority in Queensland prefers to see 100 percent reuse efficiency (i.e., the ratio of inflow to the storage versus the amount used for irrigation), with no overflows from the storage. However, if MEDLI is being used to design the scheme, 95 percent reuse efficiency is normally accepted considering uncertainties in the MEDLI model parameters and practicality of operation.

Schemes using fixed daily irrigation strategies require a minimum storage capacity of three to four days of effluent volume to deal with contingencies.

3.3.8 Summary of input parameters

A summary of the parameters used in the MEDLI assessment is provided in Table 19.

Table 19 Summary of Parameters Used in the MEDLI Assessment

Parameters	Value	Comments
Climate data	The assessment used climate data over a ten-year period from 1 January 2013 to 31 December 2022.	Refer to section 2.3 and 3.3.1.
Soil type	Sodosols or Vertosols, as appropriate.	Refer to section 2.7 and 3.3.2.
Effluent volume	For MDC #1, #2 and #4: - 6, 12 & 18 kL/day (i.e., 30, 60 & 90 EP) For MDC #3: - 6, 12, 18 & 24 kL/day (i.e., 30, 60, 90 & 120 EP) For MDC #5: - 6.4 kL/day (i.e., 32 EP) All scenarios assume irrigation occurs every day.	Refer to section 3.3.3.
Irrigation regime	Daily flow via fixed sprinklers. A fixed maximum 3.7 mm/d irrigation depth.	Refer to section 3.3.4 and Section 3.3.8
System Infiltration	LOW	Refer to section 3.3.3.
Effluent quality	Nutrient concentrations: 30 mg/L TN, 20 mg/L TP Electrical conductivity: 1,600 µS/cm	Refer to section 3.3.5

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Parameters	Value	Comments
Plant type	Kikuyu 1	Refer to section 3.3.6.
Wet weather storage	Minimum volume allowable by MEDLI to achieve assessment criteria, OR 3 times the daily wastewater inflow, whichever is greater.	Refer to section 3.3.7 & section 4.2 for assessment criteria

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4. MEDLI Methodology

4.1 Modelled scenarios

The following scenarios were modelled for the camp:

– **Scenario 1 (10-year):** Modelling was carried out assuming that effluent produced onsite will occur consistently on a daily basis over 10 years (indicatively 1 January 2013 to 31 December 2022). This scenario was adopted with a proposed load equivalents presented in Table 20 based on 200 L/EP/day.

– **Scenario 2 (No irrigation scenario):** A no irrigation scenario (i.e., baseline case) was also included to enable comparison of critical factors from Scenario 1.

The two scenarios outlined above were modelled using the MEDLI program to gain an understanding of the environmental impacts associated with irrigating treated effluent from the Springvale Camp within the nominated facility area. Scenario 2 (no irrigation) was modelled to serve as a control, allowing for an indication of likely drainage, runoff and leaching likely to occur because of natural rainfall where no treated effluent is applied.

Table 20 Summary of modelled scenarios across all five Girrahween MDCs (run over 10-year period)

Soil Type & Relevant MDCs	Scenario	Daily Peak Design Capacity				
		30 EP	32 EP	60 EP	90 EP	120 EP
Sodosols Corresponding MDCs: #1, #3, #4, & #5	No irrigation	✓	✓ (MDC#5 only)	✓	✓	✓ (MDC#3 only)
	Fixed irrigation	✓	✓ (MDC#5 only)	✓	✓	✓ (MDC#3 only)
Vertosols Corresponding MDCs: #2	No irrigation	✓		✓	✓	
	Fixed irrigation	✓		✓	✓	

Notes:

Distribution of modelled scenarios to align with the MDC hydraulic load projections (refer Table 17) based on identified site soil type (refer Table 16)

4.2 Assessment criteria

Criteria for assessing the outcomes of the MEDLI scenarios were developed to assist in determining the maximum allowable irrigation rate (and thus required irrigation area) and the minimum wet weather storage volume and smallest irrigation area required for anticipated flows. The criteria was:

– Annual rainfall plus annual irrigation does not exceed annual pan evaporation

– Runoff occurring as a result of irrigation does not contain effluent

– Phosphorus leaching is limited to levels that would avoid soil structure failure (this is indicated by persistently high and increasing values of leached phosphorus per year reported in the MEDLI summary output)

– The soil's design life must exceed the life of the camp, although preferably greater than 30 years as contingency.

– No reduction in crop yield occurs as a result of salinity

– No incidents of over topping from the wet weather storage facility occurs

– No significant increase in crop stress as a result of water logging associated with irrigation

– Nutrient leaching (below the root zone) should be minimised as far as practicable, in consideration of the WQOs for the region (refer section 2.9.2).

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5. Results and Assessment

5.1 General

Effluent discharge was modelled to rationalise wet weather and disposal area requirements for each soil type whilst meeting the criteria nominated in section 4.2 of this report. A summary of the results of the MEDLI assessment for each scenario modelled is provided in Section 5.3. A discussion of how each scenario modelled complied with the assessment criteria has been provided below.

5.2 Water balance

Before determining the fixed effluent daily application rate (mm/yr) for the model, climate data was reviewed.

As per section 2.3, the annual average pan evaporation rate equates to 1,938 mm and average annual rainfall rate to 579 mm. This results in a net water deficit of 1360 mm/year for most soil types. This corresponds to an average a daily irrigation rate of 3.7 mm/day. This value was adopted for commencement of MEDLI modelling as the fixed daily irrigation rate for all irrigation scenarios.

5.3 Guidance table

Several modelling iterations were conducted to gain an appreciation of the minimum wastewater infrastructure required onsite for the five Girrahween MDCs. The results of these iterations are shown in the following tables for each respective MDC:

– MDCs #1, #3 and #4 (sodosols soil type); refer Table 21
– MDC #2 (vertosols soil type); refer Table 22
– MDC #5 (sodosols soil type); refer Table 23.

5.3.1 Mobile Drilling Camps 1, 3 & 4

Table 21 summarises the MEDLI outputs for three MDCs; #1, #3 and #4. All three have been modelled in 30 EP increments of increasing hydraulic load, but only the 120 EP output is relevant to MDC #3 (Bellevue Part 3) as per the anticipated loading requirements provided by Arrow Energy (Table 1).

The model indicates that the minimum wet weather storage allowance at the forecast 120 EP loading for Bellevue Part 3 corresponds to 72.0 kL (i.e., three days' storage volume), having an irrigation area of at least 0.76 ha.

Table 21 Summary of MDCs #1, #3& #4 MEDLI outputs for modelled scenarios (SODOSOL soils)

EP	Load scenario			
	30 EP	**60 EP**	**90 EP**	**120 EP ****
Hydraulic loading (L/day)	6,000	12,000	18,000	24,000 **
Maximum Irrigation Rate (mm/day) ˜	3.7	3.7	3.7	3.7 **
Wet Weather Storage (kL) ^	18	36	54	72**
Irrigation Area (m^2) – Minimum required ^*	1,900	3,800	5,675	7,575**

Notes:
^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer Section 4.2).
* Rounded up to the nearest 25 m^2
** 120 EP loading is only applicable to MDC #3
˜ Actual irrigation rate averaged over the year may differ from this value (lower)

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5.3.2 Mobile Drilling Camp 2

The table below summarises the MEDLI outputs for MDC #2 (Bellevue Part 2) exclusively. The modelling was conducted in 30 EP increments to a maximum 90 EP as per the anticipated loading requirements provided by Arrow Energy (Table 1).

The model indicates that the minimum wet weather storage allowance at the forecast 90 EP loading corresponds to 54.0 kL (i.e., three days' storage volume), having an irrigation area of at least 0.57 ha.

Table 22 Summary of MDC #2 MEDLI outputs for modelled scenarios (VERTOSOL soils)

EP	Load scenario		
	30 EP	60 EP	90 EP
Hydraulic loading (L/day)	6,000	12,000	18,000
Maximum Irrigation Rate (mm/day) ~	3.7	3.7	3.7
Wet Weather Storage (kL) ^	18	36	54
Irrigation Area (m^2) – Minimum required ^*	1,900	3,800	5,675

Notes:

^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer Section 4.2).

* Rounded up to the nearest 25 m^2

~ Actual irrigation rate averaged over the year may differ from this value (lower)

5.3.3 Mobile Drilling Camp 5

The table below summarises the MEDLI outputs for MDC #5 (Bellevue Part 5) exclusively. The modelling was conducted 32 EP increments only as per the anticipated loading requirements provided by Arrow Energy (Table 1).

The model indicates that the minimum wet weather storage allowance at the forecast loading corresponds to 19.2 kL (i.e., three days' storage volume), having an irrigation area of at least 0.2 ha.

Table 23 Summary of MDC #5 MEDLI outputs for modelled scenarios (SODOSOL soils)

EP	Load scenario
	32 EP
Hydraulic loading (L/day)	6,400
Maximum Irrigation Rate (mm/day) ~	3.7
Wet Weather Storage (kL) ^	19.2
Irrigation Area (m^2) – Minimum required ^*	2,025

Notes:

^ To achieve zero incidents of storage overflow and acceptable soil performance outcomes (refer section 4.2), OR alternatively, at least 3 days minimum storage capacity, whichever is greater.

* Rounded up to the nearest 25 m^2

~ Based on Net Evaporation. Actual irrigation rate averaged over the year may differ from this value (lower)

5.3.4 Annual (actual) irrigation depth

The MEDLI model scenario was constructed to irrigate no more than 3.7 mm/day, every day, irrespective of weather conditions.

The range of applied irrigation depths was therefore 3.1 to 3.7 mm. The lower bound corresponds to the daily effluent generation volume evenly distributed over the LAA.

Over the model run period, the annual average irrigation depth across all MEDLI models was reported at 1171 mm (or 3.2 mm/day).

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Table 24 Key MEDLI outputs for all modelled scenarios adopting SODOSOL soils

Daily Peak Design Capacity		30 EP		32 EP		60 EP		90 EP		120 EP	
Output Parameter	**Unit**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**
Required irrigation area (minimum)	m^2	1,900	1,900	2,025	2,025	3,800	3,800	5,675	5,675	7,575	7,575
Wet weather storage	kL	18	18	19.2	19.2	36	36	54	54	72	72
Wet weather storage overflow	kL/yr	n/a	0	n/a	0	n/a	0	n/a	0	n/a	0
Annual irrigation	mm/yr	0	1188	0	1189	0	1188	0	1188	0	1188
Rainfall	mm/yr	569	569	569	569	569	569	569	569	569	569
Soil evaporation	mm/yr	335	10.8	335	10.8	335	10.8	335	10.8	335	10.8
Transpiration	mm/yr	247	1365	247	1365	247	1365	247	1366	247	1365
Rain runoff	mm/yr	6.5	2.5	6.5	2.5	6.5	2.5	6.5	2.5	6.5	2.5
Irrigation portion of the runoff	mm/yr	n/a	0	n/a	0	n/a	0	n/a	0	n/a	0
Deep drainage	mm/yr	5.0	379	5.0	380	5.0	379	5.0	384	5.0	383
Average monthly plant cover	%	27	87	27	87	27	87	27	88	27	88
Nitrogen added by irrigation	$kg/m^2/yr$	0	0.03	0	0.03	0	0.03	0	0.03	0	0.03
Nitrogen removed by crop	$kg/m^2/yr$	0.002	0.03	0.002	0.03	0.002	0.03	0.002	0.03	0.002	0.03
Average nitrate concentration of deep drainage	mg/L	2.2	0.11	2.2	0.11	2.2	0.11	2.2	0.11	2.2	0.11
Phosphorous added by irrigation	$kg/m^2/yr$	0	0.02	0	0.02	0	0.02	0	0.02	0	0.02
Phosphorous removed by crop	$kg/m^2/yr$	0.0005	0.01	0.0005	0.01	0.0005	0.01	0.0005	0.01	0.0005	0.01
Average phosphate concentration of deep drainage*	mg/L	0.05	0.12	0.05	0.12	0.05	0.12	0.05	0.12	0.05	0.12
Design soil profile storage life based on average infiltrated water phosphorous concentration of 13.15 mg/L	years	n/a	37.8	n/a	37.8	n/a	37.8	n/a	37.7	n/a	37.8
Notes: * Due to an unavoidable model stabilisation period, the average nutrient concentrations for the 10-year run period are skewed by high values reported in year 1.											

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Table 25 Key MEDLI outputs for all modelled scenarios adopting VERTOSOL soils

Daily Peak Design Capacity		30 EP		60 EP		90 EP	
Output Parameter	**Unit**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**
Required irrigation area (minimum)	m^2	1,900	1,900	3,800	3,800	5,675	5,675
Wet weather storage	kL	18	18	36	36	54	54
Wet weather storage overflow	kL/yr	n/a	0	n/a	0	n/a	0
Annual irrigation	mm/yr	0	1188	0	1188	0	1188
Rainfall	mm/yr	569	569	569	569	569	569
Soil evaporation	mm/yr	264	9.6	264	9.6	264	9.6
Transpiration	mm/yr	303	1310	303	1310	303	1310
Rain runoff	mm/yr	6.8	40.3	6.8	40.3	6.8	42.3
Irrigation portion of the runoff	mm/yr	0	0	0	0	0	0
Deep drainage	mm/yr	8.50	398	8.50	398	8.50	401
Average monthly plant cover	%	36	87	36	87	36	87
Nitrogen added by irrigation	$kg/m^2/yr$	0	0.03	0	0.03	0	0.03
Nitrogen removed by crop	$kg/m^2/yr$	0.01	0.04	0.01	0.04	0.01	0.04
Average nitrate concentration of deep drainage	mg/L	25.9	1.47	25.9	1.47	25.9	1.46
Phosphorous added by irrigation	$kg/m^2/yr$	0	0.02	0	0.02	0	0.02
Phosphorous removed by crop	$kg/m^2/yr$	0.001	0.01	0.001	0.01	0.001	0.01
Average phosphate	mg/L	0.10	0.10	0.10	0.10	0.10	0.10

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Daily Peak Design Capacity		30 EP		60 EP		90 EP	
Output Parameter	**Unit**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**	**No Irrigation**	**Irrigation**
concentration of deep drainage*							
Design soil profile storage life based on average infiltrated water phosphorous concentration of 13.4 mg/L	years	n/a	33.8	n/a	33.9	n/a	33.8
Notes: * Due to an unavoidable model stabilisation period, the average nutrient concentrations for the 10-year run period are skewed by high values reported in year 1							

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5.3.5 Soil parameters

5.3.5.1 Runoff

Results show that no runoff of irrigation effluent occurs from the irrigation area. That is, the irrigation rate does not exceed the capacity of the soil to accommodate the discharged effluent, as well as confirming that the effluent volume is able to be assimilated by the endemic soil during wet days without mixing with runoff associated with precipitation.

5.3.5.2 Deep Drainage

The fixed irrigation schemes contribute an additional 380 to 401 mm/year (depending on the MDC and soil type) to deep drainage in the irrigation area, compared to the dryland (no irrigation) baseline.

Due to the low nutrient concentrations reported in deep drainage (approaching zero after model stabilisation, refer Figure 15) in addition to the moderate (>24 m) depth to groundwater anticipated based on the construction of nearby groundwater bores logged on the DNRME database, this is considered to present a low risk to groundwater in the land application area. Particularly noting the short-term operation of the scheme (indicatively 2-3 years).

5.3.5.3 Nitrogen and phosphorous leaching

Nitrate concentrations in deep drainage are higher for all dryland scenarios when compared to irrigation.

Nitrate concentrations in deep drainage are usually higher for dryland (no irrigation) scenarios because of decreased crop cover. Increased crop cover correlates with larger root mass which will provide a greater surface area to facilitate the uptake of nutrients. In dryland scenarios the low plant cover results in nitrate being transported below the root zone, returning higher results in the model.

The annual nutrient leaching concentrations modelled over the 10-year run period for the Bellevue Part 2 (MDC#2) 30 EP hydraulic loading scenario is presented below. It is evident that following the model equilibration period that the annual nutrient leaching concentrations for the irrigation scenario approach zero. This trend is repeated for all irrigation cases across the five MDCs (refer Appendix B).

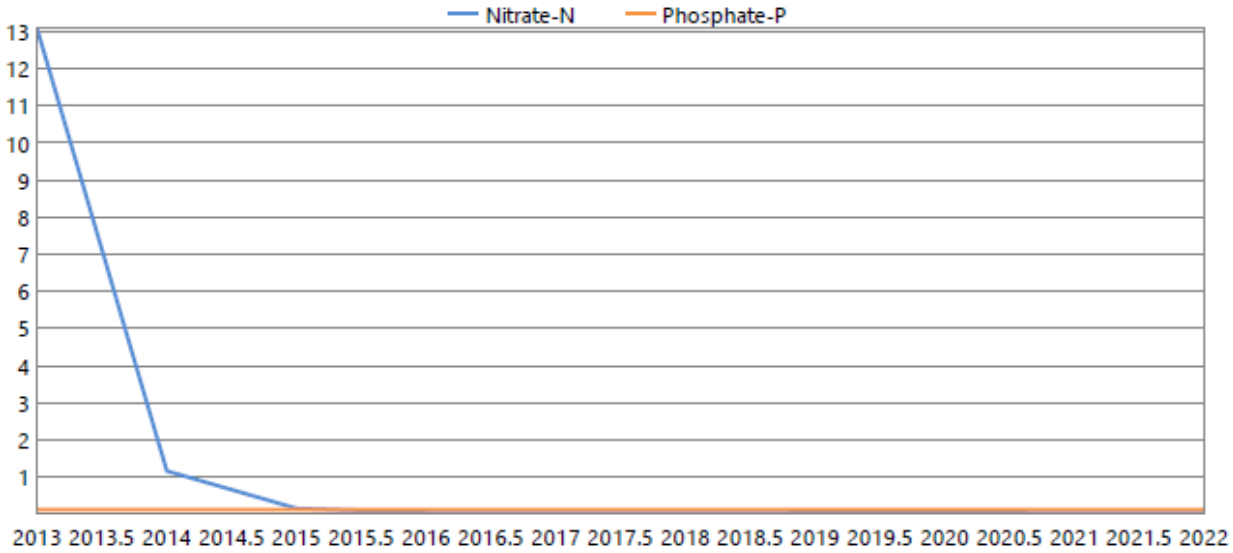

Figure 15 Annual nutrient leaching concentration for the 30EP loading scenario at MDC#2 (0.19 ha irrigation area)

Phosphorus concentrations reported to occur below the root zone were ≤ 0.12 mg/L for all scenarios. In general terms, the low results returned indicate that phosphorus is not a significant limiting factor for disposal for all scenarios modelled at the nominated effluent nutrient quality.

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5.3.5.4 Soil Design Life

The soil design life which is an indication of the soil's nutrient absorption capacity measure was sufficiently high for all scenarios when irrigation was triggered, being more than 33 years. This far exceeds the lifespan of the semi-permanent camp (2-3 years).

5.3.6 Crop

5.3.6.1 Salinity Impacts

Results that suggest that salinity will not adversely impact on crop yield for the Vertosols (Black Earth), nor Sodosols soil type modelled at the nominated irrigation rate and effluent quality (being of low-risk conductivity, noting the sites' sodic soil type). Results show a zero reduction in crop yield due to salinity.

5.3.6.2 Crop Cover

Comparisons of all "no irrigation" loading scenarios to their corresponding irrigation scenarios demonstrates that improved crop cover occurs in each instance.

Under natural (dryland) conditions, plant cover was as low as 27%, while under irrigated conditions plant cover averaged 87%, respectively.

5.3.7 Wet Weather Storage

All flow volumes for all soil types confirmed the size of the wet weather storages outlined in Table 22 as sufficient, with no overtopping reported. These were equivalent to three days' storage volume in accordance with the Queensland technical guideline for disposal of effluent using irrigation (Tennakoon and Ramsay, 2020).

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6. Conclusions

6.1 General

The MEDLI model scenarios described in this report suggest the following:

– Salinity had no adverse impacts on crop yield for any of the soil types, noting that a salt-tolerant grass species (Kikuyu) was assumed to be planted within the irrigation area.
– Despite the low hydraulic conductivity of the Vertosols (Black Earth) and Sodosol soil horizons (1 mm/hr or less) which generally restricts internal drainage and increases the propensity for runoff to occur, irrigation did not contribute to runoff for any modelled irrigation scenario. The maximum allowable irrigation rate (3.7 mm/d) was not exceeded on any day during the modelled period.
– The level of nutrients in deep drainage are considered sufficiently low to protect groundwater environmental values, noting the moderate depth to groundwater (>24 m) and low nitrogen and phosphorus concentrations after the model stabilisation period (~1 year).

6.2 Design and sizing implications

The following conclusions were made regarding infrastructure sizing.

– Wet weather storage having three days' storage capacity suitably mitigates incidents of overtopping under the modelled irrigation regime.
– All modelled LAAs for the five MDCs fit within the inferred available irrigation areas (shown in Table 26).
– Under the maximum hydraulic loading provided by Arrow Energy, the irrigation area consumes the largest fraction of available MDC area for MDC#2 (Bellevue Part 2), being ~57%. The footprint proposed to be consumed by temporary camp facilities has not been communicated to GHD for consideration in this assessment. For example, offsets from spaces accessed by camp occupants should be maintained in consideration of effluent spray drift.

Table 26 Comparison of MDC footprints to modelled LAAs

Camp Name	Maximum EP	GHD inferred total MDC area (ha)*	LAA (ha) for irrigation at Maximum EP
Temporary MDC #1 – Bellevue Part 1	90	1.3	0.57 ha
Temporary MDC #2 – Bellevue Part 2	90	1.0	0.57 ha
Temporary MDC #3 – Bellevue Part 3	120	2.0	0.76 ha
Temporary MDC #4 – Girrahween Central	90	1.2	0.57 ha
Temporary MDC #5 – Girrahween Central	32	0.5	0.20 ha
Notes: *GHD have inferred MDC footprints directly from images (jpeg) provided by Arrow Energy. GHD does not accept responsibility for errors in these values, which were chosen to provide a high-level judgement on the footprint's capacity to fit the LAAs.			

MDC #2 and 3 encompass Category B remnant vegetation (being endangered or of concern). GHD's scope of works included identification of environmentally sensitive areas only. Review of the permissible activities under Arrow Energy's EA EA0001399 as it pertains to effluent irrigation of remnant vegetation or clearing for establishment of crop cover, is outside of GHD's scope. The MEDLI models that adopt Kikuyu crop cover would indicate different environmental outcomes for the MDC land application areas than what may occur under regulated vegetation cover.

6.2.1 Recommended Irrigation management

Crop selection and management are imperative to facilitating the high degree of nutrient uptake modelled. For example, a grass type having similar nutrient uptake and salt tolerance to Kikuyu should be implemented. Regular inspections of the irrigation area should be conducted to identify any waterlogging, or crop stress. Choosing crops

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that are tolerant to high nutrient and moisture levels can help utilise the nutrients effectively and reduce the risk of nutrient leaching.

Other elements to consider include:

Irrigation practices

Implementing irrigation practices that avoid waterlogging and minimise salt accumulation, such as using efficient irrigation systems and scheduling irrigation based on soil moisture levels, can help maintain soil health.

Irrigation Scheduling

To prevent waterlogging and nutrient leaching, irrigation should be scheduled to match the soil's water-holding capacity and crop water requirements.

Monitoring Soil Health

Regular monitoring of soil pH, salinity, and nutrient levels is essential to manage the long-term effects of effluent irrigation and prevent soil degradation.

Soil additives

To improve the absorptivity and reduce the negative impacts of sodicity, soil additives such as gypsum (Calcium sulphate) can be applied. Gypsum helps to replace sodium ions with calcium ions, improving soil structure and permeability. Adding organic matter will improve soil structure and mitigate some negative effects of sodicity and poor drainage.

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Appendices

Appendix A

Environmental Desktop Searches

resources.QLD.GOV.AU

Vegetation management report

For Lot: 671 Plan: RP897022

27/07/2023

Queensland Government

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 671 Plan: RP897022, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
671	RP897022	Freehold	1,873,000

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

Does this property have a freehold tenure and is in the Wet Tropics of Queensland World Heritage Area?

No, this property is not located in the Wet Tropics of Queensland World Heritage Area.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 671 Plan: RP897022, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Western Downs Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Barakula

Catchment(s)
Balonne-Condamine

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 671 Plan: RP897022

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 189.15ha

Vegetation category	Area (ha)
Category C	< 0.1
Category X	189.1

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

There is no Property Map of Assessable Vegetation (PMAV) present on this property.

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.4.3	Endangered	C	0.04	Acacia harpophylla and/or Casuarina cristata shrubby open forest on Cainozoic clay plains	Mid-dense
non-rem	None	X	189.11	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.
2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or
2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

No records

3.6 Area Management Plan(s)

Mulga Lands Fodder Area Management Plan

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

No Class A

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 671 Plan: RP897022.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

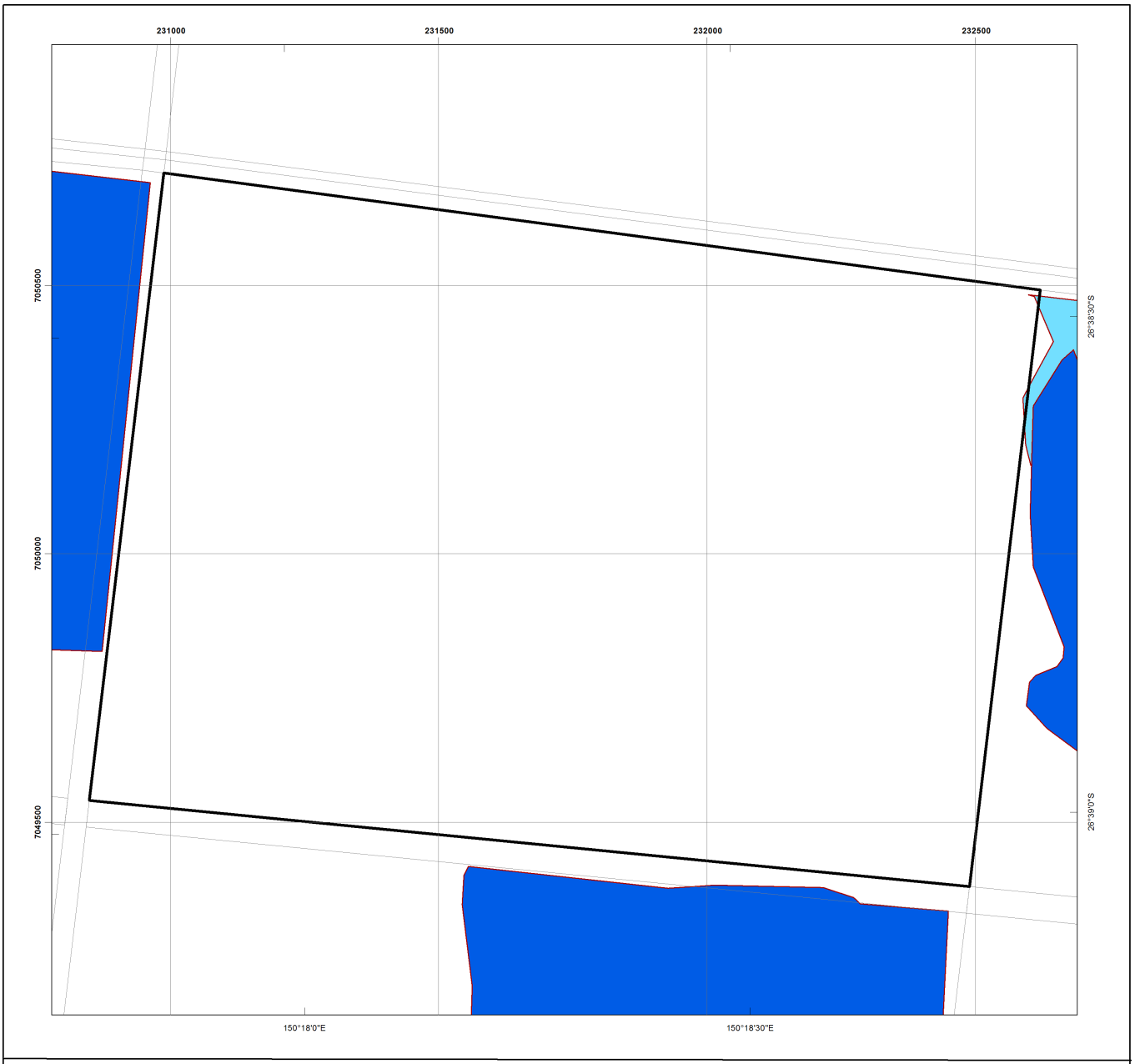
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map

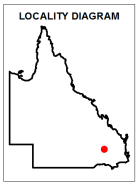


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries

LOCALITY DIAGRAM



N

0 100 200 300 400 500 m

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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

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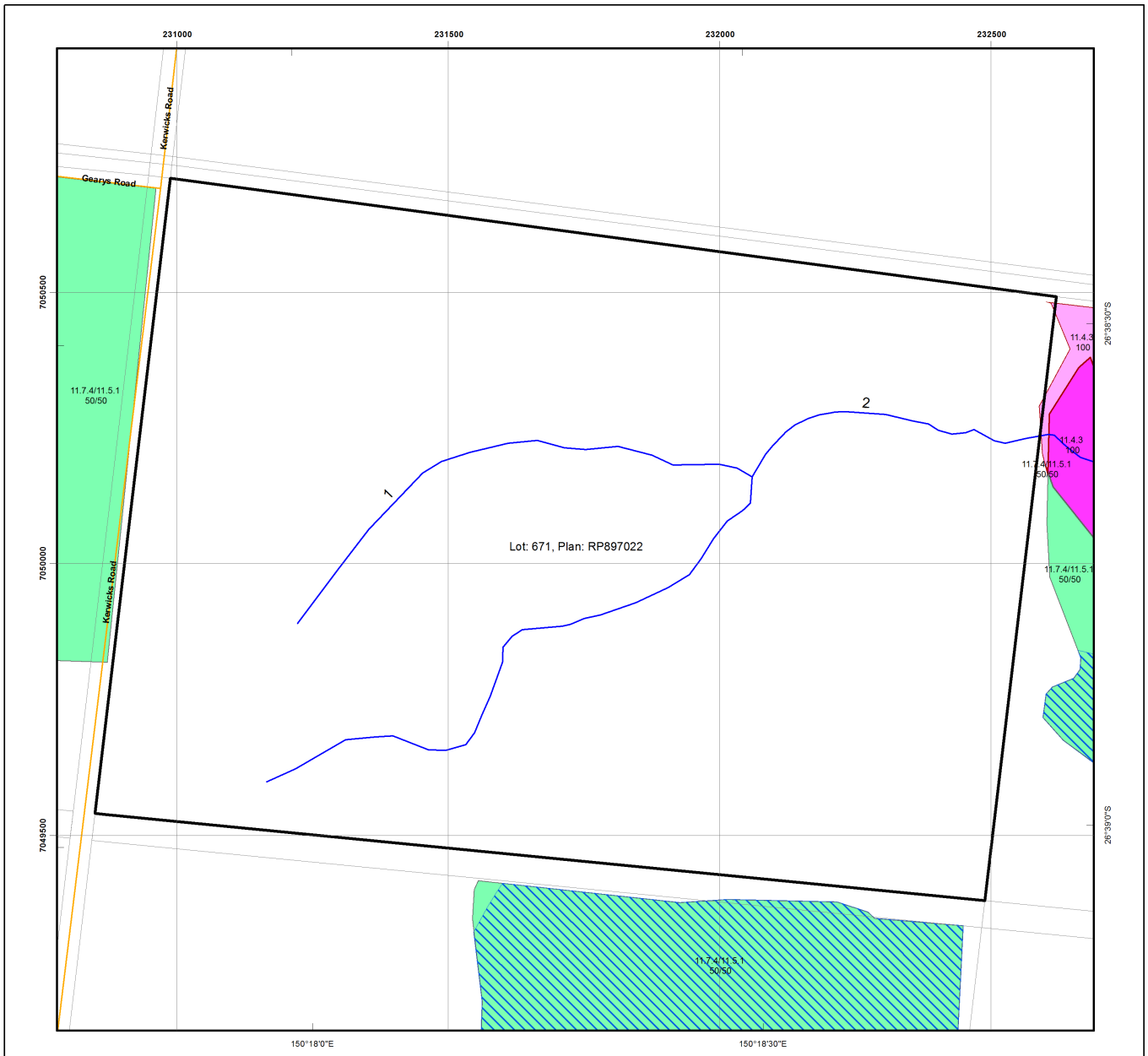
4.2 Vegetation management supporting map



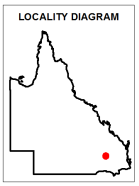
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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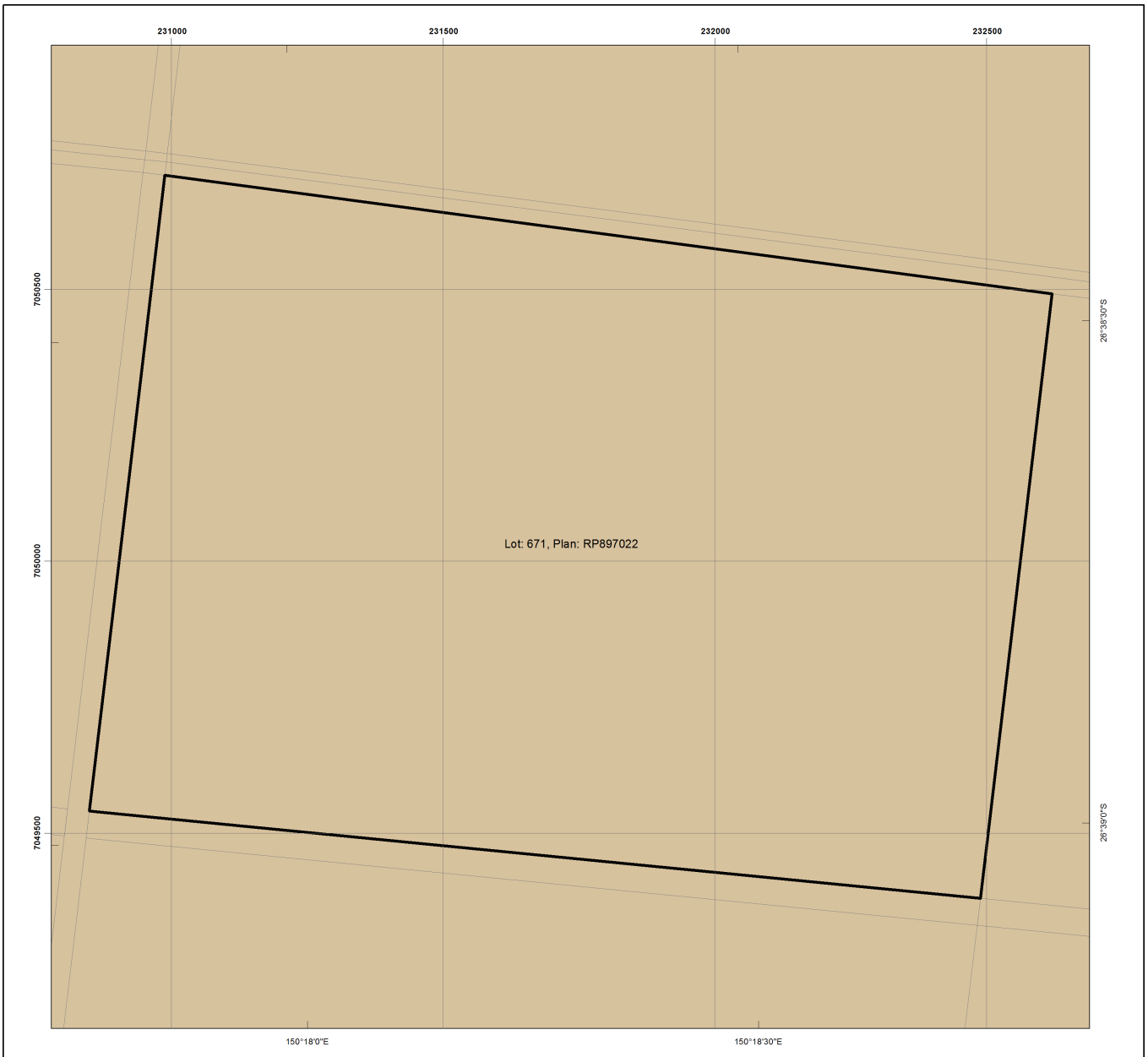
4.3 Coastal/non-coastal map

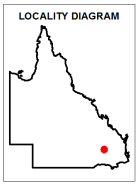


Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries

LOCALITY DIAGRAM



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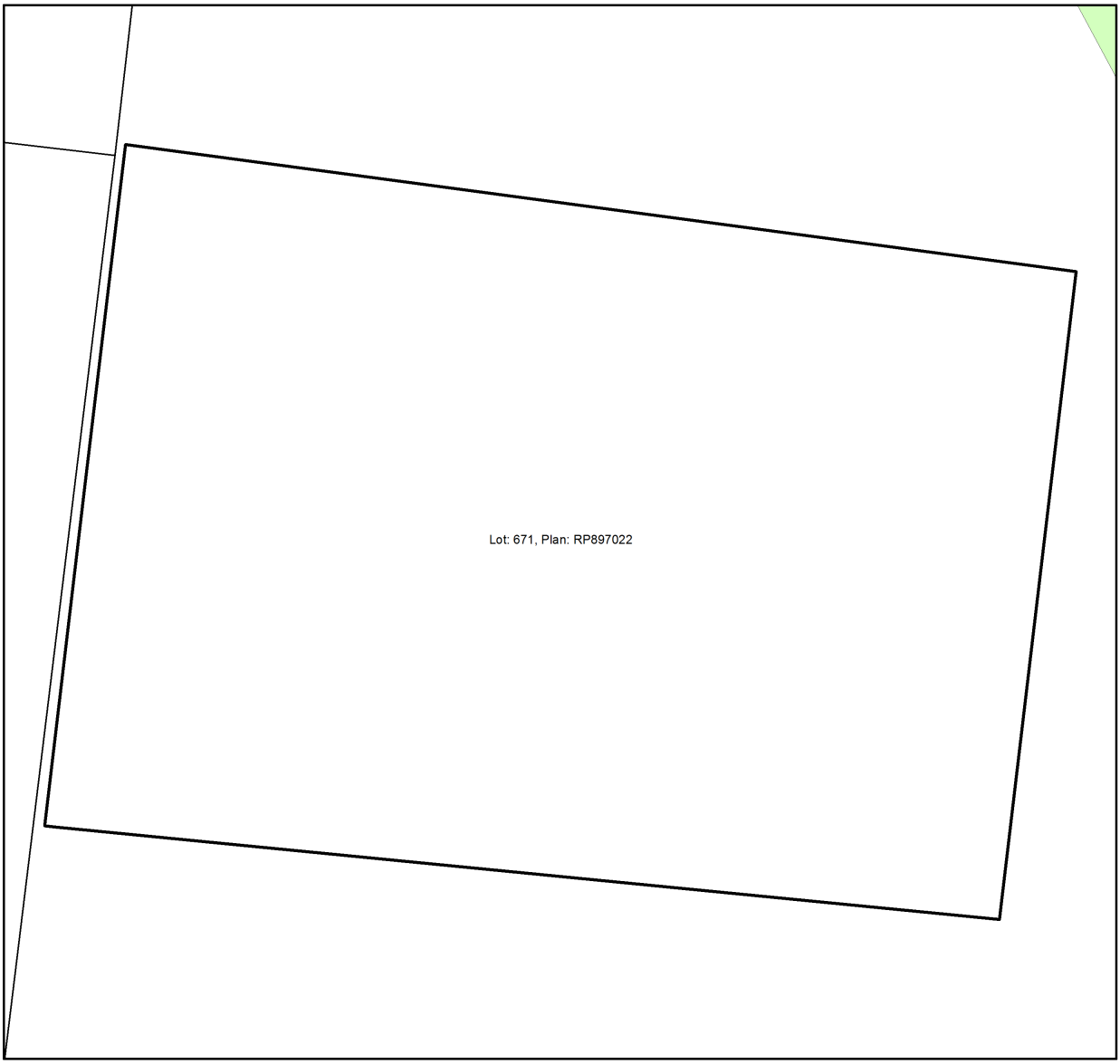
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



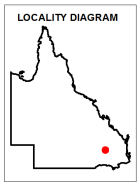
Agricultural Land Class A or B
as per State Planning Policy: State Interest for Agriculture

Legend

- Selected Lot and Plan
- Towns
- Rivers and creeks
- Freeways / motorways; Highways
- Secondary roads; Streets

Agricultural land class A or B

- A
- B
- Not class A or B



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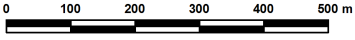

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5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:
Phone 1300 130 372 (and select option four)
Email palm@des.qld.gov.au
Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

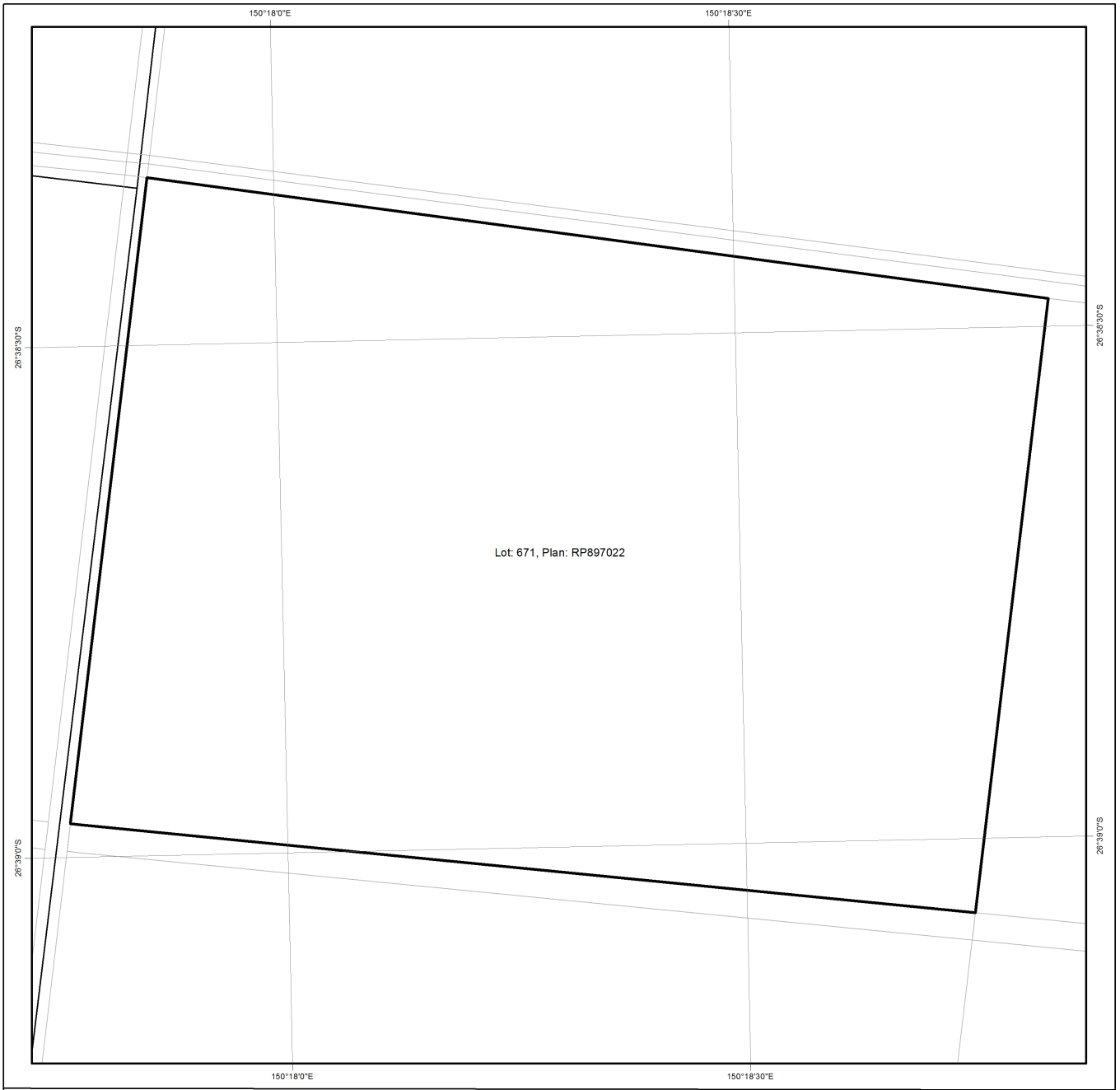
This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.

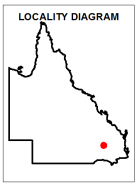


Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM



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This product is projected into:
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This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as endangered by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and

- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 671 Plan: RP897022

7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map

Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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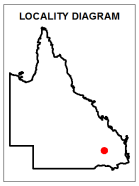
LOCALITY DIAGRAM



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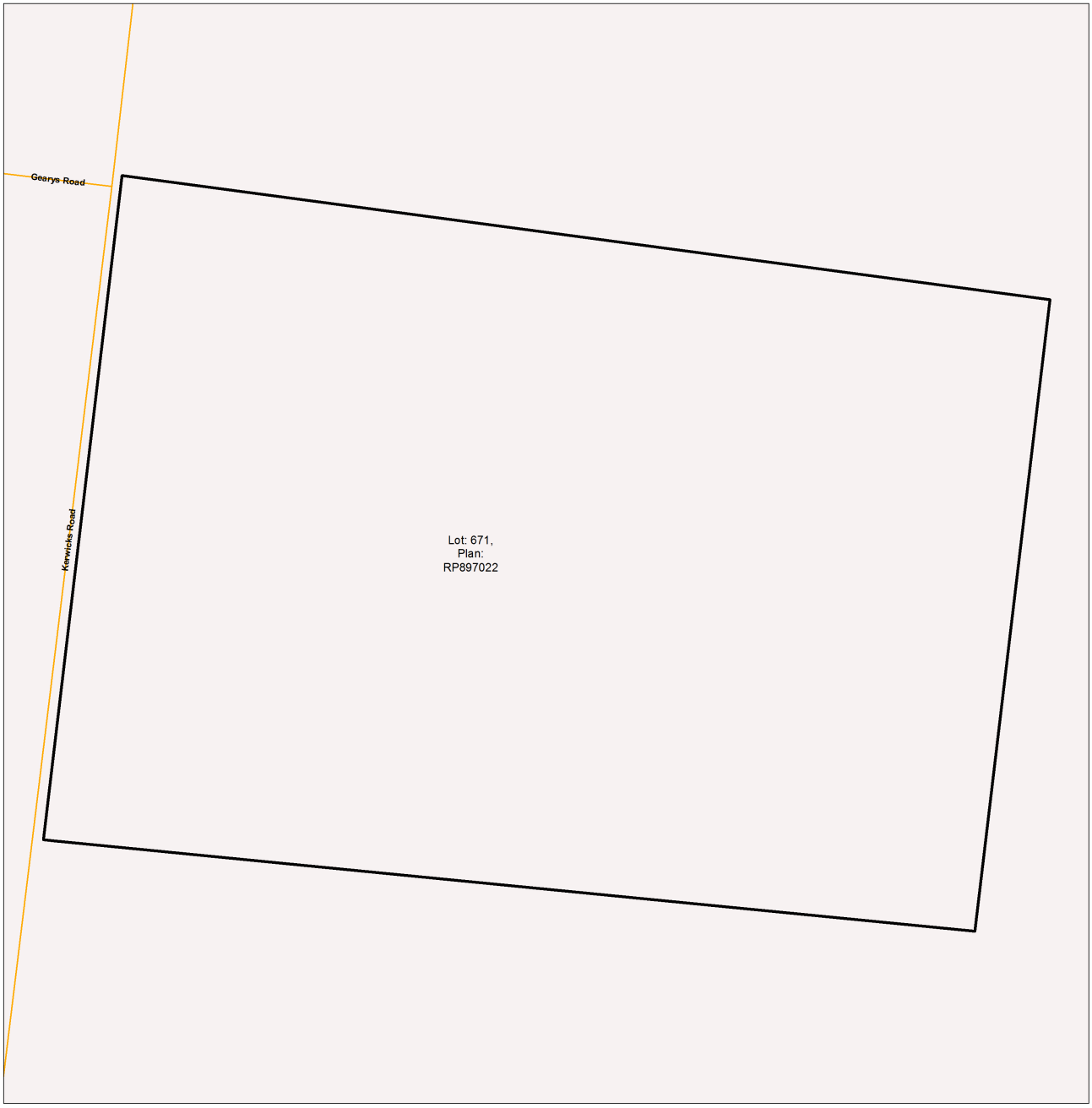
The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/. The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

7.3 Koala habitat regional ecosystems for core koala habitat areas

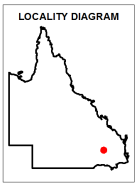


Koala habitat regional ecosystems for core koala habitat areas

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM



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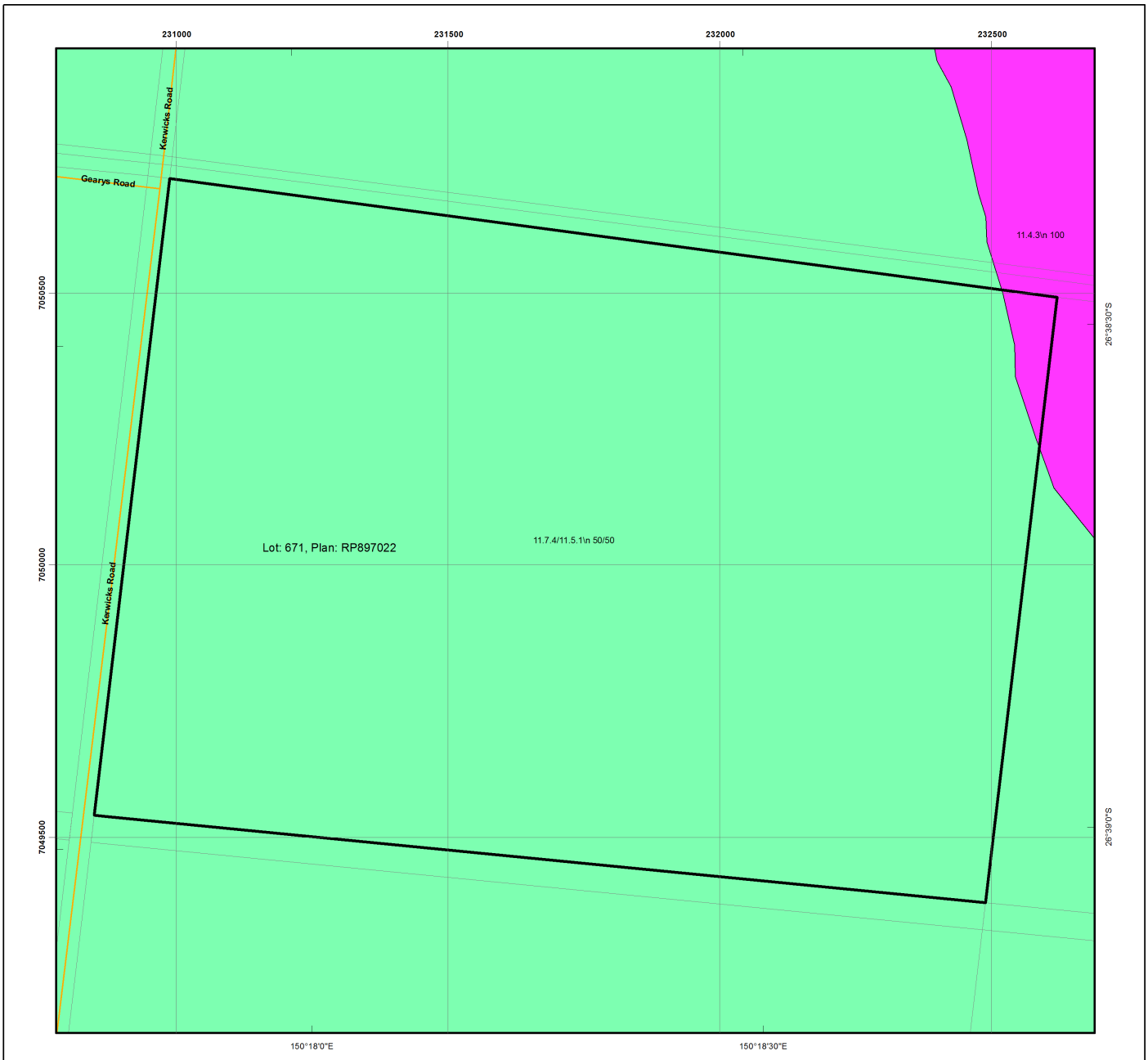
8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au



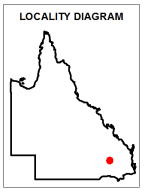
Vegetation Management Pre-clear Regional Ecosystem Map

Legend

- Selected Lot and Plan
- Pre-clearing area containing Endangered RE
- Pre-clearing area containing Of Concern RE
- Pre-clearing area that is a Least Concern RE
- Water
- Highway
- Connector
- Street/Local Road
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Pre-clearing regional ecosystem line-work reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only.

Digital data for the Pre-clearing regional ecosystem map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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Vegetation management report

For Lot: 16 Plan: AU38

27/07/2023

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 16 Plan: AU38, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
16	AU38	Freehold	6,209,900
CN	SP265432	Easement	75,700
CT	SP261960	Easement	56,780
CO	SP265433	Easement	75,310
CU	SP261960	Easement	53,230

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

Does this property have a freehold tenure and is in the Wet Tropics of Queensland World Heritage Area?

No, this property is not located in the Wet Tropics of Queensland World Heritage Area.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 16 Plan: AU38, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Western Downs Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Barakula

Catchment(s)
Balonne-Condamine

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 16 Plan: AU38

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 619.61ha

Vegetation category	Area (ha)
Category B	172.3
Category X	447.3

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

The following Property Map of Assessable Vegetation (PMAVs) may be present on this property:

Reference number

2006/011741

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.3.14	Least concern	B	30.72	Eucalyptus spp., Angophora spp., Callitris spp. woodland on alluvial plains	Sparse
11.3.25	Least concern	B	3.82	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.4	Of concern	B	8.92	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.5.21	Least concern	B	2.18	Corymbia bloxsomei +/- Callitris glaucophylla +/- Eucalyptus crebra +/- Angophora leiocarpa woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
11.5.4	Least concern	B	1.09	Eucalyptus chloroclada, Callitris glaucophylla, C. endlicheri, Angophora leiocarpa woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
11.7.2	Least concern	B	6.17	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.4	Least concern	B	100.91	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.5	Least concern	B	6.17	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.7	Least concern	B	12.34	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse
non-rem	None	X	447.29	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or
2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None
939	Nyctophilus corbeni	eastern long-eared bat	V	Dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris), also vine thickets.	100-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21

Label	Regional Ecosystem (mandatory unless otherwise specified)
939	5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.3.10, 5.3.20, 5.5.6, 5.7.4, 5.7.8, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.16, 6.3.17, 6.3.18, 6.3.24, 6.3.25, 6.4.3, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.17, 6.5.18, 6.5.19, 6.7.5, 6.7.6, 6.7.7, 6.9.2, 11.2.1, 11.2.3, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.8, 11.3.9, 11.3.10, 11.3.11, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.39, 11.3.40, 11.4.1, 11.4.2, 11.4.3, 11.4.5, 11.4.6, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.15, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.8.2, 11.8.3, 11.8.4, 11.8.5, 11.8.6, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.13, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.4, 11.9.7, 11.9.8, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.8, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.5, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.15, 11.11.16, 11.11.17, 11.11.18, 11.11.19, 11.11.20, 11.11.21, 11.12.1, 11.12.2, 11.12.3, 11.12.4, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 13.3.1, 13.3.4, 13.11.1, 13.11.3, 13.11.4, 13.11.7, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10, 13.12.11

3.6 Area Management Plan(s)

Mulga Lands Fodder Area Management Plan

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

No Class A

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 16 Plan: AU38.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

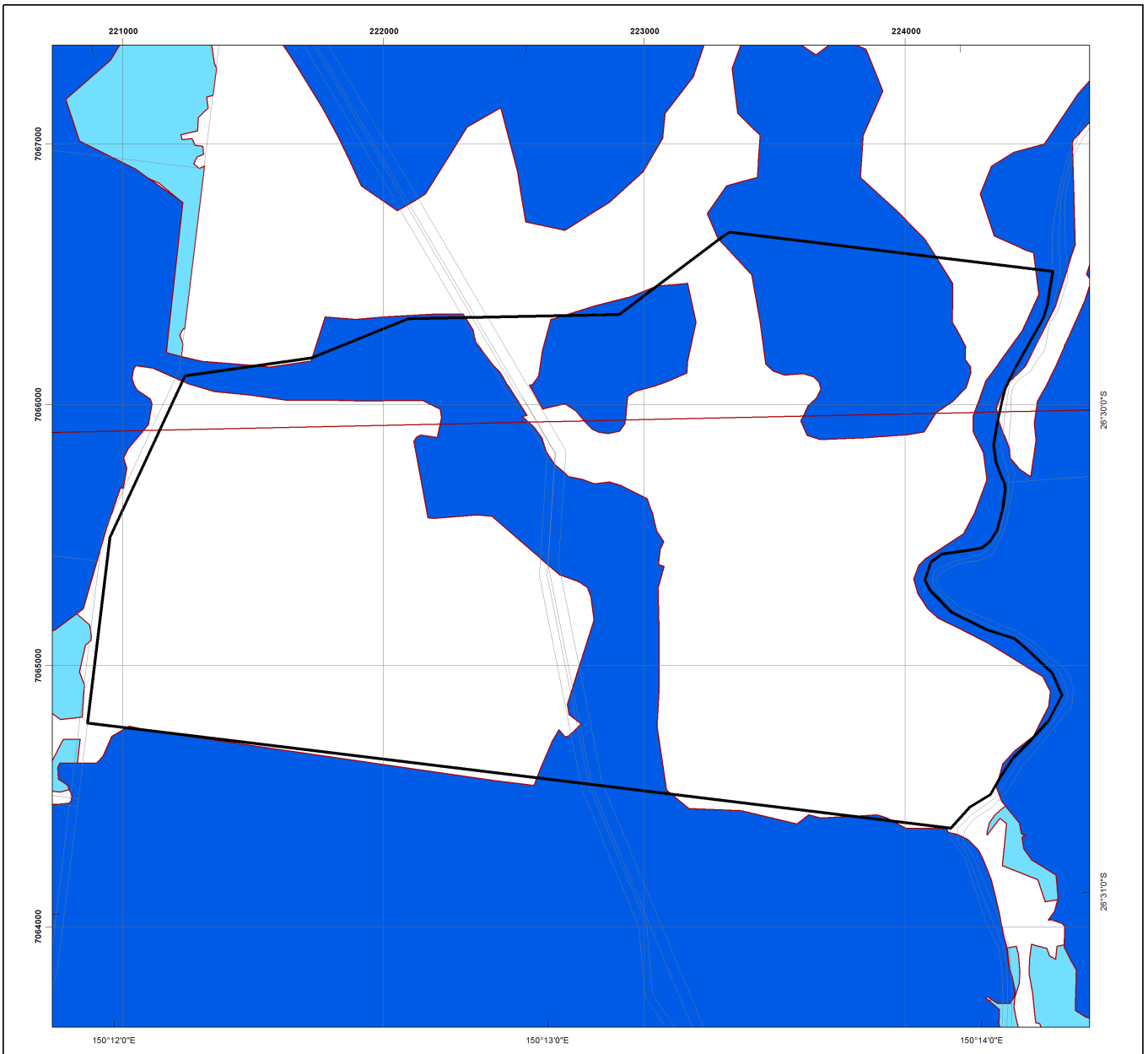
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map

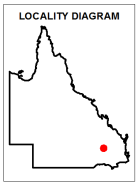


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries

LOCALITY DIAGRAM



N

0 210 420 630 840 1,050 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

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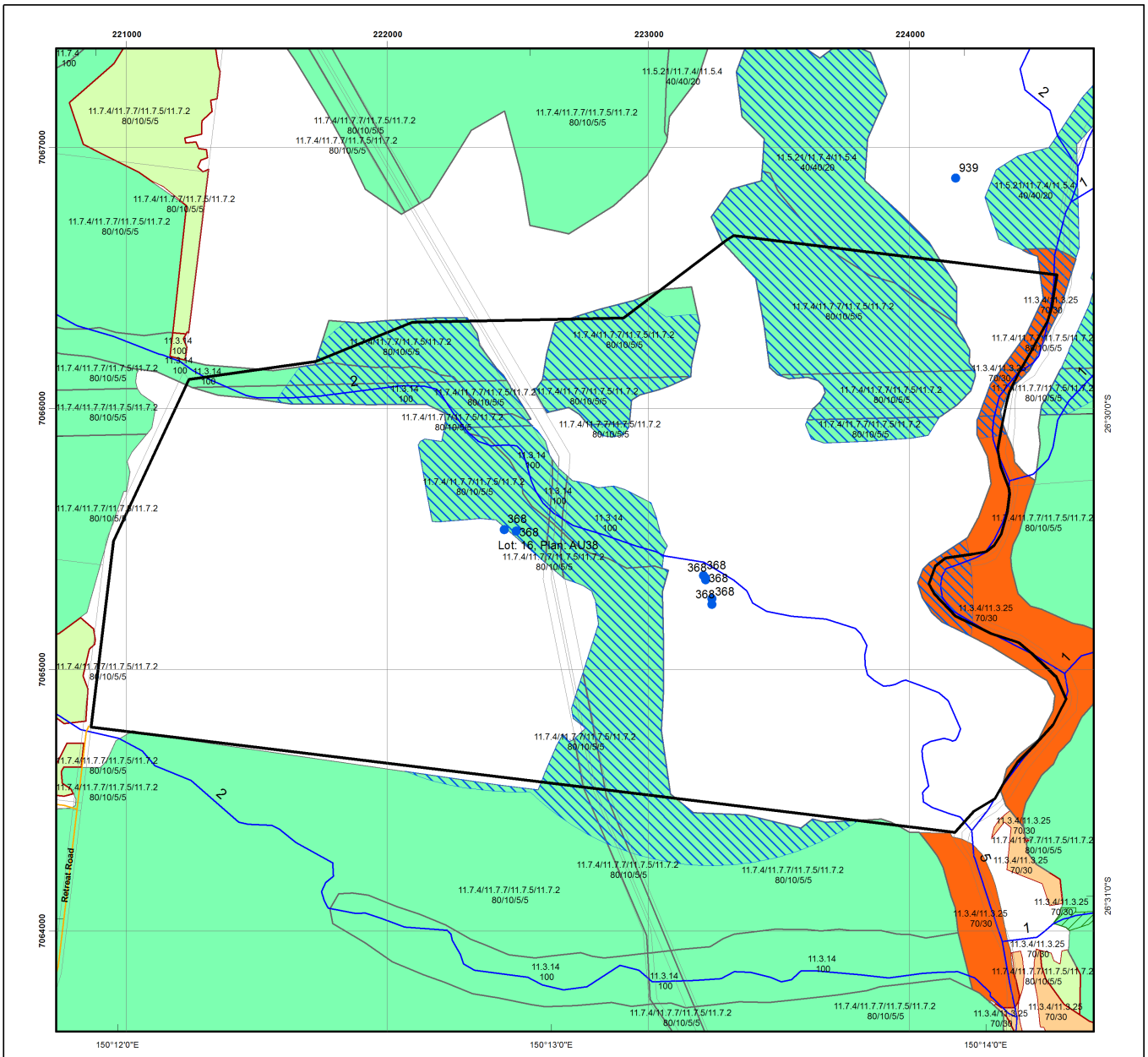
4.2 Vegetation management supporting map



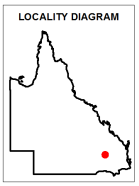
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features maps (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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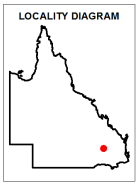
4.3 Coastal/non-coastal map

Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries

LOCALITY DIAGRAM



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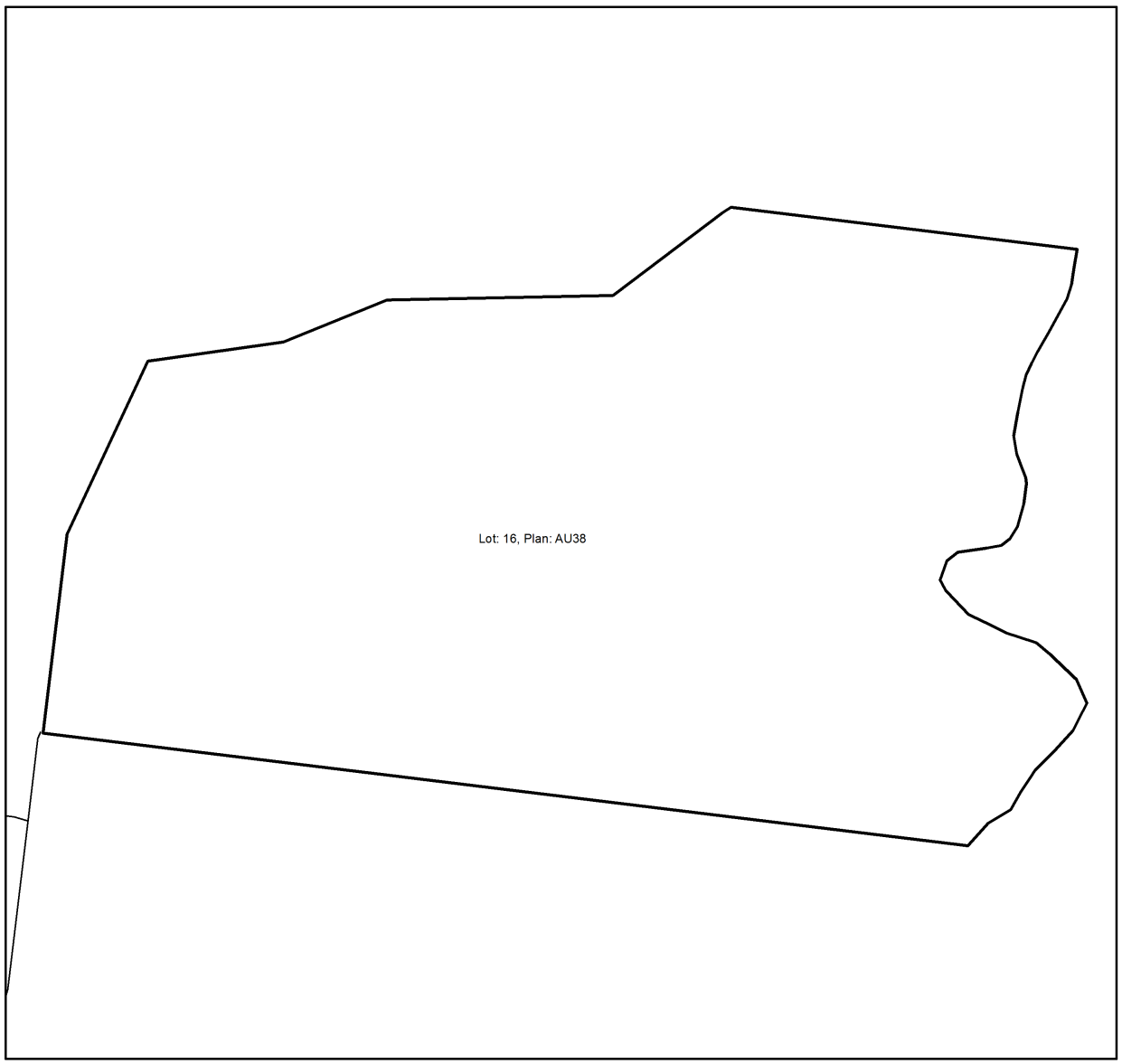
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



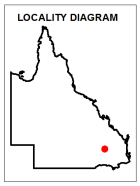
Agricultural Land Class A or B
as per State Planning Policy: State Interest for Agriculture

Legend

- Selected Lot and Plan
- Towns
- Rivers and creeks
- Freeways / motorways; Highways
- Secondary roads; Streets

Agricultural land class A or B

- A
- B
- Not class A or B



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5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:
Phone 1300 130 372 (and select option four)
Email palm@des.qld.gov.au
Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

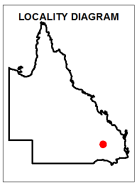
Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.

Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM



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This product is projected into:
GDA 1994 MGA Zone 56

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as endangered by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and

- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 16 Plan: AU38

7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map

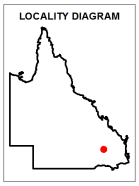
Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

LOCALITY DIAGRAM



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The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/. The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

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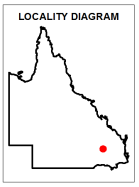
7.3 Koala habitat regional ecosystems for core koala habitat areas

Koala habitat regional ecosystems for core koala habitat areas

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM



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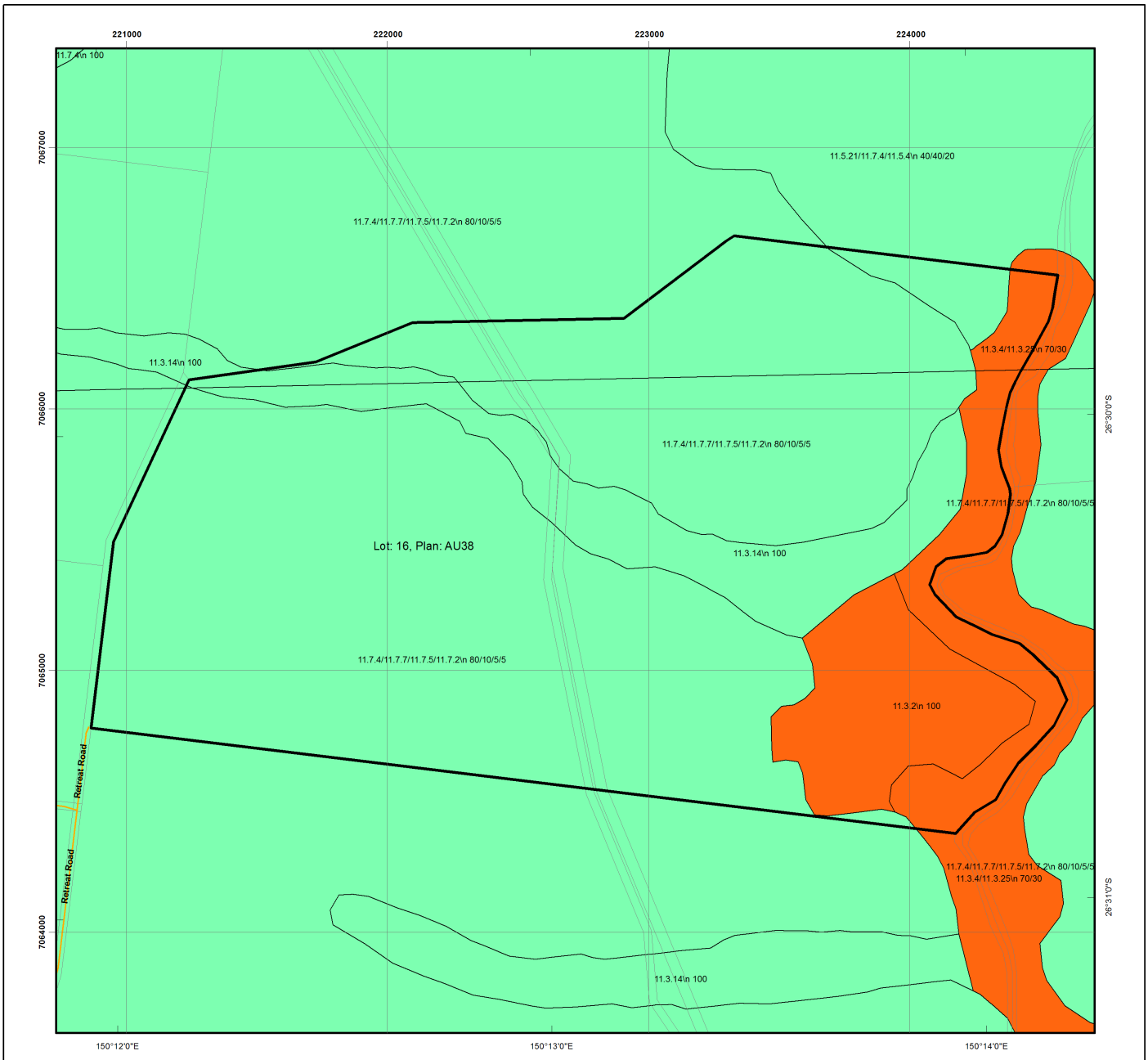
8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au



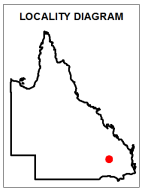
Vegetation Management Pre-clear Regional Ecosystem Map

Legend

- Selected Lot and Plan
- Pre-clearing area containing Endangered RE
- Pre-clearing area containing Of Concern RE
- Pre-clearing area that is a Least Concern RE
- Water
- Highway
- Connector
- Street/Local Road
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Pre-clearing regional ecosystem line-work reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only.

Digital data for the Pre-clearing regional ecosystem map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries shown are provided as a locational aid only.

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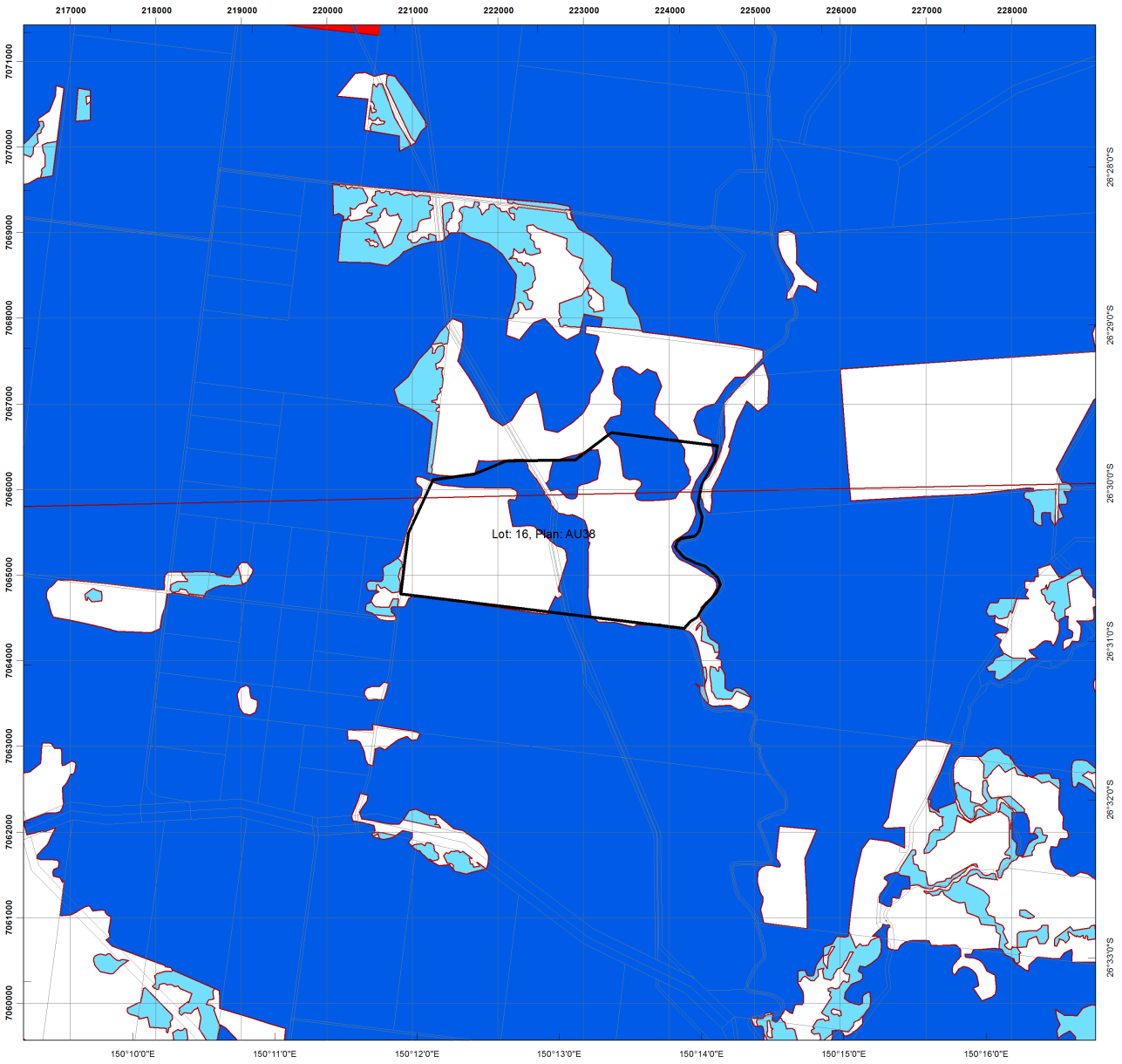
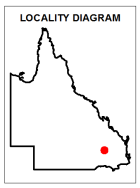


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries



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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

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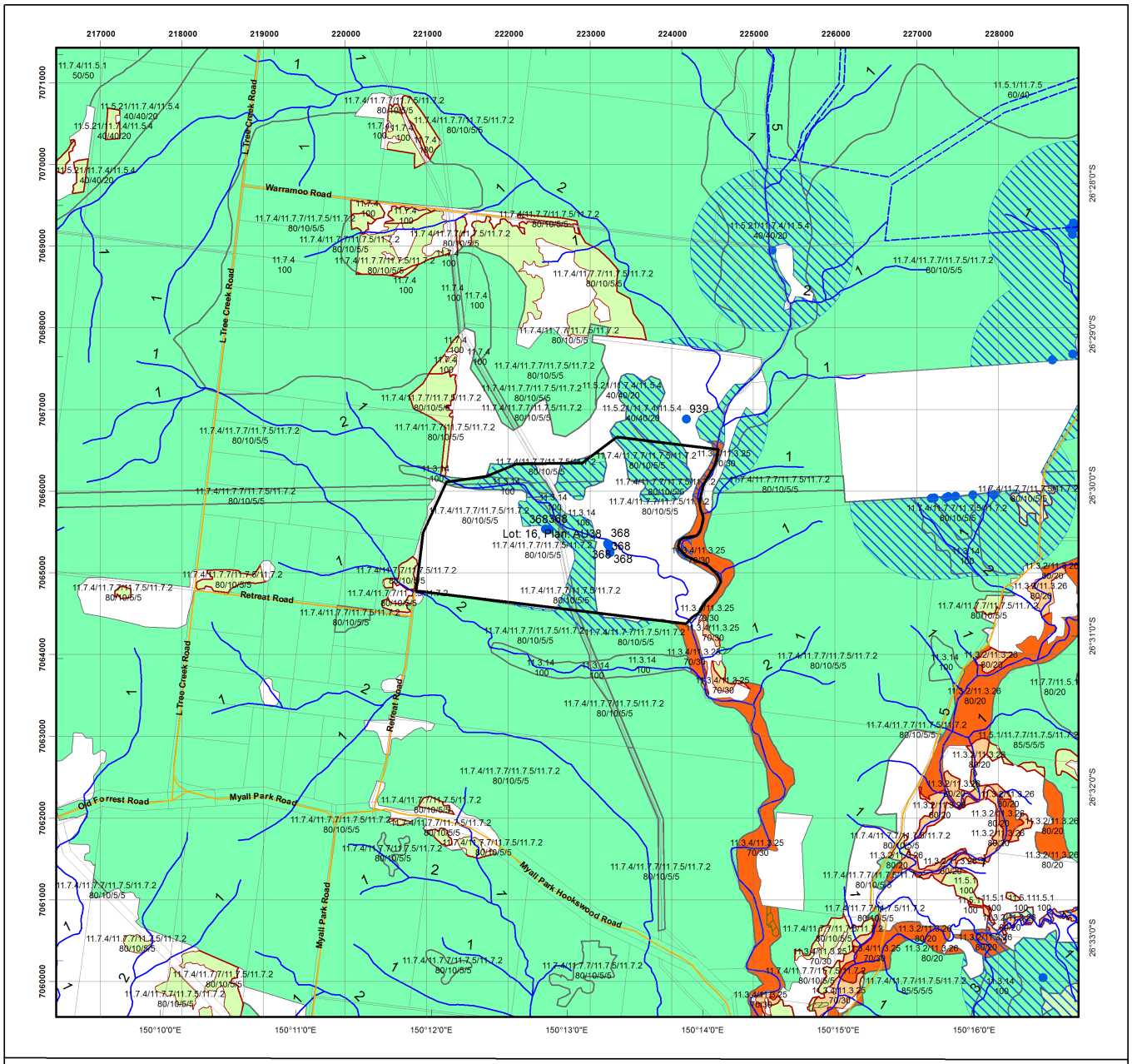

Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features maps (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

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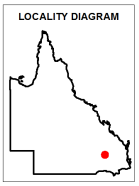
LOCALITY DIAGRAM



N

0 480 960 1,440 1,920 2,400 m

This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*; and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (http://www.resources.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None
939	Nyctophilus corbeni	eastern long-eared bat	V	Dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris), also vine thickets.	100-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21
939	5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.3.10, 5.3.20, 5.5.6, 5.7.4, 5.7.8, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.16, 6.3.17, 6.3.18, 6.3.24, 6.3.25, 6.4.3, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.17, 6.5.18, 6.5.19, 6.7.5, 6.7.6, 6.7.7, 6.9.2, 11.2.1, 11.2.3, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.8, 11.3.9, 11.3.10, 11.3.11, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.39, 11.3.40, 11.4.1, 11.4.2, 11.4.3, 11.4.5, 11.4.6, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.15, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.8.2, 11.8.3, 11.8.4, 11.8.5, 11.8.6, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.13, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.4, 11.9.7, 11.9.8, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.8, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.5, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.15, 11.11.16, 11.11.17, 11.11.18, 11.11.19, 11.11.20, 11.11.21, 11.12.1, 11.12.2, 11.12.3, 11.12.4, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 13.3.1, 13.3.4, 13.11.1, 13.11.3, 13.11.4, 13.11.7, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10, 13.12.11

resources.QLD.GOV.AU

Vegetation management report

For Lot: 19 Plan: BWR293

27/07/2023

Queensland Government

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 19 Plan: BWR293, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
19	BWR293	Freehold	1,297,600
D	SP243360	Easement	112,300
A	SP168213	Easement	29,120
CG	SP265425	Easement	5,792
E	SP243361	Easement	104,000

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

Does this property have a freehold tenure and is in the Wet Tropics of Queensland World Heritage Area?

No, this property is not located in the Wet Tropics of Queensland World Heritage Area.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 19 Plan: BWR293, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Western Downs Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Barakula

Catchment(s)
Balonne-Condamine

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 19 Plan: BWR293

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 129.75ha

Vegetation category	Area (ha)
Category B	29.9
Category X	99.9

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

The following Property Map of Assessable Vegetation (PMAVs) may be present on this property:

Reference number

2017/006861

2012/001702

2010/008125

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at
https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.4.3	Endangered	B	28.08	Acacia harpophylla and/or Casuarina cristata shrubby open forest on Cainozoic clay plains	Mid-dense
11.7.2	Least concern	B	0.09	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.4	Least concern	B	1.52	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.5	Least concern	B	0.09	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.7	Least concern	B	0.09	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse
non-rem	None	X	99.87	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.
2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21

3.6 Area Management Plan(s)

Mulga Lands Fodder Area Management Plan

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

Class A (with urban areas masked as per SPP): 82.49ha

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 19 Plan: BWR293.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

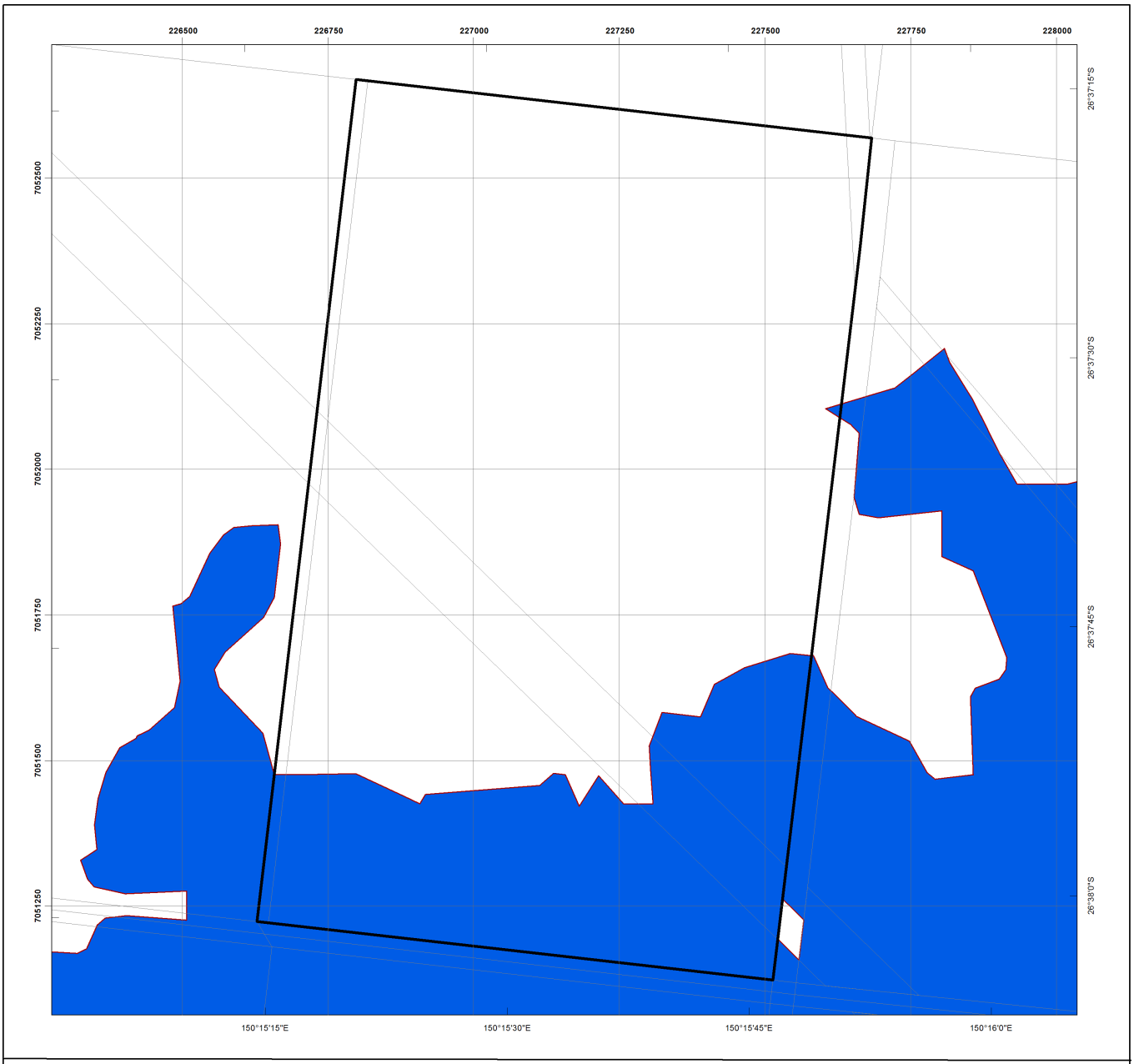
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map

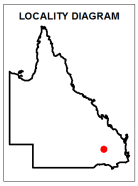


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries

LOCALITY DIAGRAM



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0 90 180 270 360 450 m

This product is projected into:
GDA 1994 MGA Zone 56

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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

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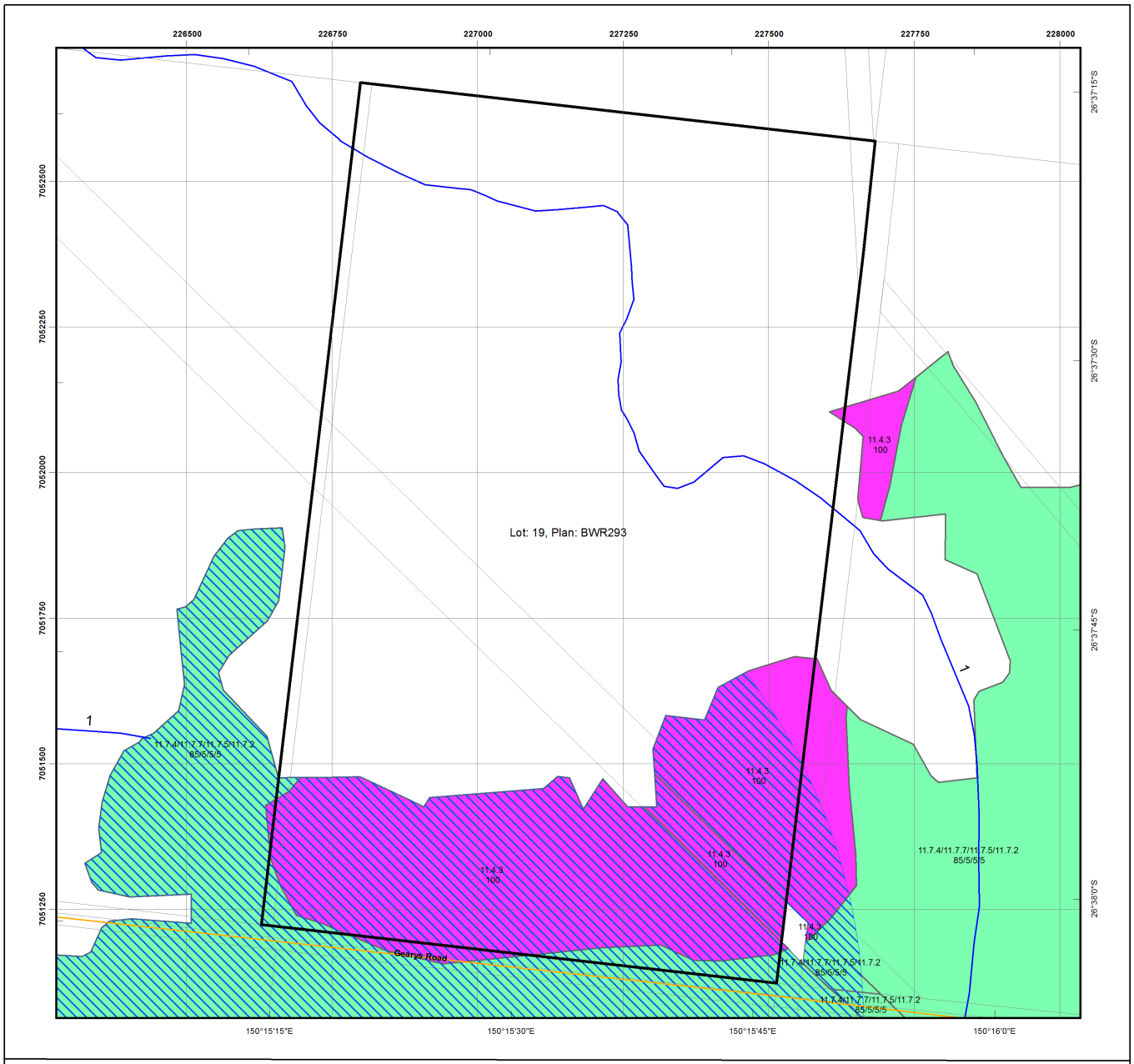
4.2 Vegetation management supporting map



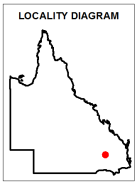
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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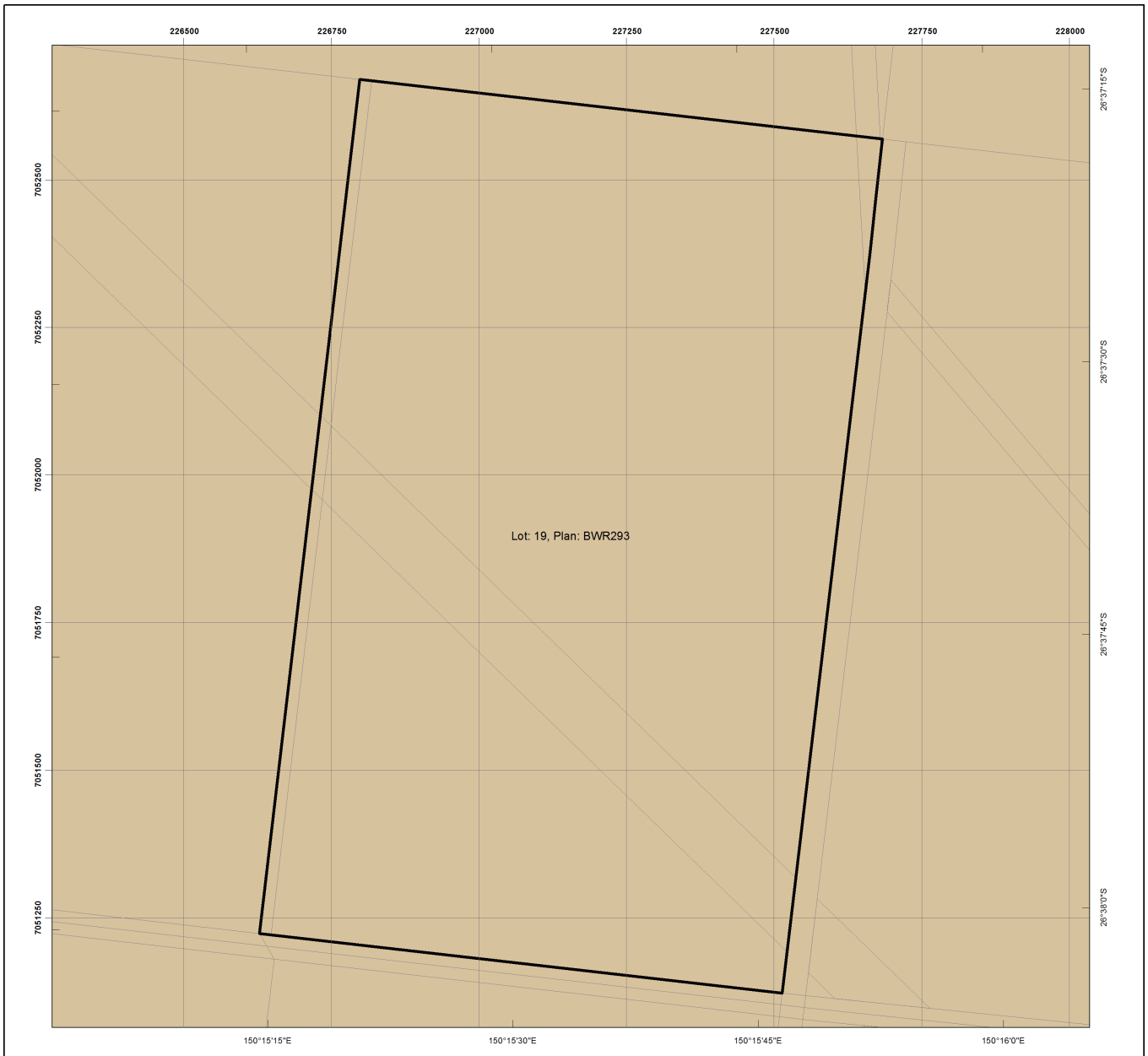
4.3 Coastal/non-coastal map

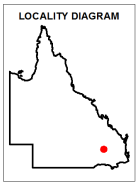


Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries

LOCALITY DIAGRAM



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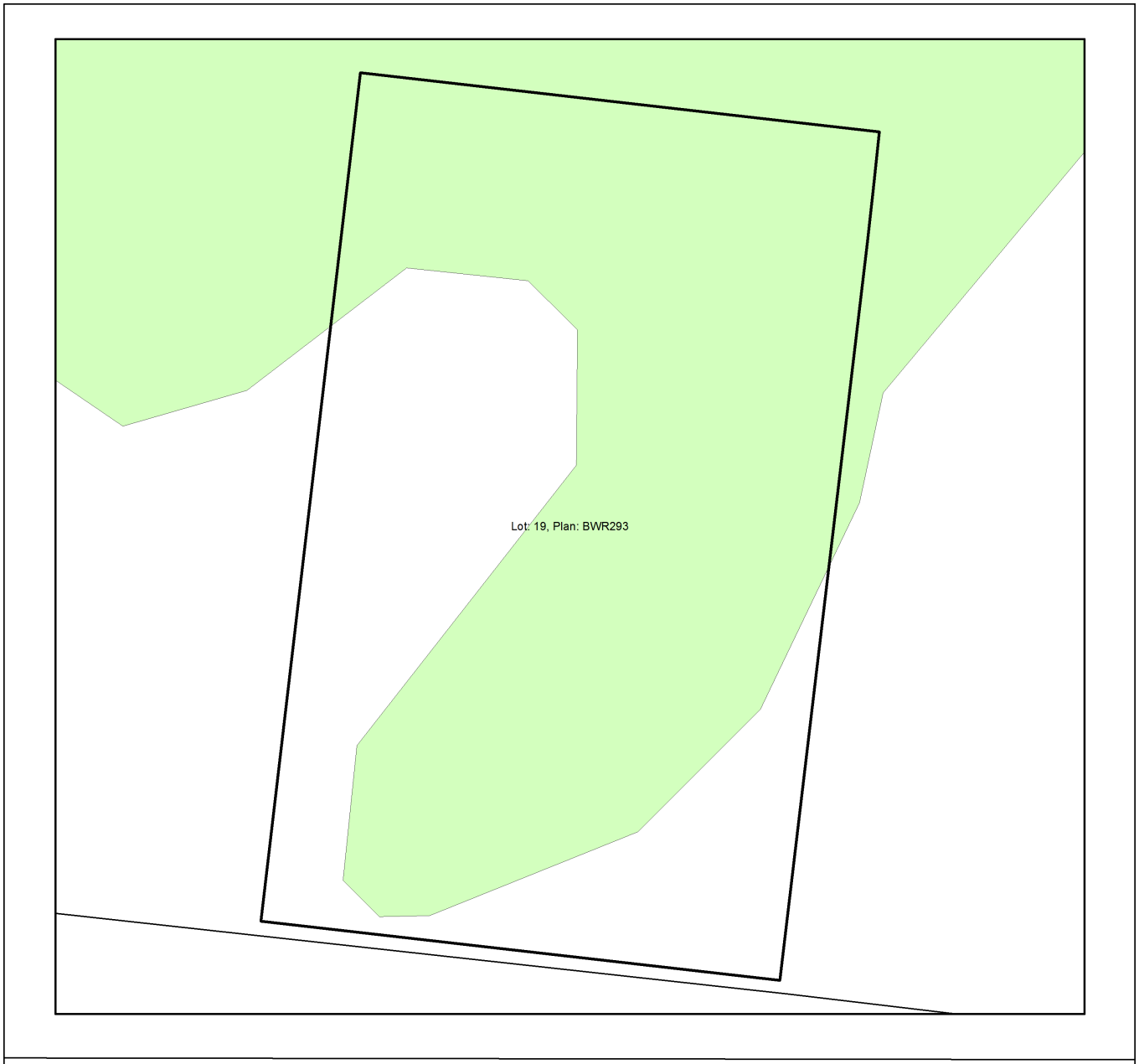
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



Agricultural Land Class A or B
as per State Planning Policy: State Interest for Agriculture

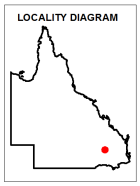
Legend

- Selected Lot and Plan
- Towns
- Rivers and creeks
- Freeways / motorways; Highways
- Secondary roads; Streets

Agricultural land class A or B

- A
- B
- Not class A or B

LOCALITY DIAGRAM



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5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:
Phone 1300 130 372 (and select option four)
Email palm@des.qld.gov.au
Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

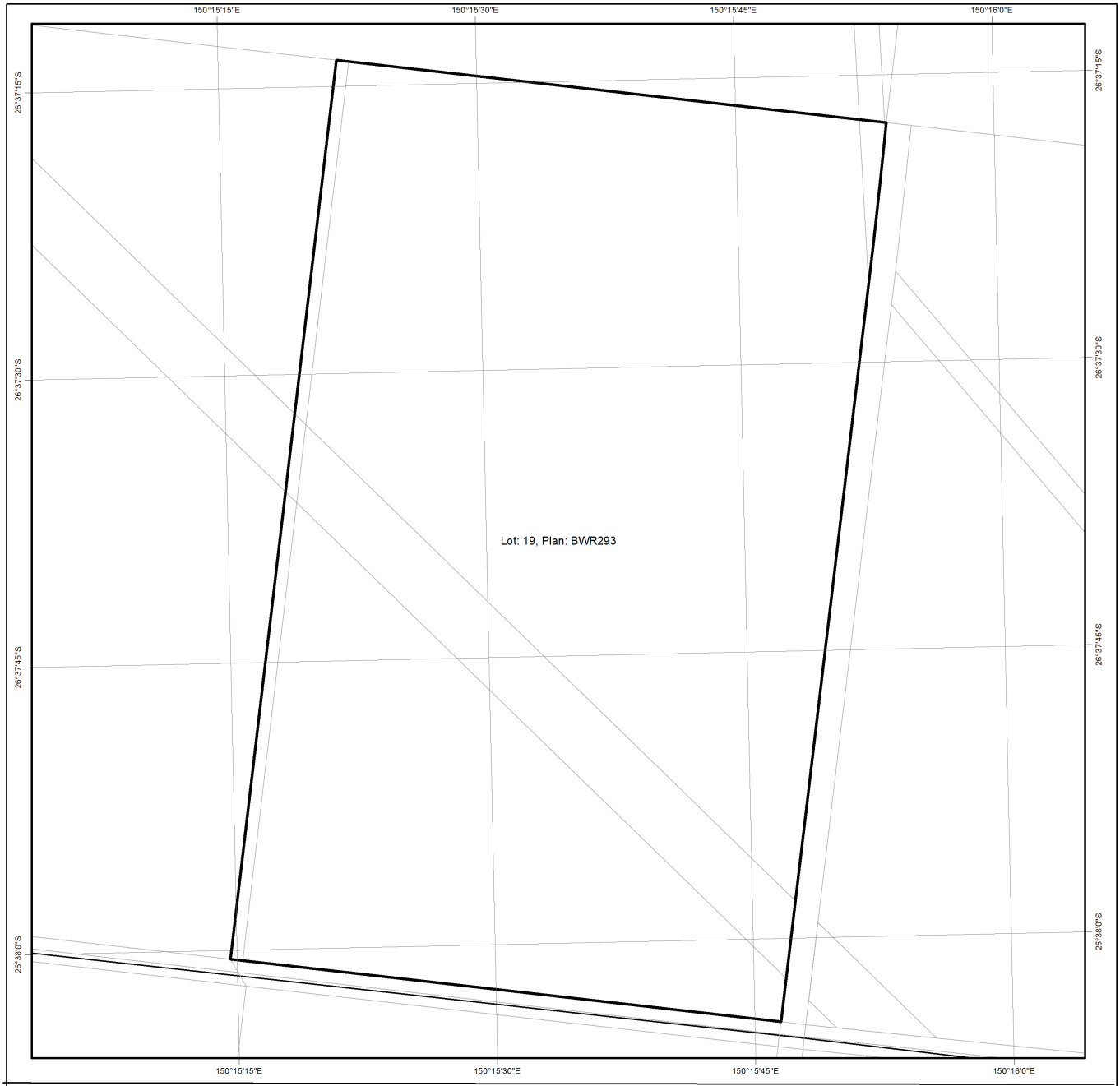
This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.

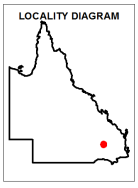


Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

LOCALITY DIAGRAM



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This product is projected into:
GDA 1994 MGA Zone 56

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as endangered by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and

- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 19 Plan: BWR293

7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map

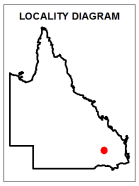
Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

LOCALITY DIAGRAM



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The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/. The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

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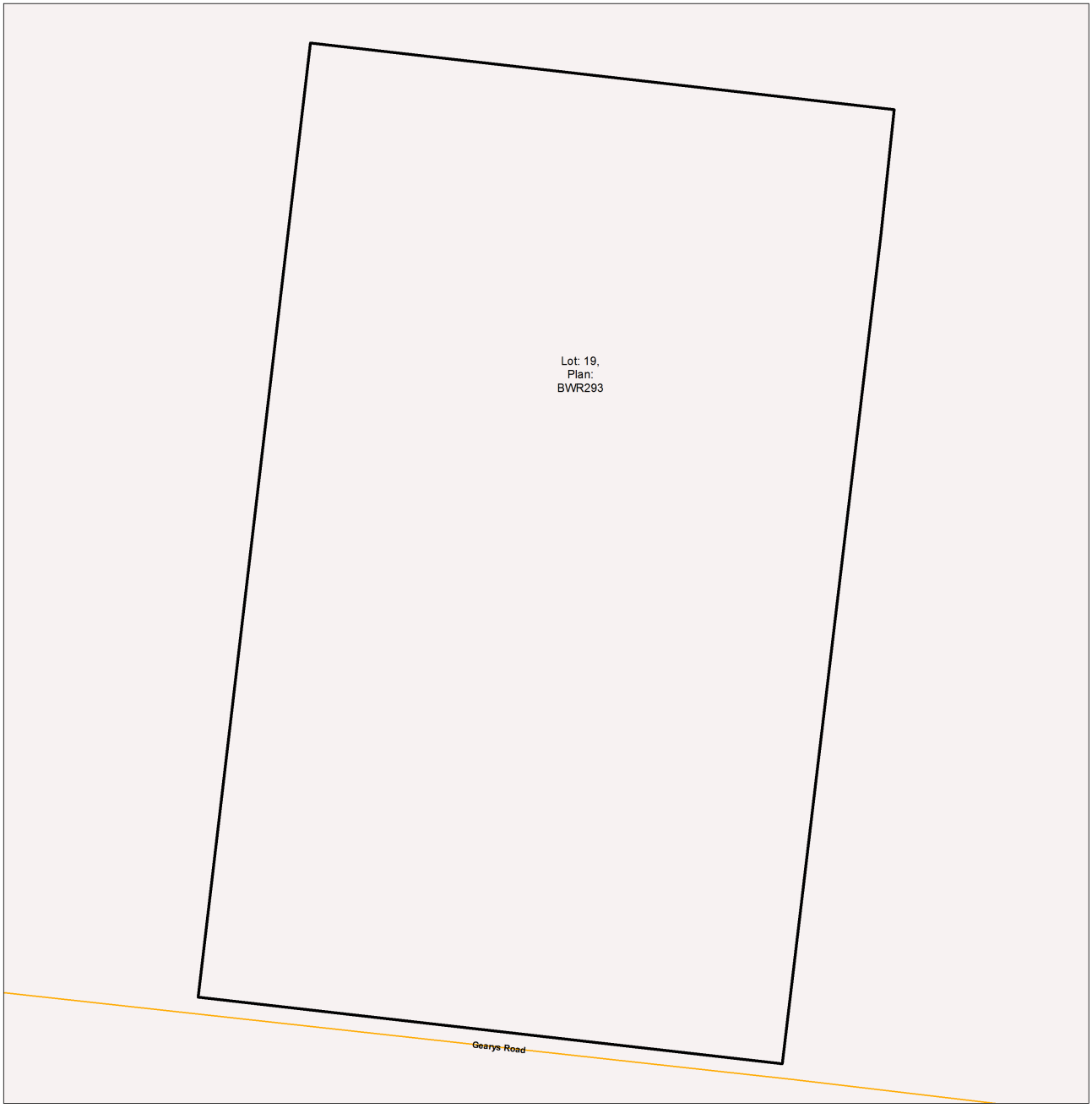
7.3 Koala habitat regional ecosystems for core koala habitat areas

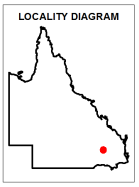


Koala habitat regional ecosystems for core koala habitat areas

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM



N

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The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au

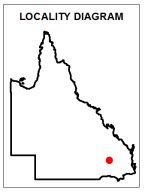
Vegetation Management Pre-clear Regional Ecosystem Map

Legend

- Selected Lot and Plan
- Pre-clearing area containing Endangered RE
- Pre-clearing area containing Of Concern RE
- Pre-clearing area that is a Least Concern RE
- Water
- Highway
- Connector
- Street/Local Road
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Pre-clearing regional ecosystem line-work reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only.

Digital data for the Pre-clearing regional ecosystem map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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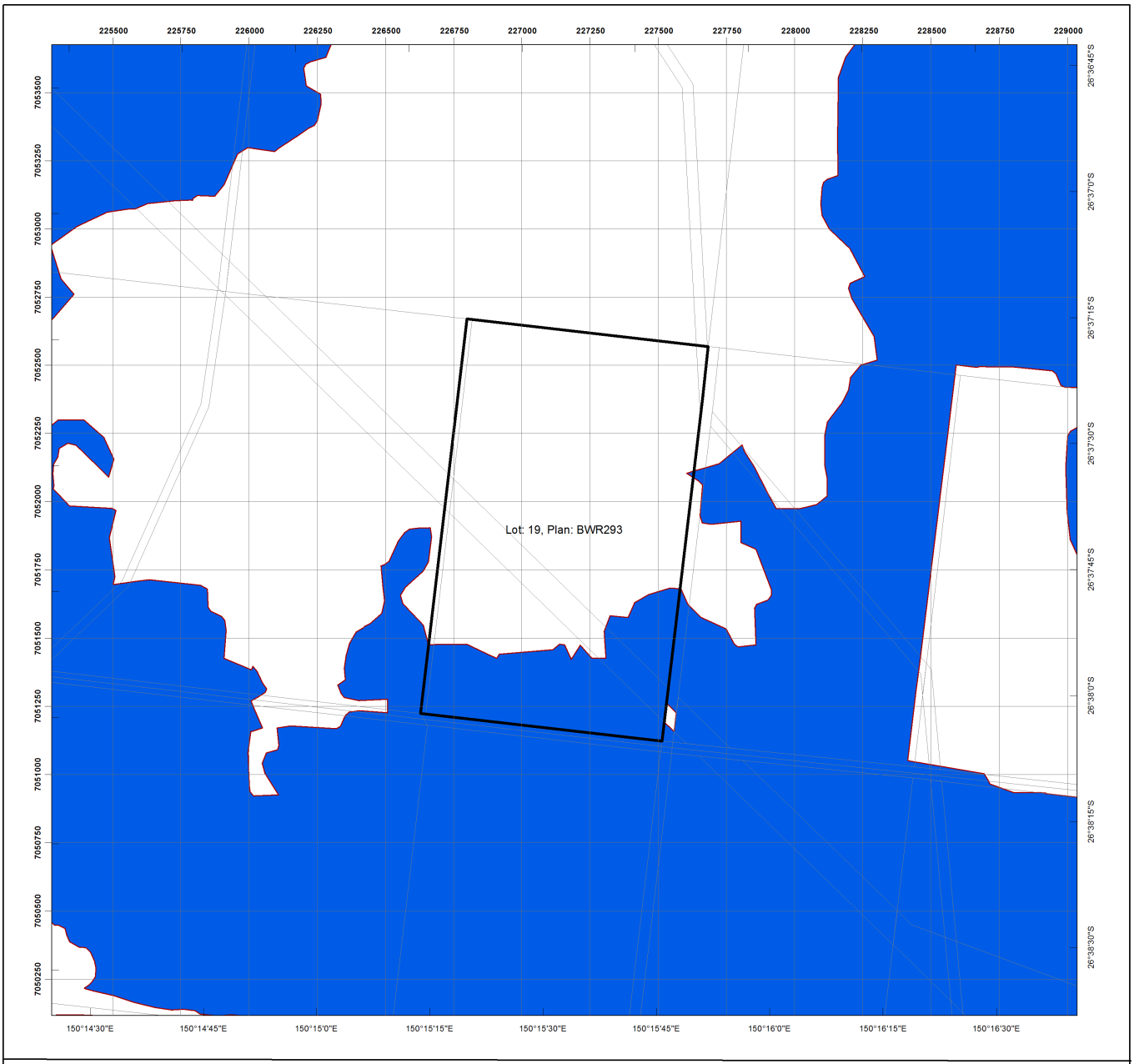
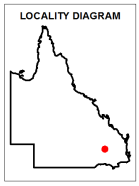
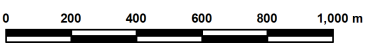


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries





This product is projected into:
GDA 1994 MGA Zone 56

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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

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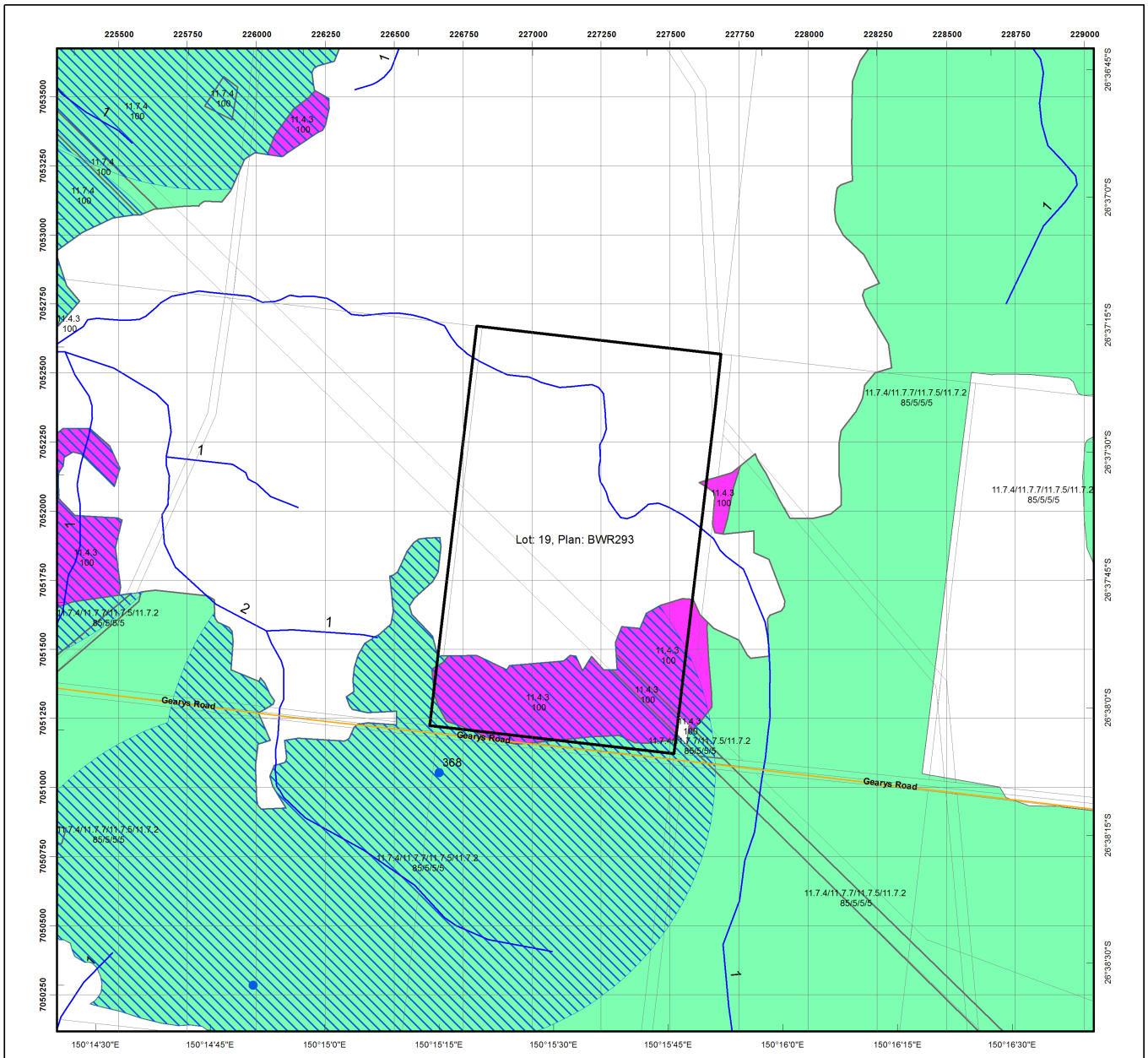


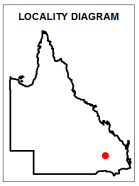
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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0 140 280 420 560 700 m

This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*; and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (http://www.resources.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21

resources.QLD.GOV.AU

Vegetation management report

For Lot: 17 Plan: AU199

27/07/2023

Queensland Government

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 17 Plan: AU199, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
17	AU199	Freehold	4,911,610
CO	SP265433	Easement	75,310
CU	SP261960	Easement	53,230
CV	SP261961	Easement	47,080
CP	SP265434	Easement	58,230

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

Does this property have a freehold tenure and is in the Wet Tropics of Queensland World Heritage Area?

No, this property is not located in the Wet Tropics of Queensland World Heritage Area.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 17 Plan: AU199, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Western Downs Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Barakula

Catchment(s)
Balonne-Condamine

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 17 Plan: AU199

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 491.57ha

Vegetation category	Area (ha)
Category B	216.3
Category C	0.1
Category X	275.1

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

The following Property Map of Assessable Vegetation (PMAVs) may be present on this property:

Reference number

2006/011741

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.3.14	Least concern	B	0.96	Eucalyptus spp., Angophora spp., Callitris spp. woodland on alluvial plains	Sparse
11.3.14	Least concern	C	0.01	Eucalyptus spp., Angophora spp., Callitris spp. woodland on alluvial plains	Sparse
11.3.25	Least concern	B	0.23	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.4	Of concern	B	0.53	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.5.21	Least concern	B	21.38	Corymbia bloxsomei +/- Callitris glaucophylla +/- Eucalyptus crebra +/- Angophora leiocarpa woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
11.5.4	Least concern	B	10.69	Eucalyptus chloroclada, Callitris glaucophylla, C. endlicheri, Angophora leiocarpa woodland on Cainozoic sand plains and/or remnant surfaces	Sparse
11.7.2	Least concern	B	7.63	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.2	Least concern	C	0.01	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.4	Least concern	B	151.99	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.4	Least concern	C	0.10	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.5	Least concern	B	7.63	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.5	Least concern	C	0.01	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.7	Least concern	B	15.25	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse
11.7.7	Least concern	C	0.01	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse
non-rem	None	X	275.15	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

There are no vegetation management wetlands present on this property.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
939	Nyctophilus corbeni	eastern long-eared bat	V	Dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris), also vine thickets.	100-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21
939	5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.3.10, 5.3.20, 5.5.6, 5.7.4, 5.7.8, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.16, 6.3.17, 6.3.18, 6.3.24, 6.3.25, 6.4.3, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.17, 6.5.18, 6.5.19, 6.7.5, 6.7.6, 6.7.7, 6.9.2, 11.2.1, 11.2.3, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.8, 11.3.9, 11.3.10, 11.3.11, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.39, 11.3.40, 11.4.1, 11.4.2, 11.4.3, 11.4.5, 11.4.6, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.15, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.8.2, 11.8.3, 11.8.4, 11.8.5, 11.8.6, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.13, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.4, 11.9.7, 11.9.8, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.8, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.5, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.15, 11.11.16, 11.11.17, 11.11.18, 11.11.19, 11.11.20, 11.11.21, 11.12.1, 11.12.2, 11.12.3, 11.12.4, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 13.3.1, 13.3.4, 13.11.1, 13.11.3, 13.11.4, 13.11.7, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10, 13.12.11

3.6 Area Management Plan(s)

Mulga Lands Fodder Area Management Plan

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

No Class A

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 17 Plan: AU199.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

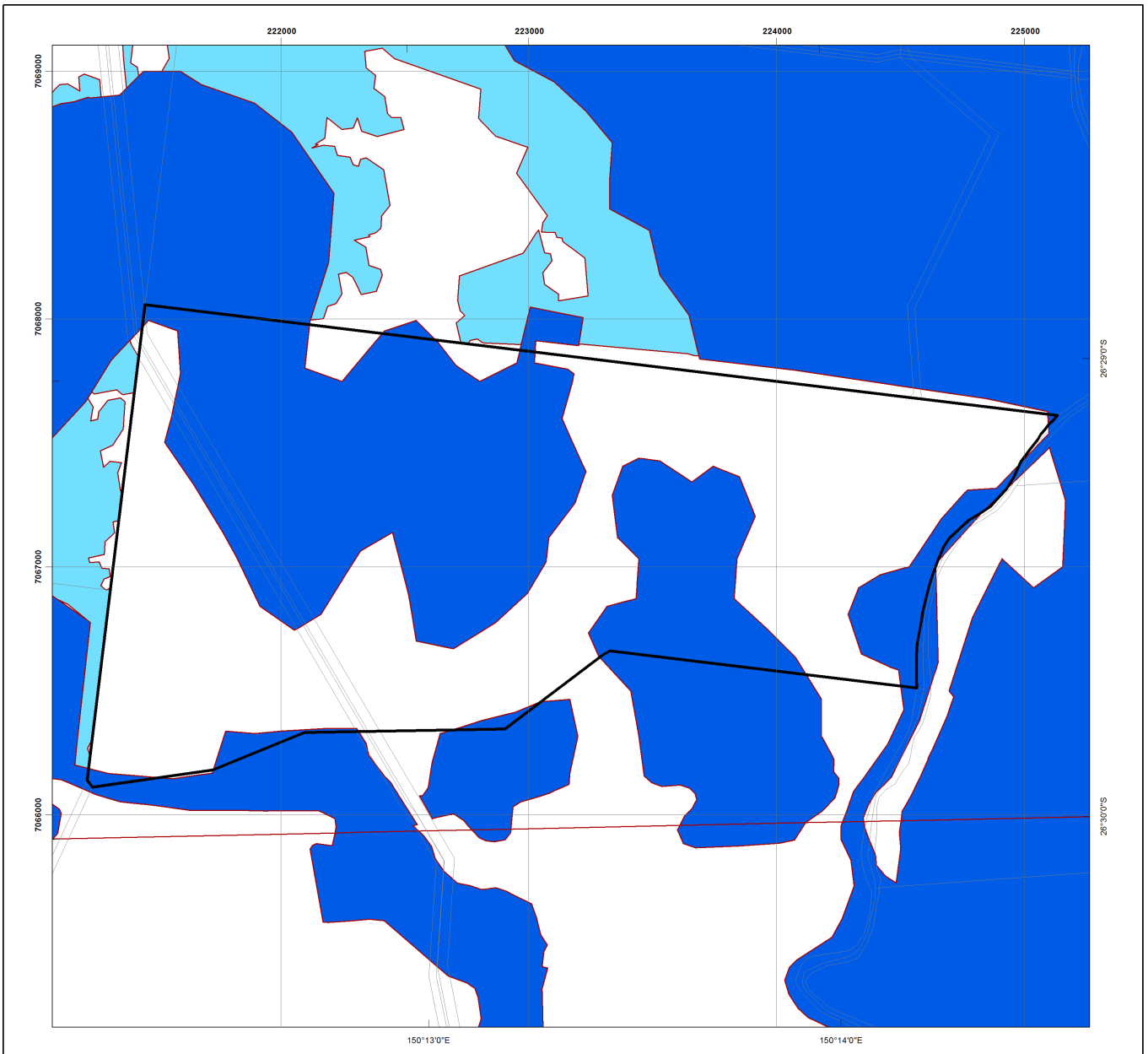
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map

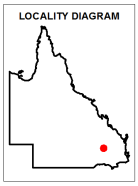


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries

LOCALITY DIAGRAM



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This product is projected into:
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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

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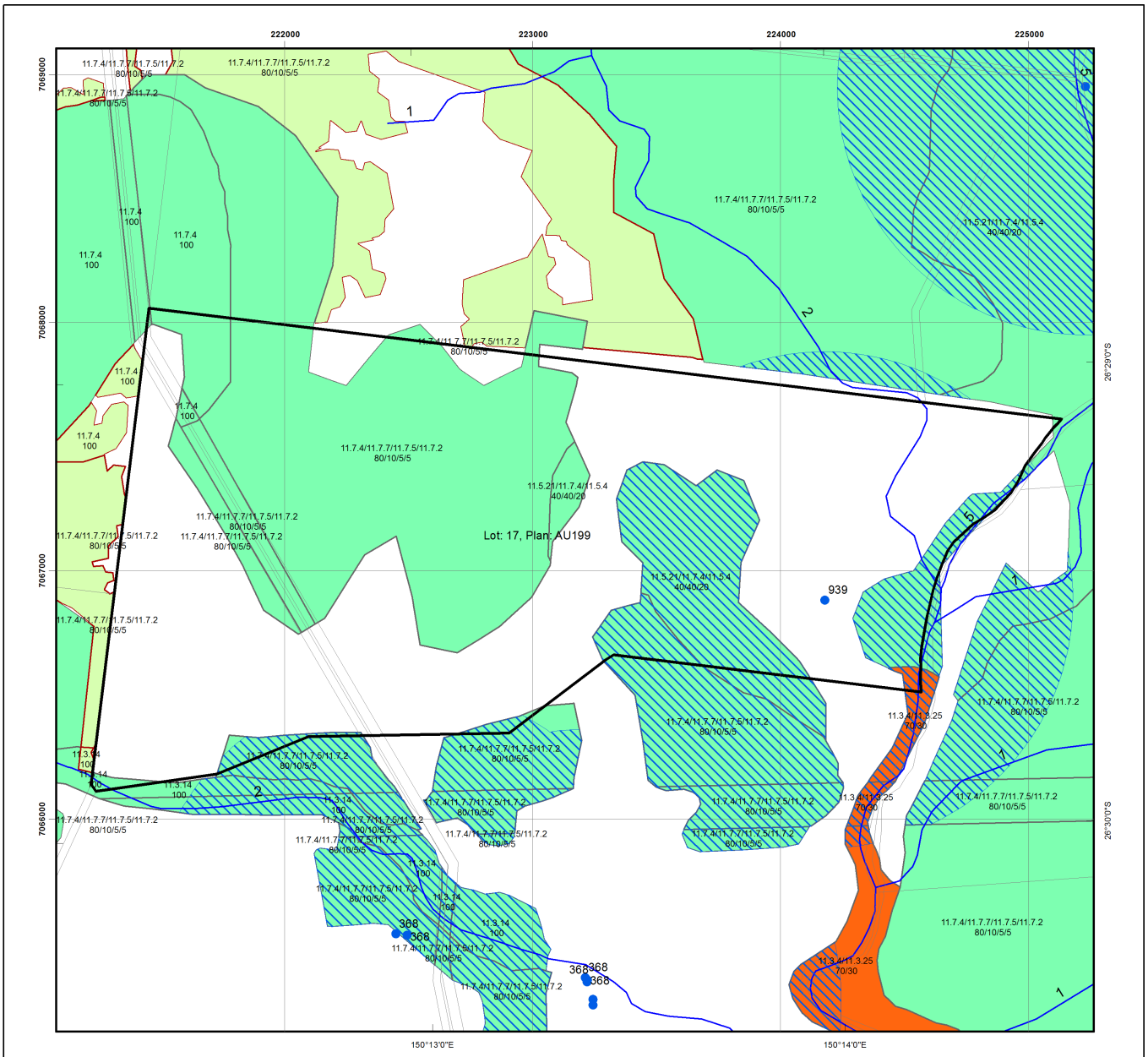
4.2 Vegetation management supporting map



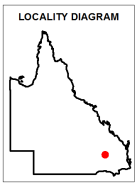
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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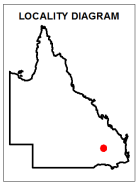
4.3 Coastal/non-coastal map

Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries

LOCALITY DIAGRAM



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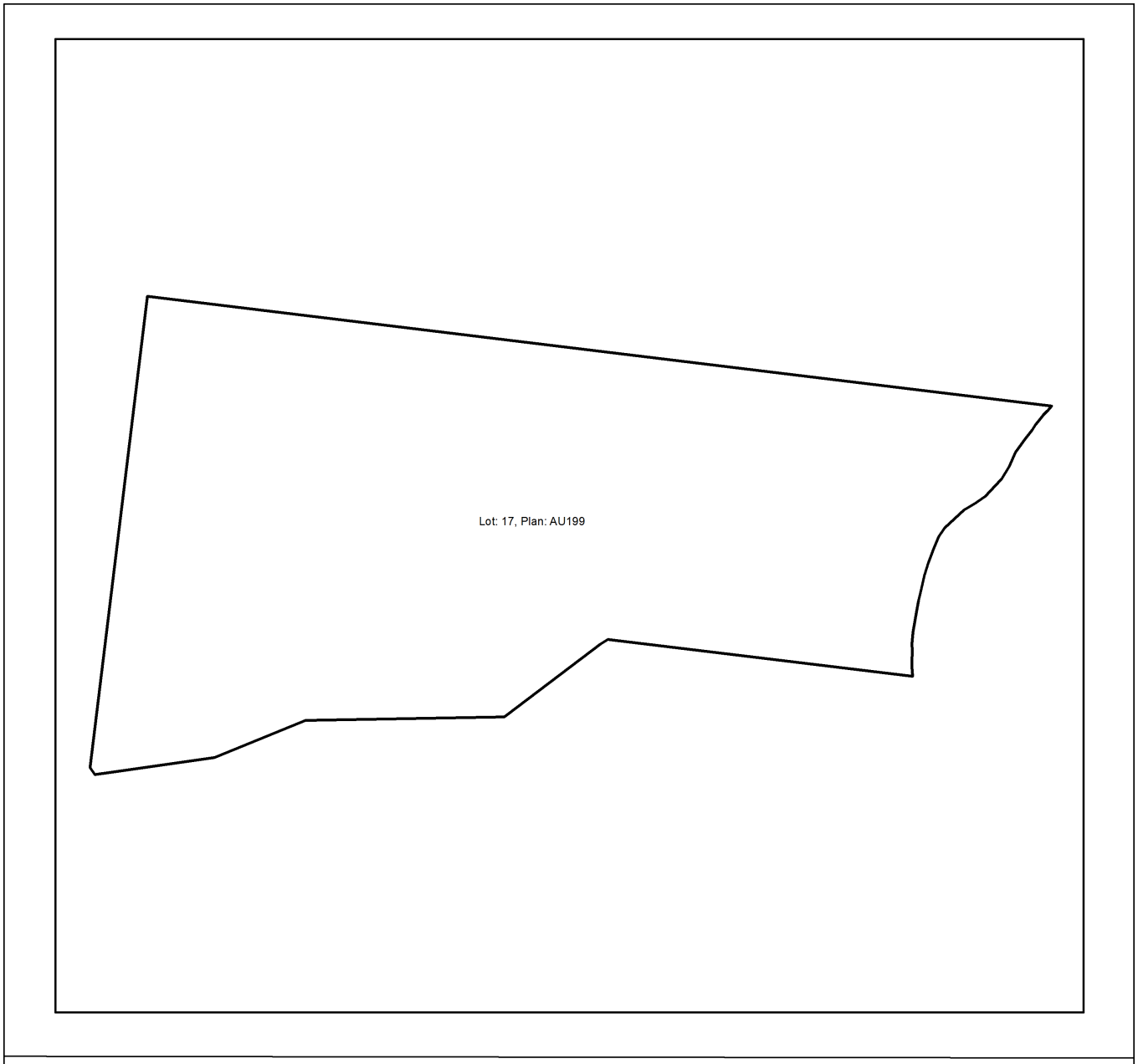
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



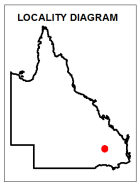
Agricultural Land Class A or B
as per State Planning Policy: State Interest for Agriculture

Legend

- Selected Lot and Plan
- Towns
- Rivers and creeks
- Freeways / motorways; Highways
- Secondary roads; Streets

Agricultural land class A or B

- A
- B
- Not class A or B



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5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:
Phone 1300 130 372 (and select option four)
Email palm@des.qld.gov.au
Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

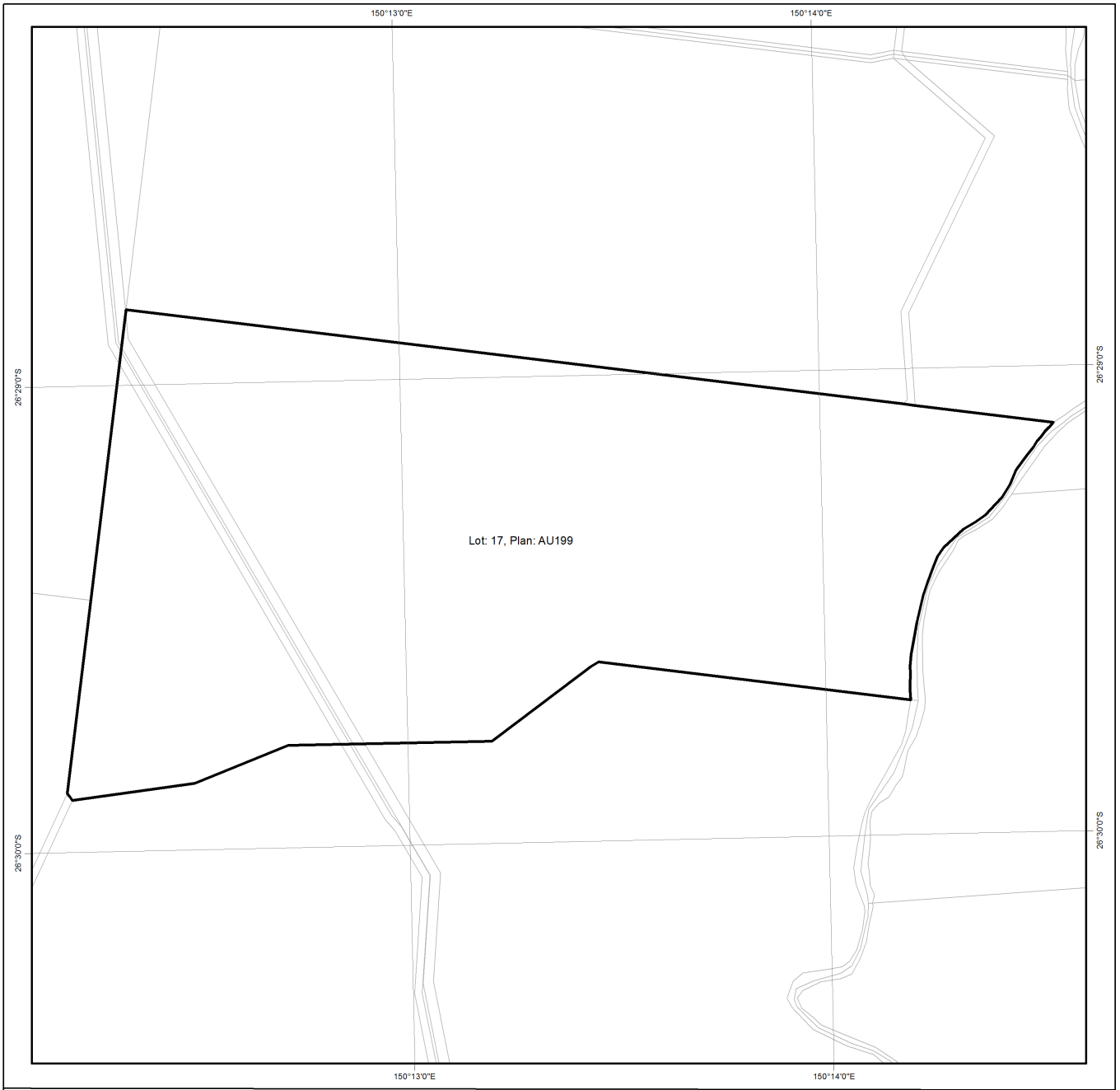
This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.



Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets

N

0 160 320 480 640 800 m

This product is projected into:
GDA 1994 MGA Zone 56

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as endangered by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and

- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 17 Plan: AU199

7.1 Koala districts

Koala District C

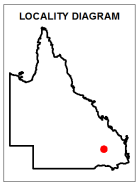
7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map

Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.



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The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/. The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

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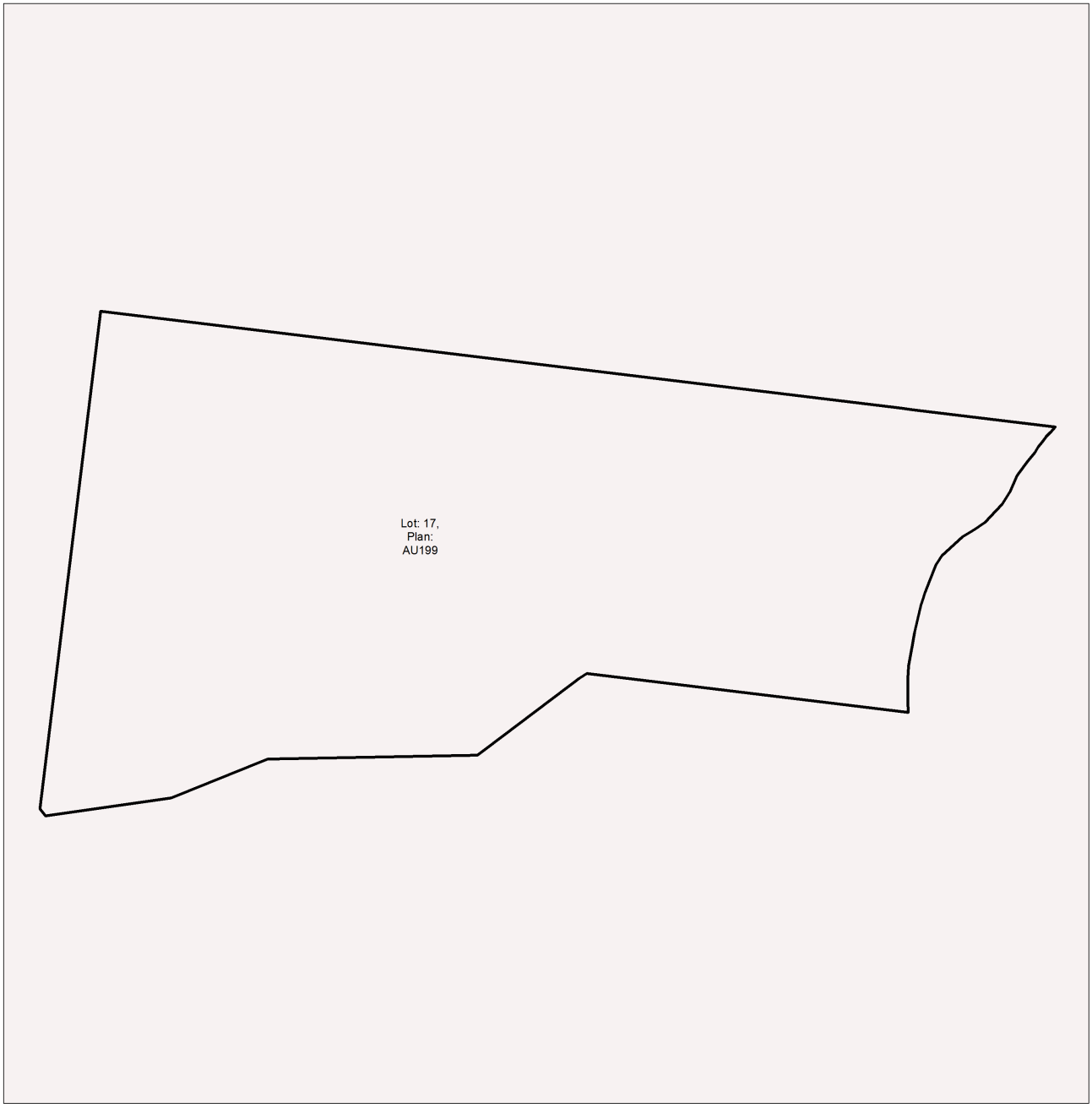
7.3 Koala habitat regional ecosystems for core koala habitat areas

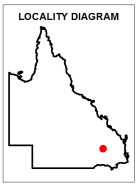


Koala habitat regional ecosystems for core koala habitat areas

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM



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The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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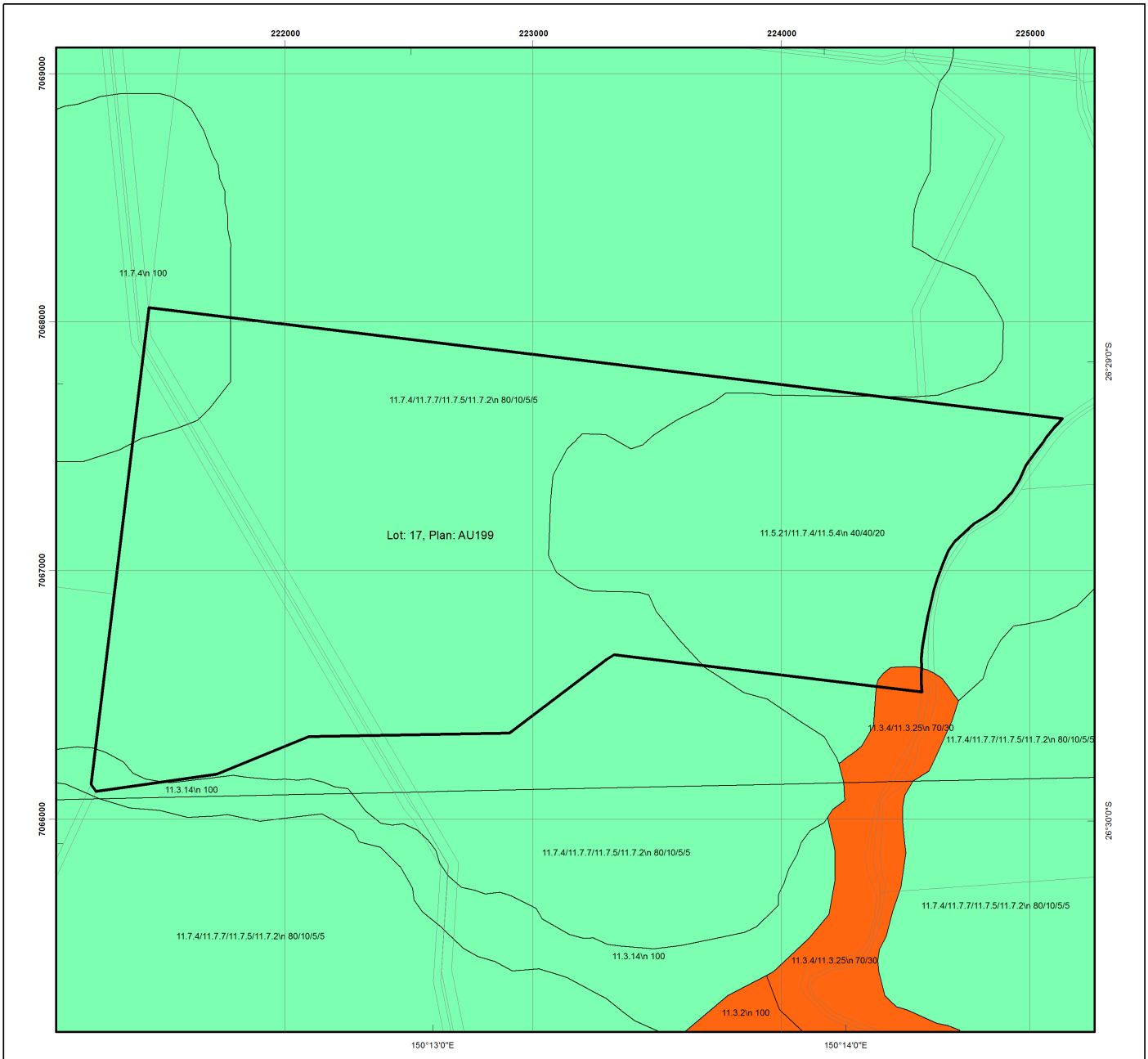
8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au



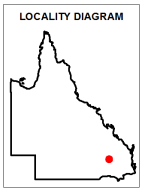
Vegetation Management Pre-clear Regional Ecosystem Map

Legend

- Selected Lot and Plan
- Pre-clearing area containing Endangered RE
- Pre-clearing area containing Of Concern RE
- Pre-clearing area that is a Least Concern RE
- Water
- Highway
- Connector
- Street/Local Road
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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Pre-clearing regional ecosystem line-work reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only.

Digital data for the Pre-clearing regional ecosystem map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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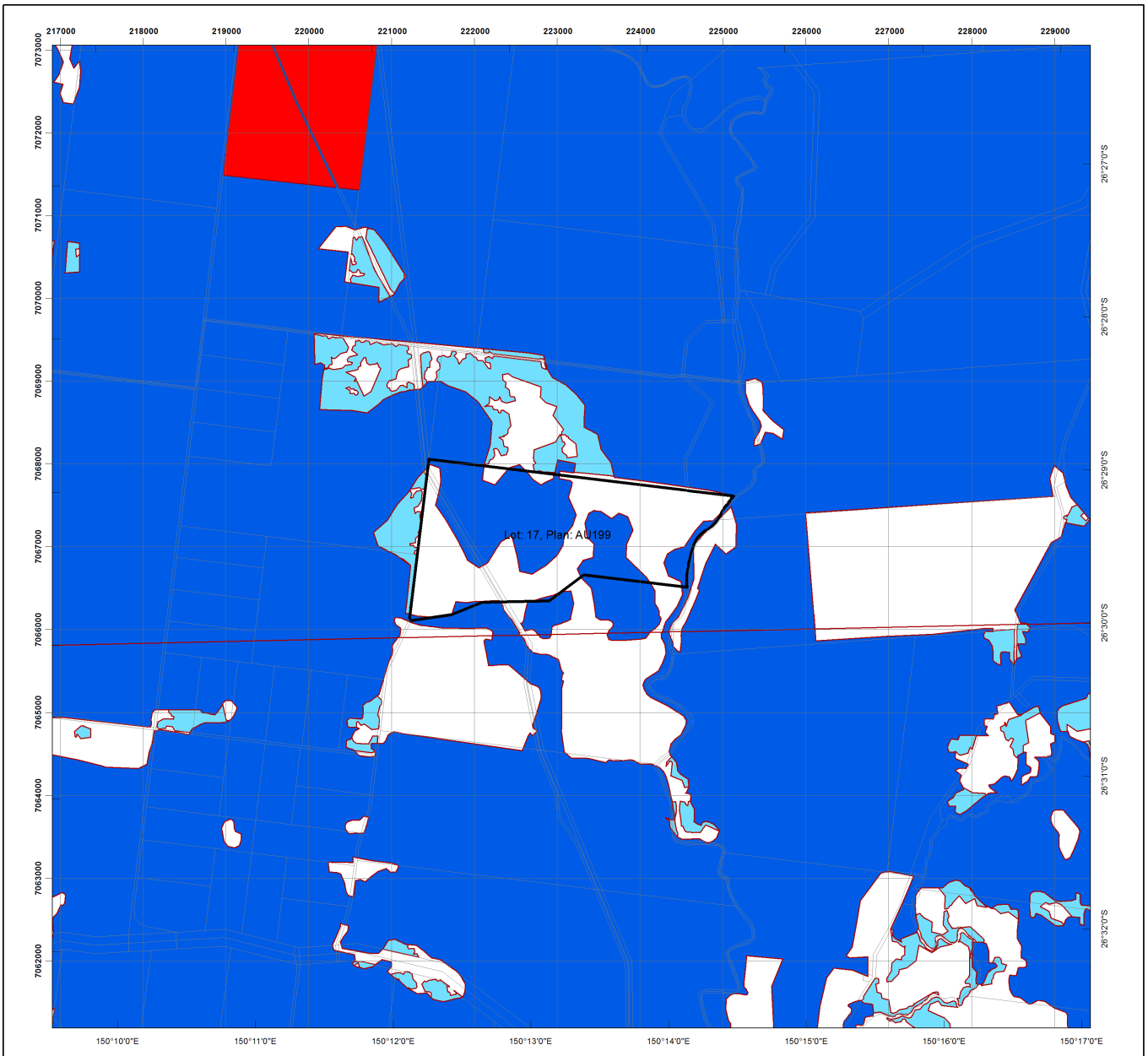
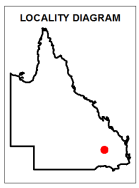
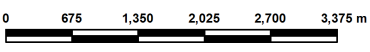


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries





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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

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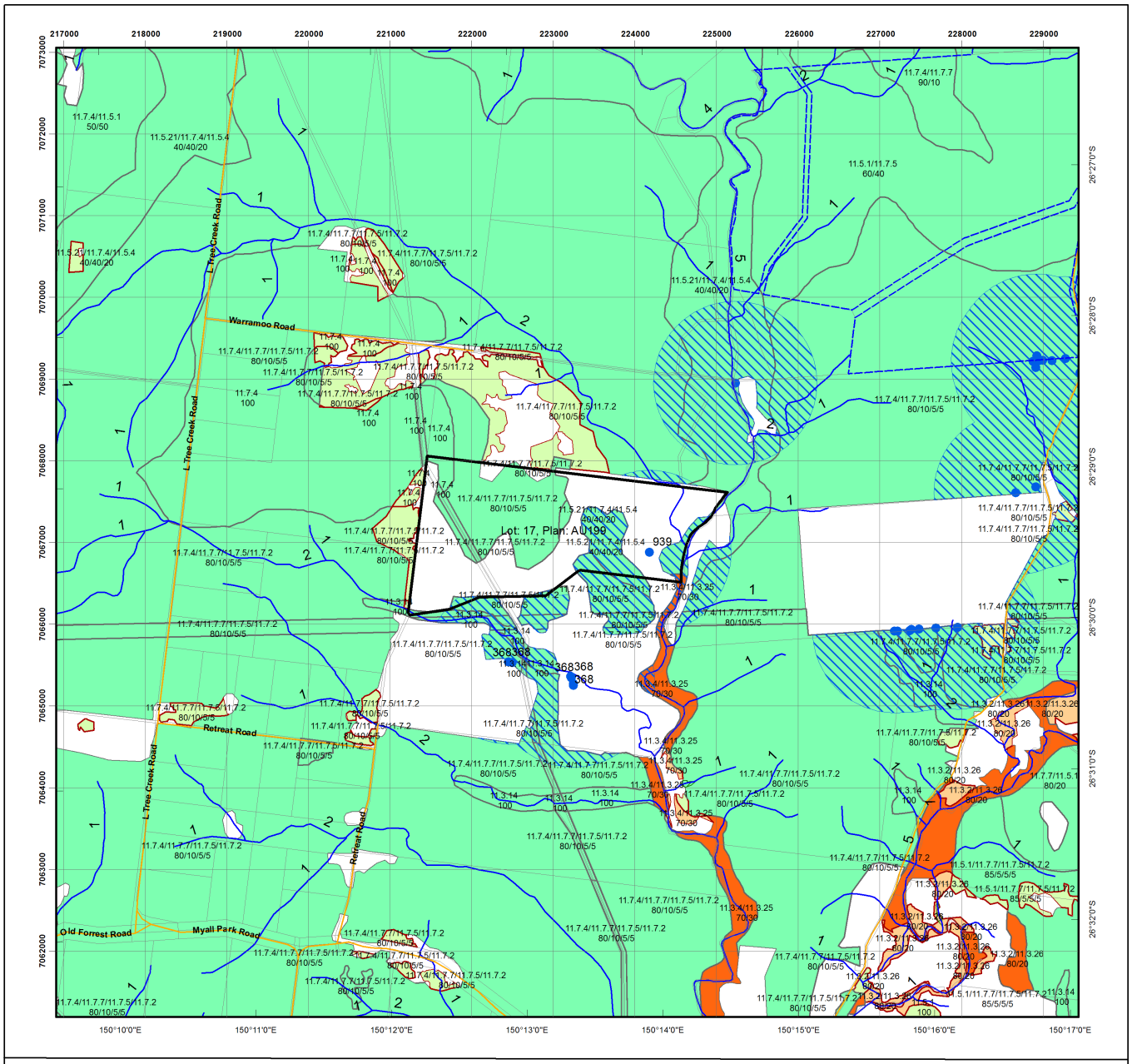


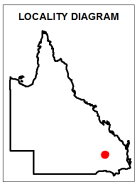
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features maps (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



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This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*; and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (http://www.resources.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
368	Strophurus taenicauda	golden-tailed gecko	NT	Open Acacia scrubs, eucalypt and Callitris woodland, and dry sclerophyll forest.	150-600m.	None	None
939	Nyctophilus corbeni	eastern long-eared bat	V	Dry open woodland (box and/or ironbark, savannah) and mallee; particularly riparian vegetation (Eucalyptus camaldulensis, Allocasuarina luehmanni, A. cristata and Callitris), also vine thickets.	100-600m.	None	None

Label	Regional Ecosystem (mandatory unless otherwise specified)
368	11.1.4, 11.2.1, 11.2.2, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.8, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.34, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.5, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.16, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 11.12.21
939	5.3.1, 5.3.2, 5.3.3, 5.3.4, 5.3.5, 5.3.6, 5.3.7, 5.3.8, 5.3.9, 5.3.10, 5.3.20, 5.5.6, 5.7.4, 5.7.8, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.16, 6.3.17, 6.3.18, 6.3.24, 6.3.25, 6.4.3, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.17, 6.5.18, 6.5.19, 6.7.5, 6.7.6, 6.7.7, 6.9.2, 11.2.1, 11.2.3, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.6, 11.3.8, 11.3.9, 11.3.10, 11.3.11, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.20, 11.3.23, 11.3.25, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.39, 11.3.40, 11.4.1, 11.4.2, 11.4.3, 11.4.5, 11.4.6, 11.4.8, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.15, 11.5.17, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.8.2, 11.8.3, 11.8.4, 11.8.5, 11.8.6, 11.8.8, 11.8.9, 11.8.11, 11.8.12, 11.8.13, 11.8.14, 11.8.15, 11.9.2, 11.9.3, 11.9.4, 11.9.7, 11.9.8, 11.9.9, 11.9.14, 11.10.1, 11.10.4, 11.10.6, 11.10.7, 11.10.8, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.5, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.15, 11.11.16, 11.11.17, 11.11.18, 11.11.19, 11.11.20, 11.11.21, 11.12.1, 11.12.2, 11.12.3, 11.12.4, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.11, 11.12.12, 11.12.13, 11.12.14, 11.12.17, 11.12.20, 13.3.1, 13.3.4, 13.11.1, 13.11.3, 13.11.4, 13.11.7, 13.11.8, 13.12.2, 13.12.3, 13.12.5, 13.12.8, 13.12.9, 13.12.10, 13.12.11

resources.QLD.GOV.AU

Vegetation management report

For Lot: 27 Plan: AU49

27/07/2023

Queensland Government

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Recent changes

Updated mapping

Updated vegetation mapping was released on 8 September 2022 and includes the most recent Queensland Herbarium scientific updates to the Regulated Vegetation Management Map, regional ecosystems, wetland, high-value regrowth and essential habitat mapping.

The Department of Environment and Science have also updated their protected plant and koala protection mapping to align with the Queensland Herbarium scientific updates.

Overview

Based on the lot on plan details you have supplied, this report provides the following detailed information:

Property details - information about the specified Lot on Plan, lot size, local government area, bioregion(s), subregion(s) and catchment(s);

Vegetation management framework - an explanation of the application of the framework and contact details for the Department of Resources who administer the framework;

Vegetation management framework details for the specified Lot on Plan including:

- the vegetation management categories on the property;
- the vegetation management regional ecosystems on the property;
- vegetation management watercourses or drainage features on the property;
- vegetation management wetlands on the property;
- vegetation management essential habitat on the property;
- whether any area management plans are associated with the property;
- whether the property is coastal or non-coastal; and
- whether the property is mapped as Agricultural Land Class A or B;

Protected plant framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework, including:

- high risk areas on the protected plant flora survey trigger map for the property;

Koala protection framework - an explanation of the application of the framework and contact details for the Department of Environment and Science who administer the framework; and

Koala protection framework details for the specified Lot on Plan including:

- the koala district the property is located in;
- koala priority areas on the property;
- core and locally refined koala habitat areas on the property;
- whether the lot is located in an identified koala broad-hectare area; and
- koala habitat regional ecosystems on the property for core koala habitat areas.

This information will assist you to determine your options for managing vegetation under:

- the vegetation management framework, which may include:

- exempt clearing work;
- accepted development vegetation clearing code;
- an area management plan;
- a development approval;

- the protected plant framework, which may include:

- the need to undertake a flora survey;
- exempt clearing;
- a protected plant clearing permit;

- the koala protection framework, which may include:

- exempted development;
- a development approval;
- the need to undertake clearing sequentially and in the presence of a koala spotter.

Other laws

The clearing of native vegetation is regulated by both Queensland and Australian legislation, and some local governments also regulate native vegetation clearing. You may need to obtain an approval or permit under another Act, such as the Commonwealth Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Section 8 of this guide provides contact details of other agencies you should confirm requirements with, before commencing vegetation clearing.

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1. Property details

1.1 Tenure and title area

All of the lot, plan, tenure and title area information associated with property Lot: 27 Plan: AU49, are listed in Table 1.

Table 1: Lot, plan, tenure and title area information for the property

Lot	Plan	Tenure	Property title area (sq metres)
27	AU49	Freehold	10,040,251

The tenure of the land may affect whether clearing is considered exempt clearing work or may be carried out under an accepted development vegetation clearing code.

Does this property have a freehold tenure and is in the Wet Tropics of Queensland World Heritage Area?

No, this property is not located in the Wet Tropics of Queensland World Heritage Area.

1.2 Property location

Table 2 provides a summary of the locations for property Lot: 27 Plan: AU49, in relation to natural and administrative boundaries.

Table 2: Property location details

Local Government(s)
Western Downs Regional

Bioregion(s)	Subregion(s)
Brigalow Belt	Barakula

Catchment(s)
Balonne-Condamine

2. Vegetation management framework (administered by the Department of Resources)

The *Vegetation Management Act 1999* (VMA), the Vegetation Management Regulation 2012, the *Planning Act 2016* and the Planning Regulation 2017, in conjunction with associated policies and codes, form the Vegetation Management Framework.

The VMA does not apply to all land tenures or vegetation types. State forests, national parks, forest reserves and some tenures under the *Forestry Act 1959* and *Nature Conservation Act 1992* are not regulated by the VMA. Managing or clearing vegetation on these tenures may require approvals under these laws.

The following native vegetation is not regulated under the VMA but may require permit(s) under other laws:

- grass or non-woody herbage;
- a plant within a grassland regional ecosystem prescribed under Schedule 5 of the Vegetation Management Regulation 2012; and
- a mangrove.

2.1 Exempt clearing work

Exempt clearing work is an activity for which you do not need to notify the Department of Resources or obtain an approval under the vegetation management framework. Exempt clearing work was previously known as exemptions.

In areas that are mapped as Category X (white in colour) on the regulated vegetation management map (see section 4.1), and where the land tenure is freehold, indigenous land and leasehold land for agriculture and grazing purposes, the clearing of vegetation is considered exempt clearing work and does not require notification or development approval under the vegetation management framework. For all other land tenures, contact the Department of Resources before commencing clearing to ensure that the proposed activity is exempt clearing work.

A range of routine property management activities are considered exempt clearing work. A list of exempt clearing work is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/exemptions.

Exempt clearing work may be affected if the proposed clearing area is subject to development approval conditions, a covenant, an environmental offset, an exchange area, a restoration notice, or an area mapped as Category A. Exempt clearing work may require approval under other Commonwealth, State or Local Government laws, or local government planning schemes. Contact the Department of Resources prior to clearing in any of these areas.

2.2 Accepted development vegetation clearing codes

Some clearing activities can be undertaken under an accepted development vegetation clearing code. The codes can be downloaded at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/codes

If you intend to clear vegetation under an accepted development vegetation clearing code, you must notify the Department of Resources before commencing. The information in this report will assist you to complete the online notification form.

You can complete the online form at
https://apps.dnrm.qld.gov.au/vegetation/

2.3 Area management plans

Area Management Plans (AMP) provide an alternative approval system for vegetation clearing under the vegetation management framework. They list the purposes and clearing conditions that have been approved for the areas covered by the plan. It is not necessary to use an AMP, even when an AMP applies to your property.

On 8 March 2020, AMPs ended for fodder harvesting, managing thickened vegetation and managing encroachment. New notifications cannot be made for these AMPs. You will need to consider options for fodder harvesting, managing thickened vegetation or encroachment under a relevant accepted development vegetation clearing code or apply for a development approval.

New notifications can be made for all other AMPs. These will continue to apply until their nominated end date.

If an Area Management Plan applies to your property for which you can make a new notification, it will be listed in Section 3.6 of this report. Before clearing under one of these AMPs, you must first notify the Department of Resources and then follow the conditions and requirements listed in the AMP.
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/area-management-plans

2.4 Development approvals

If under the vegetation management framework your proposed clearing is not exempt clearing work, or is not permitted under an accepted development vegetation clearing code, or an AMP, you may be able to apply for a development approval. Information on how to apply for a development approval is available at
https://www.qld.gov.au/environment/land/management/vegetation/clearing-approvals/development

2.5. Contact information for the Department of Resources

For further information on the vegetation management framework:
Phone 135VEG (135 834)
Email vegetation@resources.qld.gov.au
Visit https://www.resources.qld.gov.au/?contact=vegetation to submit an online enquiry.

3. Vegetation management framework for Lot: 27 Plan: AU49

3.1 Vegetation categories

The vegetation categories on your property are shown on the regulated vegetation management map in section 4.1 of this report. A summary of vegetation categories on the subject lot are listed in Table 3. Descriptions for these categories are shown in Table 4.

Table 3: Vegetation categories for subject property. Total area: 1000.86ha

Vegetation category	Area (ha)
Category B	827.5
Category C	124.2
Category X	49.2

Table 4: Description of vegetation categories

Category	Colour on Map	Description	Requirements / options under the vegetation management framework
A	red	Compliance areas, environmental offset areas and voluntary declaration areas	Special conditions apply to Category A areas. Before clearing, contact the Department of Resources to confirm any requirements in a Category A area.
B	dark blue	Remnant vegetation areas	Exempt clearing work, or notification and compliance with accepted development vegetation clearing codes, area management plans or development approval.
C	light blue	High-value regrowth areas	Exempt clearing work, or notification and compliance with managing Category C regrowth vegetation accepted development vegetation clearing code.
R	yellow	Regrowth within 50m of a watercourse or drainage feature in the Great Barrier Reef catchment areas	Exempt clearing work, or notification and compliance with managing Category R regrowth accepted development vegetation clearing code or area management plans.
X	white	Clearing on freehold land, indigenous land and leasehold land for agriculture and grazing purposes is considered exempt clearing work under the vegetation management framework. Contact the Department of Resources to clarify whether a development approval is required for other State land tenures.	No permit or notification required on freehold land, indigenous land and leasehold land for agriculture and grazing. A development approval may be required for some State land tenures.

Property Map of Assessable Vegetation (PMAV)

There is no Property Map of Assessable Vegetation (PMAV) present on this property.

3.2 Regional ecosystems

The endangered, of concern and least concern regional ecosystems on your property are shown on the vegetation management supporting map in section 4.2 and are listed in Table 5.

A description of regional ecosystems can be accessed online at https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/descriptions/

Table 5: Regional ecosystems present on subject property

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
11.3.14	Least concern	B	103.37	Eucalyptus spp., Angophora spp., Callitris spp. woodland on alluvial plains	Sparse
11.3.2	Of concern	B	20.94	Eucalyptus populnea woodland on alluvial plains	Sparse
11.3.2	Of concern	C	0.74	Eucalyptus populnea woodland on alluvial plains	Sparse
11.3.25	Least concern	B	16.18	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.25	Least concern	C	5.28	Eucalyptus tereticornis or E. camaldulensis woodland fringing drainage lines	Sparse
11.3.26	Least concern	B	5.24	Eucalyptus moluccana or E. microcarpa woodland to open forest on margins of alluvial plains	Sparse
11.3.26	Least concern	C	0.18	Eucalyptus moluccana or E. microcarpa woodland to open forest on margins of alluvial plains	Sparse
11.3.4	Of concern	B	37.75	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.3.4	Of concern	C	12.32	Eucalyptus tereticornis and/or Eucalyptus spp. woodland on alluvial plains	Sparse
11.7.2	Least concern	B	32.20	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.2	Least concern	C	5.28	Acacia spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Sparse
11.7.4	Least concern	B	545.46	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.4	Least concern	C	88.50	Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius woodland on Cainozoic lateritic duricrust	Sparse
11.7.5	Least concern	B	32.20	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.5	Least concern	C	5.28	Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks	Sparse
11.7.7	Least concern	B	34.12	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse
11.7.7	Least concern	C	6.60	Eucalyptus fibrosa subsp. nubilis +/- Corymbia spp. +/- Eucalyptus spp. woodland on Cainozoic lateritic duricrust	Sparse

Regional Ecosystem	VMA Status	Category	Area (Ha)	Short Description	Structure Category
non-rem	None	X	49.22	None	None

Please note:

1. All area and area derived figures included in this table have been calculated via reprojecting relevant spatial features to Albers equal-area conic projection (central meridian = 146, datum Geocentric Datum of Australia 1994). As a result, area figures may differ slightly if calculated for the same features using a different co-ordinate system.

2. If Table 5 contains a Category 'plant', please be aware that this refers to 'plantations' such as forestry, and these areas are considered non-remnant under the VMA.

The VMA status of the regional ecosystem (whether it is endangered, of concern or least concern) also determines if any of the following are applicable:

- exempt clearing work;
- accepted development vegetation clearing codes;
- performance outcomes in State Code 16 of the State Development Assessment Provisions (SDAP).

3.3 Watercourses

Vegetation management watercourses and drainage features for this property are shown on the vegetation management supporting map in section 4.2.

3.4 Wetlands

Vegetation management wetlands are present on this property and are shown on the vegetation management supporting map in section 4.2 of this report.

3.5 Essential habitat

Under the VMA, essential habitat for protected wildlife is native wildlife prescribed under the *Nature Conservation Act 1992* (NCA) as critically endangered, endangered, vulnerable or near-threatened wildlife.

Essential habitat for protected wildlife includes suitable habitat on the lot, or where a species has been known to occur up to 1.1 kilometres from a lot on which there is assessable vegetation. These important habitat areas are protected under the VMA.

Any essential habitat on this property will be shown as blue hatching on the vegetation supporting map in section 4.2.

If essential habitat is identified on the lot, information about the protected wildlife species is provided in Table 6 below. The numeric labels on the vegetation management supporting map can be cross referenced with Table 6 to outline the essential habitat factors for that particular species. There may be essential habitat for more than one species on each lot, and areas of Category A, Category B and Category C can be mapped as Essential Habitat.

Essential habitat is compiled from a combination of species habitat models and buffered species records. Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated. Essential habitat, for protected wildlife, means an area of vegetation shown on the Regulated Vegetation Management Map -

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database. Essential habitat factors are comprised of - regional ecosystem (mandatory for most species), vegetation community, altitude, soils, position in landscape; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

If there is no essential habitat mapping shown on the vegetation management supporting map for this lot, and there is no table in the sections below, it confirms that there is no essential habitat on the lot.

Category A and/or Category B and/or Category C

Table 6: Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
860	Phascolarctos cinereus	koala	E	Open forests and woodlands containing Eucalyptus, Corymbia, Lophostemon or Melaleuca trees having a trunk of a diameter of more than 10cm at 1.3m above the ground. Tree species used for food and habitat varies across the state and can include: Corymbia citriodora, Corymbia henryi, Corymbia intermedia, Eucalyptus acmenoides, Eucalyptus bancroftii, Eucalyptus biturbinata, Eucalyptus blakelyi, Eucalyptus brownii, Eucalyptus camaldulensis, Eucalyptus carnea, Eucalyptus chloroclada, Eucalyptus coolabah, Eucalyptus crebra, Eucalyptus dealbata, Eucalyptus drepanophylla, Eucalyptus dunnii, Eucalyptus eugenioides, Eucalyptus exserta, Eucalyptus fibrosa, Eucalyptus grandis, Eucalyptus helidonica, Eucalyptus latisinensis, Eucalyptus longirostrata, Eucalyptus major, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus microcarpa, Eucalyptus microcorys, Eucalyptus microtheca, Eucalyptus moluccana, Eucalyptus montivaga, Eucalyptus orgadophila, Eucalyptus papuana, Eucalyptus pilularis, Eucalyptus platyphylla, Eucalyptus populnea, Eucalyptus portuensis, Eucalyptus propinqua, Eucalyptus racemosa, Eucalyptus resinifera, Eucalyptus robusta, Eucalyptus saligna, Eucalyptus seeana, Eucalyptus siderophloia, Eucalyptus sideroxylon, Eucalyptus tereticornis, Eucalyptus thozetiana, Eucalyptus tindaliae, Eucalyptus umbra, Lophostemon confertus, Melaleuca leucadendra, Melaleuca quinquenervia.	Sea level to 1000m.	None	Riparian areas, plains and hill/escarpment slopes.

Label	Regional Ecosystem (mandatory unless otherwise specified)
860	4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, 4.3.8, 4.3.10, 4.3.11, 4.5.3, 4.5.5, 4.5.6, 4.5.8, 4.5.9, 4.7.1, 4.7.7, 4.7.8, 4.9.6, 4.9.10, 4.9.12, 4.9.17, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.11, 6.3.12, 6.3.17, 6.3.18, 6.3.22, 6.3.24, 6.3.25, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.13, 6.5.14, 6.5.15, 6.5.16, 6.5.17, 6.5.18, 6.5.19, 6.6.2, 6.7.1, 6.7.2, 6.7.5, 6.7.6, 6.7.7, 6.7.9, 6.7.11, 6.7.12, 6.7.13, 6.7.14, 6.7.17, 6.9.3, 7.2.3, 7.2.4, 7.2.7, 7.2.11, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 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11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.6, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.14, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.6, 12.5.7, 12.5.10, 12.5.12, 12.8.1, 12.8.8, 12.8.9, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 12.8.24, 12.8.25, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.14, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.21, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.15, 12.11.16, 12.11.17, 12.11.18, 12.11.22, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.2, 12.12.3, 12.12.4, 12.12.5, 12.12.6, 12.12.7, 12.12.8, 12.12.9, 12.12.11, 12.12.12, 12.12.14, 12.12.15, 12.12.23, 12.12.24, 12.12.25, 12.12.28, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.11.9, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.6, 13.12.8, 13.12.9, 13.12.10.

3.6 Area Management Plan(s)

Mulga Lands Fodder Area Management Plan

3.7 Coastal or non-coastal

For the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP), this property is regarded as*

Non Coastal

*See also Map 4.3

3.8 Agricultural Land Class A or B

The following can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code:

Does this lot contain land that is mapped as Agricultural Land Class A or B in the State Planning Interactive Mapping System?

Class A (with urban areas masked as per SPP): 16.47ha

No Class B

Note - This confirms Agricultural Land Classes as per the State Planning Interactive Mapping System only. This response does not include Agricultural Land Classes identified under local government planning schemes. For further information, check the Planning Scheme for your local government area.

See Map 4.4 to identify the location and extent of Class A and/or Class B Agricultural land on Lot: 27 Plan: AU49.

4. Vegetation management framework maps

Vegetation management maps included in this report may also be requested individually at:
https://www.resources.qld.gov.au/qld/environment/land/vegetation/vegetation-map-request-form

Regulated vegetation management map

The regulated vegetation management map shows vegetation categories needed to determine clearing requirements. These maps are updated monthly to show new property maps of assessable vegetation (PMAV).

Vegetation management supporting map

The vegetation management supporting map provides information on regional ecosystems, wetlands, watercourses and essential habitat.

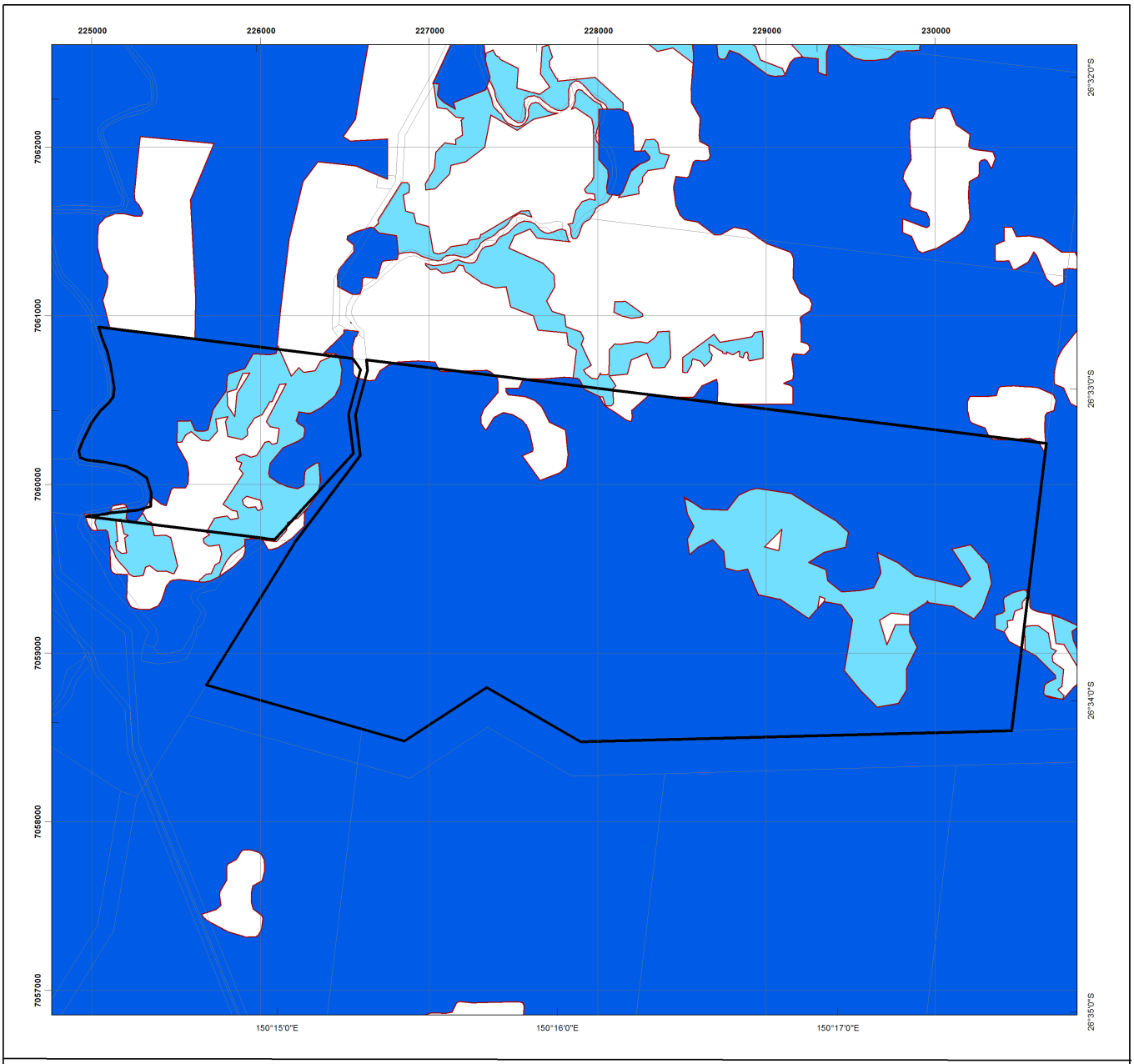
Coastal/non-coastal map

The coastal/non-coastal map confirms whether the lot, or which parts of the lot, are considered coastal or non-coastal for the purposes of the accepted development vegetation clearing codes and State Code 16 of the State Development Assessment Provisions (SDAP).

Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture

The Agricultural Land Class map confirms the location and extent of land mapped as Agricultural Land Classes A or B as identified on the State Planning Interactive Mapping System. Please note that this map does not include areas identified as Agricultural Land Class A or B in local government planning schemes. This map can be used to identify Agricultural Land Class A or B areas under the "Managing regulated regrowth vegetation" accepted development vegetation clearing code.

4.1 Regulated vegetation management map

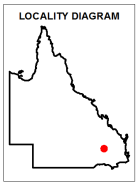


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries

LOCALITY DIAGRAM



N

0 330 660 990 1,320 1,650 m

This product is projected into:
GDA 1994 MGA Zone 56

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

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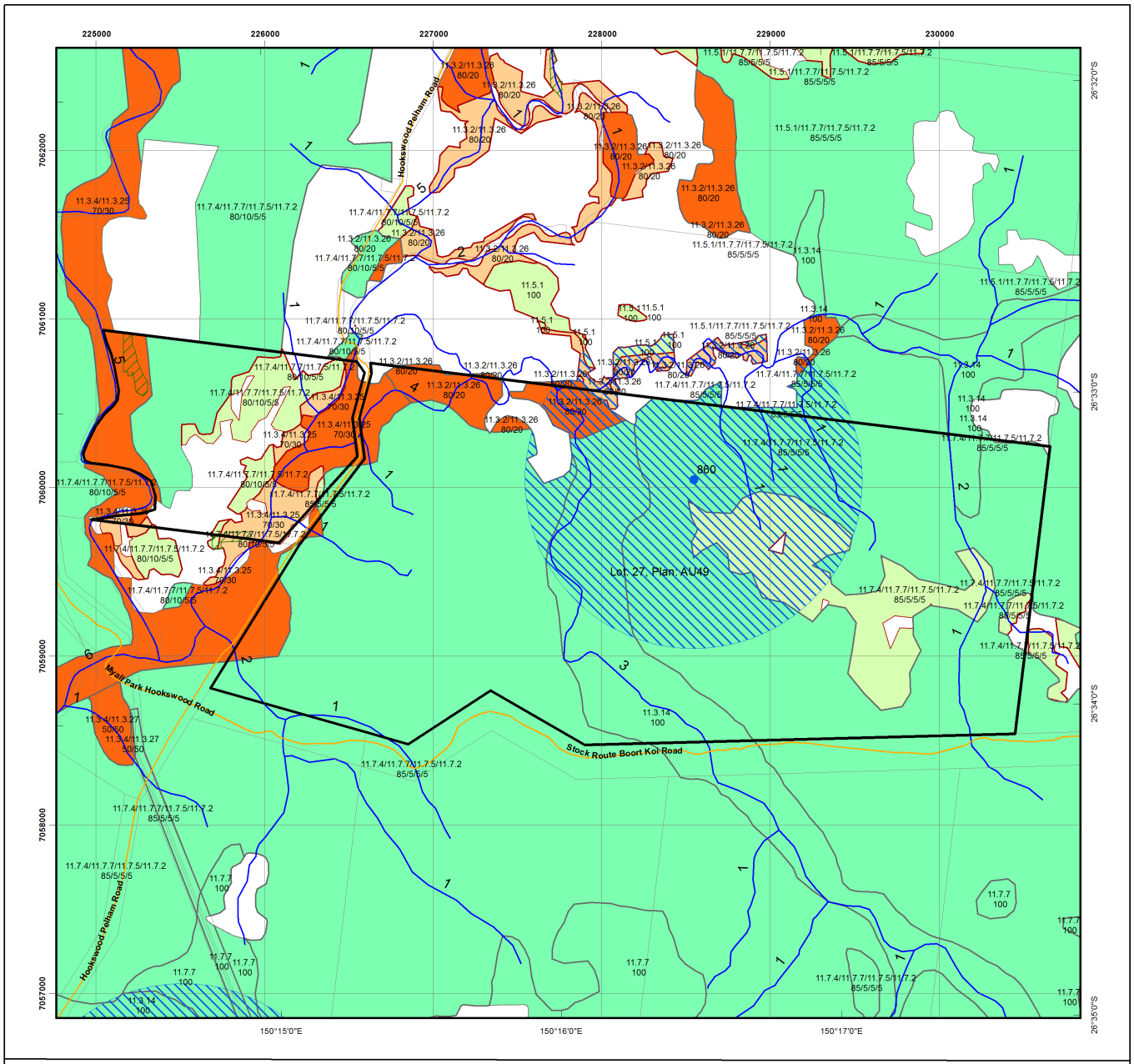
4.2 Vegetation management supporting map



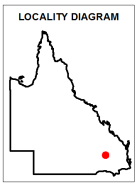
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features maps (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



N

0 230 460 690 920 1,150 m

This product is projected into: GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Resources makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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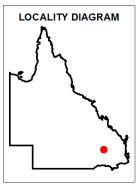
4.3 Coastal/non-coastal map

Coastal/Non Coastal Map

Legend

- Selected Lot and Plan
- Coastal
- Non Coastal
- Other land parcel boundaries

LOCALITY DIAGRAM



N

0 330 660 990 1,320 1,650 m

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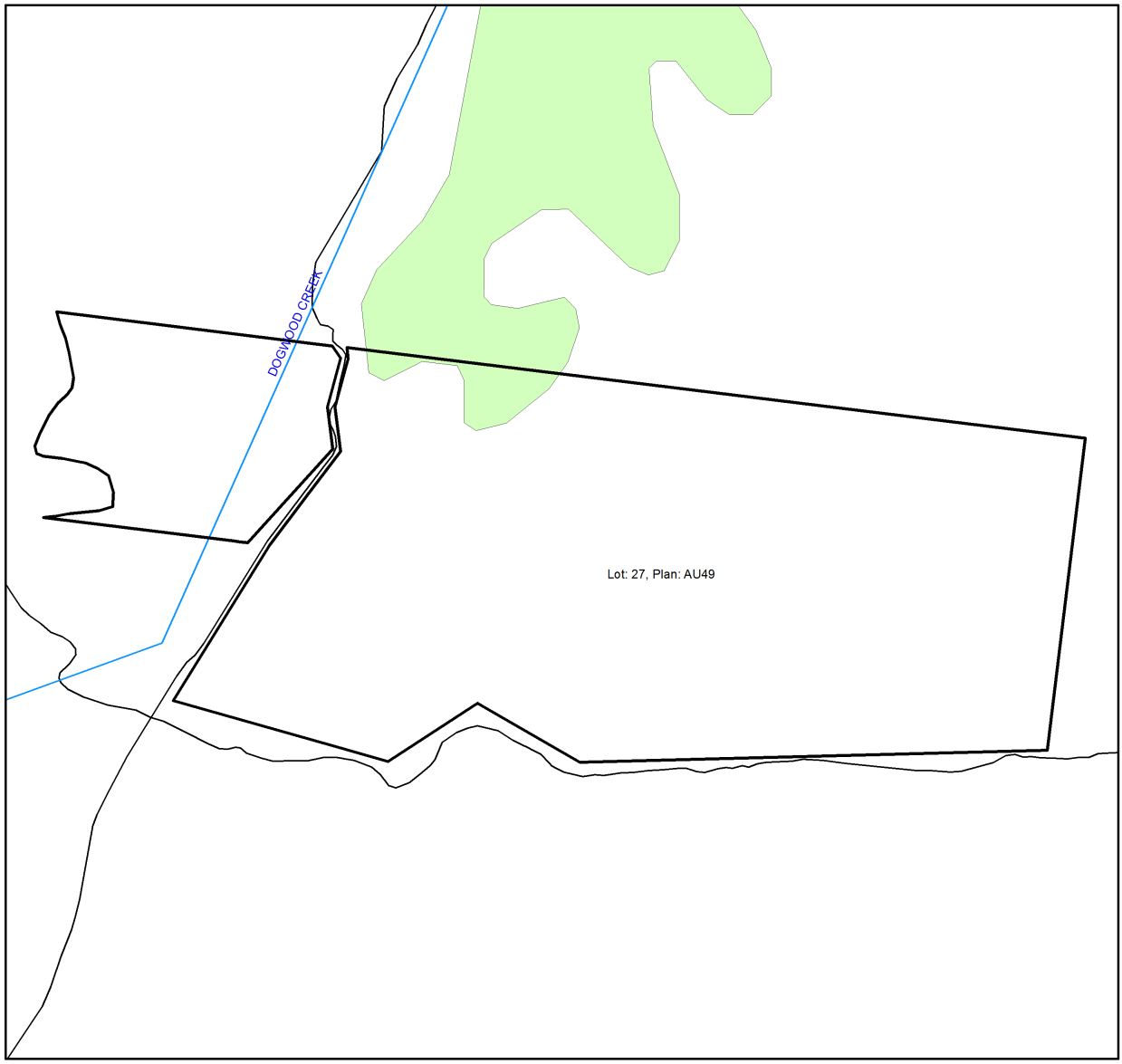
4.4 Agricultural Land Class A or B as per State Planning Policy: State Interest for Agriculture



Agricultural Land Class A or B
as per State Planning Policy: State Interest for Agriculture

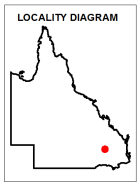
Legend

- Selected Lot and Plan
- Towns
- Rivers and creeks
- Freeways / motorways; Highways
- Secondary roads; Streets

Agricultural land class A or B

- A
- B
- Not class A or B

LOCALITY DIAGRAM



N

Disclaimer
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0 330 660 990 1320 1650 m

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This product is projected into GDA 1994 MGA Zone 56

5. Protected plants framework (administered by the Department of Environment and Science (DES))

In Queensland, all plants that are native to Australia are protected plants under the *Nature Conservation Act 1992* (NCA). The NCA regulates the clearing of protected plants 'in the wild' (see Operational policy: When a protected plant in Queensland is considered to be 'in the wild') that are listed as critically endangered, endangered, vulnerable or near threatened under the Act.

Please note that the protected plant clearing framework applies irrespective of the classification of the vegetation under the *Vegetation Management Act 1999* and any approval or exemptions given under another Act, for example, the *Vegetation Management Act 1999* or *Planning Regulation 2017*.

5.1 Clearing in high risk areas on the flora survey trigger map

The flora survey trigger map identifies high-risk areas for threatened and near threatened plants. These are areas where threatened or near threatened plants are known to exist or are likely to exist based on the habitat present. The flora survey trigger map for this property is provided in section 5.5.

If you are proposing to clear an area shown as high risk on the flora survey trigger map, a flora survey of the clearing impact area must be undertaken by a suitably qualified person in accordance with the Flora survey guidelines. The main objective of a flora survey is to locate any threatened or near threatened plants that may be present in the clearing impact area.

If the flora survey identifies that threatened or near threatened plants are not present within the clearing impact area or clearing within 100m of a threatened or near threatened plant can be avoided, the clearing activity is exempt from a permit. An exempt clearing notification form must be submitted to the Department of Environment and Science, with a copy of the flora survey report, at least one week prior to clearing.

If the flora survey identifies that threatened or near threatened plants are present in, or within 100m of, the area to be cleared, a clearing permit is required before any clearing is undertaken. The flora survey report, as well as an impact management report, must be submitted with the clearing permit application form.

5.2 Clearing outside high risk areas on the flora survey trigger map

In an area other than a high risk area, a clearing permit is only required where a person is, or becomes aware that threatened or near threatened plants are present in, or within 100m of, the area to be cleared. You must keep a copy of the flora survey trigger map for the area subject to clearing for five years from the day the clearing starts. If you do not clear within the 12 month period that the flora survey trigger map was printed, you need to print and check a new flora survey trigger map.

5.3 Exemptions

Many activities are 'exempt' under the protected plant clearing framework, which means that clearing of native plants that are in the wild can be undertaken for these activities with no need for a flora survey or a protected plant clearing permit. The Information sheet - General exemptions for the take of protected plants provides some of these exemptions.

Some exemptions under the NCA are the same as exempt clearing work (formerly known as exemptions) under the *Vegetation Management Act 1999* (i.e. listed in Schedule 21 of the Planning Regulations 2017) while some are different.

5.4 Contact information for DES

For further information on the protected plants framework:
Phone 1300 130 372 (and select option four)
Email palm@des.qld.gov.au
Visit https://www.qld.gov.au/environment/plants-animals/plants/protected-plants

5.5 Protected plants flora survey trigger map

This map included may also be requested individually at: https://apps.des.qld.gov.au/map-request/flora-survey-trigger/.

Updates to the data informing the flora survey trigger map

The flora survey trigger map will be reviewed, and updated if necessary, at least every 12 months to ensure the map reflects the most up-to-date and accurate data available.

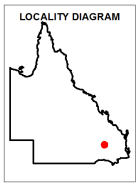
Species information

Please note that flora survey trigger maps do not identify species associated with 'high risk areas'. While some species information may be publicly available, for example via the Queensland Spatial Catalogue, the Department of Environment and Science does not provide species information on request. Regardless of whether species information is available for a particular high risk area, clearing plants in a high risk area may require a flora survey and/or clearing permit. Please see the Department of Environment and Science webpage on the clearing of protected plants for more information.

Protected Plants Flora Survey Trigger Map

Legend

- Selected Lot and Plan
- High risk area
- Other land parcel boundaries
- Freeways / motorways / highways
- Secondary roads / streets



N

0 225 450 675 900 1,125 m

This product is projected into:
GDA 1994 MGA Zone 56

This map shows areas where particular provisions of the Nature Conservation Act 1992 apply to the clearing of protected plants.

Land parcel boundaries are provided as locational aid only.

This map is produced at a scale relevant to the size of the area selected and should be printed as A4 size in portrait orientation.

For further information or assistance with interpretation of this product, please contact the Department of Environment and Science at palm@des.qld.gov.au

Disclaimer:
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6. Koala protection framework (administered by the Department of Environment and Science (DES))

The koala (*Phascolarctos cinereus*) is listed in Queensland as endangered by the Queensland Government under *Nature Conservation Act 1992* and by the Australian Government under the *Environment Protection and Biodiversity Conservation Act 1999*.

The Queensland Government's koala protection framework is comprised of the *Nature Conservation Act 1992*, the Nature Conservation (Animals) Regulation 2020, the Nature Conservation (Koala) Conservation Plan 2017, the *Planning Act 2016* and the Planning Regulation 2017.

6.1 Koala mapping

6.1.1 Koala districts

The parts of Queensland where koalas are known to occur has been divided into three koala districts - koala district A, koala district B and koala district C. Each koala district is made up of areas with comparable koala populations (e.g. density, extent and significance of threatening processes affecting the population) which require similar management regimes.

Section 7.1 identifies which koala district your property is located in.

6.1.2 Koala habitat areas

Koala habitat areas are areas of vegetation that have been determined to contain koala habitat that is essential for the conservation of a viable koala population in the wild based on the combination of habitat suitability and biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water). In order to protect this important koala habitat, clearing controls have been introduced into the Planning Regulation 2017 for development in koala habitat areas.

Please note that koala habitat areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley, Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

There are two different categories of koala habitat area (core koala habitat area and locally refined koala habitat), which have been determined using two different methodologies. These methodologies are described in the document Spatial modelling in South East Queensland.

Section 7.2 shows any koala habitat area that exists on your property.

Under the Nature Conservation (Koala) Conservation Plan 2017, an owner of land (or a person acting on the owner's behalf with written consent) can request to make, amend or revoke a koala habitat area determination if they believe, on reasonable grounds, that the existing determination for all or part of their property is incorrect.

More information on requests to make, amend or revoke a koala habitat area determination can be found in the document Guideline - Requests to make, amend or revoke a koala habitat area determination.

The koala habitat area map will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

Changes to the koala habitat area map which occur between annual updates because of a request to make, amend or revoke a koala habitat area determination can be viewed on the register of approved requests to make, amend or revoke a koala habitat area available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/koalamaps. The register includes the lot on plan for the change, the date the decision was made and the map issued to the landholder that shows areas determined to be koala habitat areas.

6.1.3 Koala priority areas

Koala priority areas are large, connected areas that have been determined to have the highest likelihood of achieving conservation outcomes for koalas based on the combination of habitat suitability, biophysical variables with known relationships to koala habitat (e.g. landcover, soil, terrain, climate and ground water) and a koala conservation cost benefit analysis.

Conservation efforts will be prioritised in these areas to ensure the conservation of viable koala populations in the wild including a focus on management (e.g. habitat protection, habitat restoration and threat mitigation) and monitoring. This includes a prohibition on clearing in koala habitat areas that are in koala priority areas under the Planning Regulation 2017 (subject to some exemptions).

Please note that koala priority areas only exist in koala district A which is the South East Queensland "Shaping SEQ" Regional Plan area. These areas include the local government areas of Brisbane, Gold Coast, Logan, Lockyer Valley,

Ipswich, Moreton Bay, Noosa, Redland, Scenic Rim, Somerset, Sunshine Coast and Toowoomba (urban extent).

Section 7.2 identifies if your property is in a koala priority area.

6.1.4 Identified koala broad-hectare areas

There are seven identified koala broad-hectare areas in SEQ. These are areas of koala habitat that are located in areas committed to meet development targets in the SEQ Regional Plan to accommodate SEQ's growing population including bring-forward Greenfield sites under the Queensland Housing Affordability Strategy and declared master planned areas under the repealed *Sustainable Planning Act 2009* and the repealed *Integrated Planning Act 1997*.

Specific assessment benchmarks apply to development applications for development proposed in identified koala broad-hectare areas to ensure koala conservation measures are incorporated into the proposed development.

Section 7.2 identifies if your property is in an identified koala broad-hectare area.

6.2 Koala habitat planning controls

On 7 February 2020, the Queensland Government introduced new planning controls to the Planning Regulation 2017 to strengthen the protection of koala habitat in South East Queensland (i.e. koala district A).

More information on these planning controls can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

As a high-level summary, the koala habitat planning controls make:

- development that involves interfering with koala habitat (defined below) in an area that is both a koala priority area and a koala habitat area, prohibited development (i.e. development for which a development application cannot be made);
- development that involves interfering with koala habitat (defined below) in an area that is a koala habitat area but is not a koala priority area, assessable development (i.e. development for which development approval is required); and
- development that is for extractive industries where the development involves interfering with koala habitat (defined below) in an area that is both a koala habitat area and a key resource area, assessable development (i.e. development for which development approval is required).

Interfering with koala habitat means:

1) Removing, cutting down, ringbarking, pushing over, poisoning or destroying in anyway, including by burning, flooding or draining native vegetation in a koala habitat area; but
2) Does not include destroying standing vegetation by stock or lopping a tree.

However, these planning controls do not apply if the development is exempted development as defined in Schedule 24 of the Planning Regulation 2017. More information on exempted development can be found here:
https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/legislation-policy.

There are also assessment benchmarks that apply to development applications for:

- building works, operational works, material change of use or reconfiguration of a lot where:
  - the local government planning scheme makes the development assessable;
  - the premises includes an area that is both a koala priority area and a koala habitat area; and
  - the development does not involve interfering with koala habitat (defined above); and

- development in identified koala broad-hectare areas.

The Guideline - Assessment Benchmarks in relation to Koala Habitat in South East Queensland assessment benchmarks outlines these assessment benchmarks, the intent of these assessment benchmarks and advice on how proposed development may meet these assessment benchmarks.

6.3 Koala Conservation Plan clearing requirements

Section 10 and 11 of the Nature Conservation (Koala) Conservation Plan 2017 prescribes requirements that must be met when clearing koala habitat in koala district A and koala district B.

These clearing requirements are independent to the koala habitat planning controls introduced into the Planning Regulation 2017, which means they must be complied with irrespective of any approvals or exemptions offered under other legislation.

Unlike the clearing controls prescribed in the Planning Regulation 2017 that are to protect koala habitat, the clearing requirements prescribed in the Nature Conservation (Koala) Conservation Plan 2017 are in place to prevent the injury or death of koalas when koala habitat is being cleared.

6.4 Contact information for DES

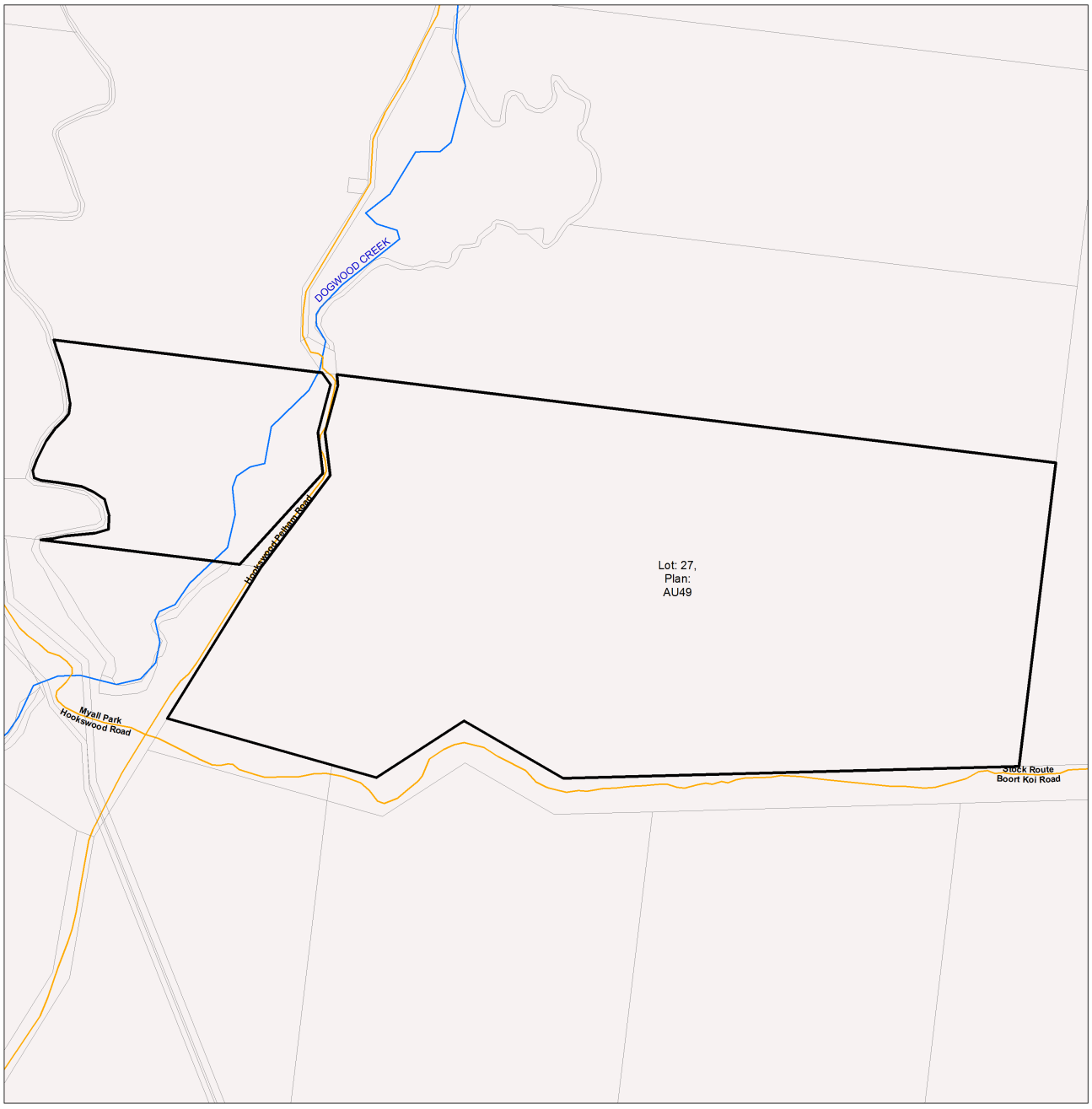
For further information on the koala protection framework:
Phone 13 QGOV (13 74 68)
Email koala.assessment@des.qld.gov.au
Visit https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping

7. Koala protection framework details for Lot: 27 Plan: AU49

7.1 Koala districts

Koala District C

7.2 Koala priority area, koala habitat area and identified koala broad-hectare area map



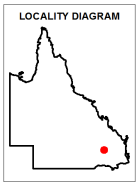
Koala priority area, koala habitat area and identified koala broad-hectare area map

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Koala habitat area (locally refined)
- Koala priority area
- Identified koala broad-hectare area
- Cadastral Boundaries
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

LOCALITY DIAGRAM



N

0 310 620 930 1,240 1,550 m

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The koala conservation plan maps will be updated at least annually to include any koala habitat areas that have been made, amended or revoked.

In order to ensure that the most recent map for an area of interest can be accessed, prior to the annual update, a register of changes made to koala habitat areas as a result of the map amendment process will be available at: https://environment.des.qld.gov.au/wildlife/animals/living-with/koalas/mapping/. The register will include lot on plan for the change, the date the decision was made and the map issued to the landholder which shows areas determined to be koala habitat areas.

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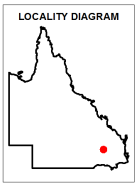
7.3 Koala habitat regional ecosystems for core koala habitat areas

Koala habitat regional ecosystems for core koala habitat areas

Legend

- Selected Lot and Plan
- Koala habitat area (core)
- Towns
- Highway
- Connector
- Street/Local Road
- Major rivers/creeks
- Queensland

LOCALITY DIAGRAM



N

0 310 620 930 1,240 1,550 m

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The koala habitat mapping within South East Queensland uses regional ecosystem linework compiled at a scale varying from 1:25,000 to 1:100,000. Linework should be used as a guide only. The positional accuracy of regional ecosystem data mapped at a scale of 1:100,000 is +/- 100 metres.

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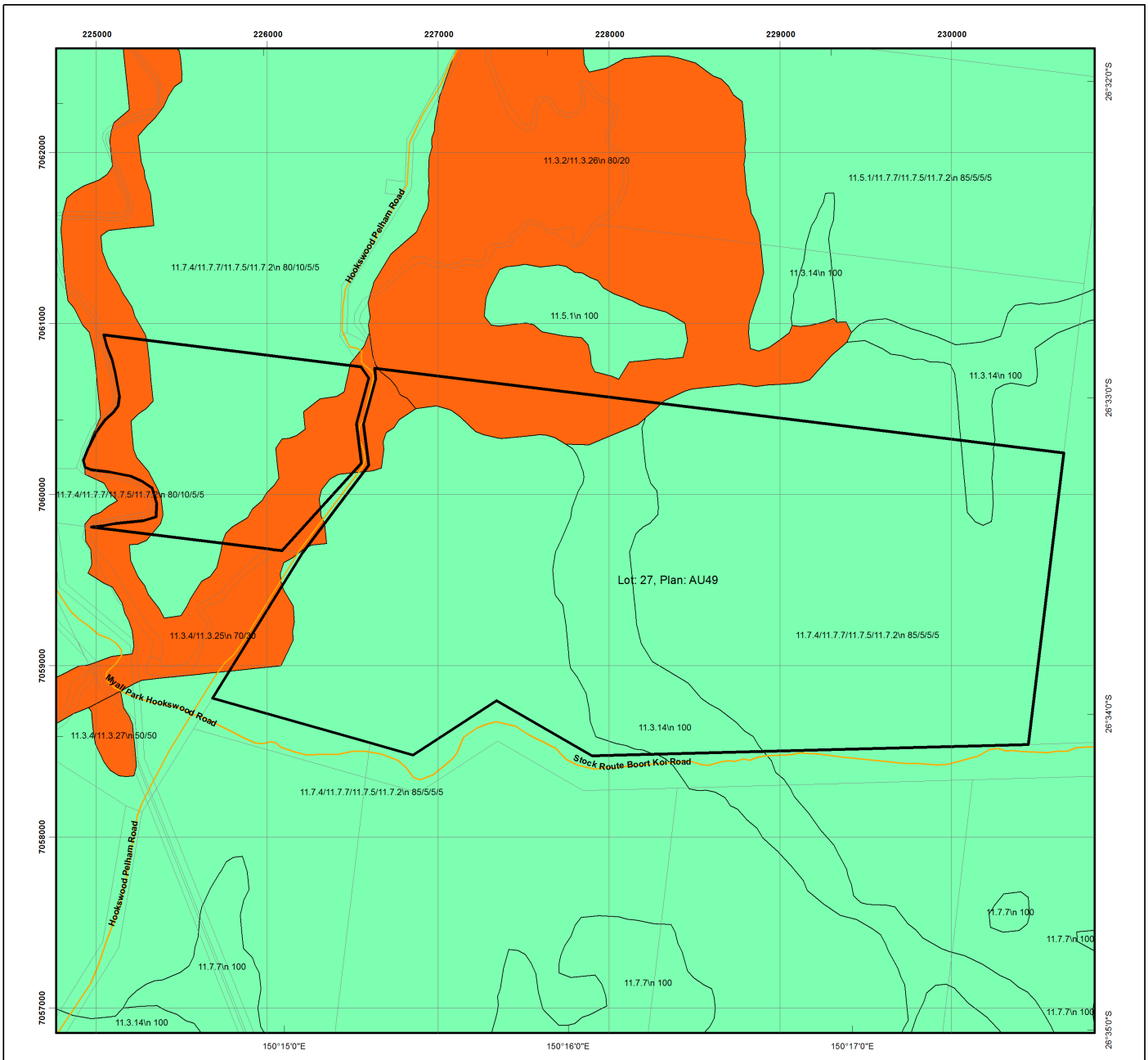
8. Other relevant legislation contacts list

Activity	Legislation	Agency	Contact details
• Interference with overland flow • Earthworks, significant disturbance	*Water Act 2000* *Soil Conservation Act 1986*	Department of Regional Development, Manufacturing and Water (Queensland Government) Department of Resources (Queensland Government)	Ph: 13 QGOV (13 74 68) www.rdmw.qld.gov.au www.resources.qld.gov.au
• Indigenous Cultural Heritage	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships	Ph: 13 QGOV (13 74 68) www.datsip.qld.gov.au
• Mining and environmentally relevant activities • Infrastructure development (coastal) • Heritage issues	*Environmental Protection Act 1994* *Coastal Protection and Management Act 1995* *Queensland Heritage Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) www.des.qld.gov.au
• Protected plants and protected areas	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 1300 130 372 (option 4) palm@des.qld.gov.au www.des.qld.gov.au
• Koala mapping and regulations	*Nature Conservation Act 1992*	Department of Environment and Science (Queensland Government)	Ph: 13 QGOV (13 74 68) Koala.assessment@des.qld.gov.au
• Interference with fish passage in a watercourse, mangroves • Forestry activities on State land tenures	*Fisheries Act 1994* *Forestry Act 1959*	Department of Agriculture and Fisheries (Queensland Government)	Ph: 13 QGOV (13 74 68) www.daf.qld.gov.au
• Matters of National Environmental Significance including listed threatened species and ecological communities	*Environment Protection and Biodiversity Conservation Act 1999*	Department of Agriculture, Water and the Environment (Australian Government)	Ph: 1800 803 772 www.environment.gov.au
• Development and planning processes	*Planning Act 2016* *State Development and Public Works Organisation Act 1971*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) www.dsdmip.qld.gov.au
• Local government requirements	*Local Government Act 2009* *Planning Act 2016*	Department of State Development, Infrastructure, Local Government and Planning (Queensland Government)	Ph: 13 QGOV (13 74 68) Your relevant local government office
• Harvesting timber in the Wet Tropics of Qld World Heritage area	*Wet Tropics World Heritage Protection and Management Act 1993*	Wet Tropics Management Authority	Ph: (07) 4241 0500 www.wettropics.gov.au



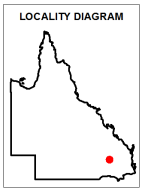
Vegetation Management Pre-clear Regional Ecosystem Map

Legend

- Selected Lot and Plan
- Pre-clearing area containing Endangered RE
- Pre-clearing area containing Of Concern RE
- Pre-clearing area that is a Least Concern RE
- Water
- Highway
- Connector
- Street/Local Road
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



N

0 230 460 690 920 1,150 m

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Pre-clearing regional ecosystem line-work reproduced at a scale greater than 1:100,000, except in designated areas, should be used as a guide only.

Digital data for the Pre-clearing regional ecosystem map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries shown are provided as a locational aid only.

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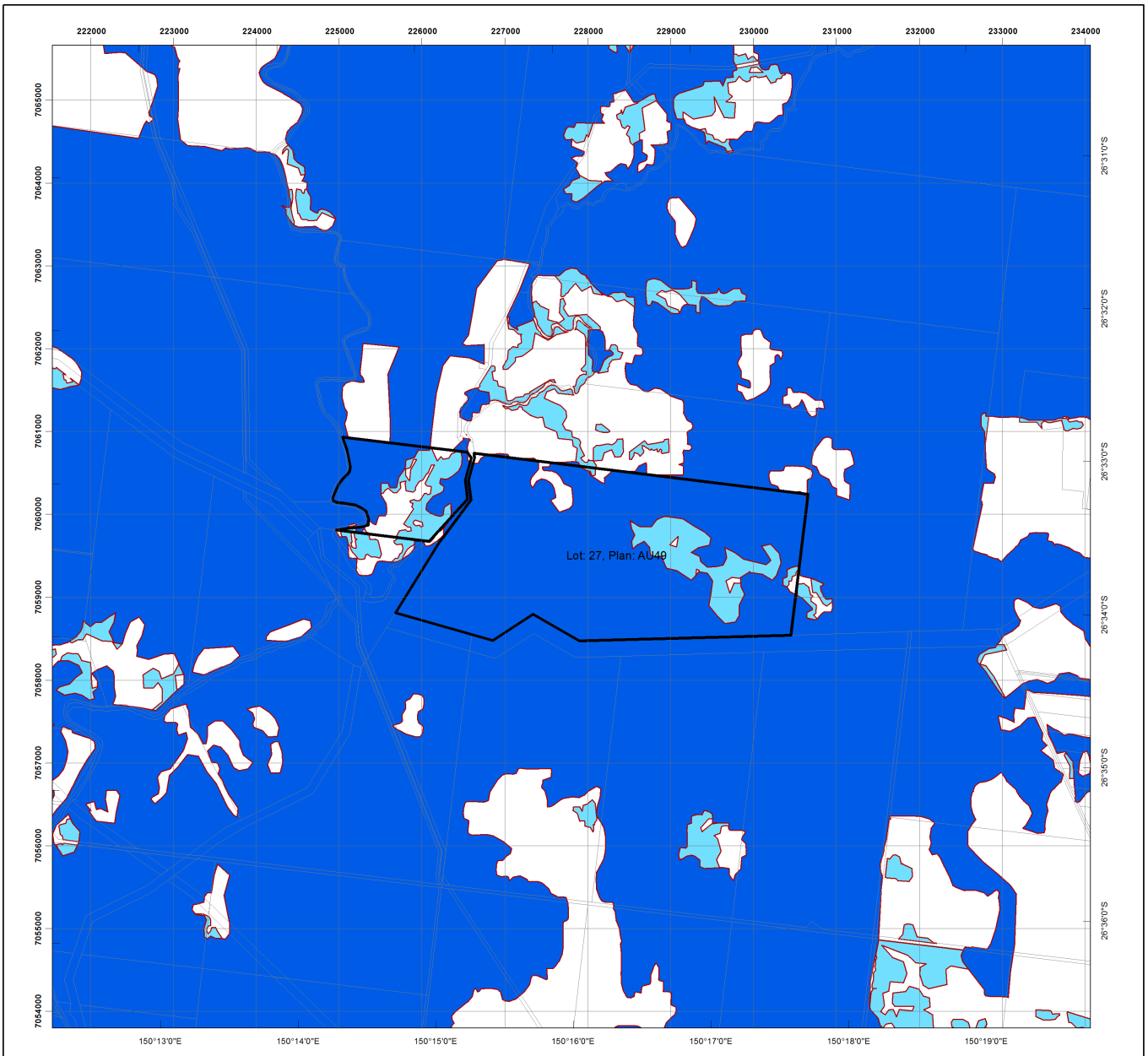
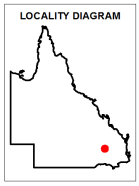


Regulated Vegetation Management Map

Legend

- Selected Lot and Plan
- Category A area (Vegetation offsets/compliance notices/VDecs)
- Category B area (Remnant vegetation)
- Category C area (High-value regrowth vegetation)
- Category R area (Reef regrowth watercourse vegetation)
- Category X area (Exempt clearing work on Freehold, Indigenous and Leasehold land)
- Water
- Other land parcel boundaries



N

0 675 1,350 2,025 2,700 3,375 m

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Additional information required for the assessment of vegetation values is provided in the accompanying "Vegetation Management Supporting map". For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the regulated vegetation management map is available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

This map is updated on a monthly basis to ensure new PMAVs are included as they are approved.

Queensland Government

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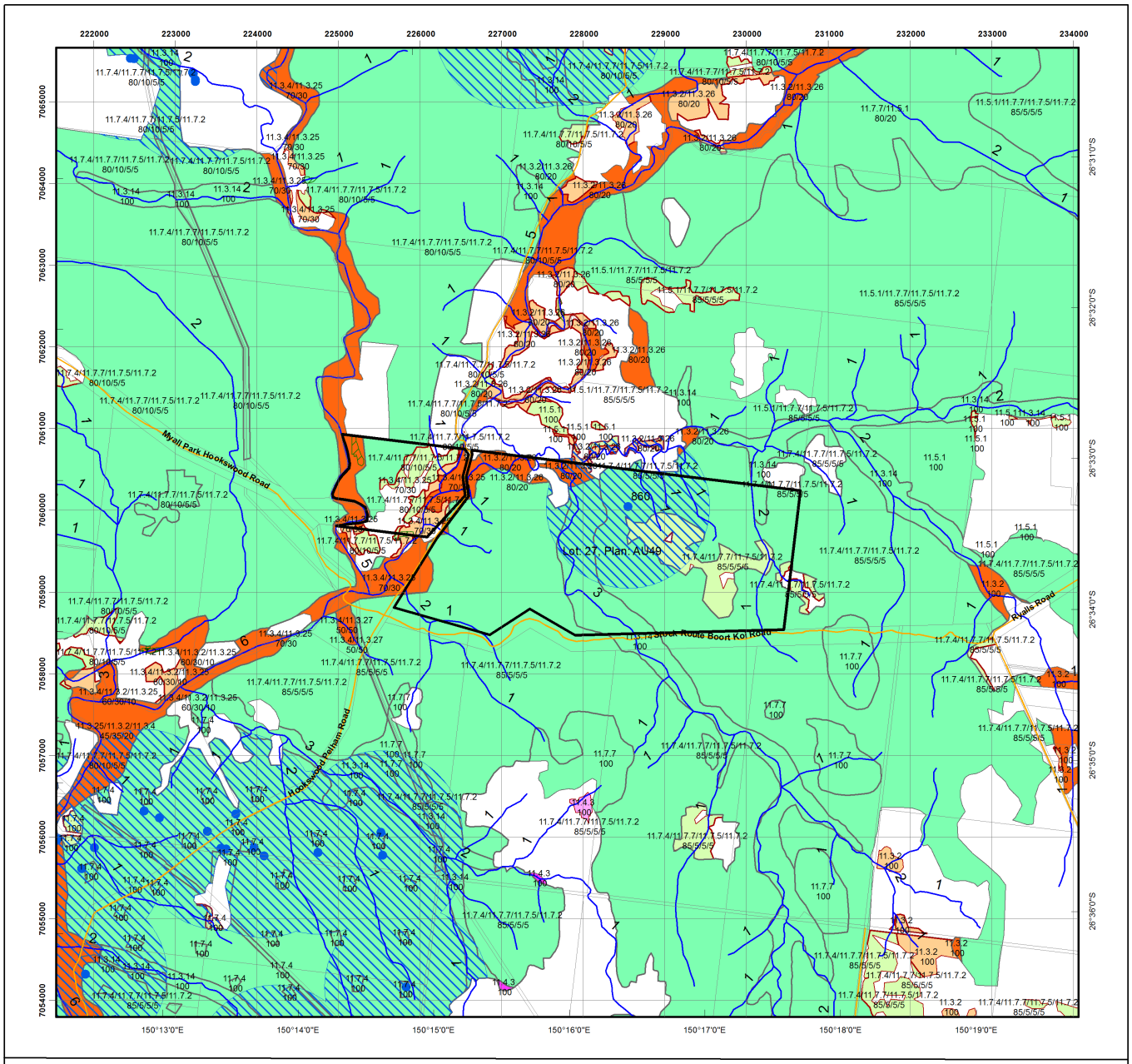


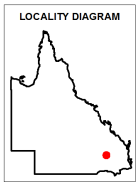
Vegetation Management Supporting Map

Legend

- Selected Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category C or R area containing endangered regional ecosystems
- Category C or R area containing of concern regional ecosystems
- Category C or R area that is a least concern regional ecosystem
- Category X area
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features maps (Stream order shown as black number against stream where available)
- Highway
- Connector
- Street/Local Road
- National Parks, State Forest and other reserves
- Other land parcel boundaries

Queensland Government

LOCALITY DIAGRAM



N

0 480 960 1,440 1,920 2,400 m

This product is projected into:
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

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Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.resources.qld.gov.au or contact the Department of Resources.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

Land parcel boundaries are provided as locational aid only.

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Vegetation Management Act 1999 - Extract from the essential habitat database

Essential habitat is required for assessment under the:

- State Development Assessment Provisions - State Code 16: Native vegetation clearing which sets out the matters of interest to the state for development assessment under the *Planning Act 2016*; and
- Accepted development vegetation clearing codes made under the *Vegetation Management Act 1999*

Essential habitat for one or more of the following species is found on and within 1.1 km of the identified subject lot/s on the accompanying essential habitat map.

This report identifies essential habitat in Category A, B and Category C areas.

The numeric labels on the essential habitat map can be cross referenced with the database below to determine which essential habitat factors might exist for a particular species.

Essential habitat is compiled from a combination of species habitat models and buffered species records.

The Department of Resources website (http://www.resources.qld.gov.au) has more information on how the layer is applied under the State Development Assessment Provisions - State Code 16: Native vegetation clearing and the *Vegetation Management Act 1999*.

Regional ecosystem is a mandatory essential habitat factor, unless otherwise stated.

Essential habitat, for protected wildlife, means a category A area, a category B area or category C area shown on the regulated vegetation management map-

1) that has at least 3 essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or

2) in which the protected wildlife, at any stage of its life cycle, is located.

Protected wildlife includes critically endangered, endangered, vulnerable or near-threatened native wildlife prescribed under the *Nature Conservation Act 1992*.

Essential habitat in Category A and/or Category B and/or Category C

Label	Scientific Name	Common Name	NCA Status	Vegetation Community	Altitude	Soils	Position in Landscape
860	Phascolarctos cinereus	koala	E	Open forests and woodlands containing Eucalyptus, Corymbia, Lophostemon or Melaleuca trees having a trunk of a diameter of more than 10cm at 1.3m above the ground. Tree species used for food and habitat varies across the state and can include: Corymbia citriodora, Corymbia henryi, Corymbia intermedia, Eucalyptus acmenoides, Eucalyptus bancroftii, Eucalyptus biturbinata, Eucalyptus blakelyi, Eucalyptus brownii, Eucalyptus camaldulensis, Eucalyptus carnea, Eucalyptus chloroclada, Eucalyptus coolabah, Eucalyptus crebra, Eucalyptus dealbata, Eucalyptus drepanophylla, Eucalyptus dunnii, Eucalyptus eugenioides, Eucalyptus exserta, Eucalyptus fibrosa, Eucalyptus grandis, Eucalyptus helidonica, Eucalyptus latisinensis, Eucalyptus longirostrata, Eucalyptus major, Eucalyptus melanophloia, Eucalyptus melliodora, Eucalyptus microcarpa, Eucalyptus microcorys, Eucalyptus microtheca, Eucalyptus moluccana, Eucalyptus montivaga, Eucalyptus orgadophila, Eucalyptus papuana, Eucalyptus pilularis, Eucalyptus platyphylla, Eucalyptus populnea, Eucalyptus portuensis, Eucalyptus propinqua, Eucalyptus racemosa, Eucalyptus resinifera, Eucalyptus robusta, Eucalyptus saligna, Eucalyptus seeana, Eucalyptus siderophloia, Eucalyptus sideroxylon, Eucalyptus tereticornis, Eucalyptus thozetiana, Eucalyptus tindaliae, Eucalyptus umbra, Lophostemon confertus, Melaleuca leucadendra, Melaleuca quinquenervia.	Sea level to 1000m.	None	Riparian areas, plains and hill/escarpment slopes.

Label	Regional Ecosystem (mandatory unless otherwise specified)
860	4.3.1, 4.3.2, 4.3.3, 4.3.4, 4.3.5, 4.3.6, 4.3.8, 4.3.10, 4.3.11, 4.5.3, 4.5.5, 4.5.6, 4.5.8, 4.5.9, 4.7.1, 4.7.7, 4.7.8, 4.9.6, 4.9.10, 4.9.12, 4.9.17, 6.3.1, 6.3.2, 6.3.3, 6.3.4, 6.3.5, 6.3.7, 6.3.8, 6.3.9, 6.3.11, 6.3.12, 6.3.17, 6.3.18, 6.3.22, 6.3.24, 6.3.25, 6.4.1, 6.4.2, 6.4.3, 6.4.4, 6.5.1, 6.5.2, 6.5.3, 6.5.5, 6.5.6, 6.5.7, 6.5.8, 6.5.9, 6.5.10, 6.5.11, 6.5.13, 6.5.14, 6.5.15, 6.5.16, 6.5.17, 6.5.18, 6.5.19, 6.6.2, 6.7.1, 6.7.2, 6.7.5, 6.7.6, 6.7.7, 6.7.9, 6.7.11, 6.7.12, 6.7.13, 6.7.14, 6.7.17, 6.9.3, 7.2.3, 7.2.4, 7.2.7, 7.2.11, 7.3.7, 7.3.8, 7.3.9, 7.3.12, 7.3.13, 7.3.14, 7.3.16, 7.3.19, 7.3.20, 7.3.21, 7.3.25, 7.3.26, 7.3.39, 7.3.40, 7.3.42, 7.3.43, 7.3.44, 7.3.45, 7.3.47, 7.3.48, 7.3.50, 7.5.1, 7.5.2, 7.5.3, 7.5.4, 7.8.7, 7.8.8, 7.8.10, 7.8.15, 7.8.16, 7.8.17, 7.8.18, 7.8.19, 7.11.5, 7.11.6, 7.11.13, 7.11.14, 7.11.16, 7.11.18, 7.11.19, 7.11.20, 7.11.21, 7.11.31, 7.11.32, 7.11.33, 7.11.34, 7.11.35, 7.11.37, 7.11.41, 7.11.42, 7.11.43, 7.11.44, 7.11.45, 7.11.46, 7.11.47, 7.11.48, 7.11.49, 7.11.50, 7.11.51, 7.12.4, 7.12.5, 7.12.17, 7.12.21, 7.12.22, 7.12.23, 7.12.24, 7.12.25, 7.12.26, 7.12.27, 7.12.28, 7.12.29, 7.12.30, 7.12.33, 7.12.34, 7.12.35, 7.12.51, 7.12.52, 7.12.53, 7.12.54, 7.12.55, 7.12.56, 7.12.57, 7.12.58, 7.12.59, 7.12.60, 7.12.61, 7.12.62, 7.12.63, 7.12.65, 7.12.66, 7.12.69, 8.1.5, 8.2.3, 8.2.6, 8.2.7, 8.2.8, 8.2.11, 8.2.12, 8.2.13, 8.2.14, 8.3.1, 8.3.2, 8.3.3, 8.3.5, 8.3.6, 8.3.8, 8.3.10, 8.3.11, 8.3.13, 8.5.1, 8.5.2, 8.5.3, 8.5.5, 8.5.6, 8.5.7, 8.9.1, 8.10.1, 8.11.1, 8.11.3, 8.11.4, 8.11.5, 8.11.6, 8.11.8, 8.11.10, 8.11.12, 8.12.4, 8.12.5, 8.12.6, 8.12.7, 8.12.8, 8.12.9, 8.12.12, 8.12.14, 8.12.20, 8.12.22, 8.12.23, 8.12.25, 8.12.26, 8.12.27, 8.12.29, 8.12.31, 8.12.32, 9.3.1, 9.3.2, 9.3.3, 9.3.4, 9.3.5, 9.3.6, 9.3.7, 9.3.8, 9.3.10, 9.3.11, 9.3.13, 9.3.14, 9.3.15, 9.3.16, 9.3.17, 9.3.19, 9.3.20, 9.3.21, 9.3.22, 9.3.27, 9.4.1, 9.4.2, 9.5.1, 9.5.3, 9.5.4, 9.5.5, 9.5.6, 9.5.7, 9.5.8, 9.5.9, 9.5.10, 9.5.11, 9.5.12, 9.5.15, 9.5.16, 9.5.17, 9.7.1, 9.7.2, 9.7.3, 9.7.4, 9.7.5, 9.7.6, 9.8.1, 9.8.2, 9.8.3, 9.8.4, 9.8.5, 9.8.9, 9.8.10, 9.8.11, 9.8.13, 9.10.1, 9.10.3, 9.10.4, 9.10.5, 9.10.7, 9.10.8, 9.11.1, 9.11.2, 9.11.3, 9.11.4, 9.11.5, 9.11.7, 9.11.10, 9.11.12, 9.11.13, 9.11.14, 9.11.15, 9.11.16, 9.11.17, 9.11.18, 9.11.19, 9.11.21, 9.11.22, 9.11.23, 9.11.24, 9.11.25, 9.11.26, 9.11.28, 9.11.29, 9.11.30, 9.11.31, 9.11.32, 9.12.1, 9.12.2, 9.12.3, 9.12.4, 9.12.5, 9.12.6, 9.12.7, 9.12.10, 9.12.11, 9.12.12, 9.12.13, 9.12.14, 9.12.15, 9.12.16, 9.12.17, 9.12.18, 9.12.19, 9.12.20, 9.12.21, 9.12.22, 9.12.23, 9.12.24, 9.12.25, 9.12.26, 9.12.27, 9.12.28, 9.12.29, 9.12.30, 9.12.31, 9.12.32, 9.12.33, 9.12.35, 9.12.36, 9.12.37, 9.12.38, 9.12.39, 9.12.44, 10.3.2, 10.3.3, 10.3.5, 10.3.6, 10.3.9, 10.3.10, 10.3.11, 10.3.12, 10.3.13, 10.3.14, 10.3.15, 10.3.17, 10.3.20, 10.3.27, 10.3.28, 10.4.3, 10.4.9, 10.5.1, 10.5.2, 10.5.4, 10.5.5, 10.5.7, 10.5.8, 10.5.9, 10.5.10, 10.5.11, 10.5.12, 10.7.1, 10.7.2, 10.7.3, 10.7.4, 10.7.5, 10.7.9, 10.7.10, 10.7.11, 10.7.12, 10.9.2, 10.9.3, 10.9.5, 10.10.1, 10.10.3, 10.10.4, 10.10.5, 10.10.7, 11.2.1, 11.2.5, 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.5, 11.3.6, 11.3.7, 11.3.9, 11.3.10, 11.3.12, 11.3.13, 11.3.14, 11.3.15, 11.3.16, 11.3.17, 11.3.18, 11.3.19, 11.3.21, 11.3.23, 11.3.25, 11.3.26, 11.3.27, 11.3.28, 11.3.29, 11.3.30, 11.3.32, 11.3.33, 11.3.35, 11.3.36, 11.3.37, 11.3.38, 11.3.39, 11.4.2, 11.4.3, 11.4.7, 11.4.8, 11.4.9, 11.4.10, 11.4.12, 11.4.13, 11.5.1, 11.5.2, 11.5.3, 11.5.4, 11.5.5, 11.5.7, 11.5.8, 11.5.9, 11.5.12, 11.5.13, 11.5.14, 11.5.17, 11.5.18, 11.5.20, 11.5.21, 11.7.1, 11.7.2, 11.7.3, 11.7.4, 11.7.6, 11.7.7, 11.8.1, 11.8.2, 11.8.4, 11.8.5, 11.8.8, 11.8.11, 11.8.12, 11.8.14, 11.8.15, 11.9.1, 11.9.2, 11.9.3, 11.9.5, 11.9.6, 11.9.7, 11.9.9, 11.9.10, 11.9.11, 11.9.13, 11.9.14, 11.10.1, 11.10.2, 11.10.3, 11.10.4, 11.10.5, 11.10.6, 11.10.7, 11.10.9, 11.10.11, 11.10.12, 11.10.13, 11.11.1, 11.11.2, 11.11.3, 11.11.4, 11.11.6, 11.11.7, 11.11.8, 11.11.9, 11.11.10, 11.11.11, 11.11.12, 11.11.13, 11.11.14, 11.11.15, 11.11.16, 11.11.17, 11.11.19, 11.11.20, 11.12.1, 11.12.2, 11.12.3, 11.12.5, 11.12.6, 11.12.7, 11.12.8, 11.12.9, 11.12.10, 11.12.13, 11.12.14, 11.12.15, 11.12.16, 11.12.17, 11.12.19, 11.12.20, 12.2.5, 12.2.6, 12.2.7, 12.2.8, 12.2.10, 12.3.2, 12.3.3, 12.3.4, 12.3.5, 12.3.6, 12.3.7, 12.3.9, 12.3.10, 12.3.11, 12.3.14, 12.3.18, 12.3.19, 12.3.20, 12.5.1, 12.5.2, 12.5.3, 12.5.4, 12.5.6, 12.5.7, 12.5.10, 12.5.12, 12.8.1, 12.8.8, 12.8.9, 12.8.11, 12.8.12, 12.8.14, 12.8.16, 12.8.17, 12.8.20, 12.8.24, 12.8.25, 12.9-10.1, 12.9-10.2, 12.9-10.3, 12.9-10.4, 12.9-10.5, 12.9-10.7, 12.9-10.8, 12.9-10.11, 12.9-10.12, 12.9-10.14, 12.9-10.17, 12.9-10.18, 12.9-10.19, 12.9-10.21, 12.9-10.25, 12.9-10.26, 12.9-10.27, 12.9-10.28, 12.9-10.29, 12.11.2, 12.11.3, 12.11.5, 12.11.6, 12.11.7, 12.11.8, 12.11.9, 12.11.14, 12.11.15, 12.11.16, 12.11.17, 12.11.18, 12.11.22, 12.11.23, 12.11.24, 12.11.25, 12.11.26, 12.11.27, 12.11.28, 12.12.2, 12.12.3, 12.12.4, 12.12.5, 12.12.6, 12.12.7, 12.12.8, 12.12.9, 12.12.11, 12.12.12, 12.12.14, 12.12.15, 12.12.23, 12.12.24, 12.12.25, 12.12.28, 13.3.1, 13.3.2, 13.3.3, 13.3.4, 13.3.5, 13.3.7, 13.9.2, 13.11.1, 13.11.2, 13.11.3, 13.11.4, 13.11.5, 13.11.6, 13.11.8, 13.11.9, 13.12.1, 13.12.2, 13.12.3, 13.12.4, 13.12.5, 13.12.6, 13.12.8, 13.12.9, 13.12.10.

Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
168216	Sub-Artesian Facility	Existing		Roma	7310 - WESTERN DOWNS REGIONAL

Details

Description			
Parish	1554 - DOGWOOD		
Original Name			
Driller Name			
Drill Company			
Const Method			
Bore Line			
D/O File No	PROJECT 508	**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date		**Data Owner**	
Roles	Water Supply		

Location

Latitude	26-38-02	**Basin**	4222
Longitude	150-18-50	**Sub-area**	
GIS Latitude	-26.63388889	**Lot**	71
GIS Longitude	150.31388889	**Plan**	BWR159
Easting	232580		
Northing	7051302	**Map Scale**	
Zone	56	**Map Series**	
Accuracy		**Map No**	
GPS Accuracy		**Map Name**	
Checked	Yes	**Prog Section**	

Casing

0 ***records for RN*** **168216**

Strata Logs

0 ***records for RN*** **168216**

Stratigraphies

0 ***records for RN*** **168216**

Aquifers

0 ***records for RN*** **168216**

Pump Tests Part 1

0 ***records for RN*** **168216**

Pump Tests Part 2

0 ***records for RN*** **168216**

Bore Report

From Year:

Bore Conditions	**0**	*records for RN*	**168216**
Elevations	**0**	*records for RN*	**168216**
Water Analysis Part 1	**0**	*records for RN*	**168216**
Water Analysis Part 2	**0**	*records for RN*	**168216**
Water Levels	**0**	*records for RN*	**168216**
Wire Line Logs	**0**	*records for RN*	**168216**
Field Measurements	**0**	*records for RN*	**168216**
Special Water Analysis	**0**	*records for RN*	**168216**

Bore Report

From Year:

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Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
160841	Sub-Artesian Facility	Existing	05/12/2011	Roma	7310 - WESTERN DOWNS REGIONAL

Details

Description			
Parish	6000 - NO LONGER USED		
Original Name			
Driller Name	BOURNE, KEVIN JOHN		
Drill Company	DEPCO		
Const Method	ROTARY AIR		
Bore Line			
D/O File No		**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date		**Data Owner**	COC
Roles	Coal Seam Gas (CSG) Monitoring		

Location

Latitude	26-30-37	**Basin**	4222
Longitude	150-12-02	**Sub-area**	
GIS Latitude	-26.5103975	**Lot**	15
GIS Longitude	150.20062958	**Plan**	AU38
Easting	221000		
Northing	7064747	**Map Scale**	
Zone	56	**Map Series**	
Accuracy		**Map No**	
GPS Accuracy		**Map Name**	
Checked	Yes	**Prog Section**	

Casing

7 ***records for RN*** **160841**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	05/12/2011	1	0.00	6.00	Polyvinyl Chloride			132
A	05/12/2011	2	0.00	42.00	Polyvinyl Chloride			60
A	05/12/2011	3	24.00	42.00	Perforated or Slotted Casing			60
X	05/12/2011	4	0.00	6.00	Grout			165
X	05/12/2011	5	6.00	21.00	Grout			120

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	05/12/2011	6	21.00	23.00	Bentonite Seal			120
X	05/12/2011	7	23.00	42.00	Gravel Pack			120

Strata Logs

7 ***records for RN*** **160841**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SAND
2	1.00	8.00	FINE SANDSTONE; IRONSTONE BANDS
3	8.00	17.00	FINE SANDSTONE; SILTSTONE BANDS
4	17.00	26.00	CLAYEY SANDSTONE
5	26.00	30.00	MUDSTONE; COAL BANDS
6	30.00	40.00	FINE SANDSTONE GREY
7	40.00	42.00	COAL

Stratigraphies

2 ***records for RN*** **160841**

Source	Rec	Top (m)	Bottom (m)	Strata Description
DNR	1	0.00	3.26	UNDIFFERENTIATED
DNR	2	3.26	42.00	WALLOON COAL MEASURES

Aquifers

1 ***records for RN*** **160841**

Rec	Top (m)	Bottom (m)	Lithology	Date	SWL (m)	Flow	Quality	Yield (L/s)	Contr	Cond	Formation Name
1	24.00	42.00	COAL - Coal						Y	PS	WALLOON COAL MEASURES

Pump Tests Part 1

0 ***records for RN*** **160841**

Bore Report

From Year:

Pump Tests Part 2

0 *records for RN* **160841**

Bore Conditions

0 *records for RN* **160841**

Elevations

1 *records for RN* **160841**

Pipe	Date	Elevation (m)	Precision		Datum	Meas	Point	Survey Source
X	05/12/2011	312.94	EST	Estimate Using Contours	AHD - Aust. Height Datum	N	Natural Surface	AUS_SRTM_1SEC_DEM_S_V1

Water Analysis Part 1

0 *records for RN* **160841**

Water Analysis Part 2

0 *records for RN* **160841**

Water Levels

0 *records for RN* **160841**

Wire Line Logs

0 *records for RN* **160841**

Field Measurements

0 *records for RN* **160841**

Special Water Analysis

0 *records for RN* **160841**

Bore Report

From Year:

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Bore Report

From Year:

Registered Number	Facility Type	Facility Status	Drilled Date	Office	Shire
160575	Sub-Artesian Facility	Existing	05/12/2011	Roma	7310 - WESTERN DOWNS REGIONAL

Details

Description			
Parish	332 - BARTSCH		
Original Name			
Driller Name	BOURNE, KEVIN JOHN		
Drill Company	DEPCO		
Const Method	ROTARY AIR		
Bore Line			
D/O File No		**Polygon**	
R/O File No		**Equipment**	
H/O File No		**RN of Bore Replaced**	
Log Received Date		**Data Owner**	COC
Roles	Mine Monitoring		

Location

Latitude	26-30-37	**Basin**	4222
Longitude	150-12-03	**Sub-area**	
GIS Latitude	-26.51038104	**Lot**	15
GIS Longitude	150.2007102	**Plan**	AU38
Easting	221008		
Northing	7064749	**Map Scale**	
Zone	56	**Map Series**	
Accuracy		**Map No**	
GPS Accuracy		**Map Name**	
Checked	Yes	**Prog Section**	

Casing

7 ***records for RN*** **160575**

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
A	05/12/2011	1	0.00	6.00	Polyvinyl Chloride	6.000	WT - Wall Thickness	132
A	05/12/2011	2	0.00	88.00	Polyvinyl Chloride	5.000	WT - Wall Thickness	60
A	05/12/2011	3	46.00	88.00	Perforated or Slotted Casing	0.500	AP - Aperture Size	60
X	05/12/2011	4	0.00	6.00	Grout			165
X	05/12/2011	5	6.00	43.00	Grout			120

Bore Report

From Year:

Pipe	Date	Rec	Top (m)	Bottom (m)	Material Description	Mat Size (mm)	Size Desc	Outside Diameter (mm)
X	05/12/2011	6	43.00	45.00	Bentonite Seal			120
X	05/12/2011	7	45.00	88.00	Gravel Pack			120

Strata Logs

15 ***records for RN*** **160575**

Rec	Top (m)	Bottom (m)	Strata Description
1	0.00	1.00	SAND
2	1.00	8.00	SANDSTONE WITH IRONSTONE BANDS
3	8.00	17.00	FINE SANDSTONE WITH SILTSTONE BANDS
4	17.00	26.00	CLAYEY SANDSTONE
5	26.00	30.00	MUDSTONE WITH COAL BANDS
6	30.00	40.00	GREY SANDSTONE
7	40.00	44.00	COAL
8	44.00	49.00	GREY SANDSTONE WITH SILTSTONE BANDS
9	49.00	52.00	COAL, SILTSTONE BANDS
10	52.00	57.00	SILTSTONE, GREY
11	57.00	60.00	MUDSTONE, CARBONACEOUS
12	60.00	64.00	SANDSTONE GREY
13	64.00	73.00	MUDSTONE, COAL BANDS
14	73.00	80.00	GREY SANDSTONE, CARBONACEOUS
15	80.00	88.00	GREY SANDSTONE

Stratigraphies

0 ***records for RN*** **160575**

Aquifers

0 ***records for RN*** **160575**

Pump Tests Part 1

0 ***records for RN*** **160575**

Bore Report

From Year:

Pump Tests Part 2	**0**	***records for RN***	**160575**
Bore Conditions	**0**	***records for RN***	**160575**
Elevations	**0**	***records for RN***	**160575**
Water Analysis Part 1	**0**	***records for RN***	**160575**
Water Analysis Part 2	**0**	***records for RN***	**160575**
Water Levels	**0**	***records for RN***	**160575**
Wire Line Logs	**0**	***records for RN***	**160575**
Field Measurements	**0**	***records for RN***	**160575**
Special Water Analysis	**0**	***records for RN***	**160575**

Bore Report

From Year:

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Appendix B

MEDLI Output Reports

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
IRRIGATION LOAD SCENARIO: 30EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

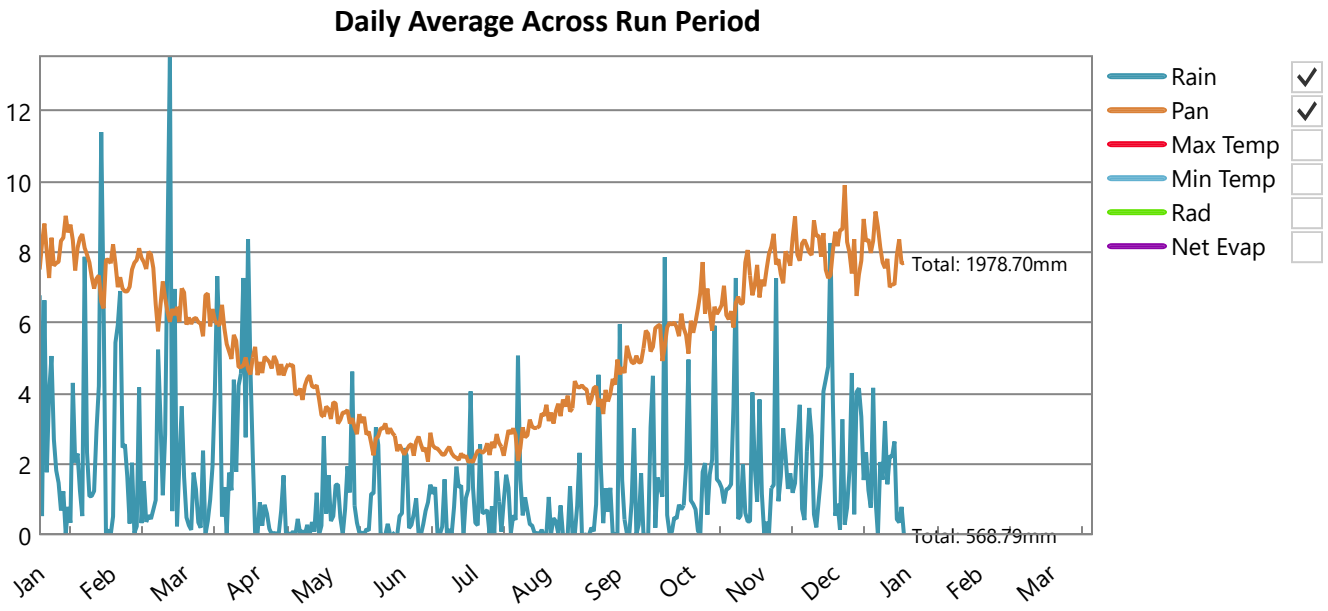
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

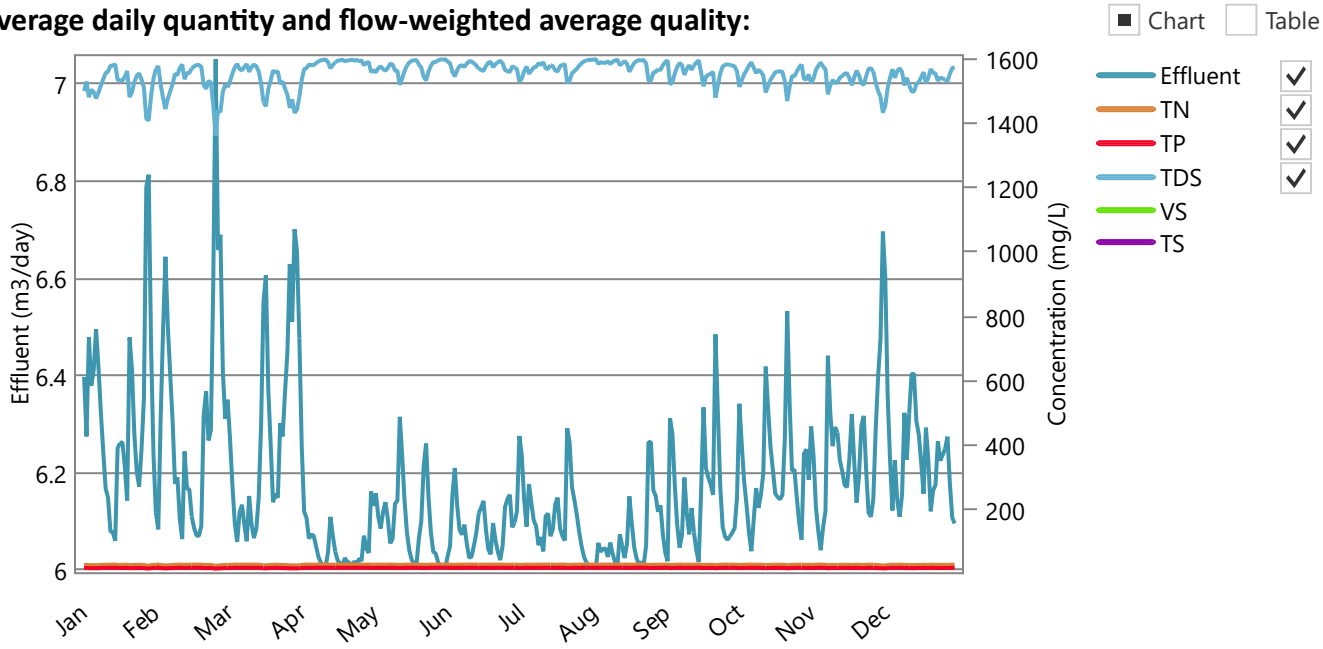


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **2257.07 m3/year** or 6.18 m3/day (Min-Max: 6.00 - 11.10)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

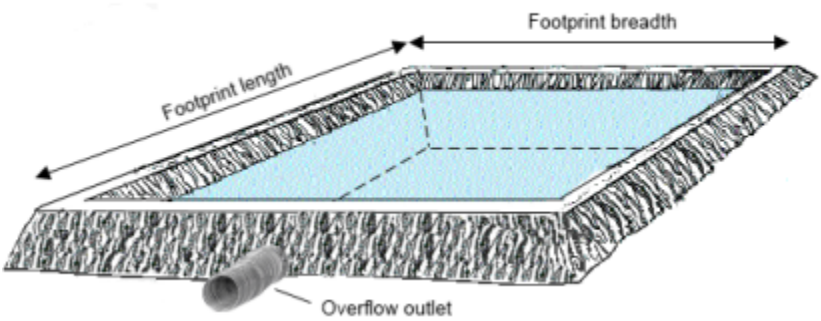
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	65.74 (65.70 - 65.88)
Total Phosphorus	19.42 (10.81 - 20.00)	43.82 (43.80 - 43.92)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	3505.92 (3504.00 - 3513.60)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

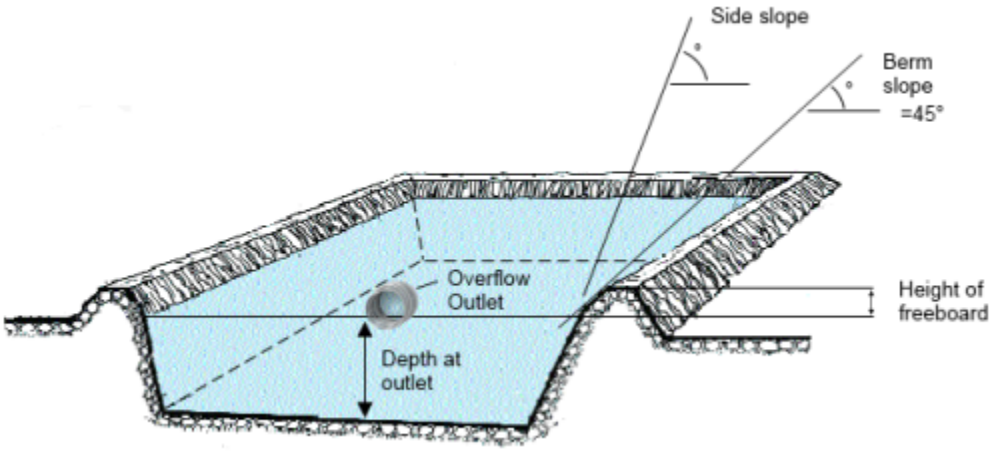
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	18.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	23.70
Pond footprint length (m)	4.87
Pond footprint width (m)	4.87
Pond catchment area (m2)	23.70
Average active volume (m3)	0.22





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

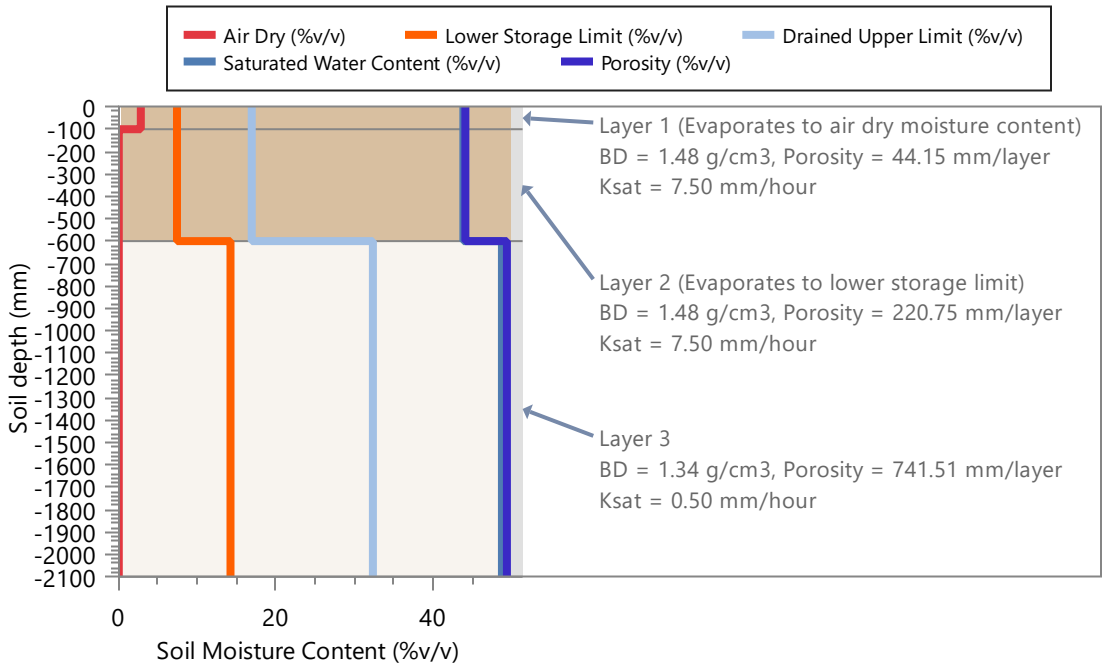
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 1900.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

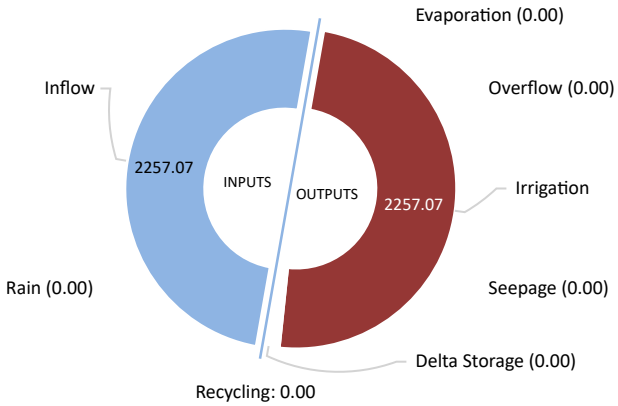
Average monthly cover (fraction) (minimum - maximum)	0.87 (0.81 - 0.93)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **18 m3**

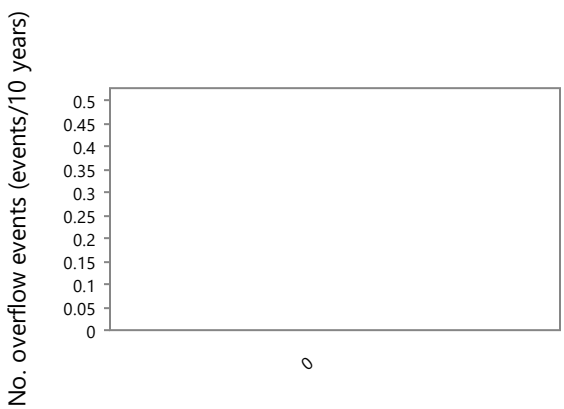
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	2257.07
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	2257.07
Seepage	0.00
Delta Storage	0.00

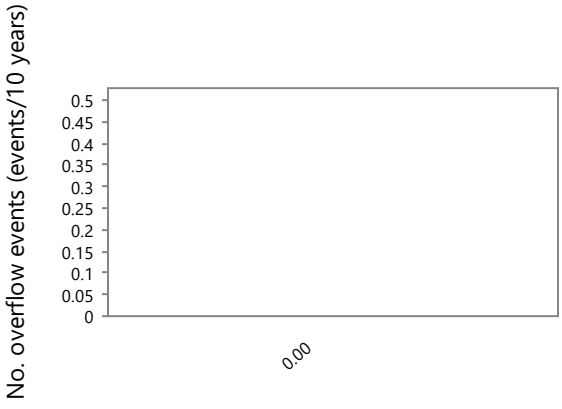
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



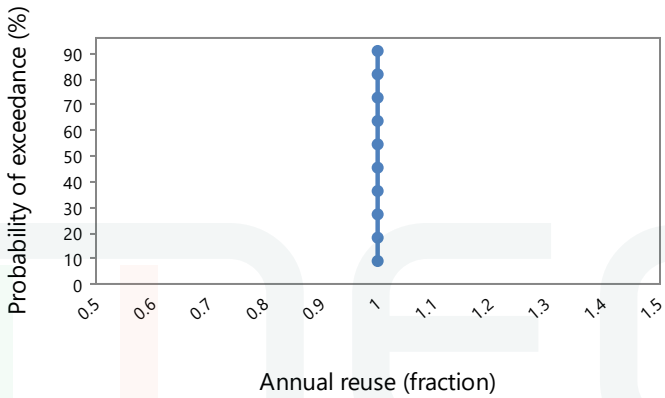
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

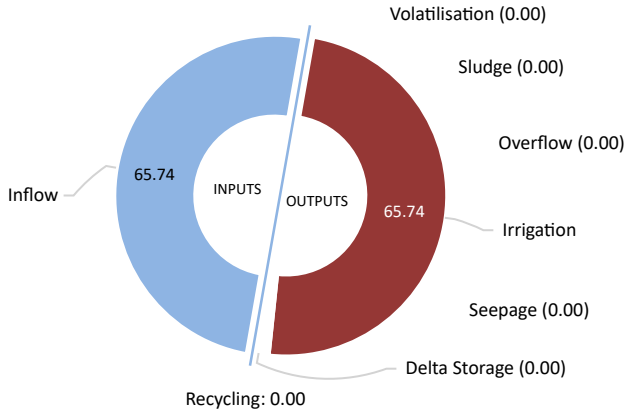
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

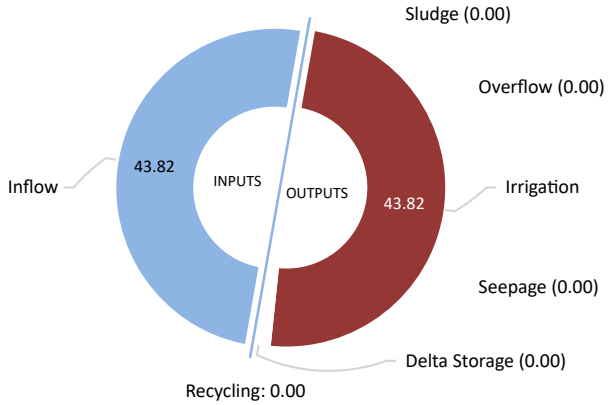
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



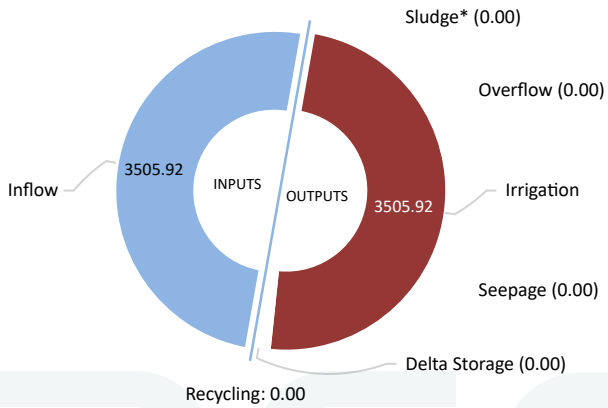
Name	Value
Inflow	65.74
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	65.74
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	43.82
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	43.82
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	3505.92
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	3505.92
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.74
Average phosphorus concentration of pond liquid (mg/L)	16.49
Average salinity of pond liquid (dS/m)	2.06

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	29.99
Final phosphorus concentration of pond liquid (mg/L)	19.99
Final salinity of pond liquid (dS/m)	2.50

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	2257.07
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	2257.07
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

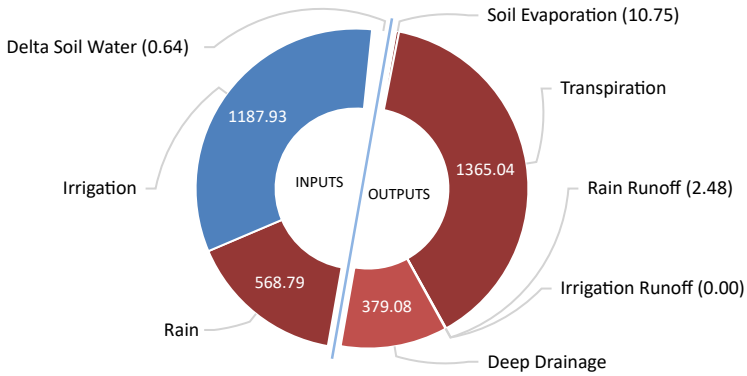
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 1900 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

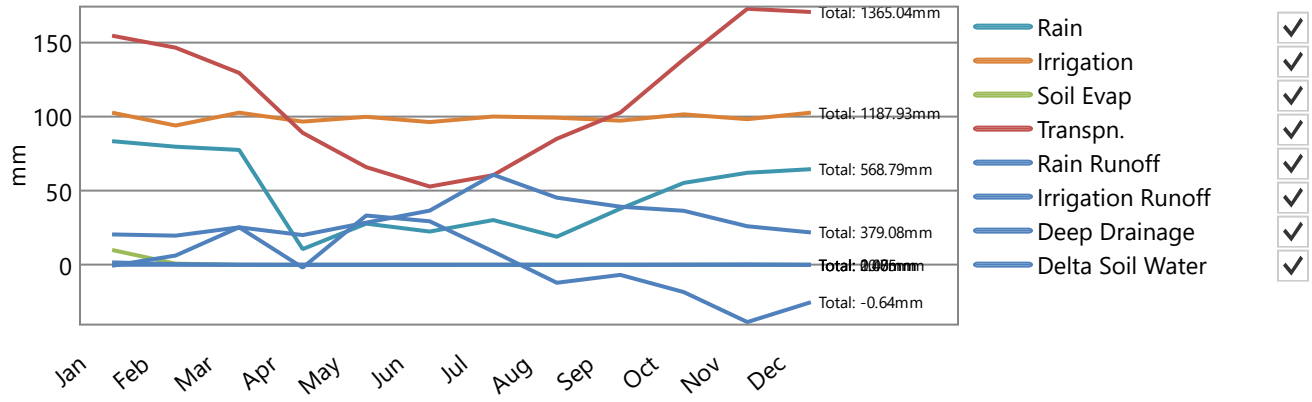
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1187.93
Soil Evaporation	10.75
Transpiration	1365.04
Rain Runoff	2.48
Irrigation Runoff	0.00
Deep Drainage	379.08
Delta Soil Water	-0.64

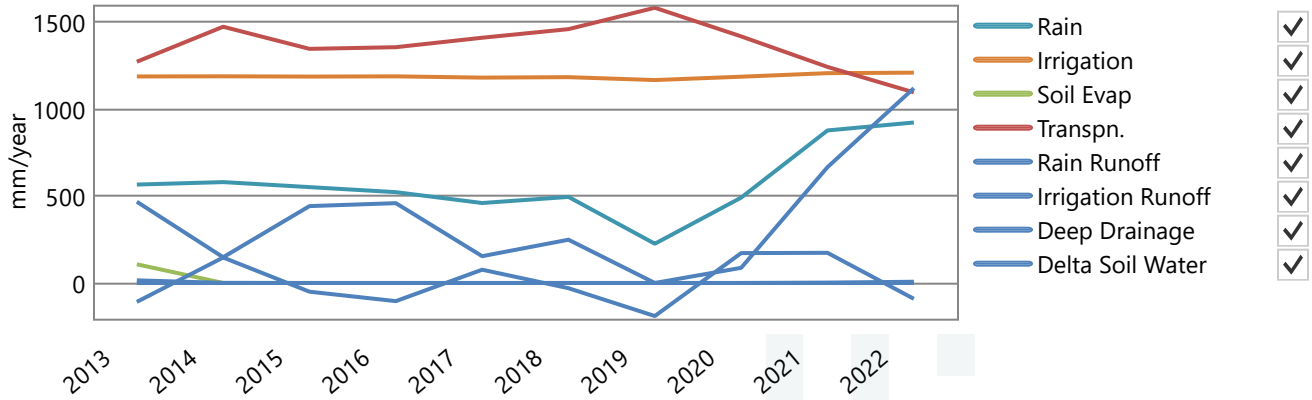
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

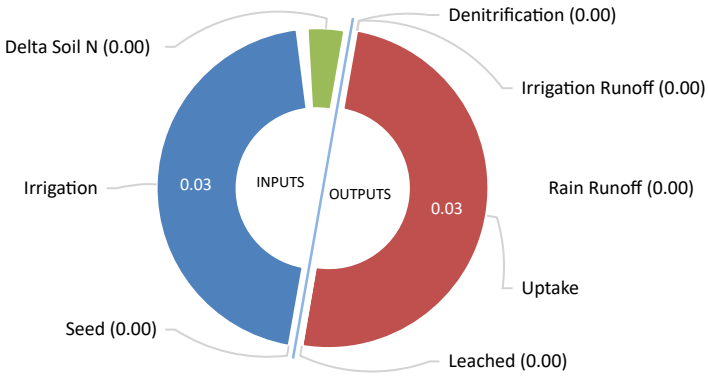
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

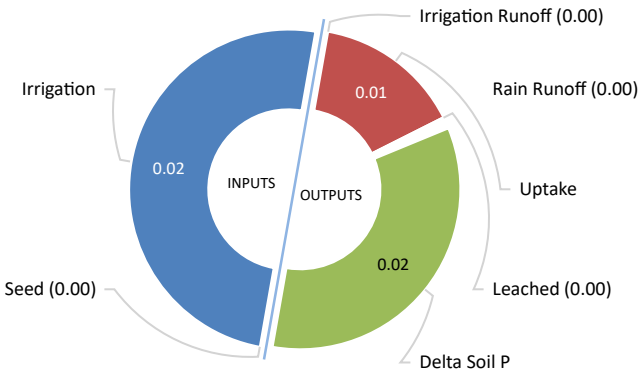
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	3.18E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.03
Leached	4.15E-05
Delta Soil N	-2.36E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.66E-05
Delta Soil P	0.02

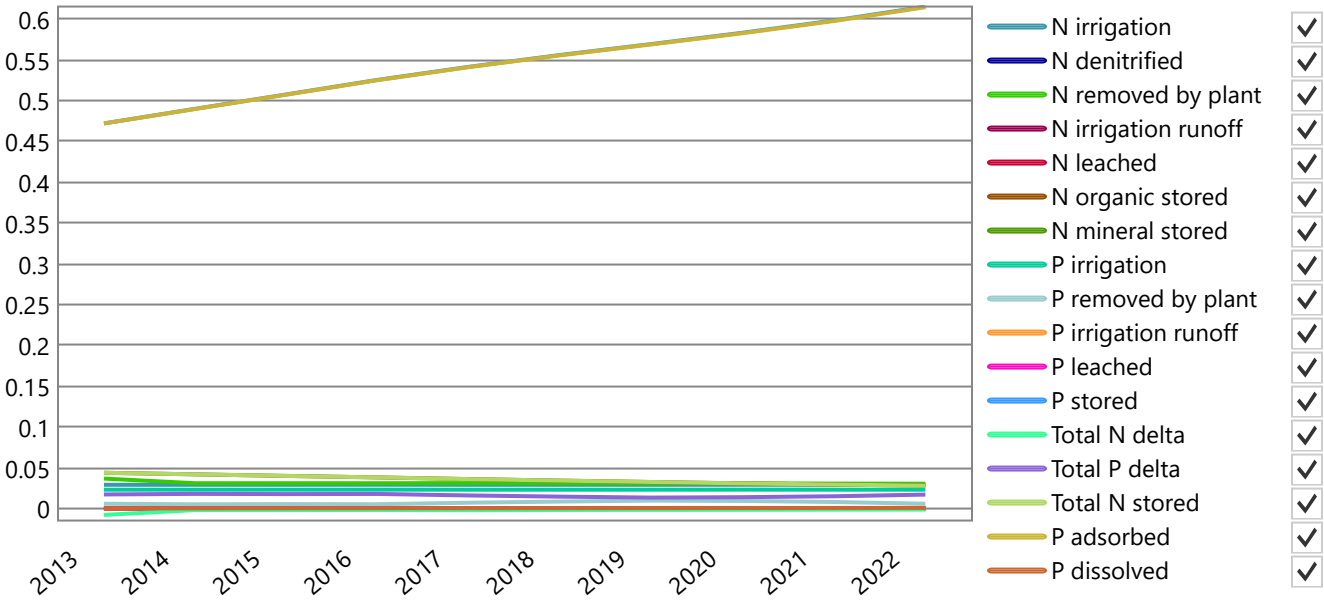
PERFORMANCE

Land Performance - Soil Nutrient

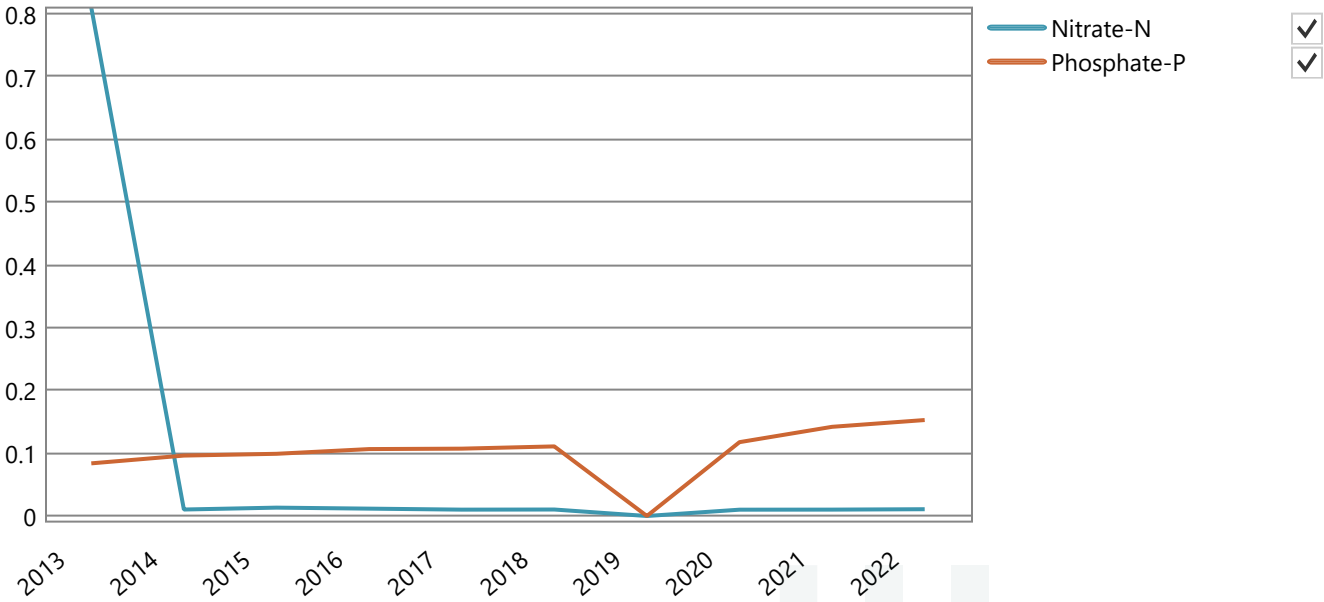
Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

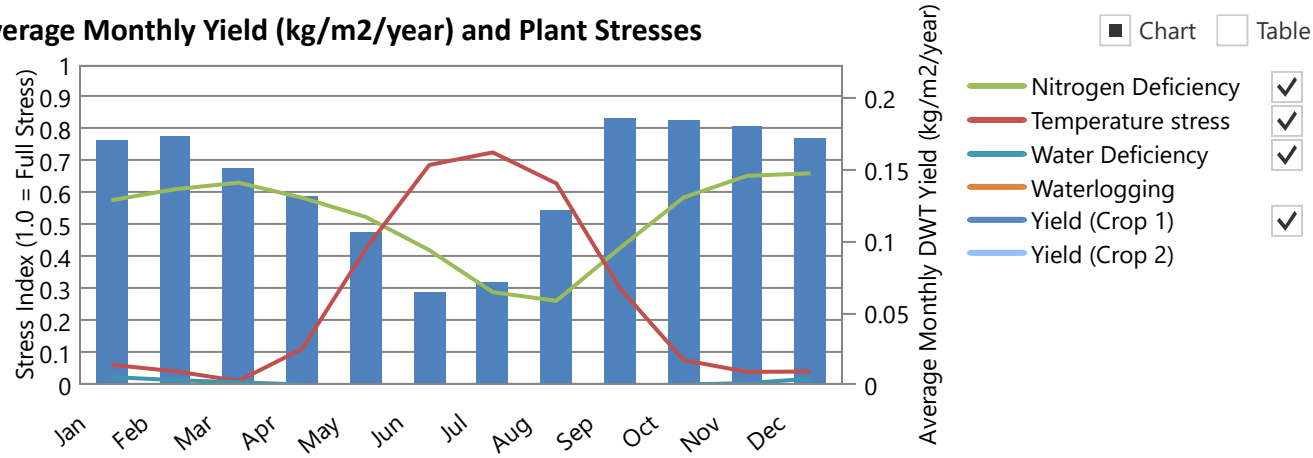
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.87 (0.81 - 0.93)
Average monthly root depth (mm) (minimum - maximum)	1193.78 (1129.25 - 1200.00)

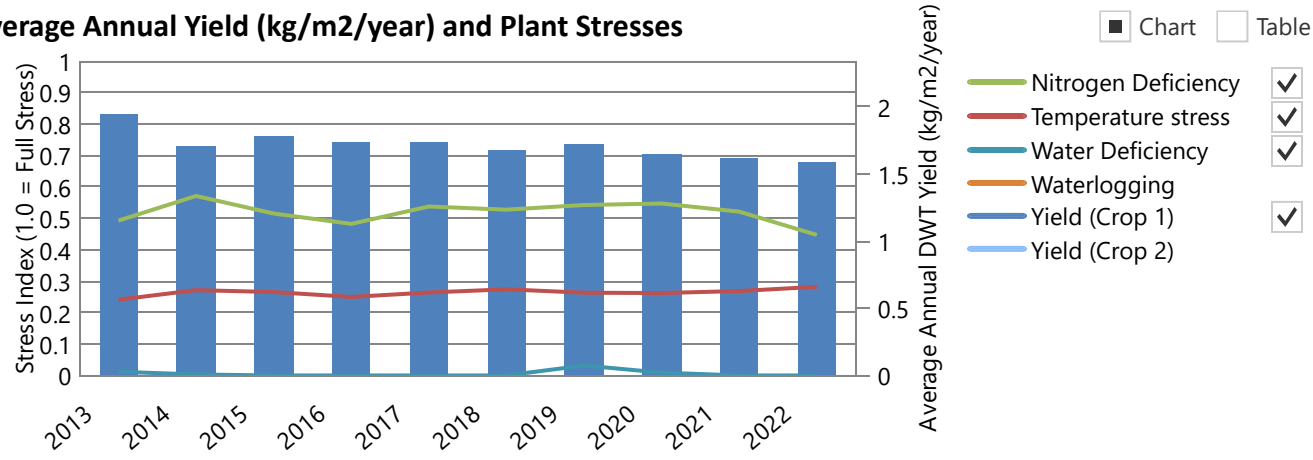
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.03 (0.03 - 0.04)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.004 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.00 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

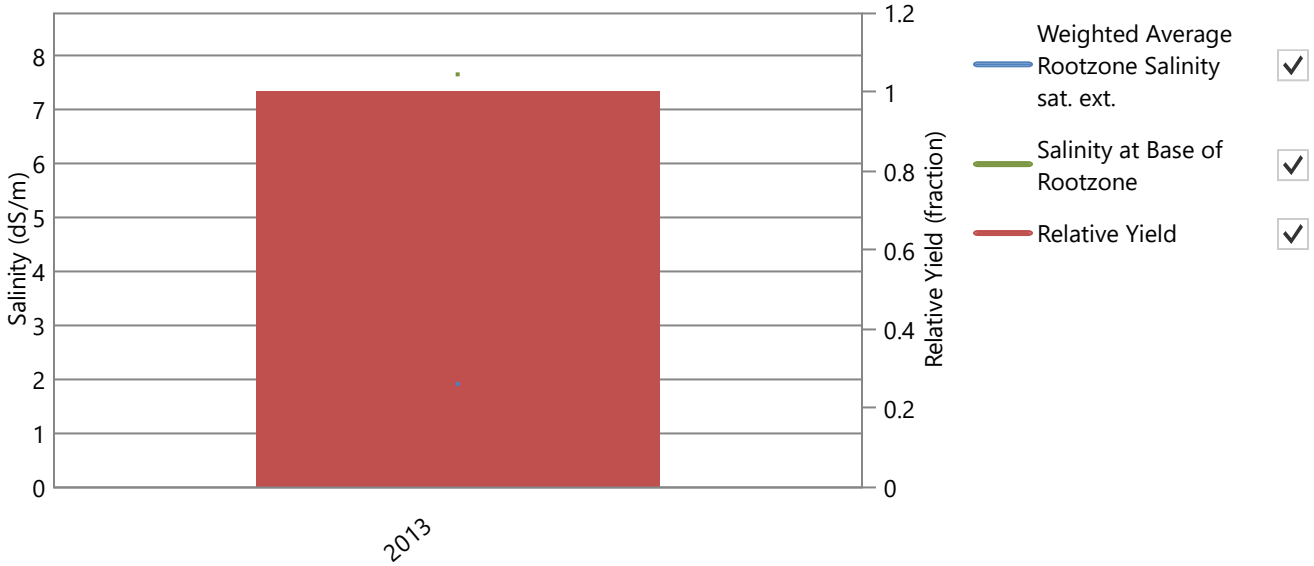
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.65
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



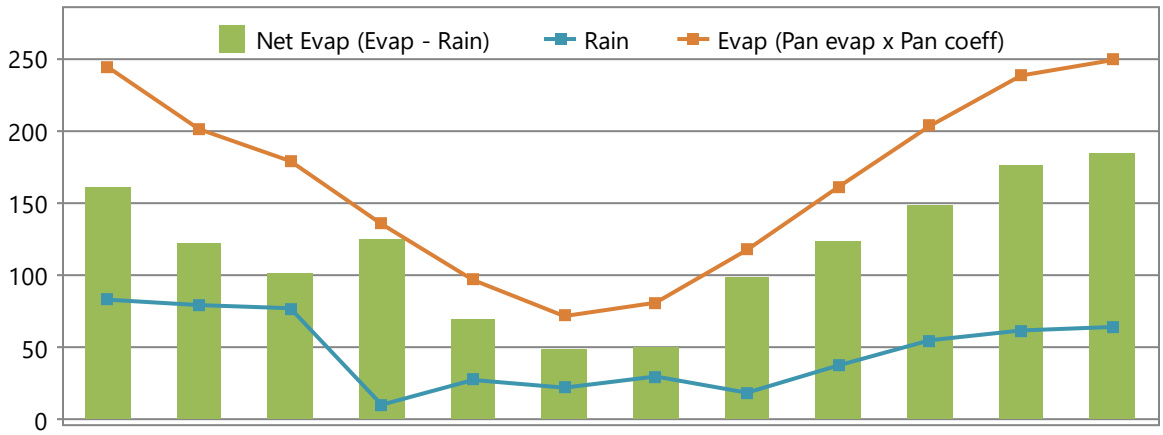
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 2257.07 m3/year or 6.18 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	65.74 (65.70 - 65.88)
Total Phosphorus	19.42 (10.81 - 20.00)	43.82 (43.80 - 43.92)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	3505.92 (3504.00 - 3513.60)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

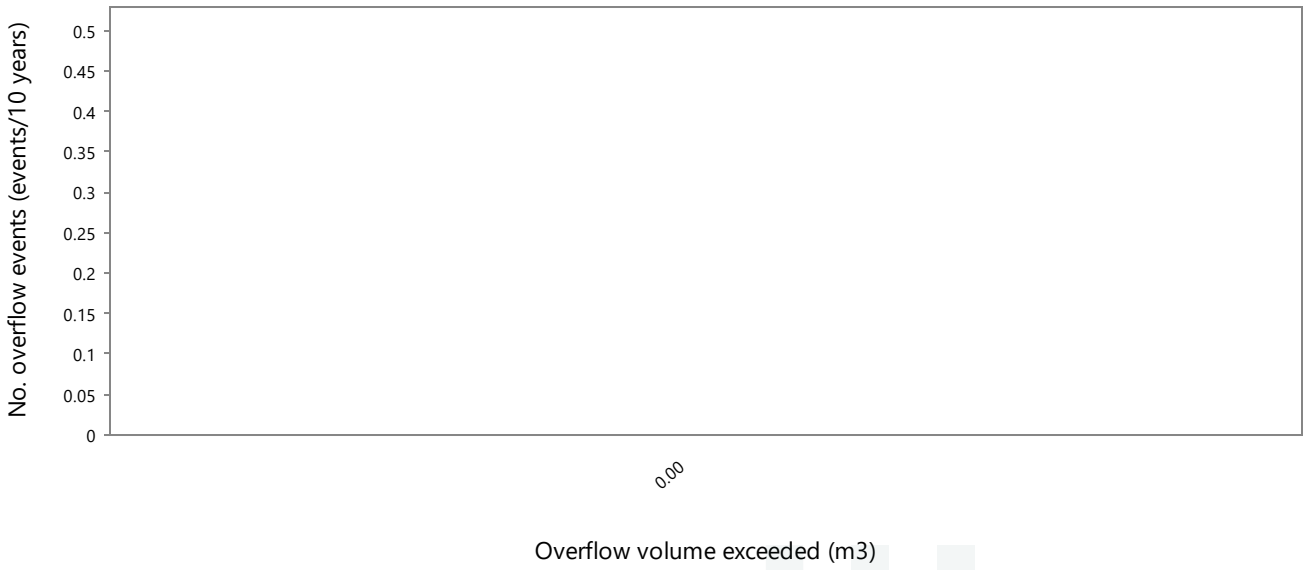
Last pond (Wet weather store): 18.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.02 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.06
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 1900 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	2257.07	1.19
Total nitrogen applied (kg)	55.22	0.03
Total phosphorus applied (kg)	43.82	0.02
Total salts applied (kg)	3505.92	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.4	93.7	102.4	96.4	99.6	96.1	99.8	99.0	97.0	101.2	98.0	102.4	1187.9
Soil Evap	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8
Transpn.	154.2	146.1	129.2	88.8	65.7	52.7	60.3	84.8	102.4	138.3	172.3	170.1	1365.0
Rain Runoff	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	2.5
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	20.4	19.6	25.2	20.0	28.4	36.5	60.6	45.2	39.1	36.3	25.9	21.8	379.1
Delta	-0.6	6.2	25.2	-1.9	33.2	29.3	8.9	-12.1	-6.8	-18.4	-38.5	-25.2	-0.6

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.18E-07
Average annual soil nitrogen leached (kg/m2/year)	4.15E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	4.15E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.03
	0.01 - 5.82E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.11
Max. annual nitrate-N concentration of deep drainage (mg/L)	0.81

Soil Phosphorus Balance

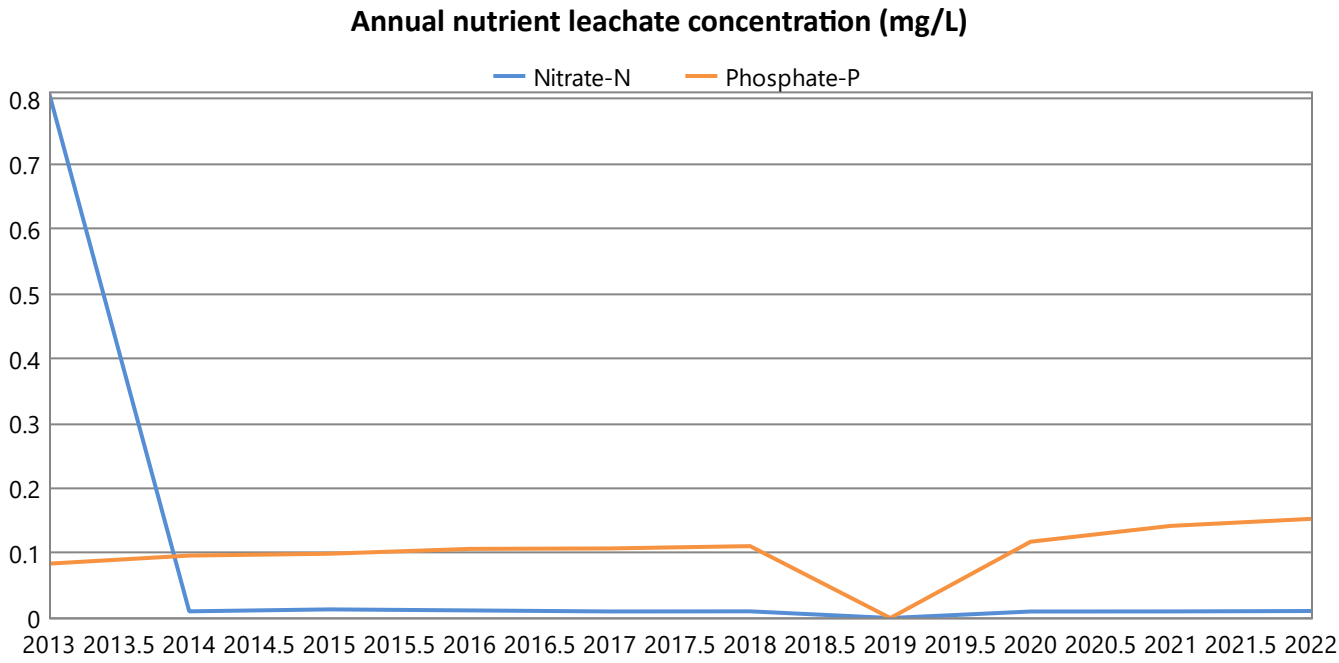
Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.66E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 7.80E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.61
Average phosphate-P concentration in rootzone (mg/L)	1.29
Average phosphate-P concentration of deep drainage (mg/L)	0.12
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.15
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.15 mg/L (years)	37.81

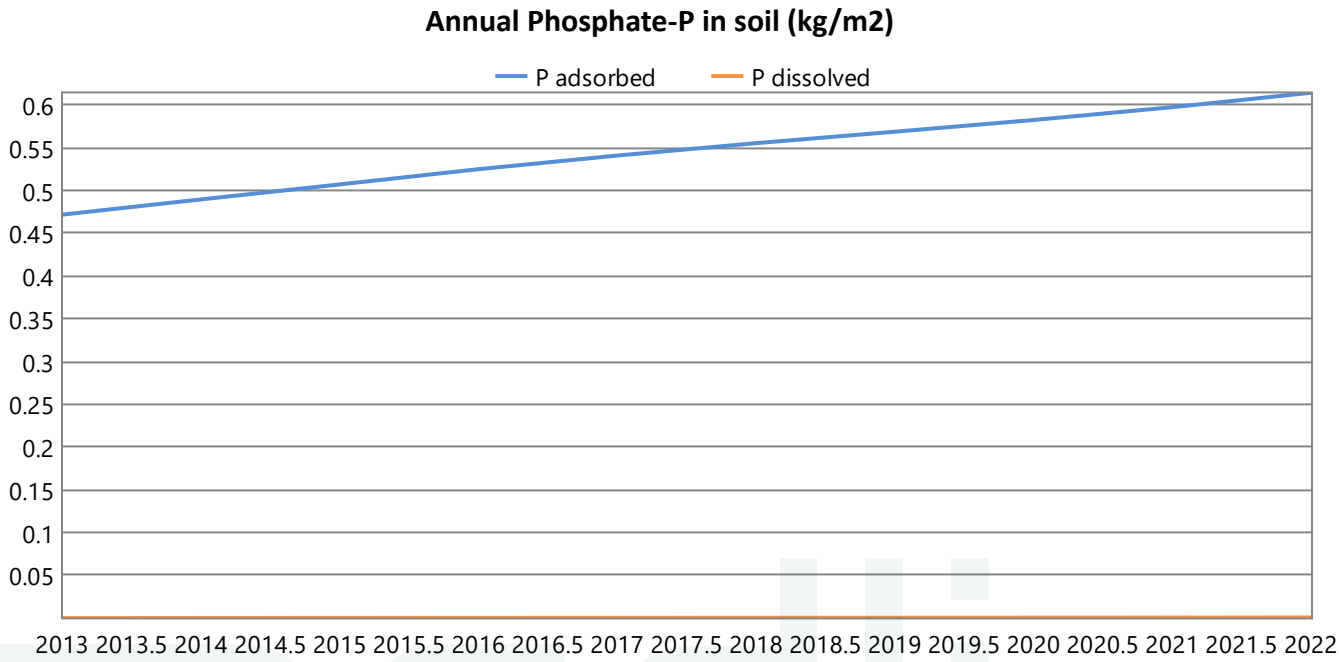
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation





DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 1900 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction)	0.87 (0.81 - 0.93)
Average monthly crop factor (fraction)	0.70 (0.65 - 0.74)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1193.78 (1129.25 - 1200.00)
Average number of normal harvests per year (no./year)	3.00 (2.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	2.80
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.52 (0.45 - 0.57)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.02)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.65
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
NO IRRIGATION SCENARIO: 30EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

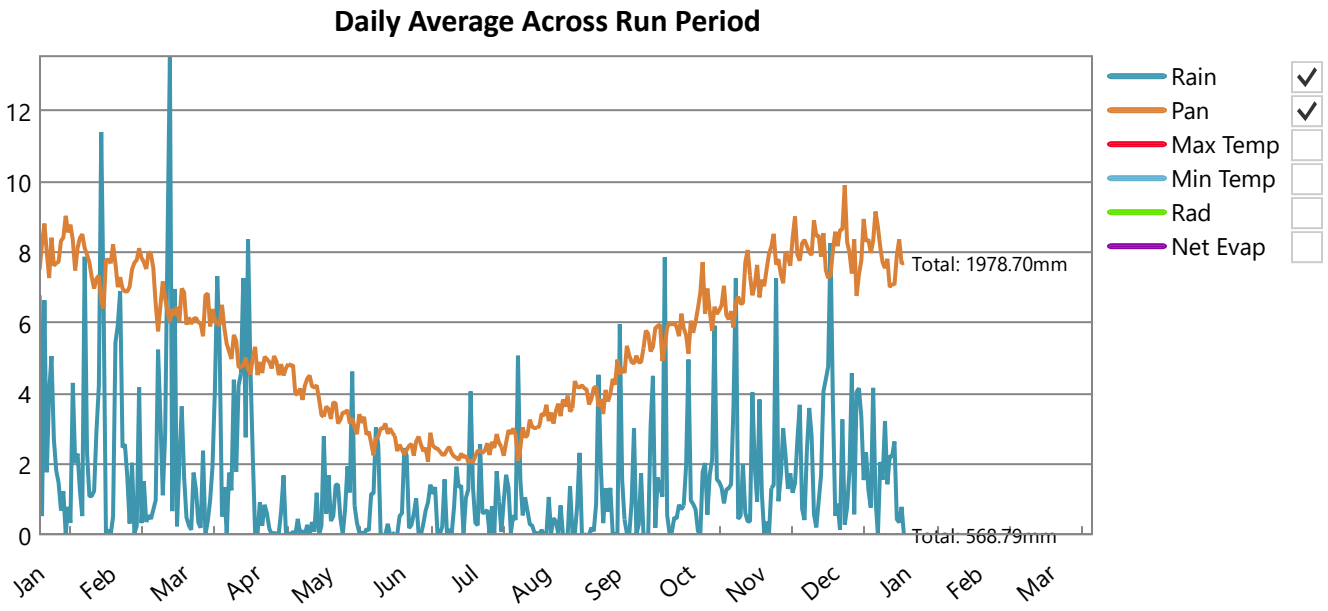
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

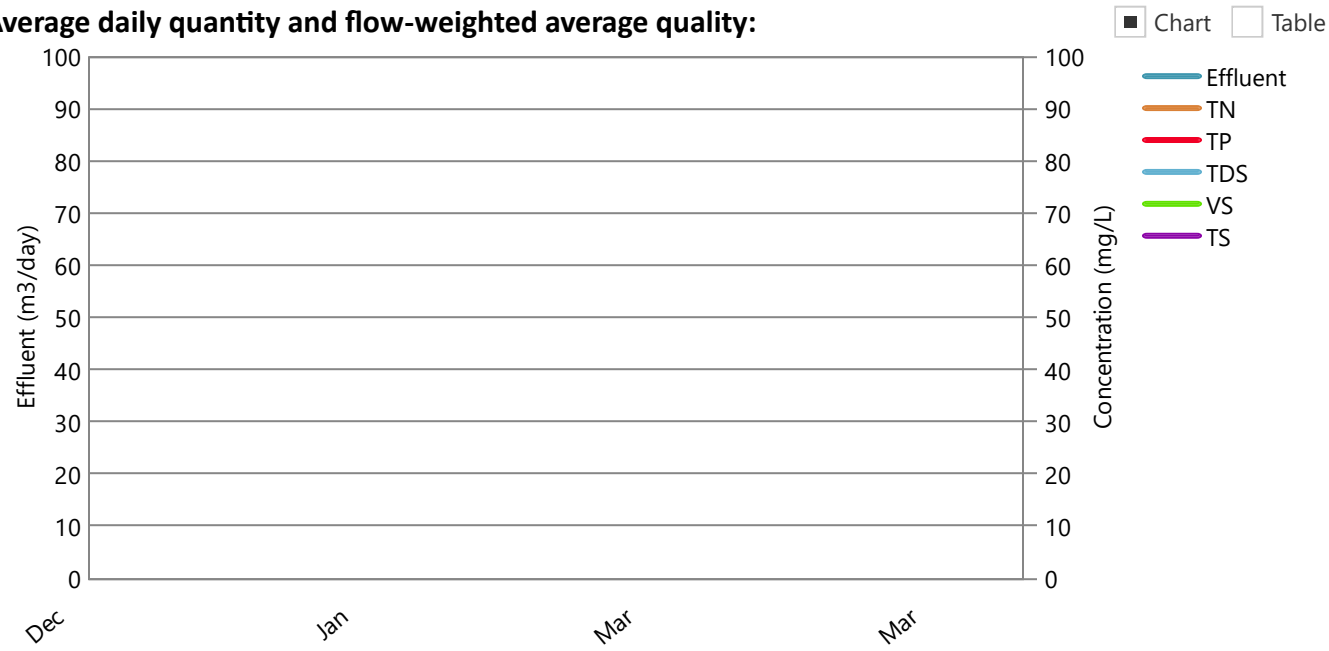


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

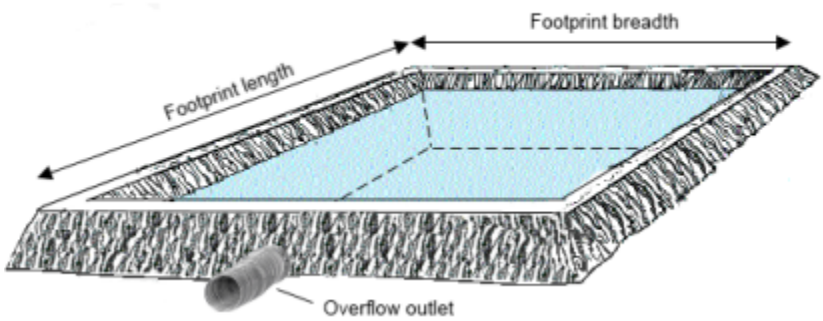
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

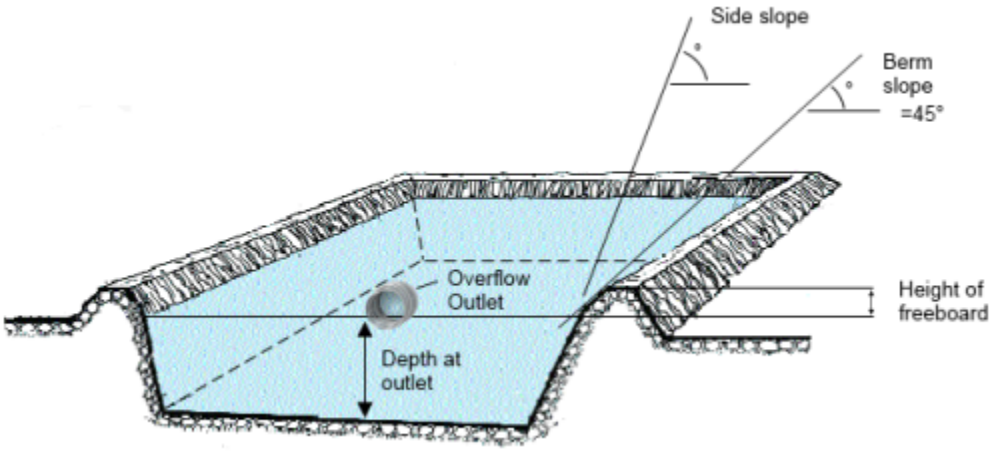
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	18.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	23.70
Pond footprint length (m)	4.87
Pond footprint width (m)	4.87
Pond catchment area (m2)	23.70
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

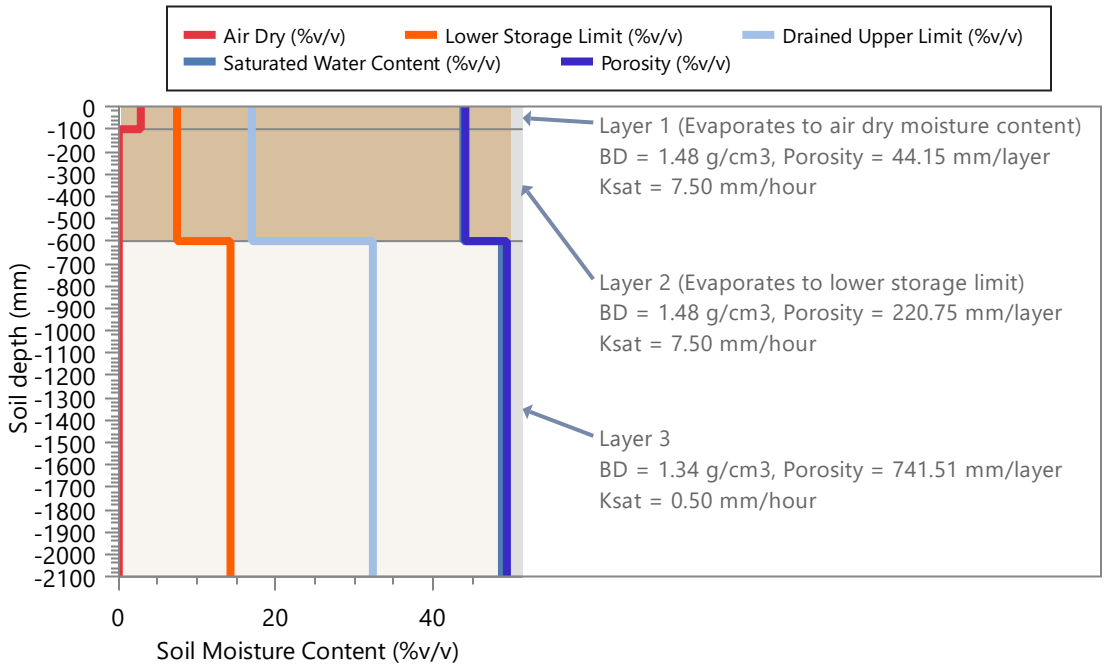
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 1900.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **18 m3**

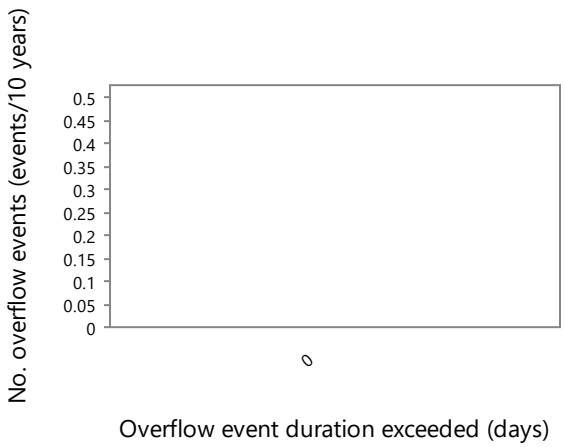
Pond System Water Balance (m3/year)

(no data available)

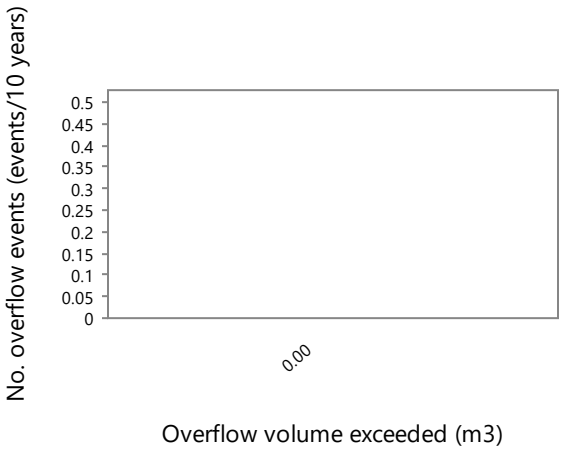
Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

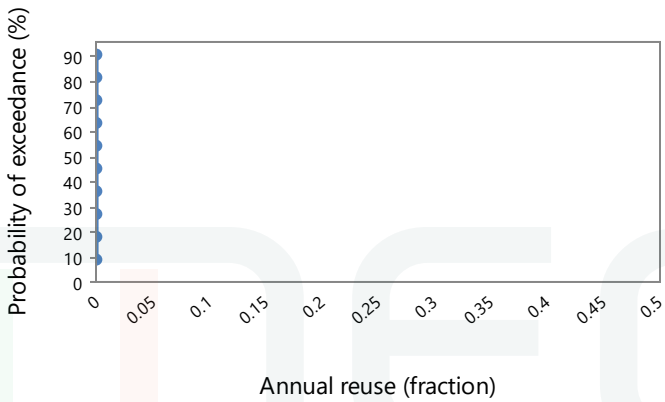
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00



Export plot



Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

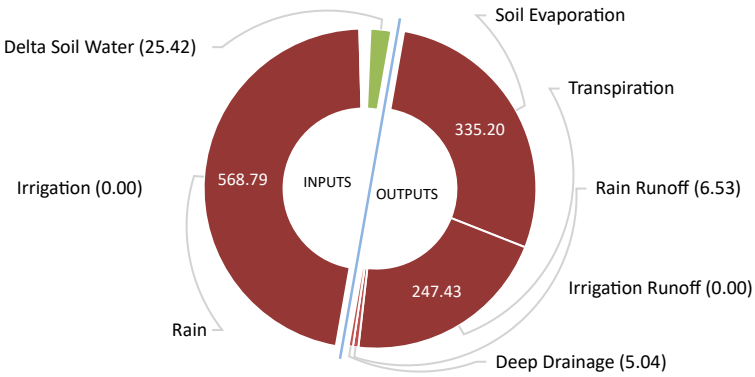
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 1900 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

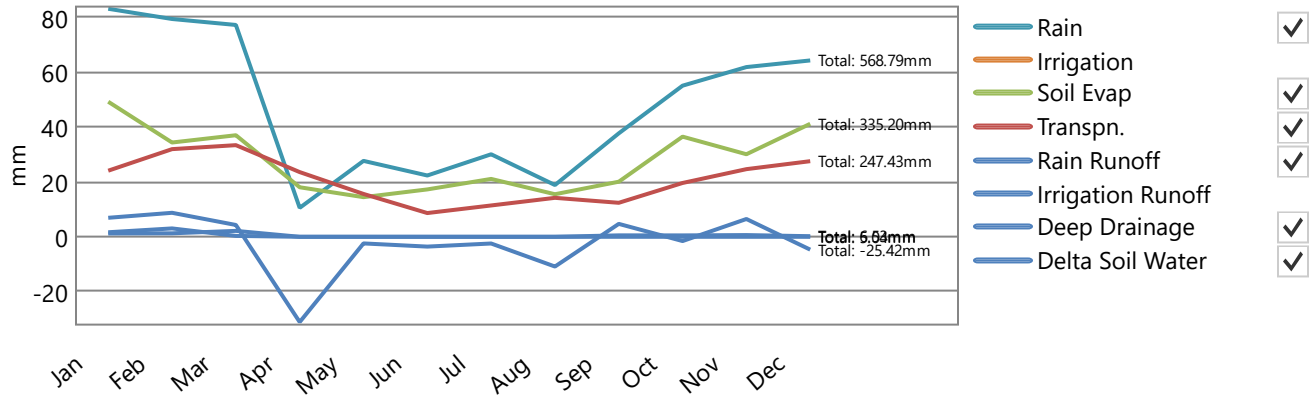
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	335.20
Transpiration	247.43
Rain Runoff	6.53
Irrigation Runoff	0.00
Deep Drainage	5.04
Delta Soil Water	-25.42

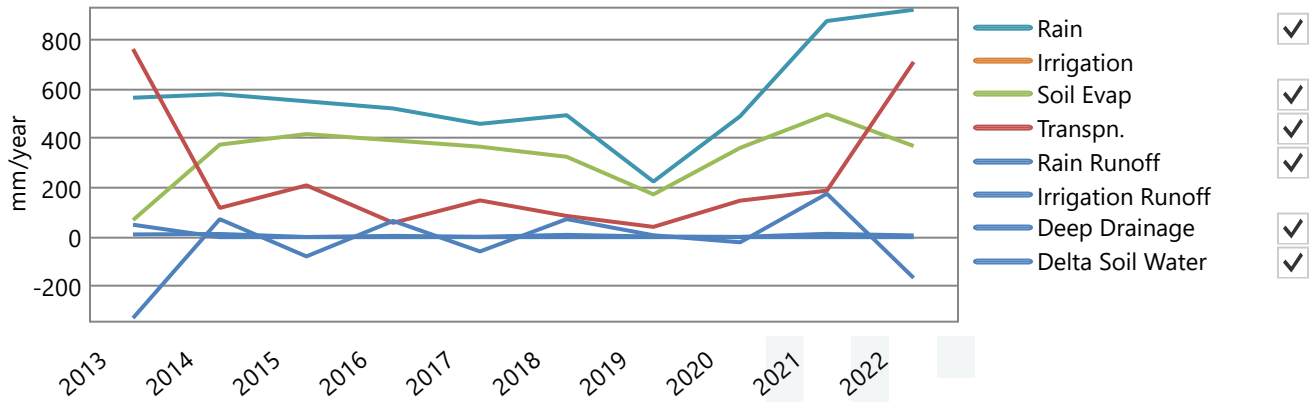
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

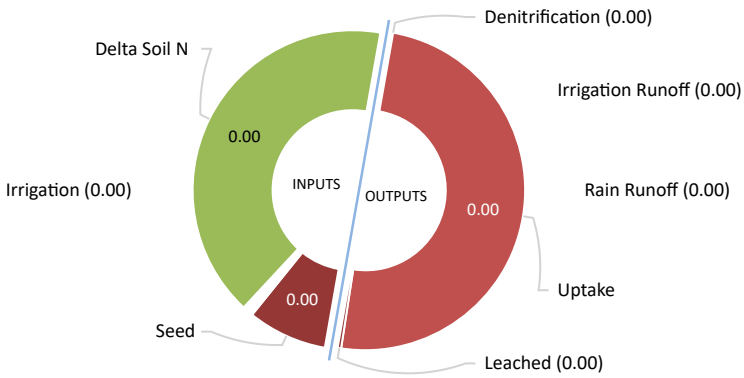
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

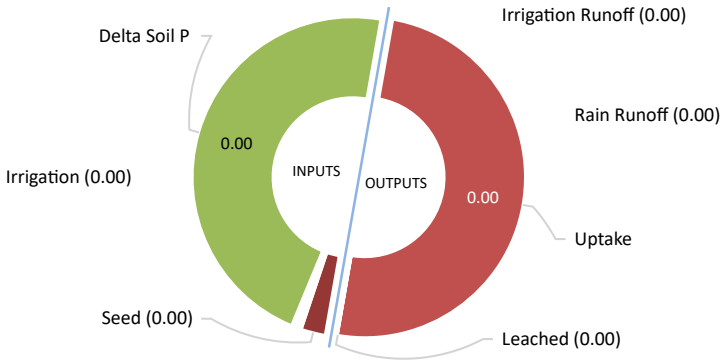
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.63E-04
Irrigation	0.00
Denitrification	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.59E-03
Leached	1.12E-05
Delta Soil N	-1.34E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	2.25E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	4.65E-04
Leached	2.34E-07
Delta Soil P	-4.42E-04

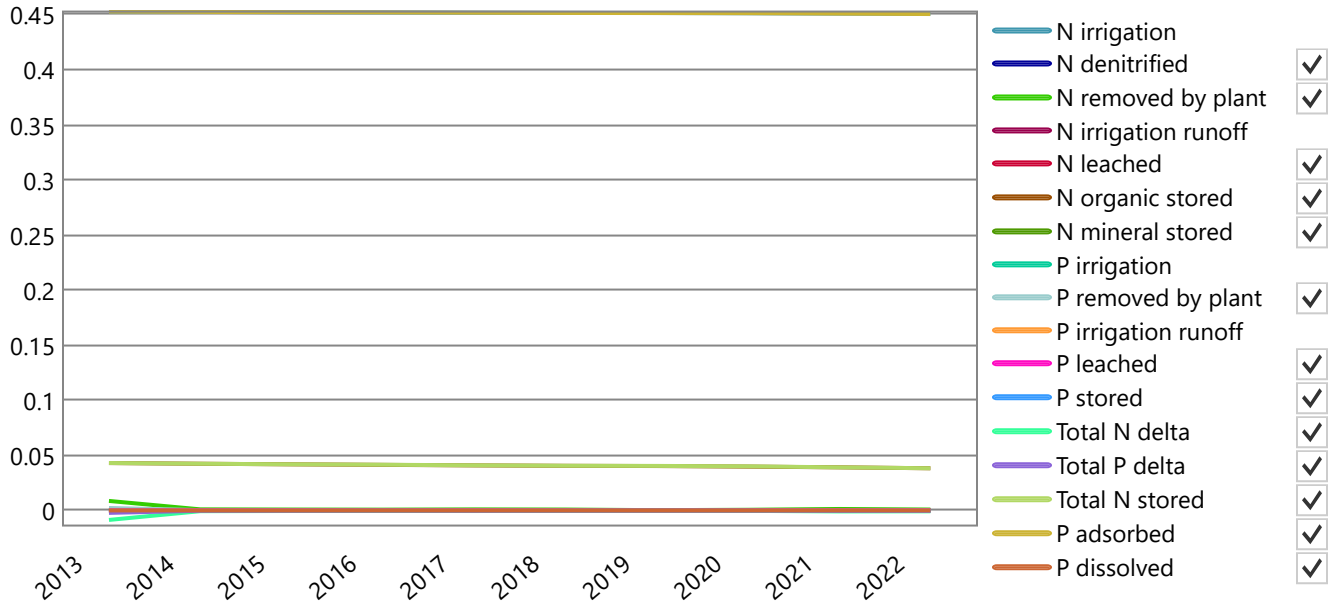
PERFORMANCE

Land Performance - Soil Nutrient

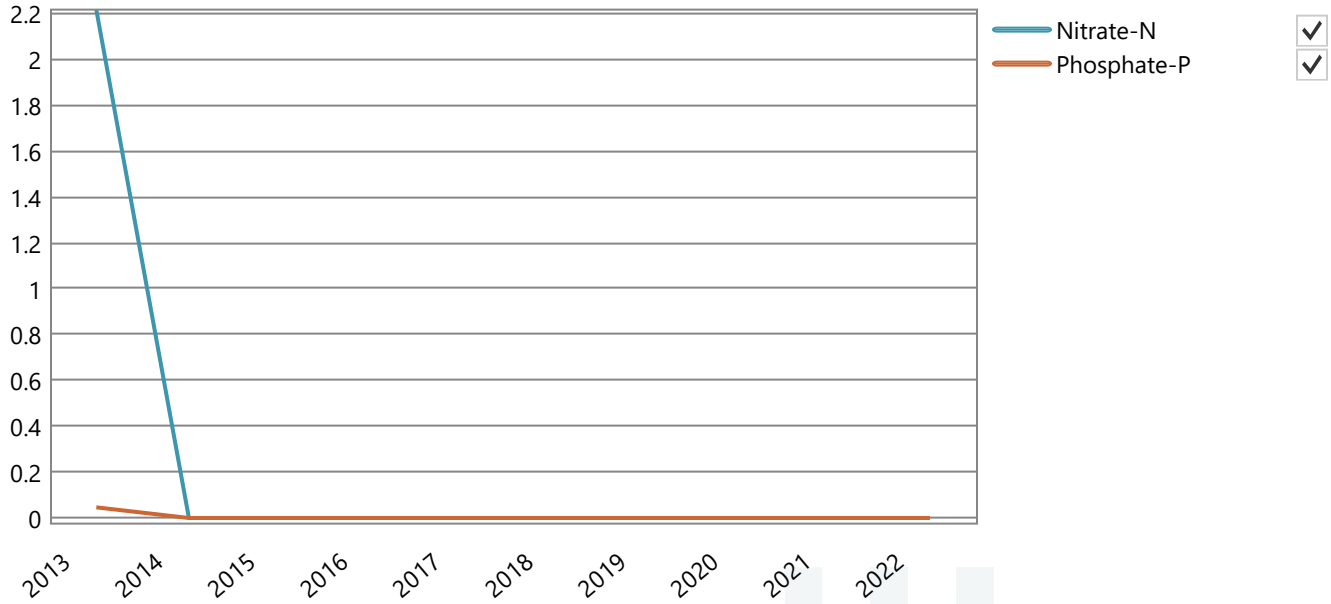
Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 1900 m2 representation_conserva

Soil Type: Sodosols

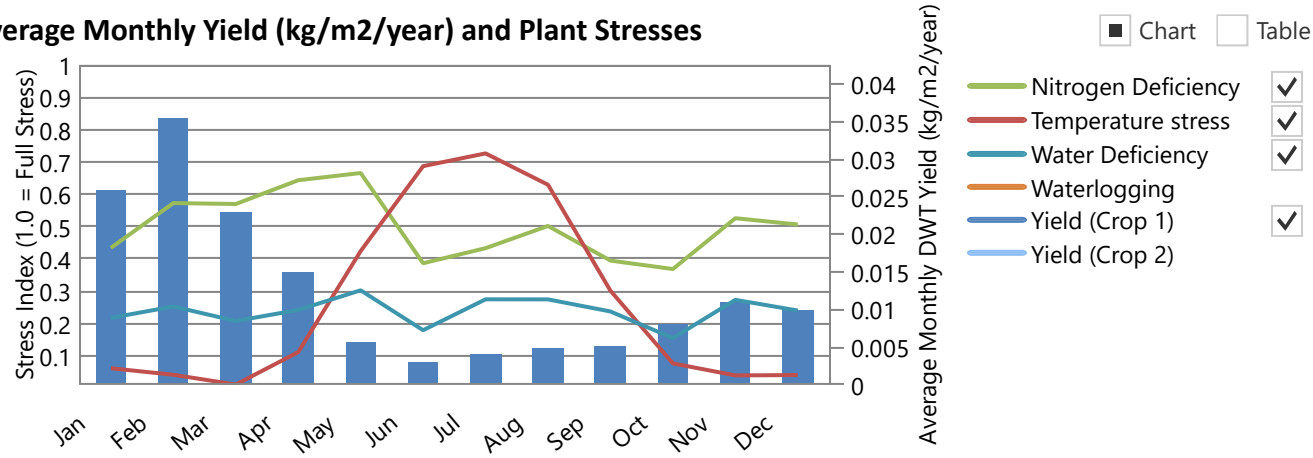
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Average monthly root depth (mm) (minimum - maximum)	383.78 (277.37 - 487.49)

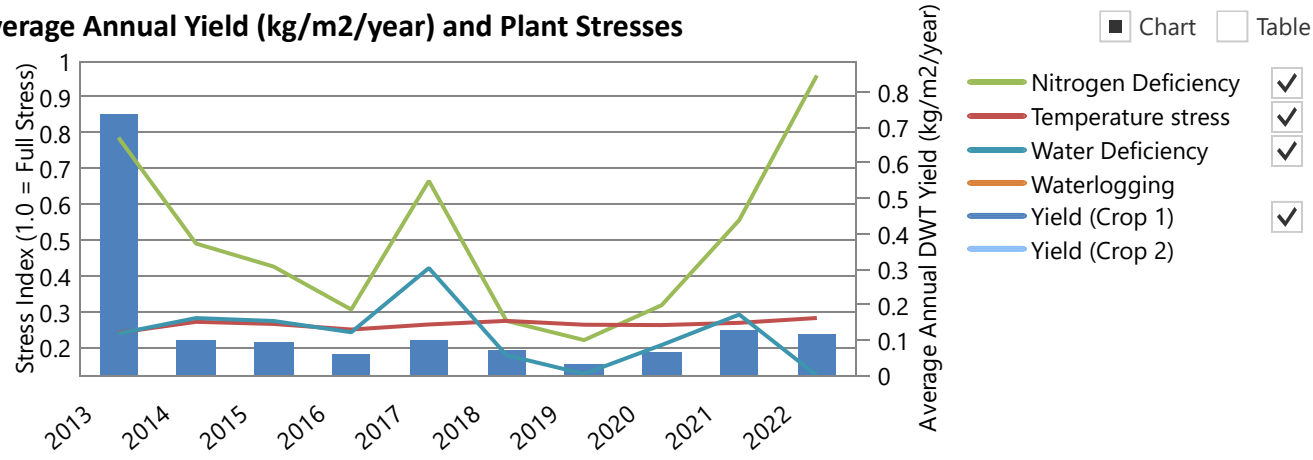
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.01)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.10 (normal), 2.40 (forced by crop death due to nitrogen stress (0.10), water stress (2.30))

No. days without crop/year (days/year): 123.20 due to frosting (4.40), temperature stress - not frost (2.00), water stress (116.80)

PERFORMANCE

Land Performance

Paddock: **Girrahween Office Application Ar, 1900 m2 representation_conserva**

Soil Type: **Sodosols**

Plant: **Continuous Kikuyu 1 Pasture**

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

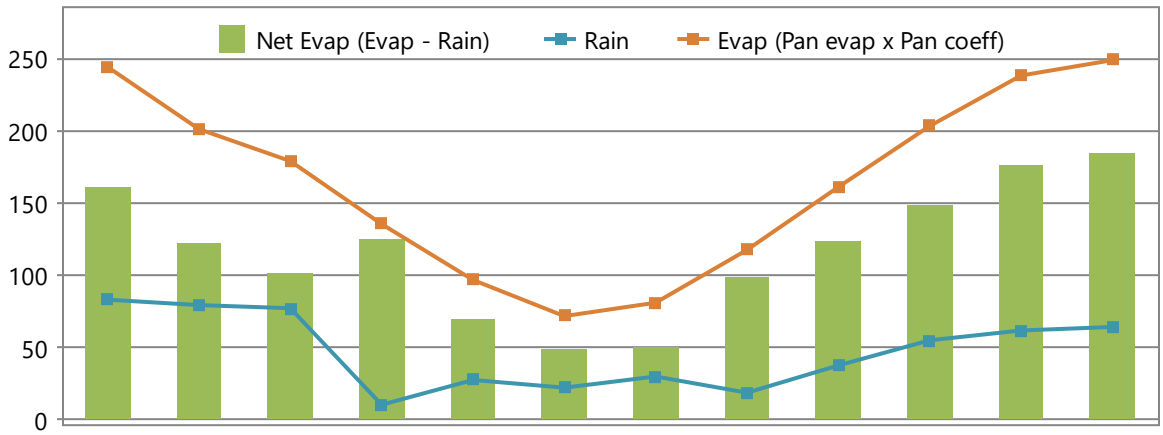
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

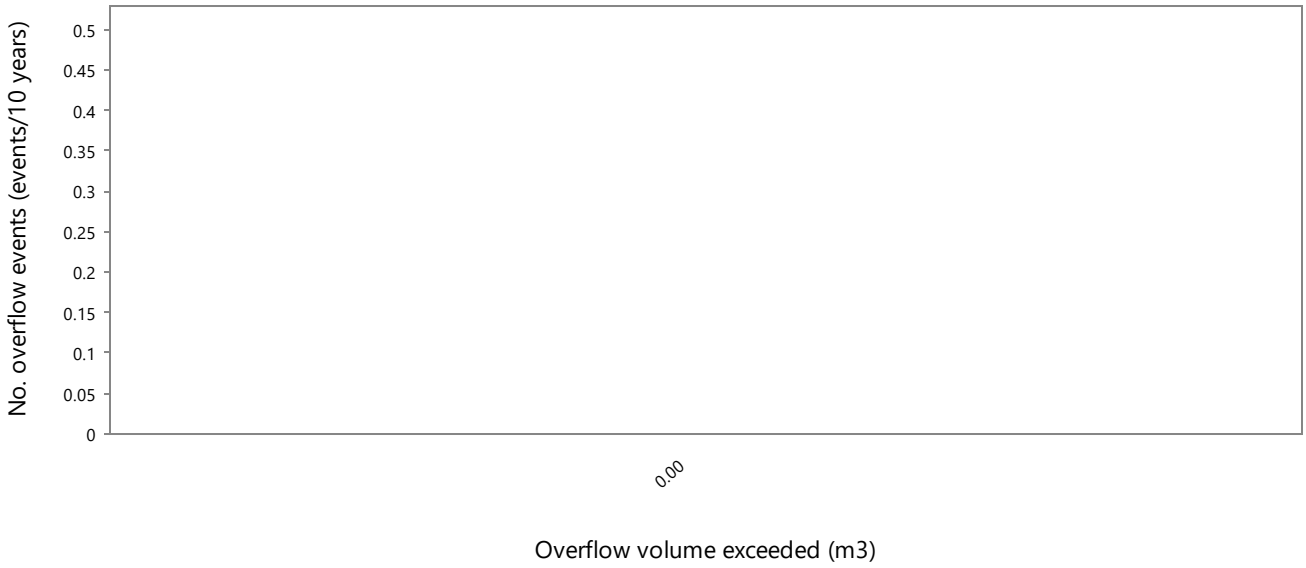
Last pond (Wet weather store): 18.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.02 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 1900 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	49.3	34.4	37.1	18.1	14.5	17.3	21.1	15.5	20.1	36.5	30.1	41.2	335.2
Transpn.	24.1	32.0	33.4	23.6	15.6	8.7	11.4	14.2	12.4	19.6	24.7	27.6	247.4
Runoff	1.2	1.3	2.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	6.5
Drainage	1.7	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Delta	6.9	8.8	4.3	-31.1	-2.4	-3.6	-2.4	-10.9	4.7	-1.6	6.5	-4.7	-25.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	1.59E-03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	0.00
Average annual soil nitrogen leached (kg/m2/year)	1.12E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	1.12E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.04
	0.01 - 2.40E-05
Average nitrate-N concentration of deep drainage (mg/L)	2.22
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.22

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	4.65E-04
Average annual soil phosphorus leached (kg/m2/year)	2.34E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 3.00E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.45
Average phosphate-P concentration in rootzone (mg/L)	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.05
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.05
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

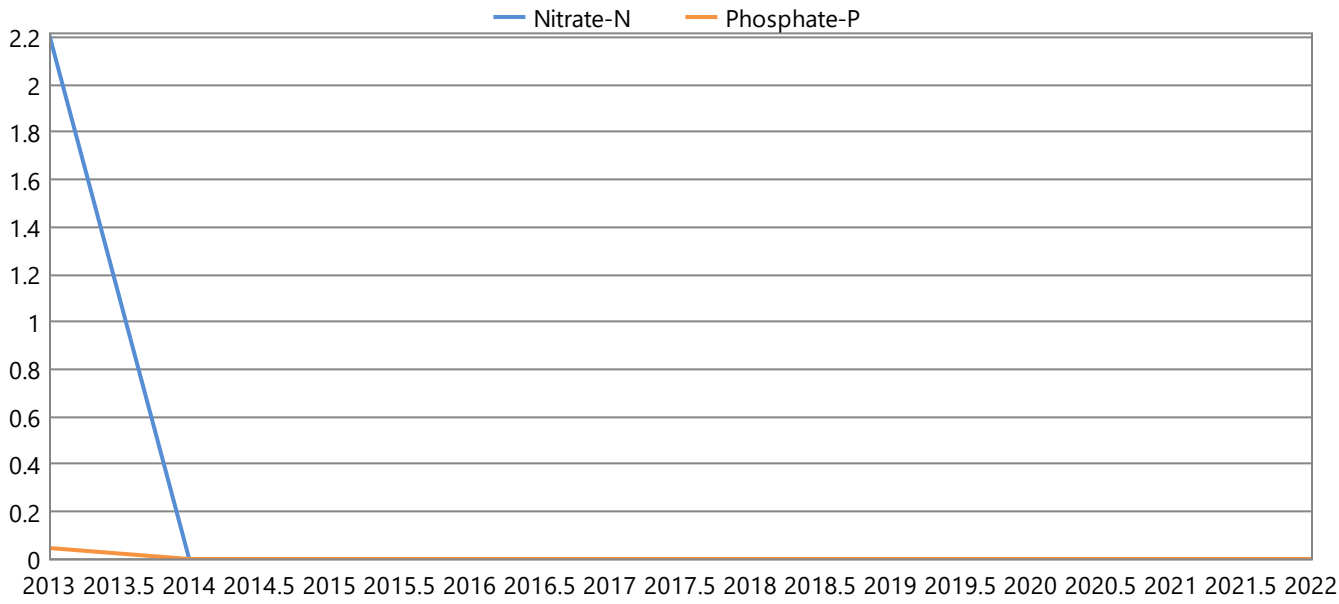
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

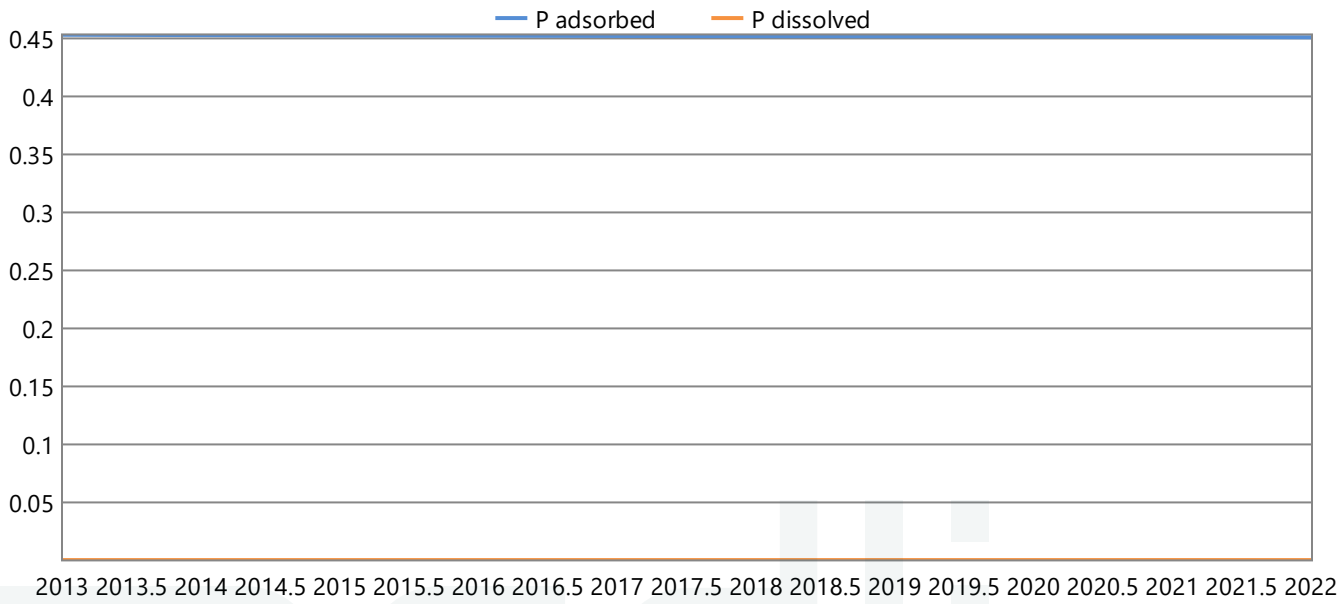
Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 1900 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction)	0.27 (0.19 - 0.34)
Average monthly crop factor (fraction)	0.21 (0.15 - 0.27)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	383.78 (277.37 - 487.49)
Average number of normal harvests per year (no./year)	0.10 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	2.40 (0.00 - 4.00)
Average number of crop deaths for last five years only (no./year)	2.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.50 (0.22 - 0.96)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.24 (0.15 - 0.30)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	123.20

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
IRRIGATION LOAD SCENARIO: 60EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

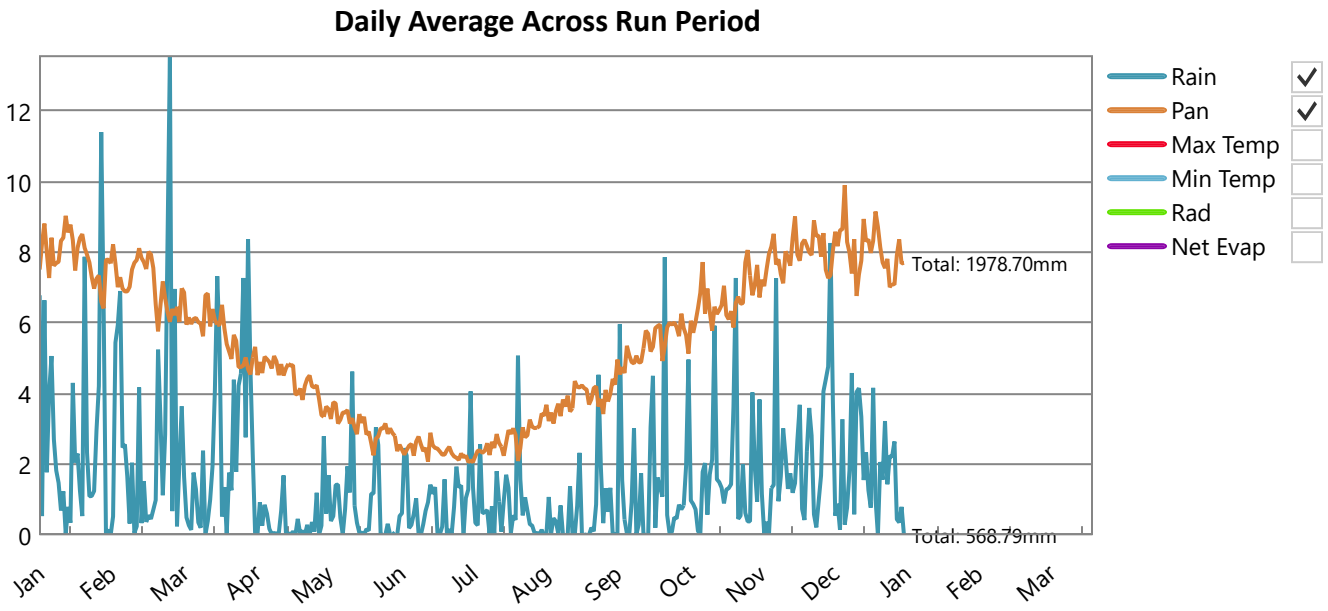
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

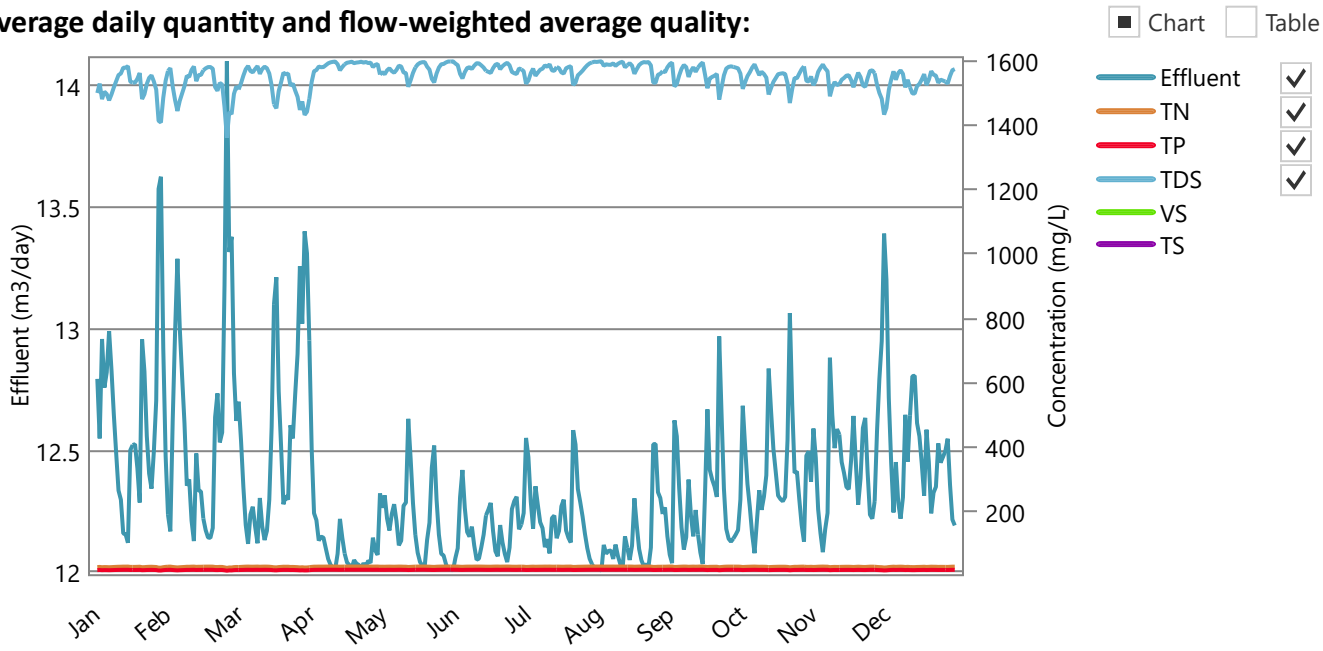


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **4514.13 m3/year** or 12.36 m3/day (Min-Max: 12.00 - 22.21)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

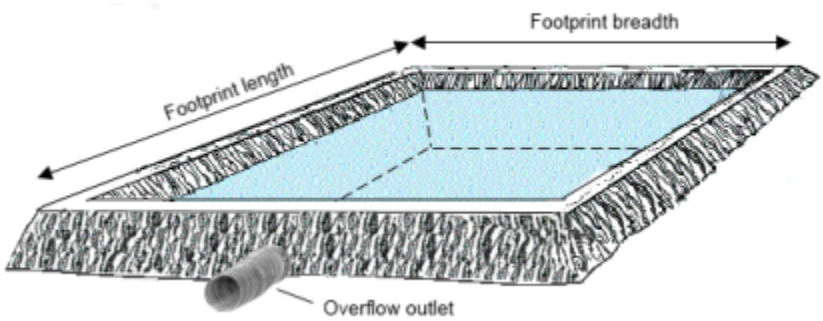
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	131.47 (131.40 - 131.76)
Total Phosphorus	19.42 (10.81 - 20.00)	87.65 (87.60 - 87.84)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	7011.84 (7008.00 - 7027.20)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

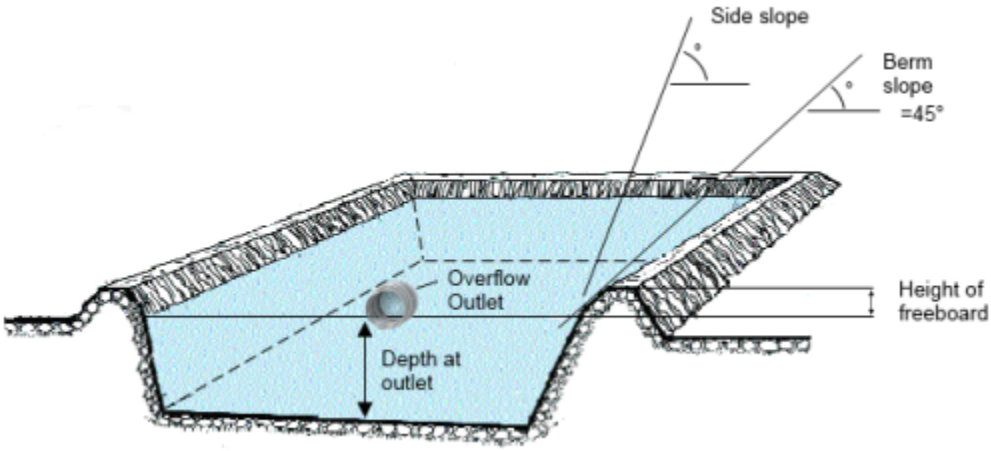
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	36.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	43.97
Pond footprint length (m)	6.63
Pond footprint width (m)	6.63
Pond catchment area (m2)	43.97
Average active volume (m3)	0.45





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

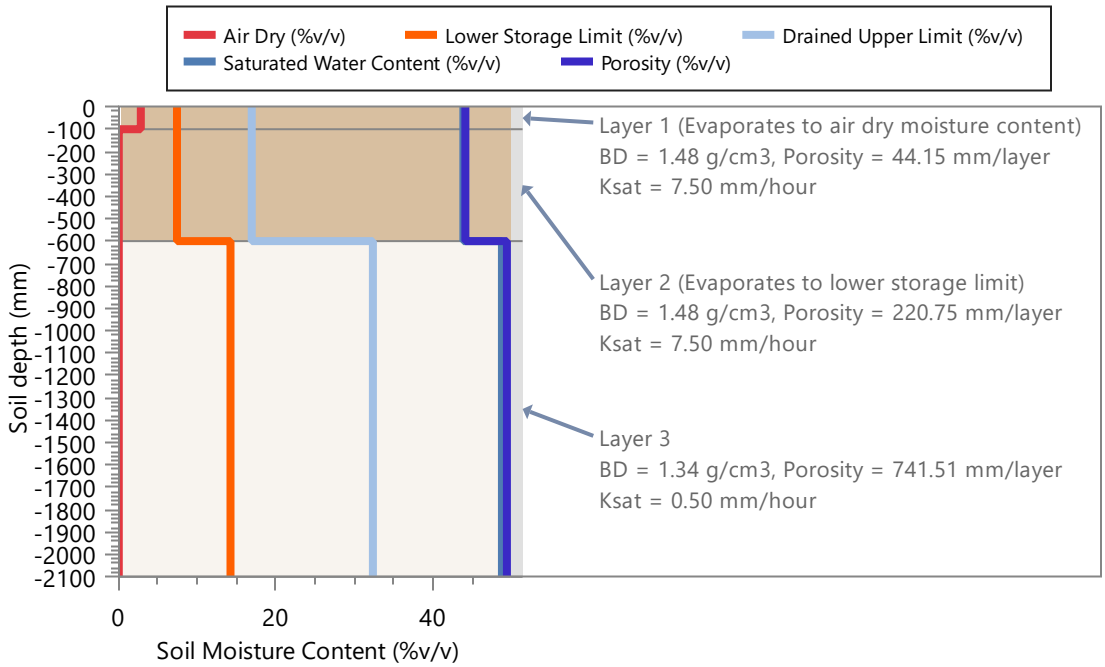
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 3800.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

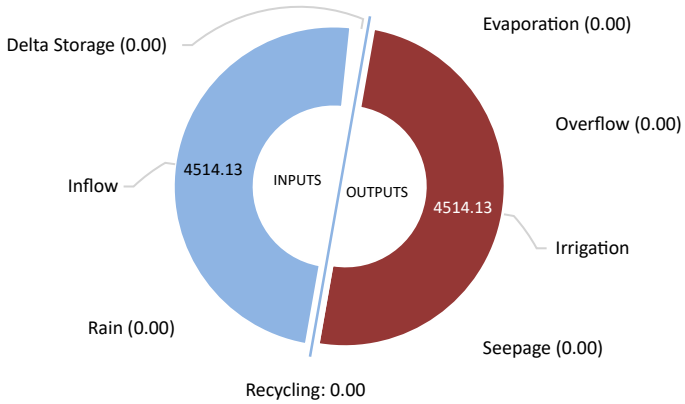
Average monthly cover (fraction) (minimum - maximum)	0.87 (0.81 - 0.93)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **36 m3**

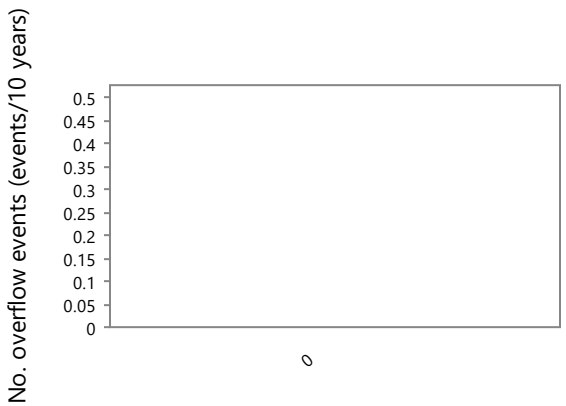
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	4514.13
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	4514.13
Seepage	0.00
Delta Storage	0.00

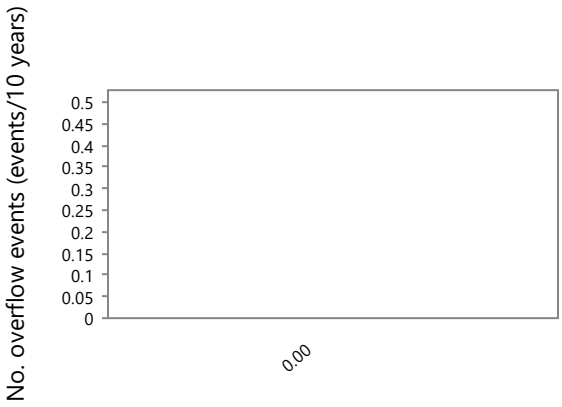
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



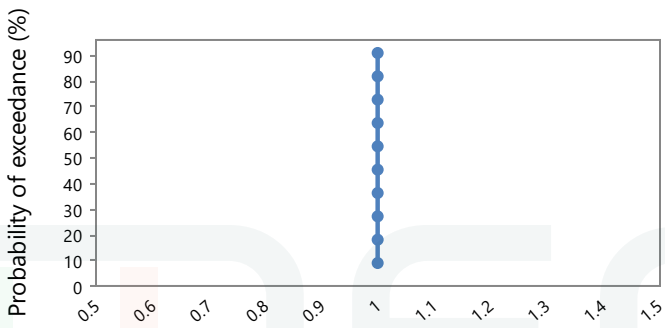
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

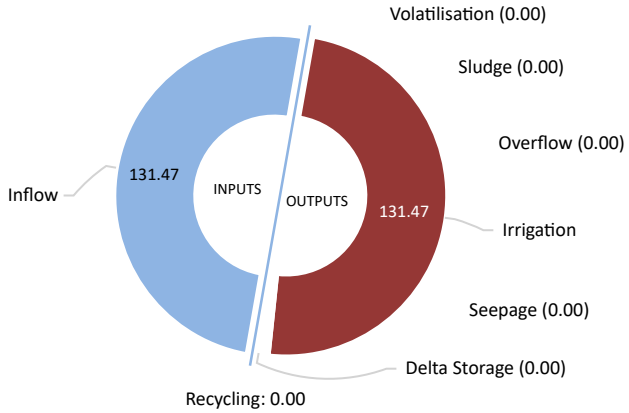
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

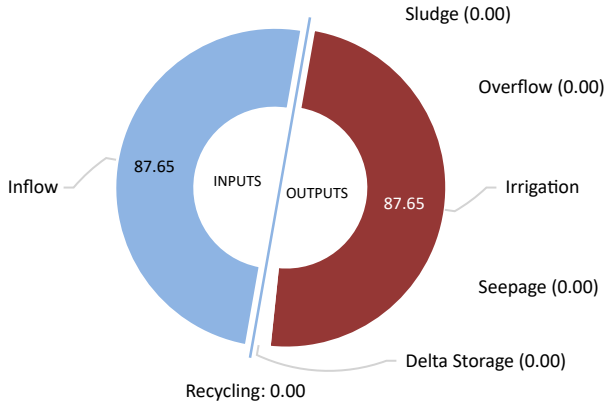
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



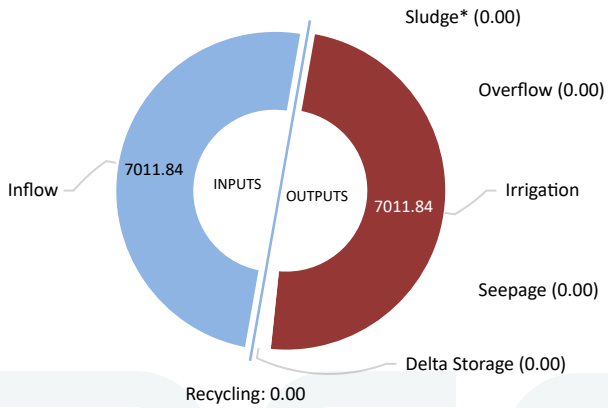
Name	Value
Inflow	131.47
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	131.47
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	87.65
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	87.65
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	7011.84
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	7011.84
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.73
Average phosphorus concentration of pond liquid (mg/L)	16.48
Average salinity of pond liquid (dS/m)	2.06

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	4514.13
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	4514.13
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

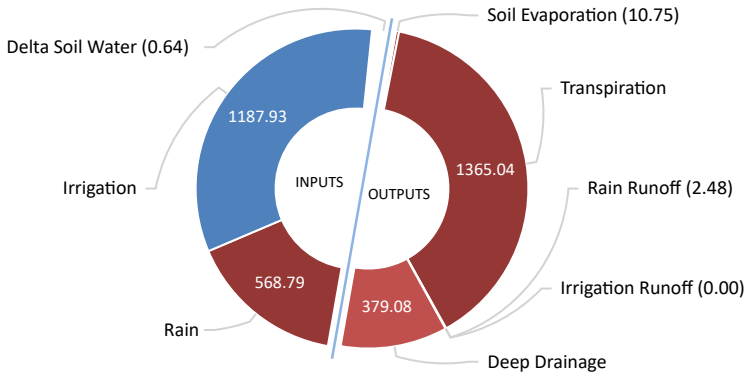
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 3800 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

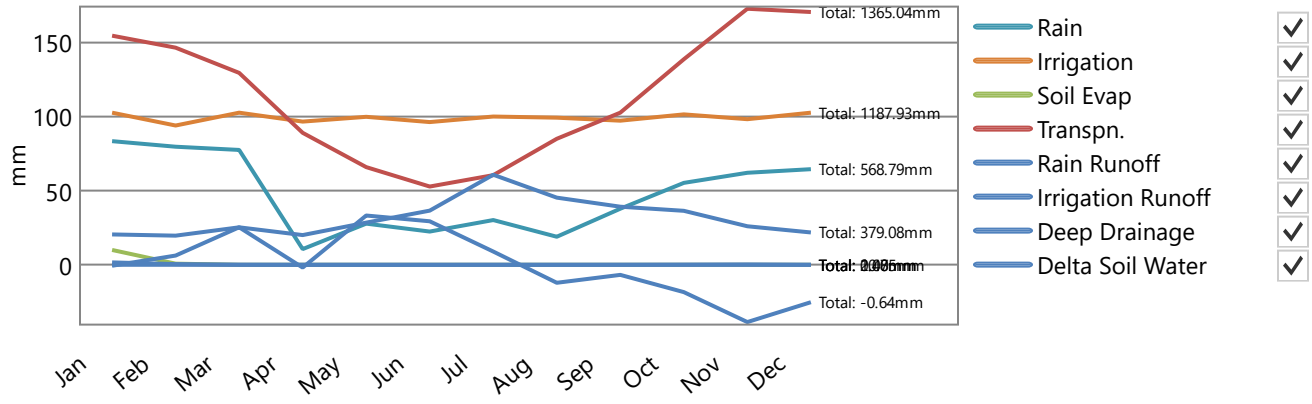
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1187.93
Soil Evaporation	10.75
Transpiration	1365.04
Rain Runoff	2.48
Irrigation Runoff	0.00
Deep Drainage	379.08
Delta Soil Water	-0.64

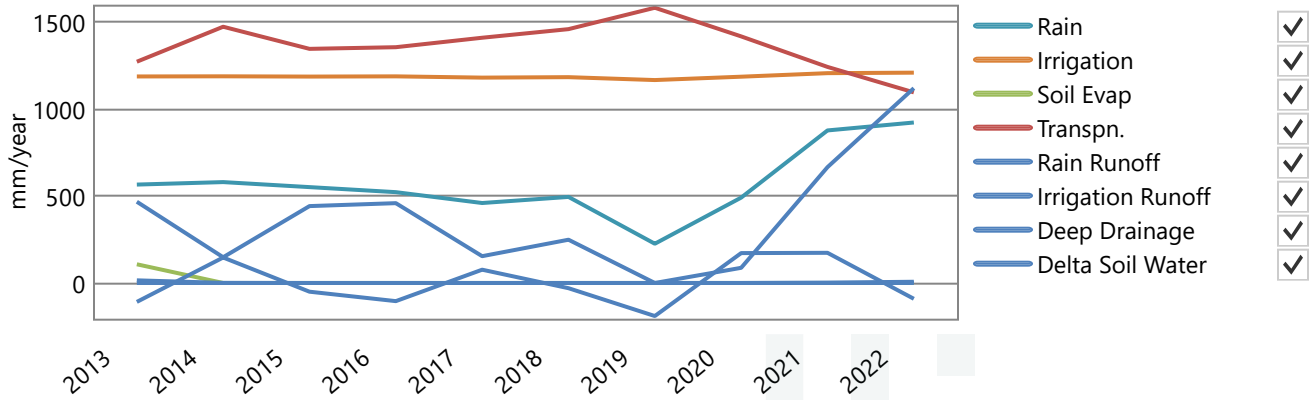
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

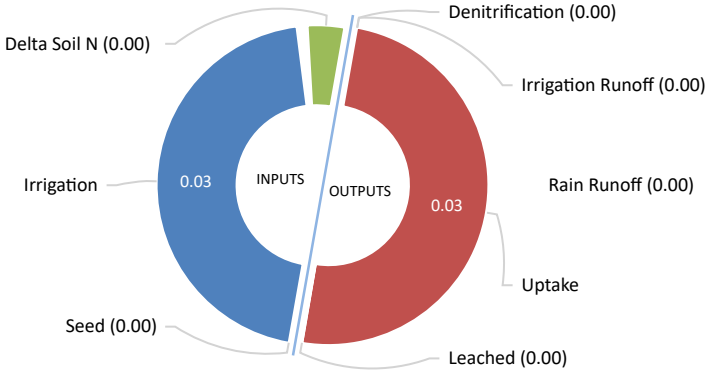
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

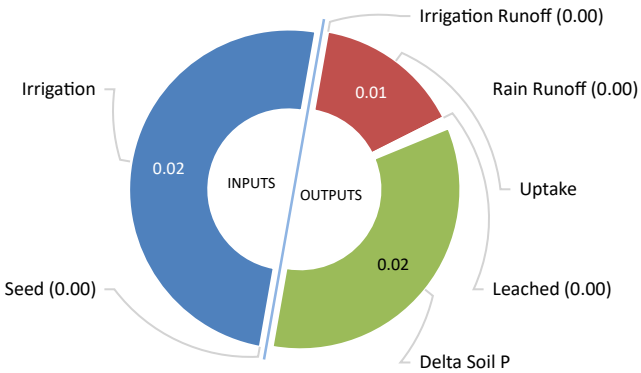
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	3.18E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.03
Leached	4.15E-05
Delta Soil N	-2.36E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.66E-05
Delta Soil P	0.02

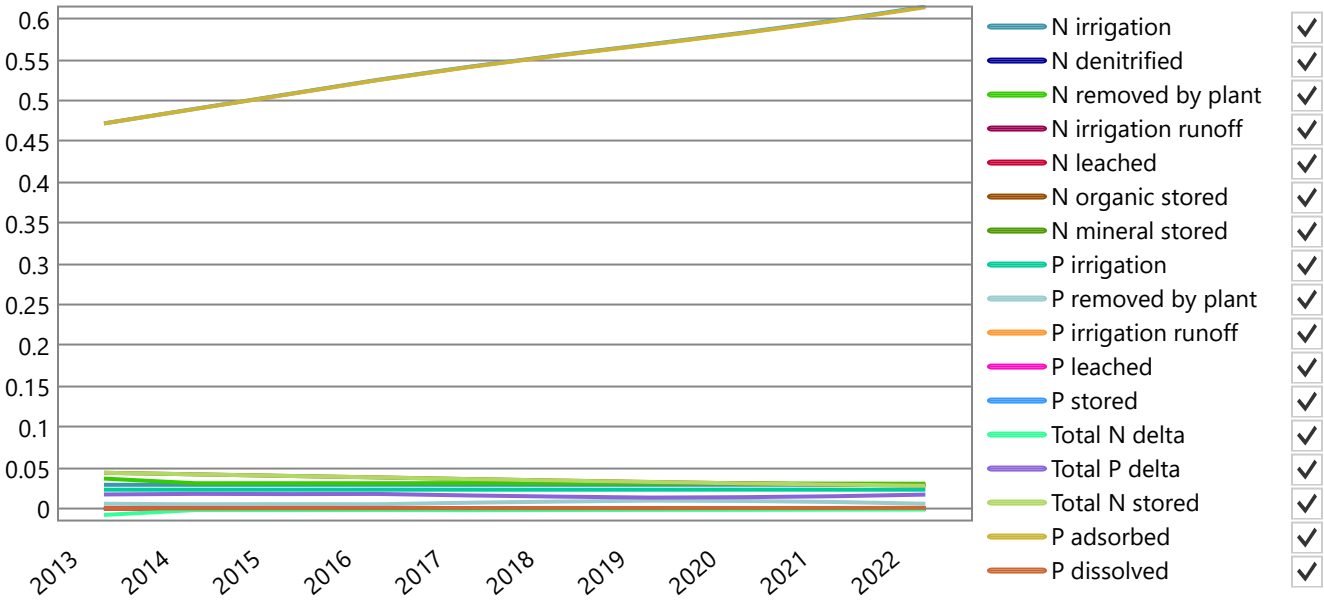
PERFORMANCE

Land Performance - Soil Nutrient

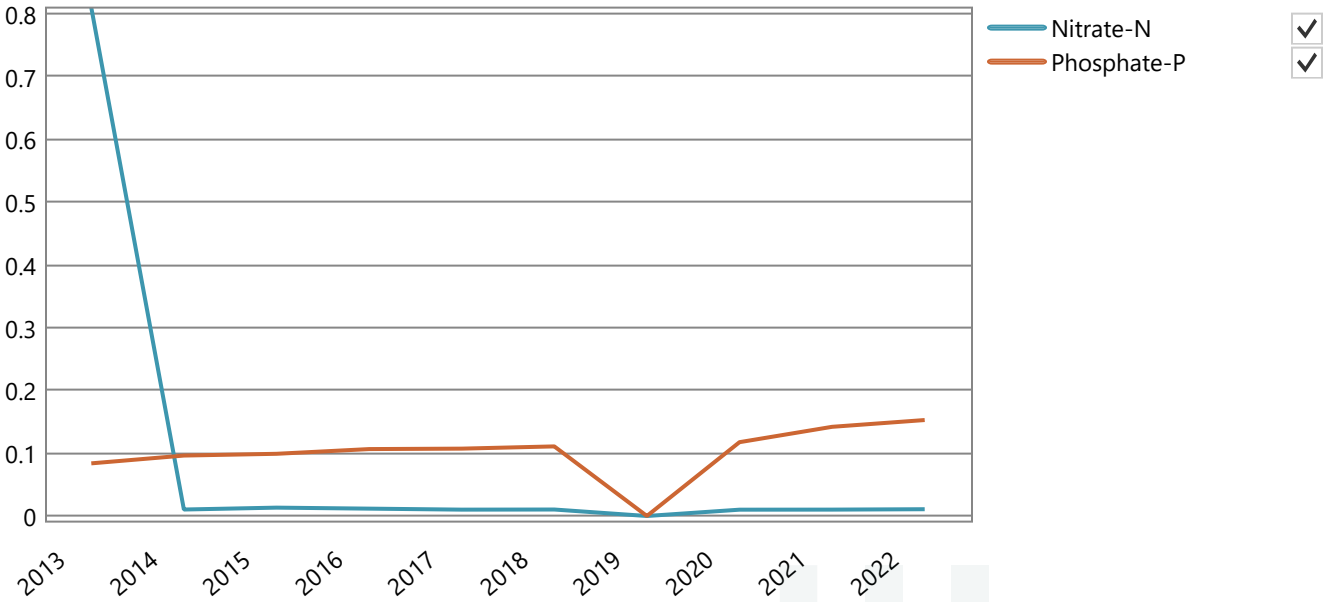
Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

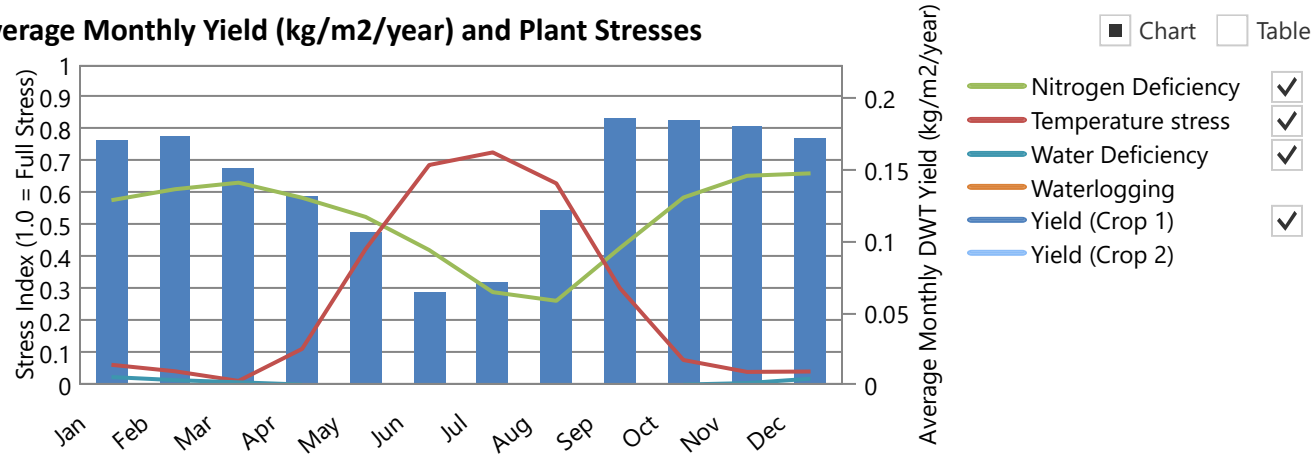
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.87 (0.81 - 0.93)
Average monthly root depth (mm) (minimum - maximum)	1193.78 (1129.25 - 1200.00)

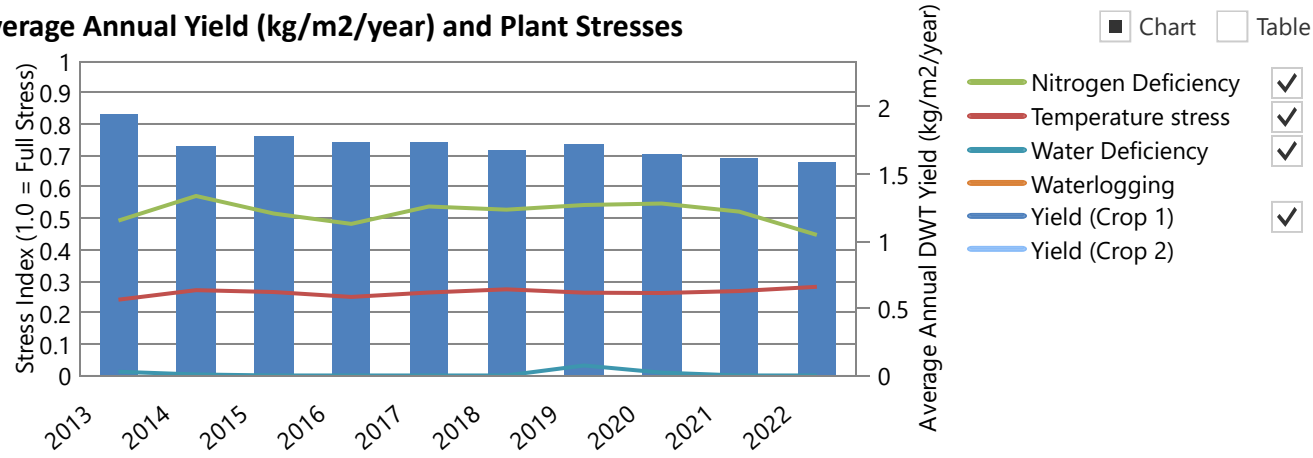
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.03 (0.03 - 0.04)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.004 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.00 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

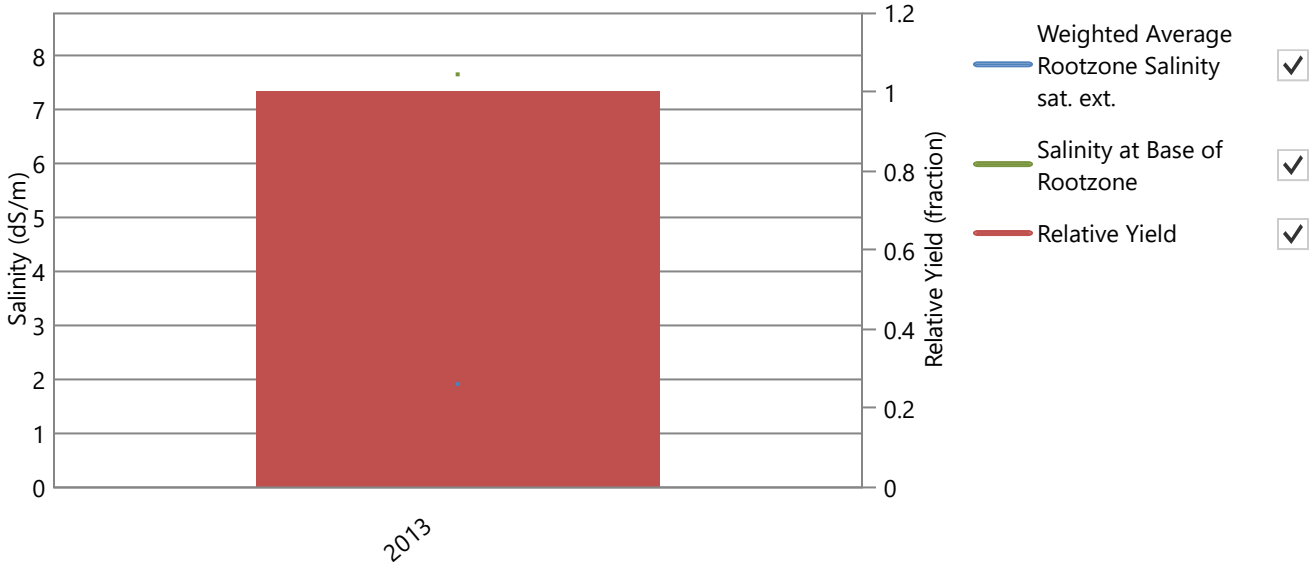
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.65
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



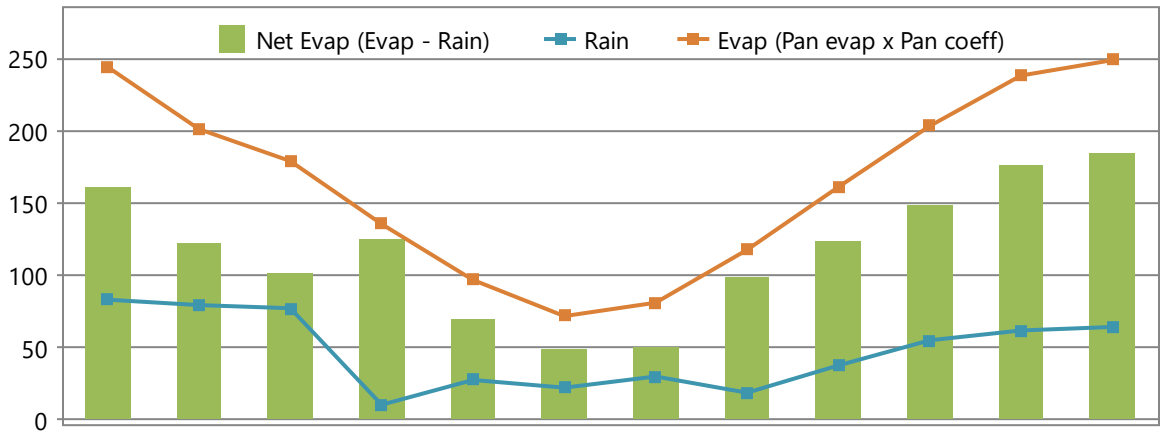
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 4514.13 m3/year or 12.36 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	131.47 (131.40 - 131.76)
Total Phosphorus	19.42 (10.81 - 20.00)	87.65 (87.60 - 87.84)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	7011.84 (7008.00 - 7027.20)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

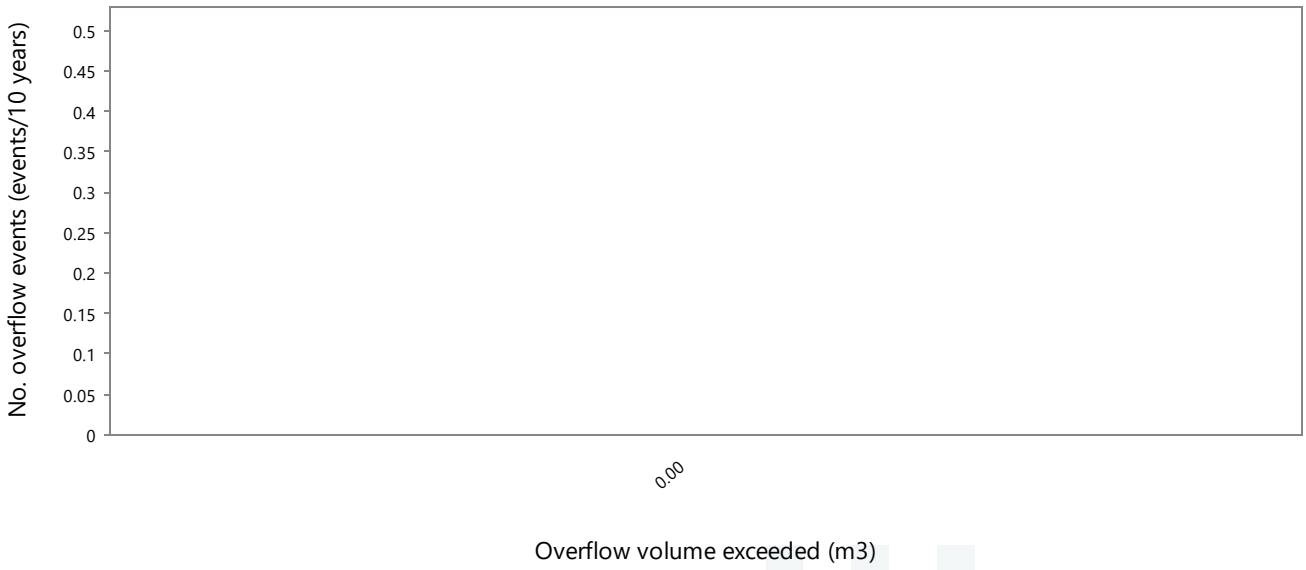
Last pond (Wet weather store): 36.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.04 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.06
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 3800 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	4514.13	1.19
Total nitrogen applied (kg)	110.44	0.03
Total phosphorus applied (kg)	87.65	0.02
Total salts applied (kg)	7011.84	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.4	93.7	102.4	96.4	99.6	96.1	99.8	99.0	97.0	101.2	98.0	102.4	1187.9
Soil Evap	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8
Transpn.	154.2	146.1	129.2	88.8	65.7	52.7	60.3	84.8	102.4	138.3	172.3	170.1	1365.0
Rain Runoff	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	2.5
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	20.4	19.6	25.2	20.0	28.4	36.5	60.6	45.2	39.1	36.3	25.9	21.8	379.1
Delta	-0.6	6.2	25.2	-1.9	33.2	29.3	8.9	-12.1	-6.8	-18.4	-38.5	-25.2	-0.6

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.18E-07
Average annual soil nitrogen leached (kg/m2/year)	4.15E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	4.15E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.03
	0.01 - 5.82E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.11
Max. annual nitrate-N concentration of deep drainage (mg/L)	0.81

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.66E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 7.80E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.61
Average phosphate-P concentration in rootzone (mg/L)	1.29
Average phosphate-P concentration of deep drainage (mg/L)	0.12
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.15
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.15 mg/L (years)	37.81

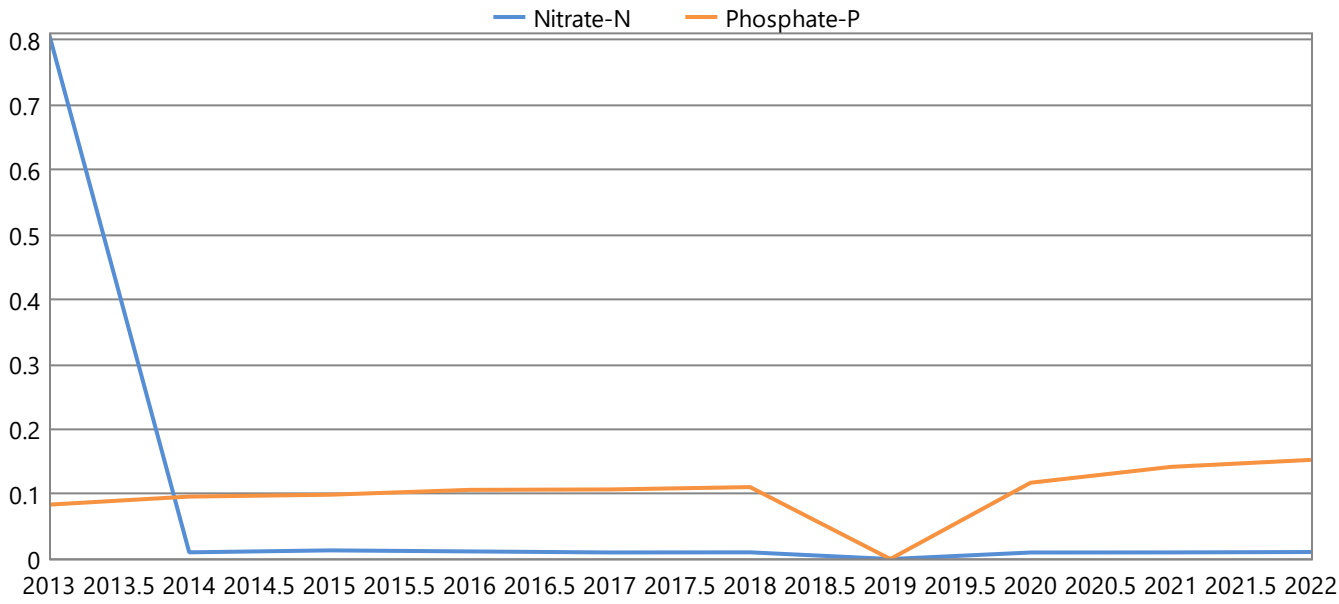
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

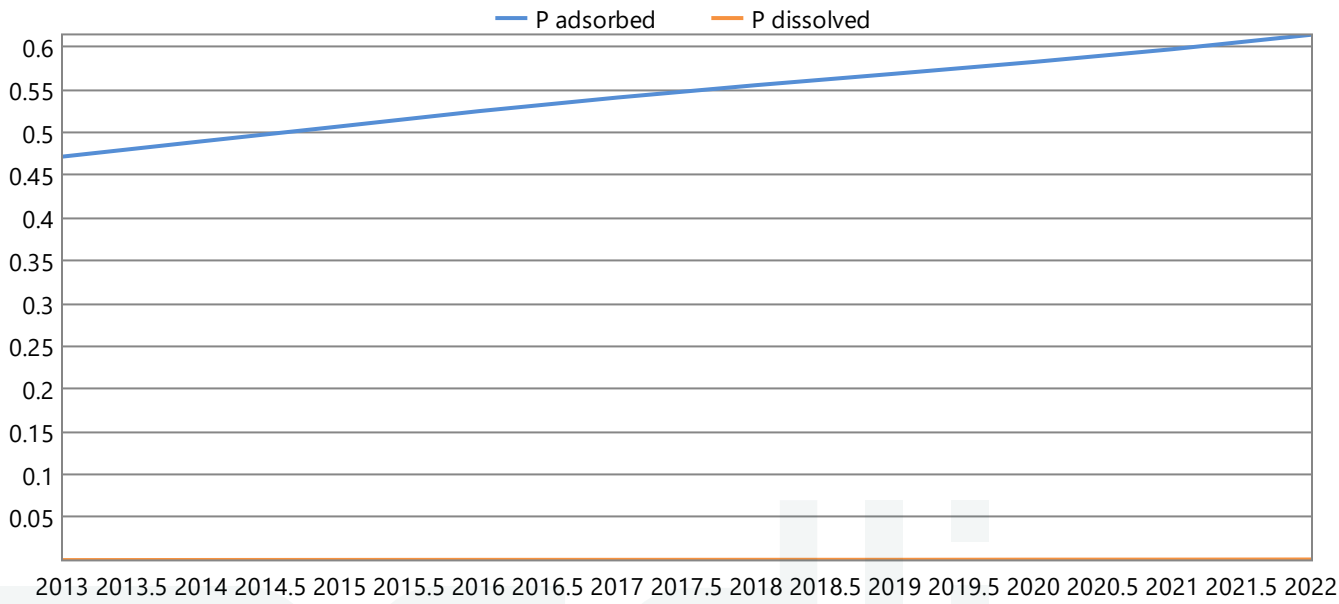
Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 3800 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction)	0.87 (0.81 - 0.93)
Average monthly crop factor (fraction)	0.70 (0.65 - 0.74)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1193.78 (1129.25 - 1200.00)
Average number of normal harvests per year (no./year)	3.00 (2.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	2.80
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.52 (0.45 - 0.57)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.02)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.65
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
IRRIGATION LOAD SCENARIO: 60EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

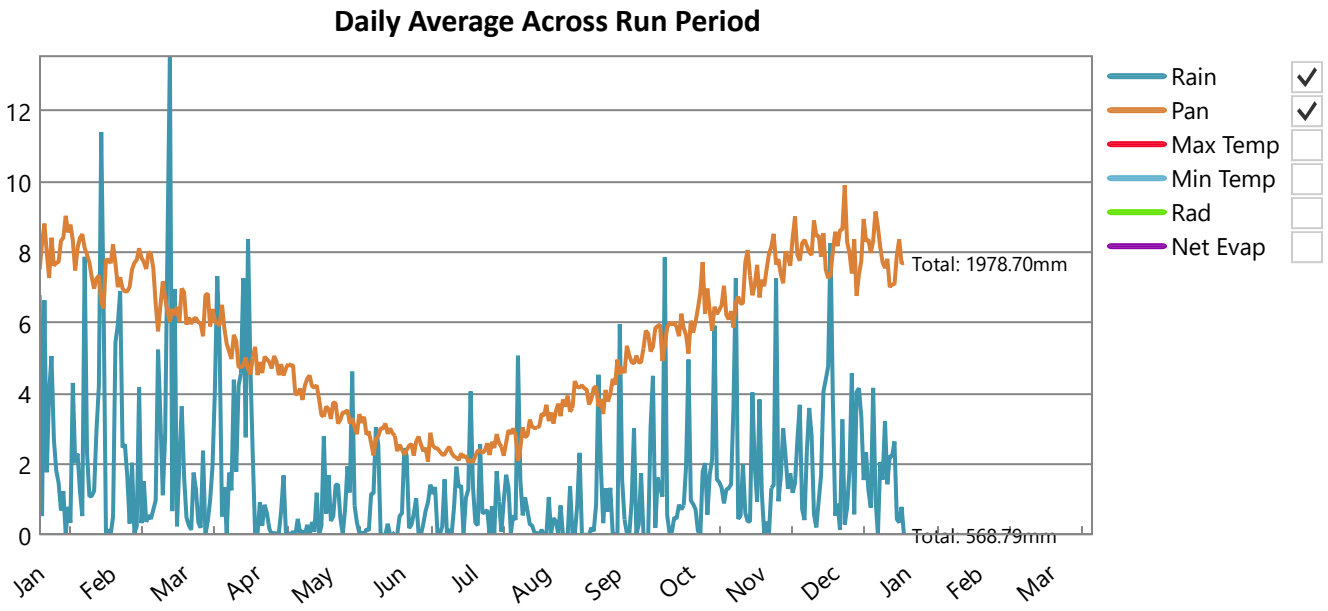
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

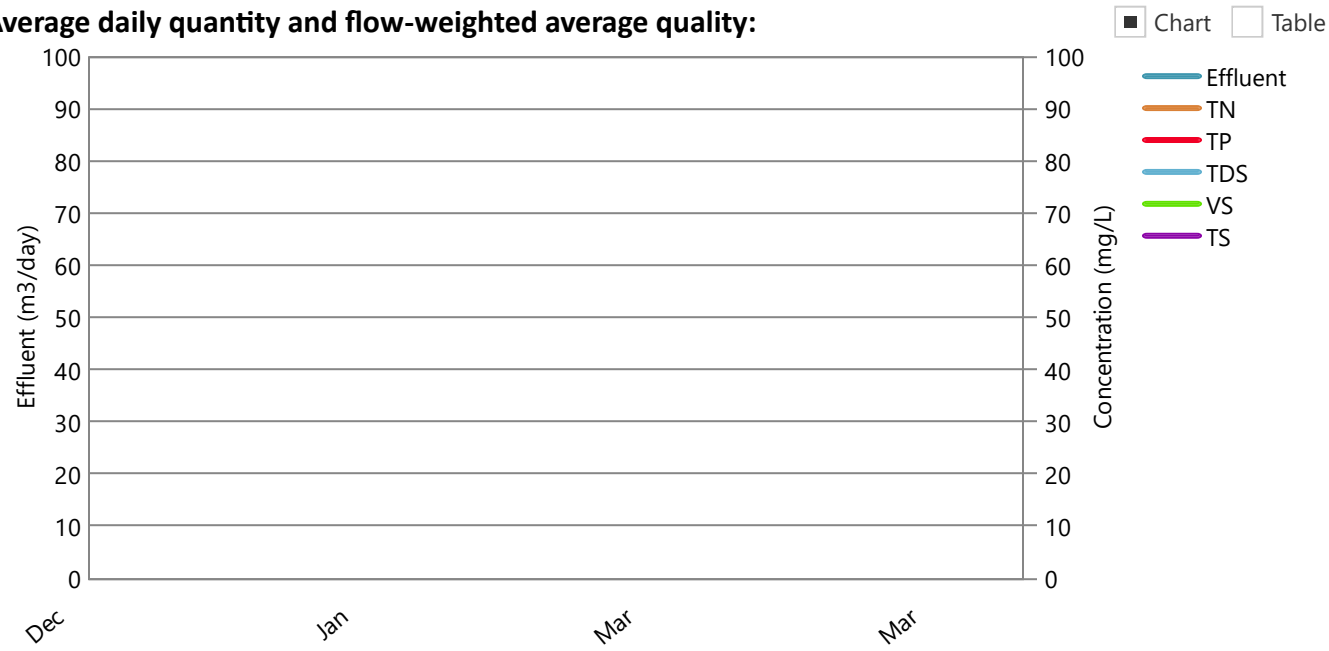


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

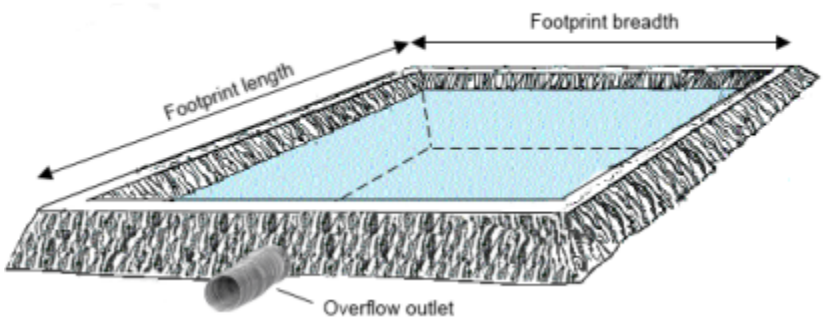
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

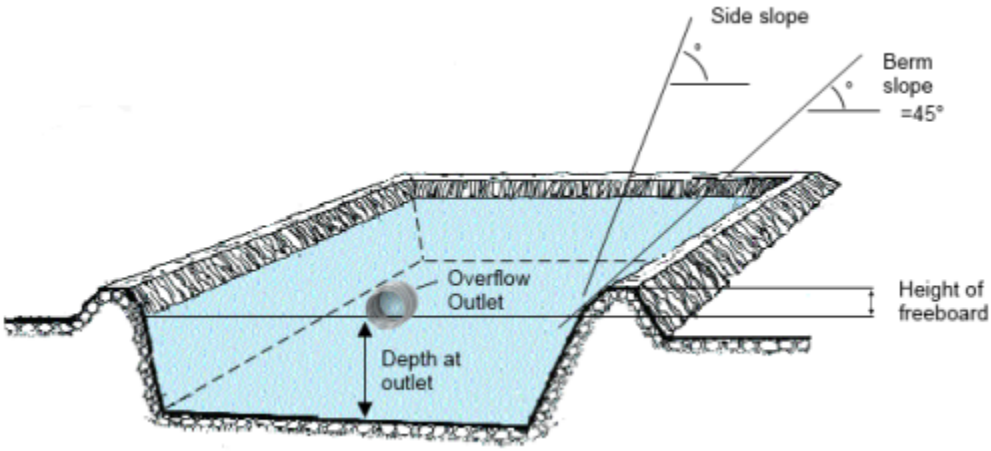
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	36.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	43.97
Pond footprint length (m)	6.63
Pond footprint width (m)	6.63
Pond catchment area (m2)	43.97
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

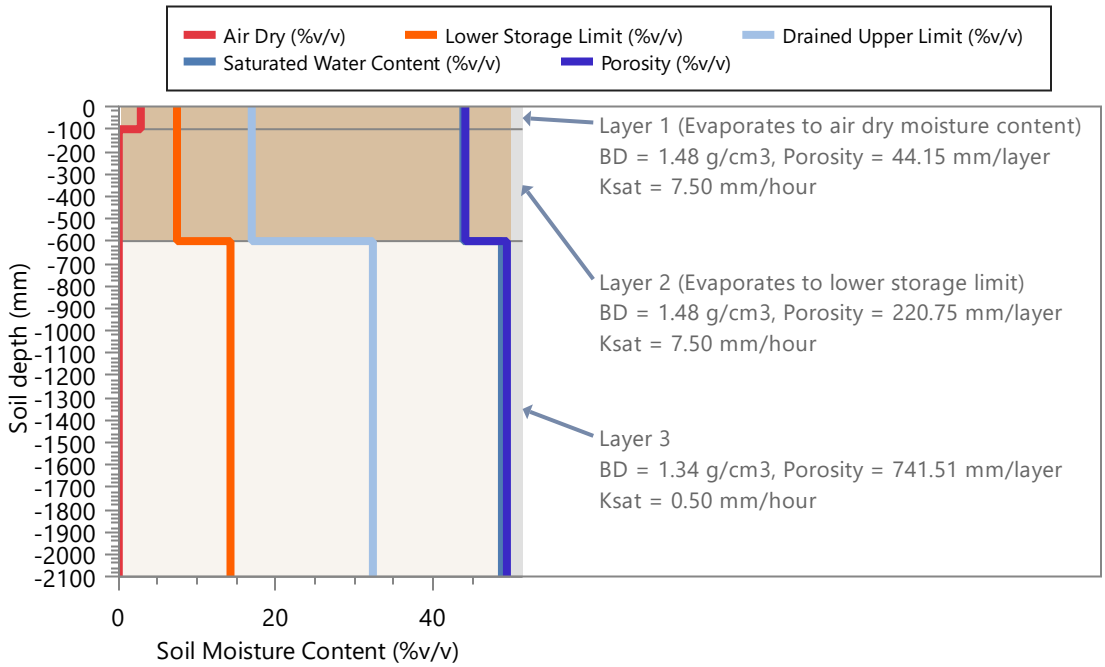
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 3800.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **36 m3**

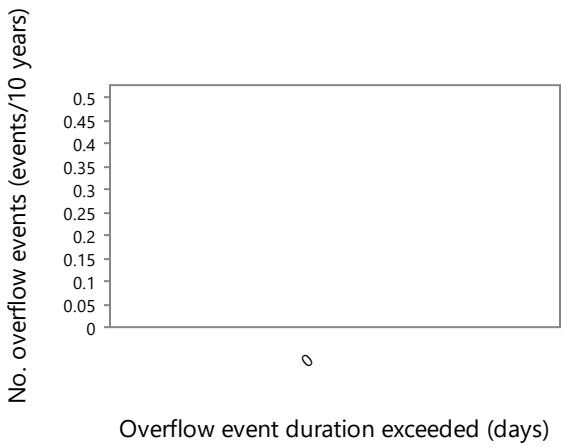
Pond System Water Balance (m3/year)

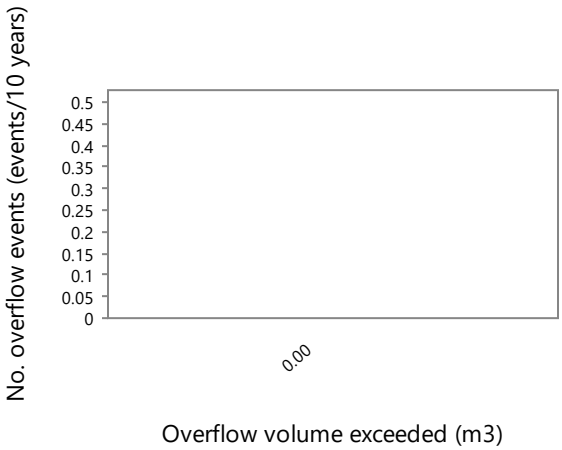
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

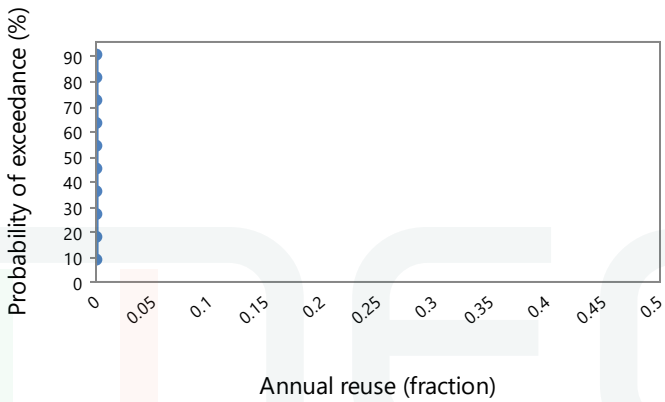
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

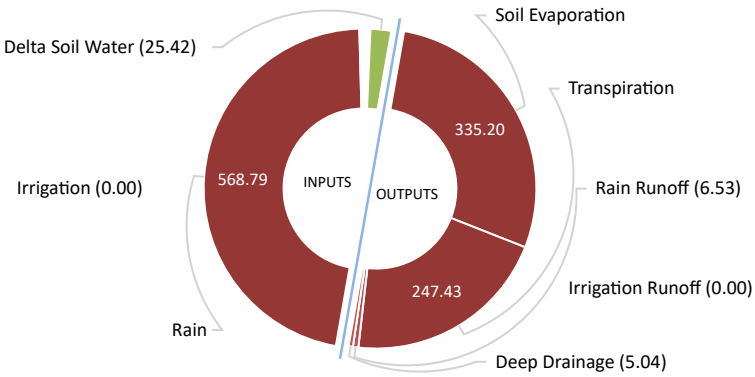
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 3800 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

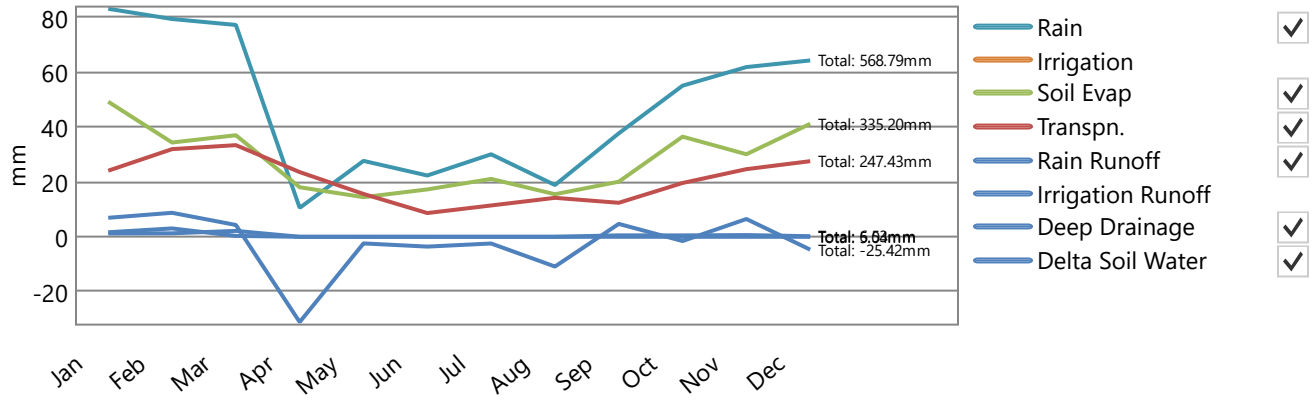
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	335.20
Transpiration	247.43
Rain Runoff	6.53
Irrigation Runoff	0.00
Deep Drainage	5.04
Delta Soil Water	-25.42

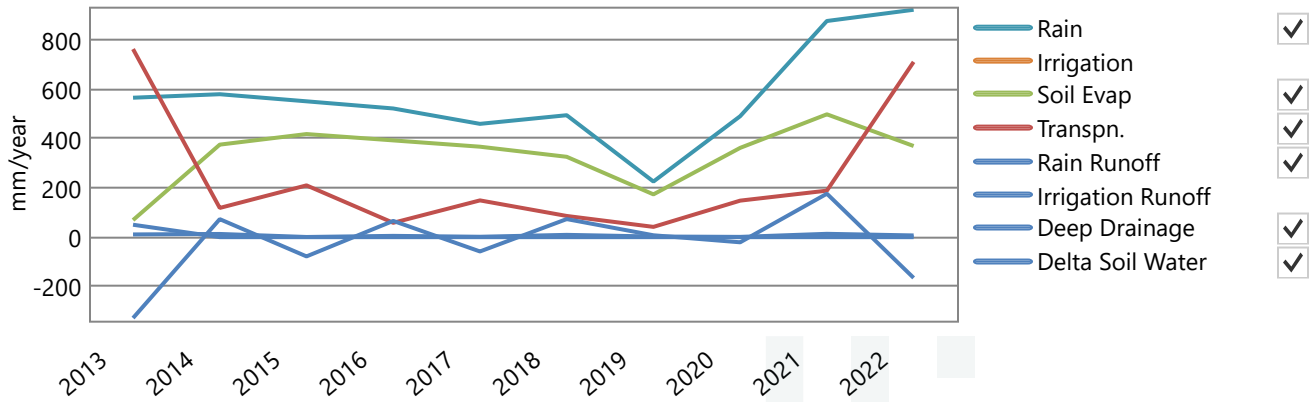
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

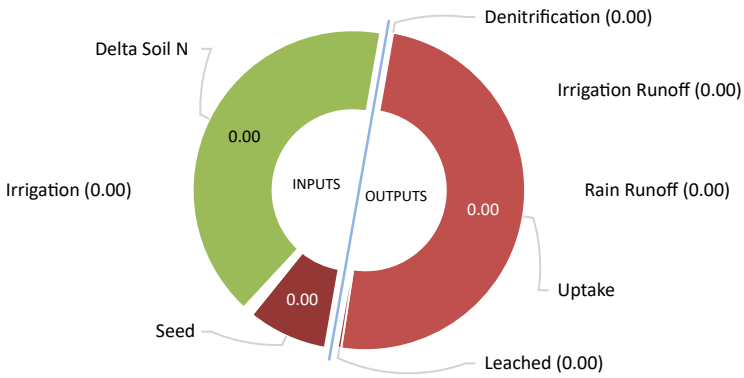
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

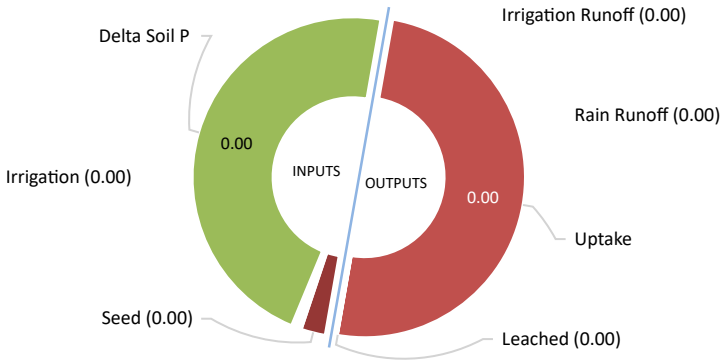
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.63E-04
Irrigation	0.00
Denitrification	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.59E-03
Leached	1.12E-05
Delta Soil N	-1.34E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	2.25E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	4.65E-04
Leached	2.34E-07
Delta Soil P	-4.42E-04

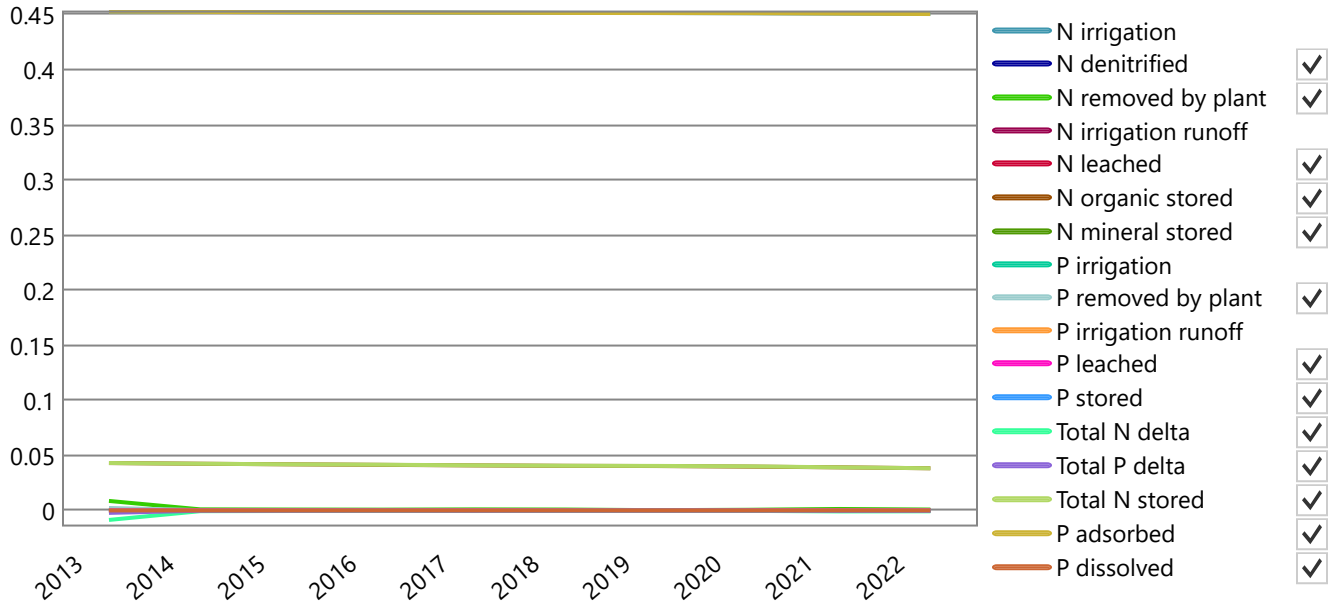
PERFORMANCE

Land Performance - Soil Nutrient

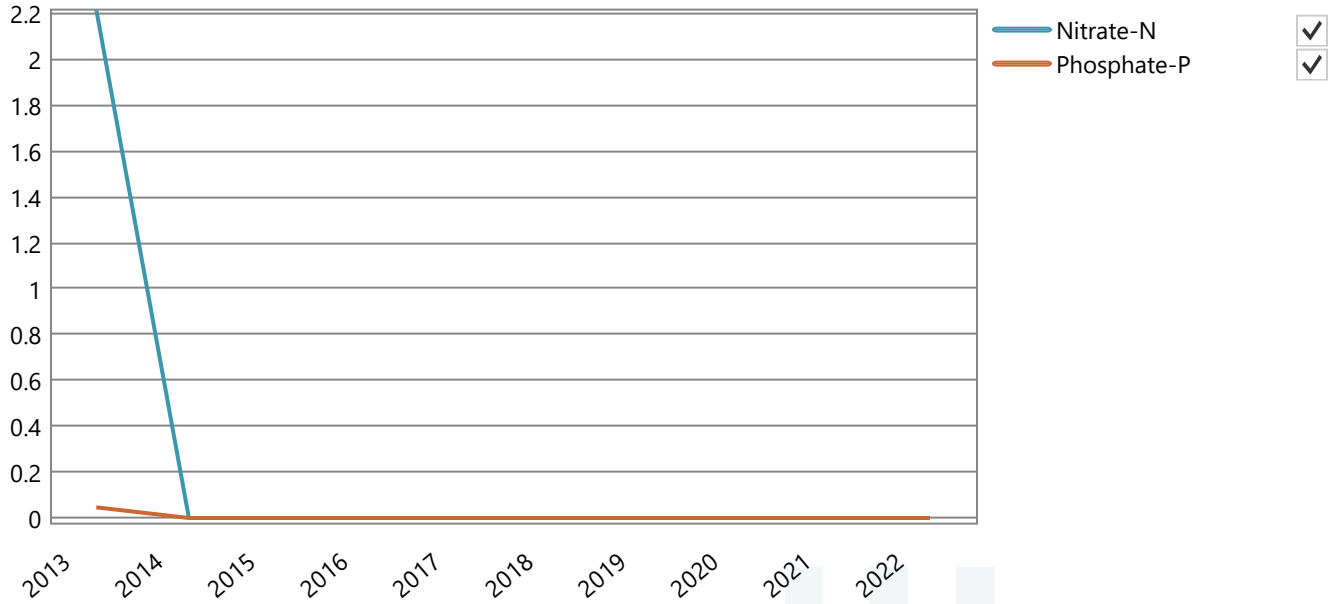
Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 3800 m2 representation_conserva

Soil Type: Sodosols

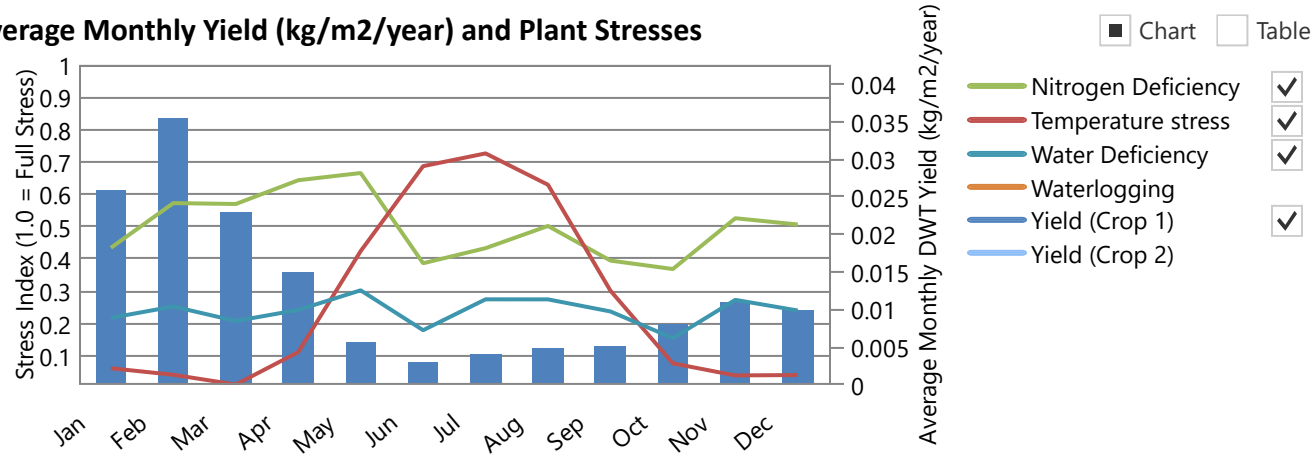
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Average monthly root depth (mm) (minimum - maximum)	383.78 (277.37 - 487.49)

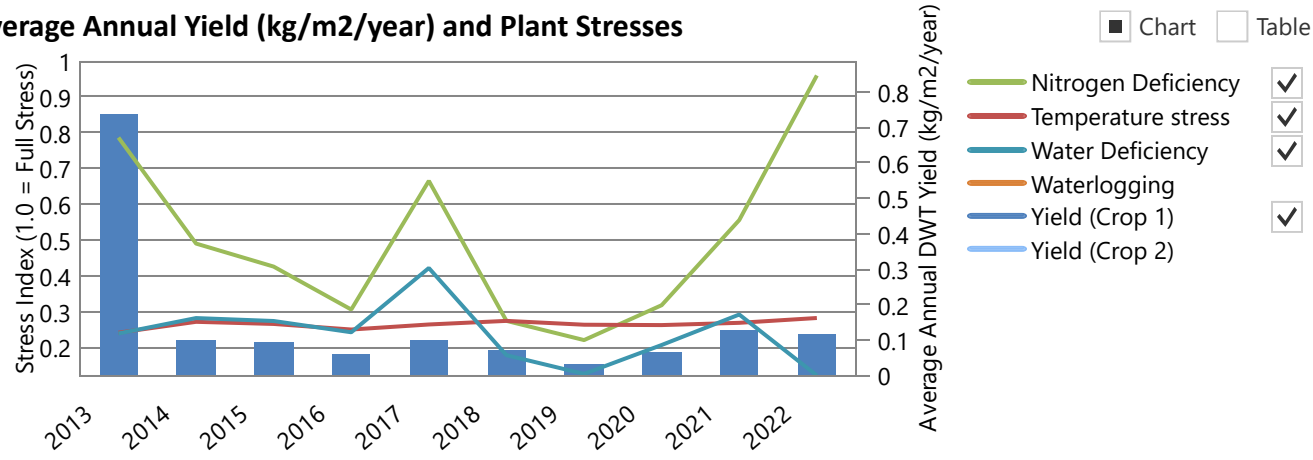
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.01)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.10 (normal), 2.40 (forced by crop death due to nitrogen stress (0.10), water stress (2.30))

No. days without crop/year (days/year): 123.20 due to frosting (4.40), temperature stress - not frost (2.00), water stress (116.80)

PERFORMANCE

Land Performance

Paddock: **Girrahween Office Application Ar, 3800 m2 representation_conserva**

Soil Type: **Sodosols**

Plant: **Continuous Kikuyu 1 Pasture**

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

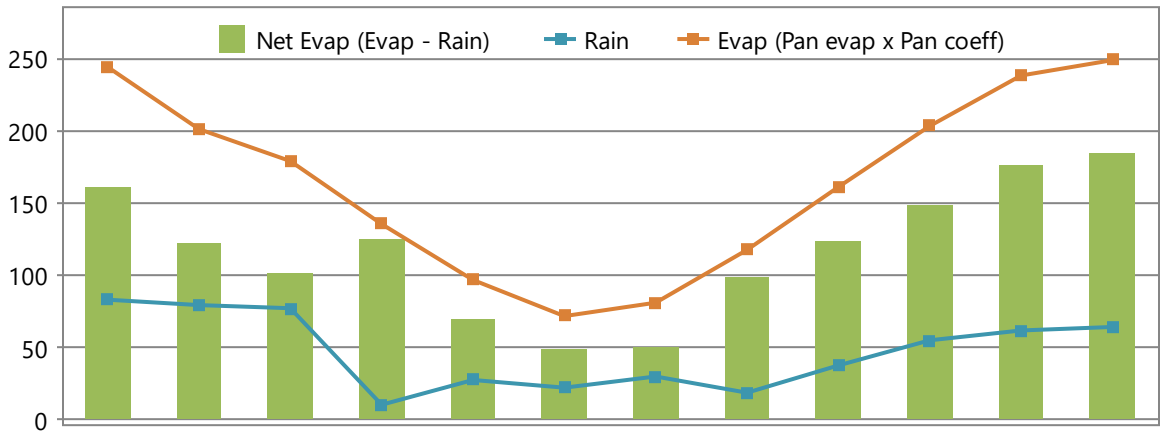
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

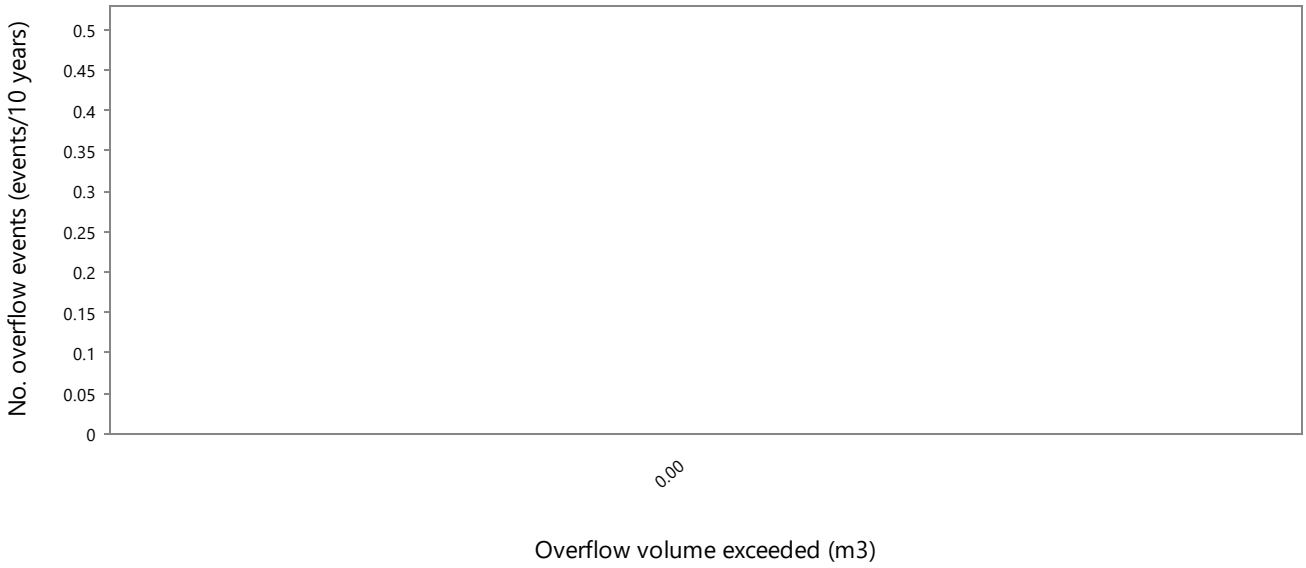
Last pond (Wet weather store): 36.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.04 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 3800 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	49.3	34.4	37.1	18.1	14.5	17.3	21.1	15.5	20.1	36.5	30.1	41.2	335.2
Transpn.	24.1	32.0	33.4	23.6	15.6	8.7	11.4	14.2	12.4	19.6	24.7	27.6	247.4
Runoff	1.2	1.3	2.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	6.5
Drainage	1.7	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Delta	6.9	8.8	4.3	-31.1	-2.4	-3.6	-2.4	-10.9	4.7	-1.6	6.5	-4.7	-25.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	1.59E-03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	0.00
Average annual soil nitrogen leached (kg/m2/year)	1.12E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	1.12E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.04
	0.01 - 2.40E-05
Average nitrate-N concentration of deep drainage (mg/L)	2.22
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.22

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	4.65E-04
Average annual soil phosphorus leached (kg/m2/year)	2.34E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 3.00E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.45
Average phosphate-P concentration in rootzone (mg/L)	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.05
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.05
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

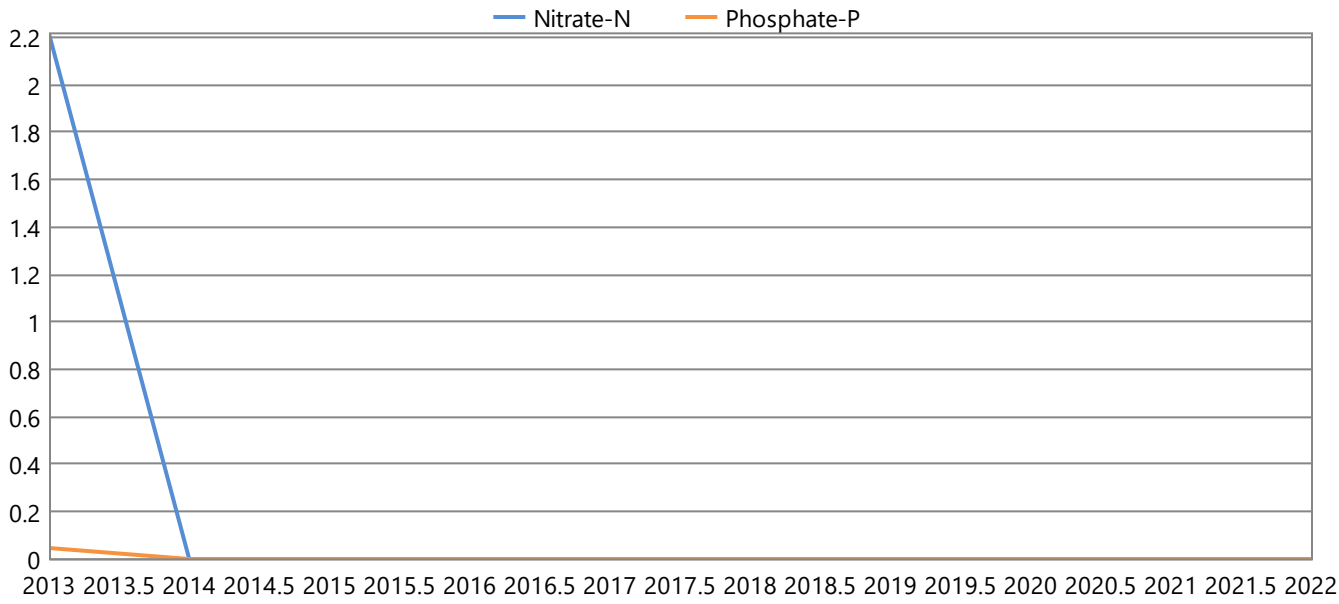
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

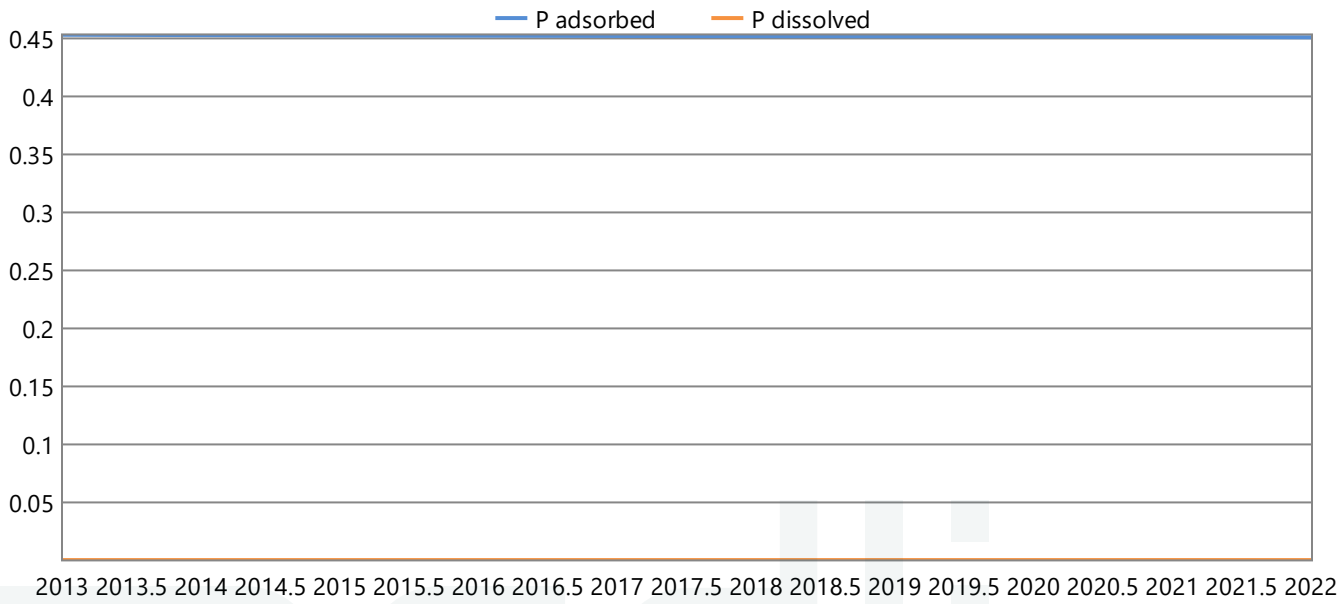
Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 3800 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction)	0.27 (0.19 - 0.34)
Average monthly crop factor (fraction)	0.21 (0.15 - 0.27)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	383.78 (277.37 - 487.49)
Average number of normal harvests per year (no./year)	0.10 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	2.40 (0.00 - 4.00)
Average number of crop deaths for last five years only (no./year)	2.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.50 (0.22 - 0.96)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.24 (0.15 - 0.30)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	123.20

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
IRRIGATION LOAD SCENARIO: 90EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

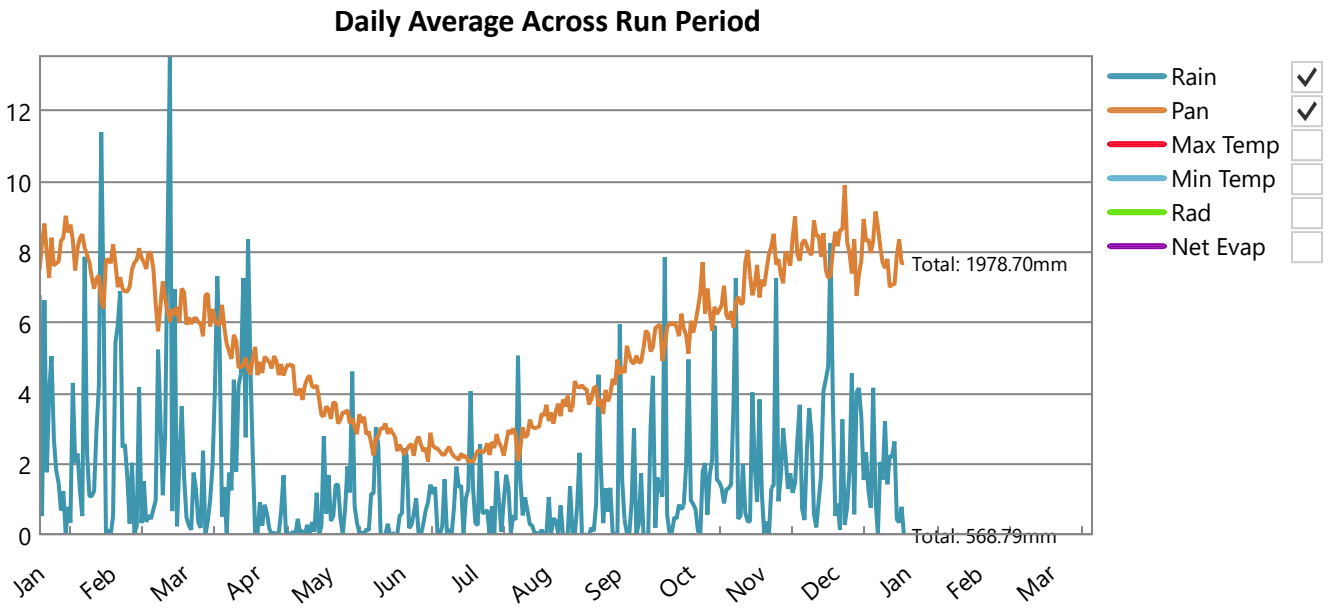
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

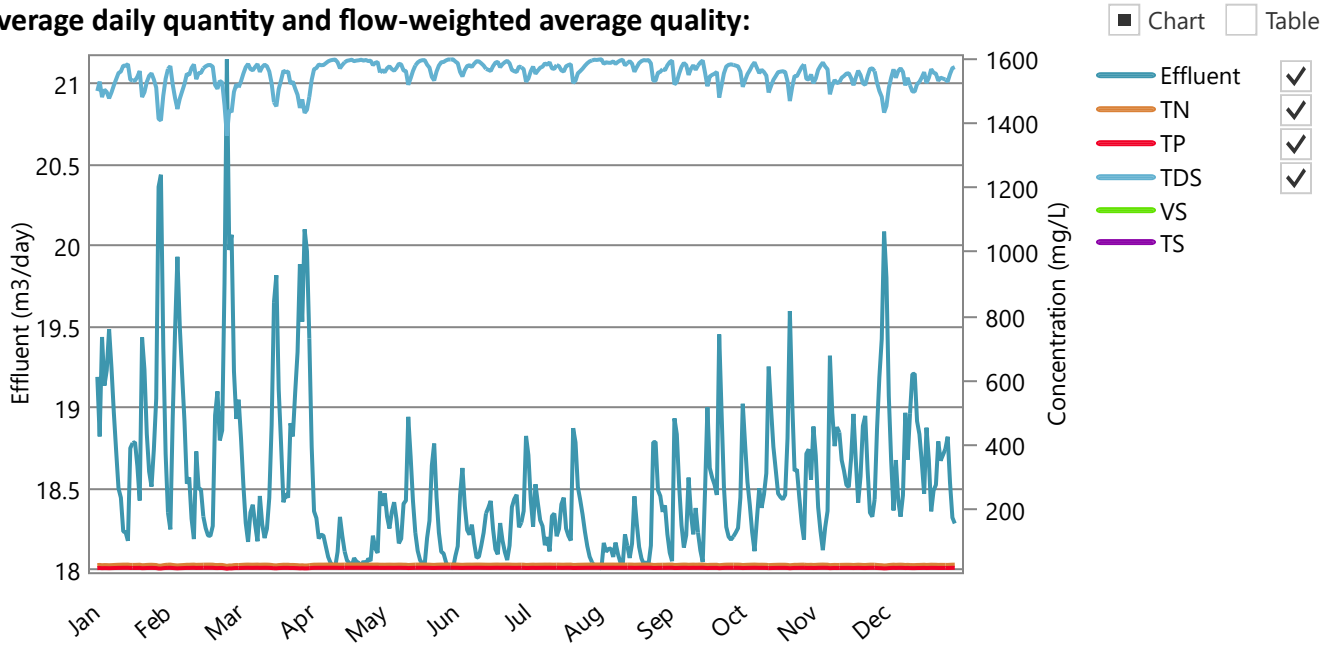


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 6771.20 m3/year or 18.54 m3/day (Min-Max: 18.00 - 33.31)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

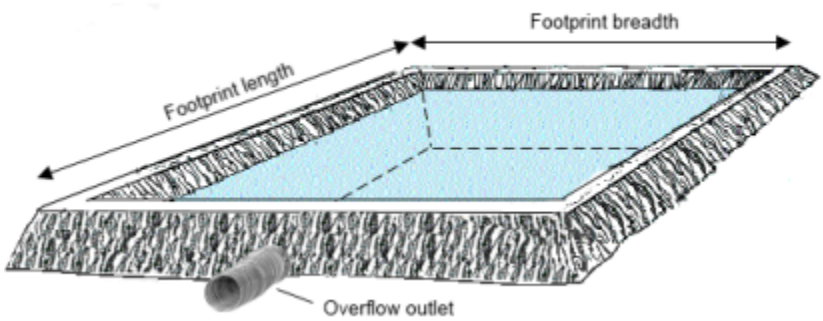
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	197.21 (197.10 - 197.64)
Total Phosphorus	19.42 (10.81 - 20.00)	131.47 (131.40 - 131.76)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	10517.76 (10512.00 - 10540.80)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

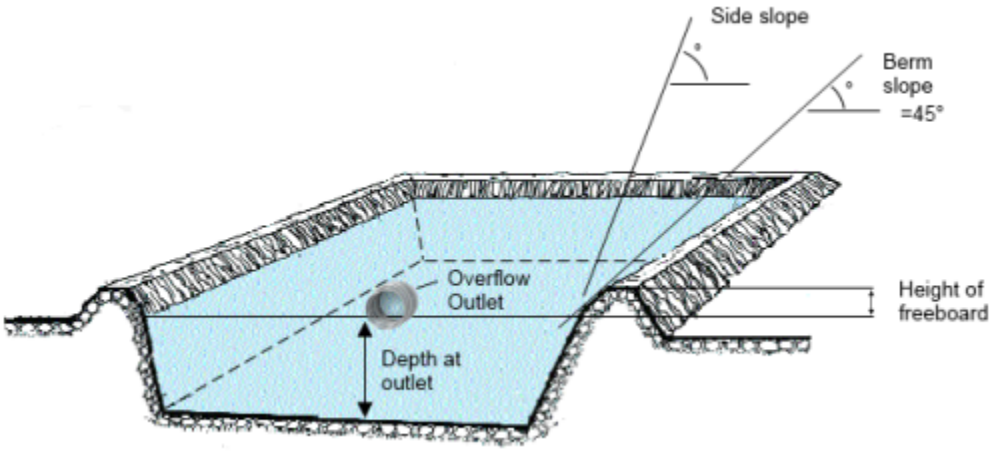
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	54.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	63.70
Pond footprint length (m)	7.98
Pond footprint width (m)	7.98
Pond catchment area (m2)	63.70
Average active volume (m3)	0.73





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

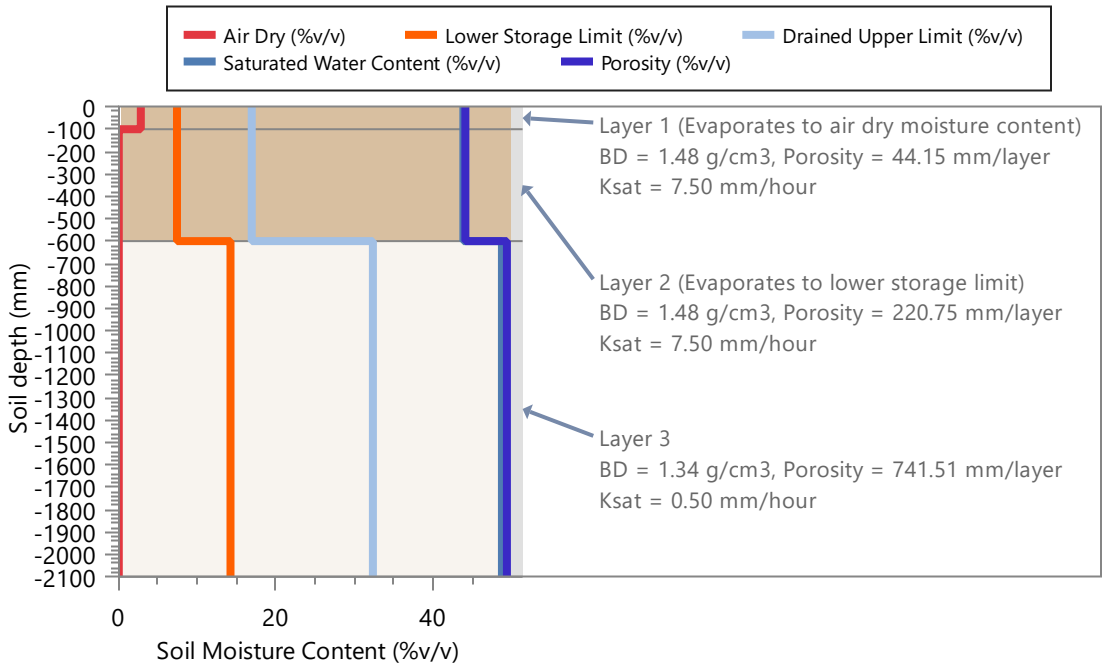
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 5675.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

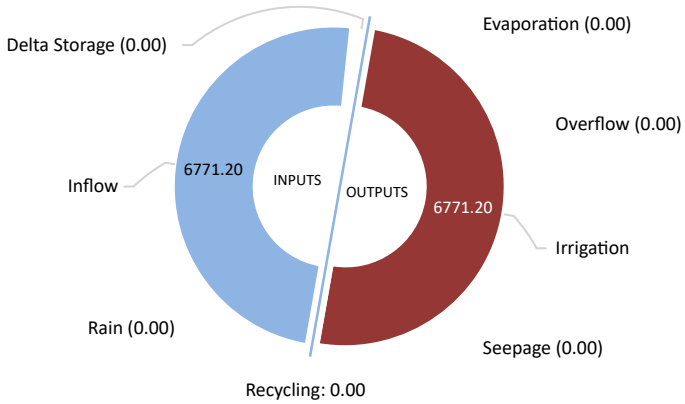
Average monthly cover (fraction) (minimum - maximum)	0.88 (0.81 - 0.93)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **54 m3**

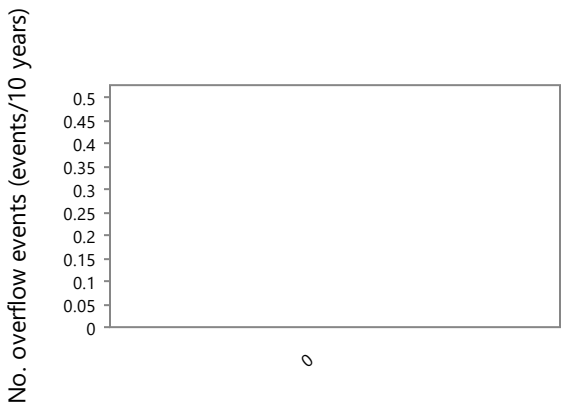
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	6771.20
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	6771.20
Seepage	0.00
Delta Storage	0.00

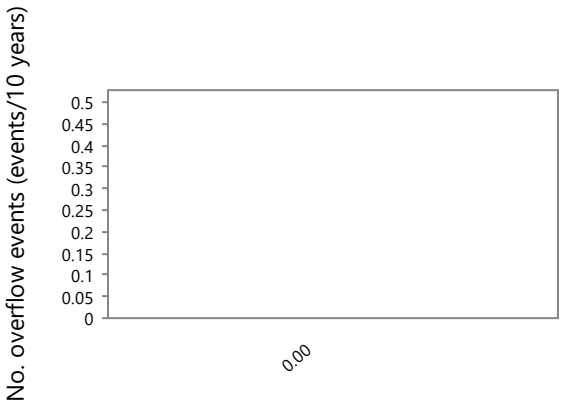
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



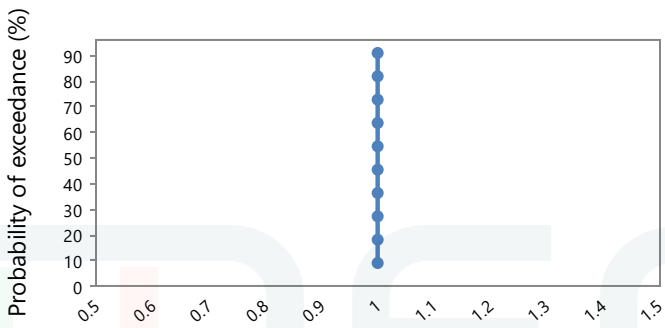
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

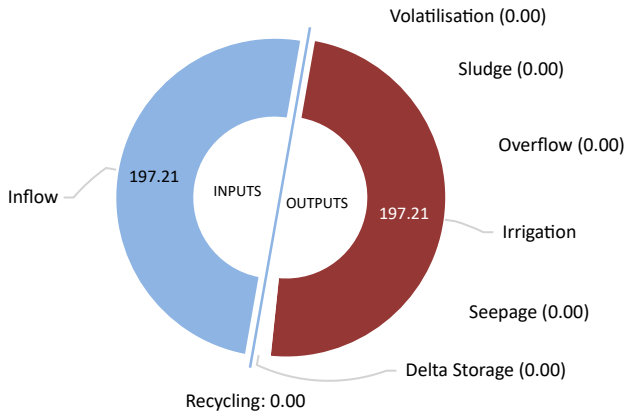
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

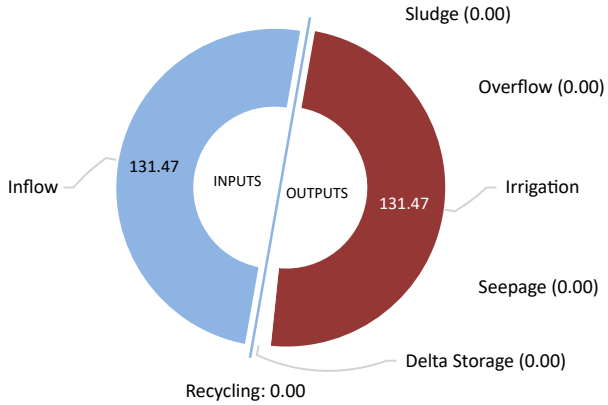
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



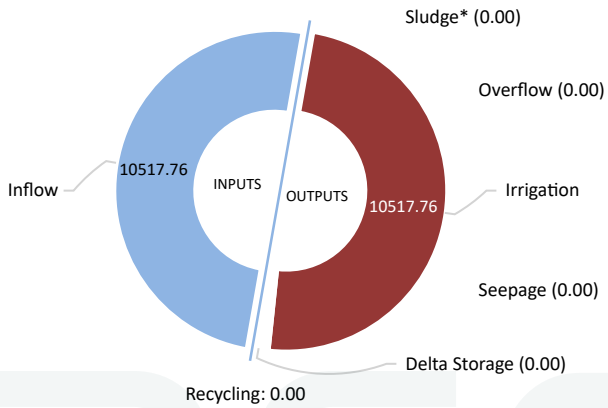
Name	Value
Inflow	197.21
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	197.21
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	131.47
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	131.47
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	10517.76
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	10517.76
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.86
Average phosphorus concentration of pond liquid (mg/L)	16.57
Average salinity of pond liquid (dS/m)	2.07

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	29.99
Final phosphorus concentration of pond liquid (mg/L)	19.99
Final salinity of pond liquid (dS/m)	2.50

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	6771.20
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	6771.20
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

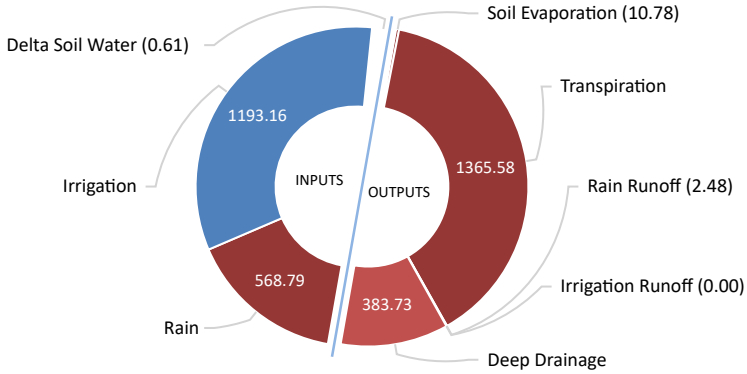
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 5675 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

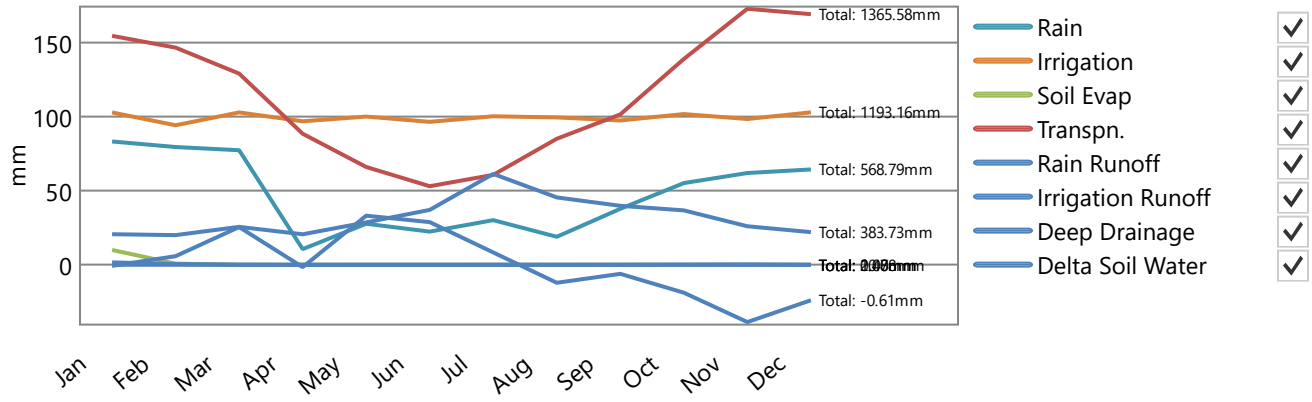
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1193.16
Soil Evaporation	10.78
Transpiration	1365.58
Rain Runoff	2.48
Irrigation Runoff	0.00
Deep Drainage	383.73
Delta Soil Water	-0.61

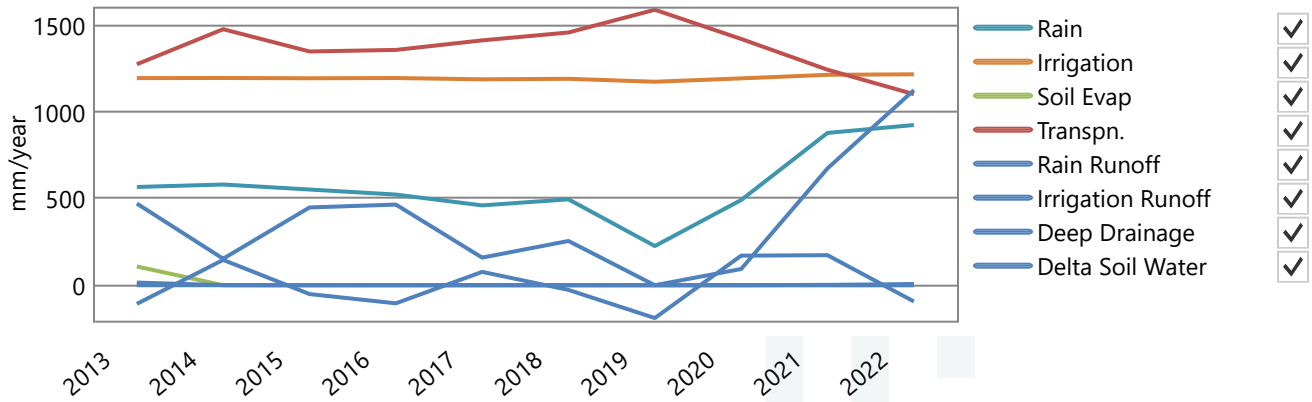
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

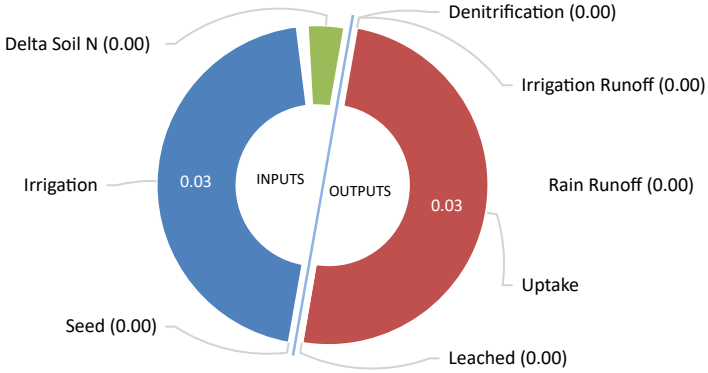
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

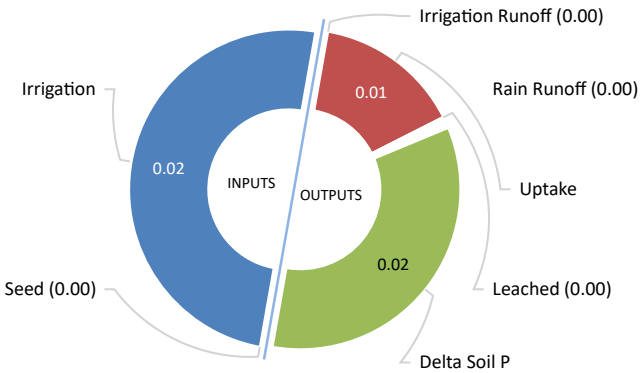
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	3.19E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.03
Leached	4.15E-05
Delta Soil N	-2.37E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.73E-05
Delta Soil P	0.02

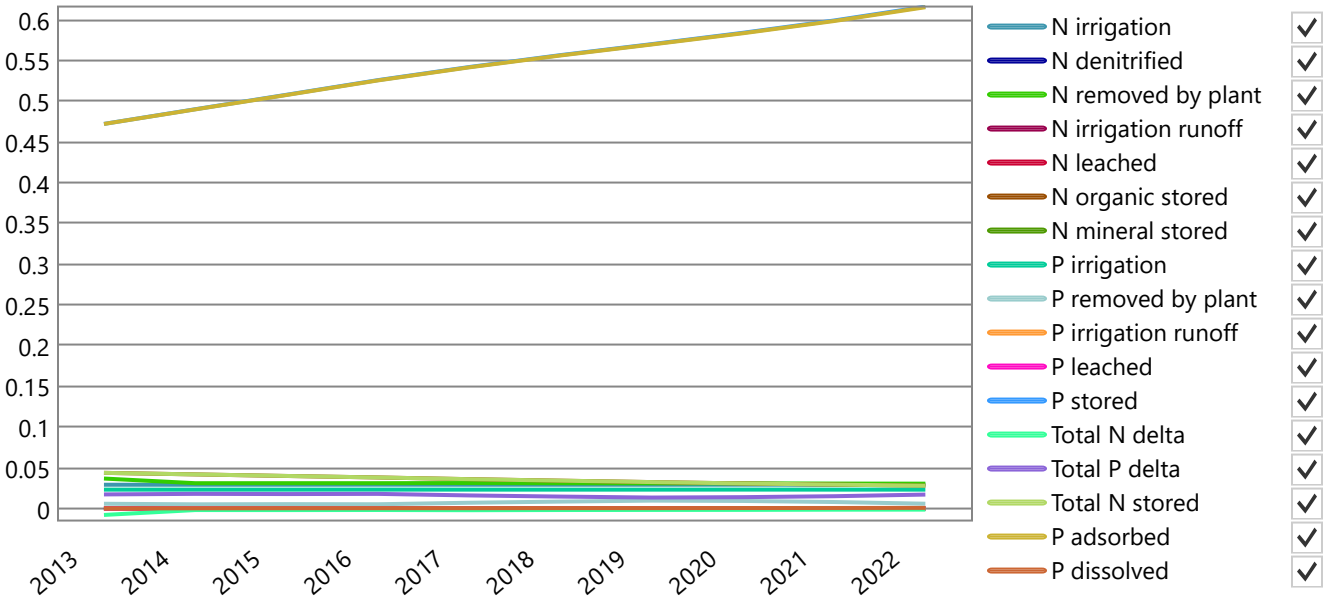
PERFORMANCE

Land Performance - Soil Nutrient

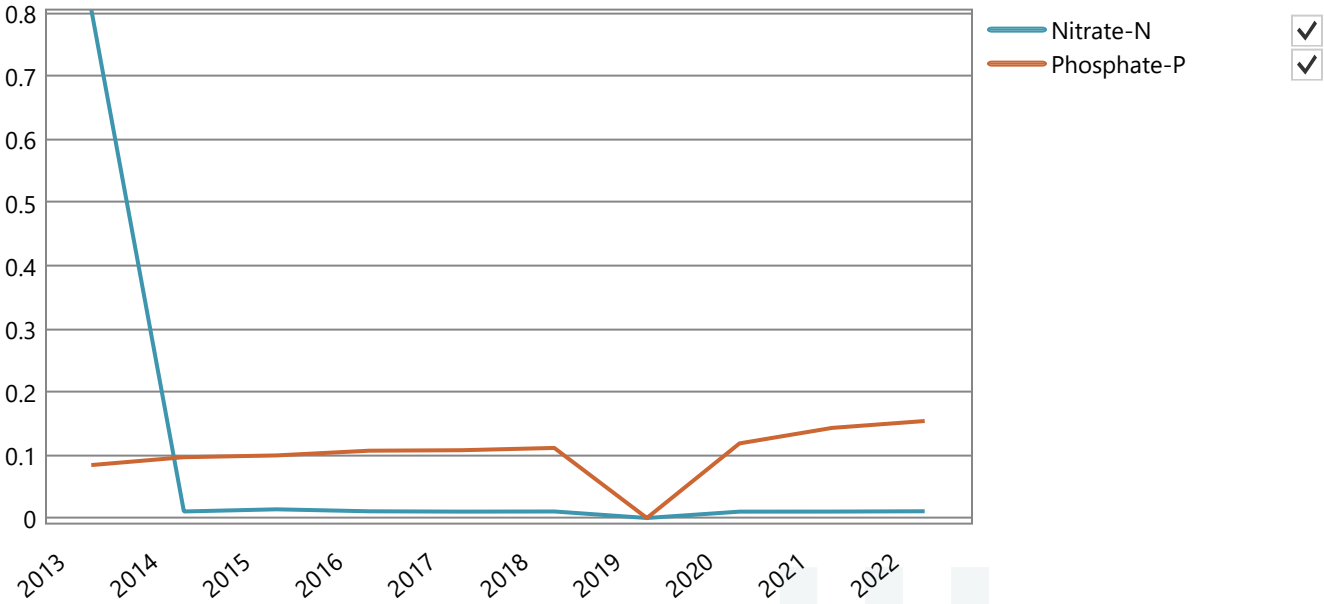
Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

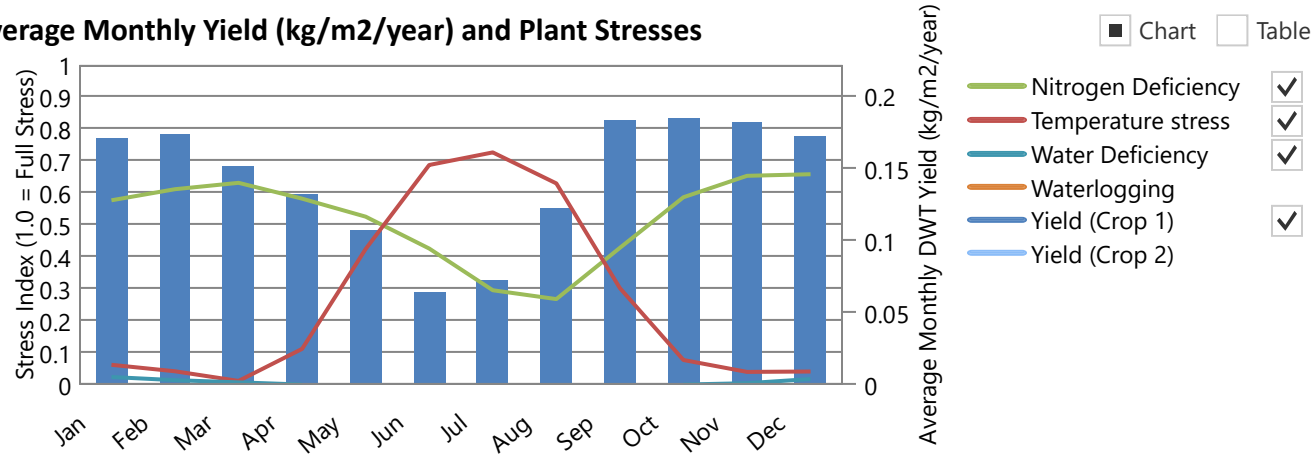
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.96)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.88 (0.81 - 0.93)
Average monthly root depth (mm) (minimum - maximum)	1193.78 (1129.25 - 1200.00)

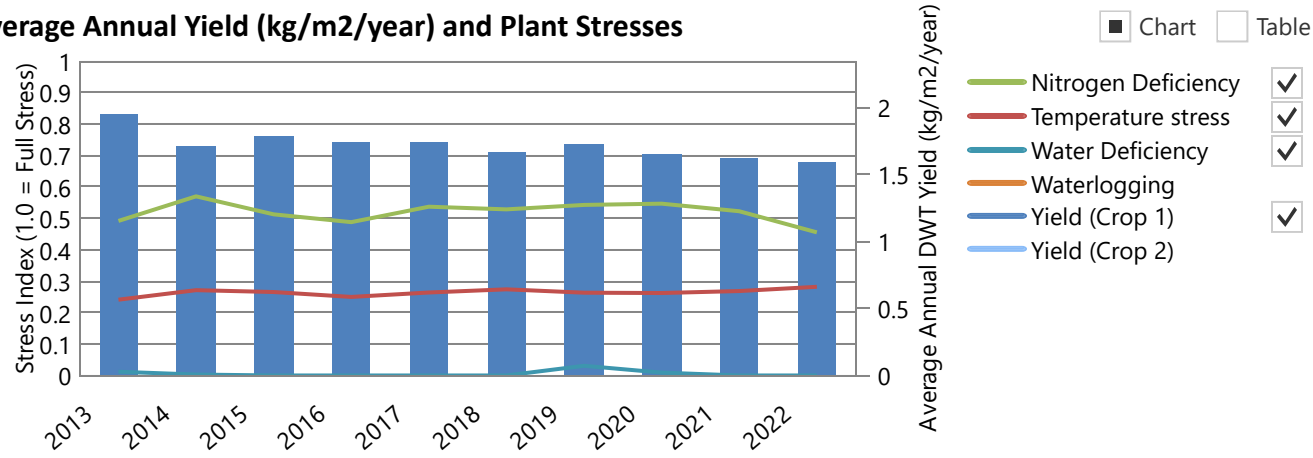
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.03 (0.03 - 0.04)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.004 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.00 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

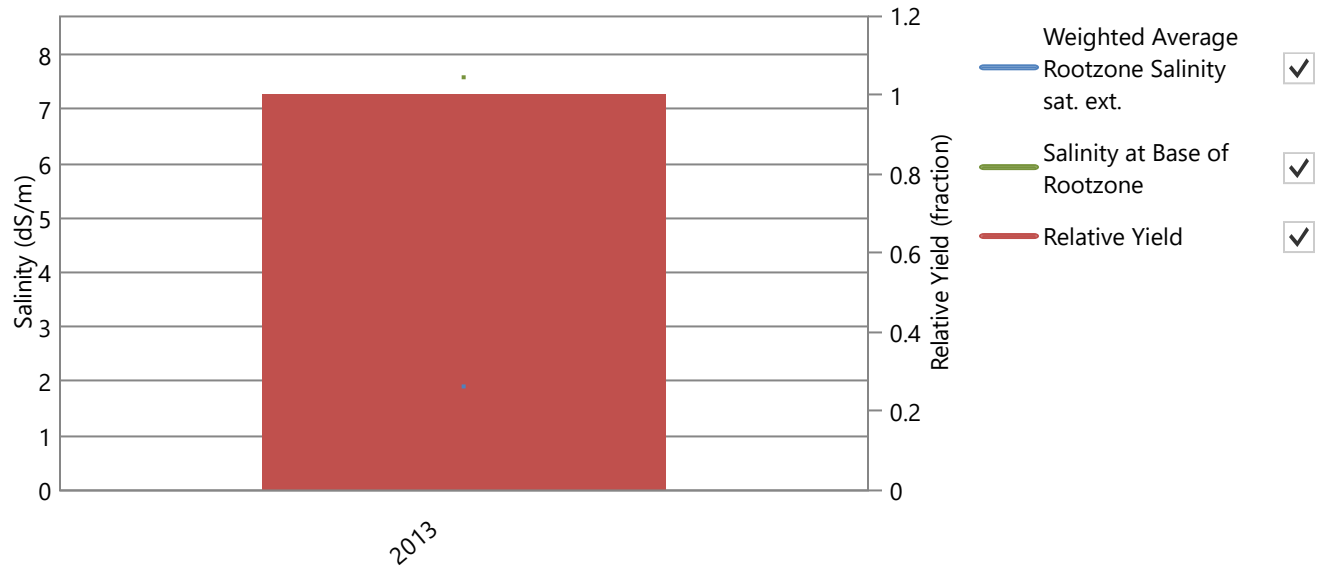
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.66
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.40
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.90
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.59
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



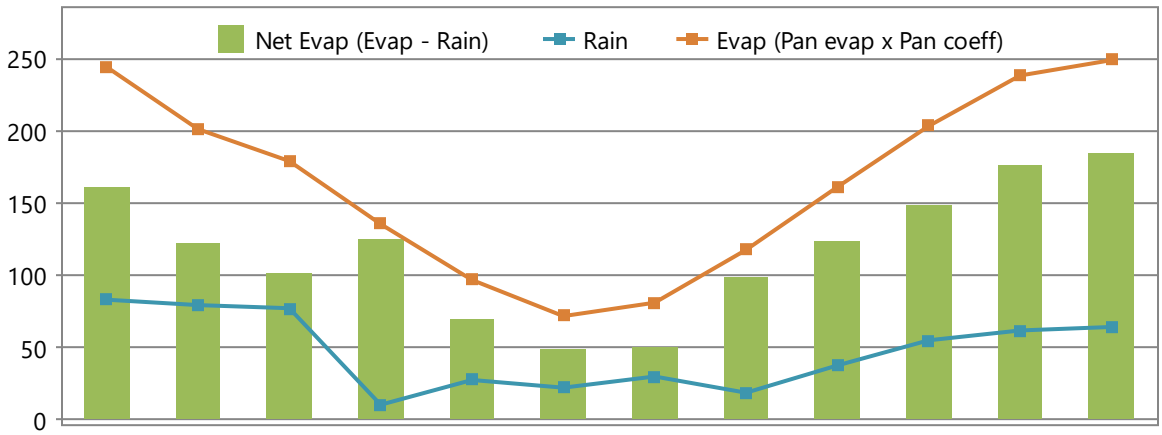
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 6771.20 m3/year or 18.54 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	197.21 (197.10 - 197.64)
Total Phosphorus	19.42 (10.81 - 20.00)	131.47 (131.40 - 131.76)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	10517.76 (10512.00 - 10540.80)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

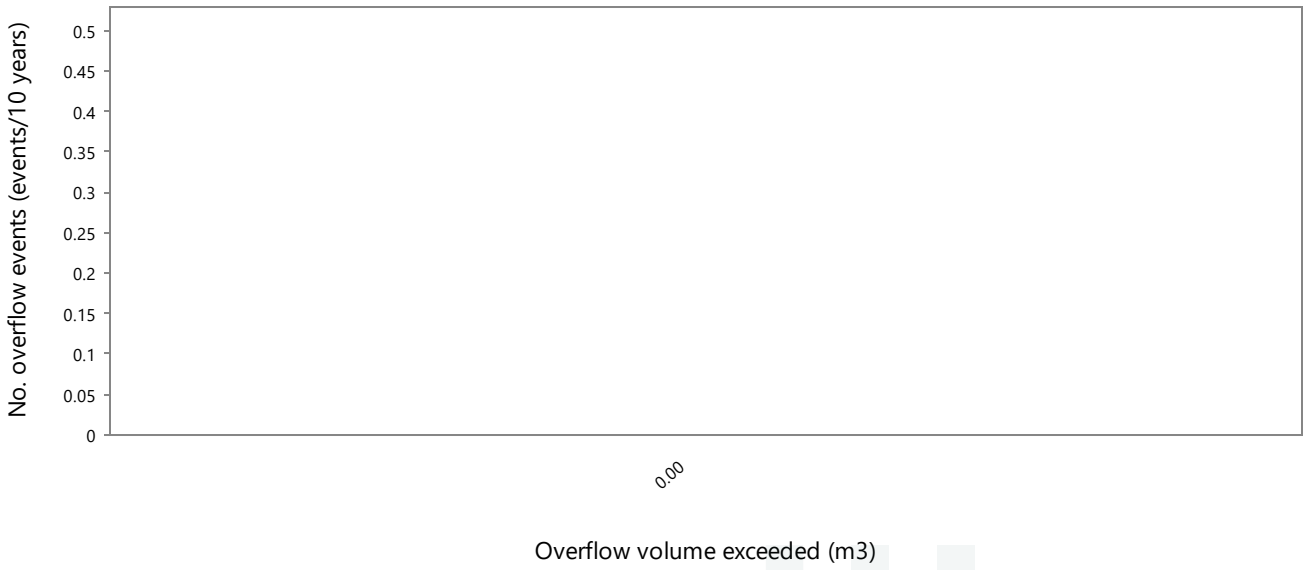
Last pond (Wet weather store): 54.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.06 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.07
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 5675 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	6771.20	1.19
Total nitrogen applied (kg)	165.65	0.03
Total phosphorus applied (kg)	131.47	0.02
Total salts applied (kg)	10517.76	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.8	94.2	102.8	96.8	100.0	96.5	100.2	99.5	97.4	101.7	98.4	102.9	1193.2
Soil Evap	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8
Transpn.	154.5	146.6	129.0	88.4	66.0	53.0	60.7	85.0	101.5	138.9	172.8	169.1	1365.6
Rain Runoff	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	2.5
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	20.6	20.0	25.6	20.6	28.6	37.0	61.3	45.5	39.8	36.7	26.0	22.0	383.7
Delta	-0.8	5.8	25.5	-1.6	33.1	28.8	8.3	-12.2	-6.1	-18.9	-38.7	-23.9	-0.6

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.19E-07
Average annual soil nitrogen leached (kg/m2/year)	4.15E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	4.15E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.03
	0.01 - 5.82E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.11
Max. annual nitrate-N concentration of deep drainage (mg/L)	0.81

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.73E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 7.88E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.62
Average phosphate-P concentration in rootzone (mg/L)	1.30
Average phosphate-P concentration of deep drainage (mg/L)	0.12
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.15
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.17 mg/L (years)	37.66

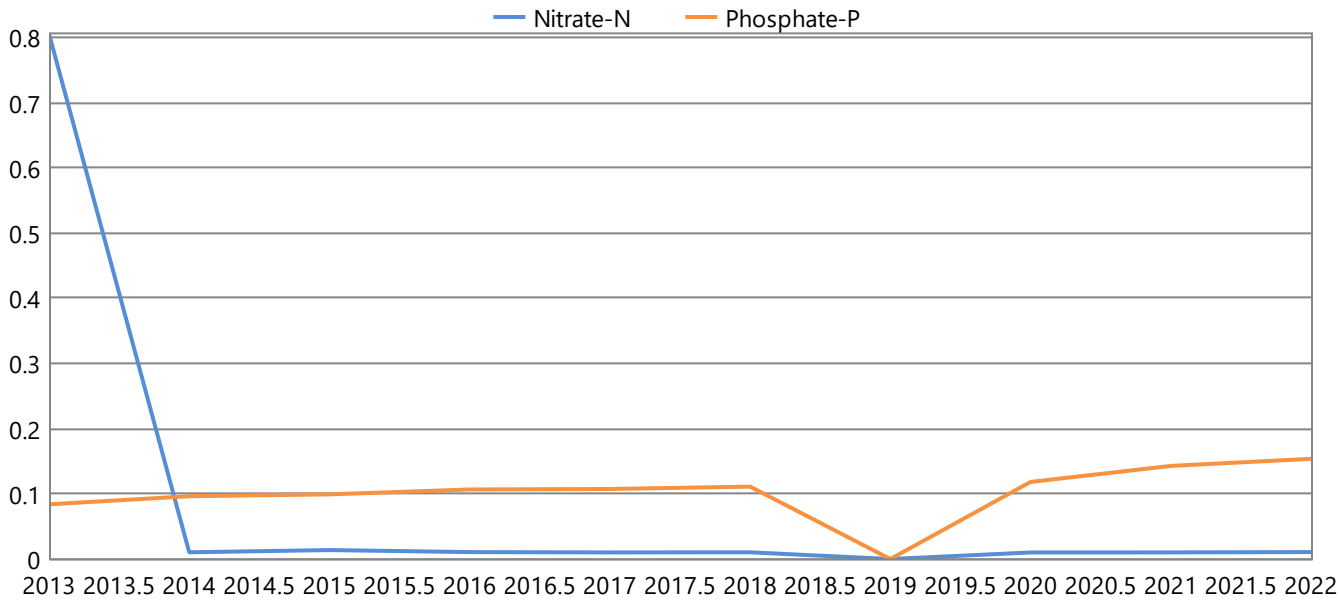
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

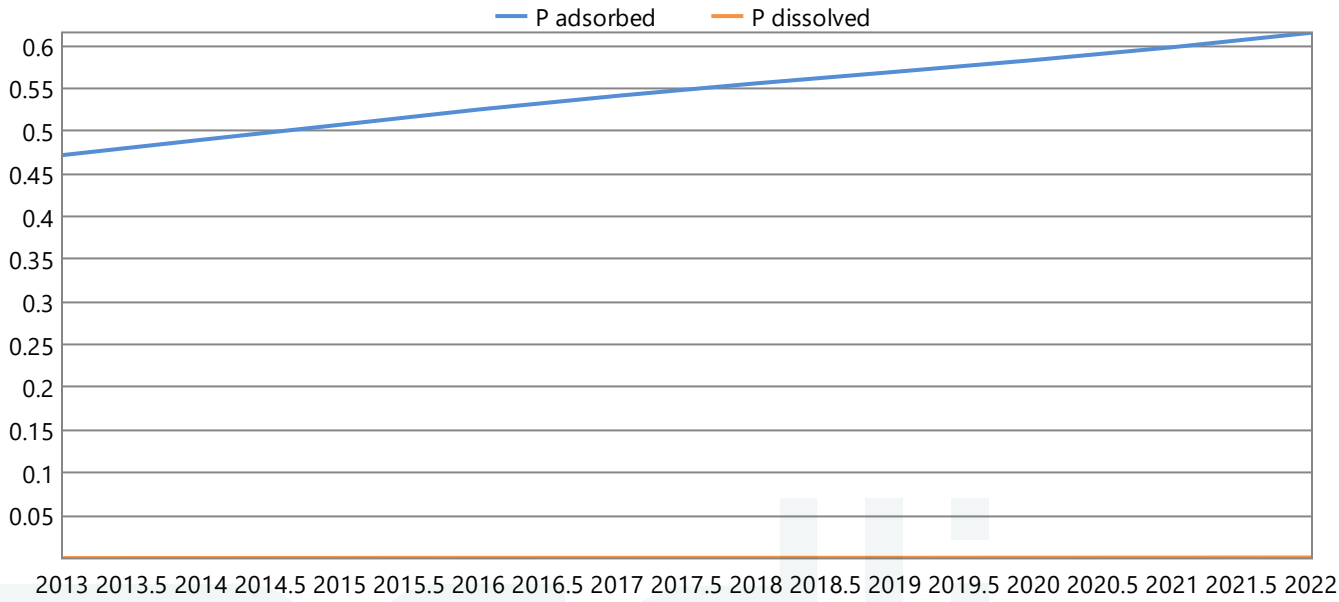
Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 5675 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.96)
Average monthly plant (green) cover (fraction)	0.88 (0.81 - 0.93)
Average monthly crop factor (fraction)	0.70 (0.64 - 0.74)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1193.78 (1129.25 - 1200.00)
Average number of normal harvests per year (no./year)	3.00 (2.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	2.80
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.52 (0.46 - 0.57)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.02)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.66
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.40
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.90
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.59
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 1'
***
NO IRRIGATION SCENARIO: 90EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

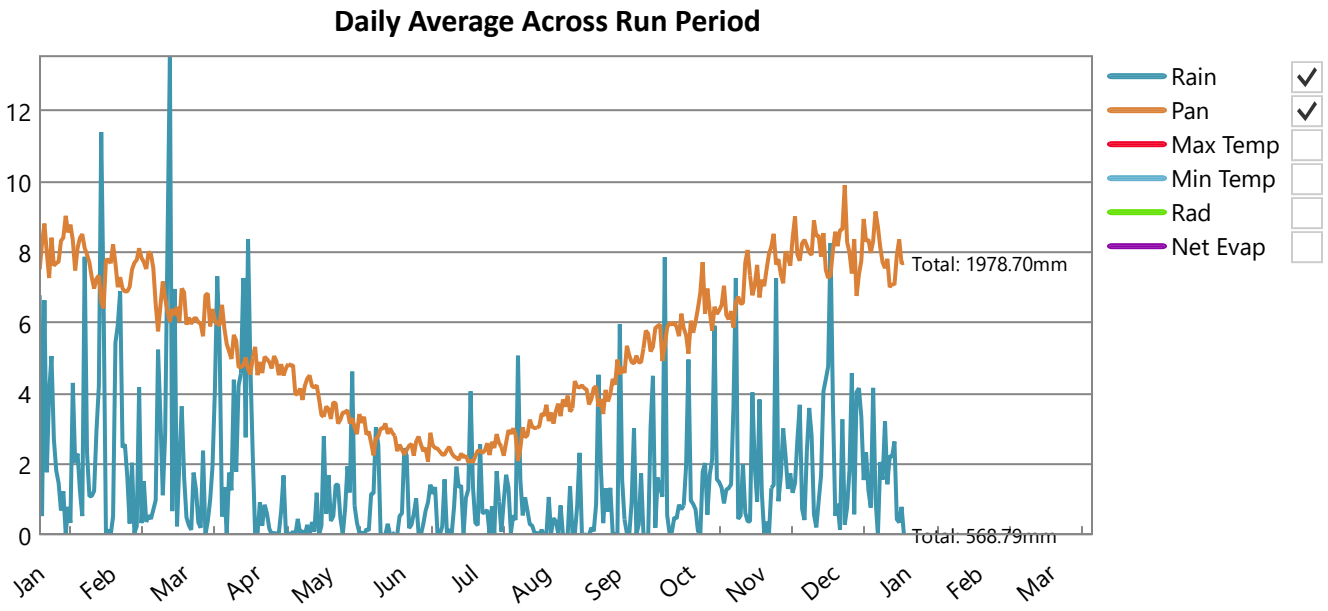
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

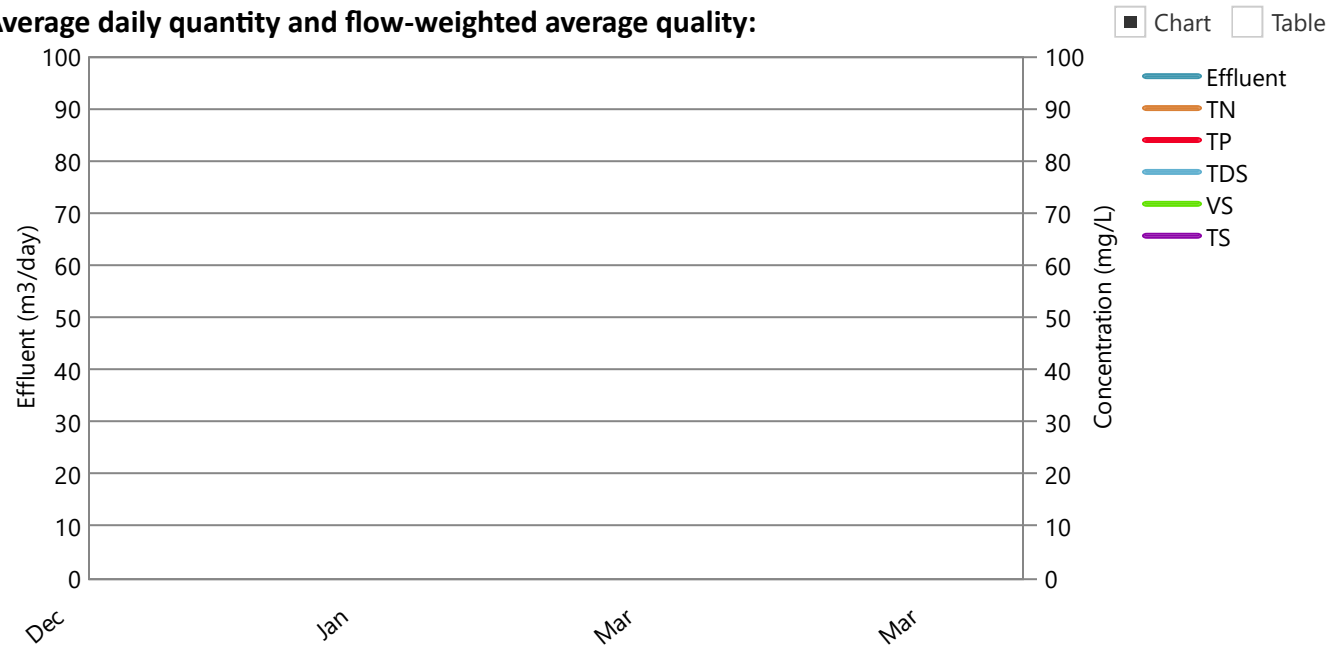


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

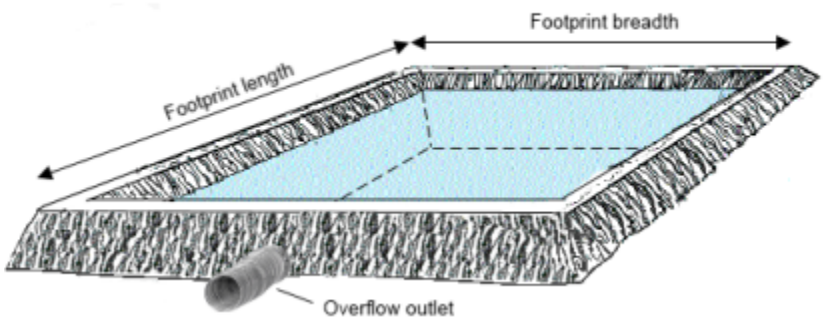
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

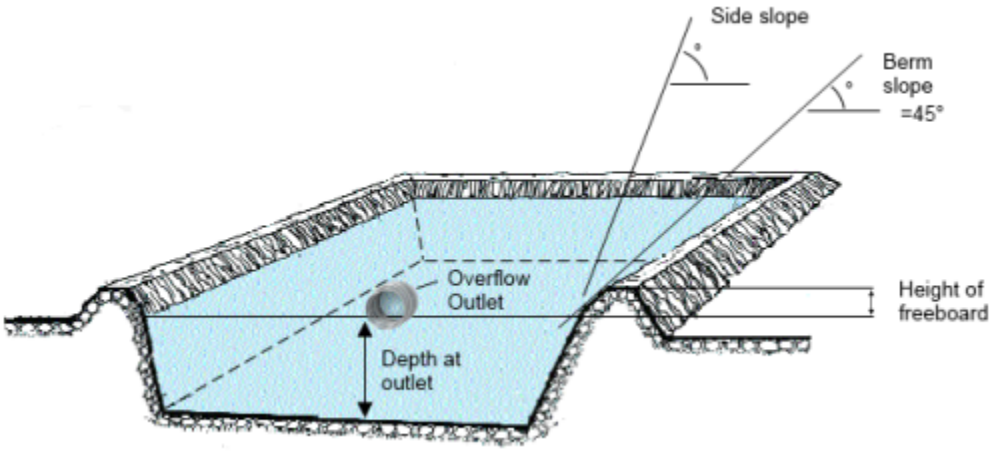
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	54.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	63.70
Pond footprint length (m)	7.98
Pond footprint width (m)	7.98
Pond catchment area (m2)	63.70
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

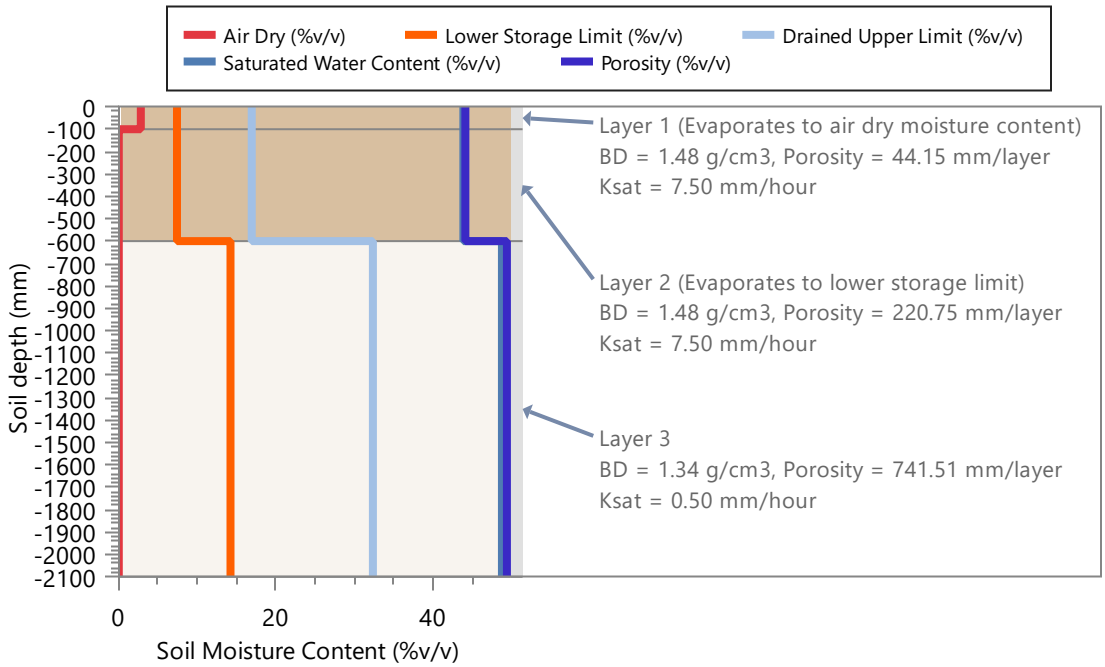
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 5675.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **54 m3**

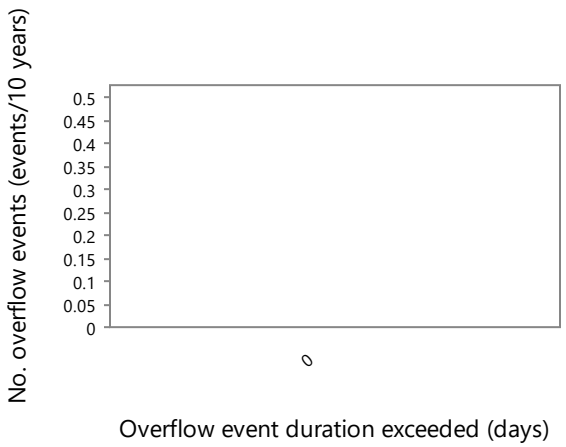
Pond System Water Balance (m3/year)

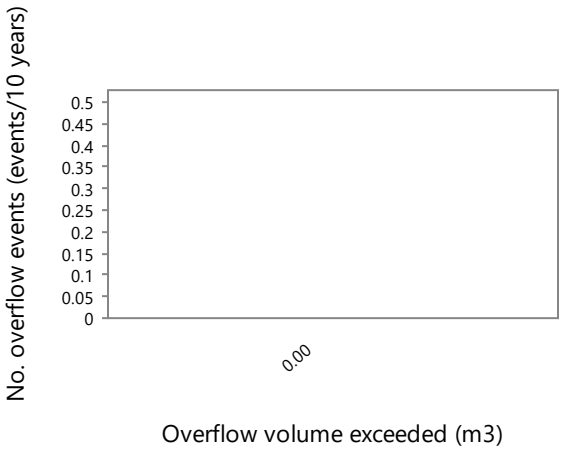
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

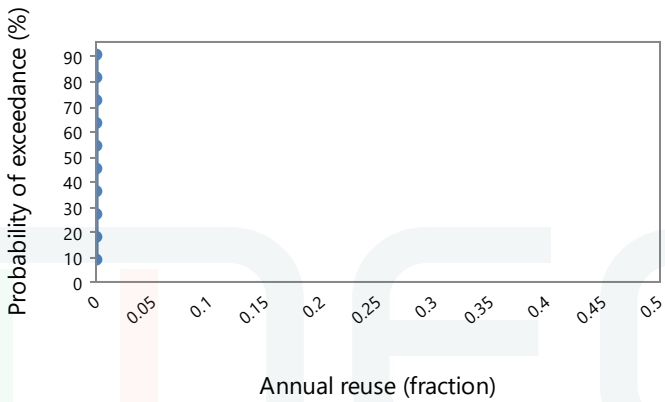
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

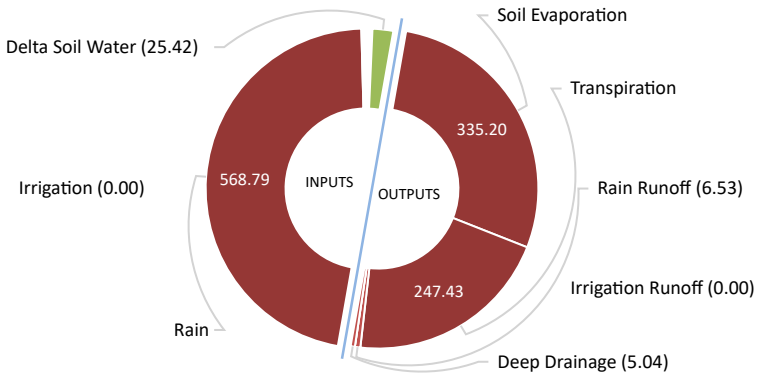
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 5675 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

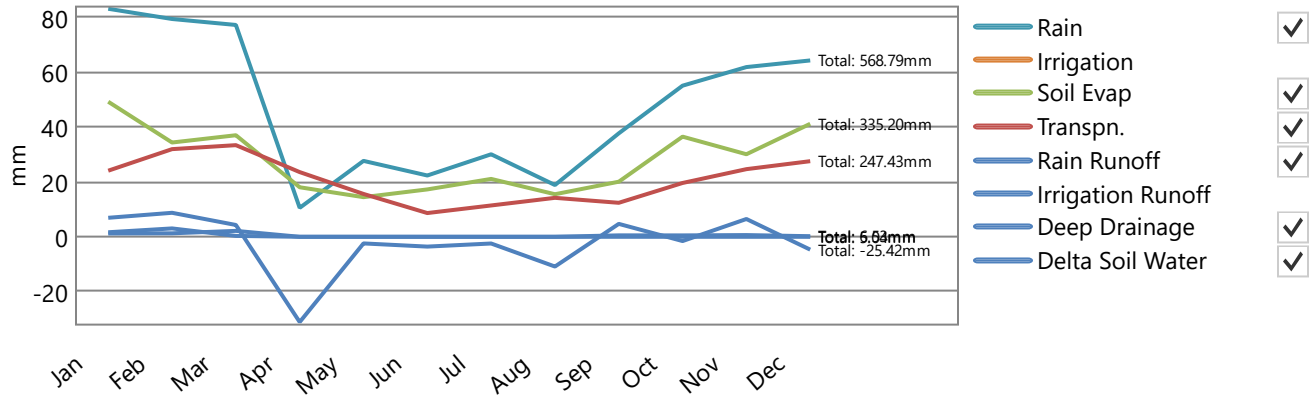
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	335.20
Transpiration	247.43
Rain Runoff	6.53
Irrigation Runoff	0.00
Deep Drainage	5.04
Delta Soil Water	-25.42

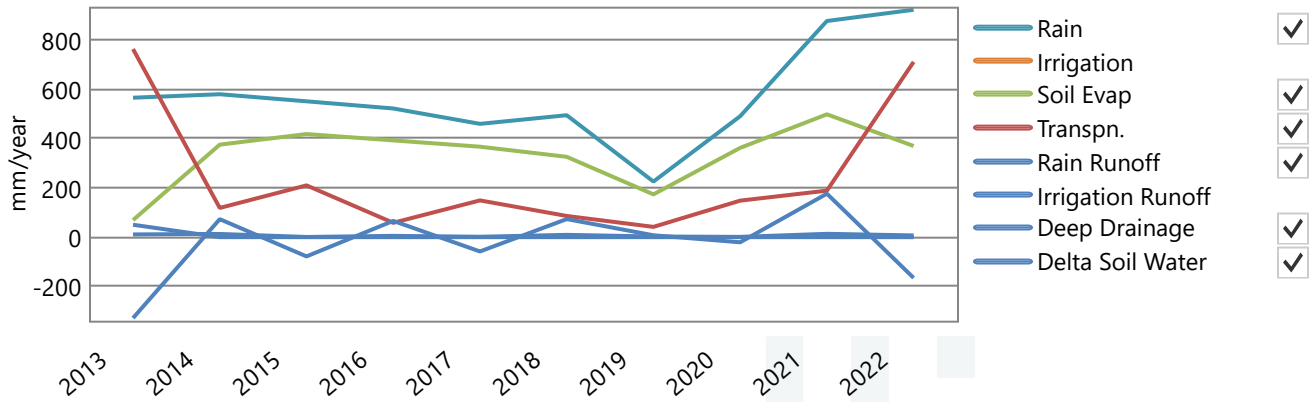
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

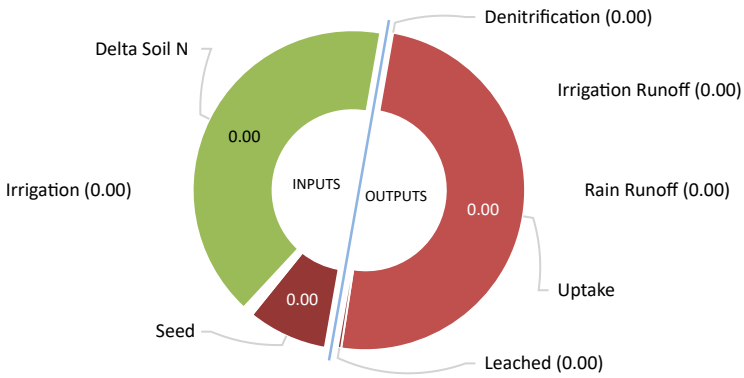
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

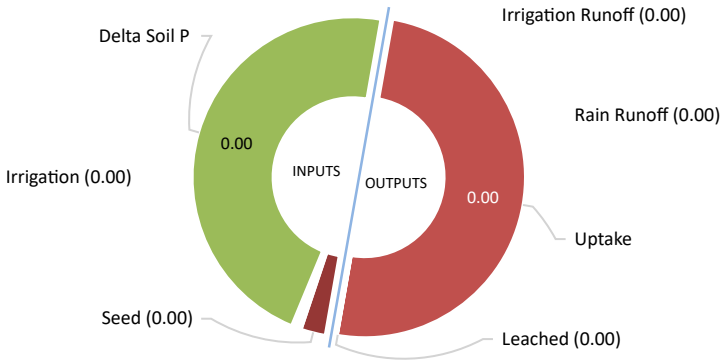
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.63E-04
Irrigation	0.00
Denitrification	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.59E-03
Leached	1.12E-05
Delta Soil N	-1.34E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	2.25E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	4.65E-04
Leached	2.34E-07
Delta Soil P	-4.42E-04

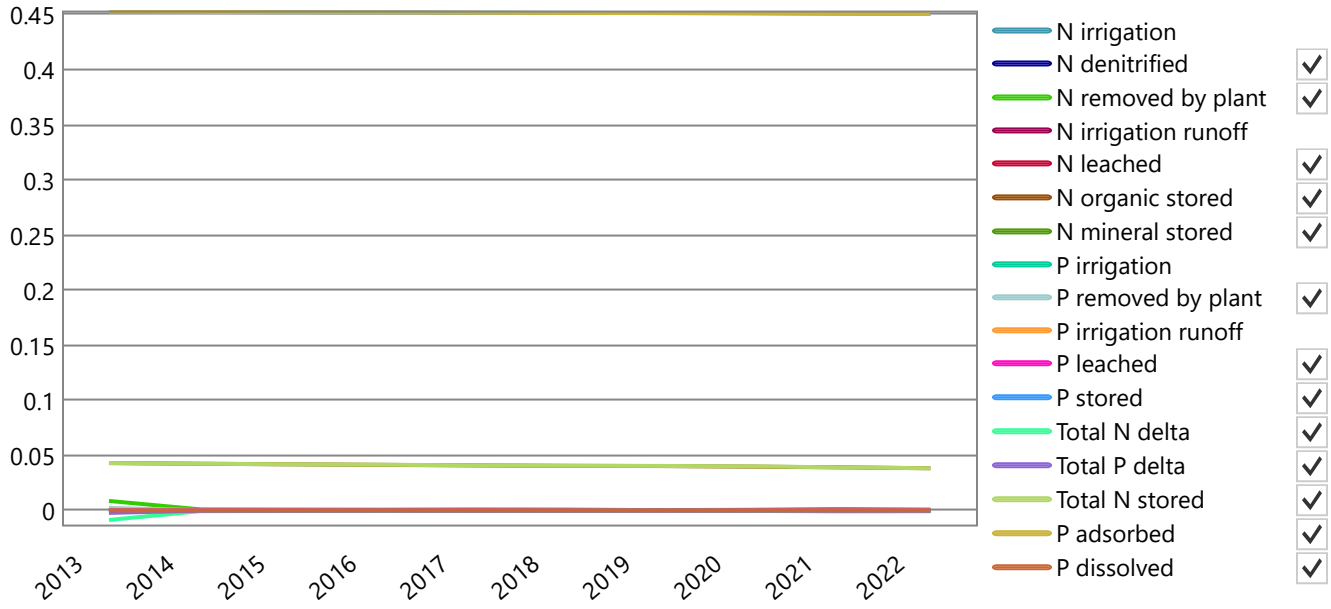
PERFORMANCE

Land Performance - Soil Nutrient

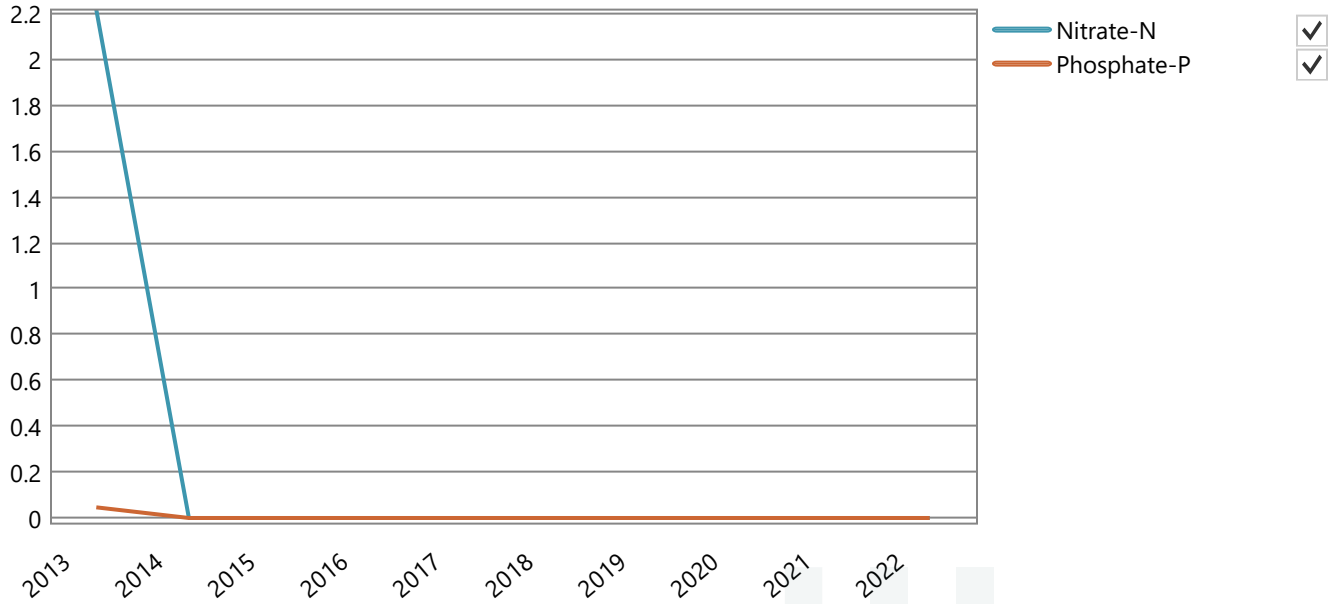
Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 5675 m2 representation_conserva

Soil Type: Sodosols

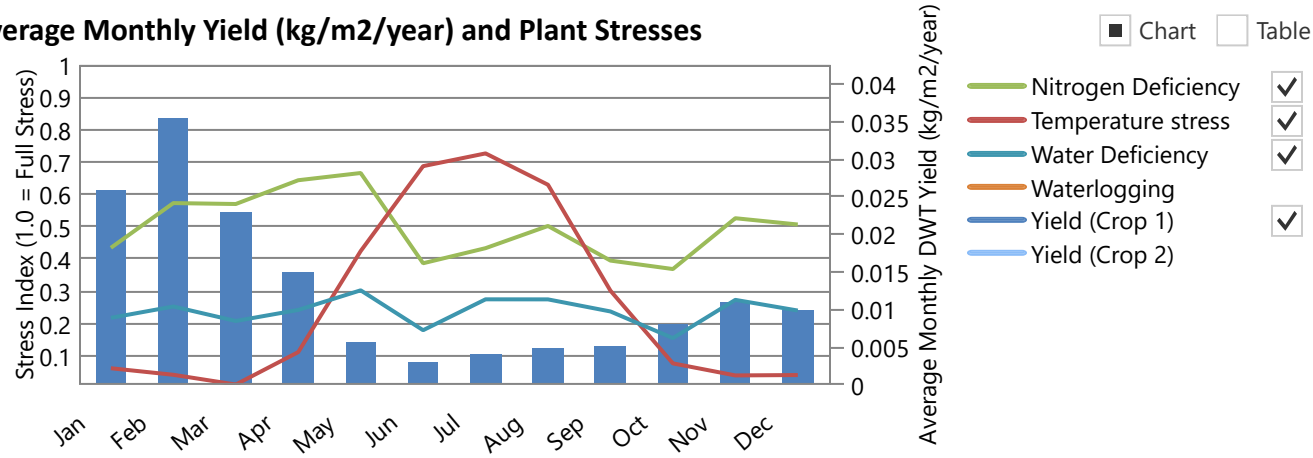
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Average monthly root depth (mm) (minimum - maximum)	383.78 (277.37 - 487.49)

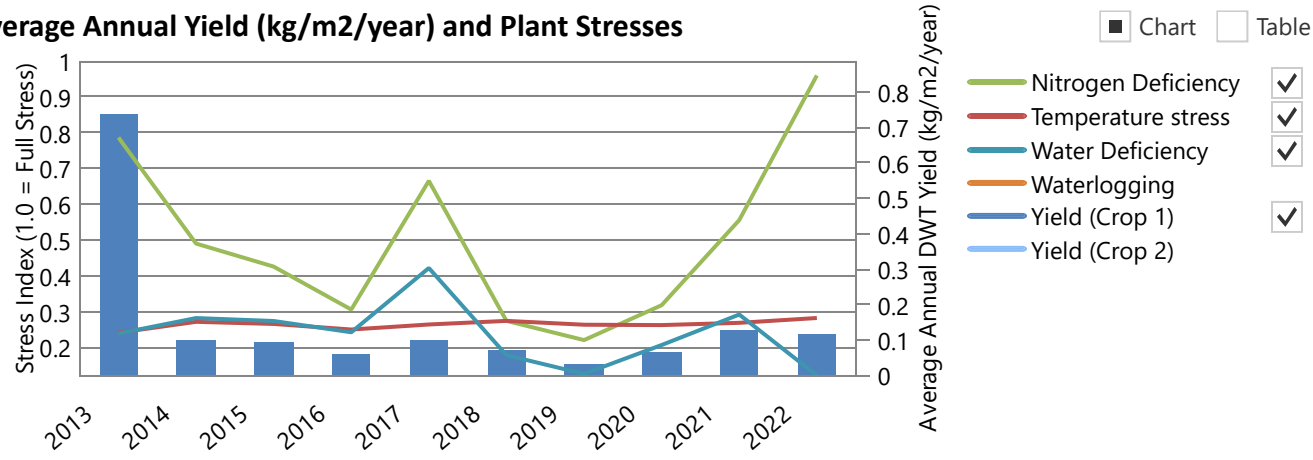
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.01)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.10 (normal), 2.40 (forced by crop death due to nitrogen stress (0.10), water stress (2.30))

No. days without crop/year (days/year): 123.20 due to frosting (4.40), temperature stress - not frost (2.00), water stress (116.80)

PERFORMANCE

Land Performance

Paddock: **Girrahween Office Application Ar, 5675 m2 representation_conserva**

Soil Type: **Sodosols**

Plant: **Continuous Kikuyu 1 Pasture**

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

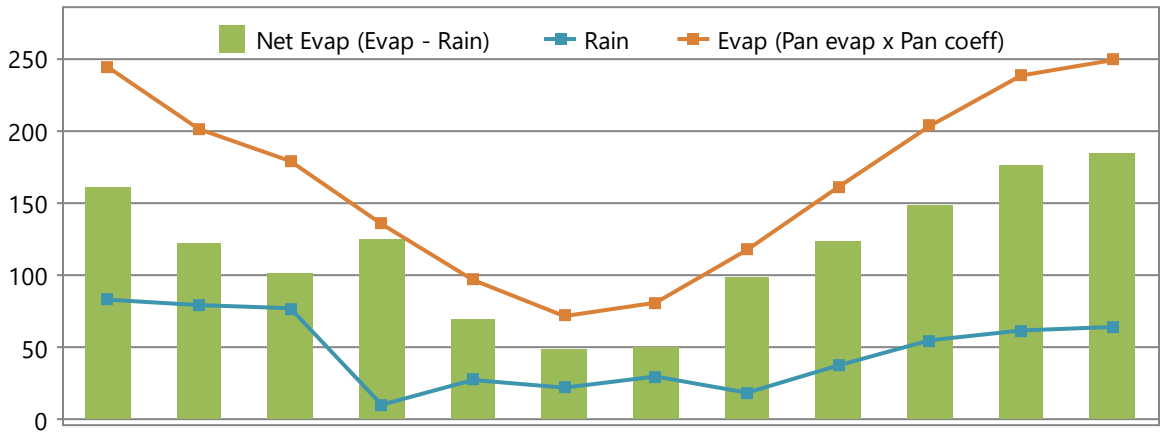
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

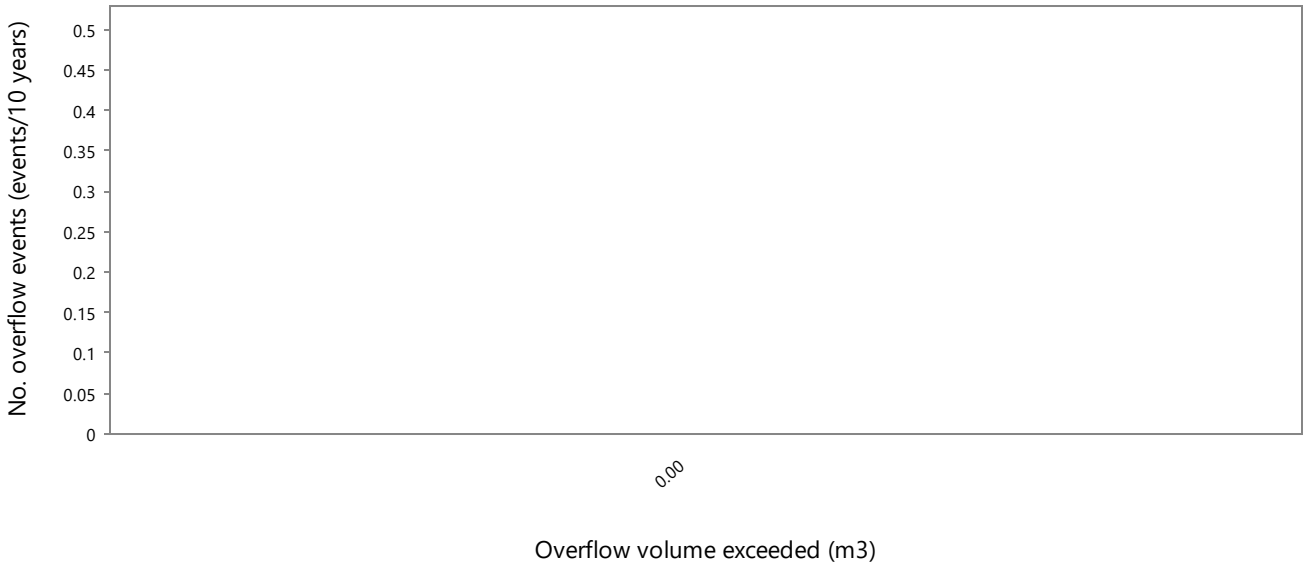
Last pond (Wet weather store): 54.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.06 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 5675 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	49.3	34.4	37.1	18.1	14.5	17.3	21.1	15.5	20.1	36.5	30.1	41.2	335.2
Transpn.	24.1	32.0	33.4	23.6	15.6	8.7	11.4	14.2	12.4	19.6	24.7	27.6	247.4
Runoff	1.2	1.3	2.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	6.5
Drainage	1.7	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Delta	6.9	8.8	4.3	-31.1	-2.4	-3.6	-2.4	-10.9	4.7	-1.6	6.5	-4.7	-25.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	1.59E-03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	0.00
Average annual soil nitrogen leached (kg/m2/year)	1.12E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	1.12E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.04
	0.01 - 2.40E-05
Average nitrate-N concentration of deep drainage (mg/L)	2.22
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.22

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	4.65E-04
Average annual soil phosphorus leached (kg/m2/year)	2.34E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 3.00E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.45
Average phosphate-P concentration in rootzone (mg/L)	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.05
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.05
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

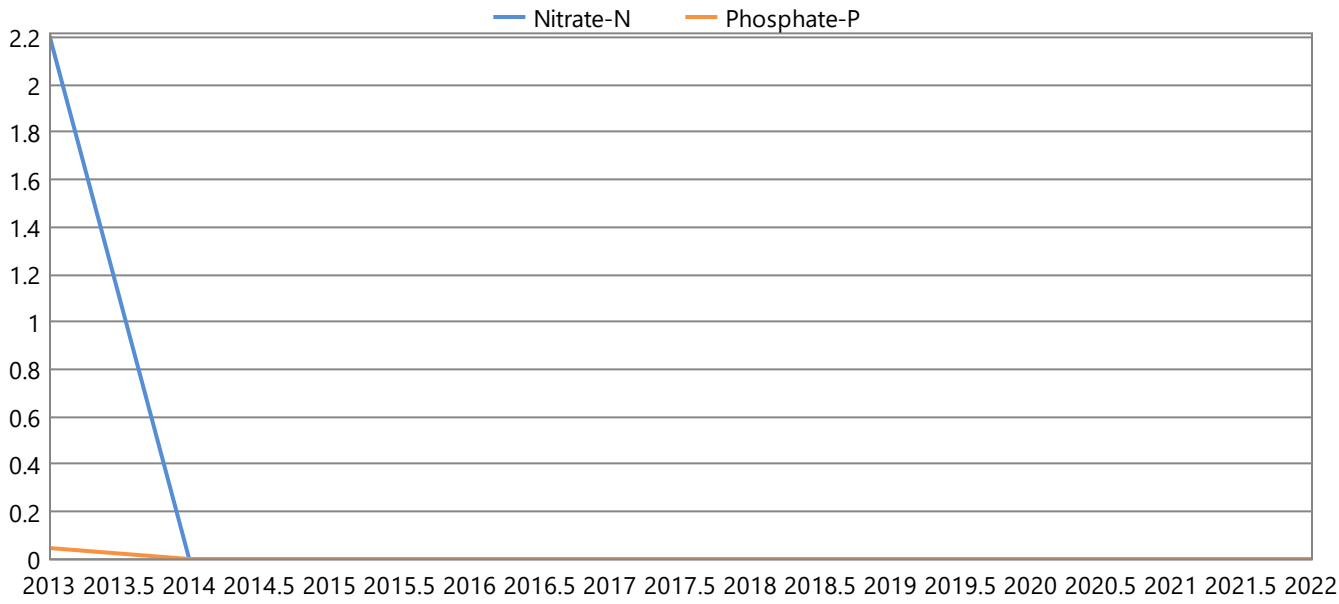
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

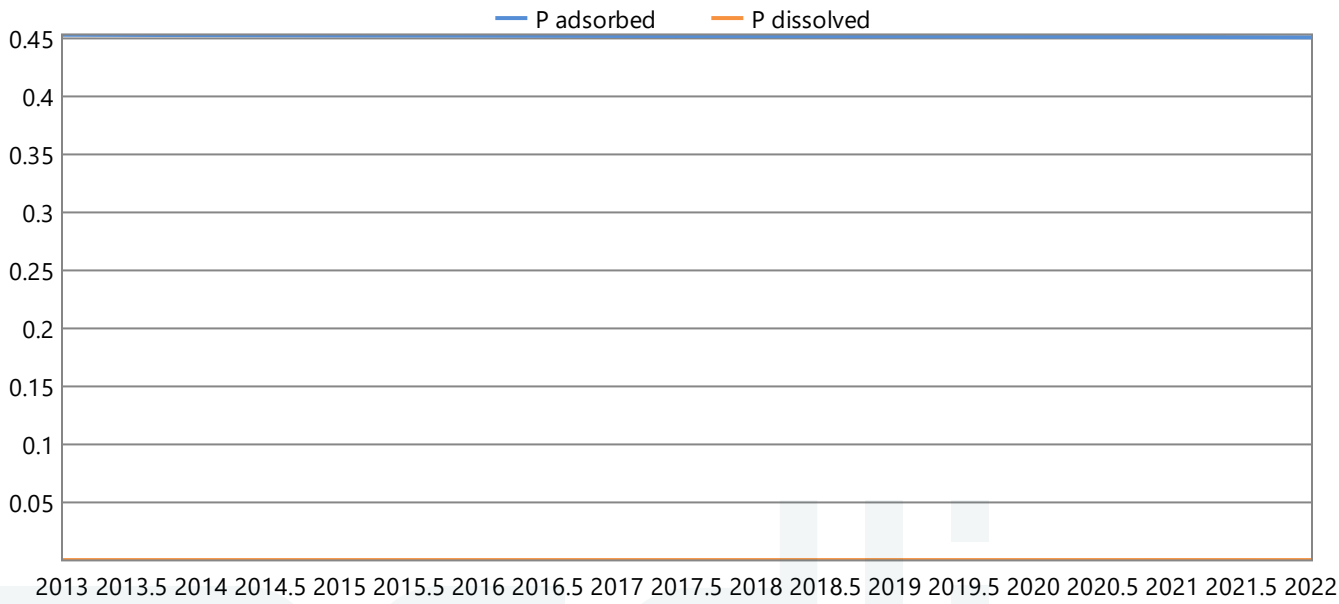
Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 5675 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction)	0.27 (0.19 - 0.34)
Average monthly crop factor (fraction)	0.21 (0.15 - 0.27)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	383.78 (277.37 - 487.49)
Average number of normal harvests per year (no./year)	0.10 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	2.40 (0.00 - 4.00)
Average number of crop deaths for last five years only (no./year)	2.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.50 (0.22 - 0.96)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.24 (0.15 - 0.30)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	123.20

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 3'
***
IRRIGATION LOAD SCENARIO: 120EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

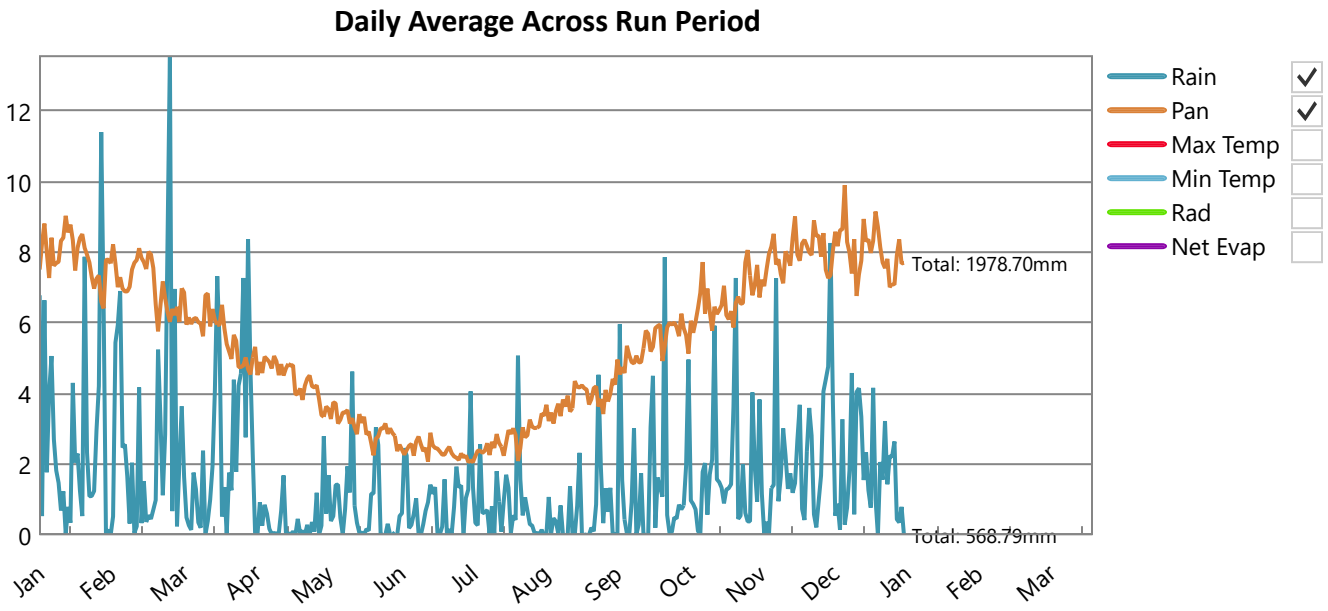
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

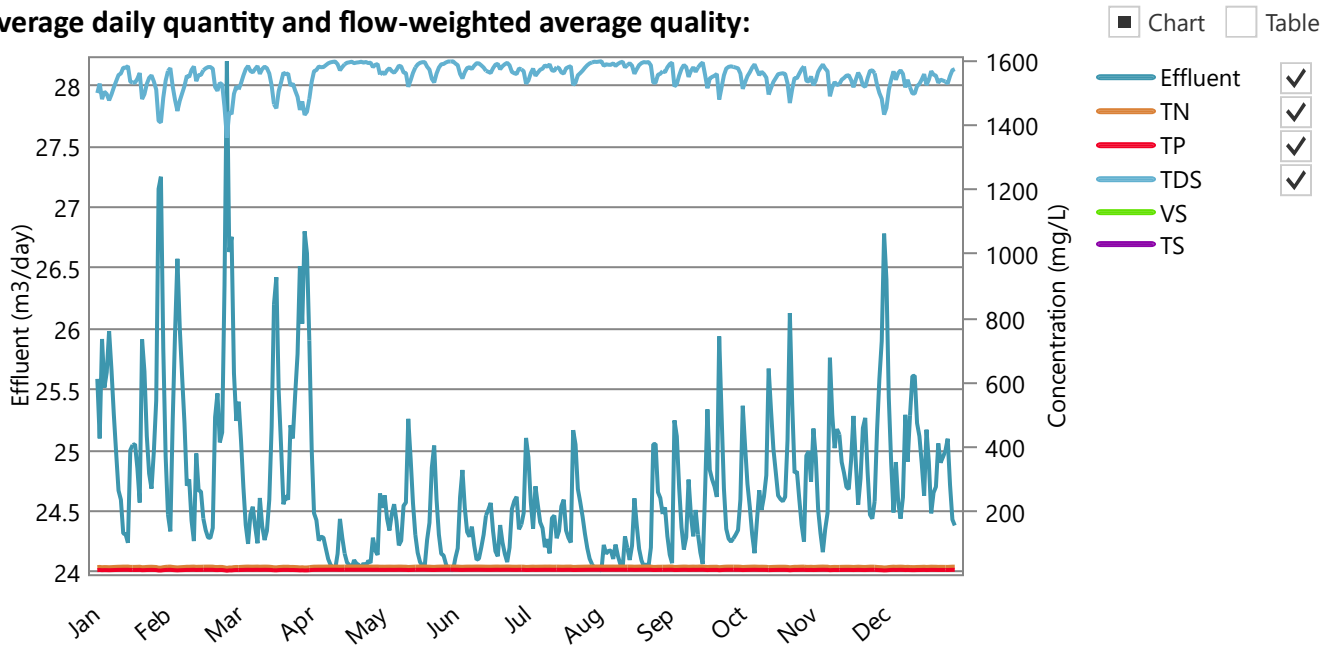


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 9028.26 m3/year or 24.72 m3/day (Min-Max: 24.00 - 44.41)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

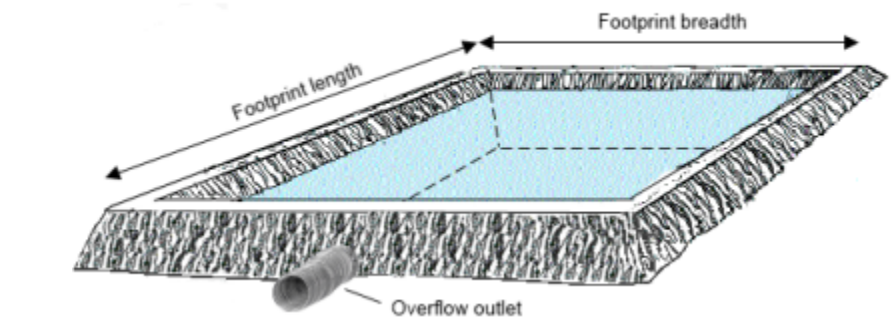
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	262.94 (262.80 - 263.52)
Total Phosphorus	19.42 (10.81 - 20.00)	175.30 (175.20 - 175.68)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	14023.68 (14016.00 - 14054.40)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

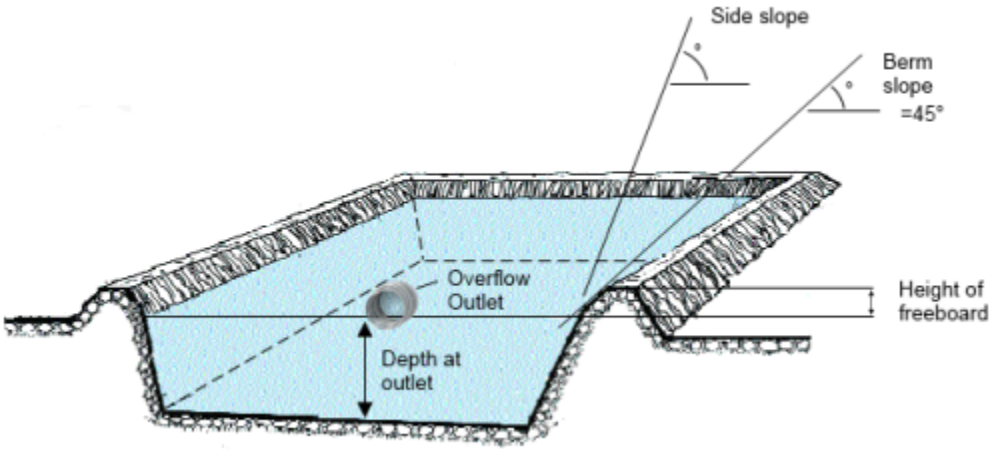
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	72.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	83.16
Pond footprint length (m)	9.12
Pond footprint width (m)	9.12
Pond catchment area (m2)	83.16
Average active volume (m3)	0.95





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

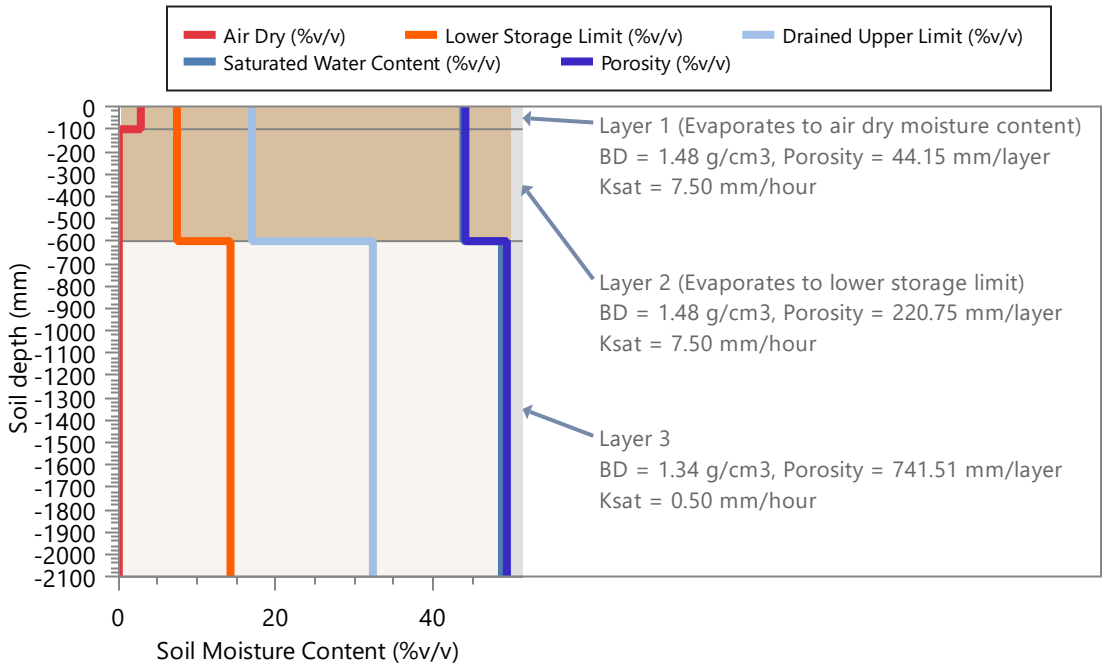
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 7575.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

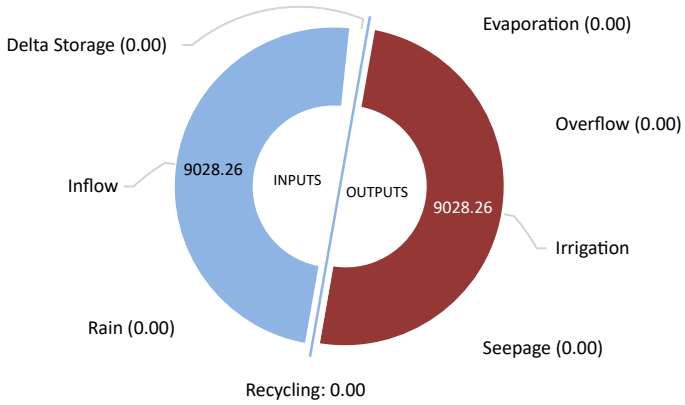
Average monthly cover (fraction) (minimum - maximum)	0.88 (0.81 - 0.93)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **72 m3**

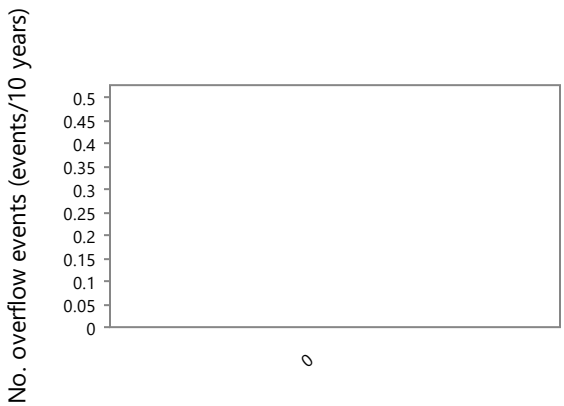
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	9028.26
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	9028.26
Seepage	0.00
Delta Storage	0.00

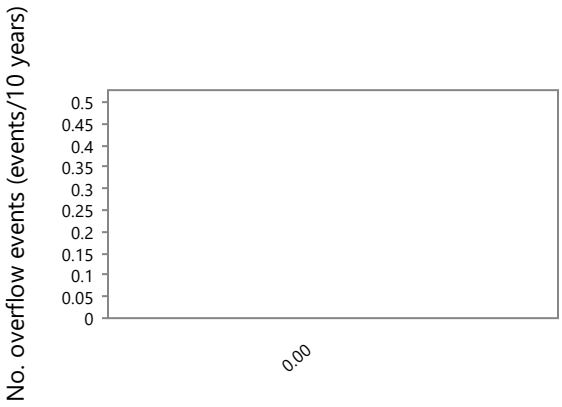
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



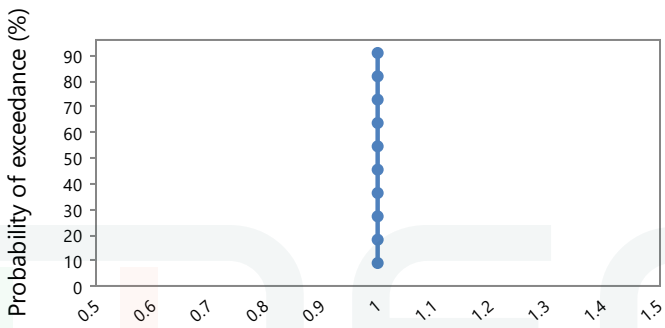
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

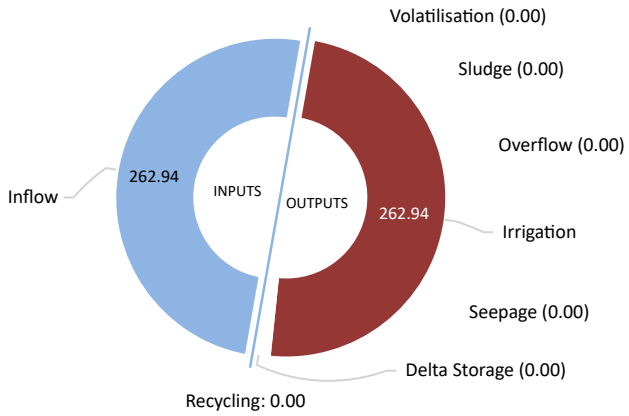
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

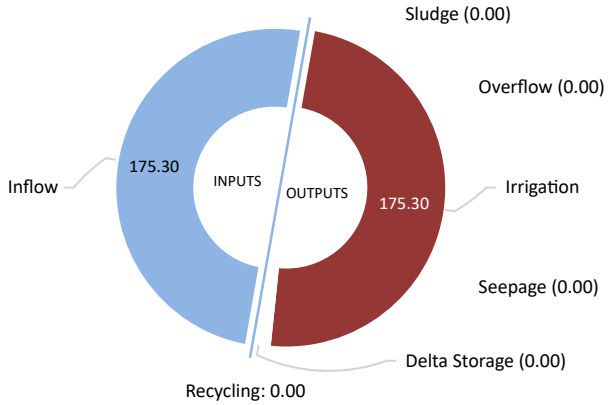
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



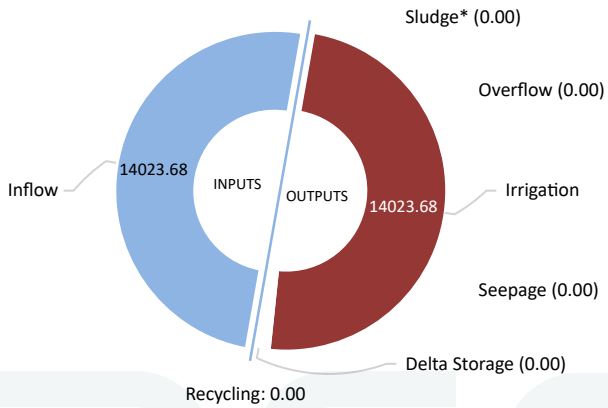
Name	Value
Inflow	262.94
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	262.94
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	175.30
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	175.30
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	14023.68
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	14023.68
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.82
Average phosphorus concentration of pond liquid (mg/L)	16.55
Average salinity of pond liquid (dS/m)	2.07

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	29.99
Final phosphorus concentration of pond liquid (mg/L)	19.99
Final salinity of pond liquid (dS/m)	2.50

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	9028.26
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	9028.26
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

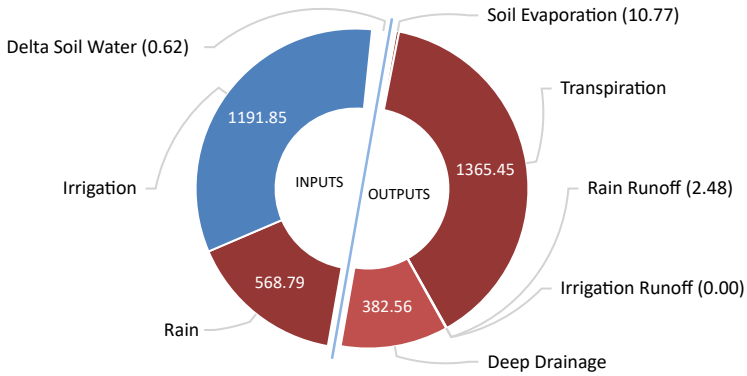
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 7575 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

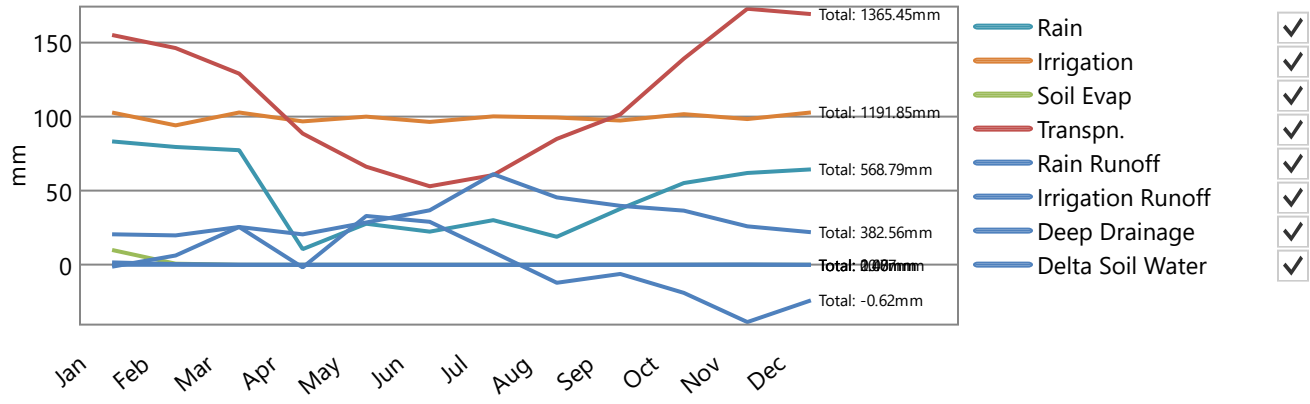
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1191.85
Soil Evaporation	10.77
Transpiration	1365.45
Rain Runoff	2.48
Irrigation Runoff	0.00
Deep Drainage	382.56
Delta Soil Water	-0.62

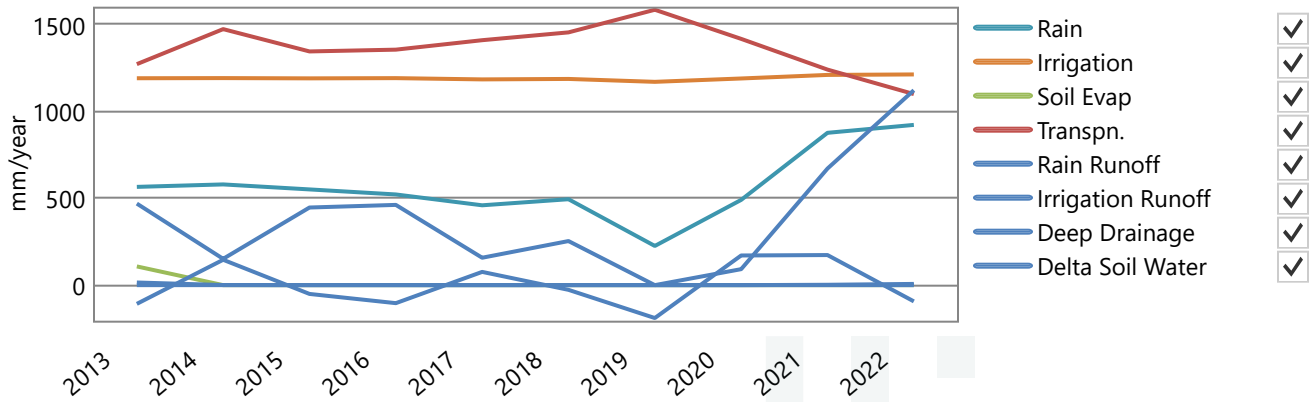
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

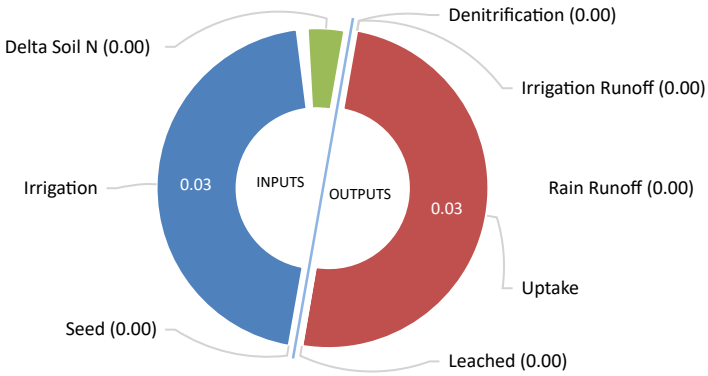
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

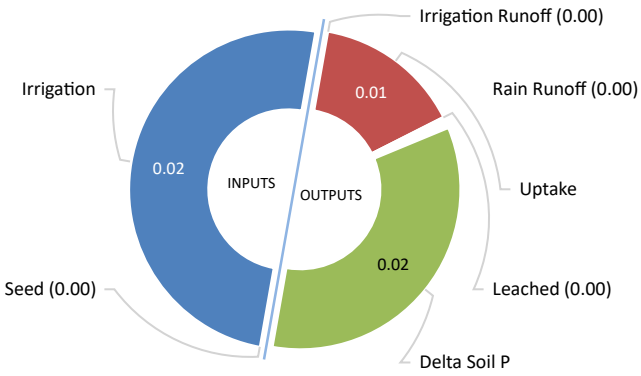
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	3.19E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.03
Leached	4.15E-05
Delta Soil N	-2.37E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.71E-05
Delta Soil P	0.02

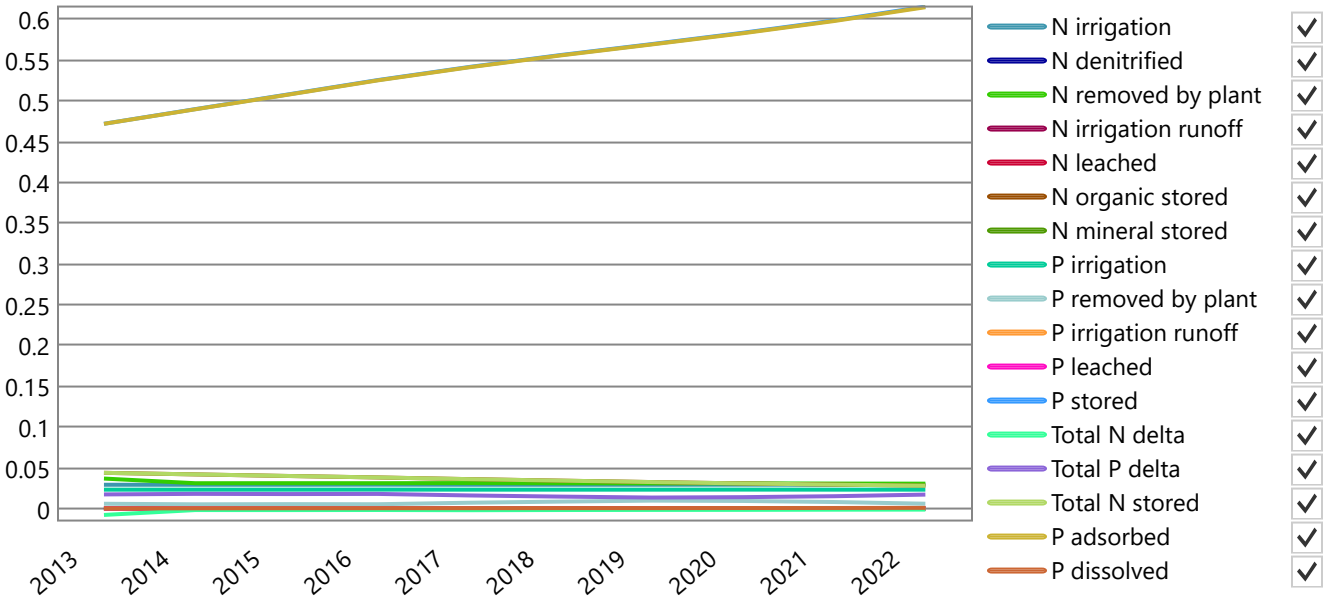
PERFORMANCE

Land Performance - Soil Nutrient

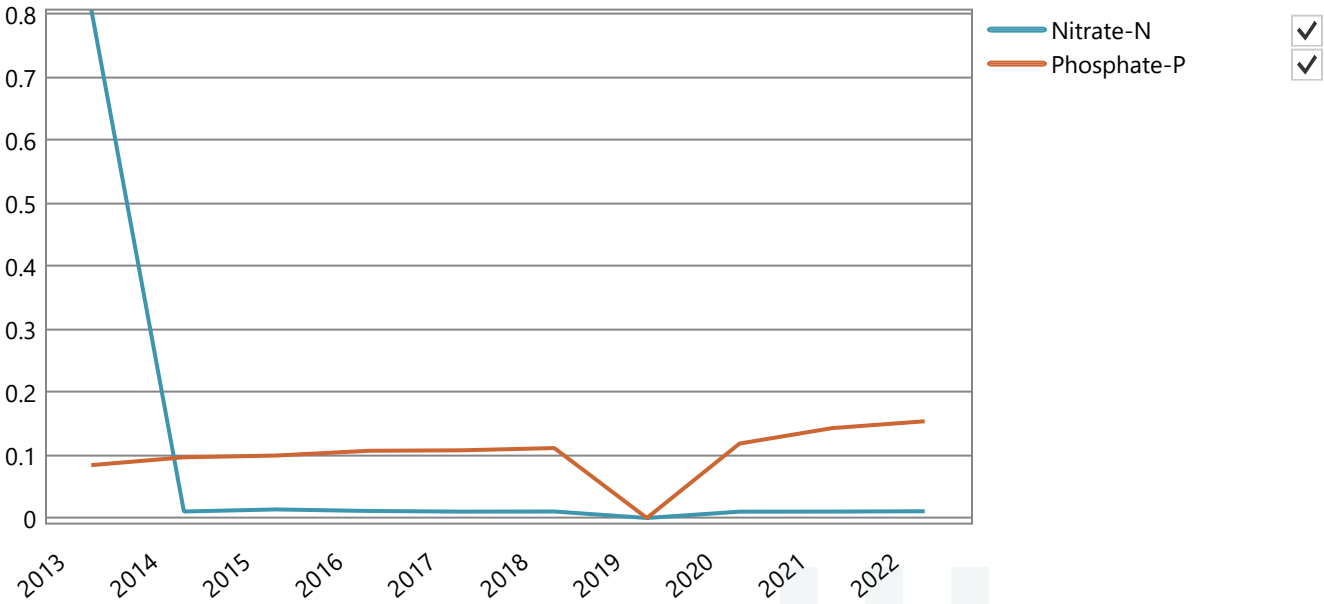
Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

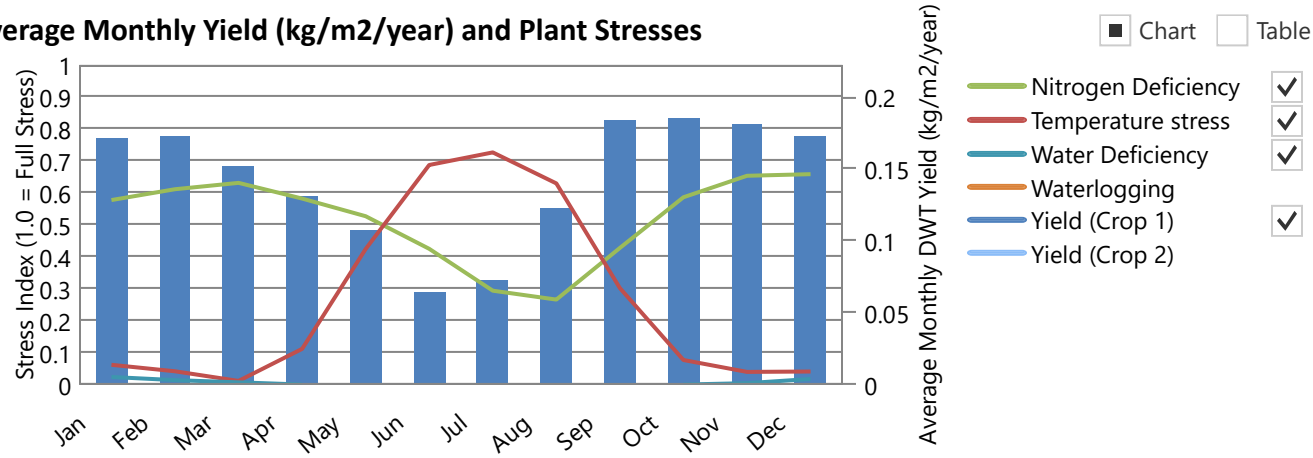
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.88 (0.81 - 0.93)
Average monthly root depth (mm) (minimum - maximum)	1193.78 (1129.25 - 1200.00)

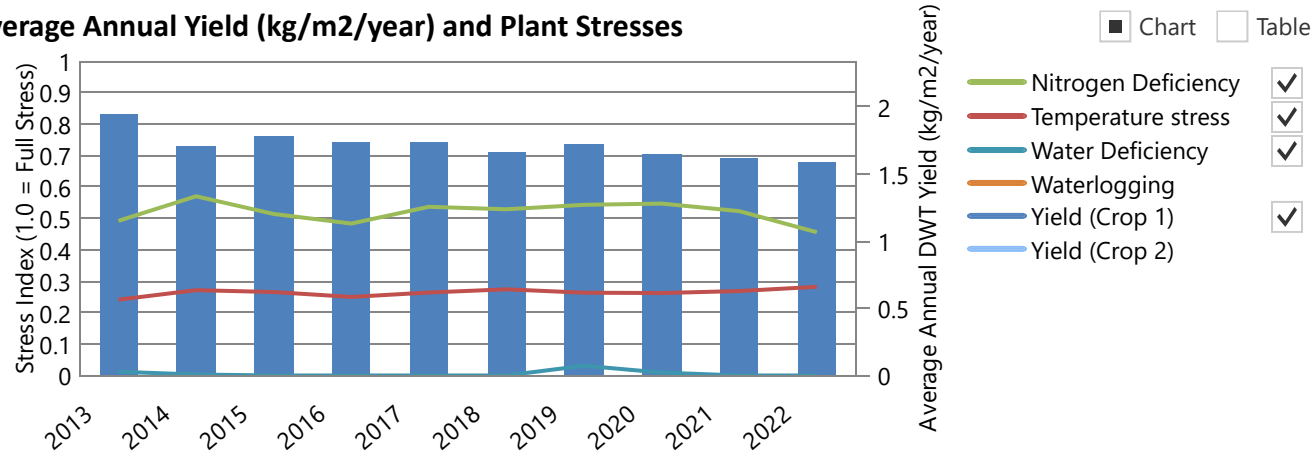
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.03 (0.03 - 0.04)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.004 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.00 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

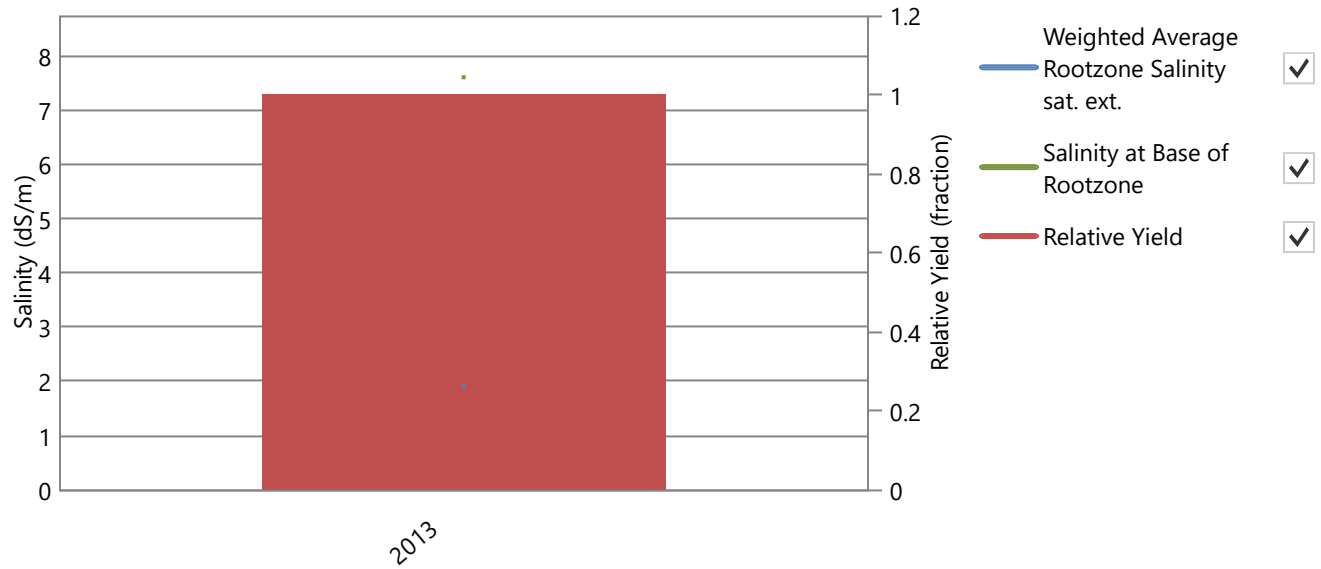
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.61
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



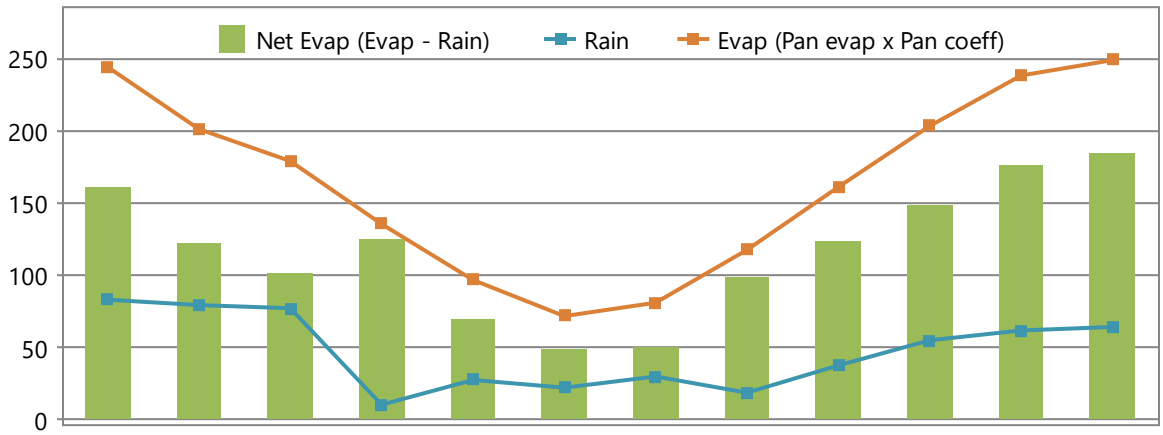
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 9028.26 m3/year or 24.72 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	262.94 (262.80 - 263.52)
Total Phosphorus	19.42 (10.81 - 20.00)	175.30 (175.20 - 175.68)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	14023.68 (14016.00 - 14054.40)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

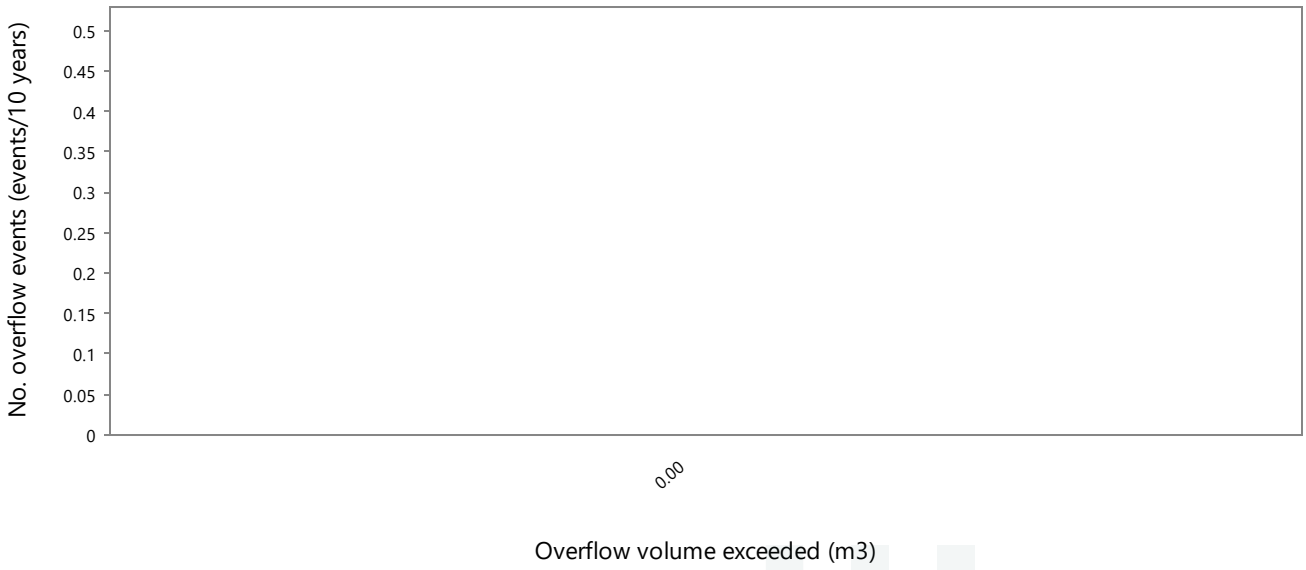
Last pond (Wet weather store): 72.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.08 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.07
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 7575 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	9028.26	1.19
Total nitrogen applied (kg)	220.87	0.03
Total phosphorus applied (kg)	175.30	0.02
Total salts applied (kg)	14023.68	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 7575 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.7	94.1	102.7	96.7	99.9	96.4	100.1	99.3	97.3	101.6	98.3	102.7	1191.8
Soil Evap	10.0	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.8
Transpn.	155.0	146.2	128.9	88.5	66.2	53.0	60.5	84.9	101.4	139.0	172.7	169.1	1365.5
Rain Runoff	1.6	0.5	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.2	0.0	2.5
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	20.6	19.8	25.5	20.5	28.5	36.8	61.1	45.5	39.8	36.5	25.9	22.0	382.6
Delta	-1.3	6.3	25.5	-1.8	32.9	29.0	8.5	-12.1	-6.2	-18.9	-38.6	-24.0	-0.6

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.19E-07
Average annual soil nitrogen leached (kg/m2/year)	4.15E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	4.15E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.03
	0.01 - 5.82E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.11
Max. annual nitrate-N concentration of deep drainage (mg/L)	0.81

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.71E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 7.86E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.61
Average phosphate-P concentration in rootzone (mg/L)	1.30
Average phosphate-P concentration of deep drainage (mg/L)	0.12
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.15
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.16 mg/L (years)	37.70

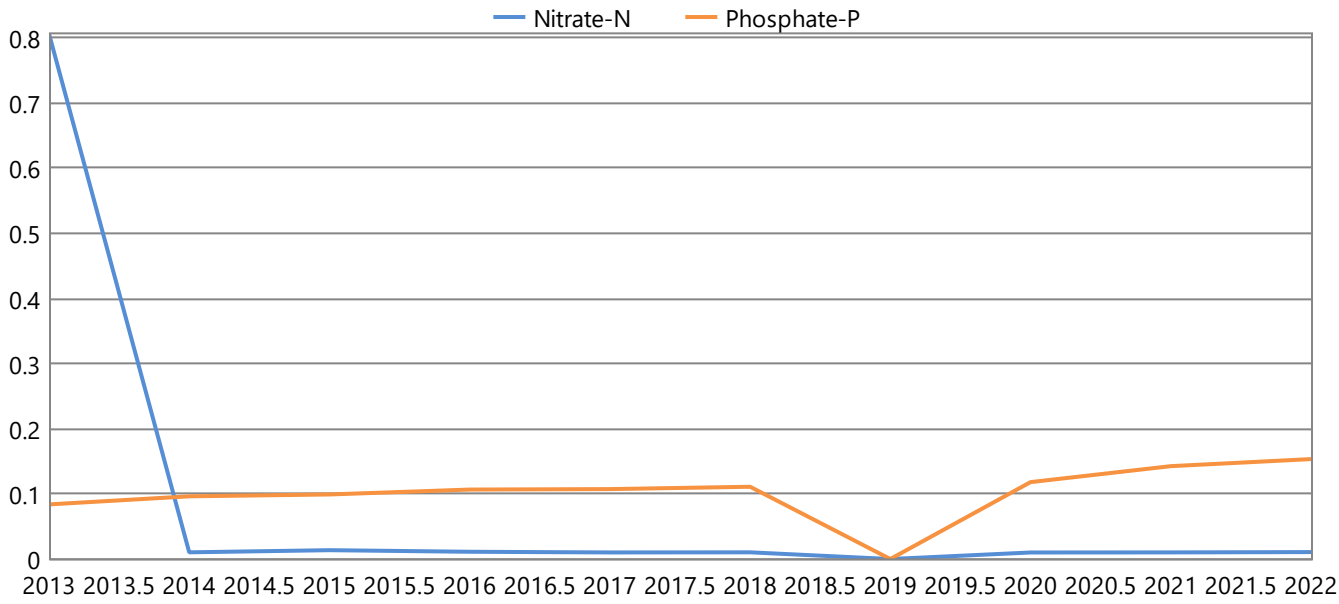
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

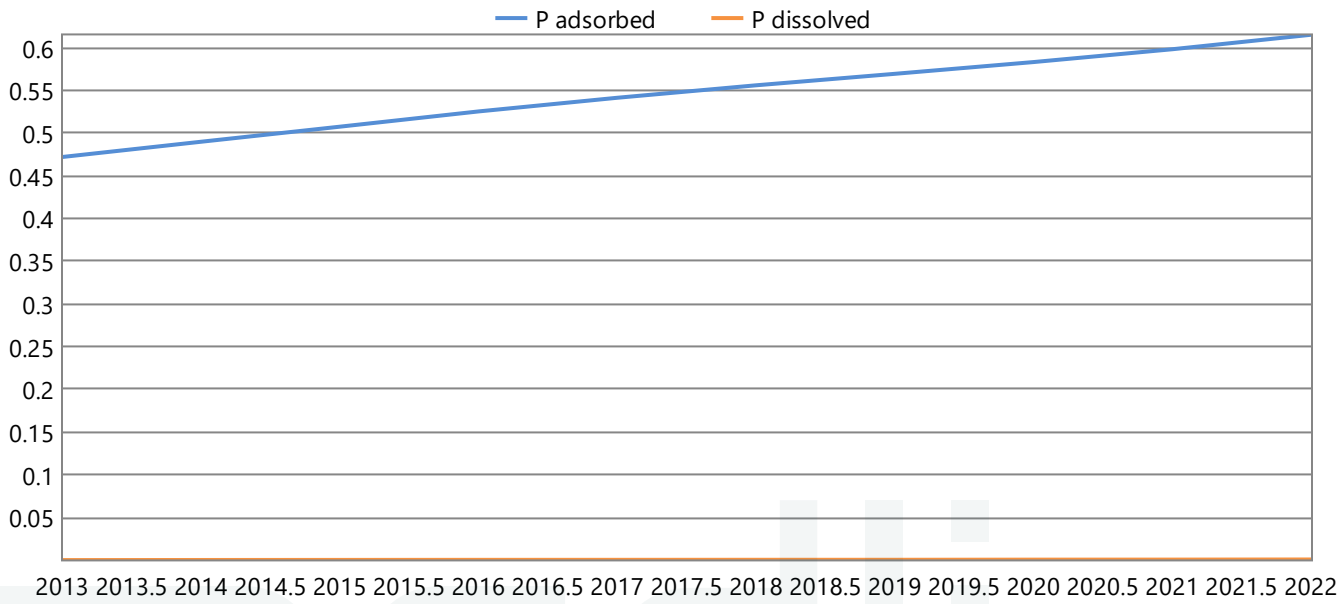
Paddock Land: Girrahween Office Application Ar: 7575 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 7575 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.72 (1.59 - 1.95)
Average monthly plant (green) cover (fraction)	0.88 (0.81 - 0.93)
Average monthly crop factor (fraction)	0.70 (0.64 - 0.74)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1193.78 (1129.25 - 1200.00)
Average number of normal harvests per year (no./year)	3.00 (2.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	2.80
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.52 (0.46 - 0.57)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.02)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.65
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.39
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.91
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.61
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 1 - "Bellevue Part 3'
***
NO IRRIGATION SCENARIO: 120EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

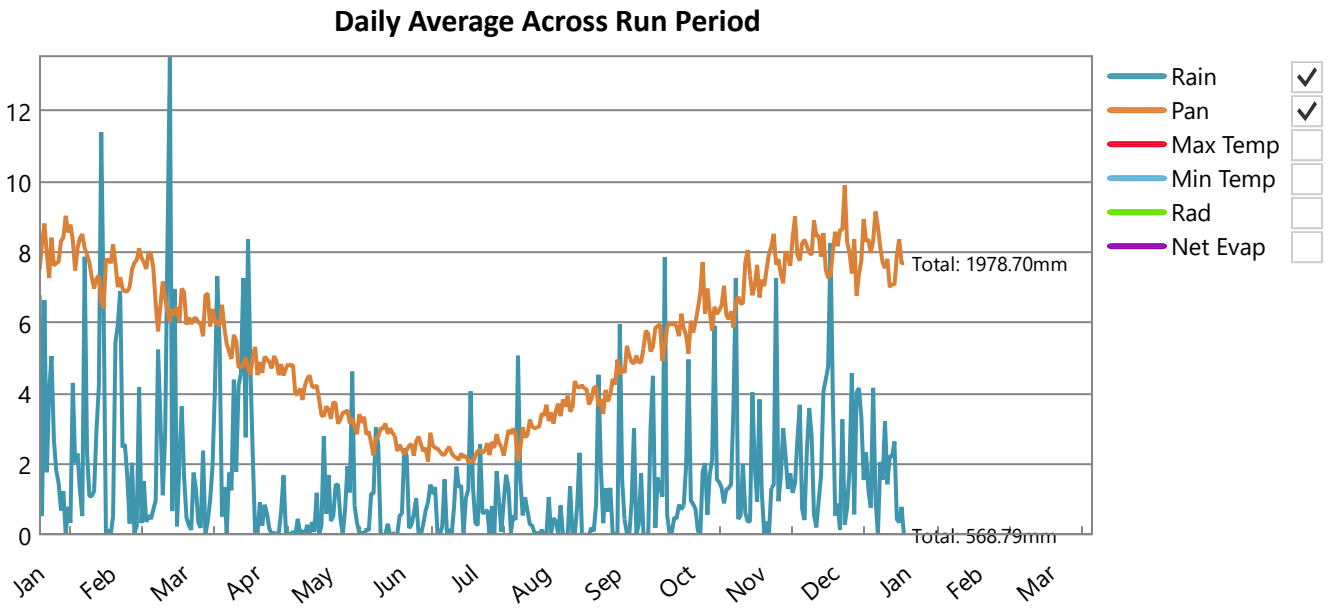
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

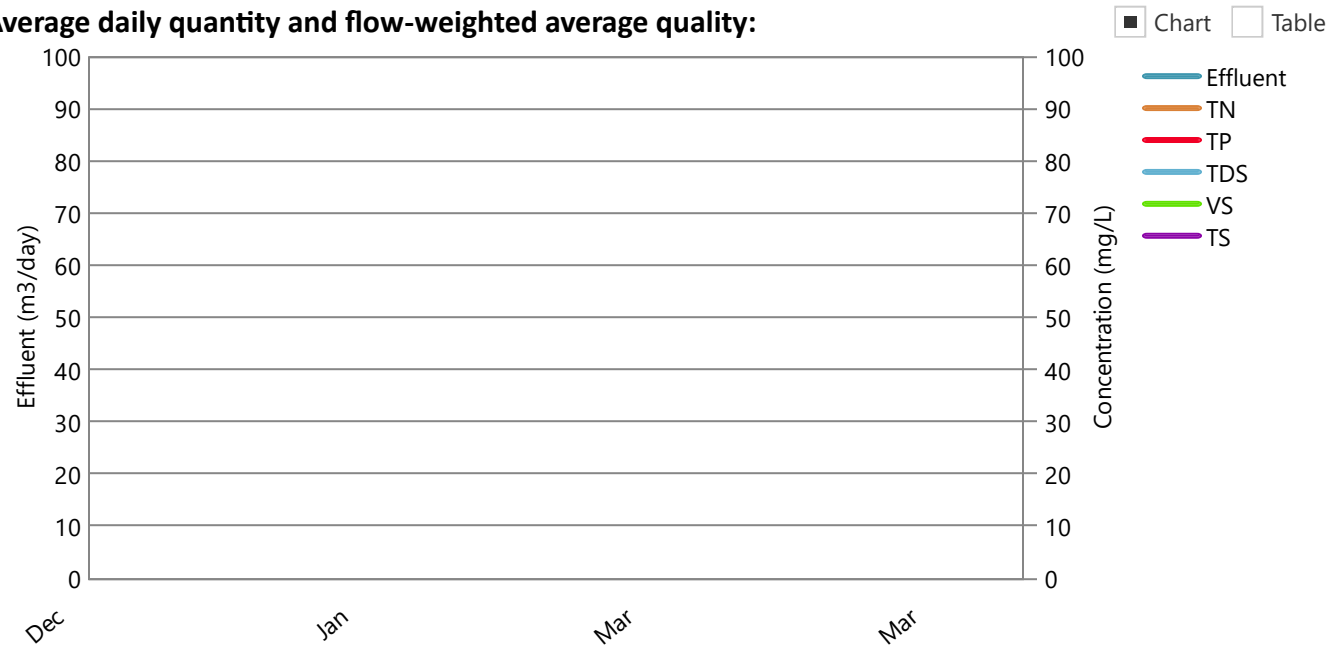


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

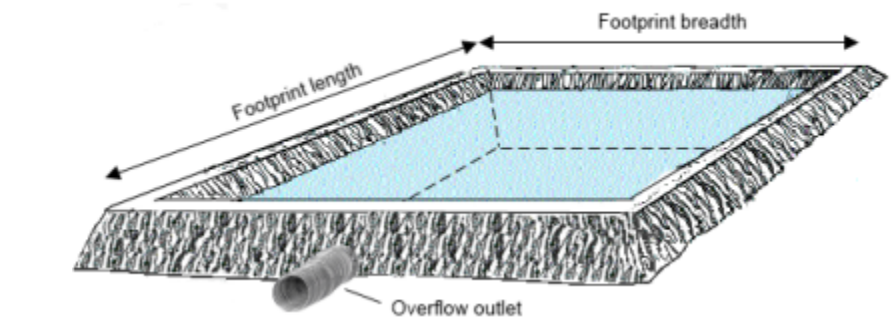
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

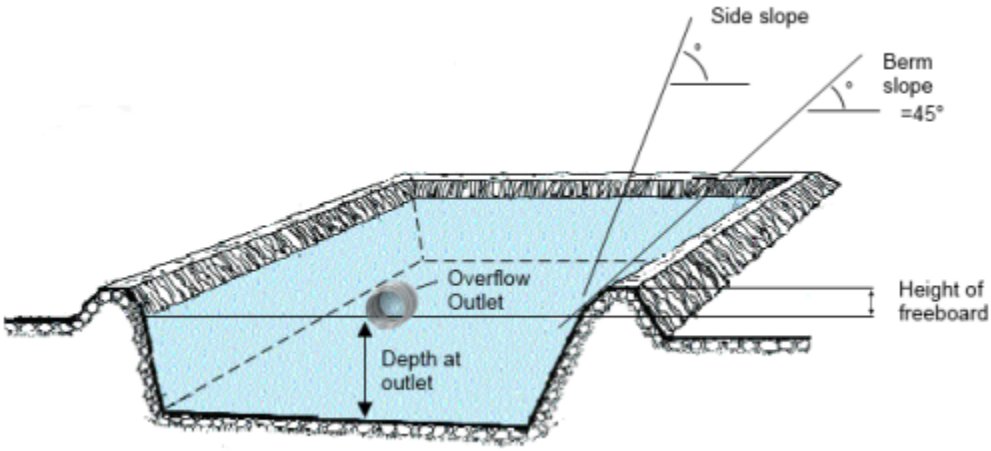
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	72.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	83.16
Pond footprint length (m)	9.12
Pond footprint width (m)	9.12
Pond catchment area (m2)	83.16
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

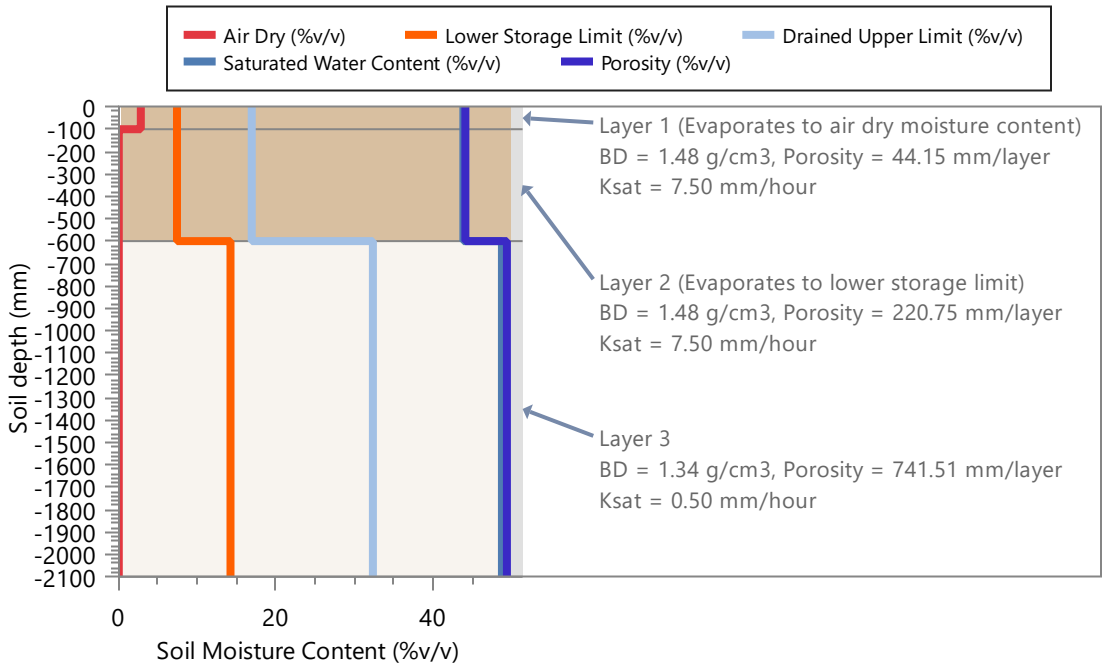
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 7575.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **72 m3**

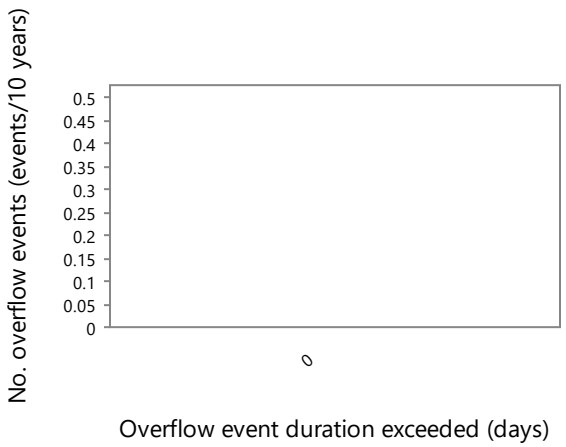
Pond System Water Balance (m3/year)

(no data available)

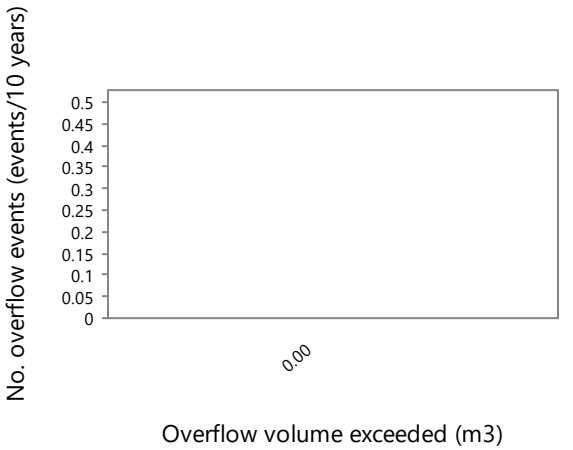
Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

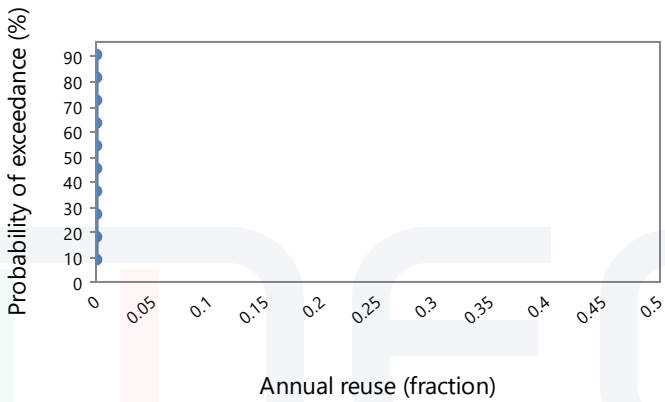
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00



Export plot



Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

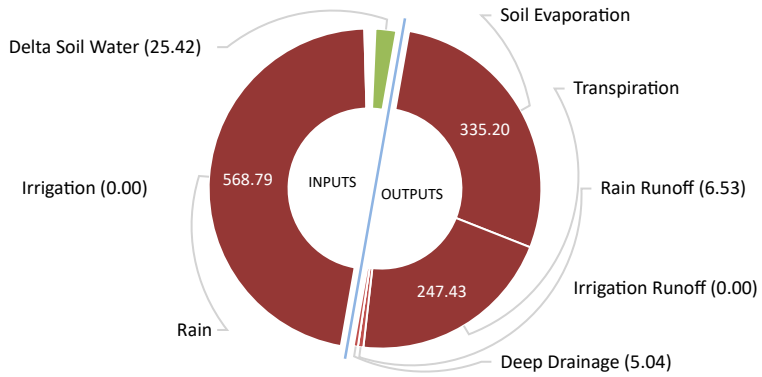
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 7575 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

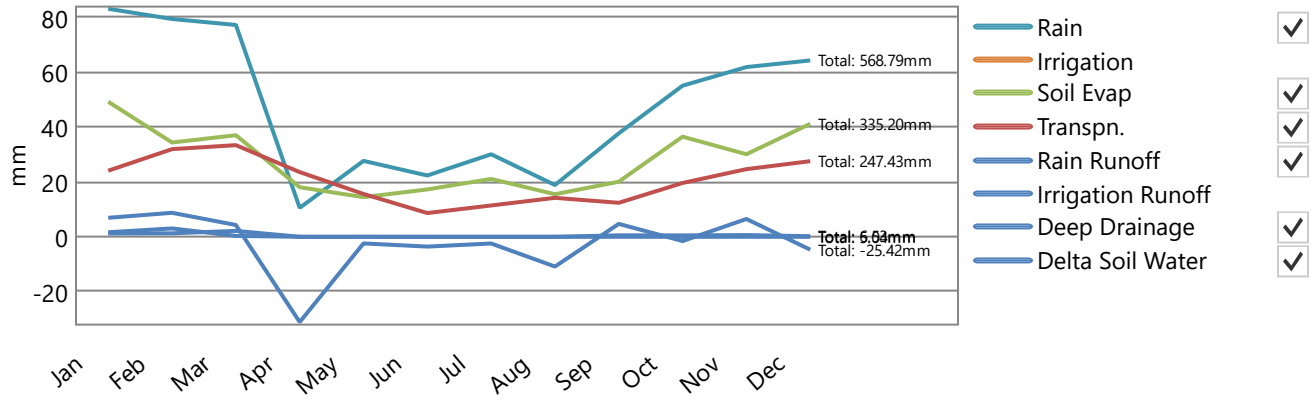
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	335.20
Transpiration	247.43
Rain Runoff	6.53
Irrigation Runoff	0.00
Deep Drainage	5.04
Delta Soil Water	-25.42

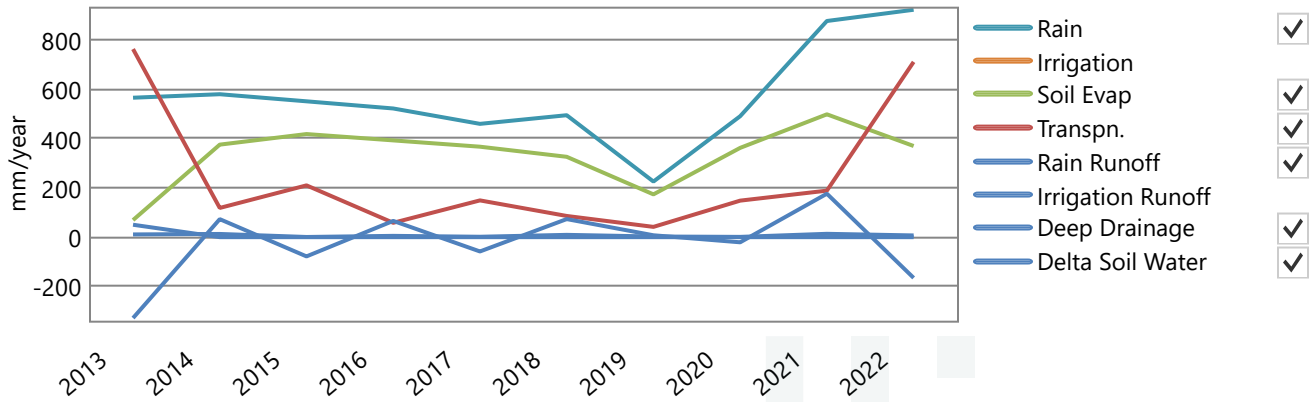
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

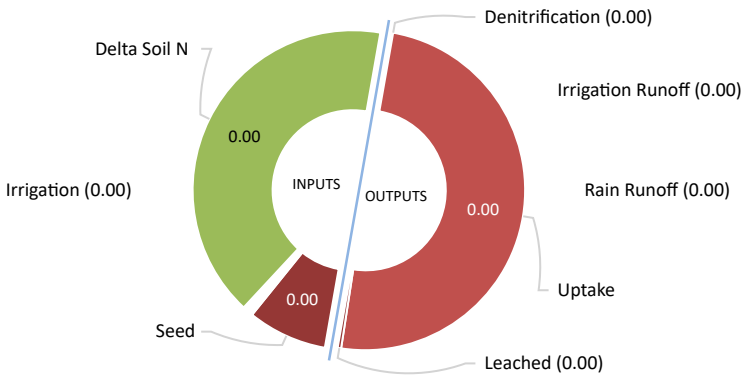
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

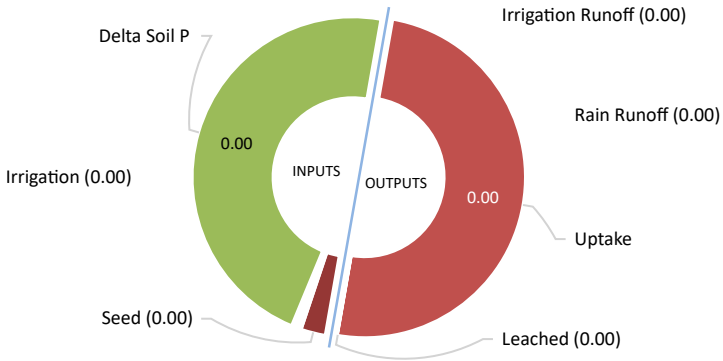
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.63E-04
Irrigation	0.00
Denitrification	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.59E-03
Leached	1.12E-05
Delta Soil N	-1.34E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	2.25E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	4.65E-04
Leached	2.34E-07
Delta Soil P	-4.42E-04

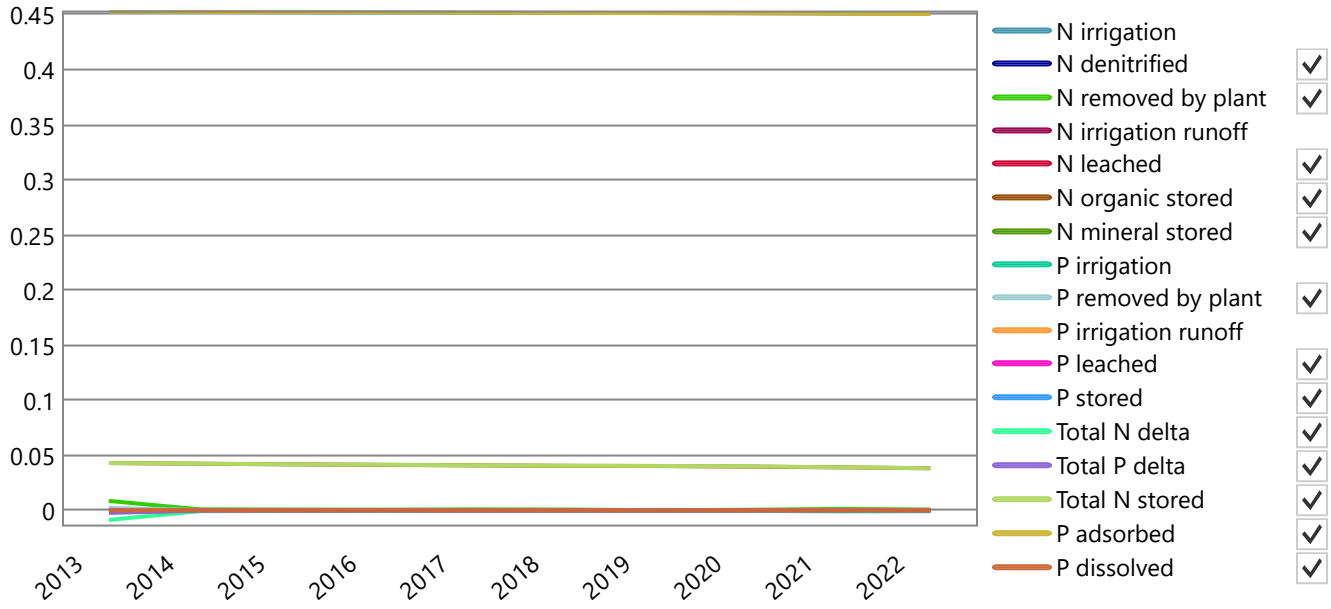
PERFORMANCE

Land Performance - Soil Nutrient

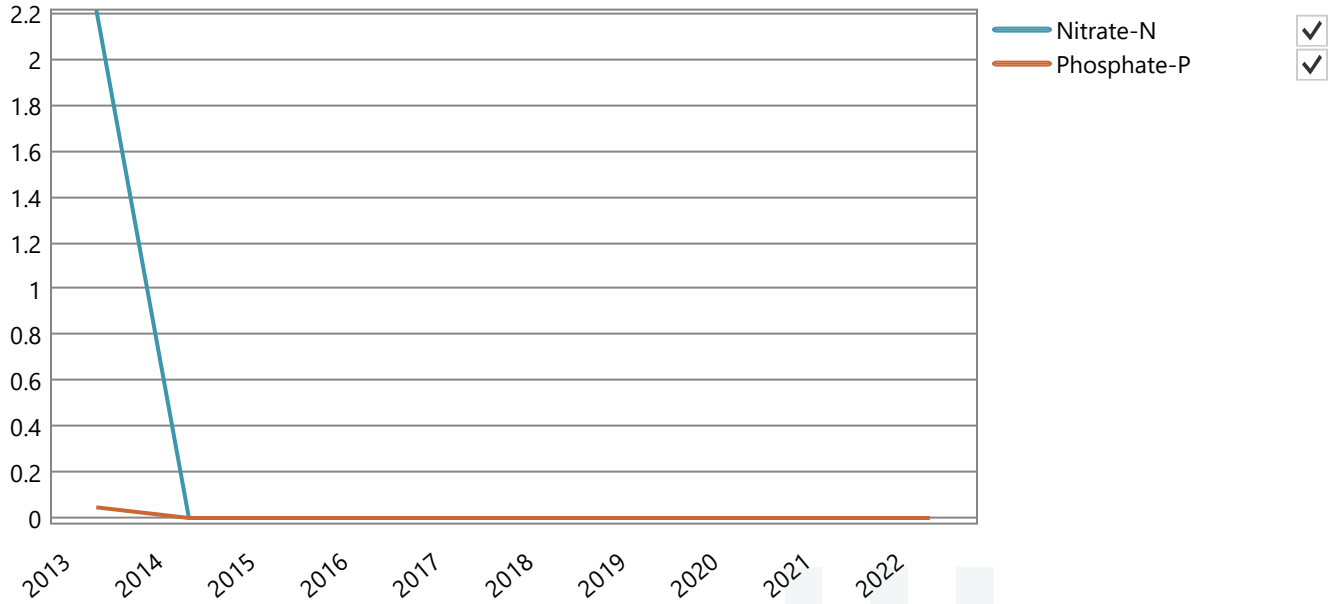
Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 7575 m2 representation_conserva

Soil Type: Sodosols

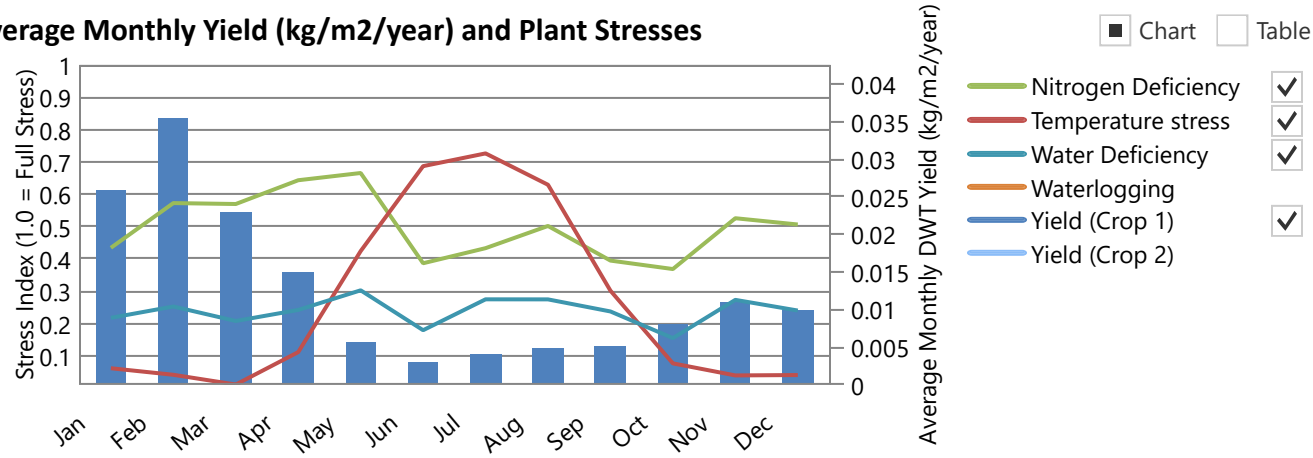
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Average monthly root depth (mm) (minimum - maximum)	383.78 (277.37 - 487.49)

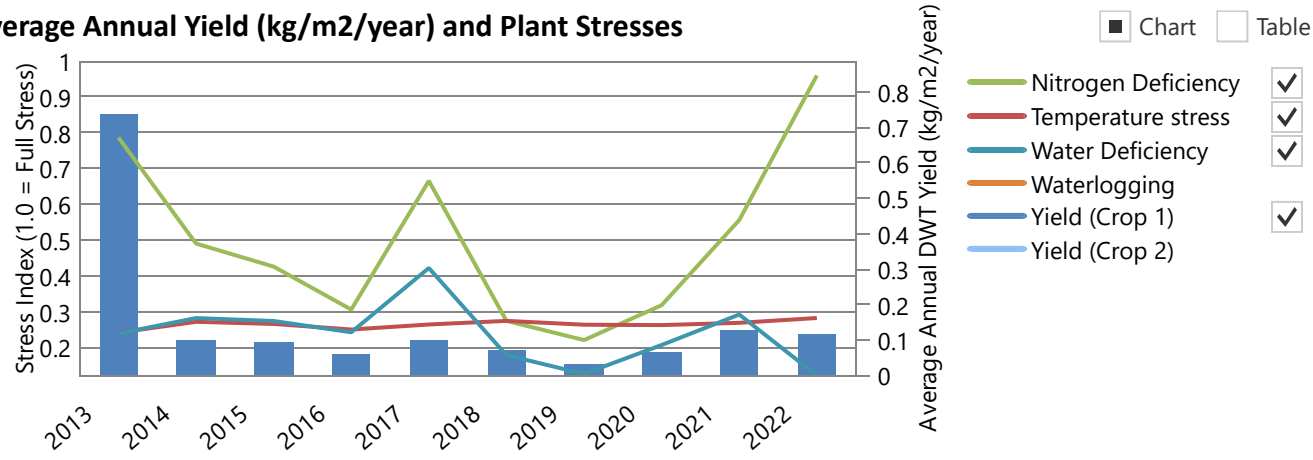
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.01)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.10 (normal), 2.40 (forced by crop death due to nitrogen stress (0.10), water stress (2.30))

No. days without crop/year (days/year): 123.20 due to frosting (4.40), temperature stress - not frost (2.00), water stress (116.80)

PERFORMANCE

Land Performance

Paddock: **Girrahween Office Application Ar, 7575 m2 representation_conserva**

Soil Type: **Sodosols**

Plant: **Continuous Kikuyu 1 Pasture**

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

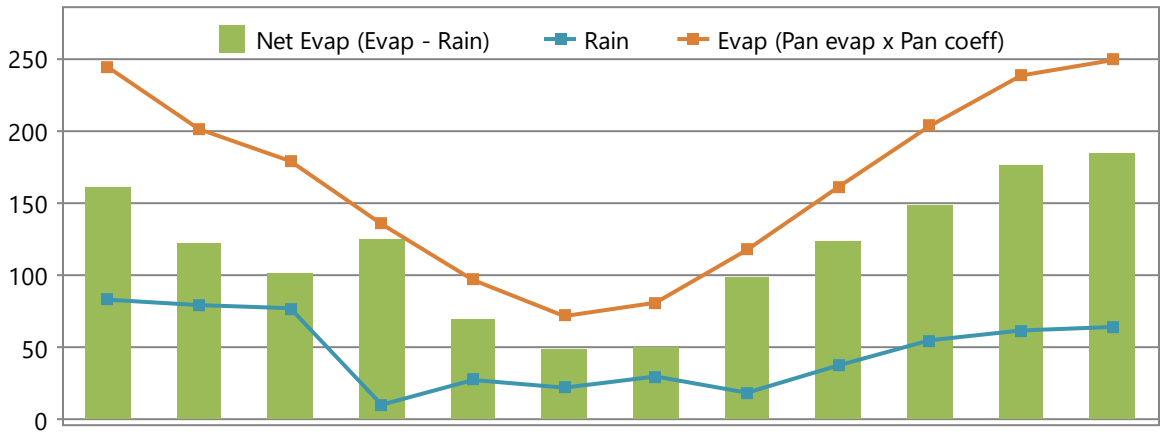
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

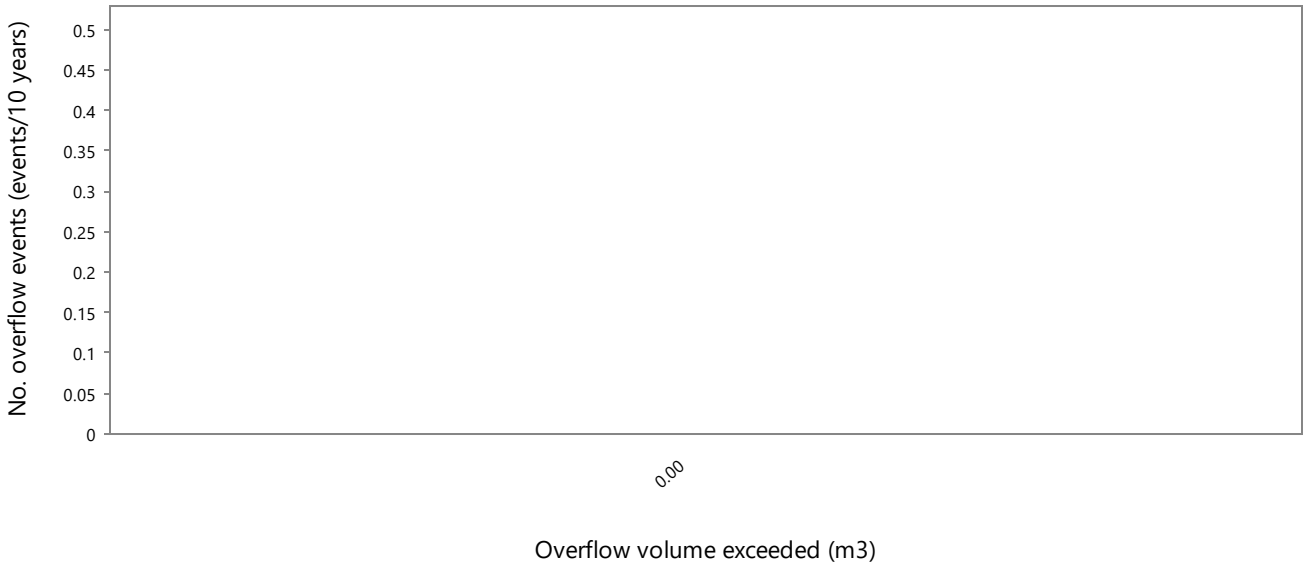
Last pond (Wet weather store): 72.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.08 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 7575 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 7575 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	49.3	34.4	37.1	18.1	14.5	17.3	21.1	15.5	20.1	36.5	30.1	41.2	335.2
Transpn.	24.1	32.0	33.4	23.6	15.6	8.7	11.4	14.2	12.4	19.6	24.7	27.6	247.4
Runoff	1.2	1.3	2.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	6.5
Drainage	1.7	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Delta	6.9	8.8	4.3	-31.1	-2.4	-3.6	-2.4	-10.9	4.7	-1.6	6.5	-4.7	-25.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	1.59E-03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	0.00
Average annual soil nitrogen leached (kg/m2/year)	1.12E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	1.12E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.04
	0.01 - 2.40E-05
Average nitrate-N concentration of deep drainage (mg/L)	2.22
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.22

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	4.65E-04
Average annual soil phosphorus leached (kg/m2/year)	2.34E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 3.00E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.45
Average phosphate-P concentration in rootzone (mg/L)	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.05
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.05
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

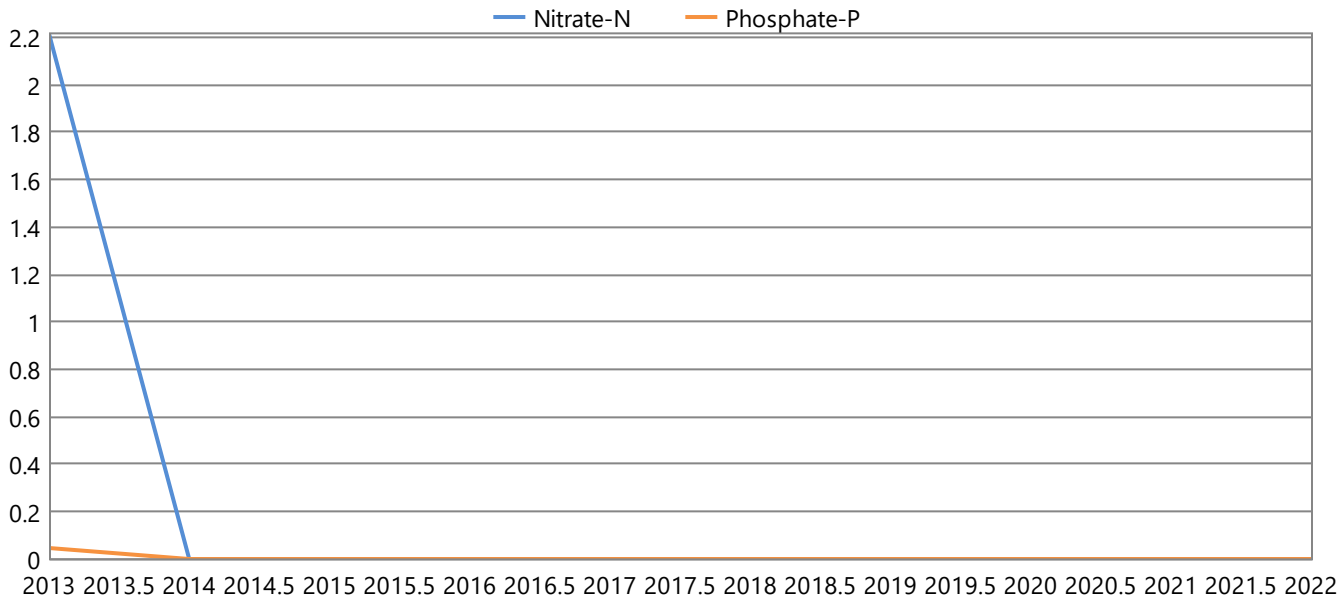
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

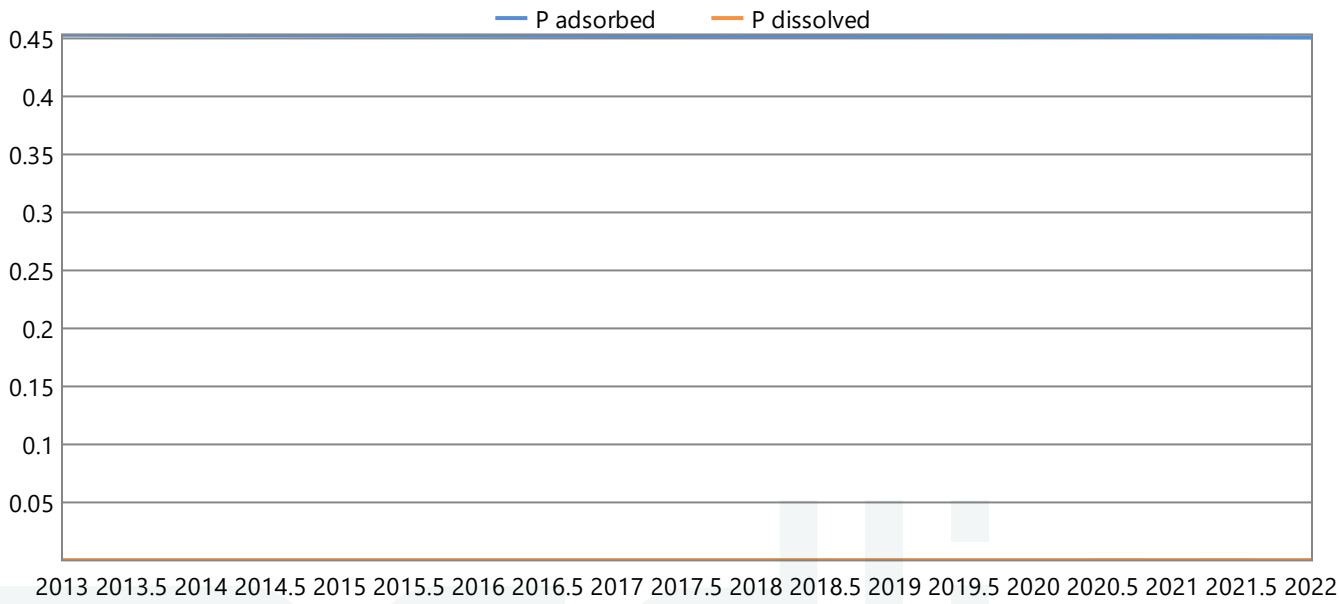
Paddock Land: Girrahween Office Application Ar: 7575 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 7575 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction)	0.27 (0.19 - 0.34)
Average monthly crop factor (fraction)	0.21 (0.15 - 0.27)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	383.78 (277.37 - 487.49)
Average number of normal harvests per year (no./year)	0.10 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	2.40 (0.00 - 4.00)
Average number of crop deaths for last five years only (no./year)	2.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.50 (0.22 - 0.96)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.24 (0.15 - 0.30)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	123.20

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 5 - "Bellevue Part 5'
***
NO IRRIGATION SCENARIO: 32EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

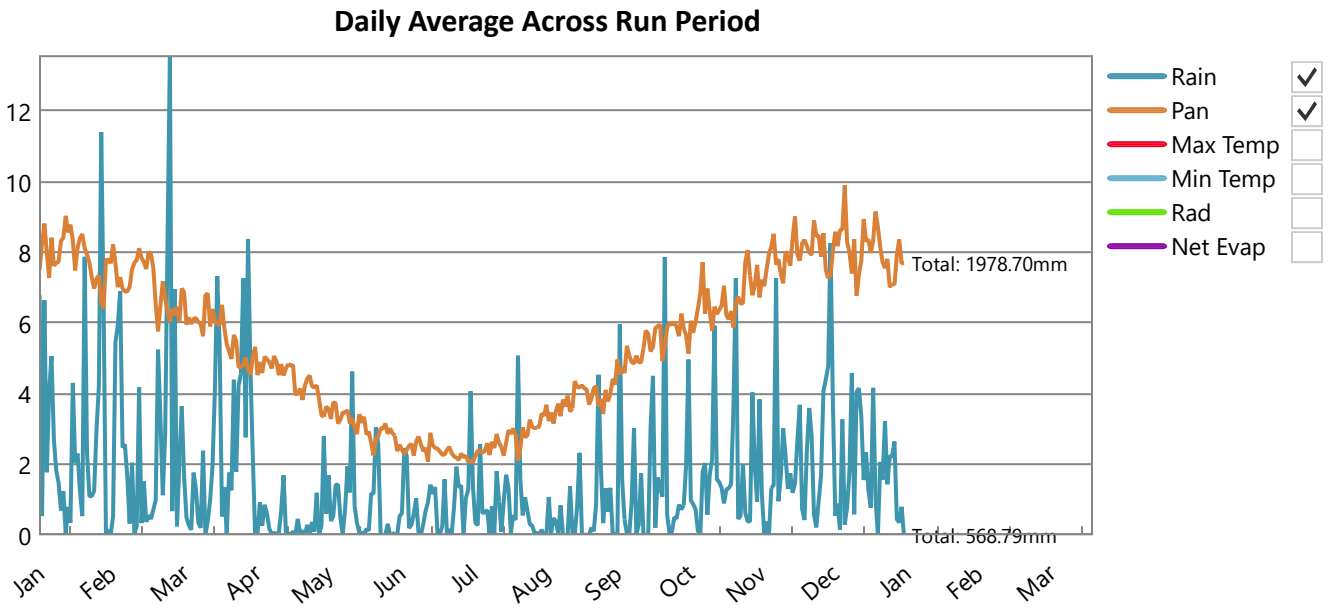
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

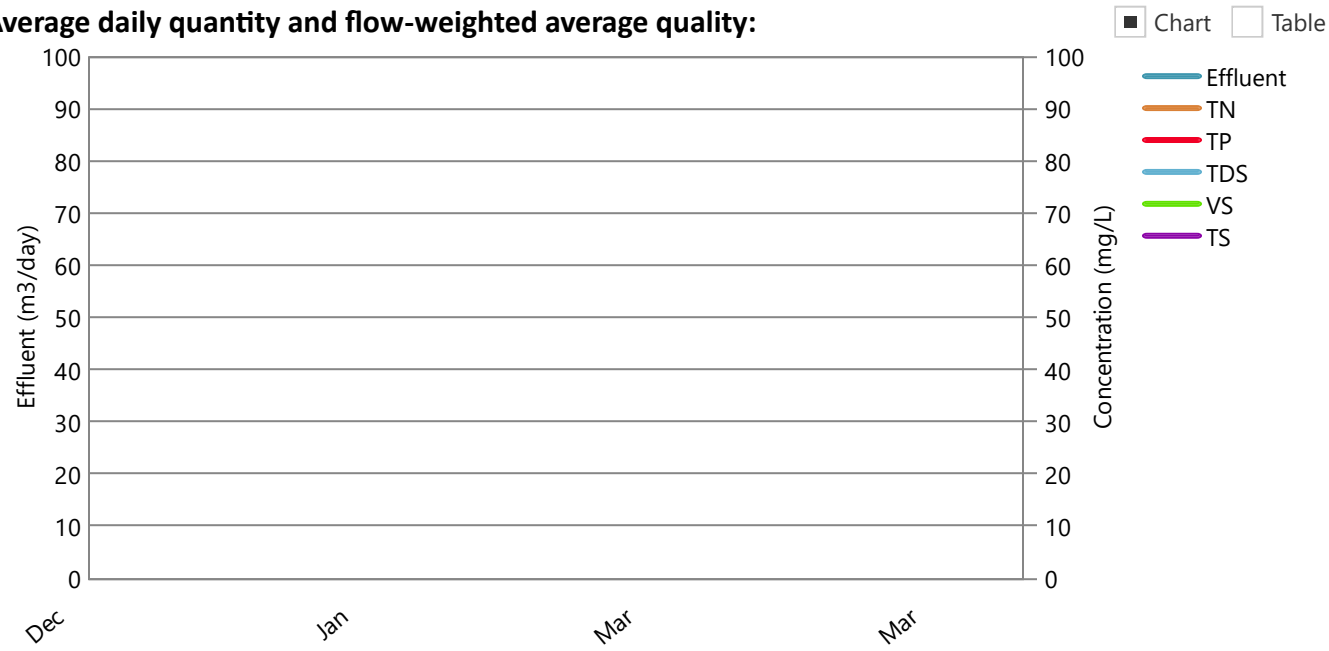


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

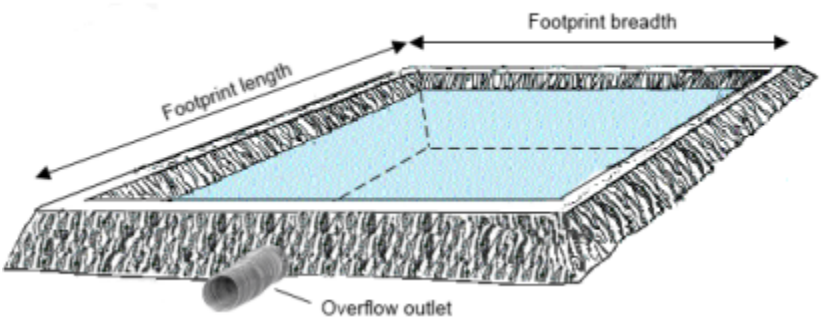
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

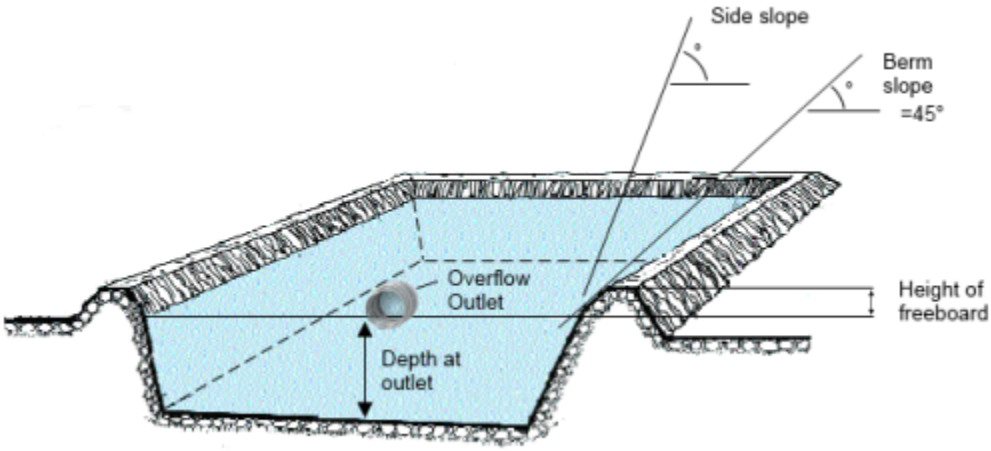
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	19.20
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	25.08
Pond footprint length (m)	5.01
Pond footprint width (m)	5.01
Pond catchment area (m2)	25.08
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

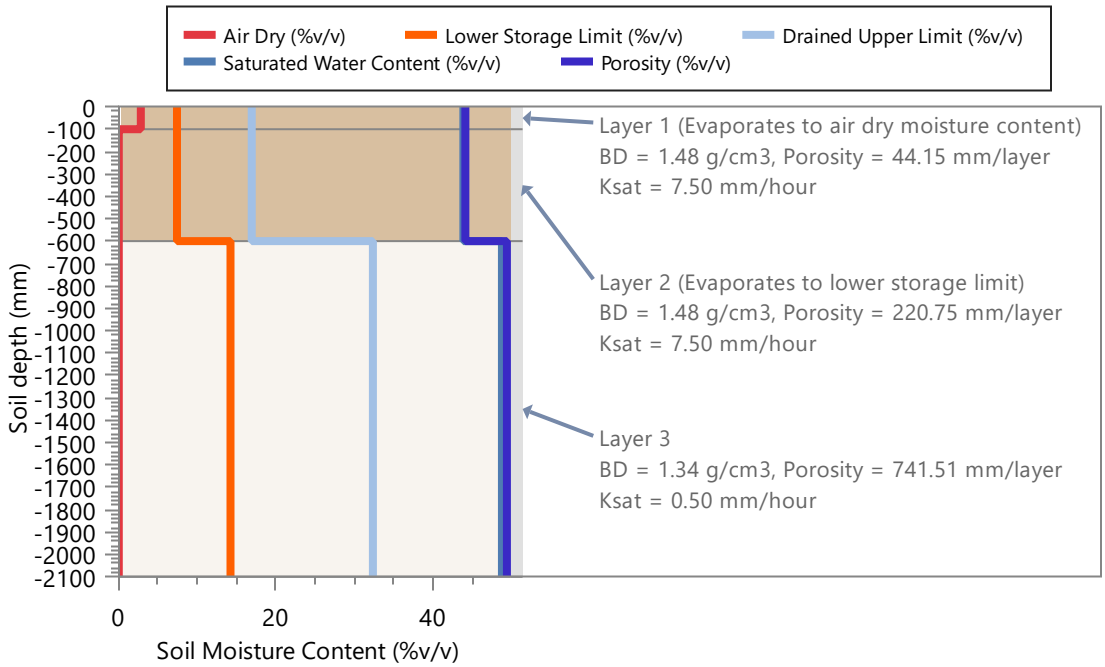
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 2025.00

Soil Type: Sodosols representation_conserva, 2100.00 mm defined profile depth

Profile Porosity (mm)	1006.42
Profile saturation water content (mm)	995.40
Profile drained upper limit (or field capacity) (mm)	588.00
Profile lower storage limit (or permanent wilting point) (mm)	259.50
Profile available water capacity (mm)	328.50
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	7.50
Runoff curve number II (coefficient)	83.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **19.2 m3**

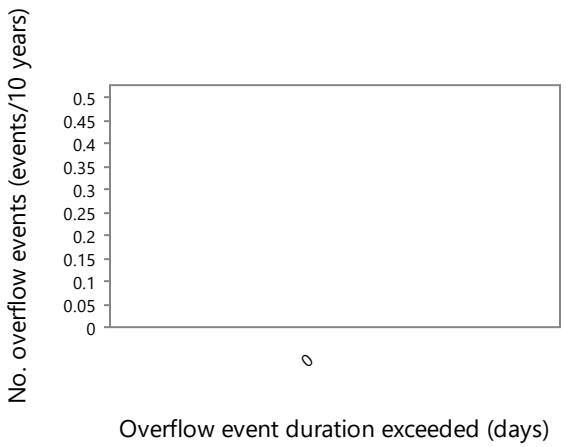
Pond System Water Balance (m3/year)

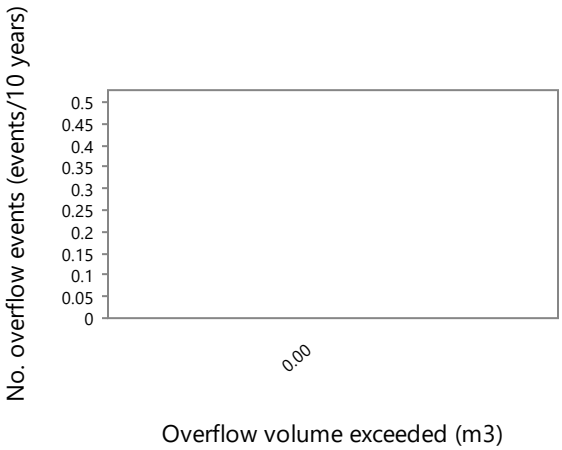
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

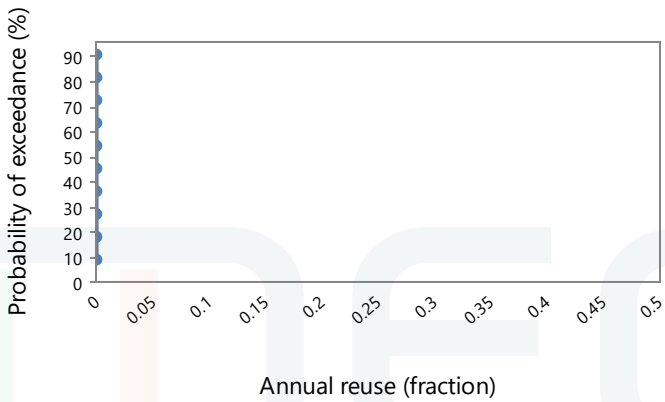
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

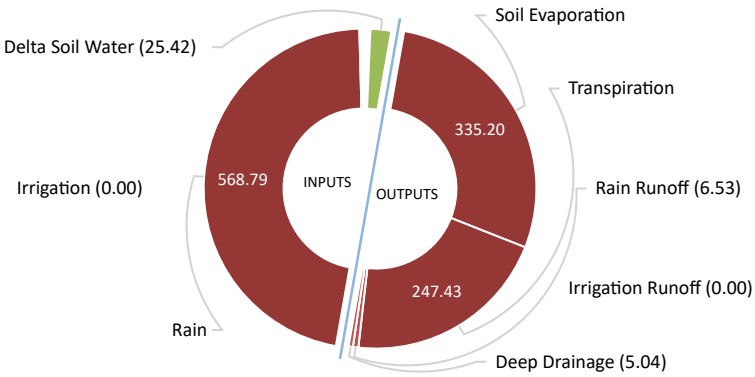
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 2025 m2
Soil Type: Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

Land Water Balance (mm/year):

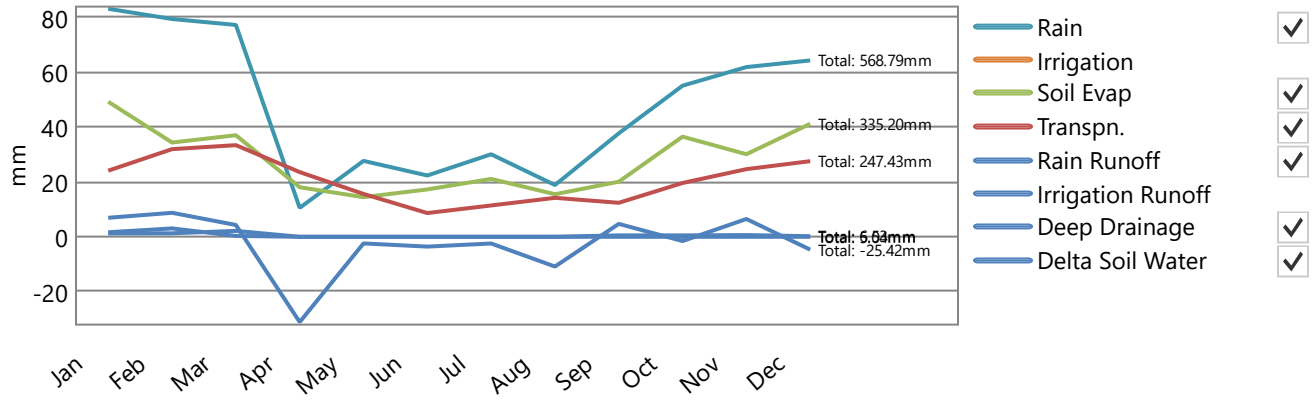
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	335.20
Transpiration	247.43
Rain Runoff	6.53
Irrigation Runoff	0.00
Deep Drainage	5.04
Delta Soil Water	-25.42

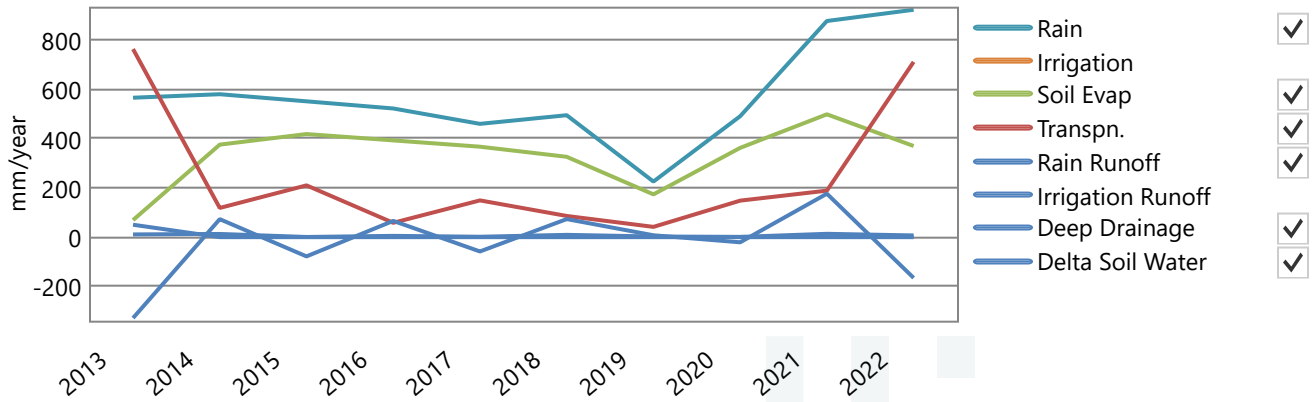
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

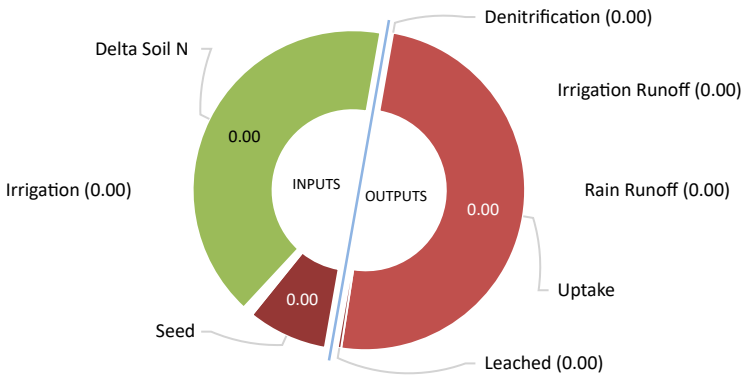
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 2025 m2 representation_conserva

Soil Type: Sodosols

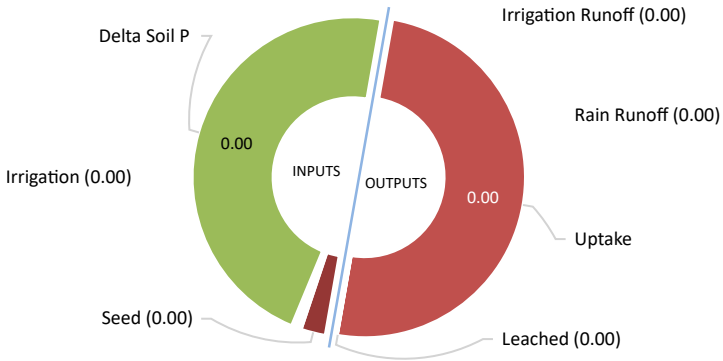
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.63E-04
Irrigation	0.00
Denitrification	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.59E-03
Leached	1.12E-05
Delta Soil N	-1.34E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	2.25E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	4.65E-04
Leached	2.34E-07
Delta Soil P	-4.42E-04

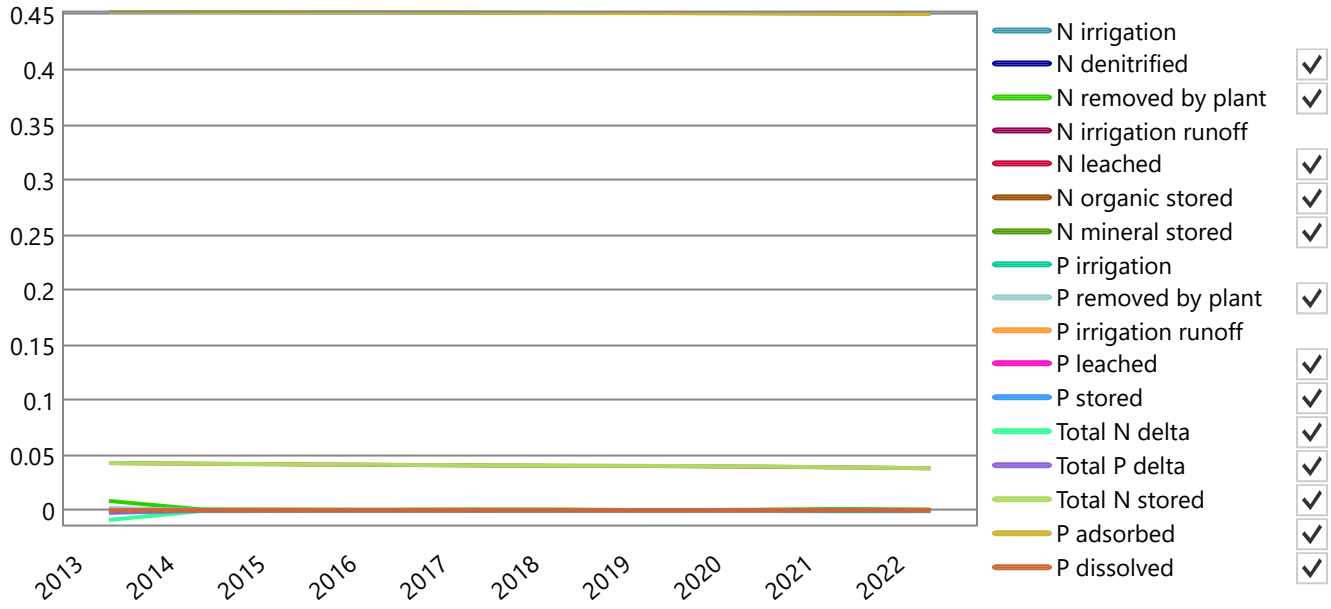
PERFORMANCE

Land Performance - Soil Nutrient

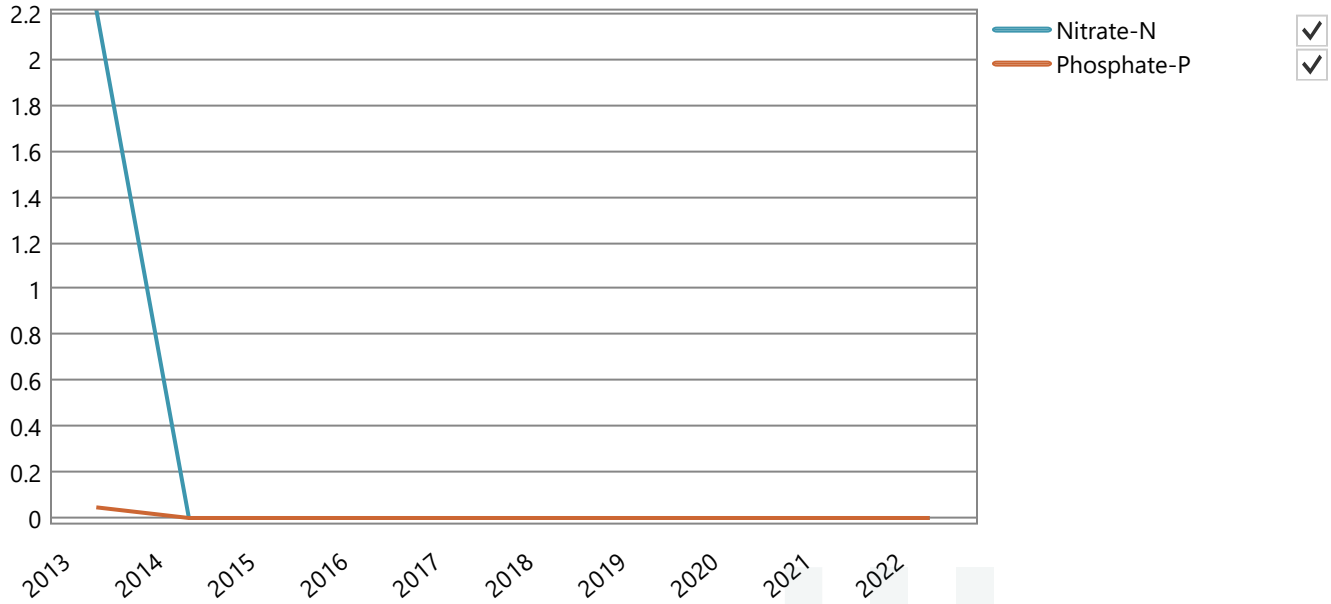
Paddock: Girrahween Office Application Ar, 2025 m2 representation_conserva

Soil Type: Sodosols

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 2025 m2 representation_conserva

Soil Type: Sodosols

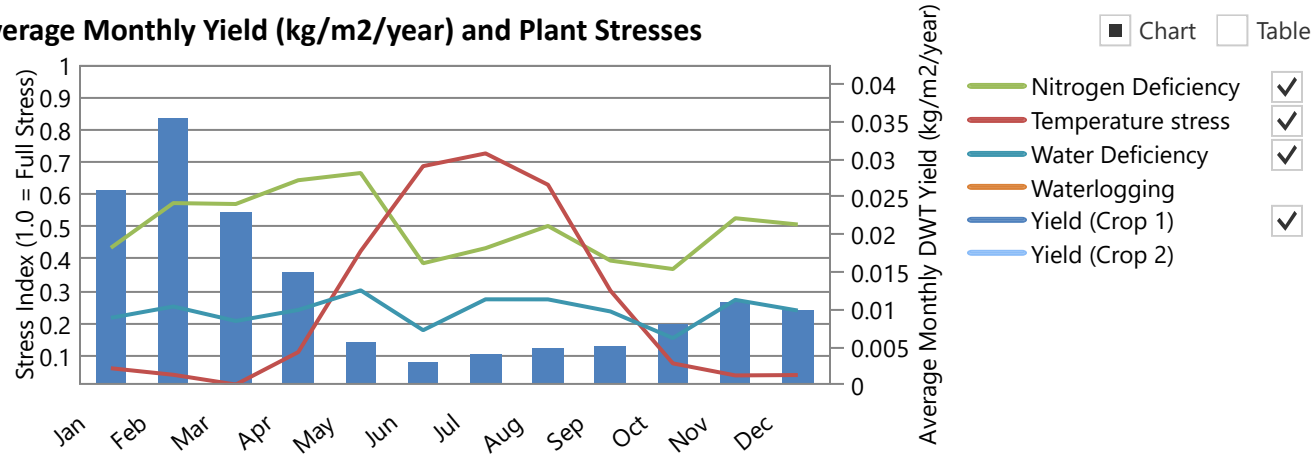
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.27 (0.19 - 0.34)
Average monthly root depth (mm) (minimum - maximum)	383.78 (277.37 - 487.49)

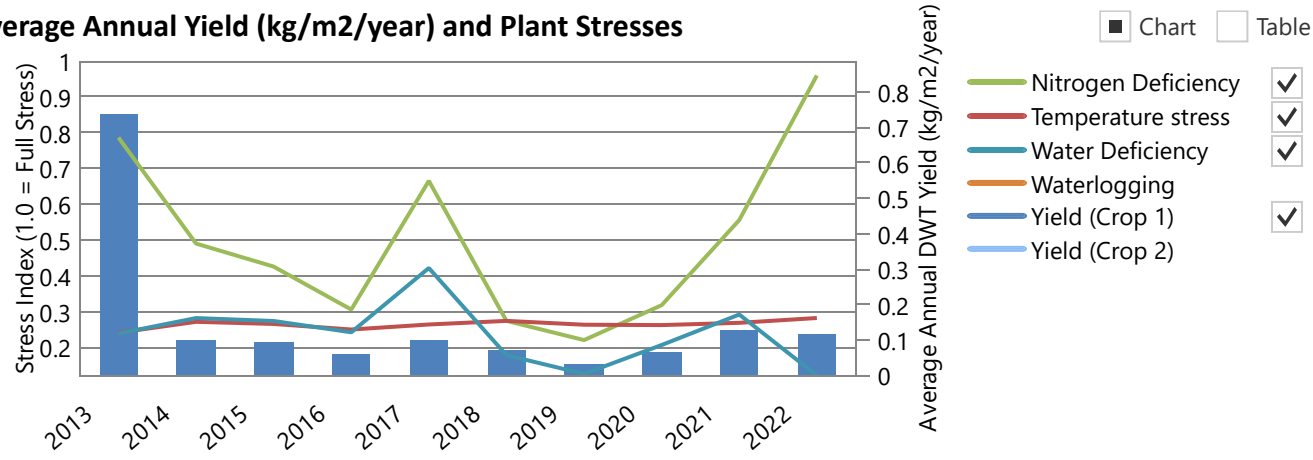
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.01)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.10 (normal), 2.40 (forced by crop death due to nitrogen stress (0.10), water stress (2.30))

No. days without crop/year (days/year): 123.20 due to frosting (4.40), temperature stress - not frost (2.00), water stress (116.80)

PERFORMANCE

Land Performance

Paddock: **Girrahween Office Application Ar, 2025 m2 representation_conserva**

Soil Type: **Sodosols**

Plant: **Continuous Kikuyu 1 Pasture**

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

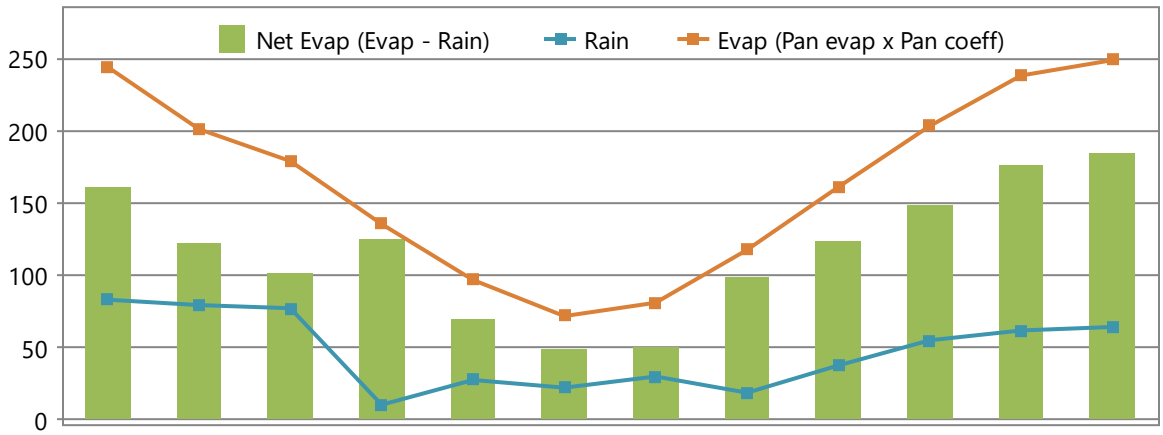
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

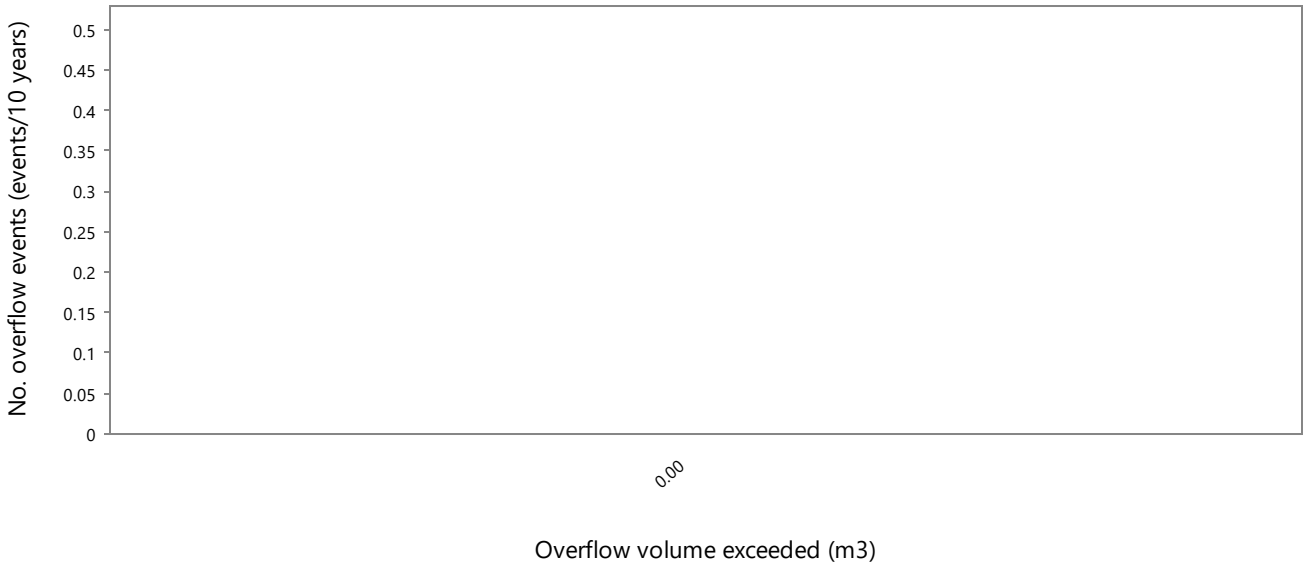
Last pond (Wet weather store): 19.20 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.03 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 2025 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 2025 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Sodosols representation_conserva, 165.60 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	49.3	34.4	37.1	18.1	14.5	17.3	21.1	15.5	20.1	36.5	30.1	41.2	335.2
Transpn.	24.1	32.0	33.4	23.6	15.6	8.7	11.4	14.2	12.4	19.6	24.7	27.6	247.4
Runoff	1.2	1.3	2.2	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.6	0.2	6.5
Drainage	1.7	3.1	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Delta	6.9	8.8	4.3	-31.1	-2.4	-3.6	-2.4	-10.9	4.7	-1.6	6.5	-4.7	-25.4

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	1.59E-03
Average annual soil nitrogen removed by denitrification (kg/m2/year)	0.00
Average annual soil nitrogen leached (kg/m2/year)	1.12E-05
Average annual nitrate-N loading to groundwater (kg/m2/year)	1.12E-05
Soil organic-N kg/m2 (Initial - Final)	0.04 - 0.04
	0.01 - 2.40E-05
Average nitrate-N concentration of deep drainage (mg/L)	2.22
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.22

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	4.65E-04
Average annual soil phosphorus leached (kg/m2/year)	2.34E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	5.88E-05 - 3.00E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.45 - 0.45
Average phosphate-P concentration in rootzone (mg/L)	0.07
Average phosphate-P concentration of deep drainage (mg/L)	0.05
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.05
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

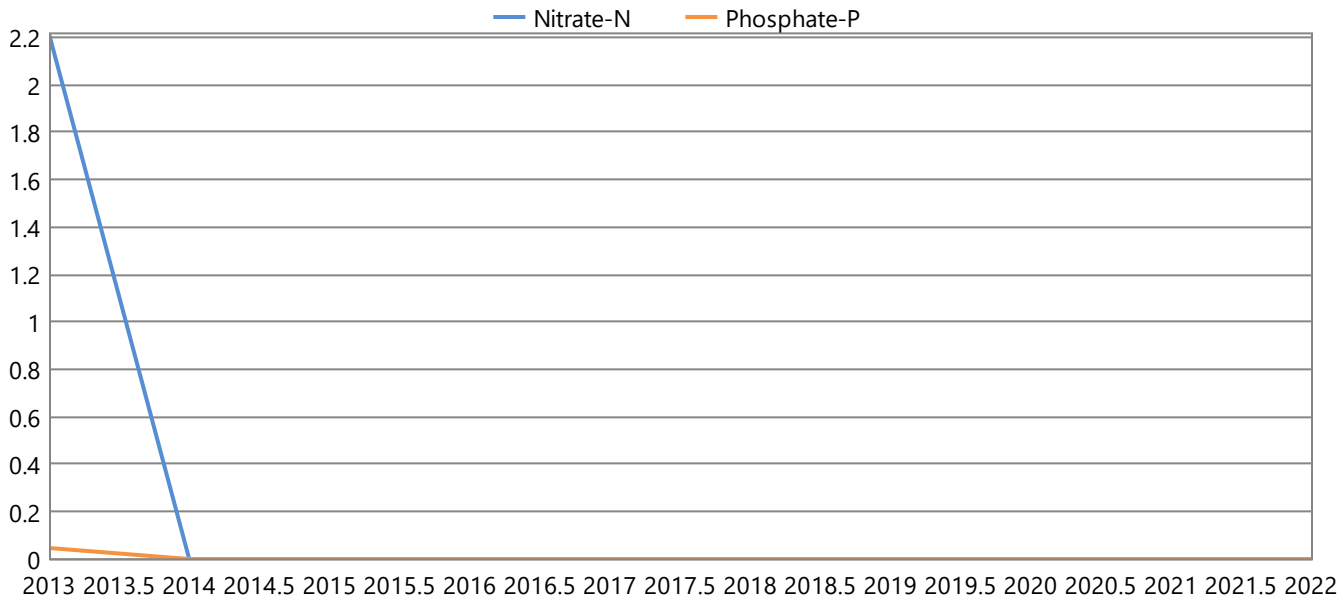
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

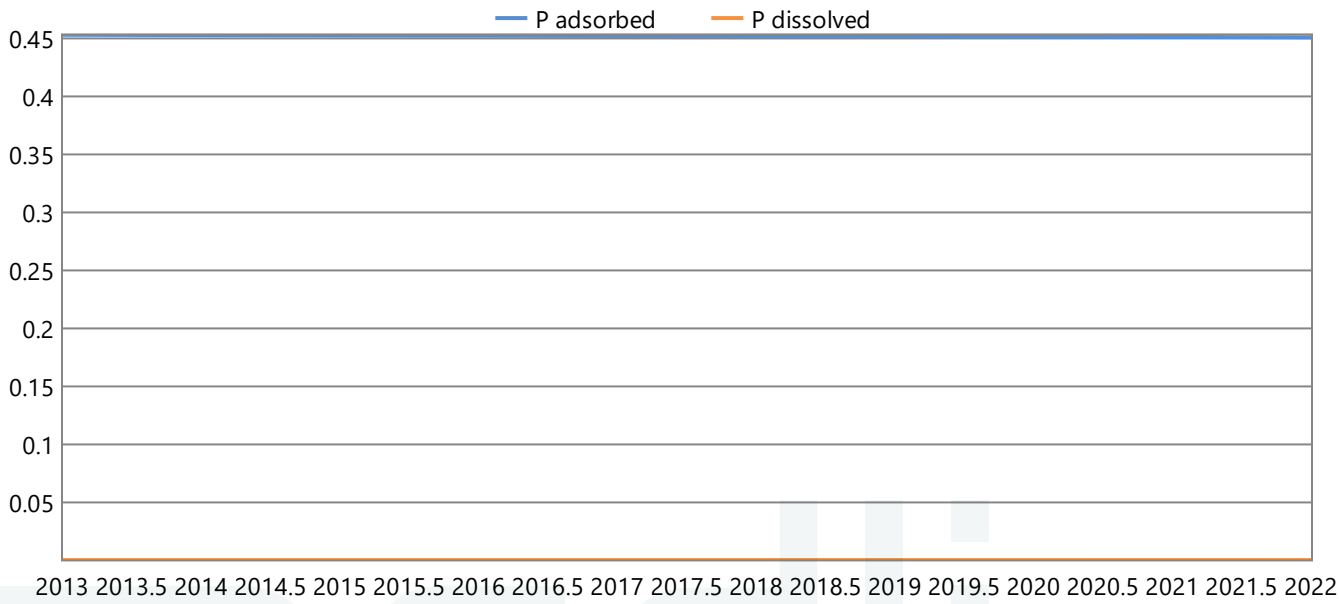
Paddock Land: Girrahween Office Application Ar: 2025 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 2025 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.16 (0.04 - 0.74)
Average monthly plant (green) cover (fraction)	0.27 (0.19 - 0.34)
Average monthly crop factor (fraction)	0.21 (0.15 - 0.27)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	383.78 (277.37 - 487.49)
Average number of normal harvests per year (no./year)	0.10 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.00
Average number of crop deaths per year (no./year)	2.40 (0.00 - 4.00)
Average number of crop deaths for last five years only (no./year)	2.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.50 (0.22 - 0.96)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.24 (0.15 - 0.30)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.00)
No. days without crop/year (days)	123.20

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
IRRIGATION LOAD SCENARIO: 30EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

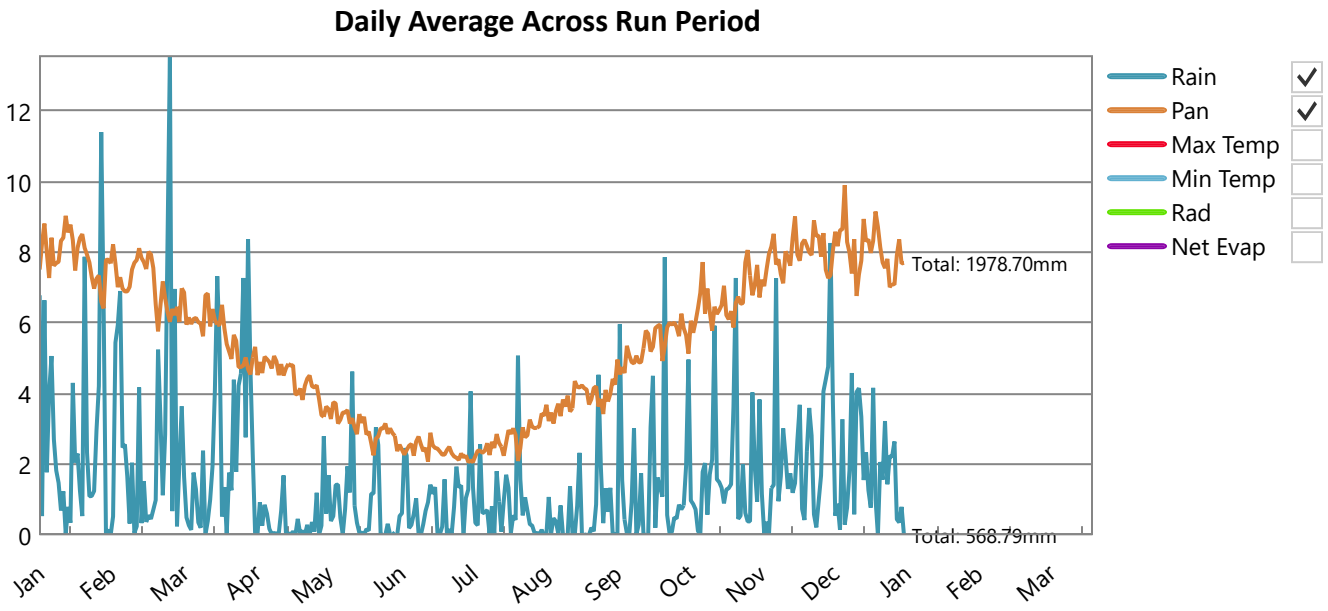
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

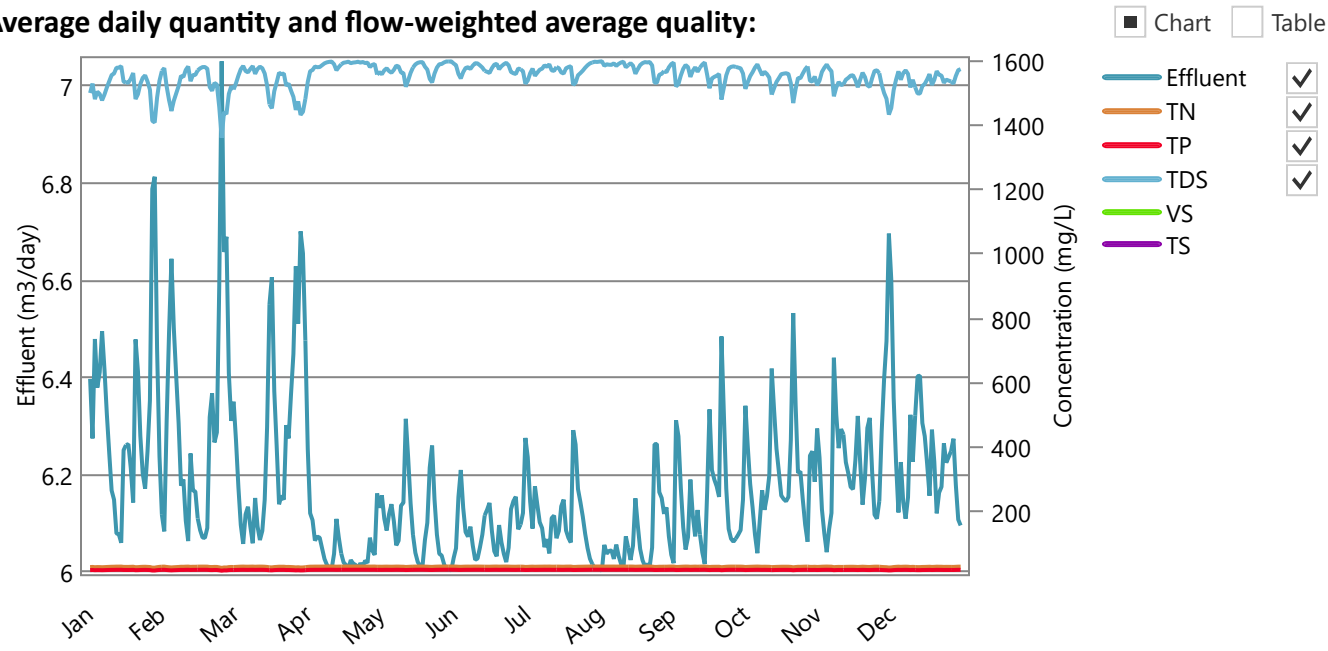


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **2257.07 m3/year** or 6.18 m3/day (Min-Max: 6.00 - 11.10)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

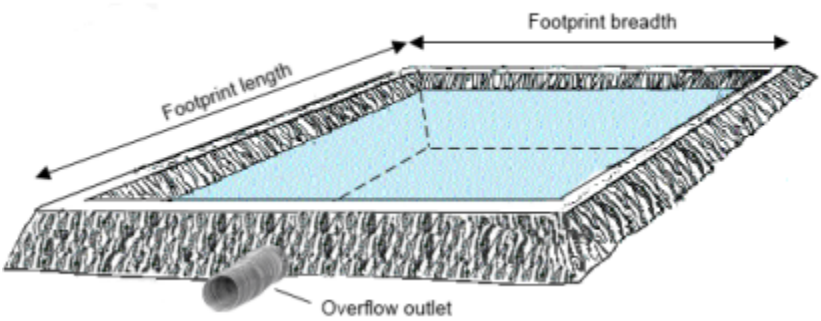
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	65.74 (65.70 - 65.88)
Total Phosphorus	19.42 (10.81 - 20.00)	43.82 (43.80 - 43.92)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	3505.92 (3504.00 - 3513.60)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

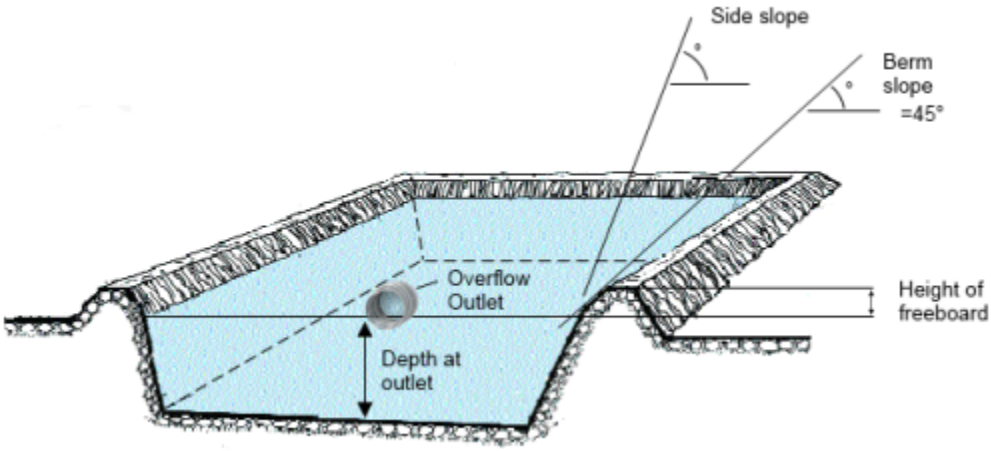
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	18.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	23.70
Pond footprint length (m)	4.87
Pond footprint width (m)	4.87
Pond catchment area (m2)	23.70
Average active volume (m3)	0.22





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

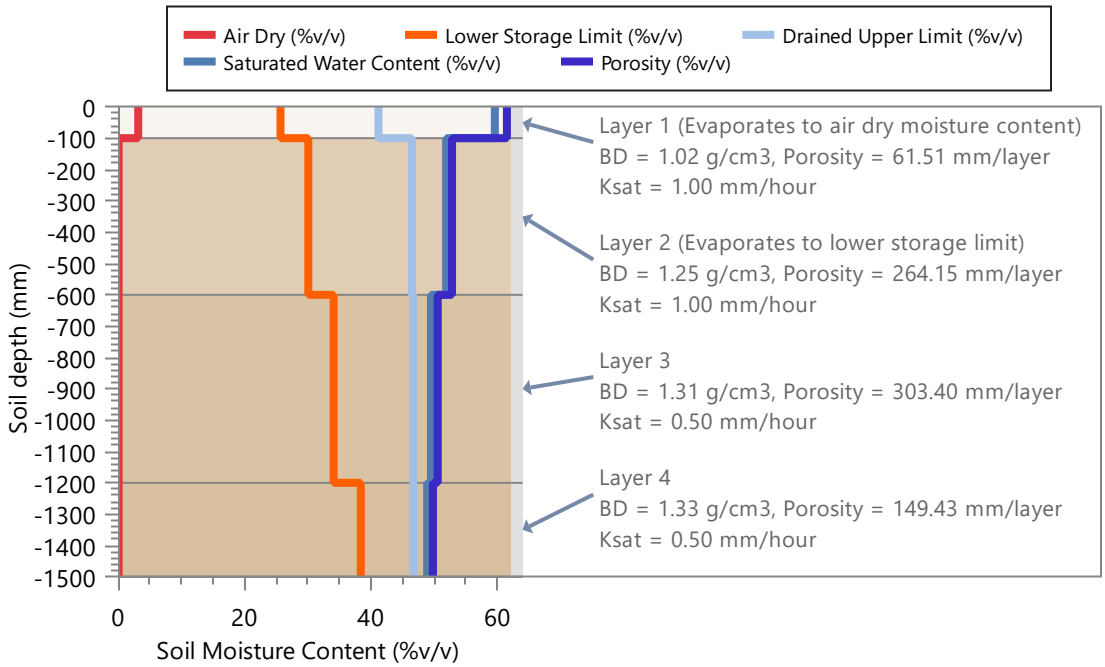
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 1900.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

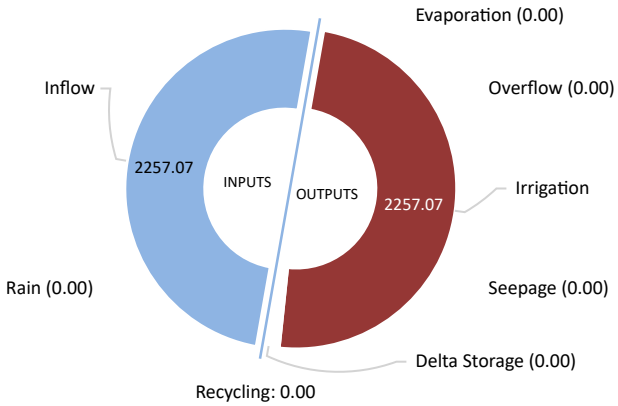
Average monthly cover (fraction) (minimum - maximum)	0.87 (0.80 - 0.92)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **18 m3**

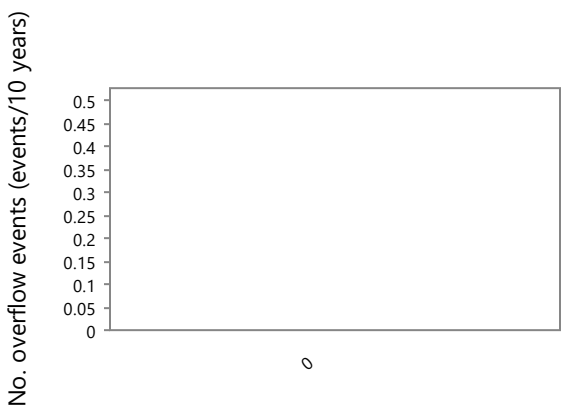
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	2257.07
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	2257.07
Seepage	0.00
Delta Storage	0.00

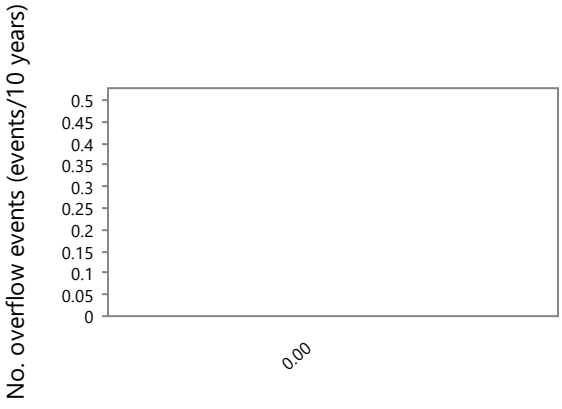
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



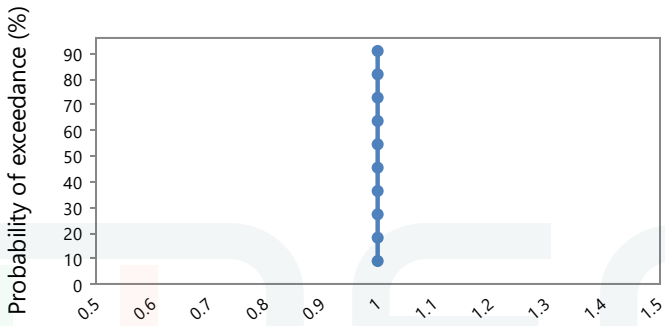
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

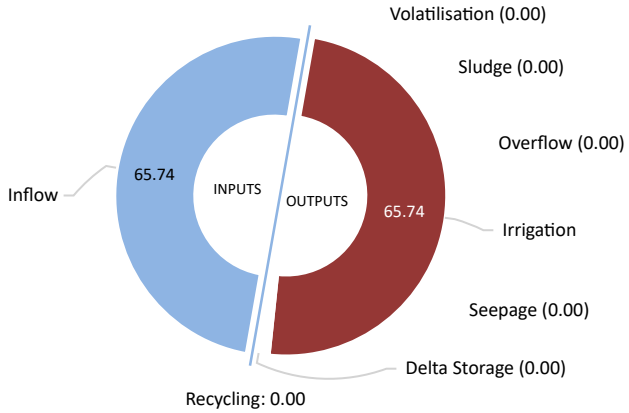
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

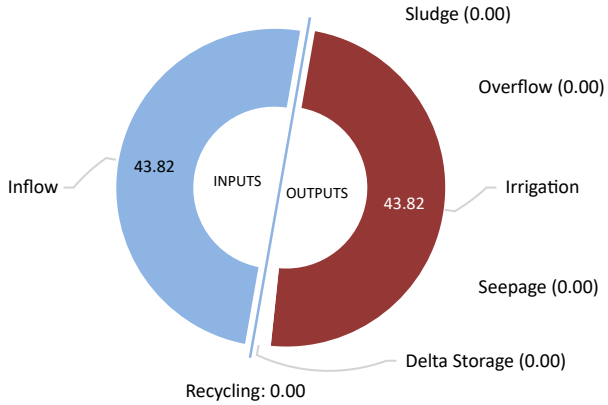
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



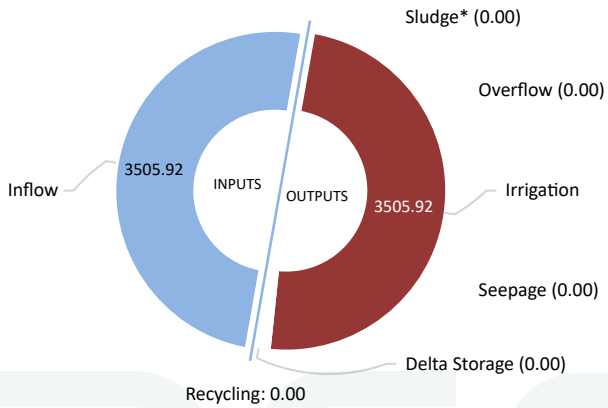
Name	Value
Inflow	65.74
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	65.74
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	43.82
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	43.82
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	3505.92
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	3505.92
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.74
Average phosphorus concentration of pond liquid (mg/L)	16.49
Average salinity of pond liquid (dS/m)	2.06

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	29.99
Final phosphorus concentration of pond liquid (mg/L)	19.99
Final salinity of pond liquid (dS/m)	2.50

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	2257.07
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	2257.07
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

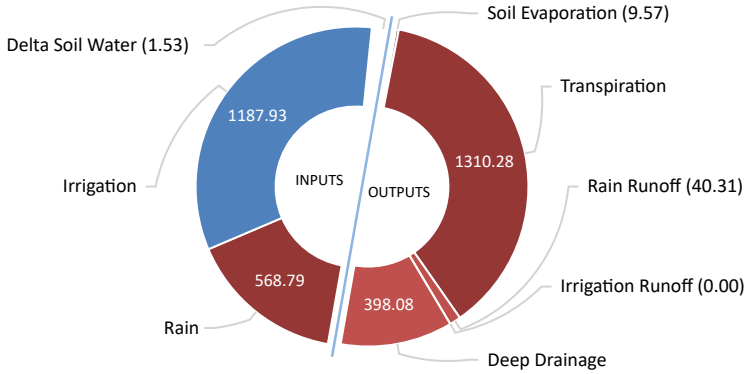
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 1900 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

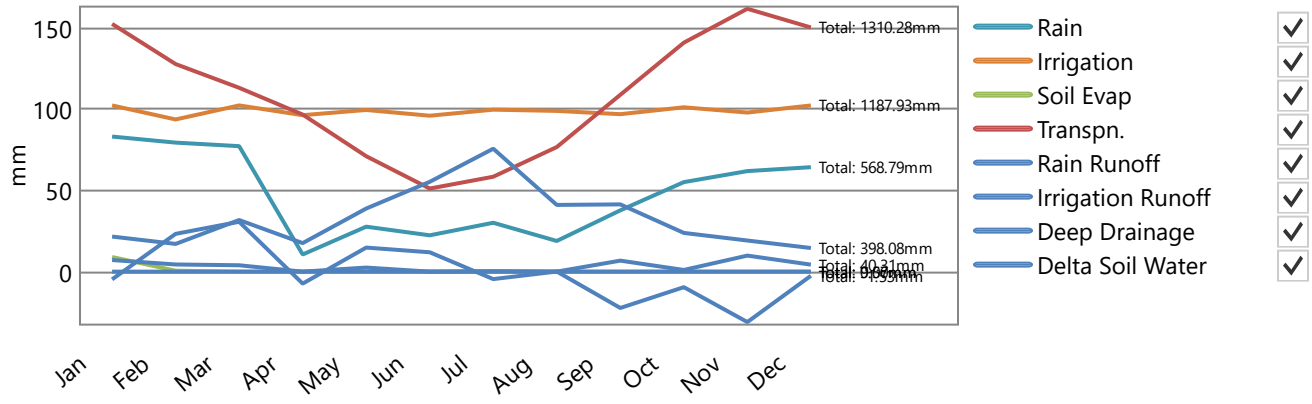
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1187.93
Soil Evaporation	9.57
Transpiration	1310.28
Rain Runoff	40.31
Irrigation Runoff	0.00
Deep Drainage	398.08
Delta Soil Water	-1.53

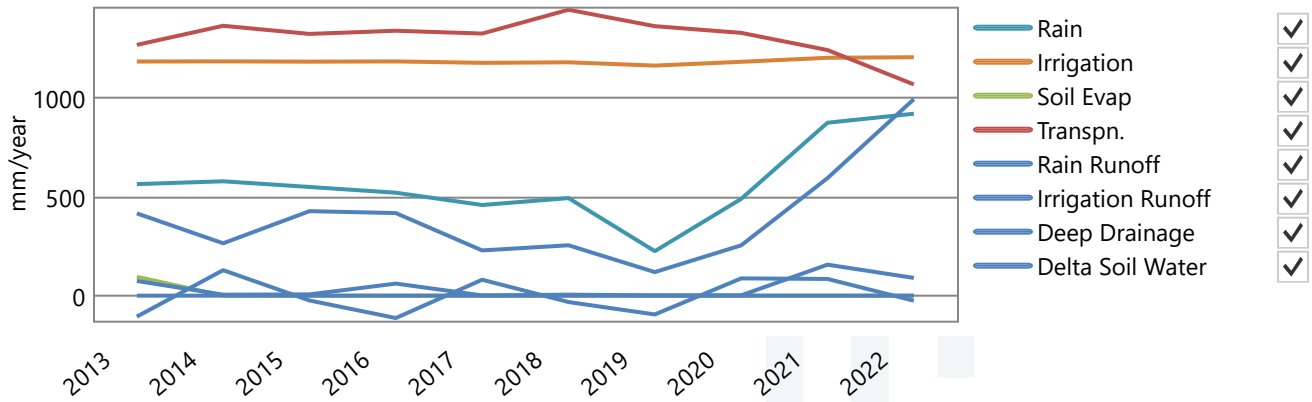
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



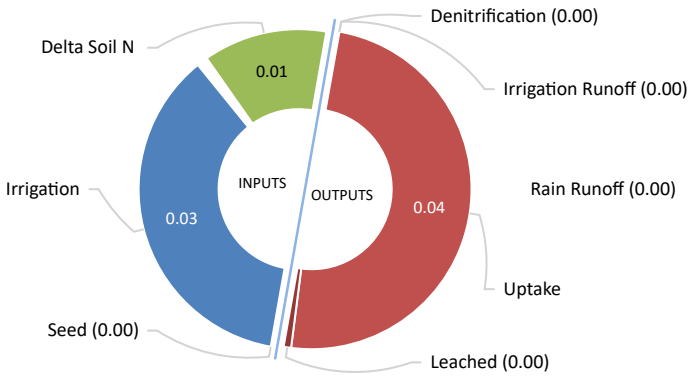
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

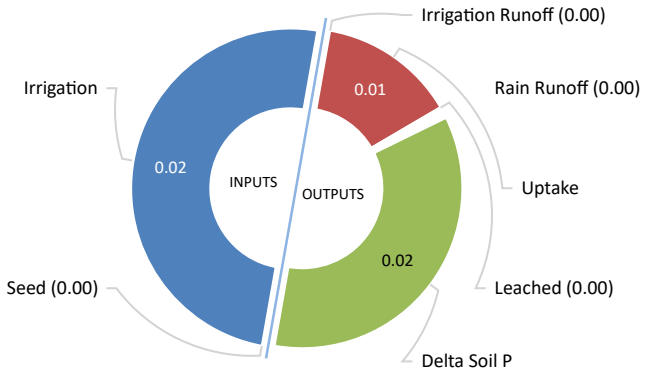
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	2.56E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.04
Leached	5.86E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



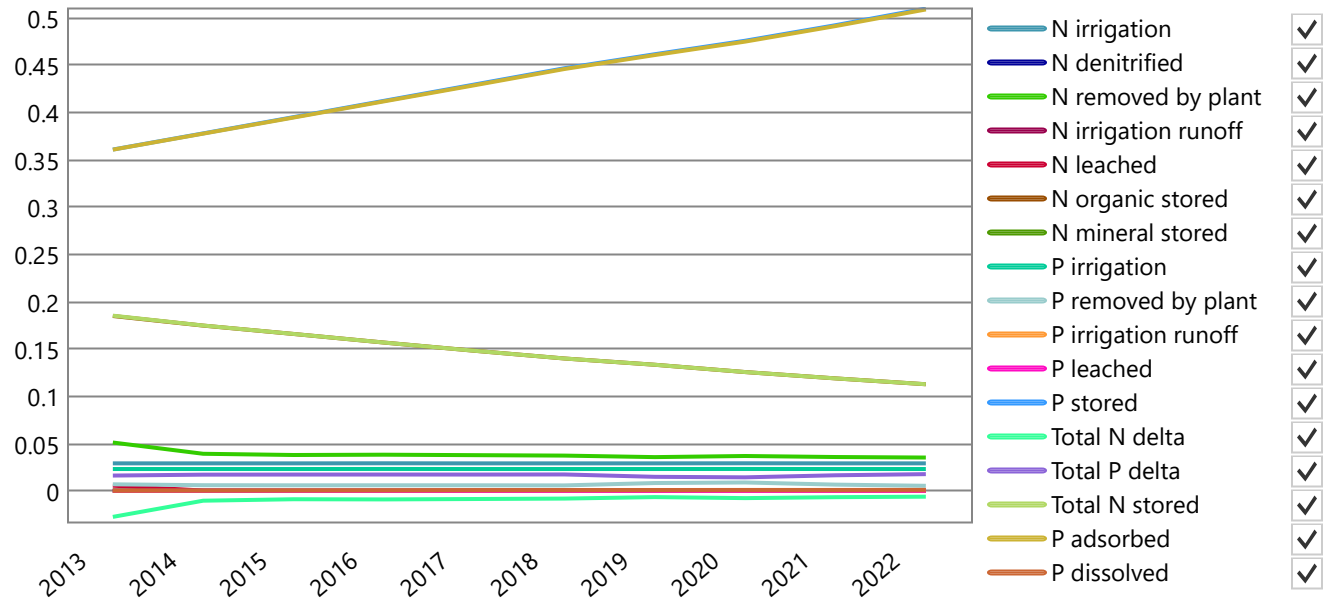
Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.00E-05
Delta Soil P	0.02

PERFORMANCE

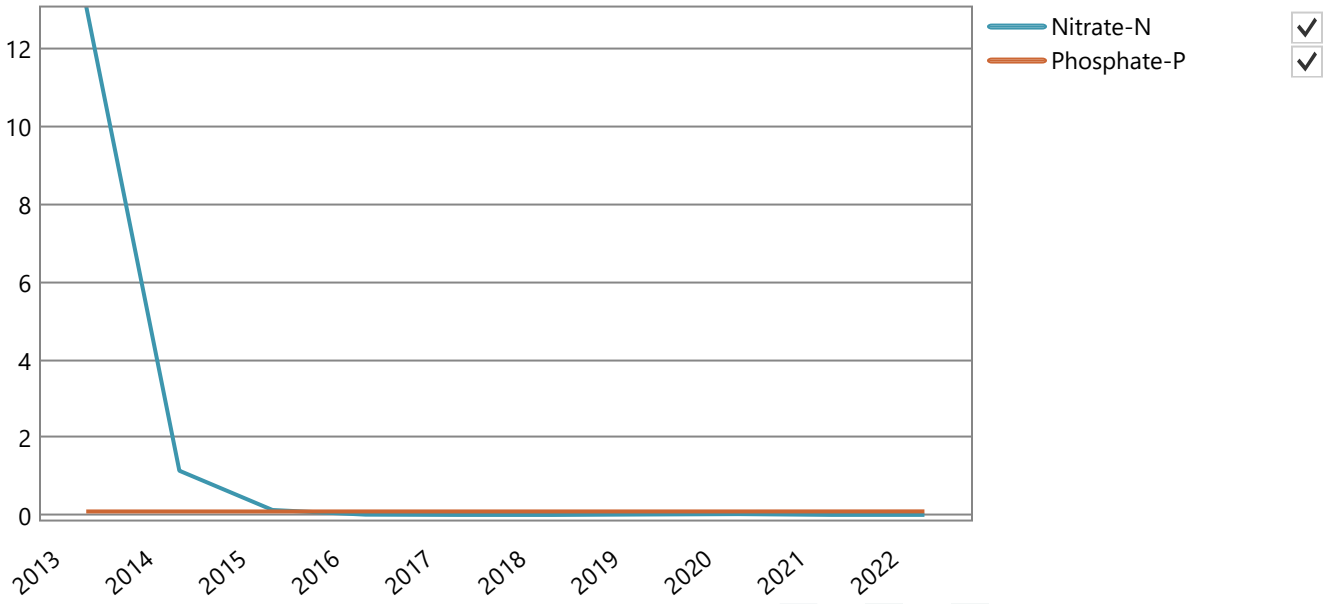
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

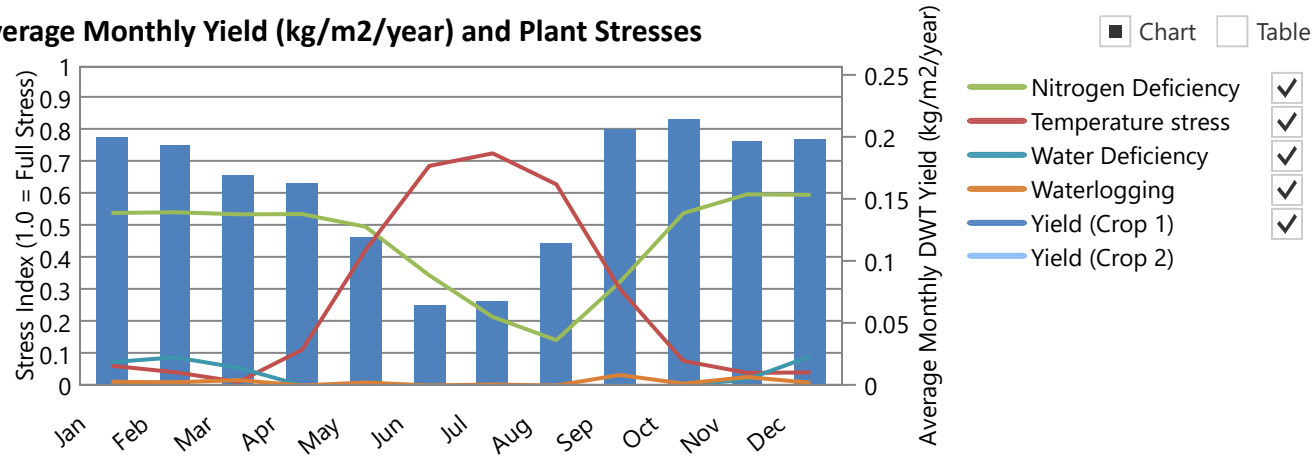
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.91 (1.67 - 2.29)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.87 (0.80 - 0.92)
Average monthly root depth (mm) (minimum - maximum)	1194.35 (1135.07 - 1200.00)

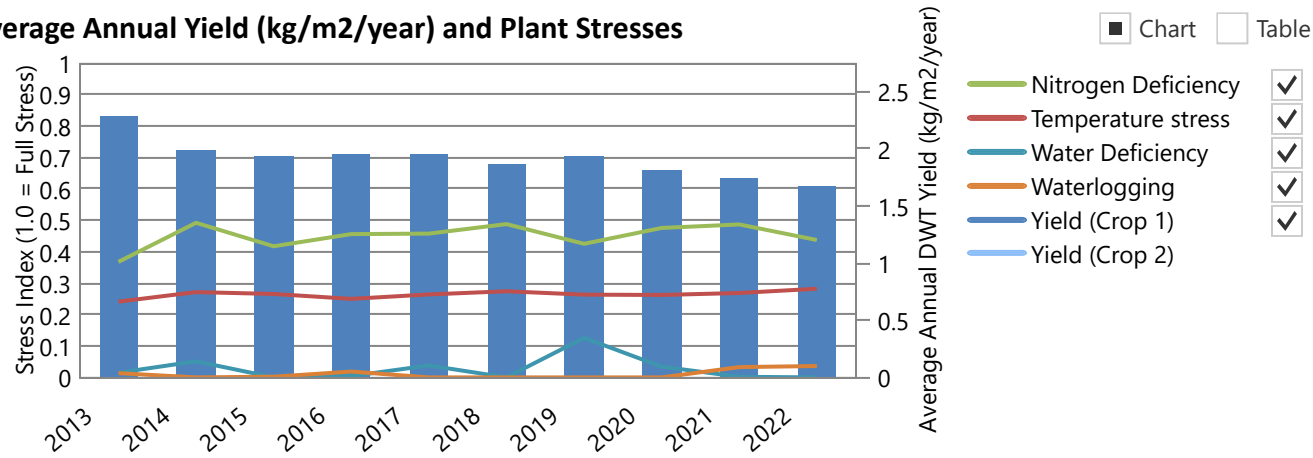
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.04 (0.04 - 0.05)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.40 (normal)
No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

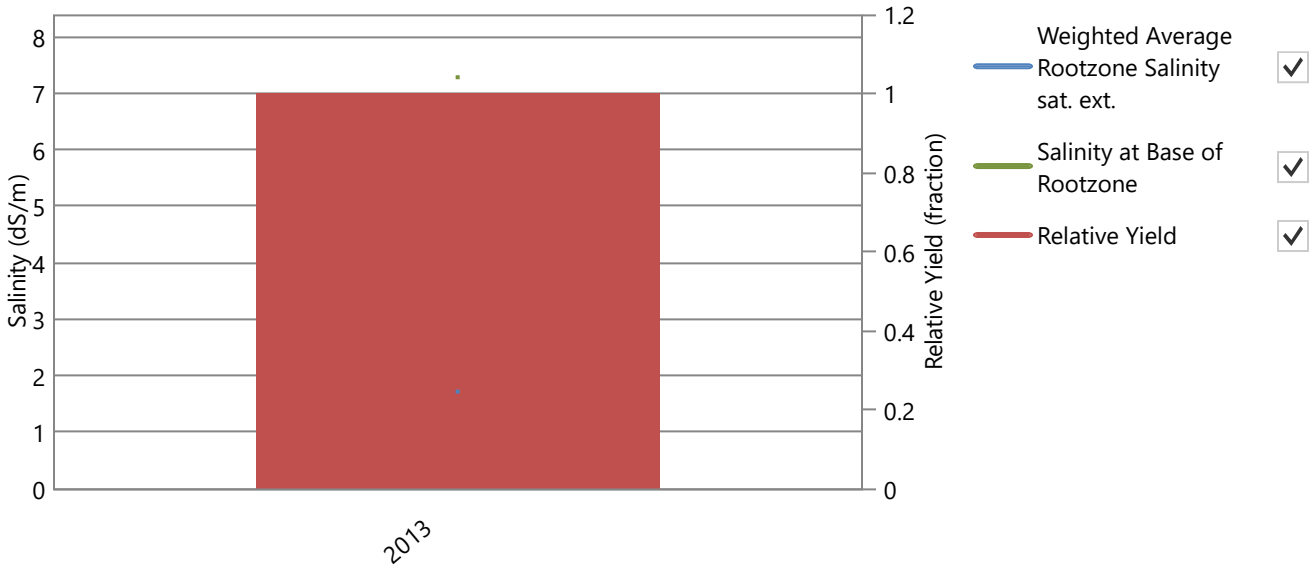
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.28
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



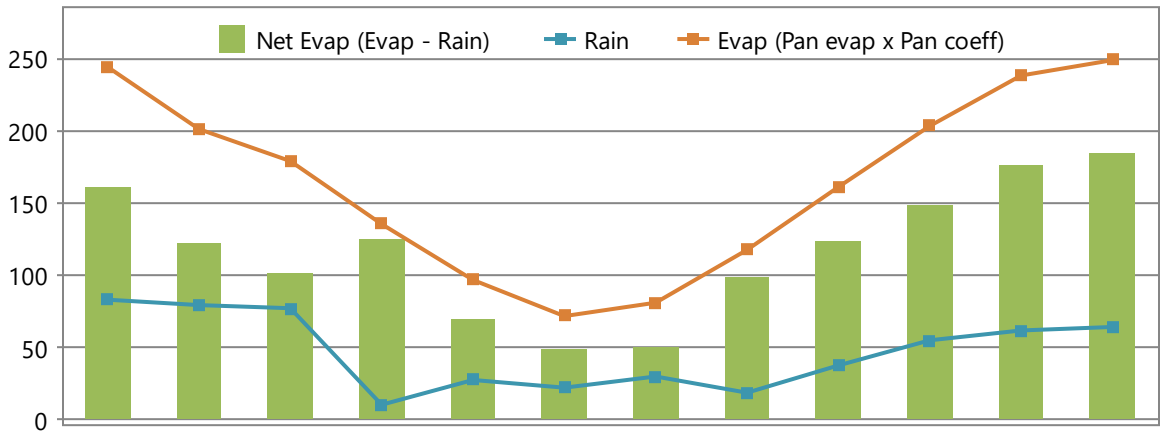
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 2257.07 m3/year or 6.18 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	65.74 (65.70 - 65.88)
Total Phosphorus	19.42 (10.81 - 20.00)	43.82 (43.80 - 43.92)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	3505.92 (3504.00 - 3513.60)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

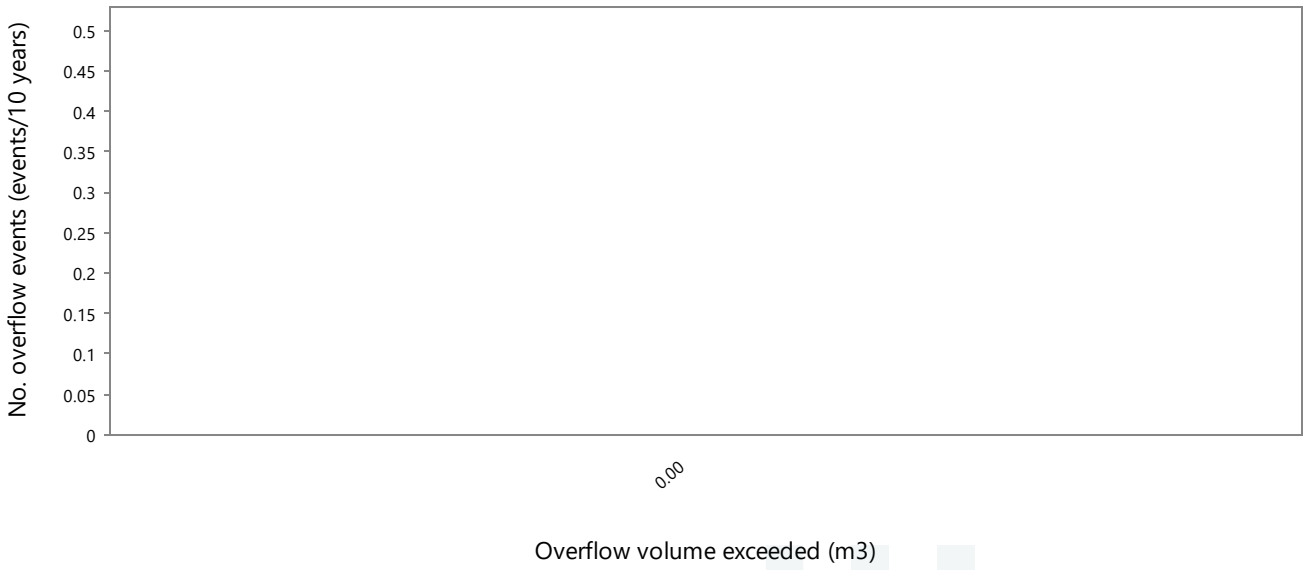
Last pond (Wet weather store): 18.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.02 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.06
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 1900 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	2257.07	1.19
Total nitrogen applied (kg)	55.22	0.03
Total phosphorus applied (kg)	43.82	0.02
Total salts applied (kg)	3505.92	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.4	93.7	102.4	96.4	99.6	96.1	99.8	99.0	97.0	101.2	98.0	102.4	1187.9
Soil Evap	9.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
Transpn.	152.6	127.9	113.2	96.8	71.1	51.2	58.5	76.7	108.9	141.0	161.9	150.4	1310.3
Rain Runoff	7.1	4.4	3.9	0.0	2.5	0.0	0.3	0.0	6.8	1.0	9.9	4.3	40.3
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	21.6	17.1	31.8	17.6	38.9	55.3	75.7	41.1	41.4	23.9	19.2	14.6	398.1
Delta	-4.8	23.3	30.7	-7.4	14.8	11.9	-4.6	0.1	-22.4	-9.6	-31.1	-2.5	-1.5

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.04
Average annual soil nitrogen removed by denitrification (kg/m2/year)	2.56E-05
Average annual soil nitrogen leached (kg/m2/year)	5.86E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	5.86E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.11
	0.02 - 6.97E-06
Average nitrate-N concentration of deep drainage (mg/L)	1.47
Max. annual nitrate-N concentration of deep drainage (mg/L)	13.07

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.00E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 9.96E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.51
Average phosphate-P concentration in rootzone (mg/L)	1.17
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.44 mg/L (years)	33.87

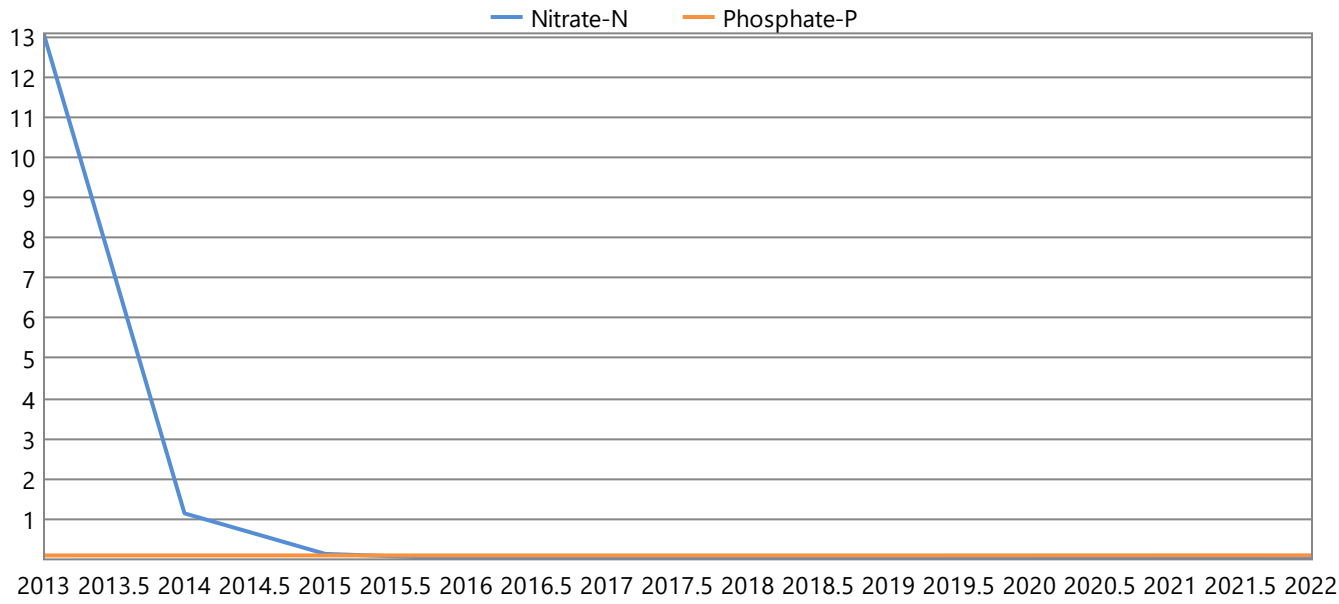
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

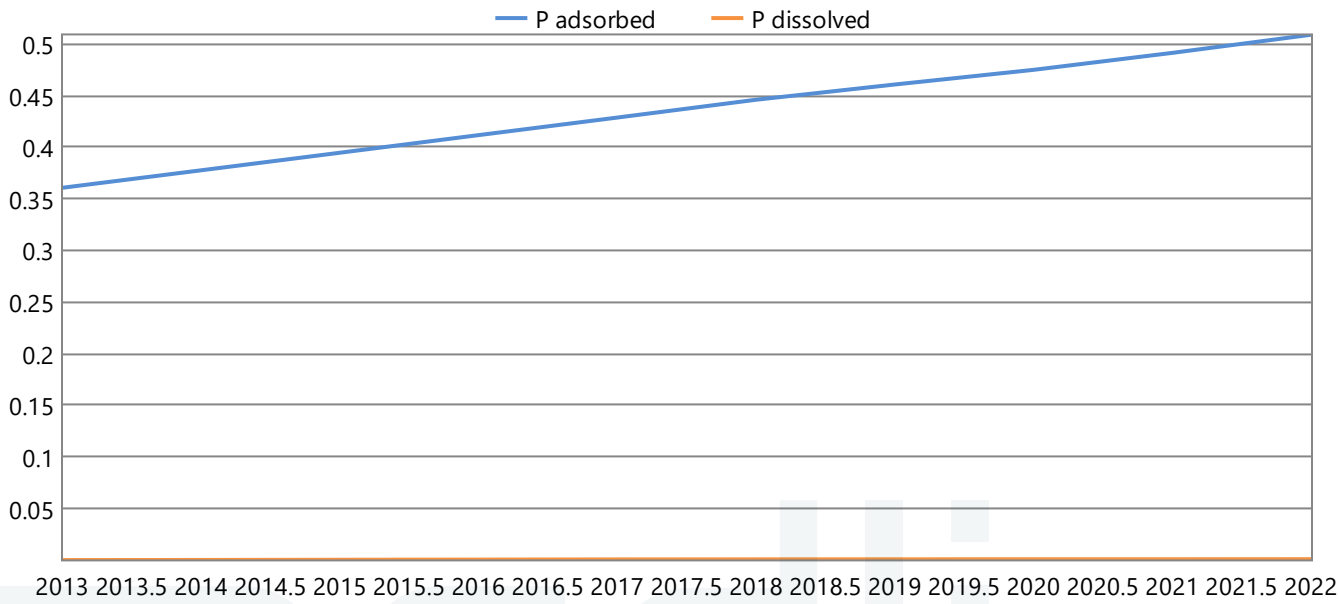
Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 1900 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.91 (1.67 - 2.29)
Average monthly plant (green) cover (fraction)	0.87 (0.80 - 0.92)
Average monthly crop factor (fraction)	0.70 (0.64 - 0.73)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1194.35 (1135.07 - 1200.00)
Average number of normal harvests per year (no./year)	3.40 (3.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	3.20
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.45 (0.37 - 0.49)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.03 (0.00 - 0.09)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.03)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.28
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
NO IRRIGATION SCENARIO: 30EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

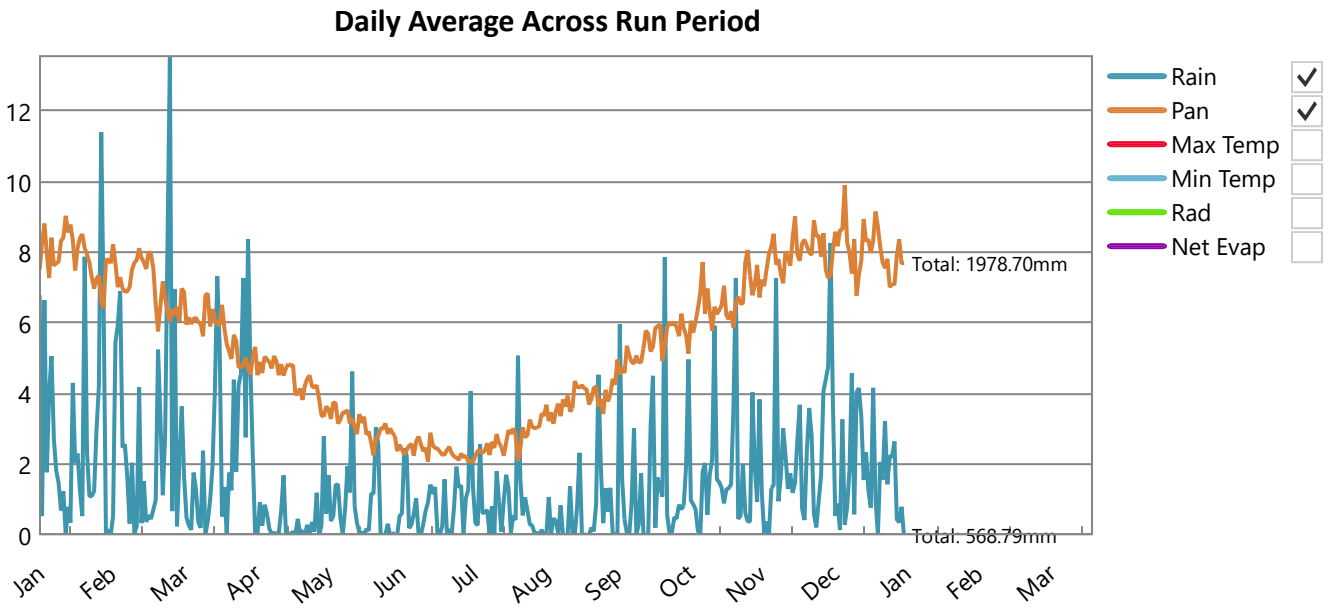
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

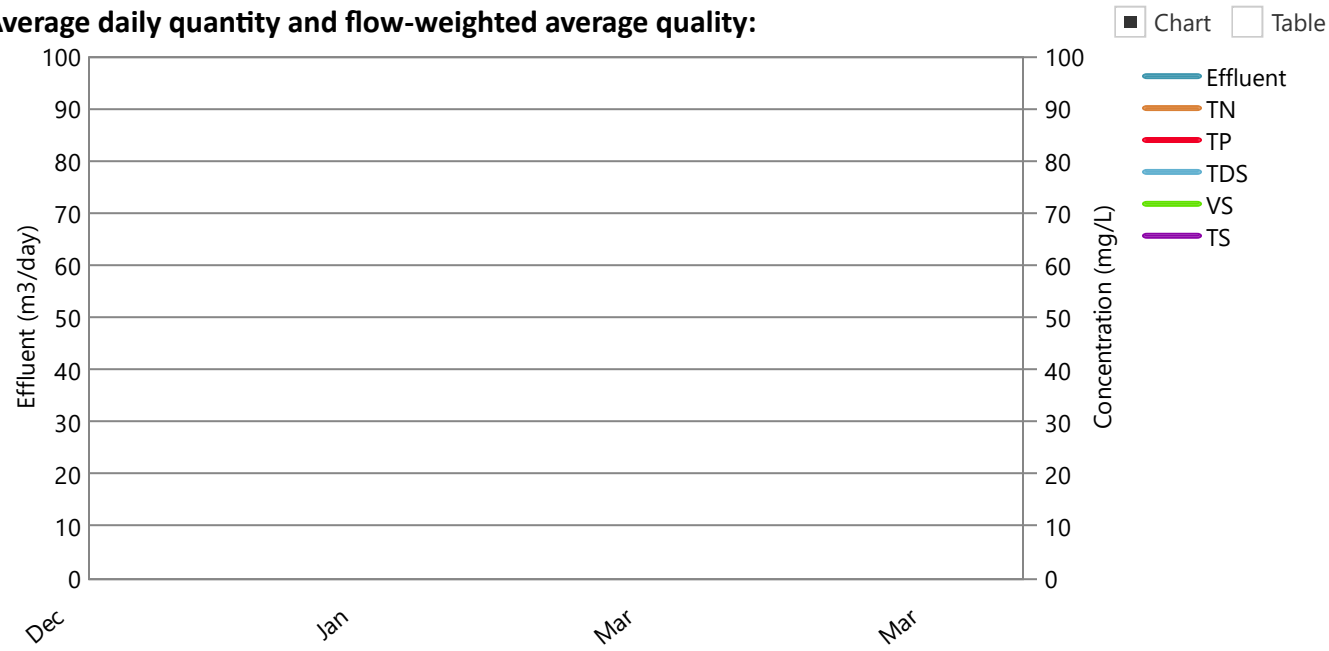


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

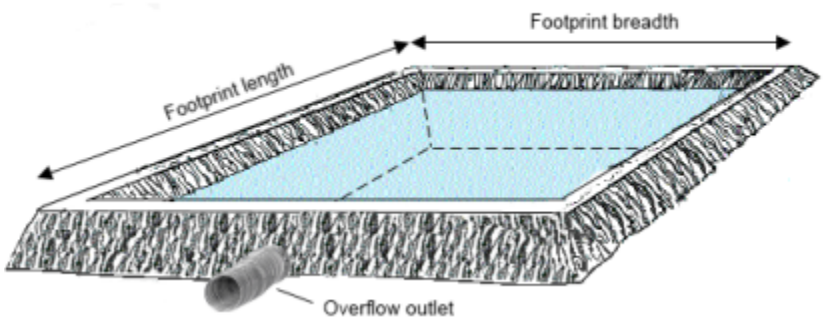
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

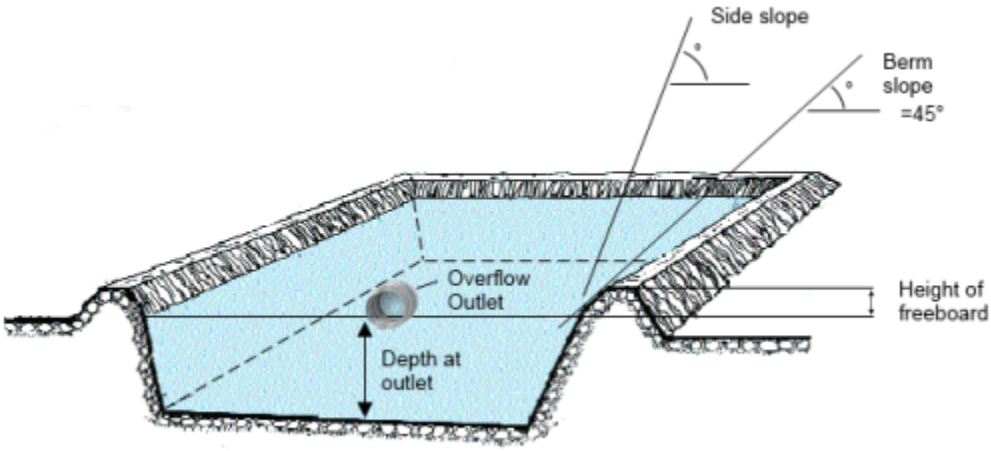
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	18.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	23.70
Pond footprint length (m)	4.87
Pond footprint width (m)	4.87
Pond catchment area (m2)	23.70
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

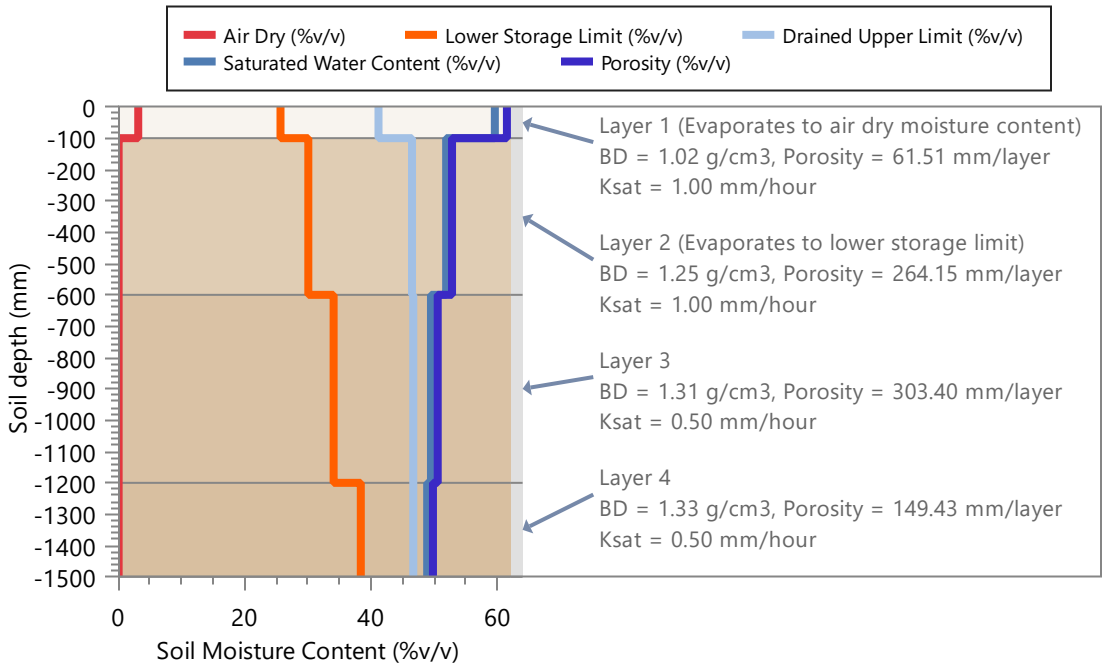
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 1900.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **18 m3**

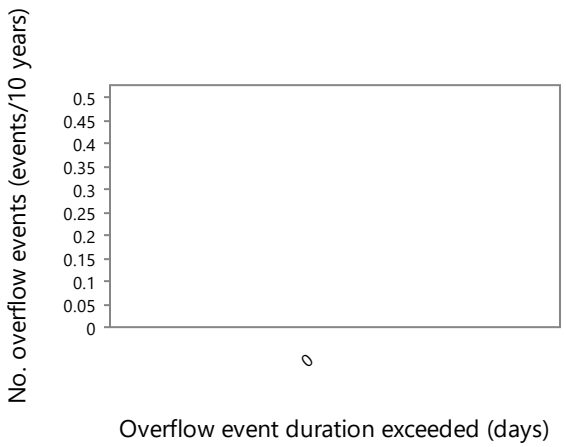
Pond System Water Balance (m3/year)

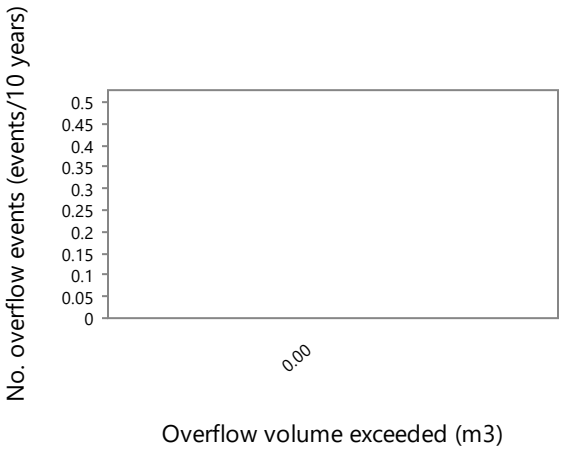
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

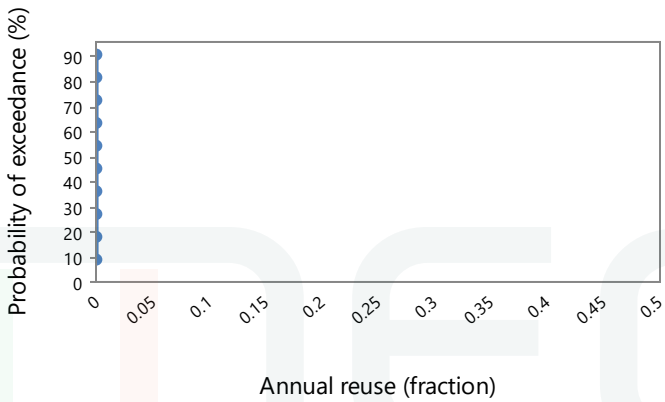
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



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PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

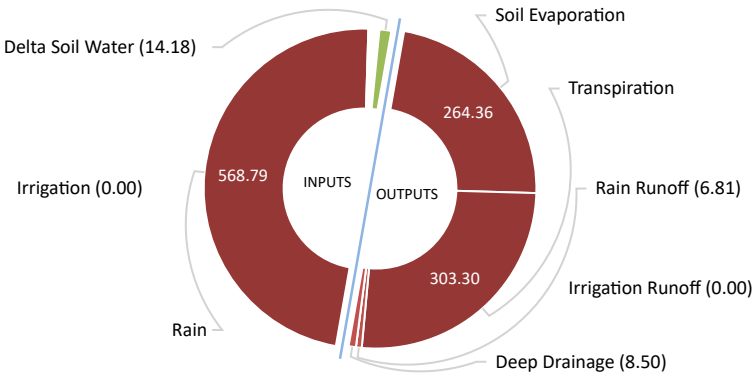
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 1900 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

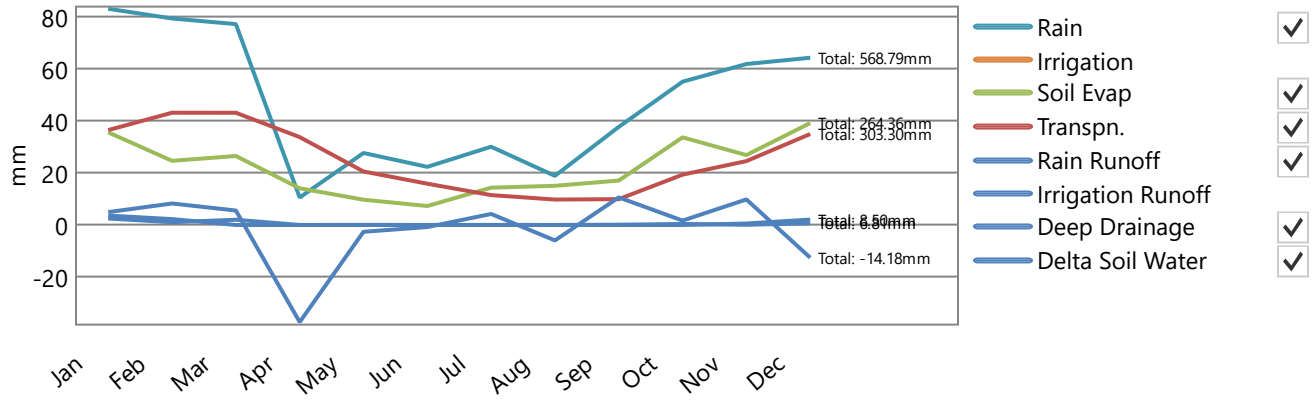
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	264.36
Transpiration	303.30
Rain Runoff	6.81
Irrigation Runoff	0.00
Deep Drainage	8.50
Delta Soil Water	-14.18

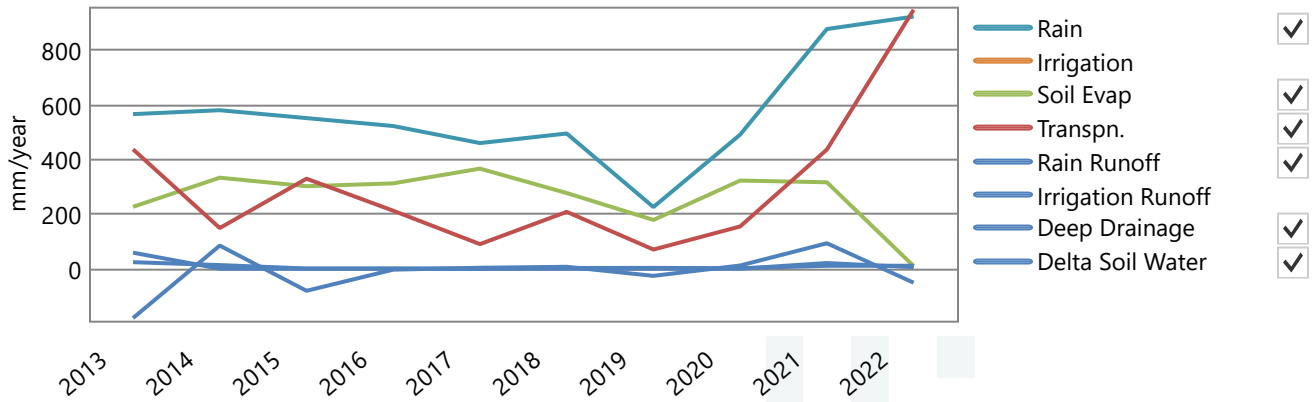
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



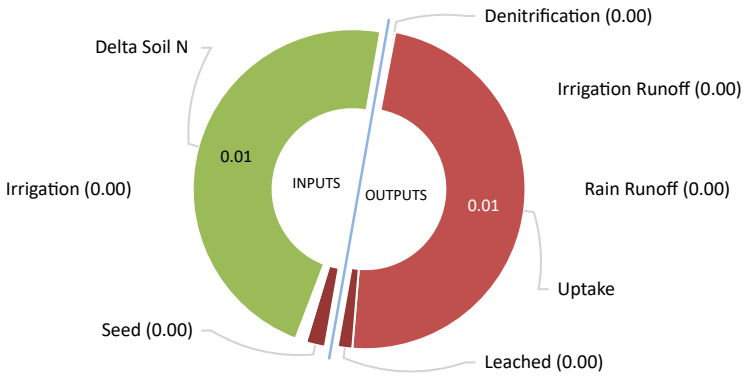
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

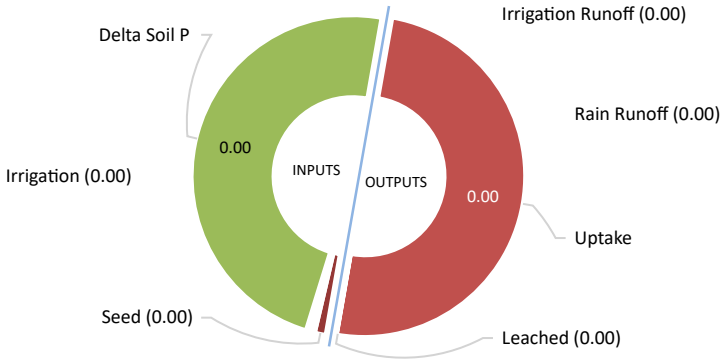
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.94E-04
Irrigation	0.00
Denitrification	3.41E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	2.20E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



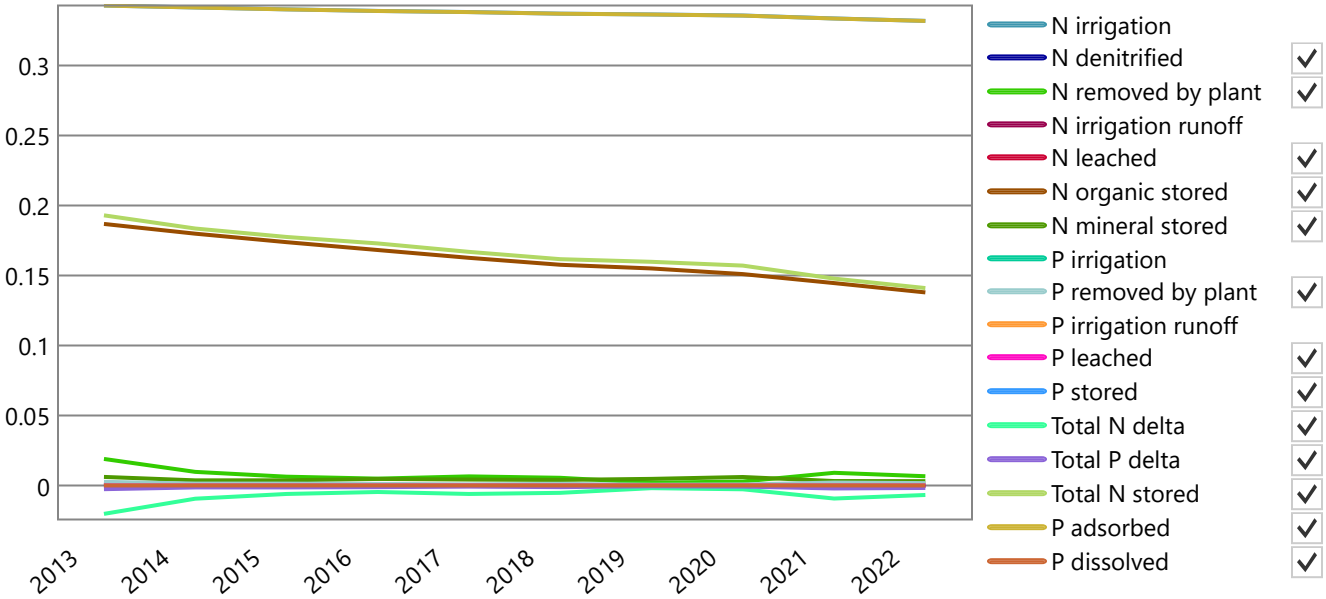
Name	Value
Seed	2.52E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.38E-03
Leached	8.41E-07
Delta Soil P	-1.36E-03

PERFORMANCE

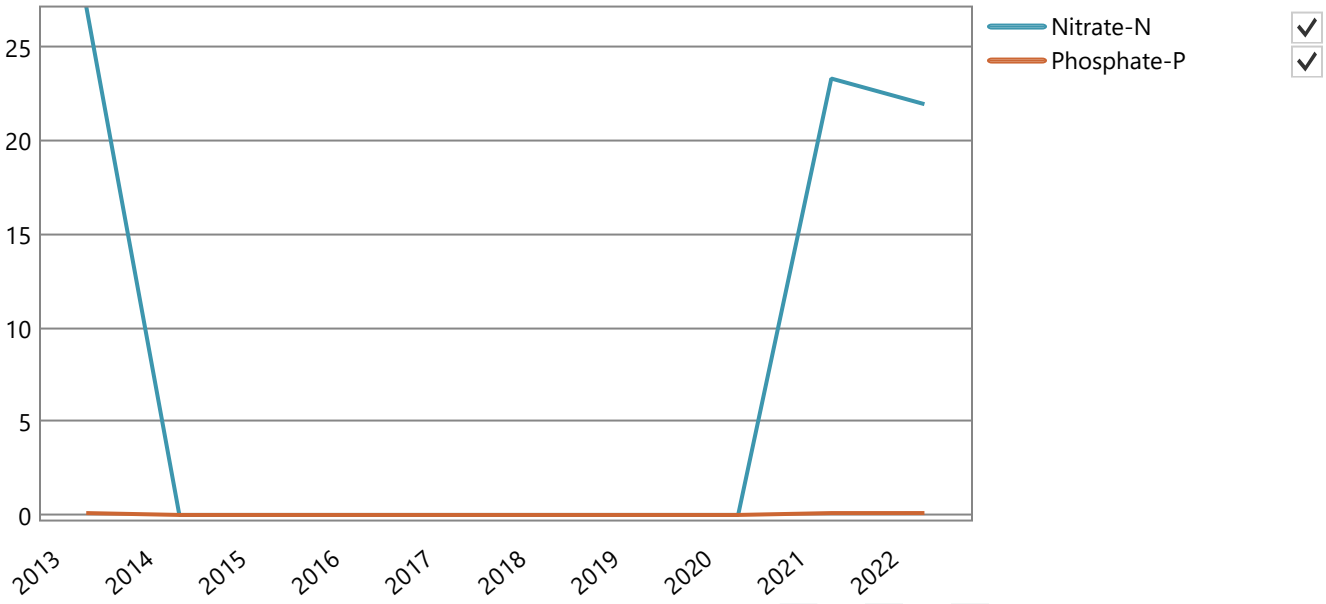
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type**: Black Earth

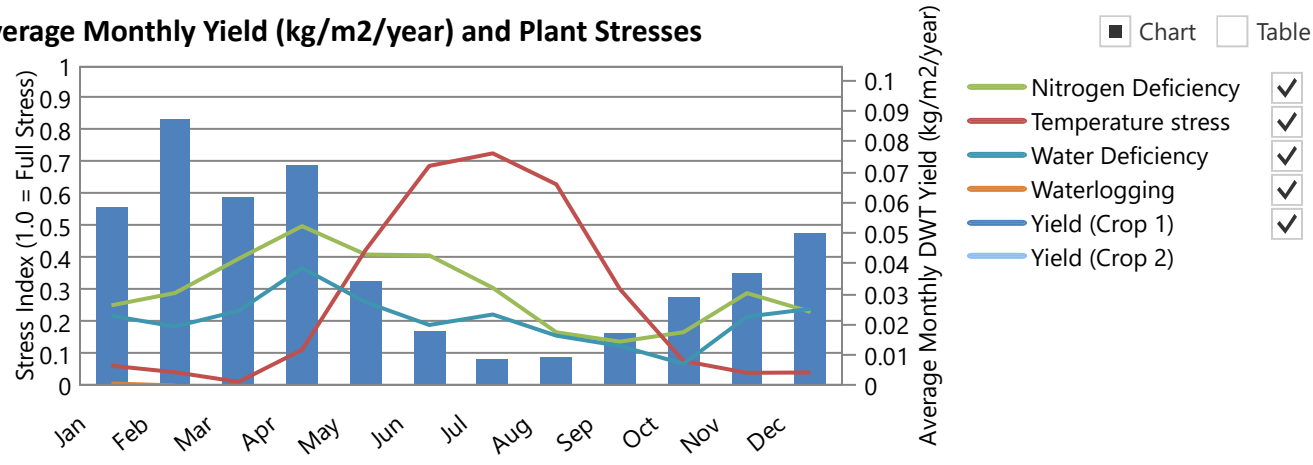
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Average monthly root depth (mm) (minimum - maximum)	467.03 (218.69 - 811.51)

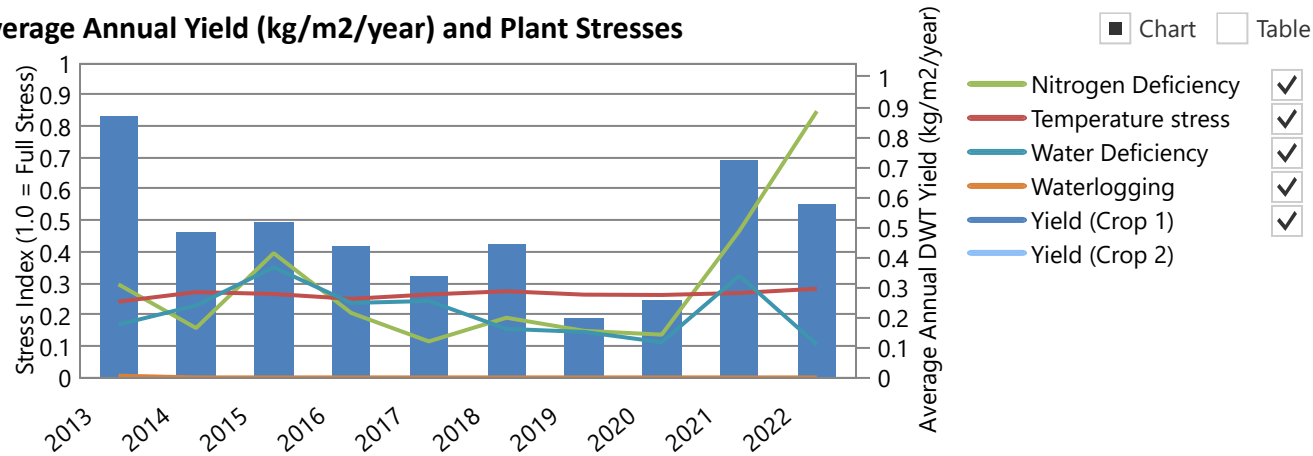
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.01 (0.00 - 0.02)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.01 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.002 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.20 (normal), 2.70 (forced by crop death due to water stress (2.70))
No. days without crop/year (days/year): 151.90 due to frosting (6.80), temperature stress - not frost (2.30), water stress (142.80)

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 1900 m2 **Soil Type: Black Earth**

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

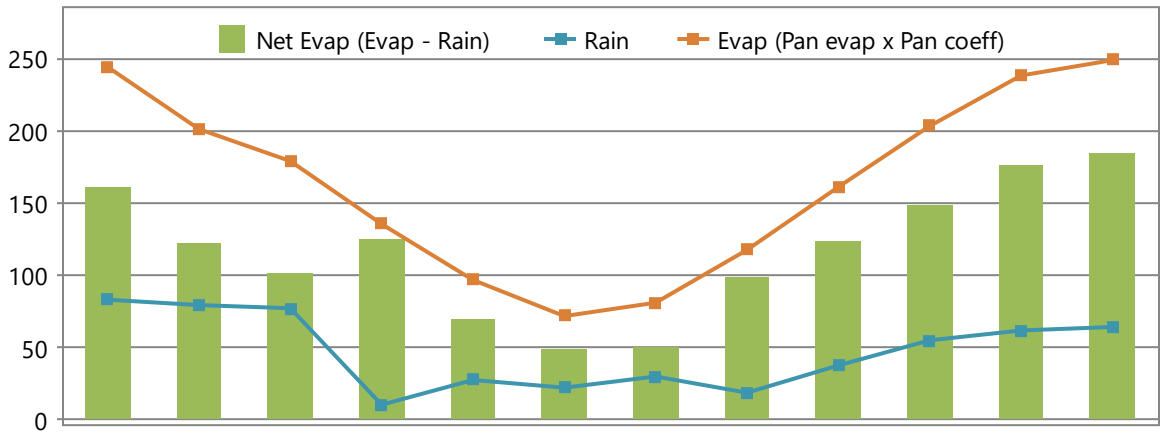
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

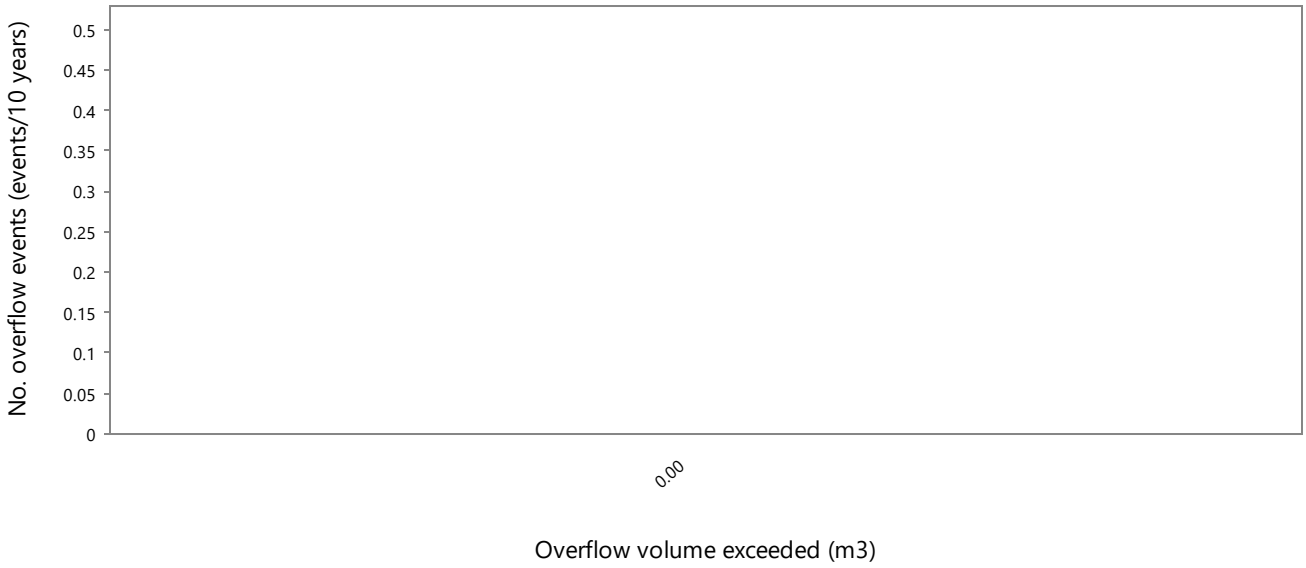
Last pond (Wet weather store): 18.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.02 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 1900 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	35.6	24.7	26.5	14.1	9.7	7.3	14.4	15.1	17.1	33.7	26.9	39.2	264.4
Transpn.	36.5	43.2	43.2	33.8	20.6	15.9	11.5	9.8	9.9	19.4	24.6	35.0	303.3
Runoff	2.5	1.1	2.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.6	6.8
Drainage	3.6	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.1	8.5
Delta	4.9	8.3	5.6	-37.4	-2.6	-0.8	4.2	-6.0	10.6	1.7	9.8	-12.6	-14.2

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.01
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.41E-05
Average annual soil nitrogen leached (kg/m2/year)	2.20E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	2.20E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.14
	0.02 - 3.11E-03
Average nitrate-N concentration of deep drainage (mg/L)	25.87
Max. annual nitrate-N concentration of deep drainage (mg/L)	27.15

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	1.38E-03
Average annual soil phosphorus leached (kg/m2/year)	8.41E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 3.47E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.33
Average phosphate-P concentration in rootzone (mg/L)	0.06
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

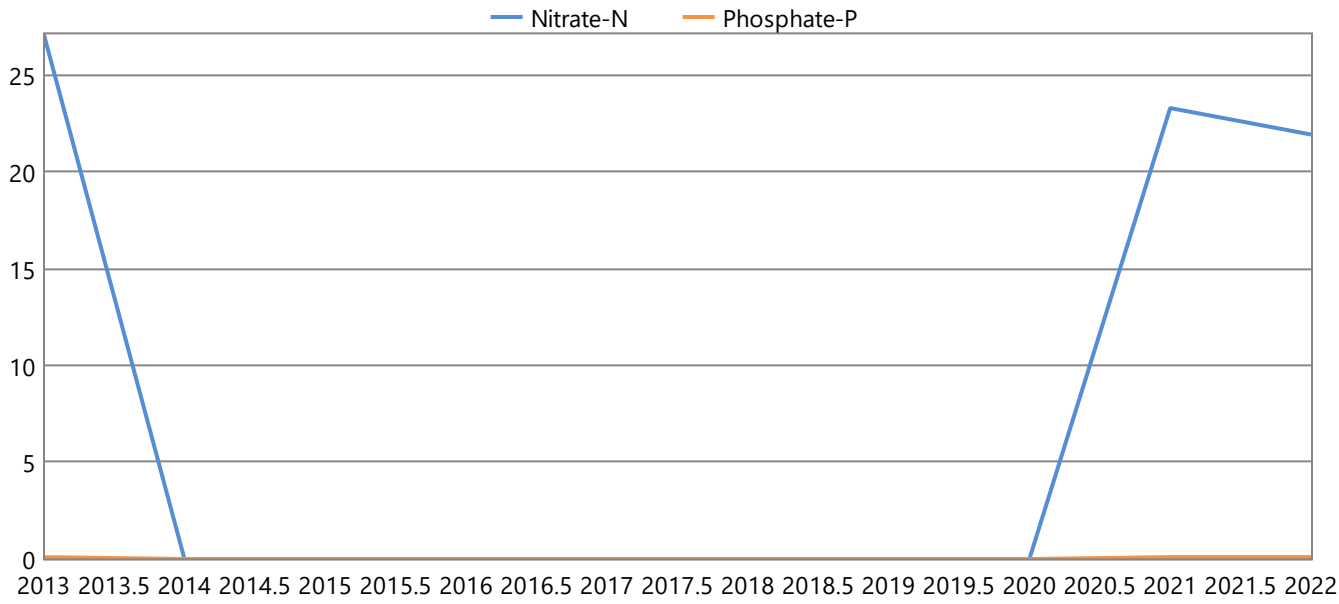
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

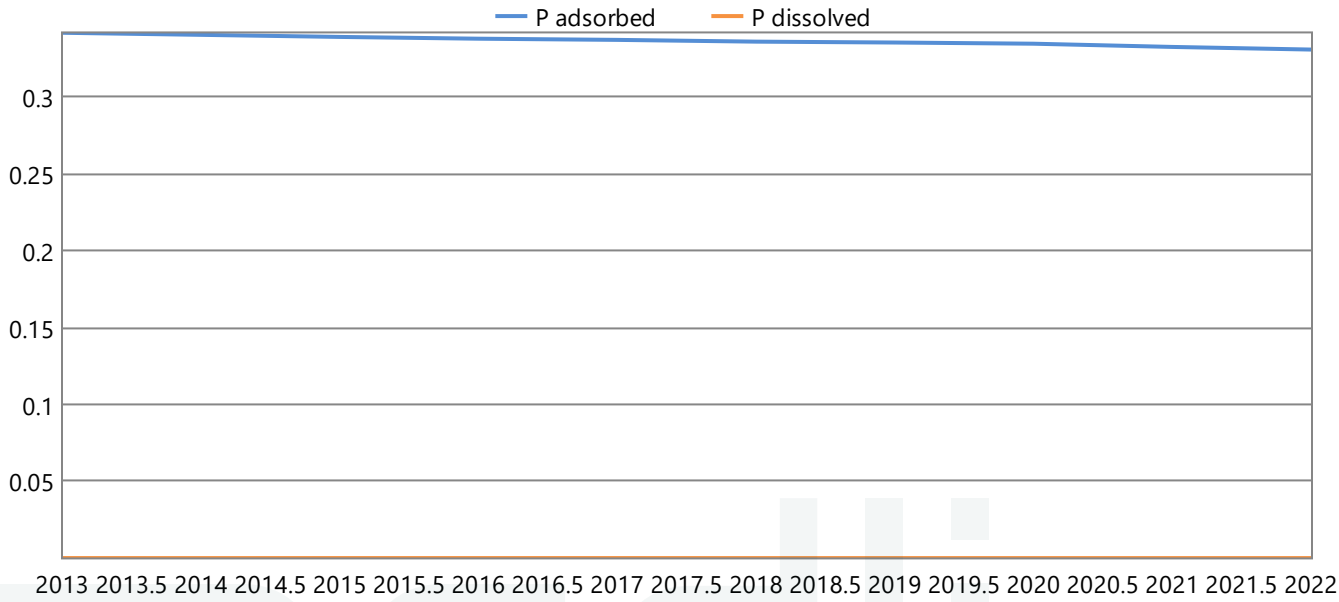
Paddock Land: Girrahween Office Application Ar: 1900 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 1900 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction)	0.36 (0.13 - 0.64)
Average monthly crop factor (fraction)	0.29 (0.10 - 0.51)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	467.03 (218.69 - 811.51)
Average number of normal harvests per year (no./year)	0.20 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.20
Average number of crop deaths per year (no./year)	2.70 (0.00 - 5.00)
Average number of crop deaths for last five years only (no./year)	1.60
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.30 (0.11 - 0.85)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.21 (0.07 - 0.37)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	151.90

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
IRRIGATION LOAD SCENARIO: 60EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

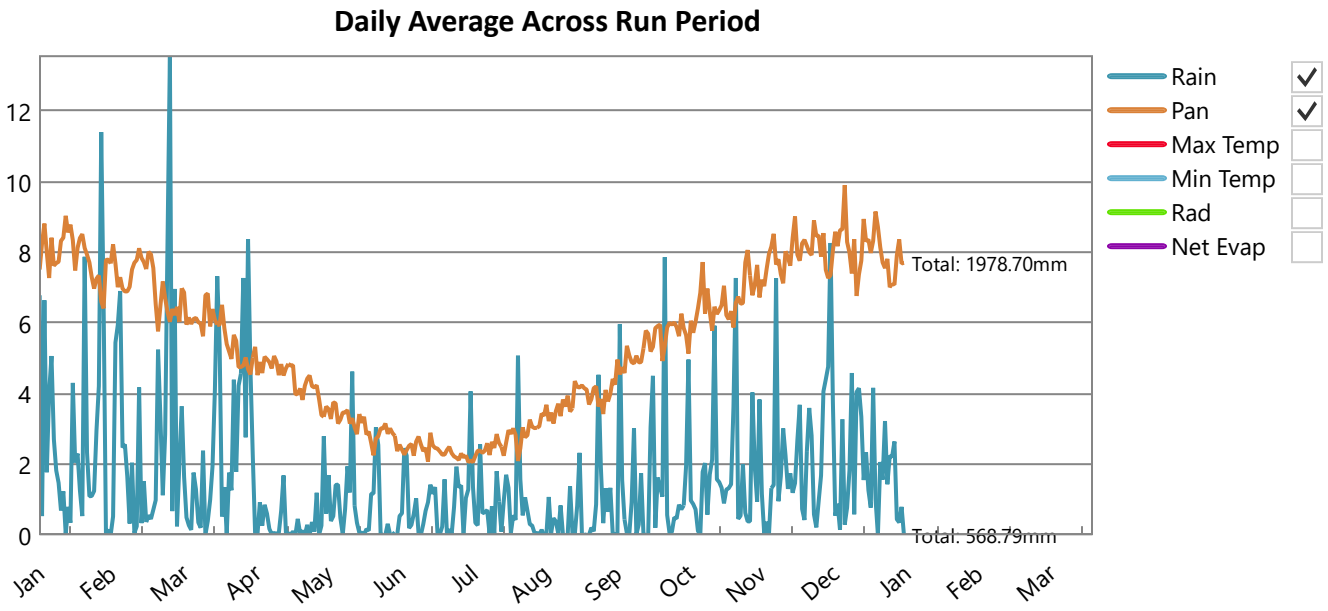
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

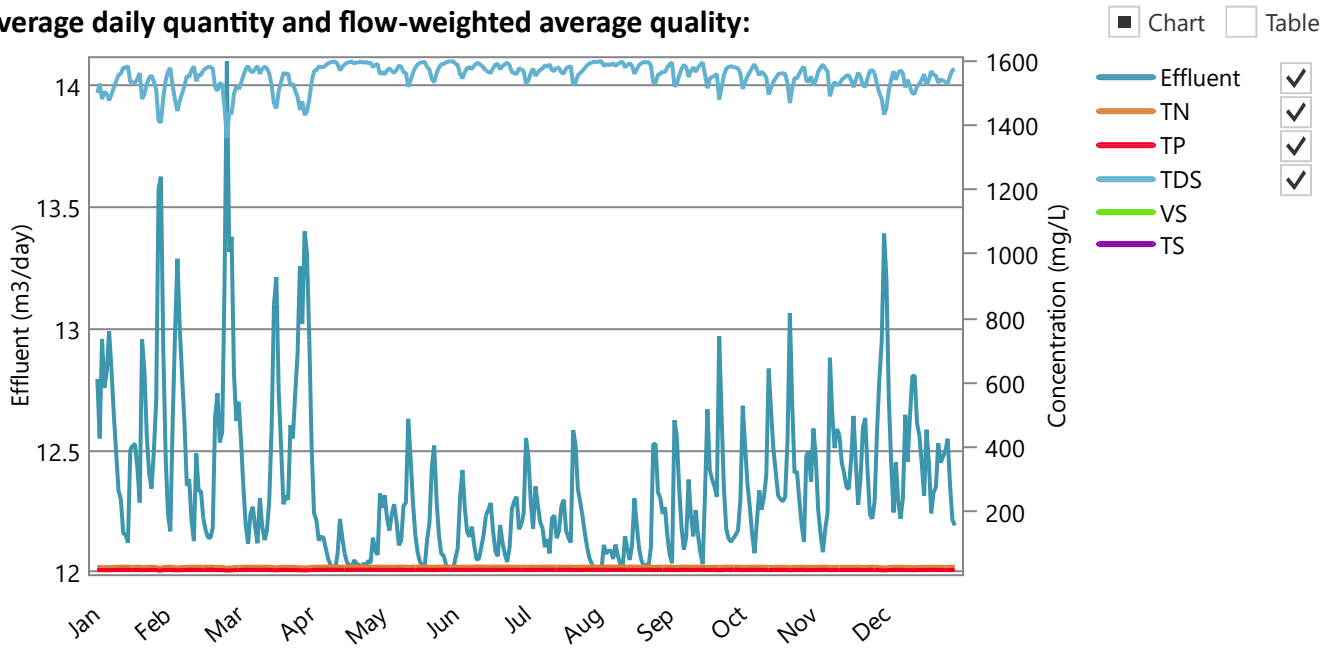


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 4514.13 m3/year or 12.36 m3/day (Min-Max: 12.00 - 22.21)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

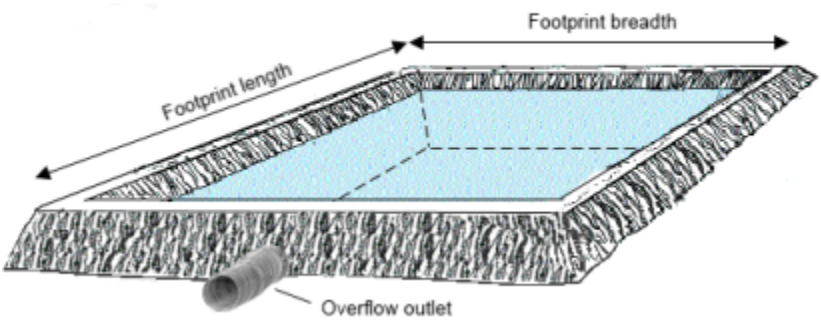
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	131.47 (131.40 - 131.76)
Total Phosphorus	19.42 (10.81 - 20.00)	87.65 (87.60 - 87.84)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	7011.84 (7008.00 - 7027.20)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

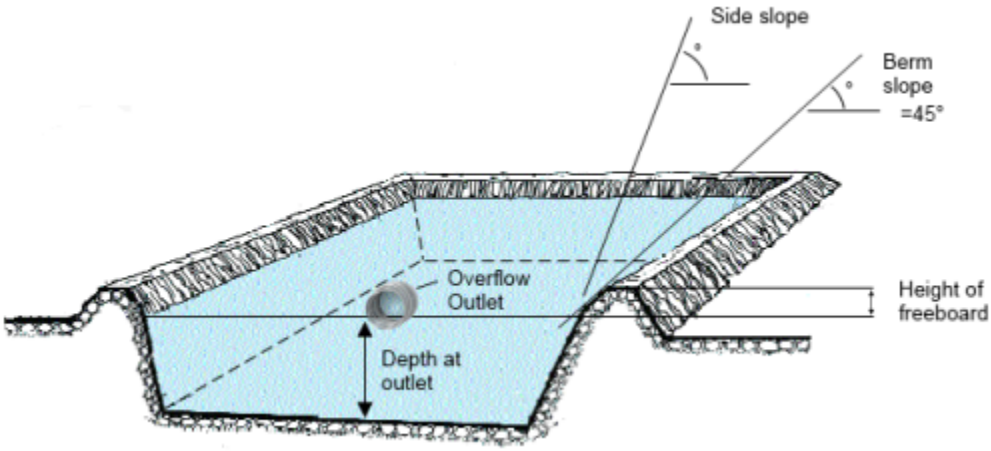
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	36.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	43.97
Pond footprint length (m)	6.63
Pond footprint width (m)	6.63
Pond catchment area (m2)	43.97
Average active volume (m3)	0.45





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

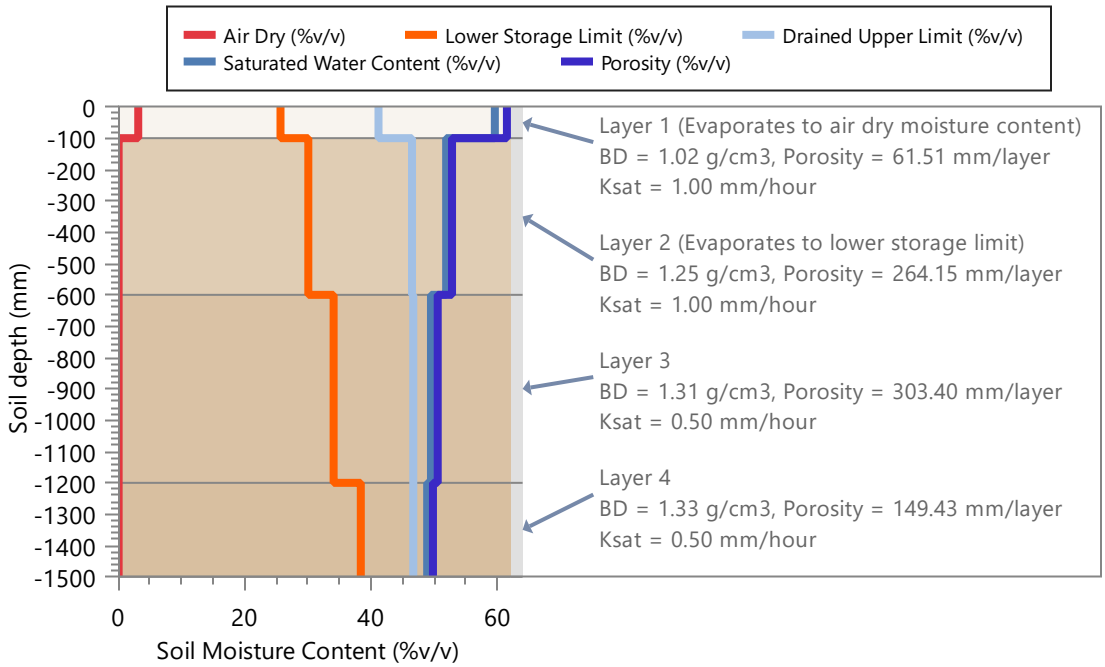
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 3800.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

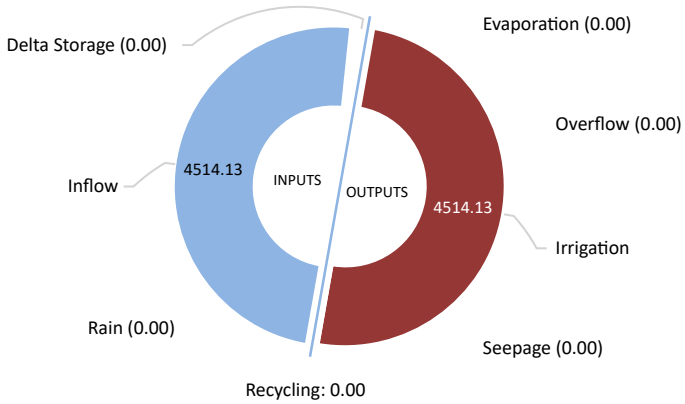
Average monthly cover (fraction) (minimum - maximum)	0.87 (0.80 - 0.92)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **36 m3**

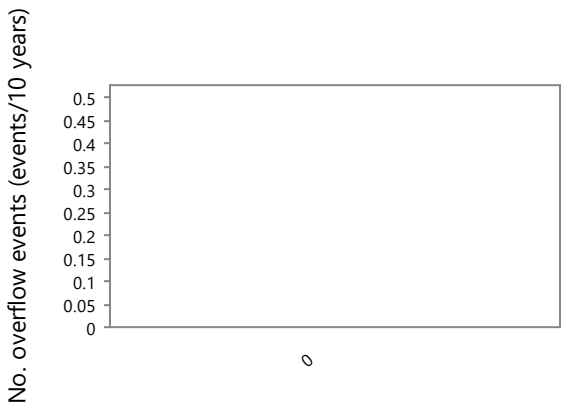
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	4514.13
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	4514.13
Seepage	0.00
Delta Storage	0.00

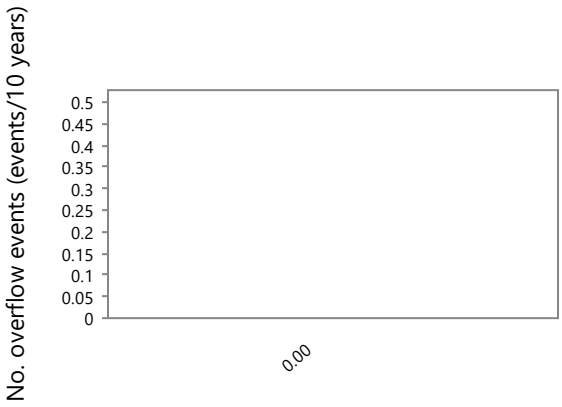
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



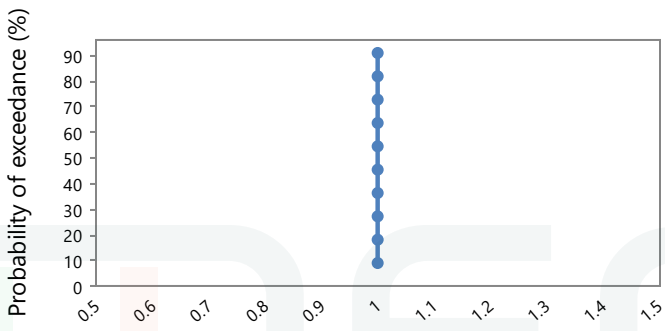
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

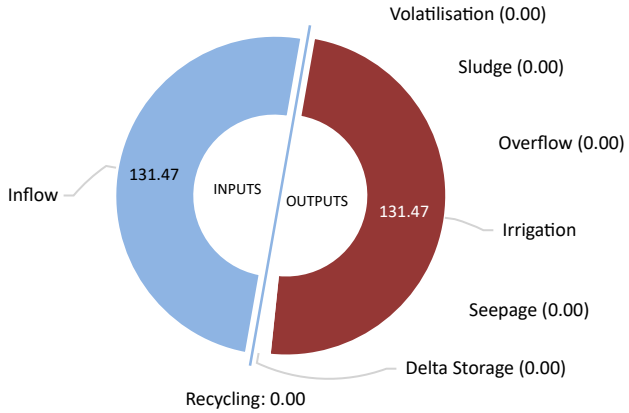
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

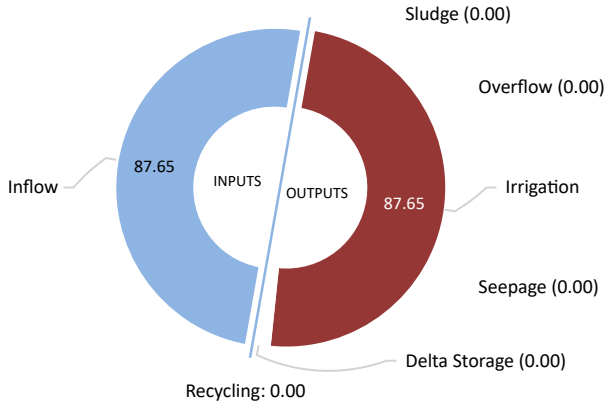
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



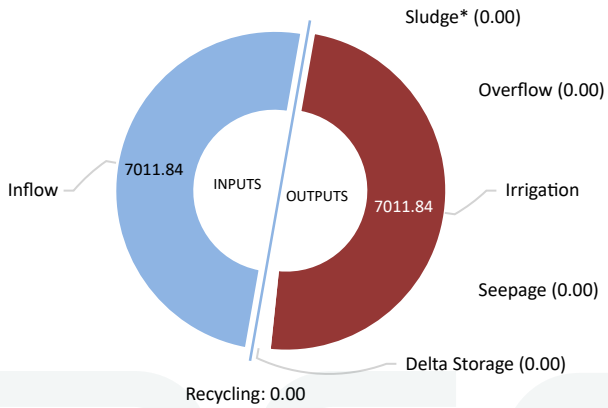
Name	Value
Inflow	131.47
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	131.47
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	87.65
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	87.65
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	7011.84
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	7011.84
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.73
Average phosphorus concentration of pond liquid (mg/L)	16.48
Average salinity of pond liquid (dS/m)	2.06

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	4514.13
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	4514.13
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

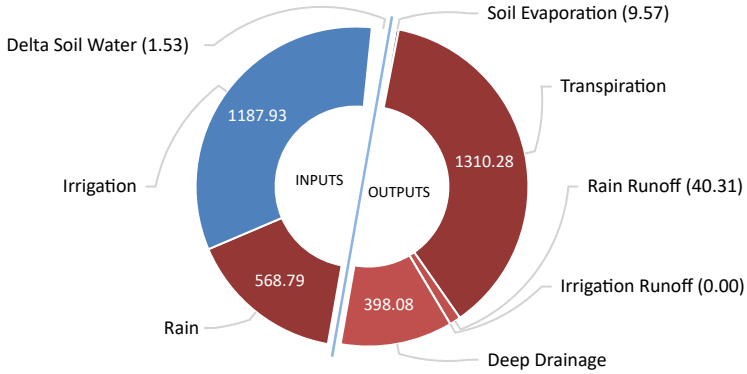
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 3800 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

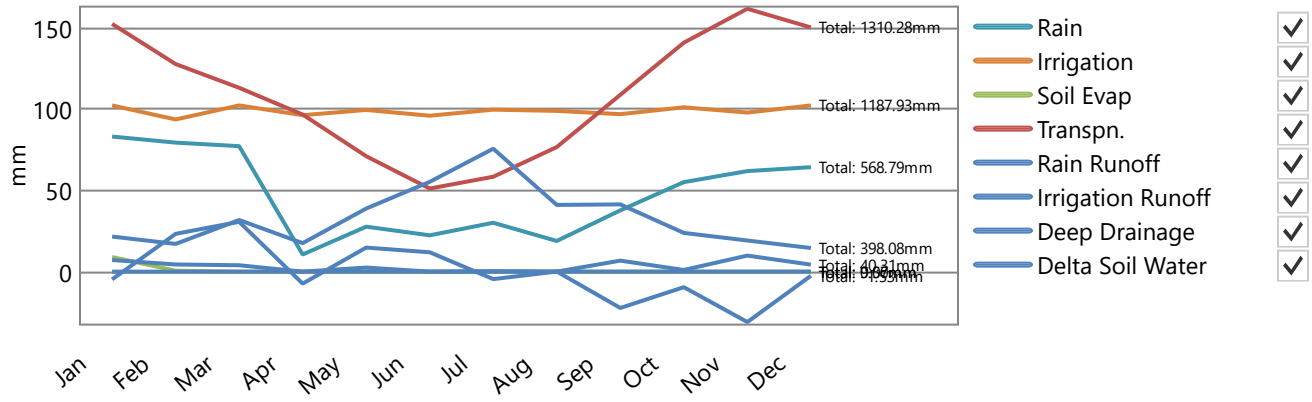
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1187.93
Soil Evaporation	9.57
Transpiration	1310.28
Rain Runoff	40.31
Irrigation Runoff	0.00
Deep Drainage	398.08
Delta Soil Water	-1.53

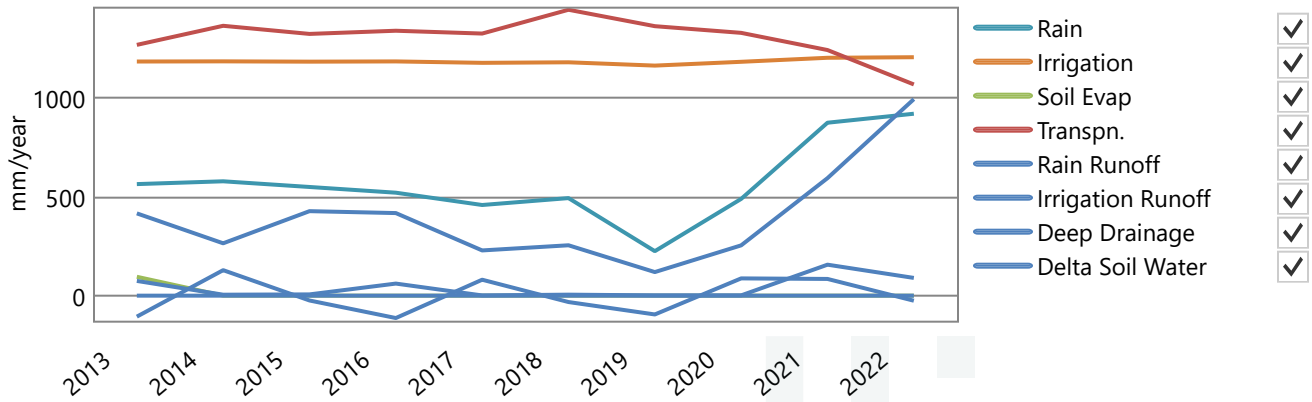
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



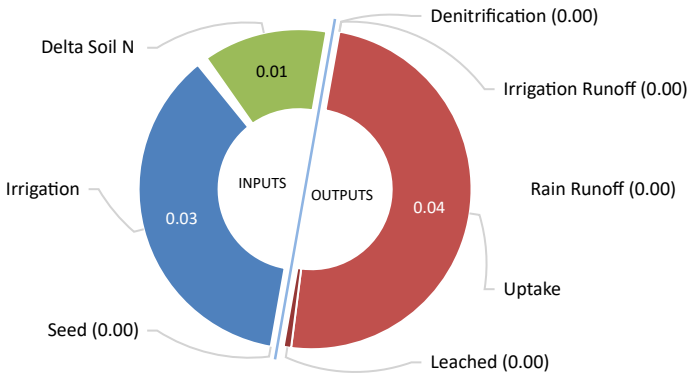
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

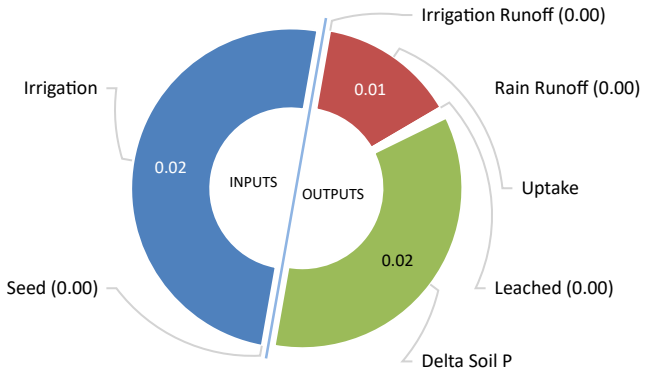
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	2.56E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.04
Leached	5.86E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



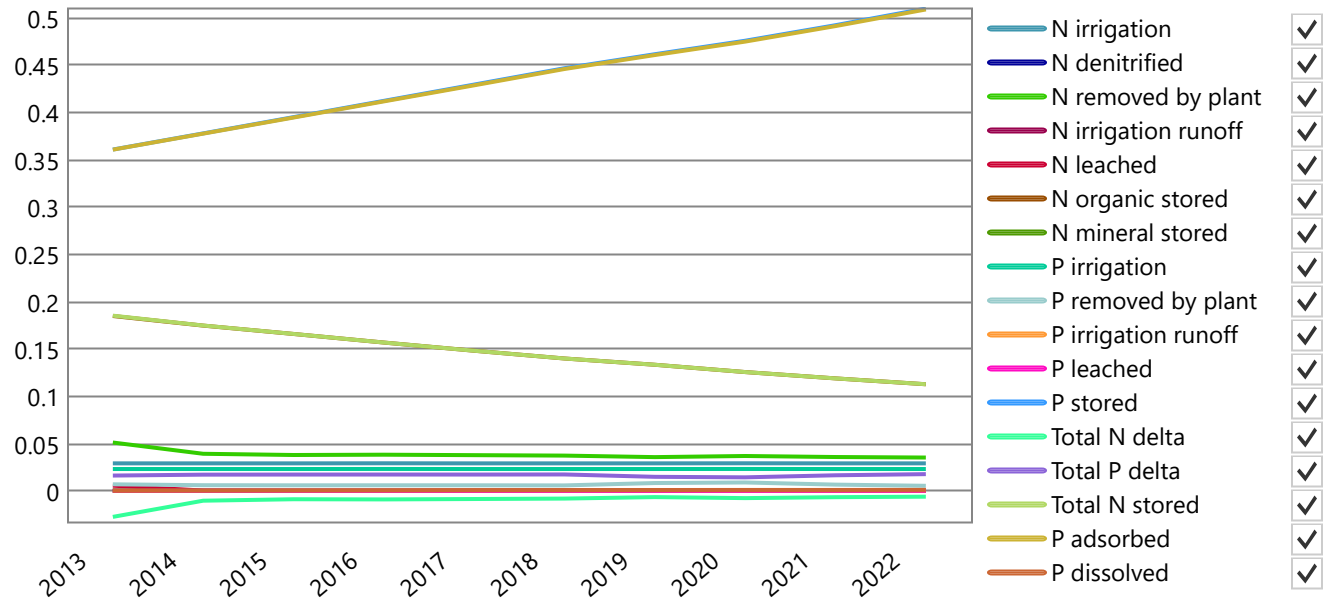
Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.00E-05
Delta Soil P	0.02

PERFORMANCE

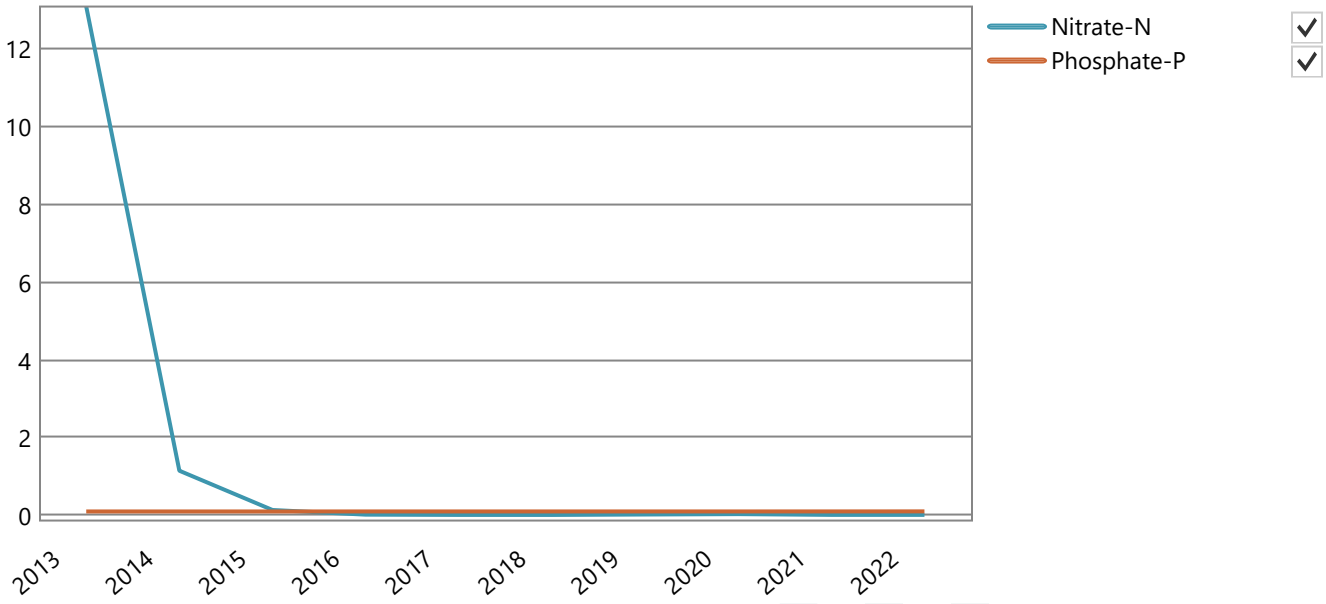
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

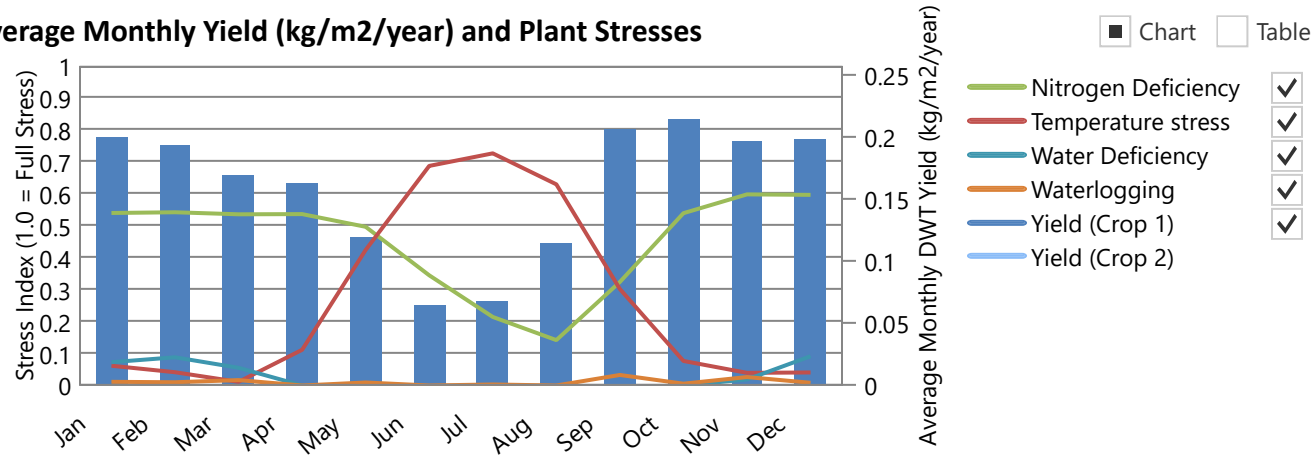
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.91 (1.67 - 2.29)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.87 (0.80 - 0.92)
Average monthly root depth (mm) (minimum - maximum)	1194.35 (1135.07 - 1200.00)

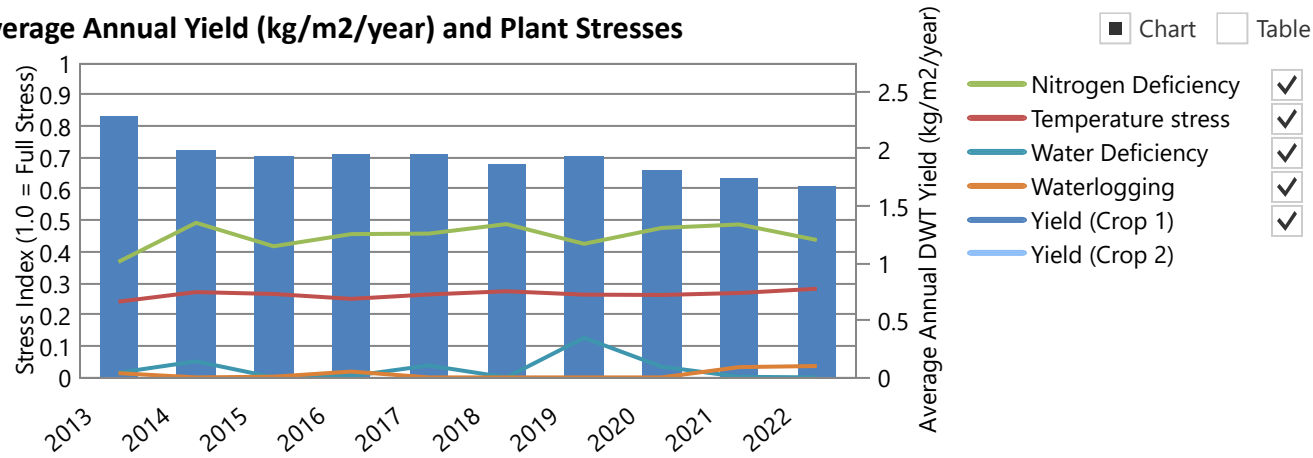
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.04 (0.04 - 0.05)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.40 (normal)
No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 3800 m2

Soil Type: **Black Earth**

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

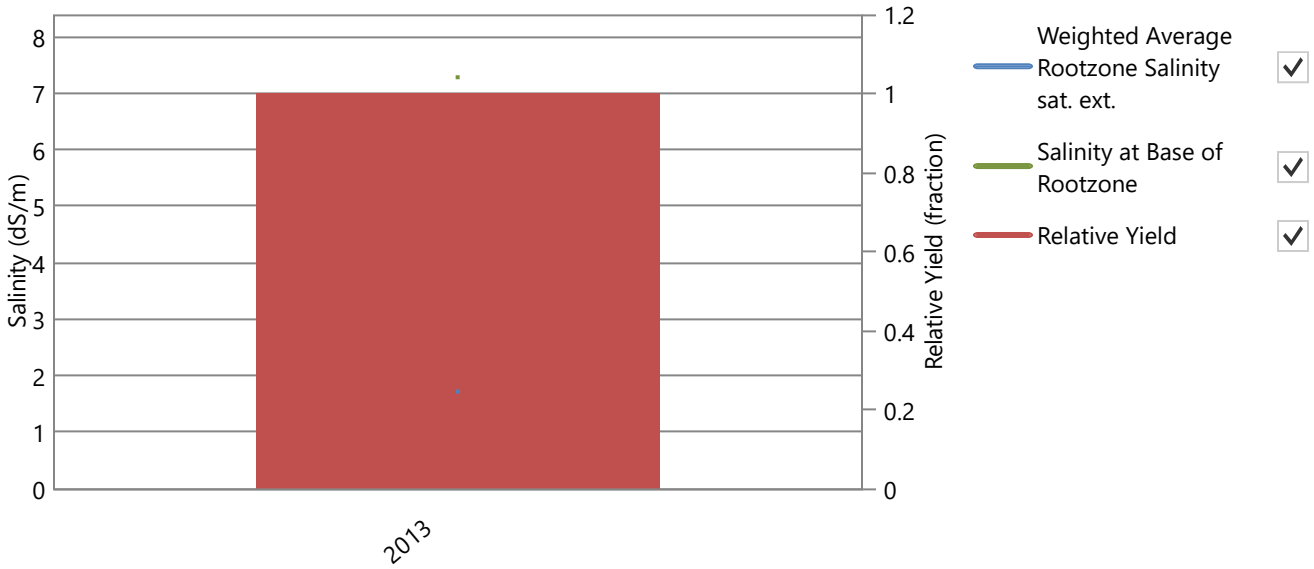
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.28
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



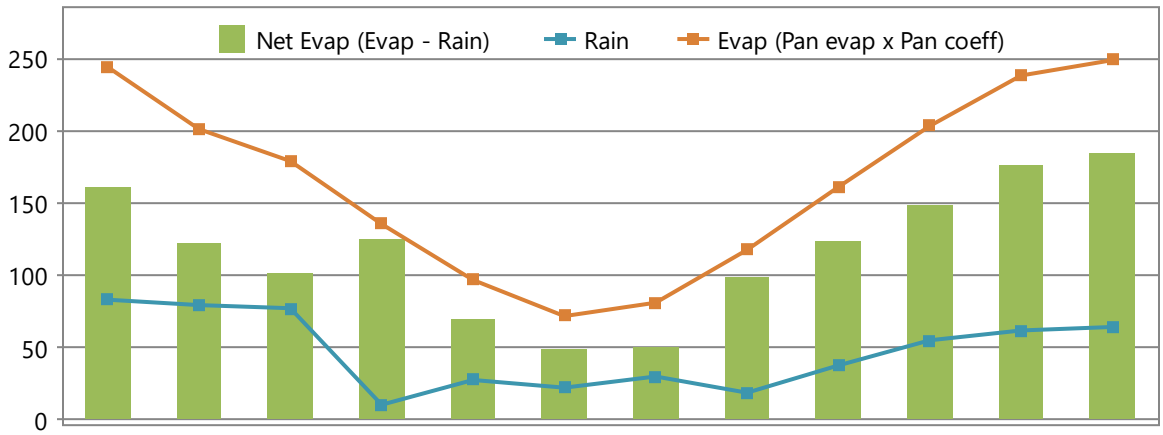
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 4514.13 m3/year or 12.36 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	131.47 (131.40 - 131.76)
Total Phosphorus	19.42 (10.81 - 20.00)	87.65 (87.60 - 87.84)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	7011.84 (7008.00 - 7027.20)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

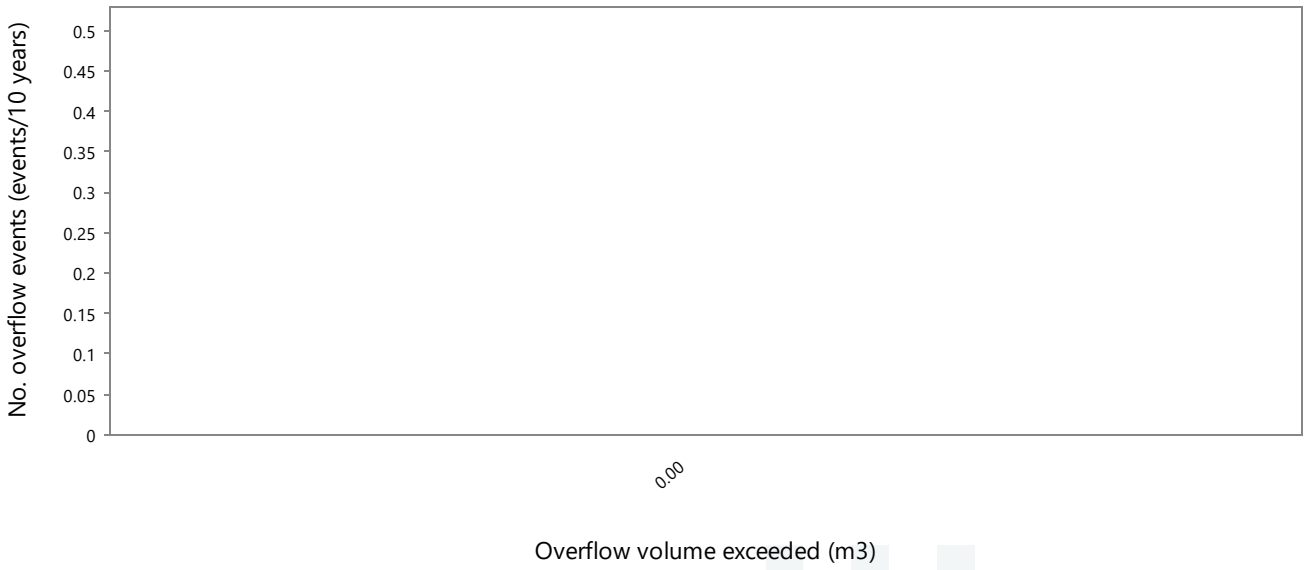
Last pond (Wet weather store): 36.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.04 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.06
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 3800 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	4514.13	1.19
Total nitrogen applied (kg)	110.44	0.03
Total phosphorus applied (kg)	87.65	0.02
Total salts applied (kg)	7011.84	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.4	93.7	102.4	96.4	99.6	96.1	99.8	99.0	97.0	101.2	98.0	102.4	1187.9
Soil Evap	9.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
Transpn.	152.6	127.9	113.2	96.8	71.1	51.2	58.5	76.7	108.9	141.0	161.9	150.4	1310.3
Rain Runoff	7.1	4.4	3.9	0.0	2.5	0.0	0.3	0.0	6.8	1.0	9.9	4.3	40.3
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	21.6	17.1	31.8	17.6	38.9	55.3	75.7	41.1	41.4	23.9	19.2	14.6	398.1
Delta	-4.8	23.3	30.7	-7.4	14.8	11.9	-4.6	0.1	-22.4	-9.6	-31.1	-2.5	-1.5

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.04
Average annual soil nitrogen removed by denitrification (kg/m2/year)	2.56E-05
Average annual soil nitrogen leached (kg/m2/year)	5.86E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	5.86E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.11
	0.02 - 6.97E-06
Average nitrate-N concentration of deep drainage (mg/L)	1.47
Max. annual nitrate-N concentration of deep drainage (mg/L)	13.07

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.00E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 9.96E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.51
Average phosphate-P concentration in rootzone (mg/L)	1.17
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.44 mg/L (years)	33.87

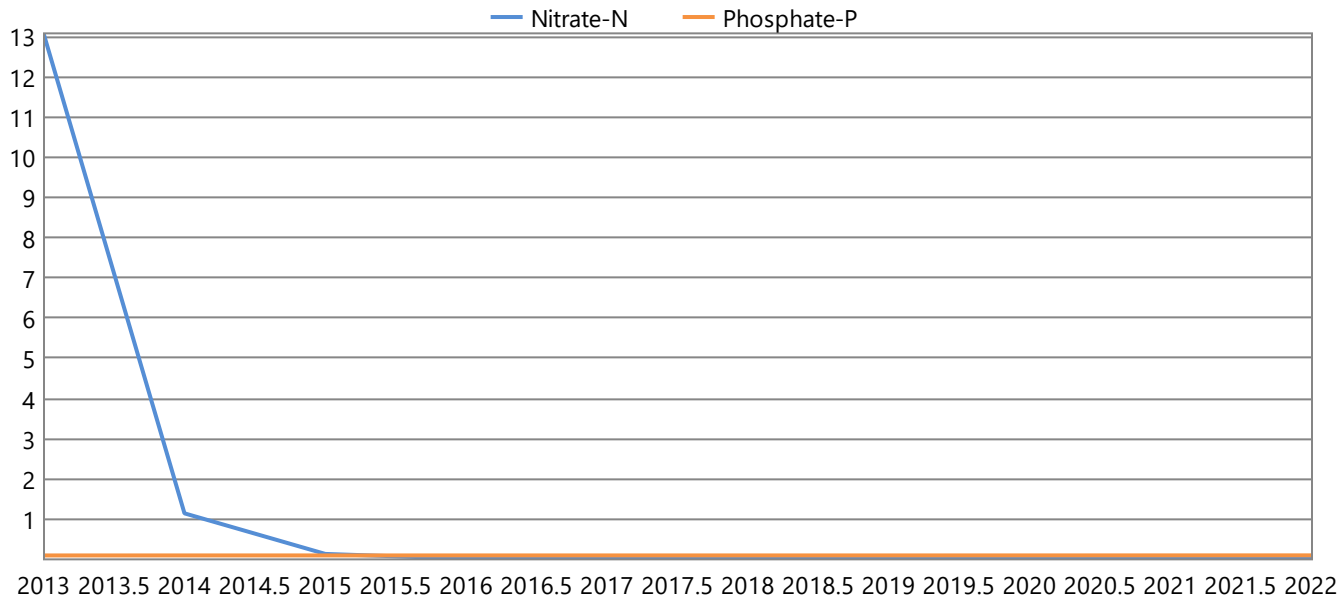
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

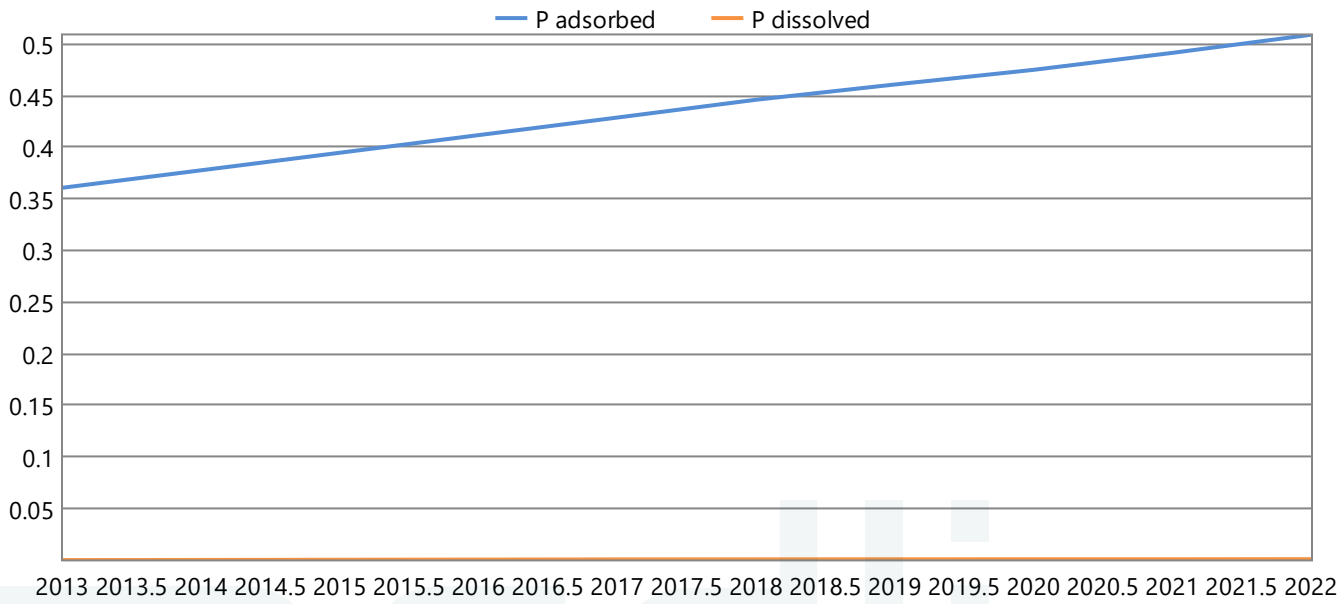
Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 3800 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.91 (1.67 - 2.29)
Average monthly plant (green) cover (fraction)	0.87 (0.80 - 0.92)
Average monthly crop factor (fraction)	0.70 (0.64 - 0.73)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1194.35 (1135.07 - 1200.00)
Average number of normal harvests per year (no./year)	3.40 (3.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	3.20
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.45 (0.37 - 0.49)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.03 (0.00 - 0.09)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.03)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.28
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
NO IRRIGATION SCENARIO: 60EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

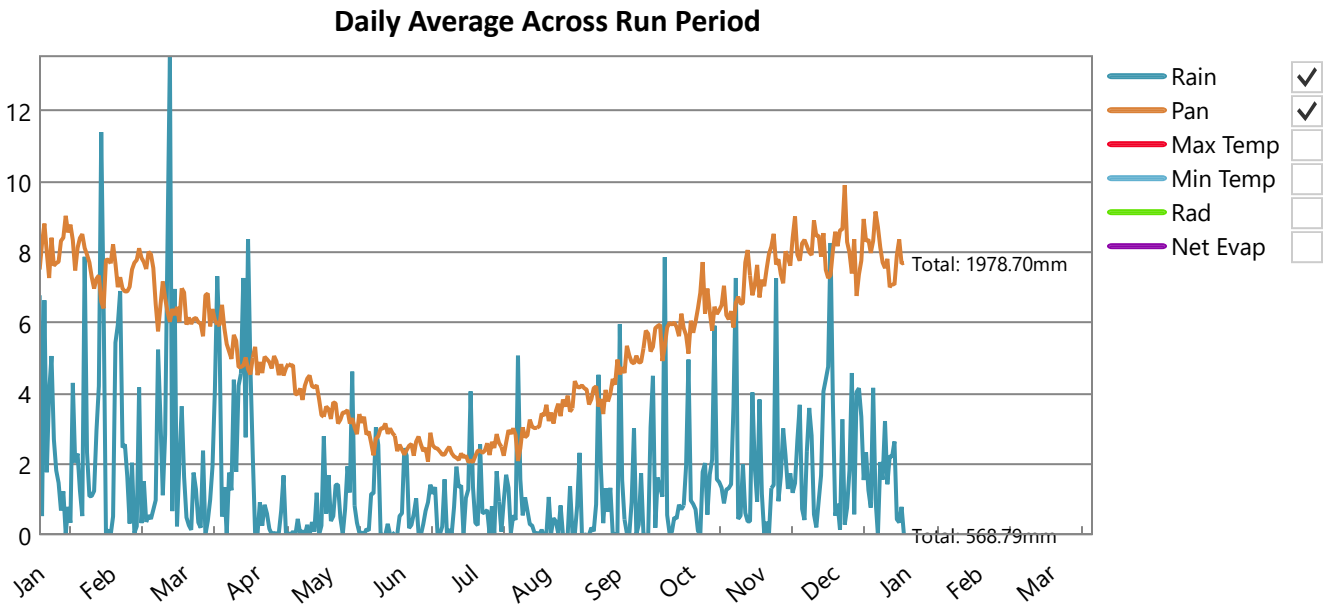
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

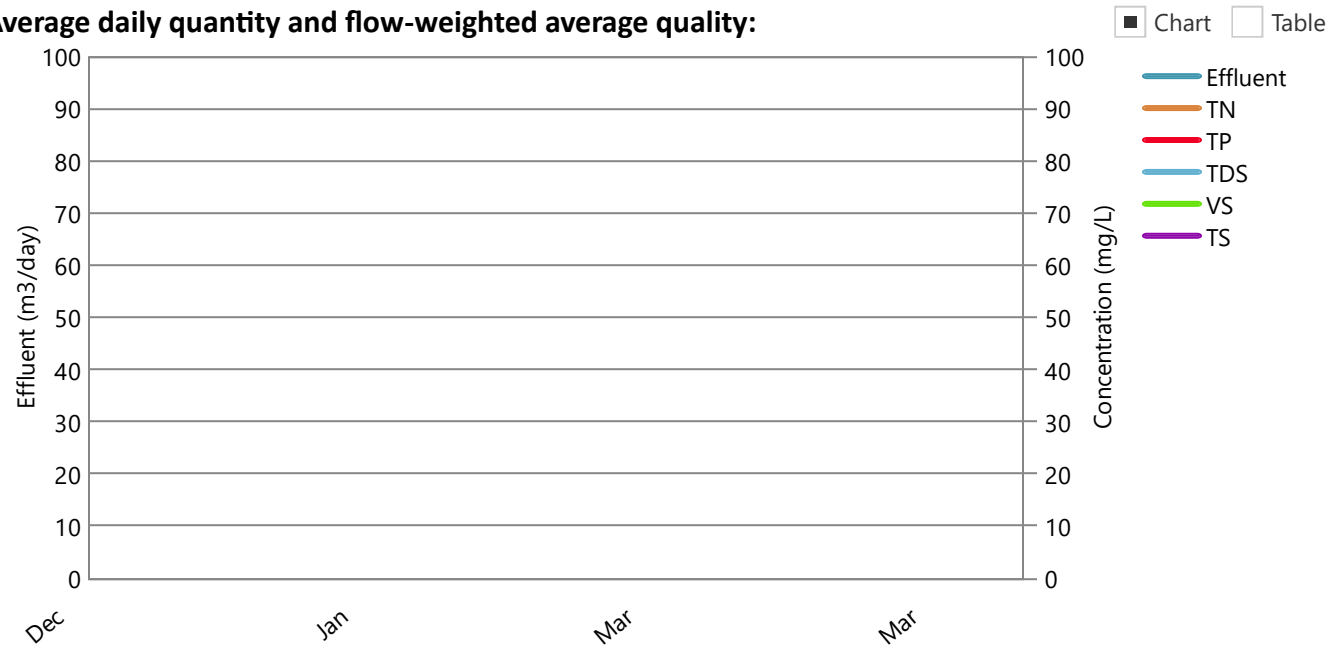


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

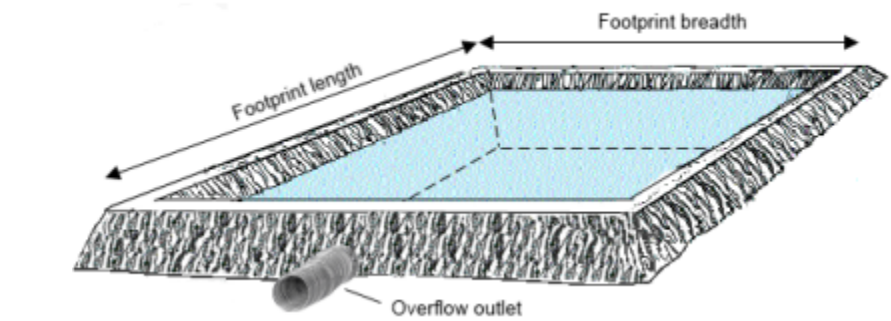
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

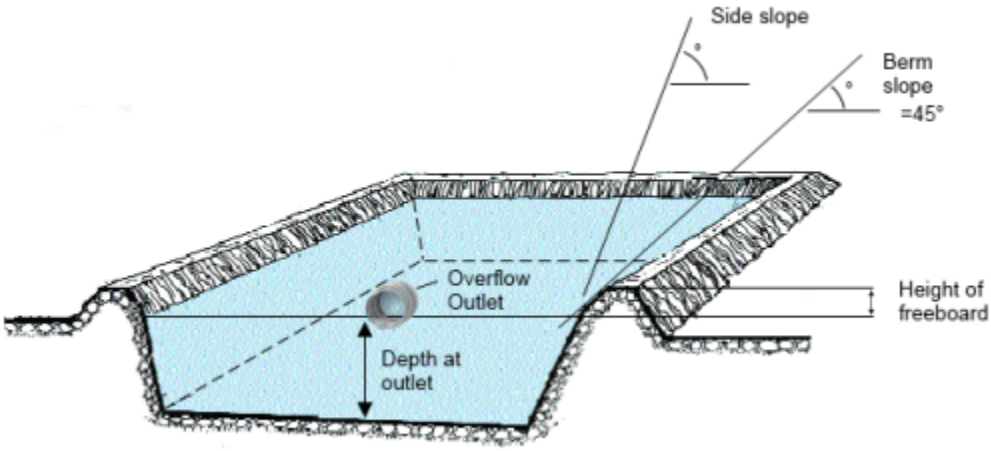
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	36.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	43.97
Pond footprint length (m)	6.63
Pond footprint width (m)	6.63
Pond catchment area (m2)	43.97
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

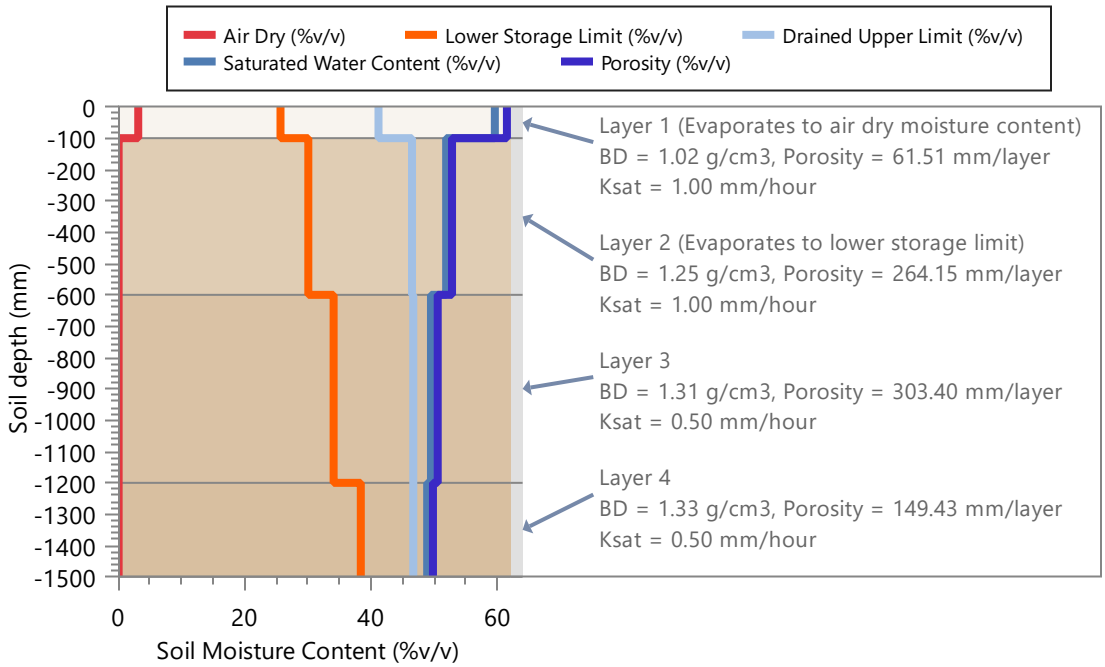
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 3800.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **36 m3**

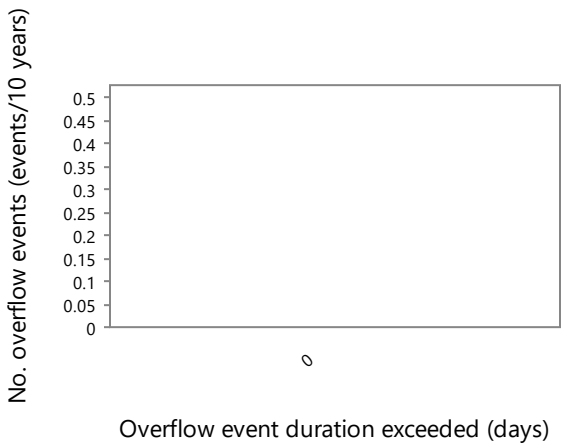
Pond System Water Balance (m3/year)

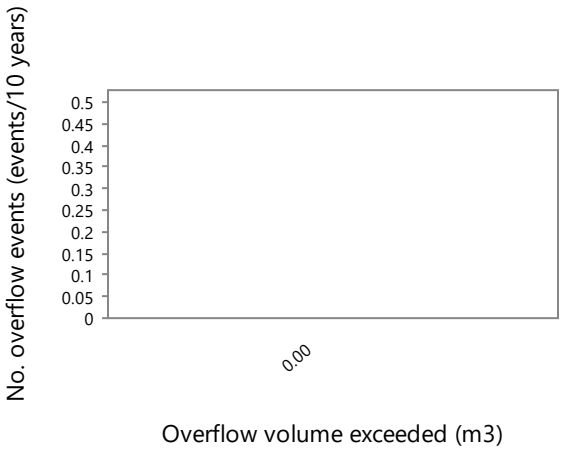
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

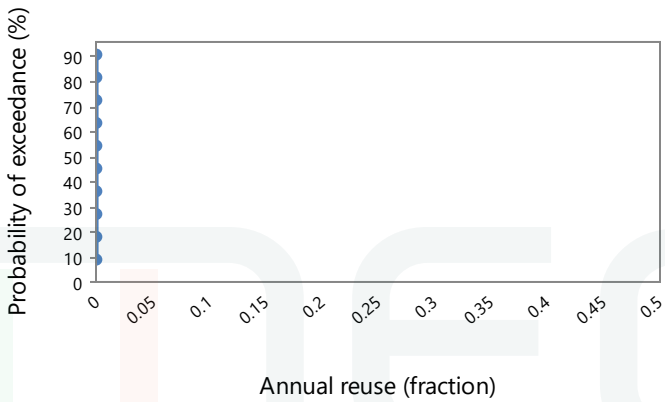
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

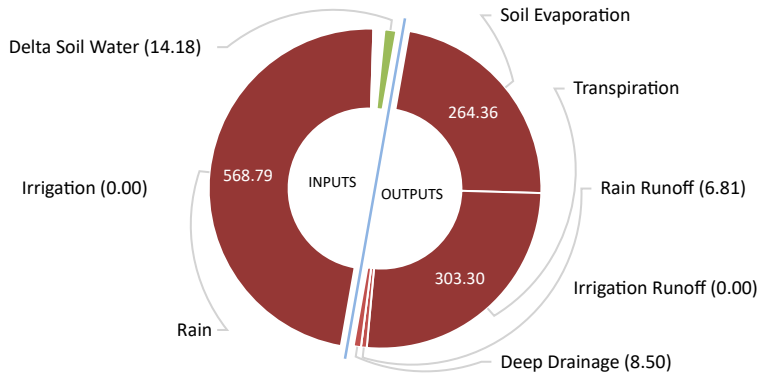
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 3800 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

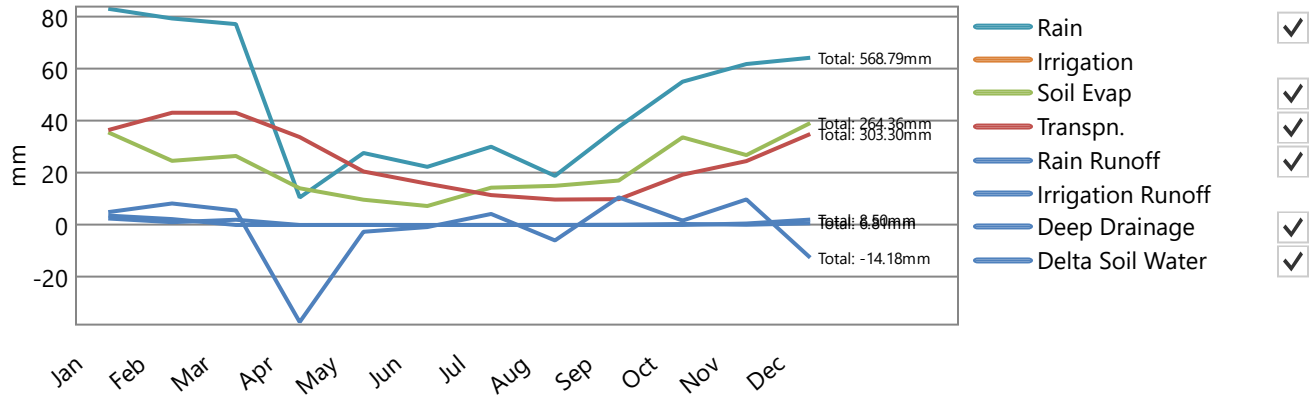
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	264.36
Transpiration	303.30
Rain Runoff	6.81
Irrigation Runoff	0.00
Deep Drainage	8.50
Delta Soil Water	-14.18

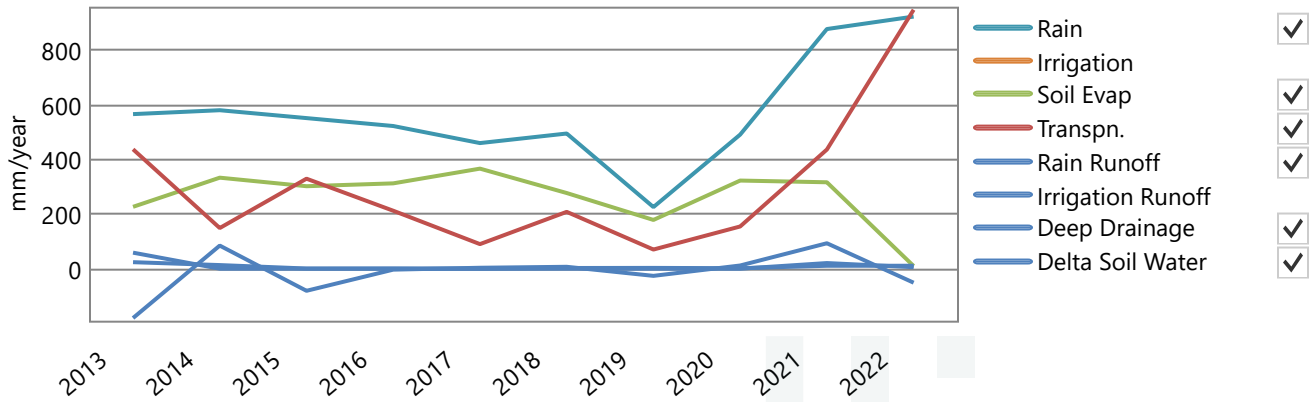
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



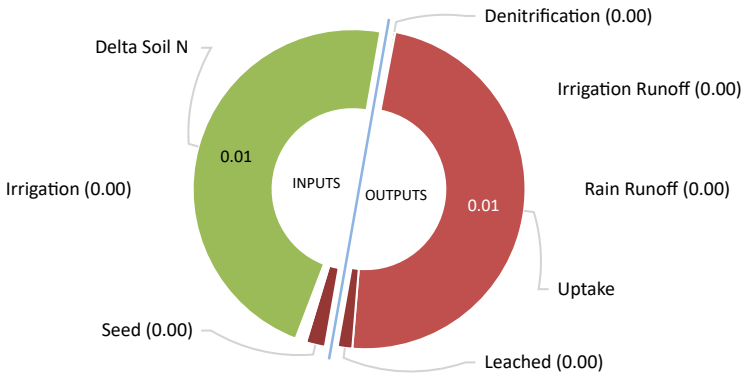
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

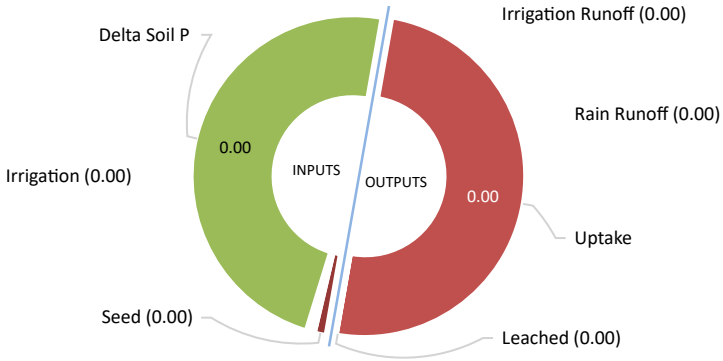
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.94E-04
Irrigation	0.00
Denitrification	3.41E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	2.20E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



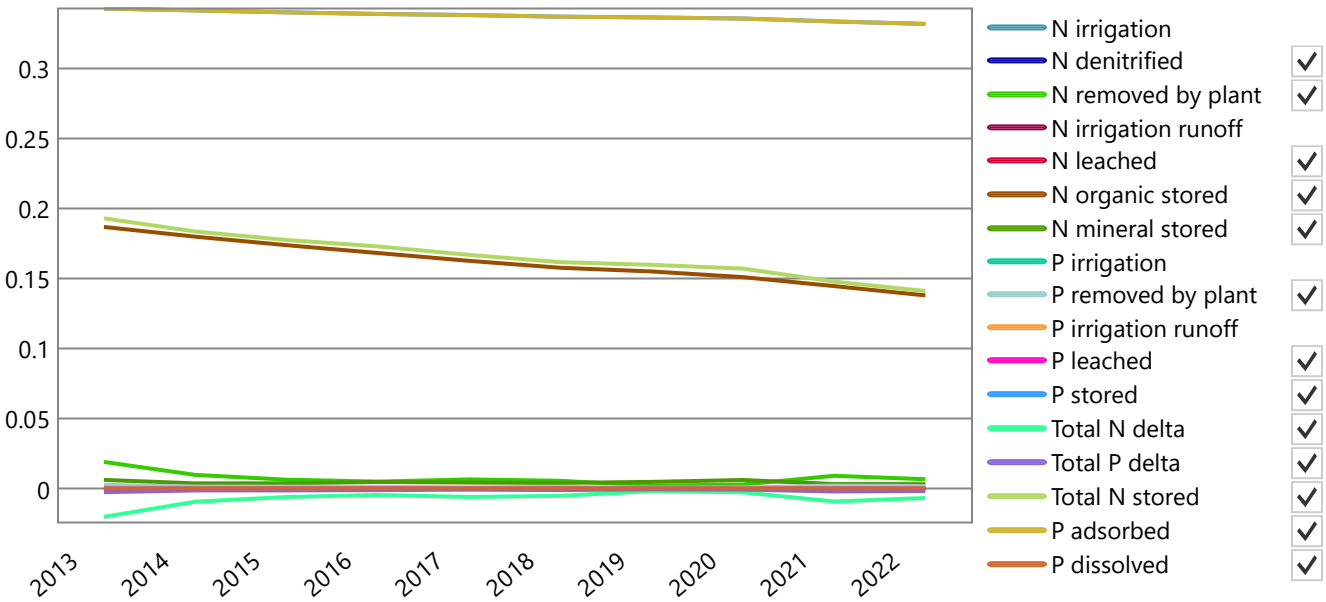
Name	Value
Seed	2.52E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.38E-03
Leached	8.41E-07
Delta Soil P	-1.36E-03

PERFORMANCE

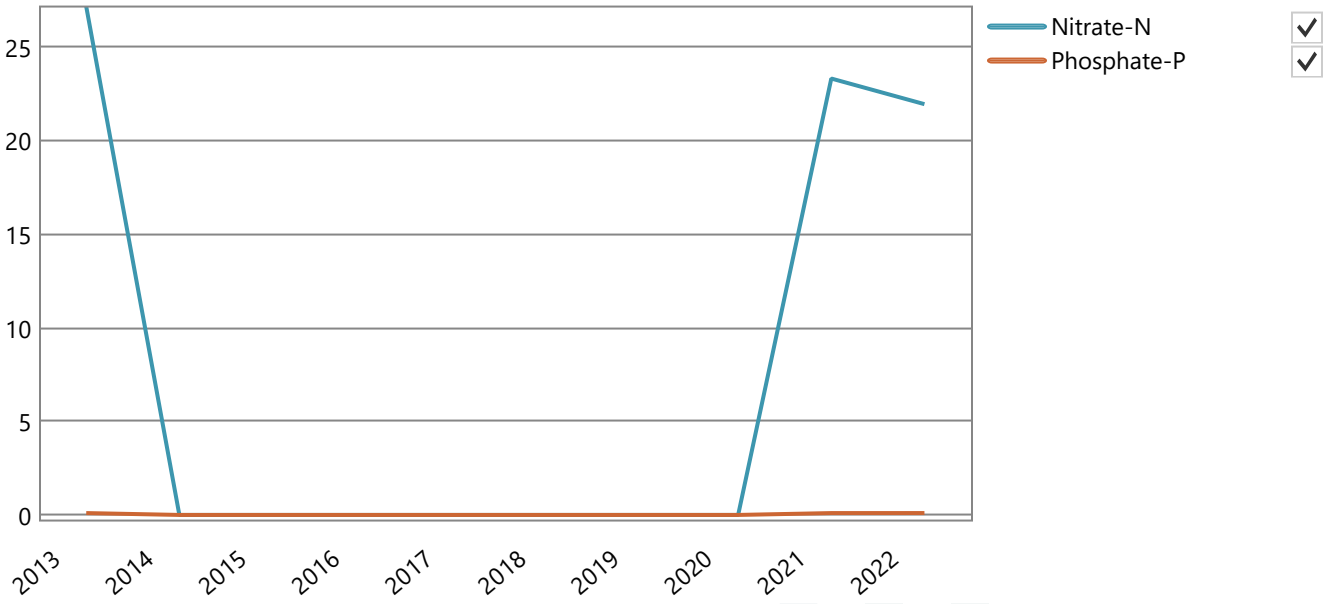
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type**: Black Earth

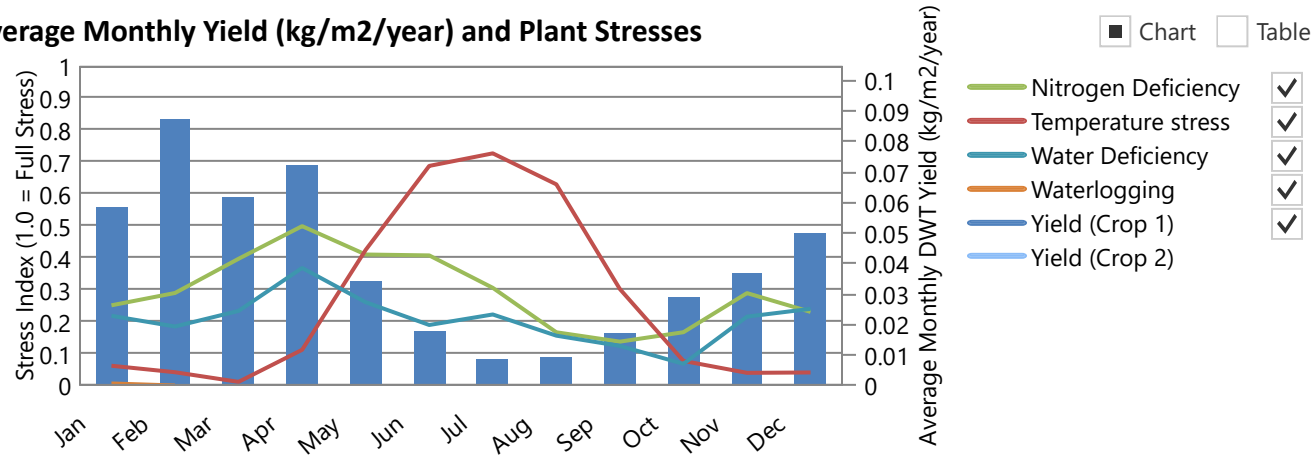
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Average monthly root depth (mm) (minimum - maximum)	467.03 (218.69 - 811.51)

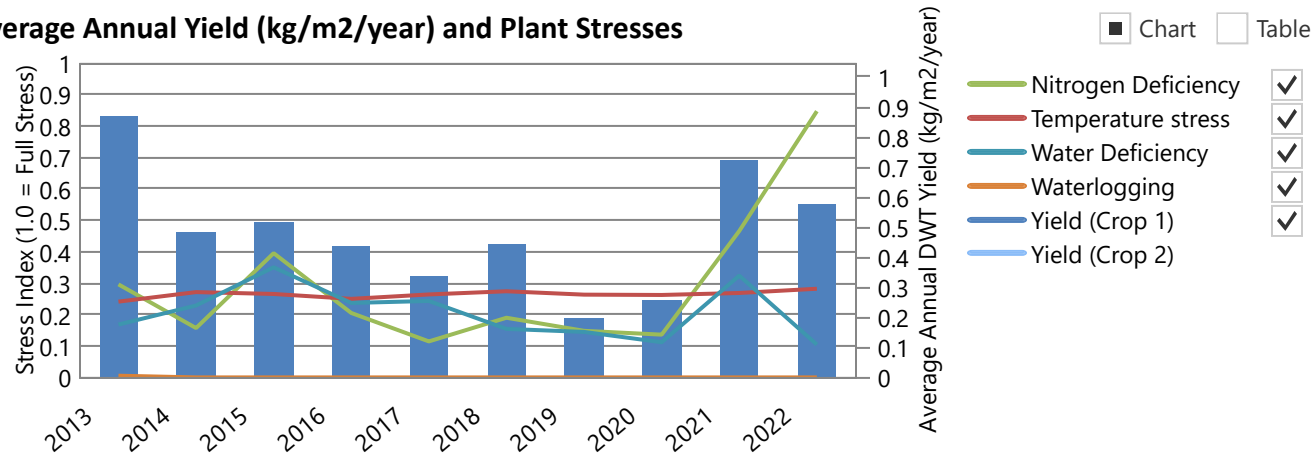
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.01 (0.00 - 0.02)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.01 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.002 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.20 (normal), 2.70 (forced by crop death due to water stress (2.70))
No. days without crop/year (days/year): 151.90 due to frosting (6.80), temperature stress - not frost (2.30), water stress (142.80)

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 3800 m2 **Soil Type: Black Earth**

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

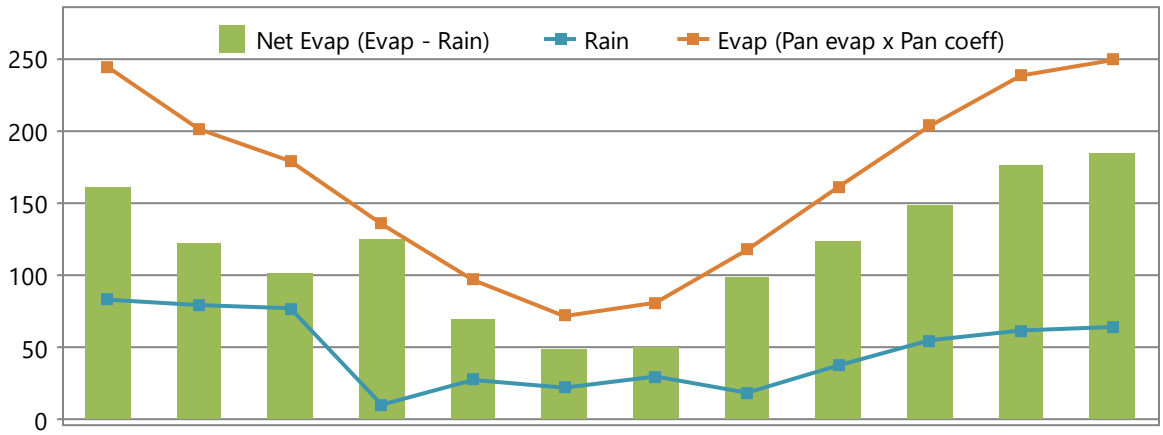
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

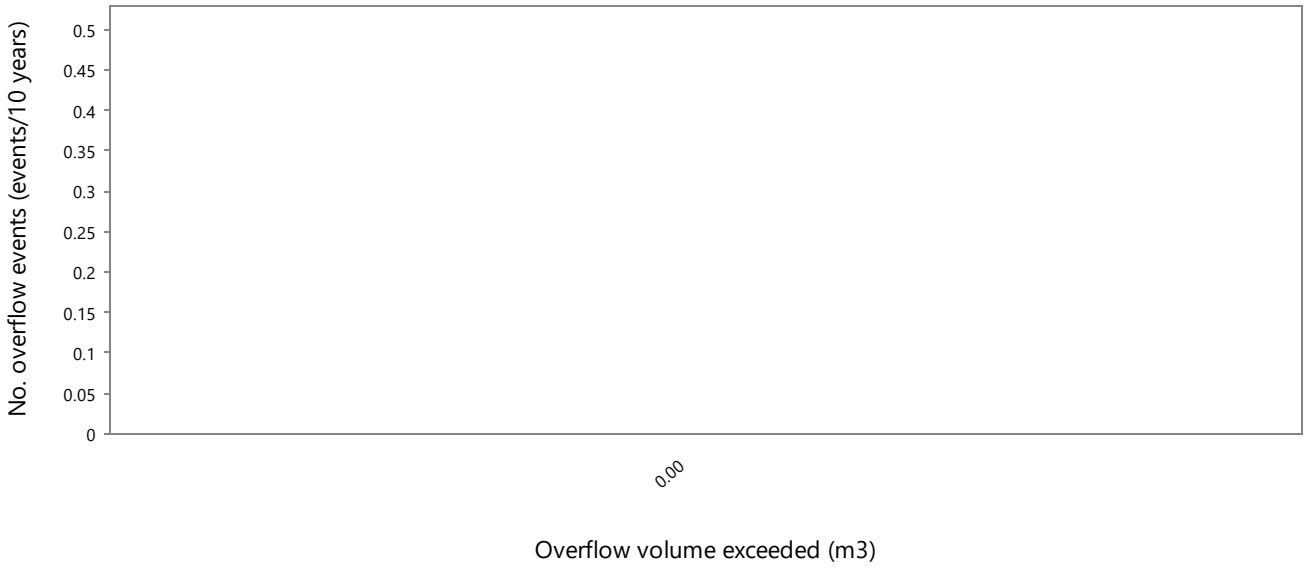
Last pond (Wet weather store): 36.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.04 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 3800 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	35.6	24.7	26.5	14.1	9.7	7.3	14.4	15.1	17.1	33.7	26.9	39.2	264.4
Transpn.	36.5	43.2	43.2	33.8	20.6	15.9	11.5	9.8	9.9	19.4	24.6	35.0	303.3
Runoff	2.5	1.1	2.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.6	6.8
Drainage	3.6	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.1	8.5
Delta	4.9	8.3	5.6	-37.4	-2.6	-0.8	4.2	-6.0	10.6	1.7	9.8	-12.6	-14.2

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.01
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.41E-05
Average annual soil nitrogen leached (kg/m2/year)	2.20E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	2.20E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.14
	0.02 - 3.11E-03
Average nitrate-N concentration of deep drainage (mg/L)	25.87
Max. annual nitrate-N concentration of deep drainage (mg/L)	27.15

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	1.38E-03
Average annual soil phosphorus leached (kg/m2/year)	8.41E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 3.47E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.33
Average phosphate-P concentration in rootzone (mg/L)	0.06
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

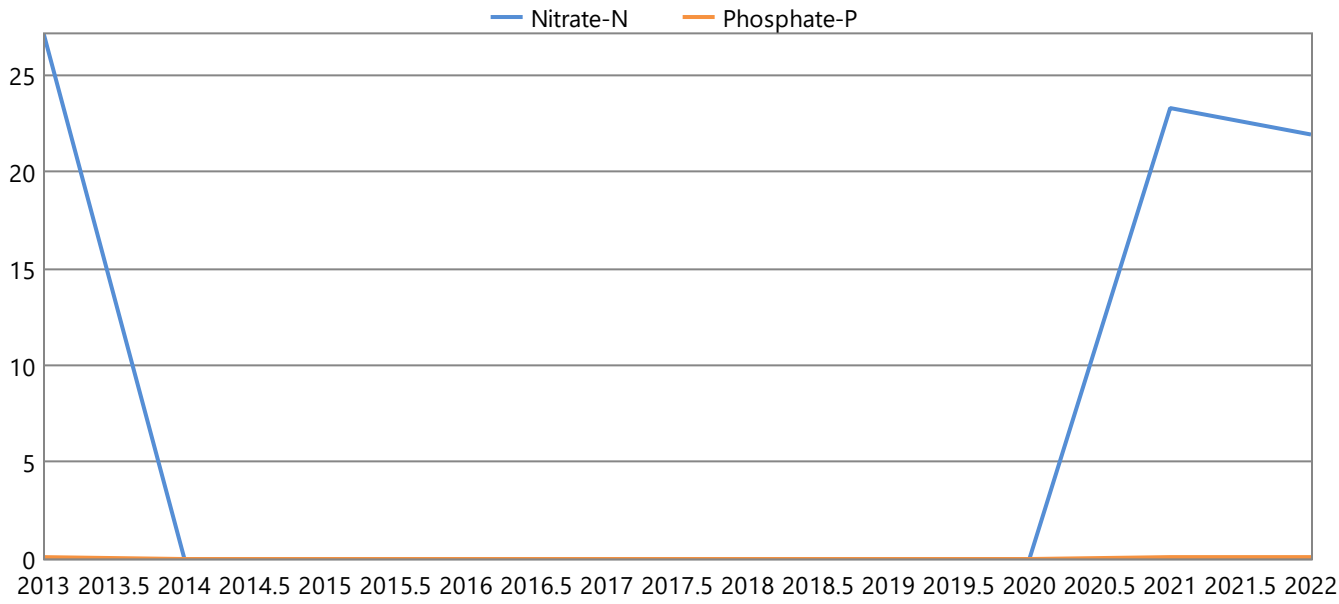
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

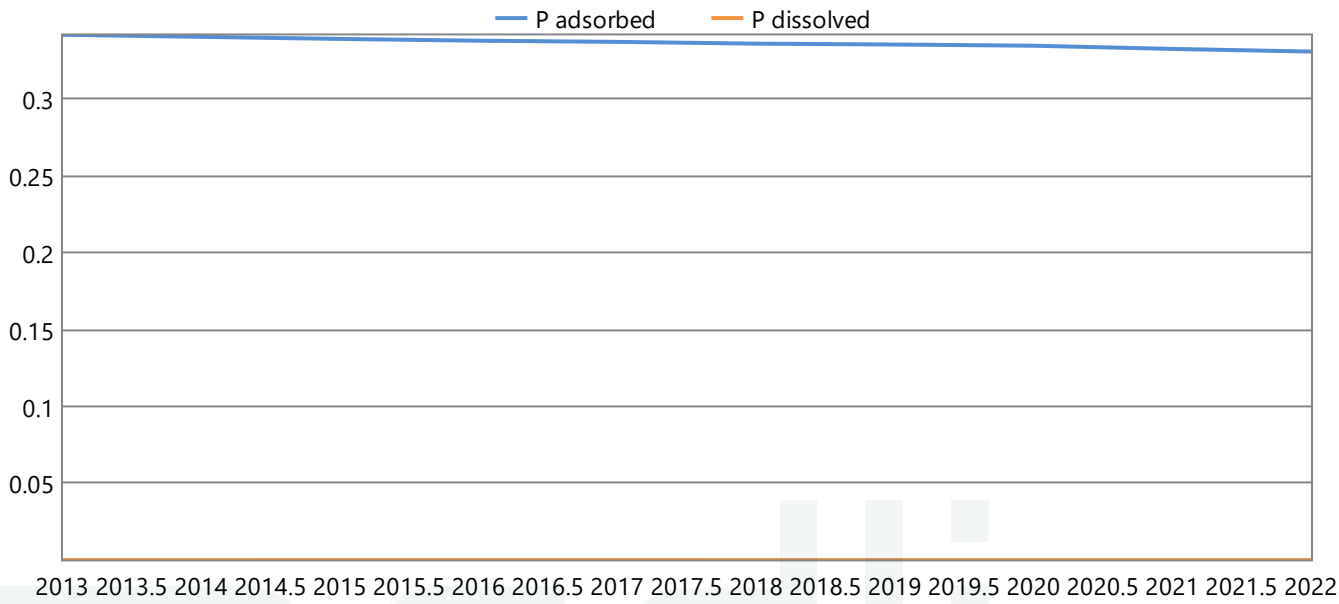
Paddock Land: Girrahween Office Application Ar: 3800 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 3800 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction)	0.36 (0.13 - 0.64)
Average monthly crop factor (fraction)	0.29 (0.10 - 0.51)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	467.03 (218.69 - 811.51)
Average number of normal harvests per year (no./year)	0.20 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.20
Average number of crop deaths per year (no./year)	2.70 (0.00 - 5.00)
Average number of crop deaths for last five years only (no./year)	1.60
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.30 (0.11 - 0.85)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.21 (0.07 - 0.37)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	151.90

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
IRRIGATION LOAD SCENARIO: 90EP
10-year run period
TN=30, TP=20, EC=1600

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

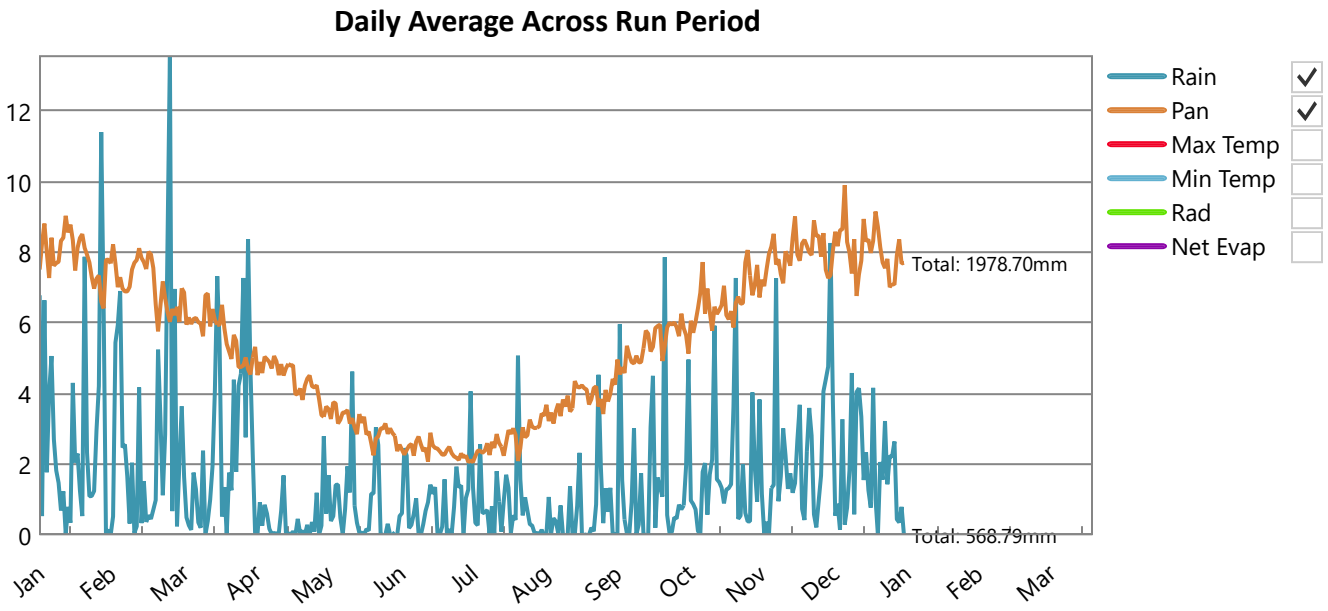
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

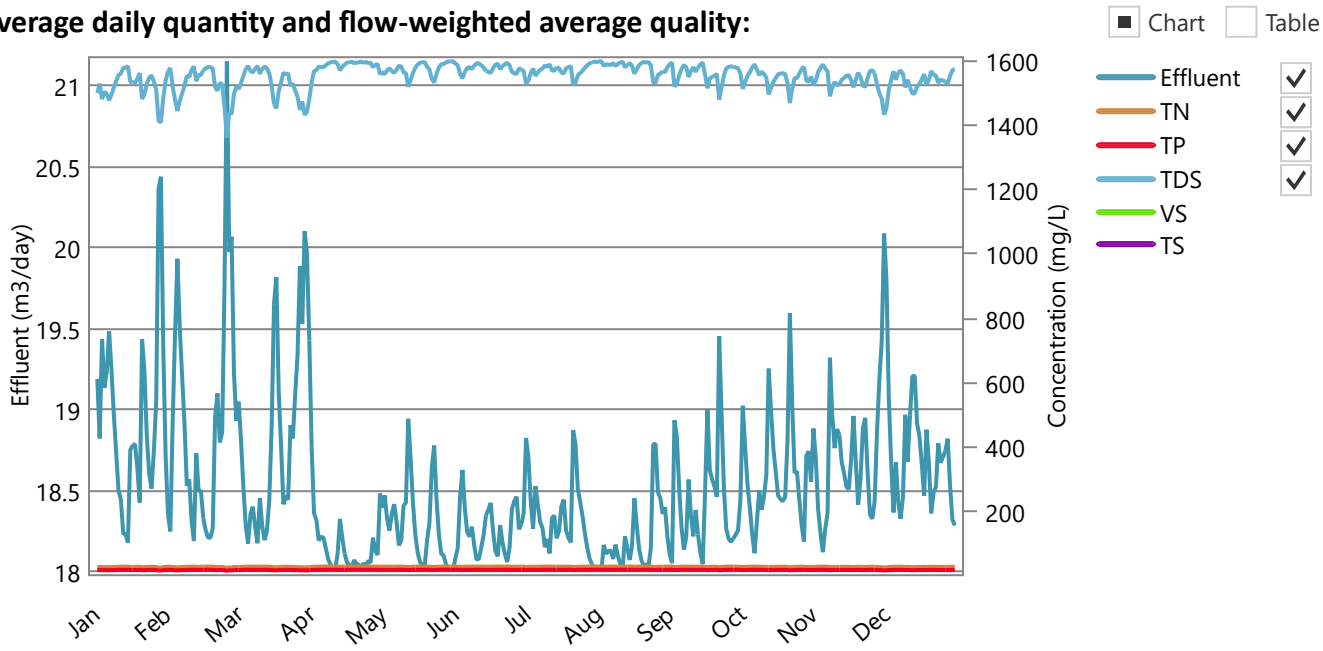


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 6771.20 m3/year or 18.54 m3/day (Min-Max: 18.00 - 33.31)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

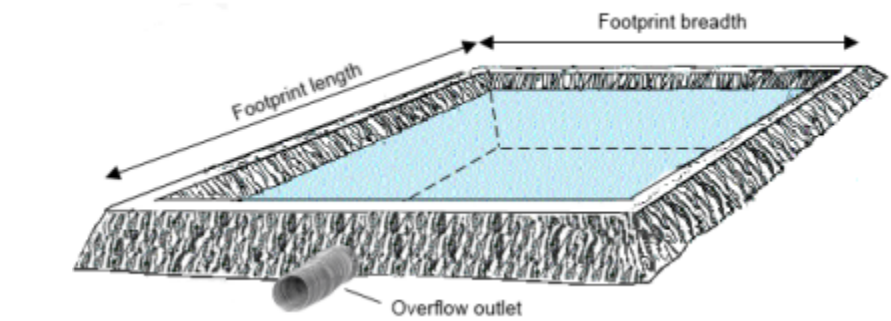
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	197.21 (197.10 - 197.64)
Total Phosphorus	19.42 (10.81 - 20.00)	131.47 (131.40 - 131.76)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	10517.76 (10512.00 - 10540.80)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

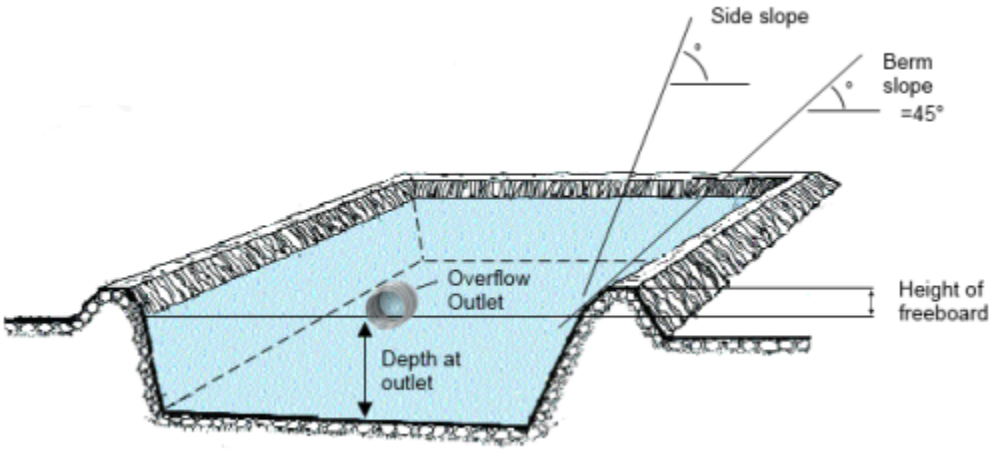
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	54.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	63.70
Pond footprint length (m)	7.98
Pond footprint width (m)	7.98
Pond catchment area (m2)	63.70
Average active volume (m3)	0.73





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	10000.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

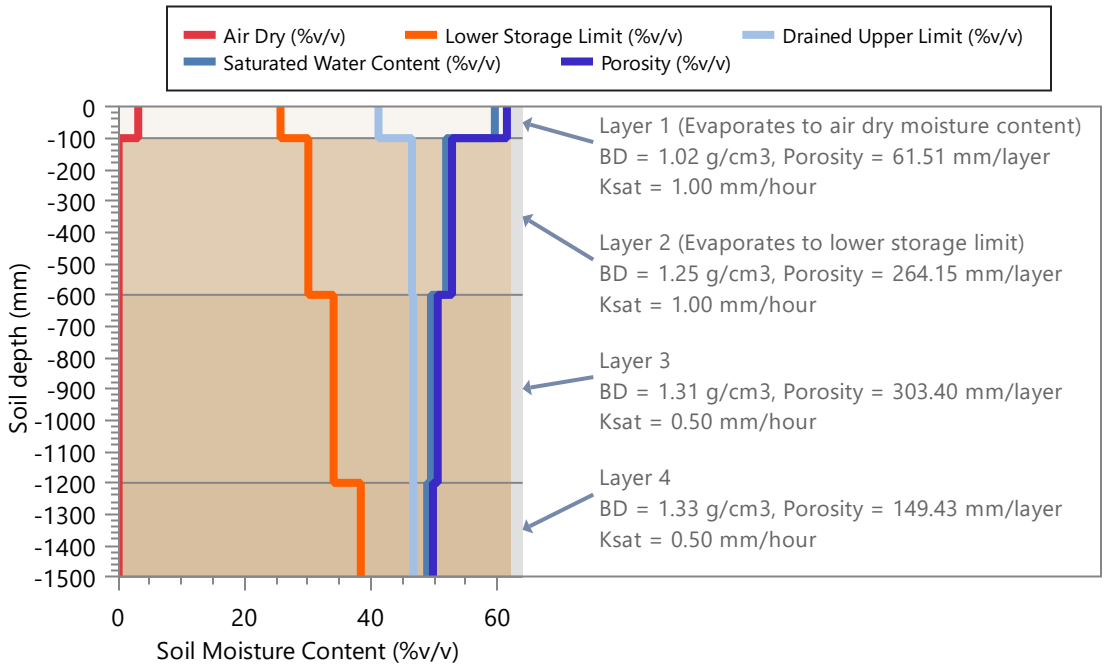
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 5675.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

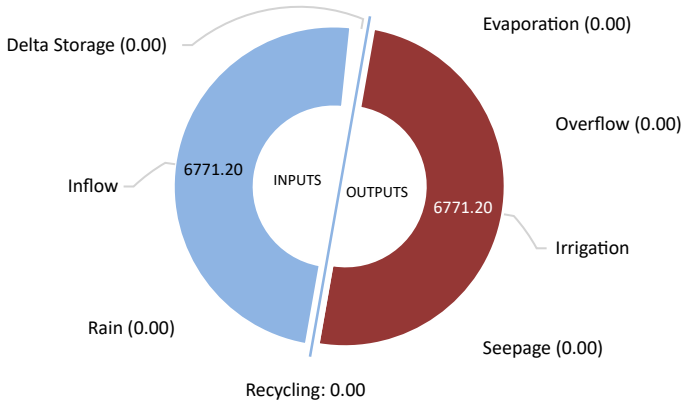
Average monthly cover (fraction) (minimum - maximum)	0.87 (0.79 - 0.91)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **54 m3**

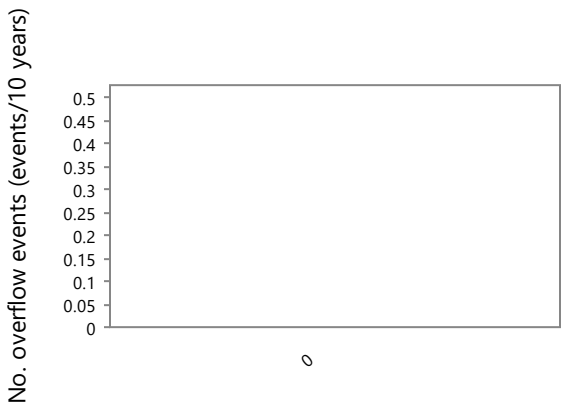
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	6771.20
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	6771.20
Seepage	0.00
Delta Storage	0.00

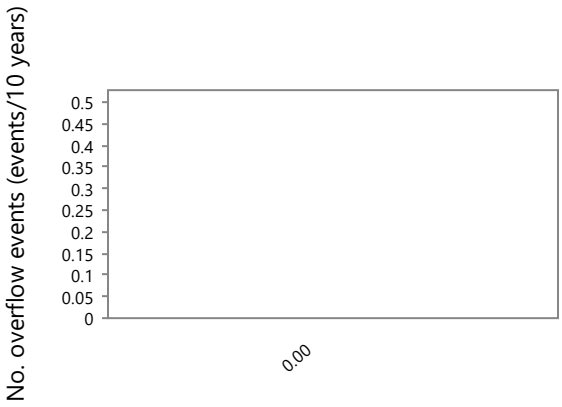
Overflow Diagnostics

Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% reuse (fraction)	1.00



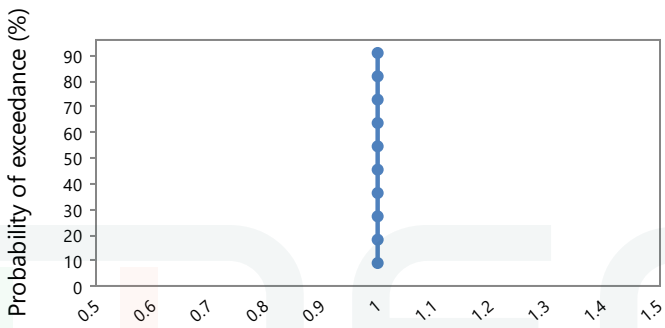
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

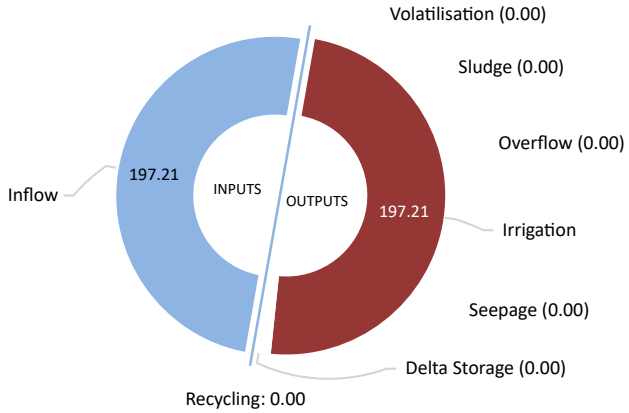
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

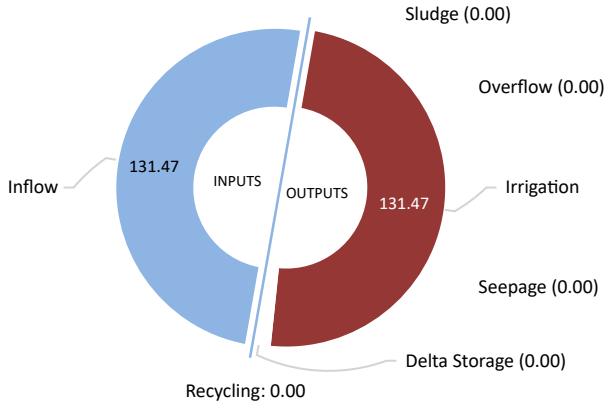
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



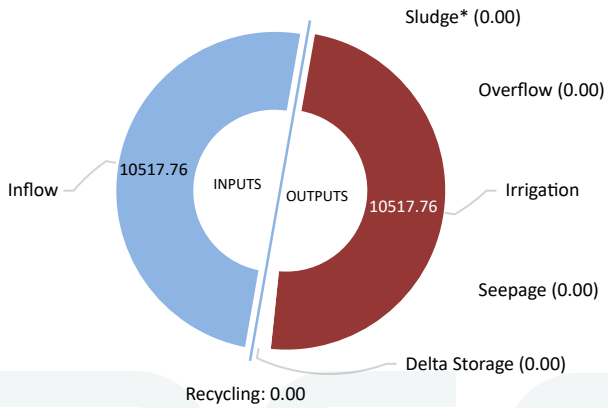
Name	Value
Inflow	197.21
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	197.21
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)



Name	Value
Inflow	131.47
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	131.47
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)



Name	Value
Inflow	10517.76
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	10517.76
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	24.86
Average phosphorus concentration of pond liquid (mg/L)	16.57
Average salinity of pond liquid (dS/m)	2.07

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	29.99
Final phosphorus concentration of pond liquid (mg/L)	19.99
Final salinity of pond liquid (dS/m)	2.50

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	6771.20
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	6771.20
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	29.12
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	24.46
Average phosphorus concentration of irrigation water (mg/L)	19.42
Average salinity of irrigation water (dS/m)	2.43

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

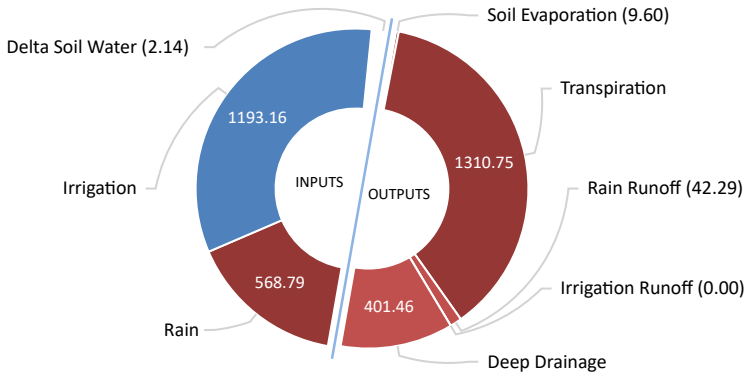
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 5675 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

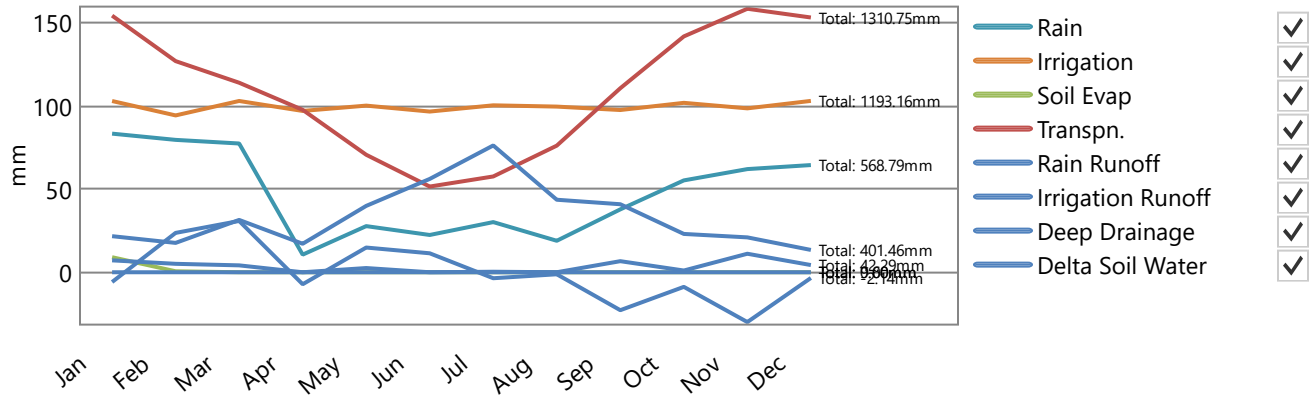
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	1193.16
Soil Evaporation	9.60
Transpiration	1310.75
Rain Runoff	42.29
Irrigation Runoff	0.00
Deep Drainage	401.46
Delta Soil Water	-2.14

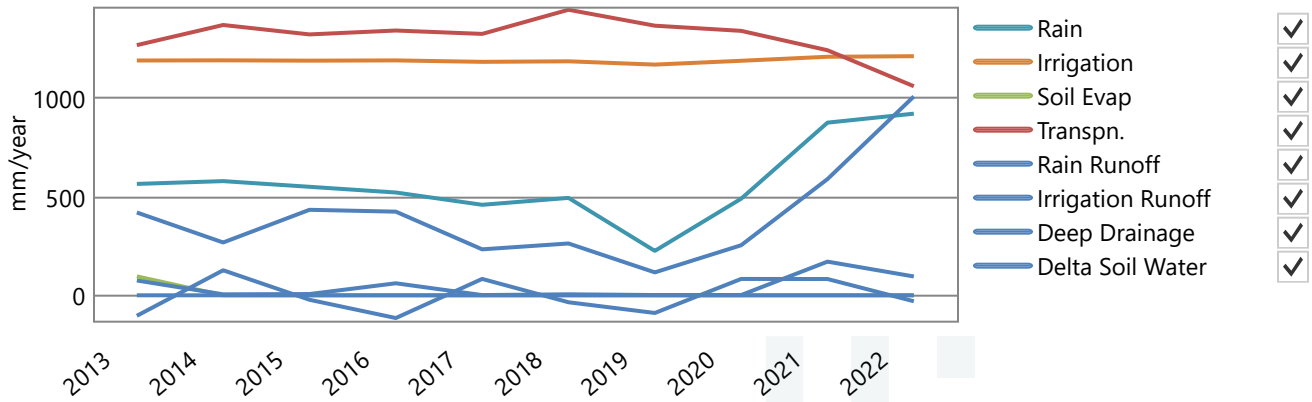
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



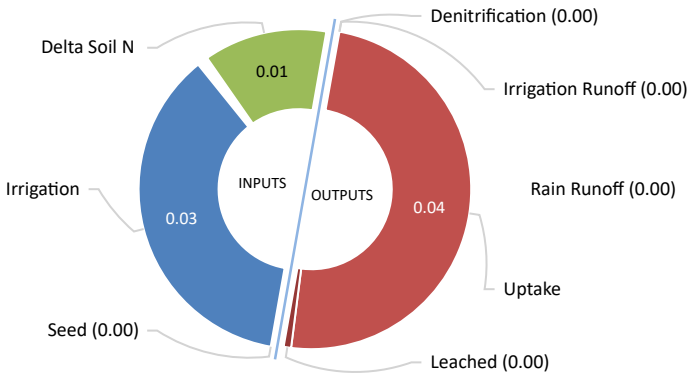
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

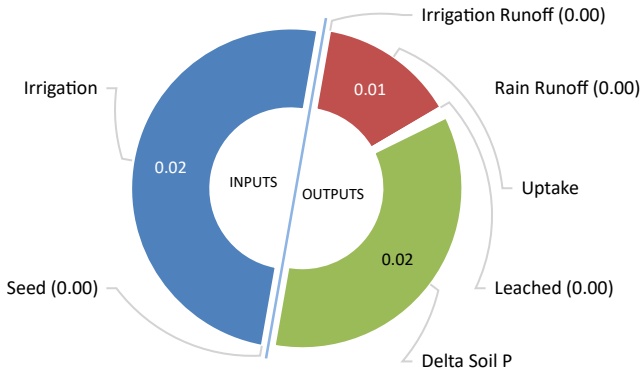
Irrigation ammonium volatilisation losses (kg/m2/year): 0.01
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.05E-05
Irrigation	0.03
Denitrification	2.65E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.04
Leached	5.86E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



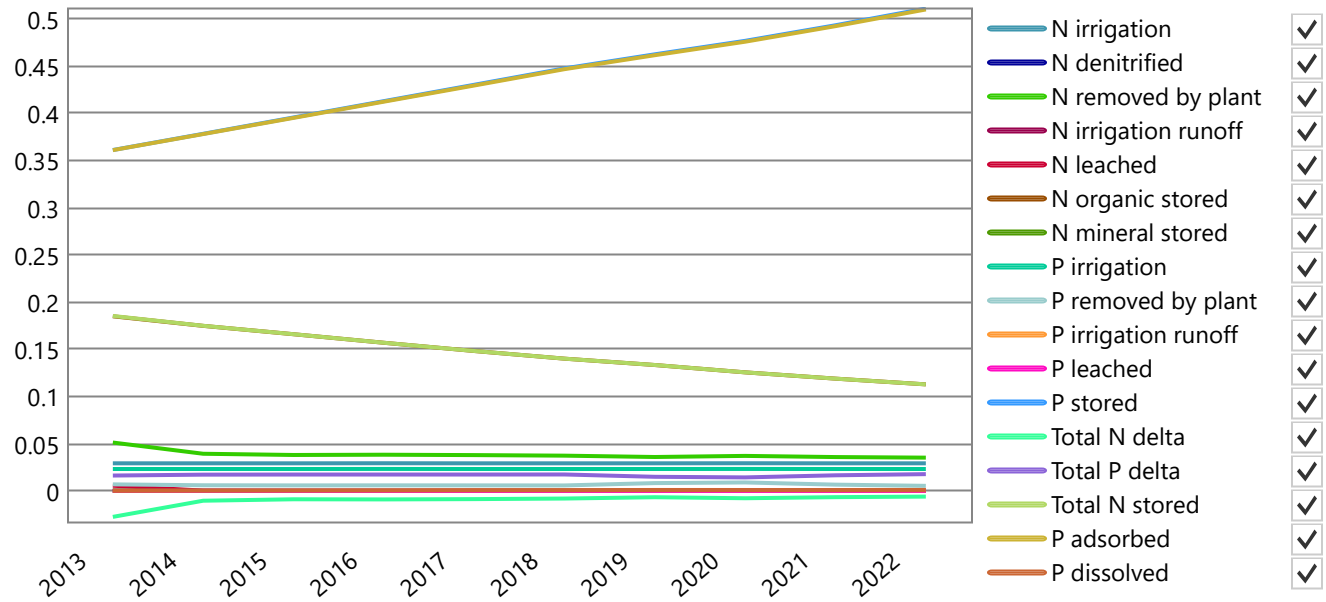
Name	Value
Seed	9.00E-07
Irrigation	0.02
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	4.03E-05
Delta Soil P	0.02

PERFORMANCE

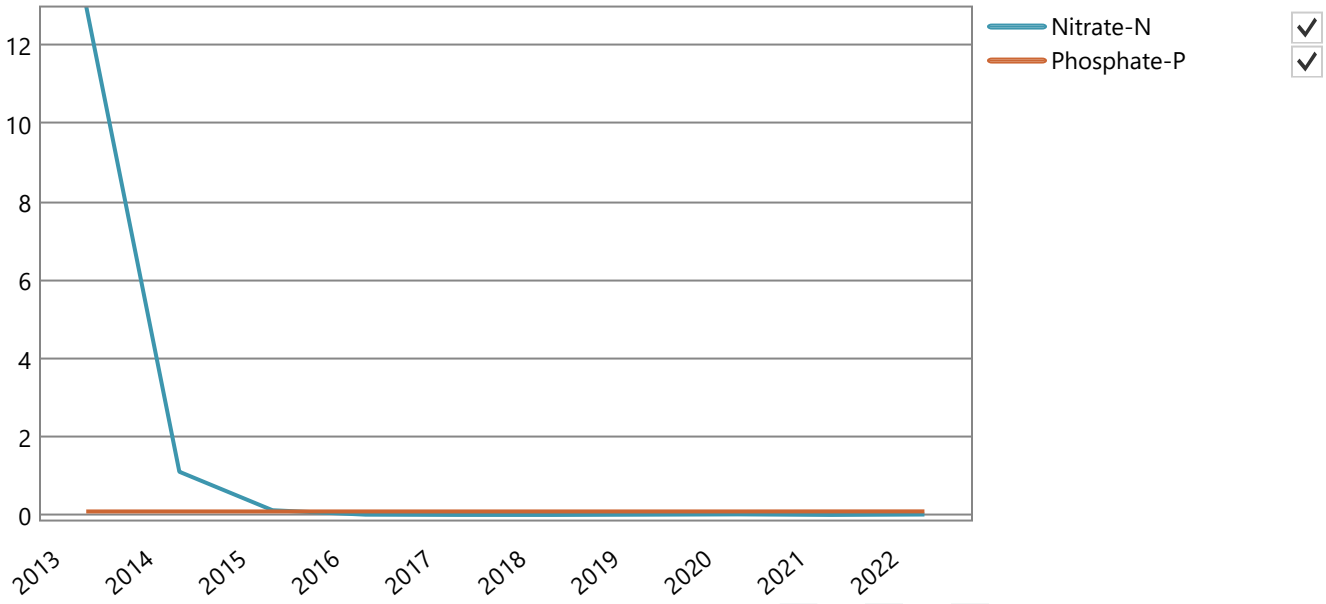
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

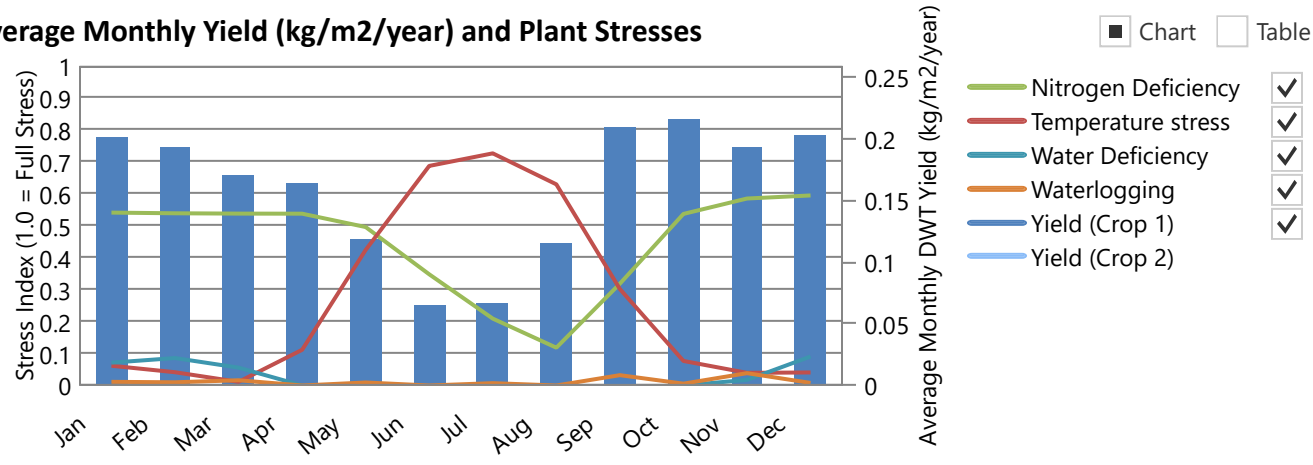
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.92 (1.67 - 2.30)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.87 (0.79 - 0.91)
Average monthly root depth (mm) (minimum - maximum)	1194.35 (1135.07 - 1200.00)

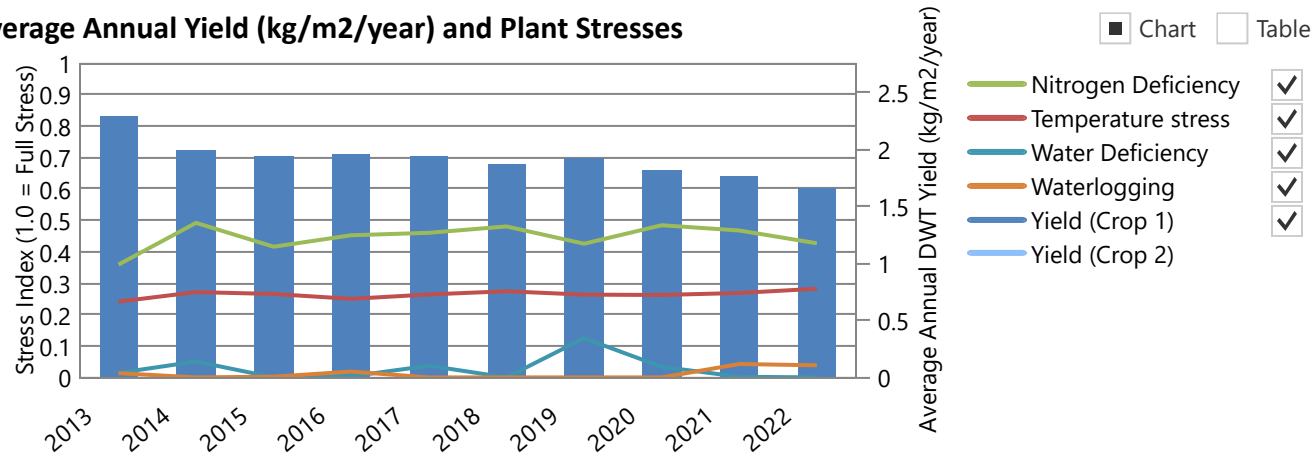
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.04 (0.04 - 0.05)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.01 (0.01 - 0.01)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.02 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.005)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 3.40 (normal)
No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

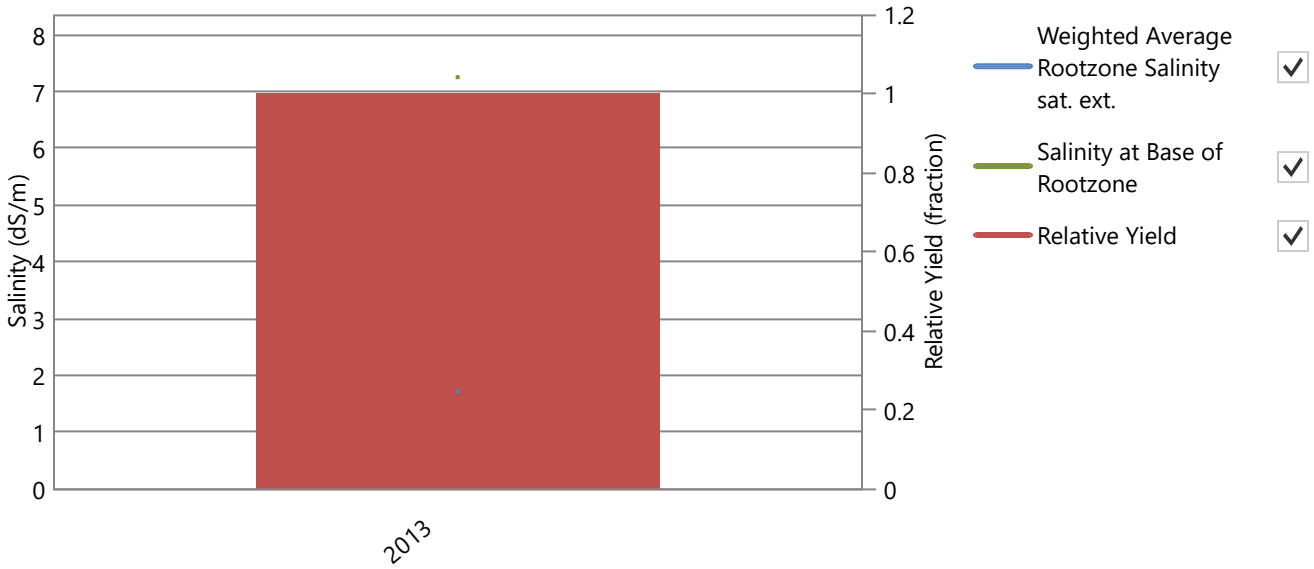
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.25
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

Average Annual Rootzone Salinity and Relative Yield:

Chart Table

All values based on 10 year running averages



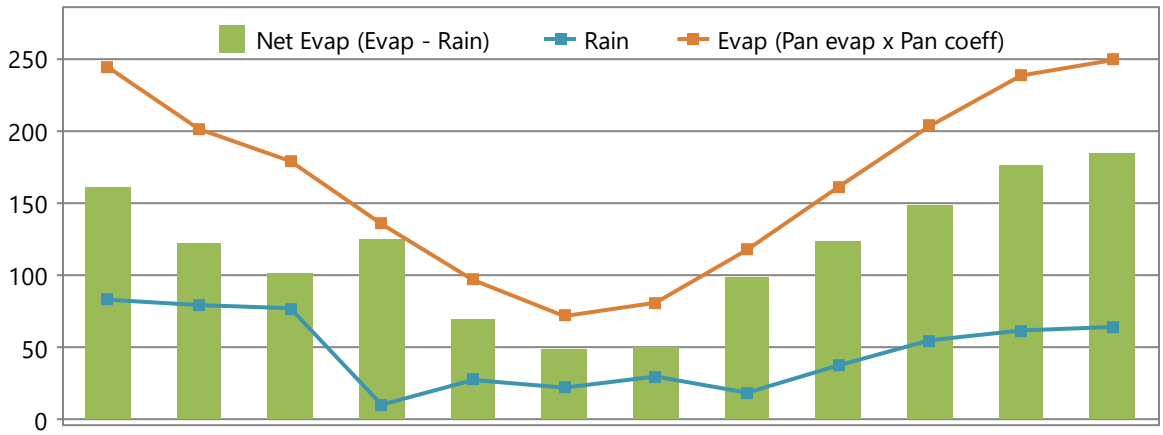
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 6771.20 m3/year or 18.54 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.20 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	29.12 (16.21 - 30.00)	197.21 (197.10 - 197.64)
Total Phosphorus	19.42 (10.81 - 20.00)	131.47 (131.40 - 131.76)
Total Dissolved Salts	1553.31 (864.63 - 1600.00)	10517.76 (10512.00 - 10540.80)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

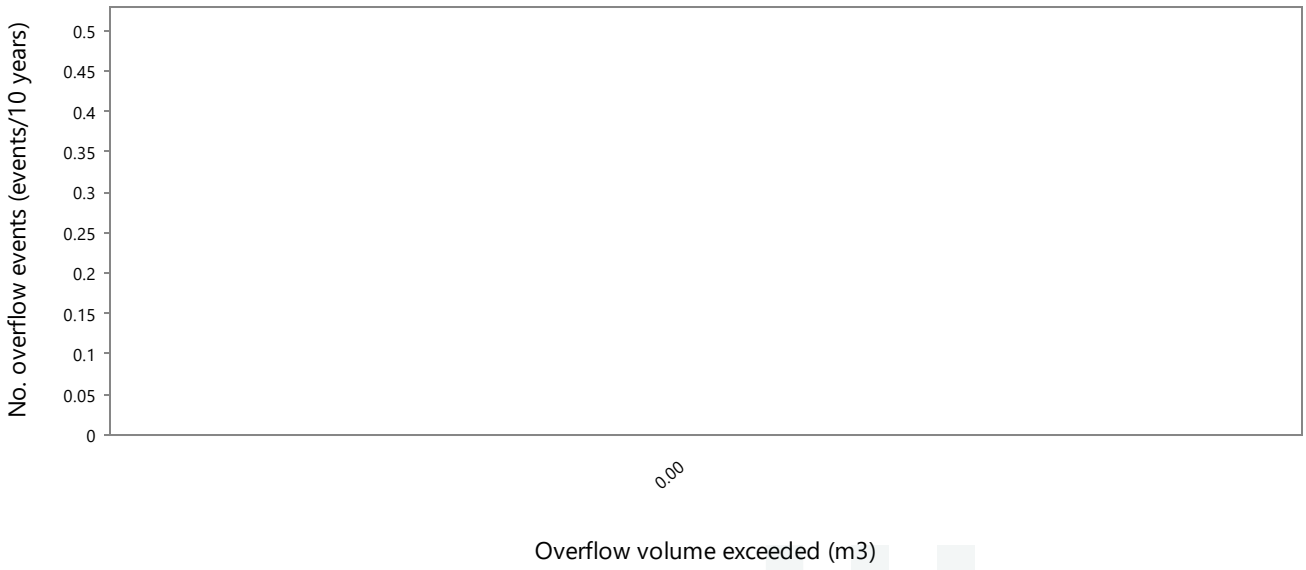
Last pond (Wet weather store): 54.00 m3

Theoretical hydraulic retention time (days)	2.91
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.06 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	1.00
Probability of at least 90% effluent reuse (fraction)	1.00
Average salinity of last pond (dS/m)	2.07
Salinity of last pond on final day of simulation (dS/m)	2.50
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 5675 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	6771.20	1.19
Total nitrogen applied (kg)	165.65	0.03
Total phosphorus applied (kg)	131.47	0.02
Total salts applied (kg)	10517.76	1.85

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	102.8	94.2	102.8	96.8	100.0	96.5	100.2	99.5	97.4	101.7	98.4	102.9	1193.2
Soil Evap	9.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
Transpn.	154.1	126.7	113.8	97.5	70.5	51.4	57.5	76.0	110.5	141.6	158.2	152.9	1310.8
Rain Runoff	7.1	5.1	4.1	0.0	2.5	0.0	0.3	0.0	6.6	1.0	11.1	4.3	42.3
Irr. Runoff	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Drainage	21.7	17.6	31.4	17.1	39.8	56.0	76.1	43.5	40.8	23.0	20.9	13.4	401.5
Delta	-5.9	23.6	30.8	-7.2	14.8	11.4	-3.6	-1.2	-22.8	-8.8	-29.9	-3.4	-2.1

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.04
Average annual soil nitrogen removed by denitrification (kg/m2/year)	2.65E-05
Average annual soil nitrogen leached (kg/m2/year)	5.86E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	5.86E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.11
	0.02 - 8.28E-06
Average nitrate-N concentration of deep drainage (mg/L)	1.46
Max. annual nitrate-N concentration of deep drainage (mg/L)	12.99

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.02
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	0.01
Average annual soil phosphorus leached (kg/m2/year)	4.03E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 1.00E-03
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.51
Average phosphate-P concentration in rootzone (mg/L)	1.17
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 13.47 mg/L (years)	33.77

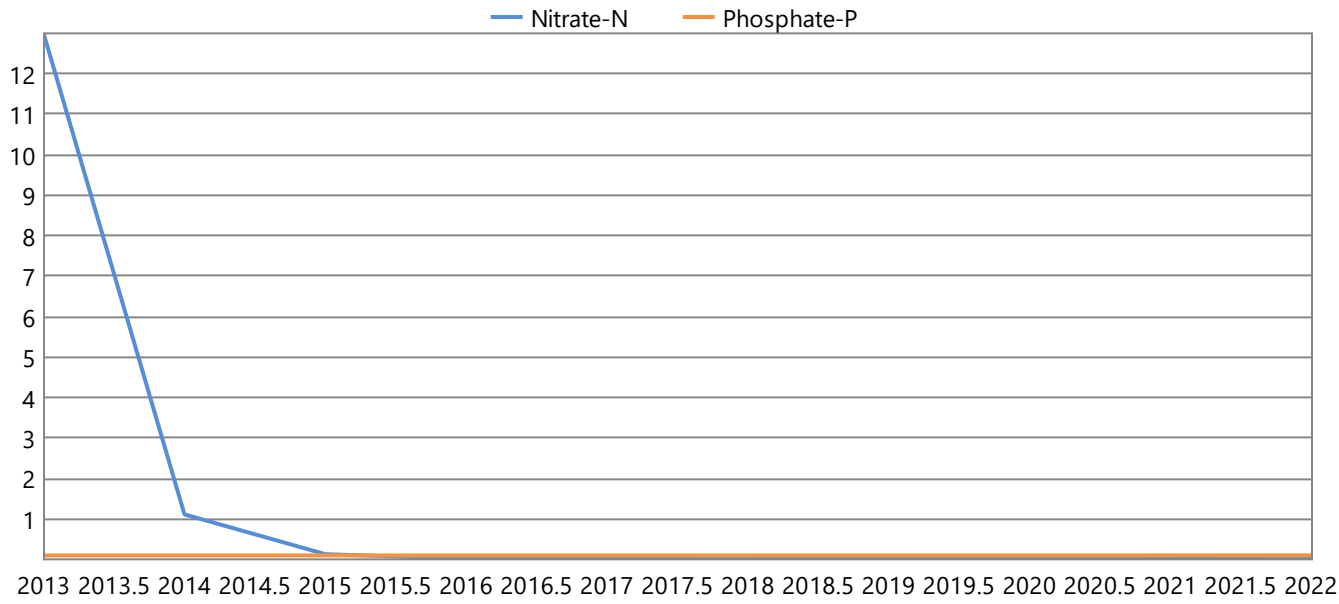
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

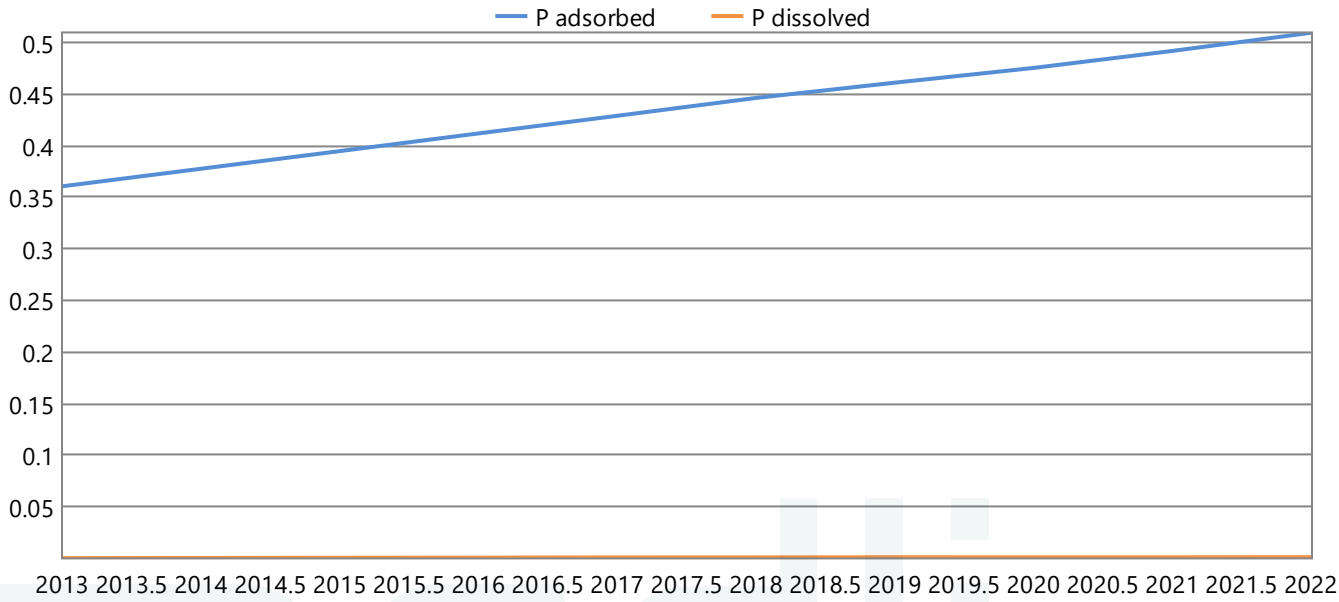
Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Annual nutrient leachate concentration (mg/L)



Annual Phosphate-P in soil (kg/m2)



DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 5675 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.92 (1.67 - 2.30)
Average monthly plant (green) cover (fraction)	0.87 (0.79 - 0.91)
Average monthly crop factor (fraction)	0.70 (0.64 - 0.73)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1194.35 (1135.07 - 1200.00)
Average number of normal harvests per year (no./year)	3.40 (3.00 - 4.00)
Average number of normal harvests for last five years only (no./year)	3.20
Average number of crop deaths per year (no./year)	0.00 (0.00 - 0.00)
Average number of crop deaths for last five years only (no./year)	0.00
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.45 (0.36 - 0.49)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.03 (0.00 - 0.09)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.04)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts

All values based on 10 year running averages

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	1.69
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	1.86
Average leaching fraction based on 10 year running averages (fraction)	0.45
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	1.72
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	7.25
Relative crop yield expected due to salinity (fraction)	1.00
Proportion of years that crop yields would be expected to fall below 90% of potential due to salinity (fraction)	0.00

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

Enterprise: **Girrahween Temporary MDCs Assessment**

Description:
Scenarios to assess the effluent irrigation scheme sizing

Client: **Arrow Energy**

MEDLI User: GHDNET\lekuskopf

Scenario Details:
MOBILE DRILLING CAMP NO. 2 - "Bellevue Part 2'
***
NO IRRIGATION SCENARIO: 90EP

DESCRIPTION

Climate Data: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days

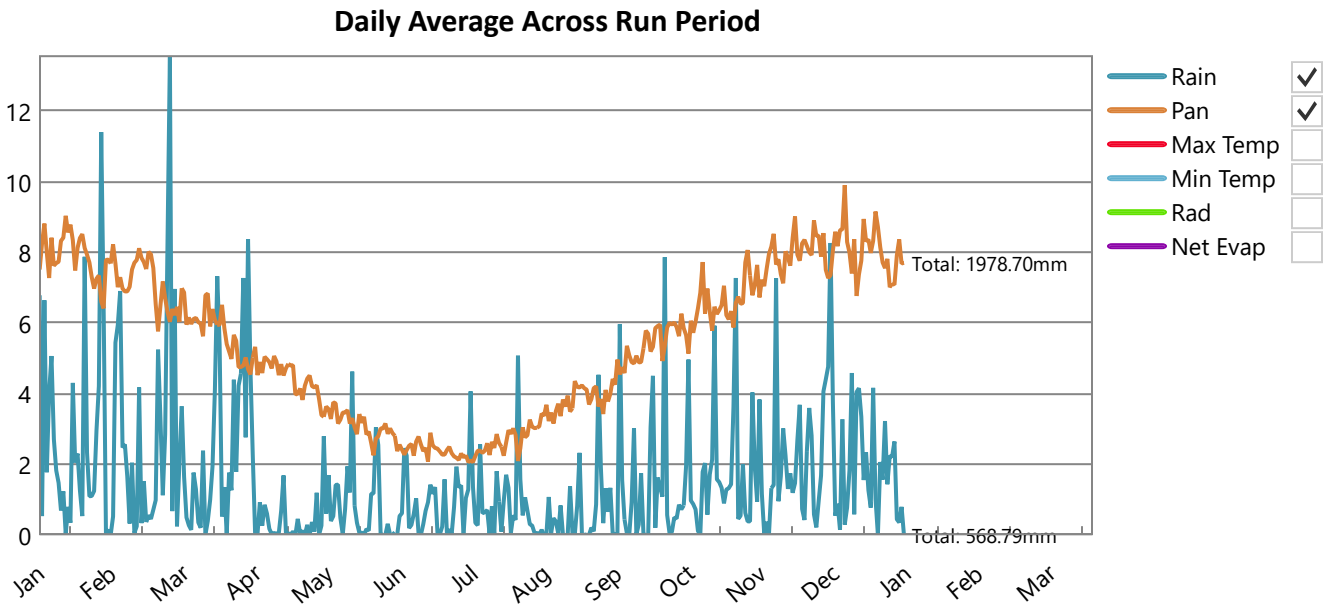
Climate Statistics:

	10th Percentile	50th Percentile	90th Percentile
Rainfall (mm/year)	343	537	900
Pan Evaporation (mm/year)	1644	2013	2259

Climate Data:

Chart Table

Monthly Daily

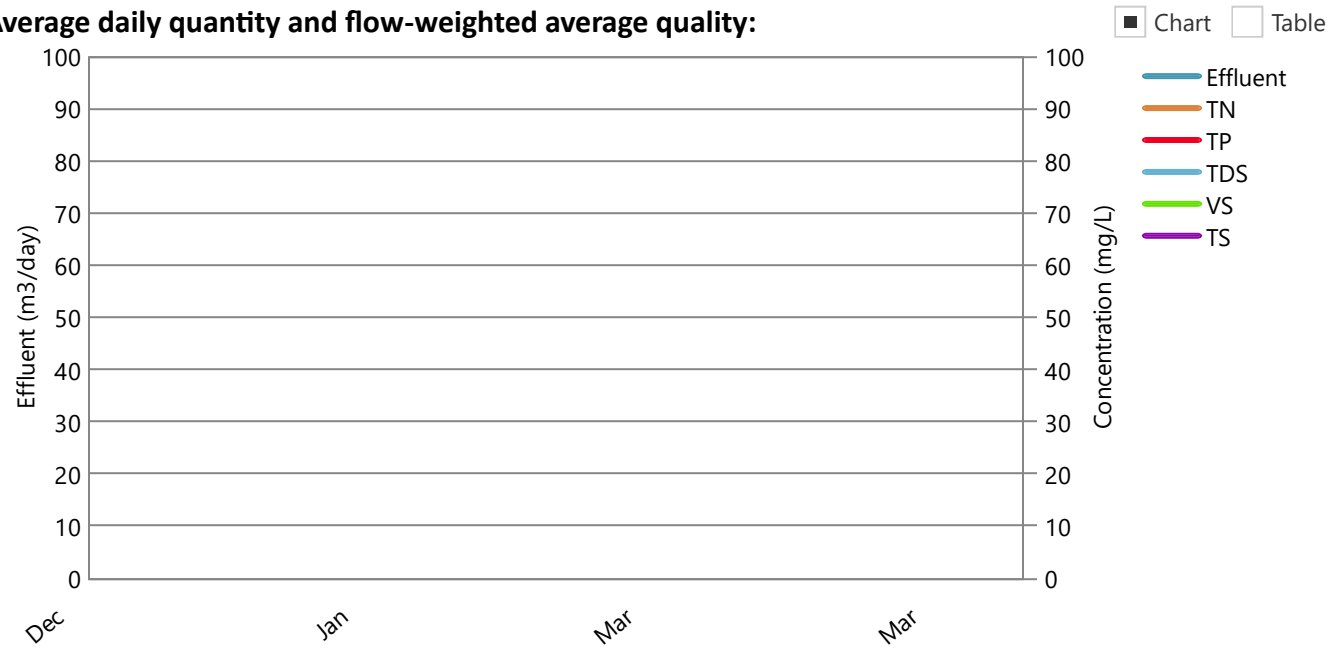


DESCRIPTION

Effluent type: Girrahween Warehouse/Office STP - Indicative

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **0.00 m3/year** or 0.00 m3/day (Min-Max: 0.00 - 0.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

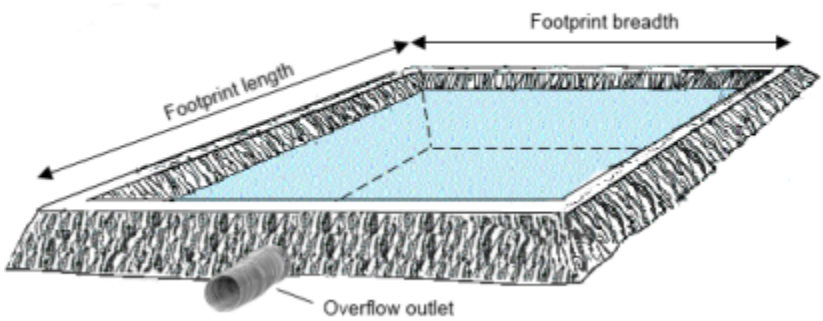
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

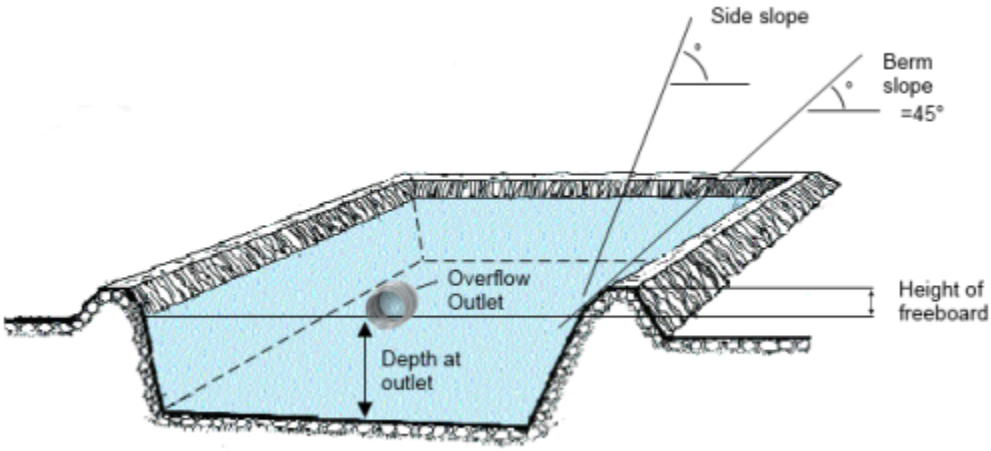
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	54.00
Minimum allowable pond volume (m3)	0.00
Pond depth at overflow outlet (m)	1.00
Maximum water surface area (m2)	63.70
Pond footprint length (m)	7.98
Pond footprint width (m)	7.98
Pond catchment area (m2)	63.70
Average active volume (m3)	0.00





Irrigation pump limits:

Minimum pump rate limit (ML/day)	0.00
Maximum pump rate limit (ML/day)	0.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (ML/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

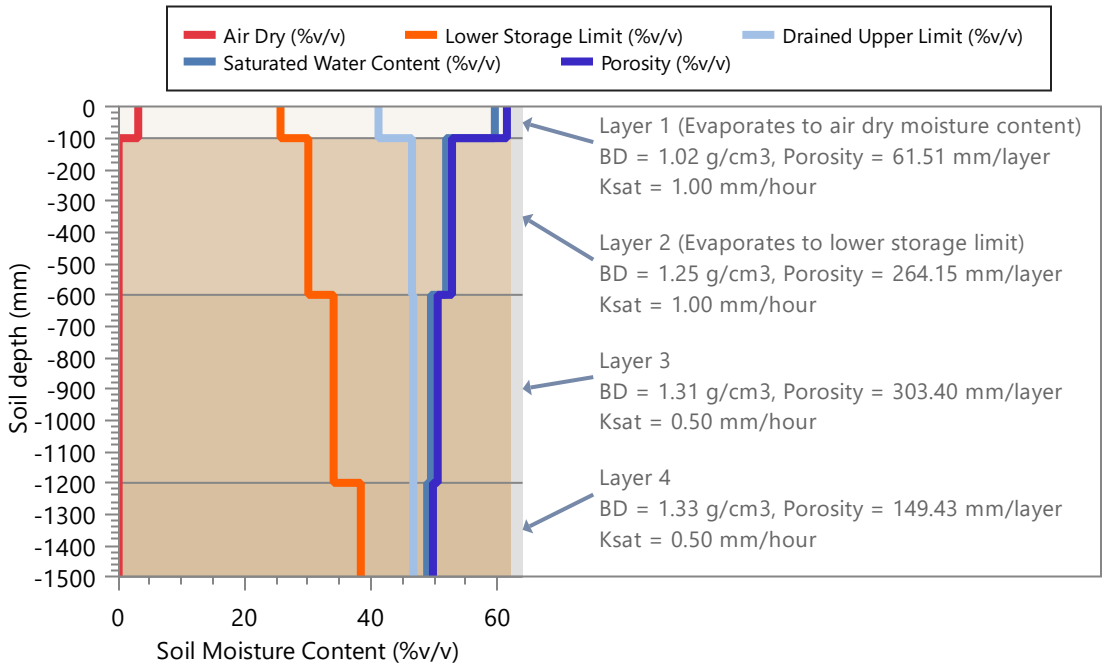
DESCRIPTION

Land: Girrahween Office Application Ar

Area (m2): 5675.00

Soil Type: Black Earth, 1500.00 mm defined profile depth

Profile Porosity (mm)	778.49
Profile saturation water content (mm)	762.80
Profile drained upper limit (or field capacity) (mm)	694.00
Profile lower storage limit (or permanent wilting point) (mm)	496.00
Profile available water capacity (mm)	198.00
Profile limiting saturated hydraulic conductivity (mm/hour)	0.50
Surface saturated hydraulic conductivity (mm/hour)	1.00
Runoff curve number II (coefficient)	73.00
Soil evaporation U (mm)	6.00
Soil evaporation Cona (mm/sqrt day)	3.50



Plant Data: Continuous Kikuyu 1 Pasture

Average monthly cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.8 x Pan coefficient 1)	0.80
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Maximum potential root depth in defined soil profile (mm)	1200.00
Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **54 m3**

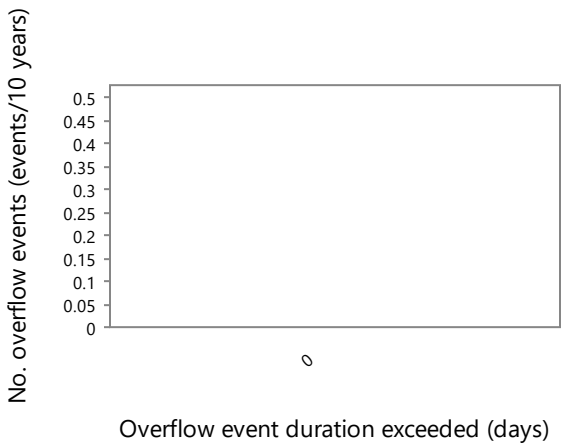
Pond System Water Balance (m3/year)

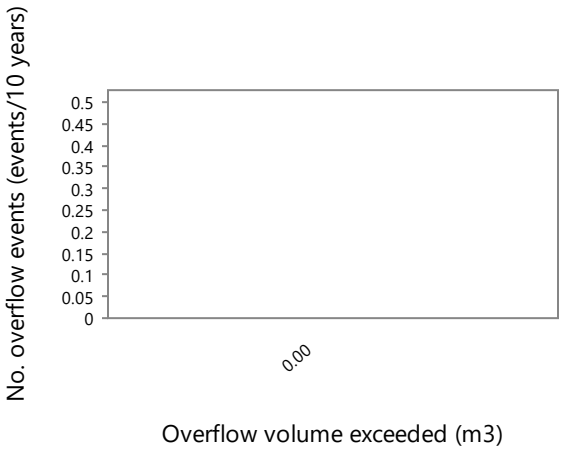
(no data available)

Name	Value
Rain	0.00
Inflow	0.00
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Overflow Diagnostics

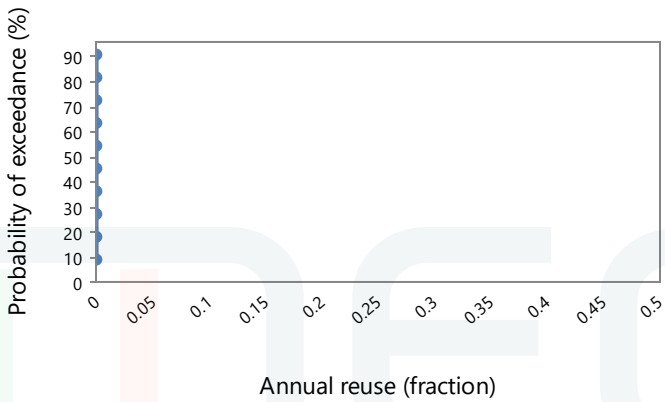
Volume of overflow (m3/year)	0.00
No. days pond overflows (days/year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% reuse (fraction)	0.00





Export plot

Export plot



Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Phosphorus Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

Salt Balance (kg/year)

(no data available)

Name	Value
Inflow	0.00
Recycling	0.00
Sludge*	0.00
Overflow	0.00
Irrigation	0.00
Seepage	0.00
Delta Storage	0.00

* Salt removal in sludge is not calculated from the pond salt balance. However if salt could be assumed to be present in the sludge at the same concentration as in the pond supernatant (up to a maximum of salt added in inflow) - then salt accumulation in the sludge could be 0.00 kg/year

Pond System Sludge Accumulation: 0.00 kg dwt/year

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

Pond Nutrient Concentrations and Salinity:

Average across simulation period	Pond 1
Average nitrogen concentration of pond liquid (mg/L)	0.00
Average phosphorus concentration of pond liquid (mg/L)	0.00
Average salinity of pond liquid (dS/m)	0.00

Value on final day of simulation period	Pond 1
Final nitrogen concentration of pond liquid (mg/L)	N.D.*
Final phosphorus concentration of pond liquid (mg/L)	N.D.*
Final salinity of pond liquid (dS/m)	N.D.*

* Not determined. Pond is empty.

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	0.00
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Proportion of years shandying water allocation of 0 m3/year is exceeded (fraction of years)	0.00
Average exceedance as a proportion of annual shandy water allocation (fraction of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)

Irrigation Quality:

Average nitrogen concentration of irrigation water - before ammonia loss during irrigation (mg/L)	0.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	0.00
Average phosphorus concentration of irrigation water (mg/L)	0.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics (No effluent irrigation occurred!):

Proportion Days Irrigation Turned Off (fraction)	1.00 (Hence no irrigation!)
Proportion of days maximum irrigation rate set to zero (fraction)	1.00 (Hence no irrigation!)
Proportion of Days irrigation occurs (fraction)	0.00

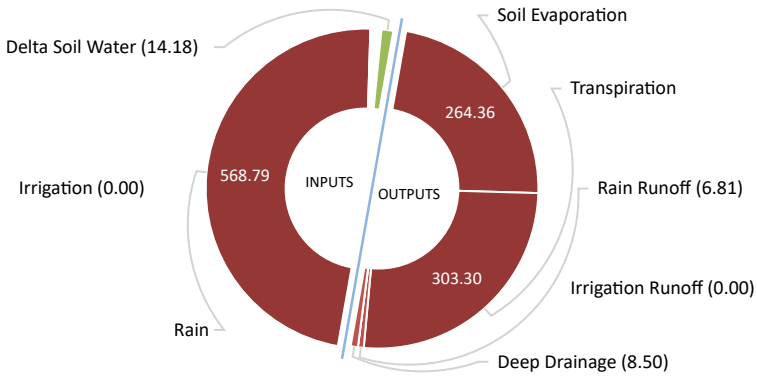
PERFORMANCE

Land Performance - Soil Water

Paddock: Girrahween Office Application Ar, 5675 m2
Soil Type: Black Earth, 173.10 mm PAWC at maximum root depth

Land Water Balance (mm/year):

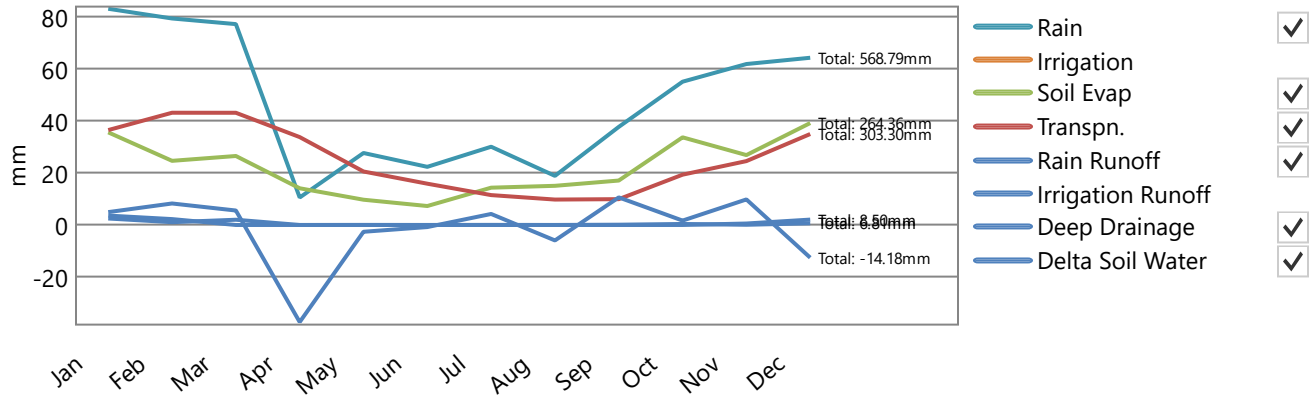
mm/year % Total inputs



Name	Value
Rain	568.79
Irrigation	0.00
Soil Evaporation	264.36
Transpiration	303.30
Rain Runoff	6.81
Irrigation Runoff	0.00
Deep Drainage	8.50
Delta Soil Water	-14.18

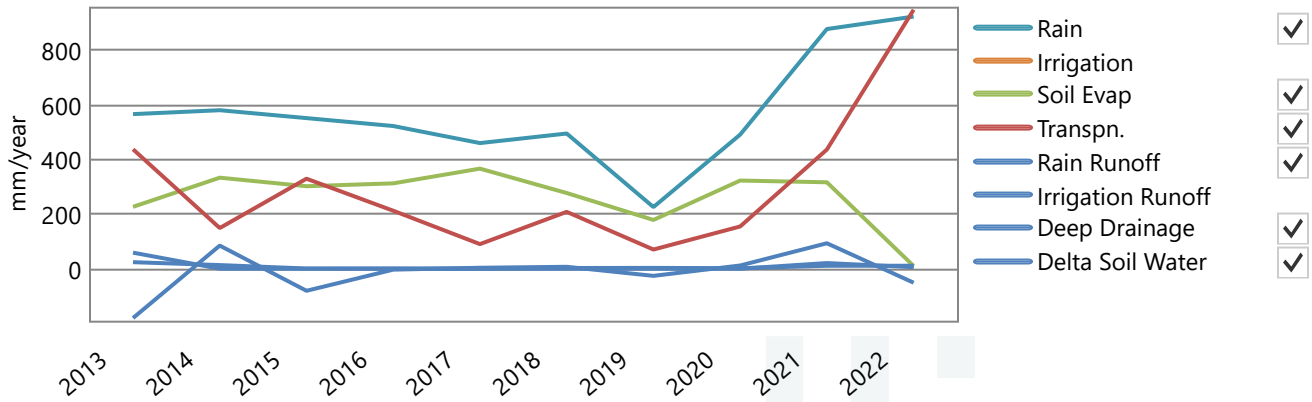
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



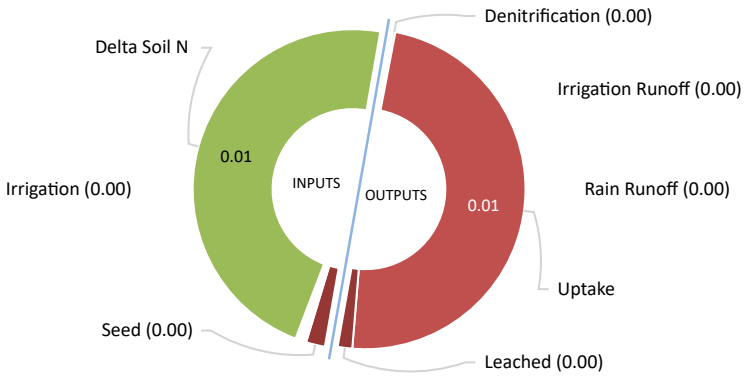
PERFORMANCE

Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

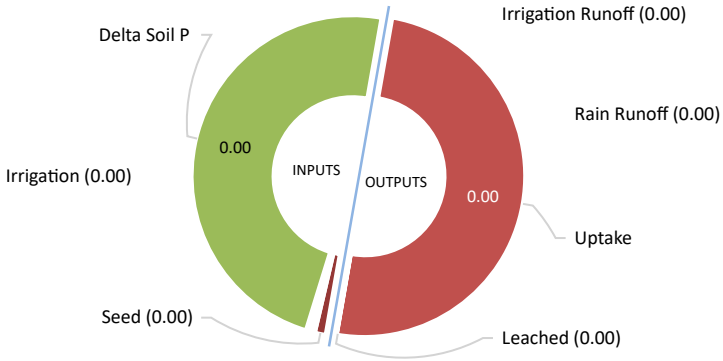
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.80

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	2.94E-04
Irrigation	0.00
Denitrification	3.41E-05
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	2.20E-04
Delta Soil N	-0.01

Land Phosphorus Balance (kg/m2/year)



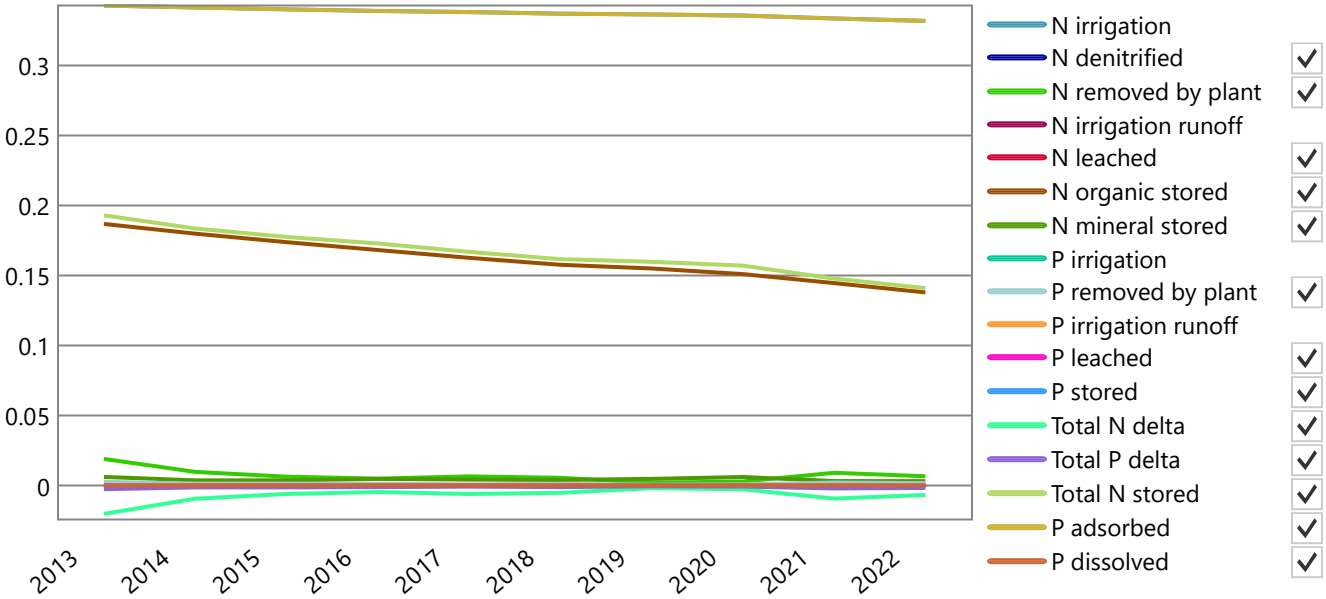
Name	Value
Seed	2.52E-05
Irrigation	0.00
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.38E-03
Leached	8.41E-07
Delta Soil P	-1.36E-03

PERFORMANCE

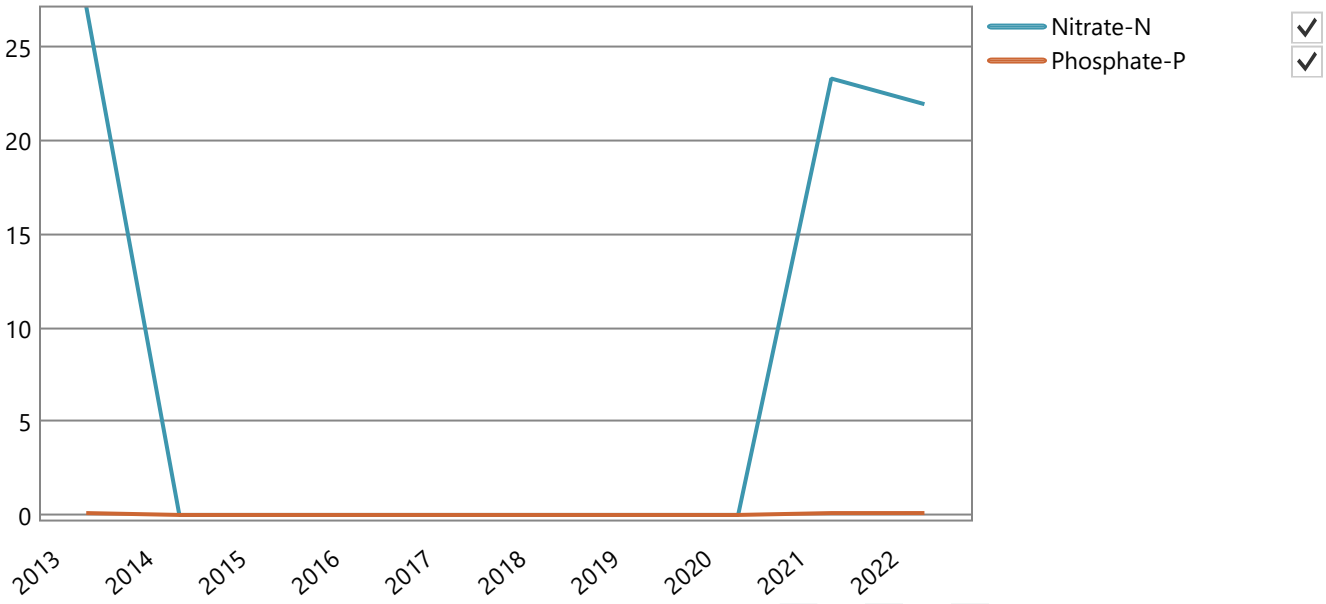
Land Performance - Soil Nutrient

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type**: Black Earth

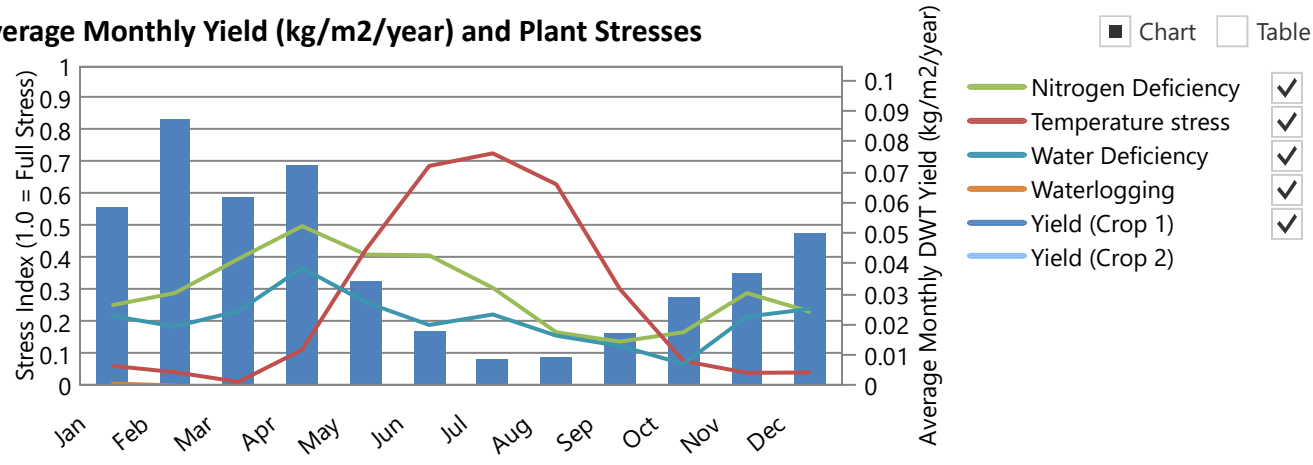
Plant: Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.36 (0.13 - 0.64)
Average monthly root depth (mm) (minimum - maximum)	467.03 (218.69 - 811.51)

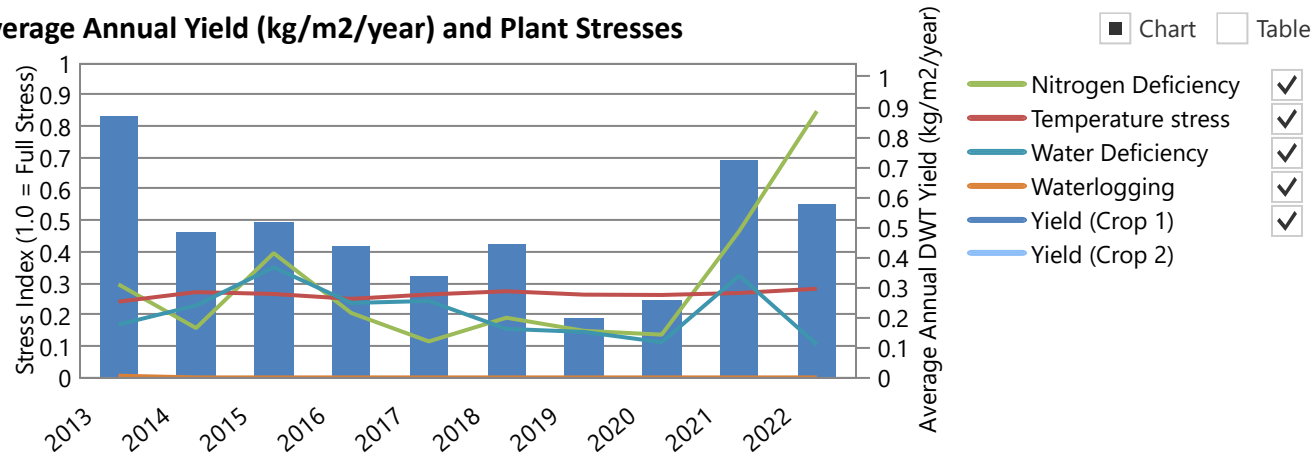
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.01 (0.00 - 0.02)
Average annual net phosphorus removed by plant uptake (kg/m2/year)	0.00 (0.00 - 0.00)
Average annual shoot nitrogen concentration (fraction dwt)	0.02 (0.01 - 0.02)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.002 - 0.003)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.20 (normal), 2.70 (forced by crop death due to water stress (2.70))
No. days without crop/year (days/year): 151.90 due to frosting (6.80), temperature stress - not frost (2.30), water stress (142.80)

PERFORMANCE

Land Performance

Paddock: Girrahween Office Application Ar, 5675 m2 **Soil Type: Black Earth**

Plant: Continuous Kikuyu 1 Pasture

Salt tolerance	Moderately tolerant
Salinity threshold EC sat. ext. (dS/m)	3.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03
No. years assumed for leaching to reach steady-state (years)	10.00

Soil Salinity:

Average Infiltrate Salinity (dS/m)	0.03

Insufficient years to run salinity calculations.

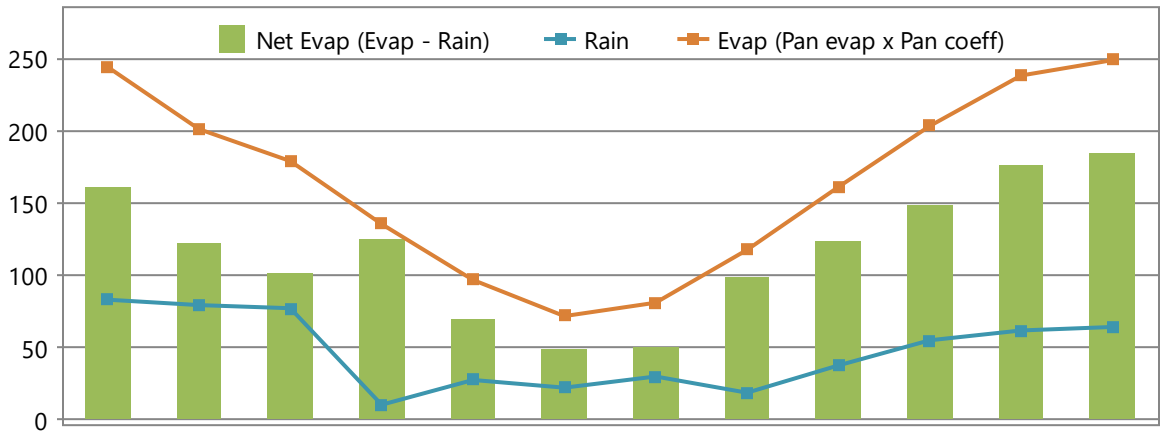
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Averaged Historical Climate Data Used in Simulation (mm)

Location: Girrahween_MDCs_-26.55_150.25 - MIDPOINT, -26.55°, 150.25°

Run Period: 01/01/2013 to 31/12/2022 10 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Evap	244.1	201.2	179.0	135.5	96.9	71.9	81.1	117.6	161.1	203.3	238.2	248.8	1978.7
Net Evap	160.9	121.7	101.7	124.9	69.2	49.5	51.0	98.8	123.4	148.1	176.3	184.5	1409.9
Net Evap/day	5.2	4.3	3.3	4.2	2.2	1.6	1.6	3.2	4.1	4.8	5.9	6.0	3.9

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Pond System: 1 closed storage tank

Girrahween Warehouse/Office STP - Indicative - 0.00 m3/year or 0.00 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 0.00 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Phosphorus	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

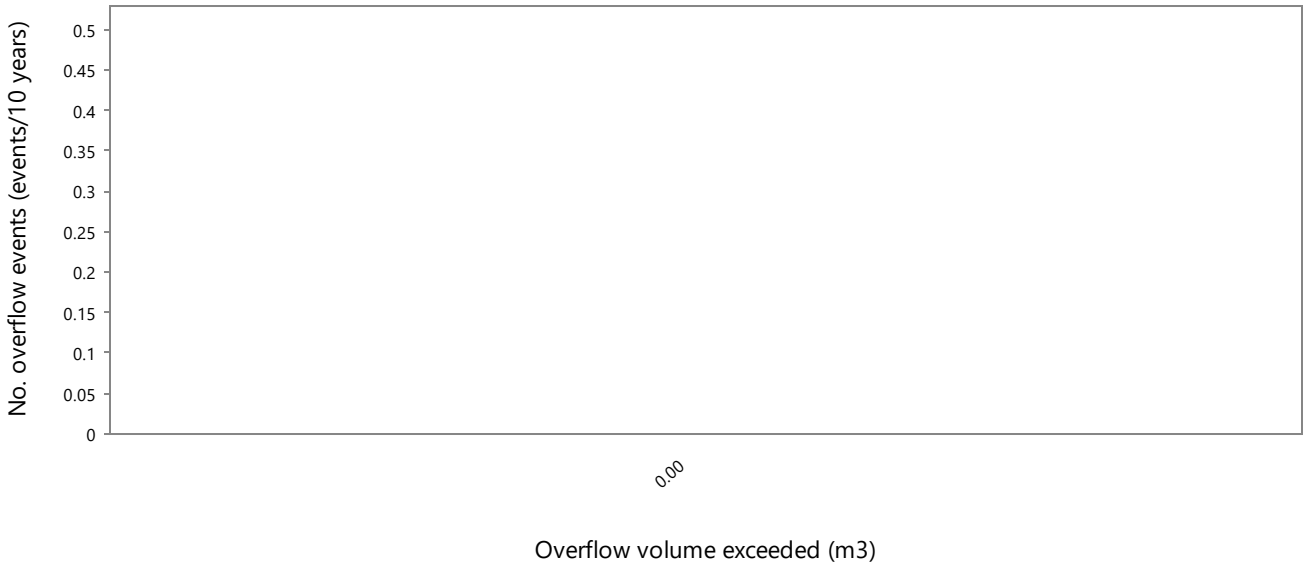
Last pond (Wet weather store): 54.00 m3

Theoretical hydraulic retention time (days)	0.00
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.06 m3 (no./year)	0.00
Average duration of overflow (days)	0.00
Effluent Reuse (Proportion of Inflow + Net Rain Gain that is Irrigated) (fraction)	0.00
Probability of at least 90% effluent reuse (fraction)	0.00
Average salinity of last pond (dS/m)	0.00
Salinity of last pond on final day of simulation (dS/m)	0.00
Ammonia loss from pond system water area (kg/m2/year)	0.00

* The threshold is the volume equivalent to the top 1 mm depth of water of a full pond

Overflow exceedance:

Chart Table



Export plot

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Irrigation Information

Irrigation: 5675 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	0.00	0.00
Total nitrogen applied (kg)	0.00	0.00
Total phosphorus applied (kg)	0.00	0.00
Total salts applied (kg)	0.00	0.00

Shandying

Annual allocation of fresh water for shandying (m3/year)	0.00
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Average exceedance as a proportion of annual shandy water allocation (% of allocation) (minimum - maximum)	0.00 (0.00 - 0.00)
Proportion of irrigation events requiring shandying (fraction of events)	0.00
Minimum shandy water is used	False

Irrigation Issues

Proportion of Days irrigation is turned off (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 3.70 mm each day
Irrigation window from 1/1 to 31/12 including the days specified
A minimum of 0 days must be skipped between irrigation events

Soil Water Balance (mm): Black Earth, 173.10 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	83.2	79.5	77.3	10.6	27.7	22.4	30.1	18.9	37.8	55.1	61.9	64.4	568.8
Irrigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Soil Evap	35.6	24.7	26.5	14.1	9.7	7.3	14.4	15.1	17.1	33.7	26.9	39.2	264.4
Transpn.	36.5	43.2	43.2	33.8	20.6	15.9	11.5	9.8	9.9	19.4	24.6	35.0	303.3
Runoff	2.5	1.1	2.0	0.0	0.0	0.0	0.0	0.0	0.1	0.4	0.1	0.6	6.8
Drainage	3.6	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	2.1	8.5
Delta	4.9	8.3	5.6	-37.4	-2.6	-0.8	4.2	-6.0	10.6	1.7	9.8	-12.6	-14.2

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.00
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.01
Average annual soil nitrogen removed by denitrification (kg/m2/year)	3.41E-05
Average annual soil nitrogen leached (kg/m2/year)	2.20E-04
Average annual nitrate-N loading to groundwater (kg/m2/year)	2.20E-04
Soil organic-N kg/m2 (Initial - Final)	0.19 - 0.14
	0.02 - 3.11E-03
Average nitrate-N concentration of deep drainage (mg/L)	25.87
Max. annual nitrate-N concentration of deep drainage (mg/L)	27.15

Soil Phosphorus Balance

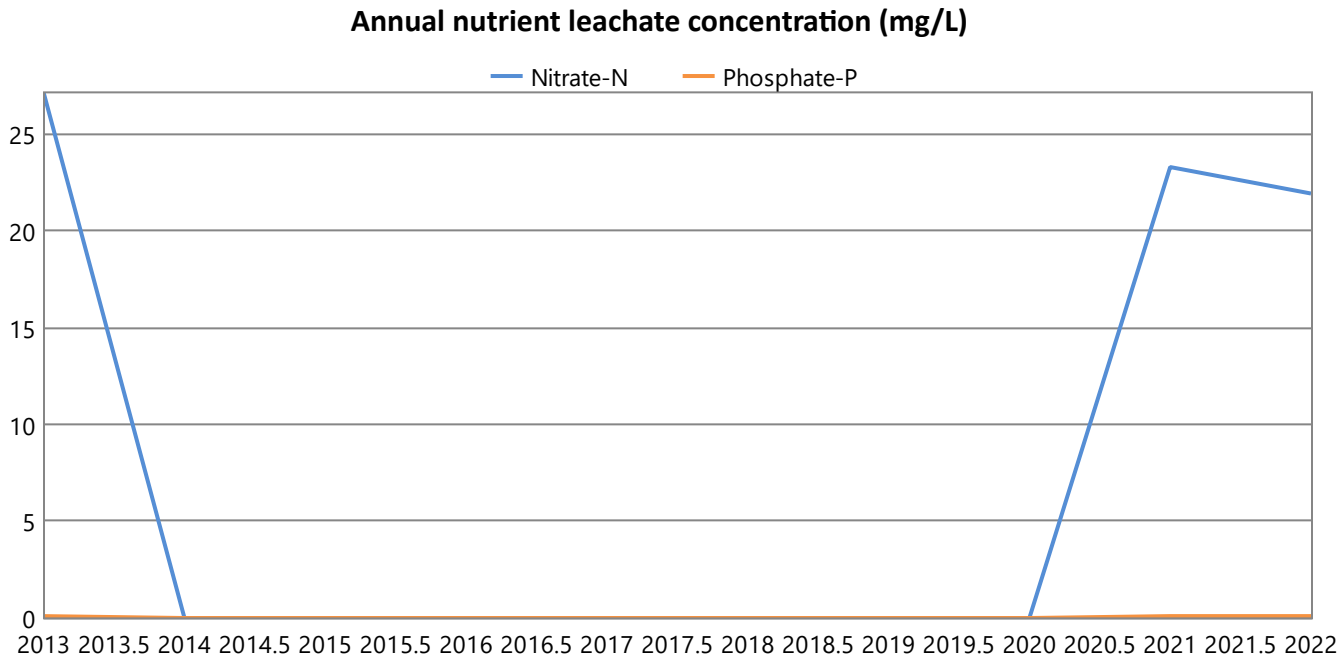
Average annual effluent phosphorus added (kg/m2/year)	0.00
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	1.38E-03
Average annual soil phosphorus leached (kg/m2/year)	8.41E-07
Dissolved phosphorus (kg/m2) (Initial - Final)	6.94E-05 - 3.47E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.34 - 0.33
Average phosphate-P concentration in rootzone (mg/L)	0.06
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.10
Design soil profile storage life based on average infiltrated water phosphorus concn. of 0.00 mg/L (years)	999.00

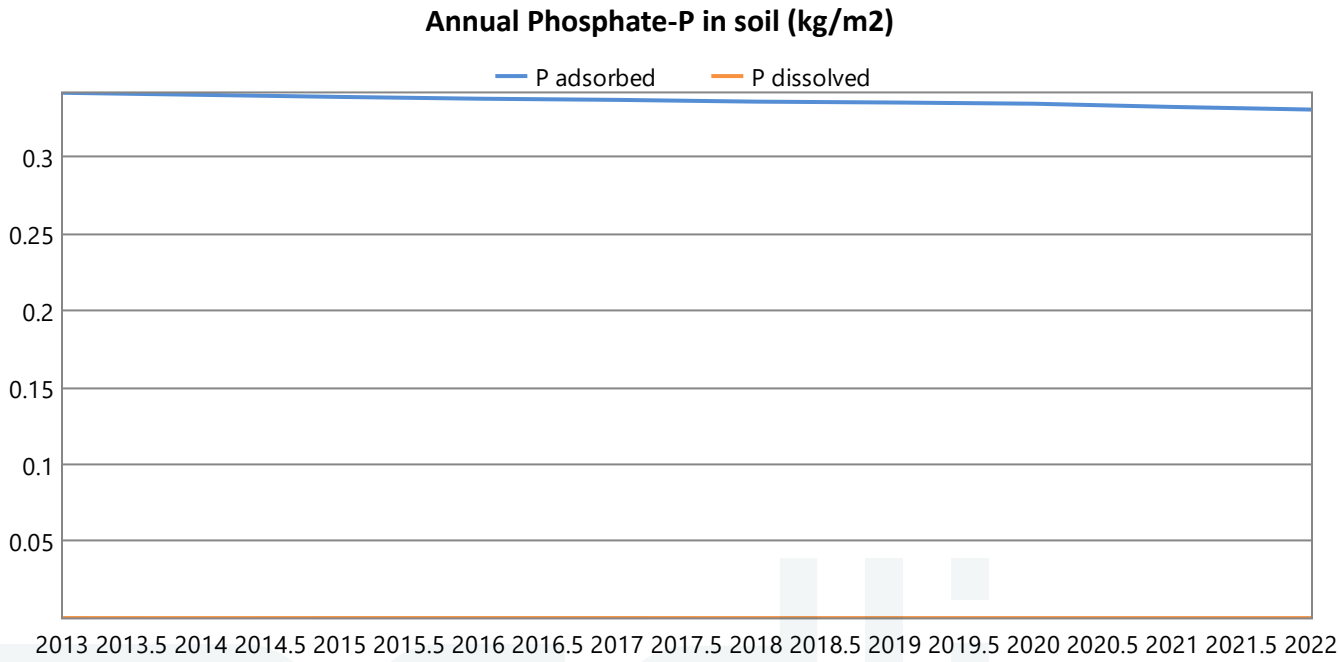
DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Land: Girrahween Office Application Ar: 5675 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation





DIAGNOSTICS

Sustainability Diagnostics: Girrahween Temporary MDCs Assessment

Paddock Plant Performance: Girrahween Office Application Ar: 5675 m2

Average Plant Performance (Minimum - Maximum): Continuous Kikuyu 1 Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.49 (0.20 - 0.88)
Average monthly plant (green) cover (fraction)	0.36 (0.13 - 0.64)
Average monthly crop factor (fraction)	0.29 (0.10 - 0.51)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	467.03 (218.69 - 811.51)
Average number of normal harvests per year (no./year)	0.20 (0.00 - 1.00)
Average number of normal harvests for last five years only (no./year)	0.20
Average number of crop deaths per year (no./year)	2.70 (0.00 - 5.00)
Average number of crop deaths for last five years only (no./year)	1.60
Average annual nitrogen deficiency index (0 = no stress, 1 = full stress) (coefficient)	0.30 (0.11 - 0.85)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.06 (0.01 - 0.12)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.73 (0.60 - 0.85)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.21 (0.07 - 0.37)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	151.90

Soil Salinity - Plant salinity tolerance: Moderately tolerant

Assumes 1.0 dS/m Electrical Conductivity = 640 mg/L Total Dissolved Salts
All values based on 10 year running averages

Insufficient years to run salinity calculations.

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

This is a Dryland scenario
No effluent irrigation has occurred!
Full run chosen

ghd.com

→ The Power of Commitment