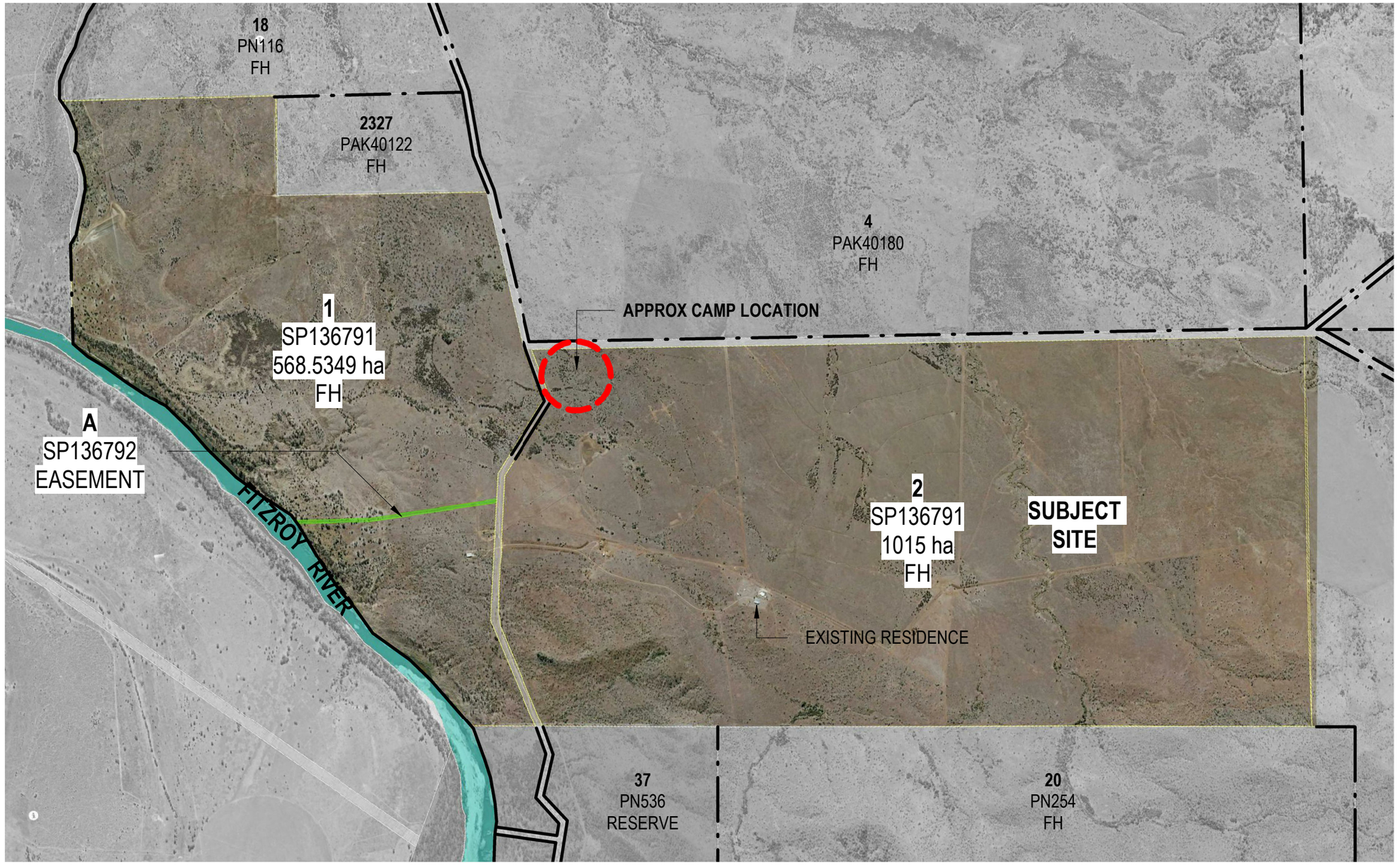

GENERAL NOTE:

- THESE DRAWINGS ARE PART OF A TOWN PLANNING APPROVAL APPLICATION AND SHOULD NOT BE USED FOR ANY OTHER REASON
- THESE DRAWINGS ARE APPROXIMATE AND HIGHLY CONCEPTUAL
- TRAFFIC/STORMWATER/OPERATIONAL WORKS: AS PER CIVIL ENGINEER DOCUMENTS AND DRAWINGS IF REQUIRED
- CURRENT LOCATIONS AND BOUNDARY LINE ARE APPROXIMATE, RELEVANT SURVEY TO BE CONDUCTED BEFORE ANY DOCUMENTATION OR CONSTRUCTION
- REFER TO TOWNPLANNING APPLICATION AND OPERATIONAL WORKS DOCUMENTATION WHEN VIEWING THESE PLANS
- THESE DRAWINGS ARE CONCEPTUAL AND DO NOT REFLECT BUILDING APPROVAL, PLUMBING APPROVAL, QFRS APPROVAL OR DISABILITY REQUIREMENTS. CLIENT TO CONFIRM AND GET APPROVAL FROM RELEVANT AUTHORITIES
- IF THE SITE OR PROJECT ARE TRIGGERED OR LOCATED IN BUSHFIRE AREA, THEN THE BUILDINGS TO COMPLY WITH BUSHFIRE REQUIREMENTS OR AS PER COUNCIL REQUIREMENTS

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/32-2020

Dated: 9 November 2020

CONCEPT ONLY

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drawing title:
LOCATION PLAN

drawing no: SK-001

project:
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
GLADSTONE AREA WATER BOARD
SUN WATER

REVISIONS

REVISION	DESCRIPTION	DATE
1	PRELIMINARY	17-09-13
2	PRELIMINARY	17-10-27
3	PRELIMINARY	17-11-16
4	PRELIMINARY	17-11-17
6	PRELIMINARY	26-06-2020
7	PRELIMINARY	17/10/2020
8	PRELIMINARY	19/10/2020

PRELIMINARY SKETCH PLANS:
If the drawings are labelled and issued 'preliminary', below, they are not suitable for Building Application, tender or construction purposes! The intent of preliminary sketch plans are only for presenting the concept for the specific project to the client as nominated in the title sheet.

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TOWN PLANNING
gg@gideontownplanning.com.au

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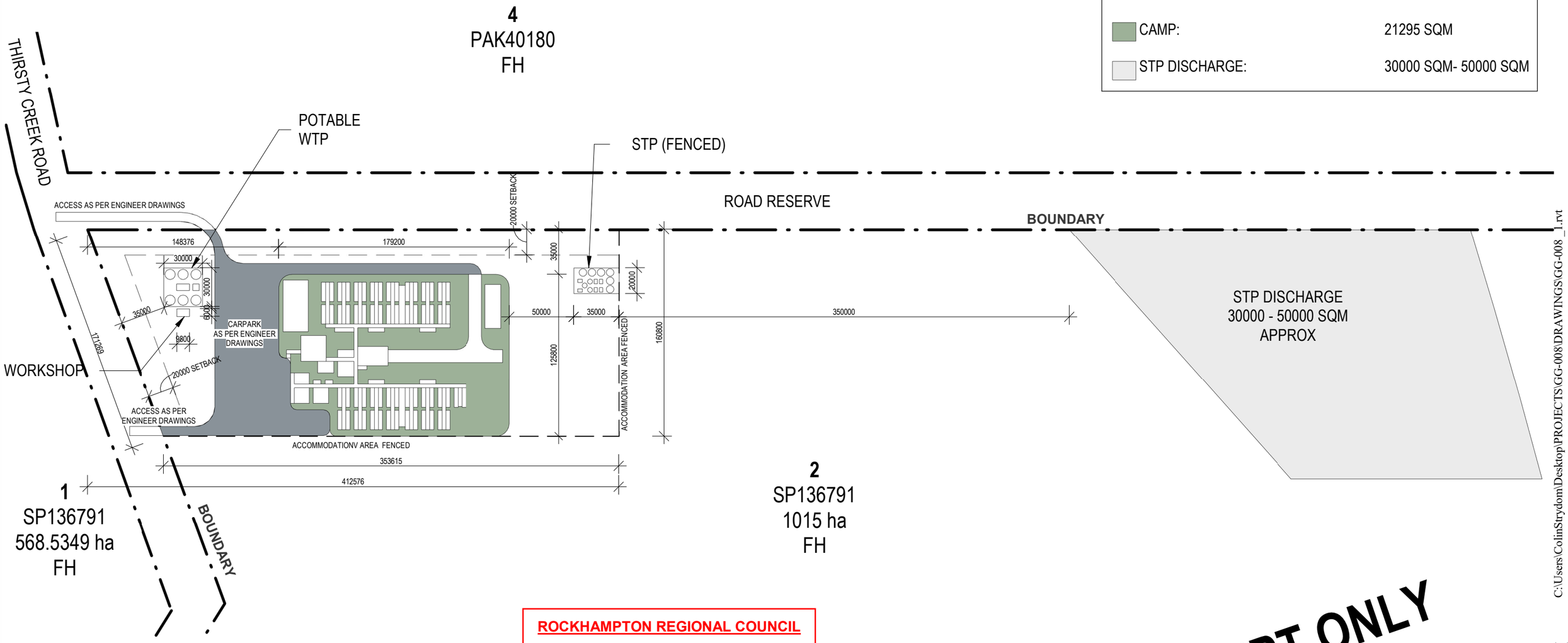
ISSUED FOR
PRELIMINARY

project no:	scale	rev
GG-008	1 : 25000	8
	date: OCT 20	
	drawn: CC	

AREA SCHEDULE

OVERALL SITE:	10150000 SQM
TOTAL ACCOMMODATION AREA	61601 SQM
CARPARKING: AS PER ENGINEER DRAWINGS	9702 SQM
CAMP:	21295 SQM
STP DISCHARGE:	30000 SQM- 50000 SQM



ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

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Development Permit No.: D/32-2020

Dated: 9 November 2020

CONCEPT ONLY

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SCALE 1 : 3000

drawing title:
CONCEPT SITE PLAN

drawing no: SK-002

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
GLADSTONE AREA WATER BOARD
SUN WATER

REVISIONS

REVISION	DESCRIPTION	DATE
2	PRELIMINARY	17-10-27
3	PRELIMINARY	17-11-16
4	PRELIMINARY	17-11-17
6	PRELIMINARY	26-06-2020
7	PRELIMINARY	17/10/2020
8	PRELIMINARY	19/10/2020

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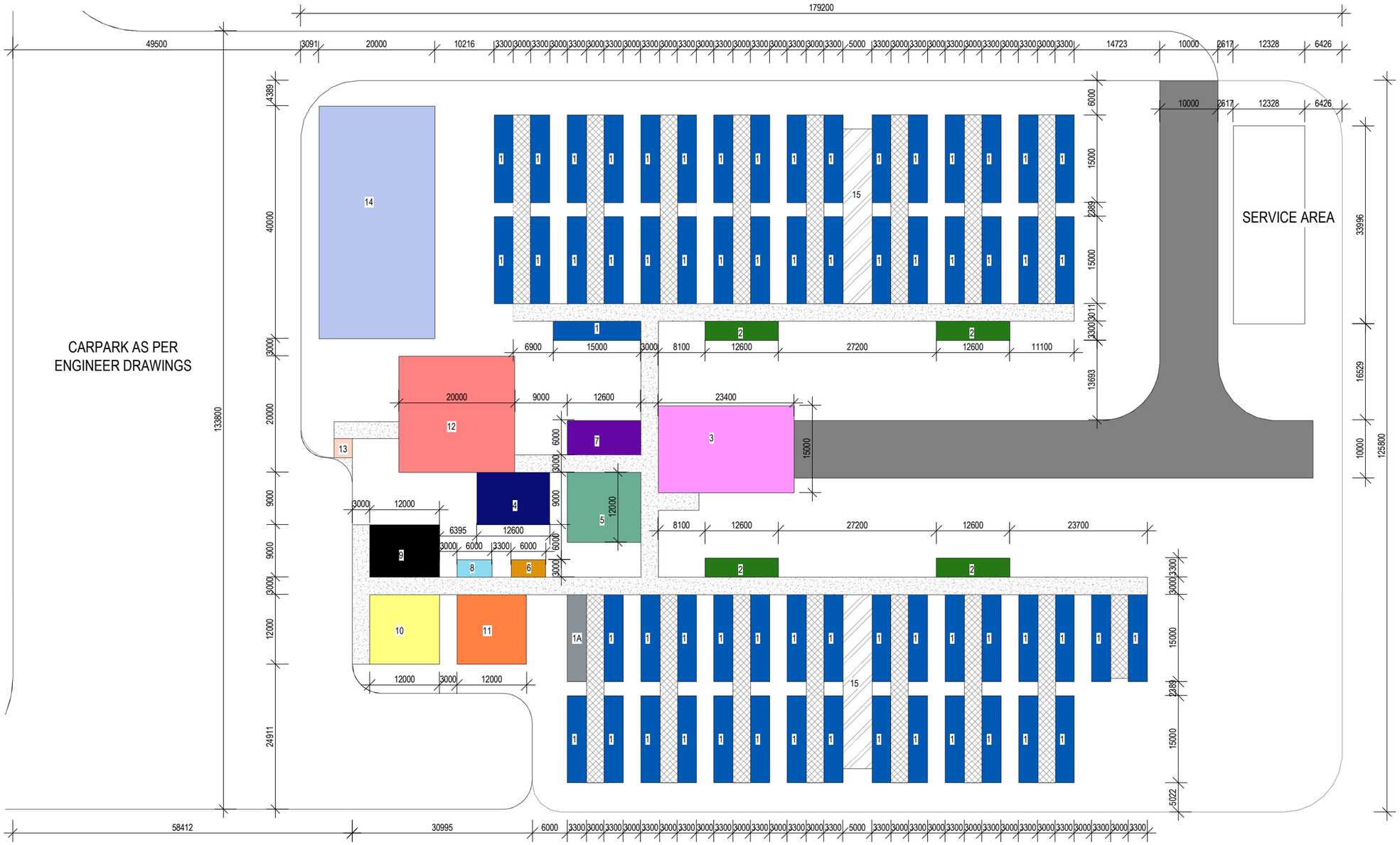
ISSUED FOR
PRELIMINARY

project no:	scale	rev
GG-008	As indicated	8
	date: OCT 20	
	drawn: CC	



IDENTIFIER	DESCRIPTION	QUANTITY
1	4 BEDROOM (PSQ)	62
1A	2 BEDROOM (PWD)	1
2	LAUNDRY/LINEN/CLEANER	4
3	KITCHEN/DINER (120 PEOPLE SEATING CAPACITY	1
4	WETMESS	1
5	GYMNASIUM	1
6	FIRST AID	1
7	REC ROOM	1
8	MFT	1
9	ADMIN OFFICE	1
10	OFFICE	1
11	TRAINING	1
12	COVERED AREA	1
13	SMOKING SHED	1
14	REC AREA	1
15	TURFED AREA WITH SEATING	2

LEGEND

- ELEVATED WALKWAY
- CONCRETE FOOTPATHS
- SERVICE ROAD

AREA SCHEDULE

OVERALL SITE:	10150000 SQM
TOTAL ACCOMMODATION AREA	61601 SQM
CARPARKING: AS PER ENGINEER DRAWINGS	9702 SQM
CAMP:	21295 SQM

250 ROOMS
(INCLUDING 2 ROOMS FOR PERSONS WITH DISABLITIES/MANAGERS)

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/32-2020
Dated: 9 November 2020

CONCEPT ONLY

SCALE 1 : 750

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19/10/2020 8:05:15 AM

drawing title:
CONCEPT CAMP PLAN

drawing no: SK-003

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
GLADSTONE AREA WATER BOARD
SUN WATER

REVISIONS

REVISION	DESCRIPTION	DATE
1	PRELIMINARY	17-09-13
2	PRELIMINARY	17-10-27
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8	PRELIMINARY	19/10/2020

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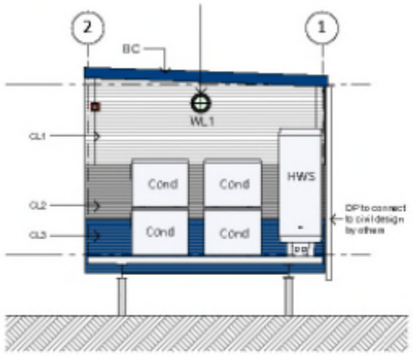
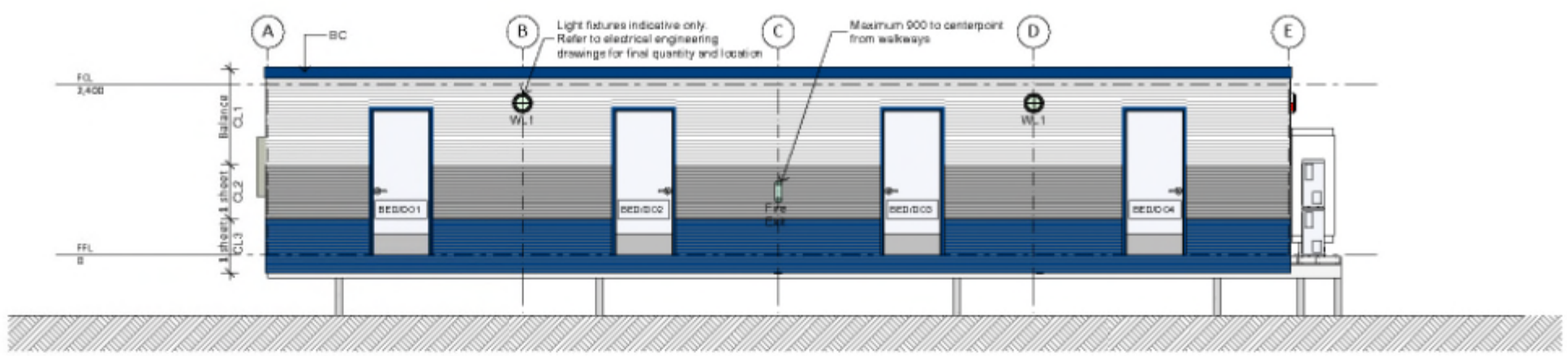
PRELIMINARY

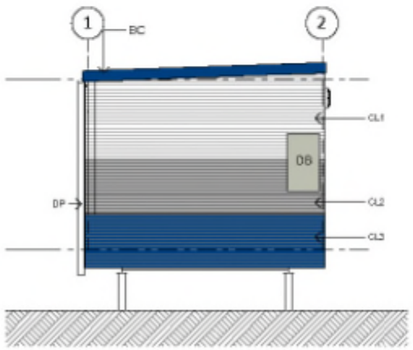
project no: GG-008
scale: As indicated
date: OCT 20
drawn: CC
rev: 8



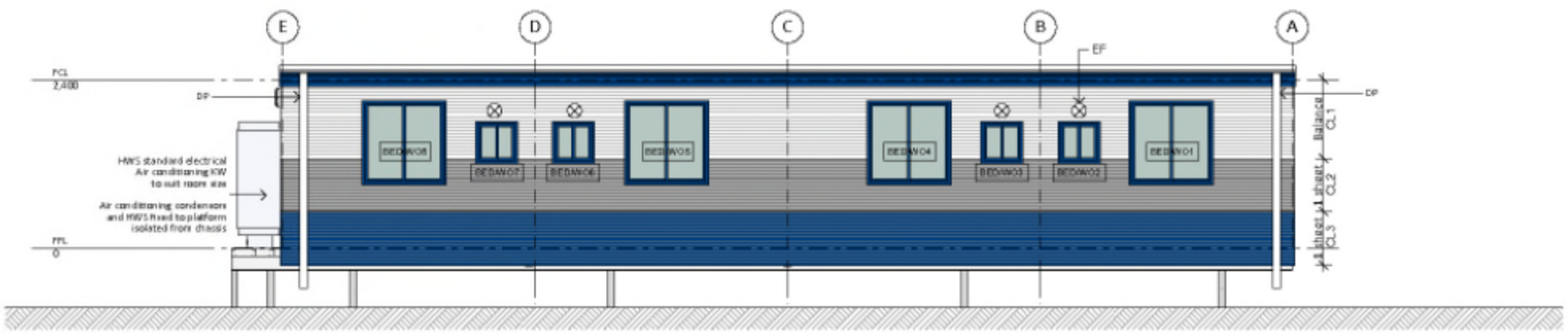
01 Elevation 1



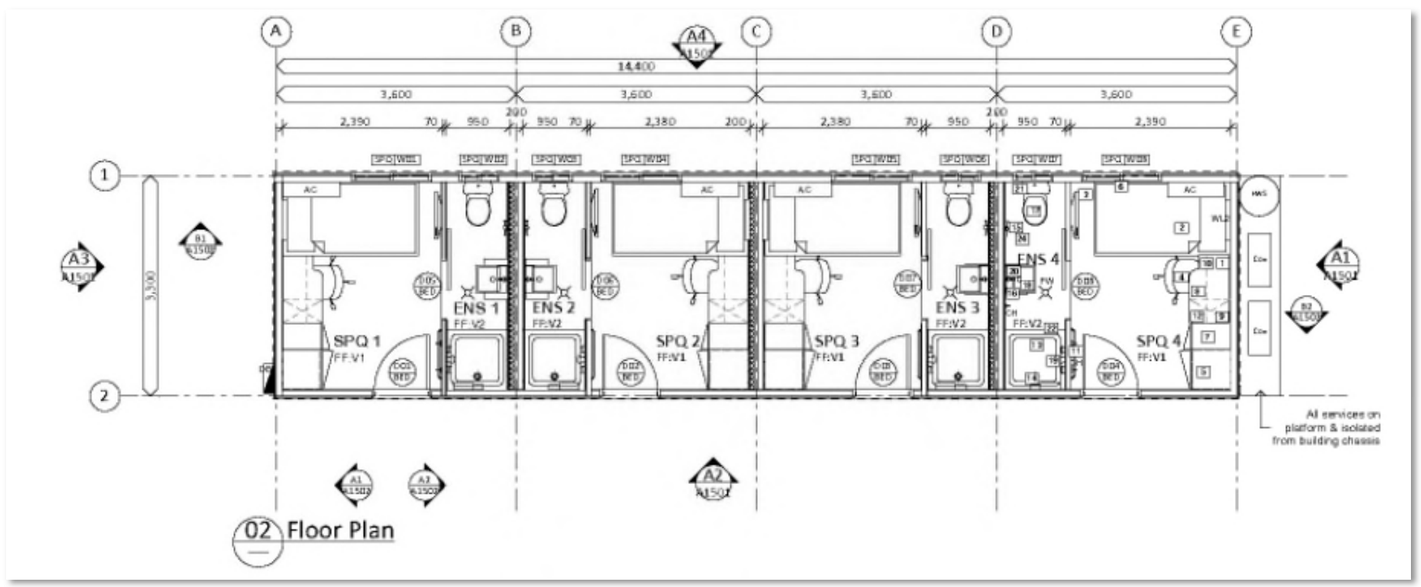
02 Elevation 2



03 Elevation 3



04 Elevation 4



02 Floor Plan

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/32-2020

Dated: 9 November 2020

Typical Unit Plan, SK001	**19 October 2020, Rev 01**

63 Charles Street
North Rockhampton Q 4700
PO Box 2149
Wandal Q 4701
P (07) 4921 1780
E mail@mcmengineers.com

TECHNICAL MEMORANDUM

To:	Gideon Genade Gideon Town Planning
From	Chris Hewitt McMurtrie Consulting Engineers
Date:	11/12/2018
Project No:	0181718
Re:	Traffic Assessment for Proposed Workers Camp and Site Offices 1486 Thirsty Creek Road (Lot 2 on SP136791) GOGANGO QLD

Dear Gideon,

Please find below our Traffic Assessment for the Proposed Workers Camp and Site Offices to service the Rookwood Weir construction project. The Proposed Workers Camp and Site Offices will be located at Thirsty Creek Road, Gogango. We have made an assessment based upon the additional traffic generated by the new proposed use.

It is understood that this Technical Memorandum will accompany a development application to Rockhampton Regional Council (RRC), as Assessment Manager, by Gideon Town Planning

EXISTING USE

The existing approved use for the site is for rural pursuits. The proposed site is located adjacent to the proposed Rookwood Weir construction site. The Rookwood Weir construction site in relation to surrounding features is shown in Figure 1.

The proposed Workers Camp and Site Offices will be located on Lot 2 on SP136791 and will be a permanent facility for the life of the project only – assuming 2 to 3 years.

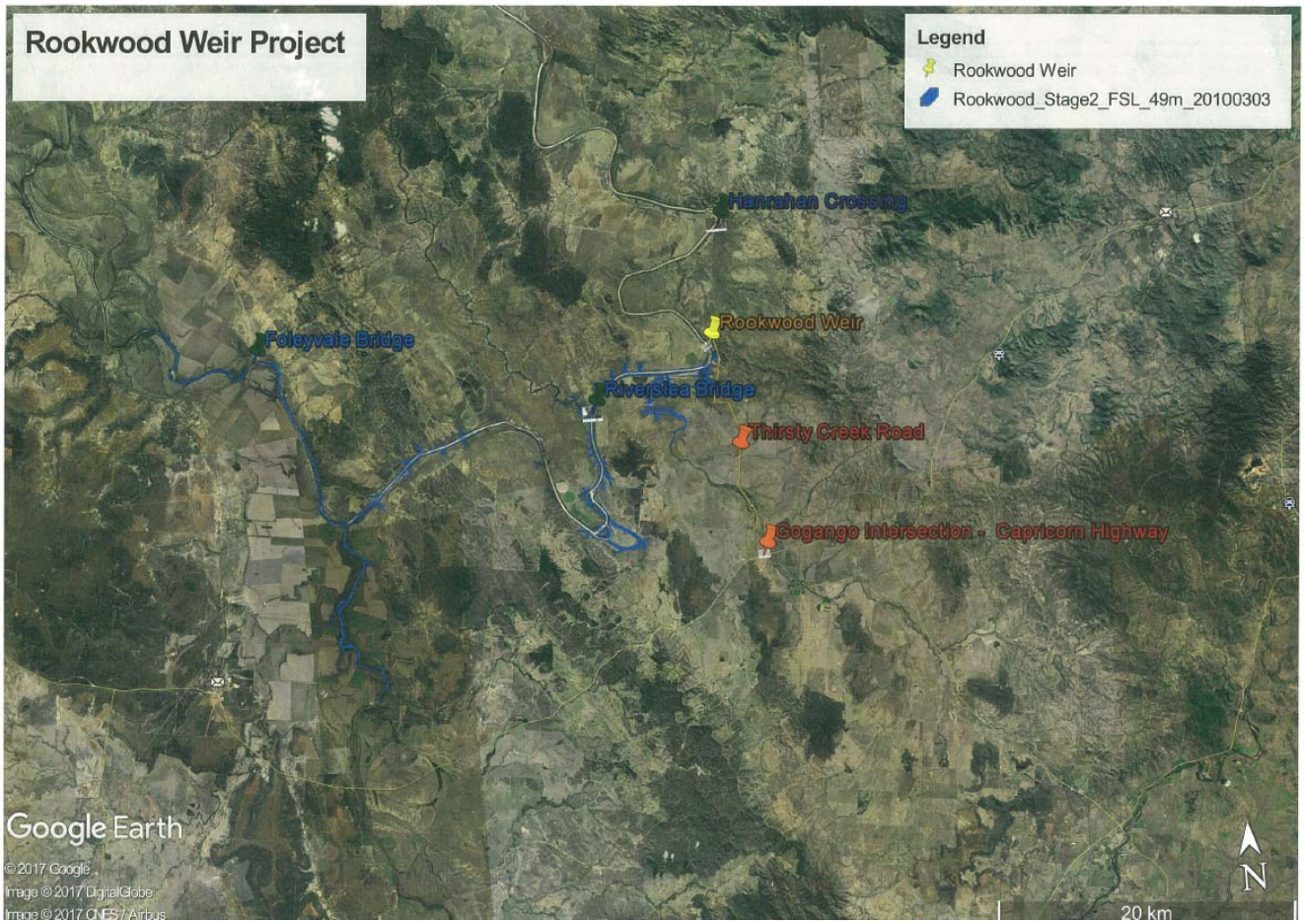


Figure 1 – Rookwood Weir Site

PROPOSED USE

The new proposed use is for a fully serviced 250 person Workers Camp plus 80 person Site Office with associated facilities including:

- Car park
- Mess facilities
- Laundry Facilities

For the purposes of this analysis it has been assumed that all construction staff and office staff will be accommodated within the camp itself and will not have to access Council's road network to travel between accommodation and site offices.

It is understood that during the peak construction periods, the hours of construction would be between 6:00 AM to 6:00 PM, with workers working 12-hour shifts with rotating shift patterns based on a 7 day roster. Occasional night work may also be required. Due to the locality of the project site, the camp will be constructed to accommodate all workers for the operating life of the project.

The proposed camp layout will be as per Design Architecture plans attached in Attachment 1 and the camp location in relation to other site facilities will be as per Figure 2.

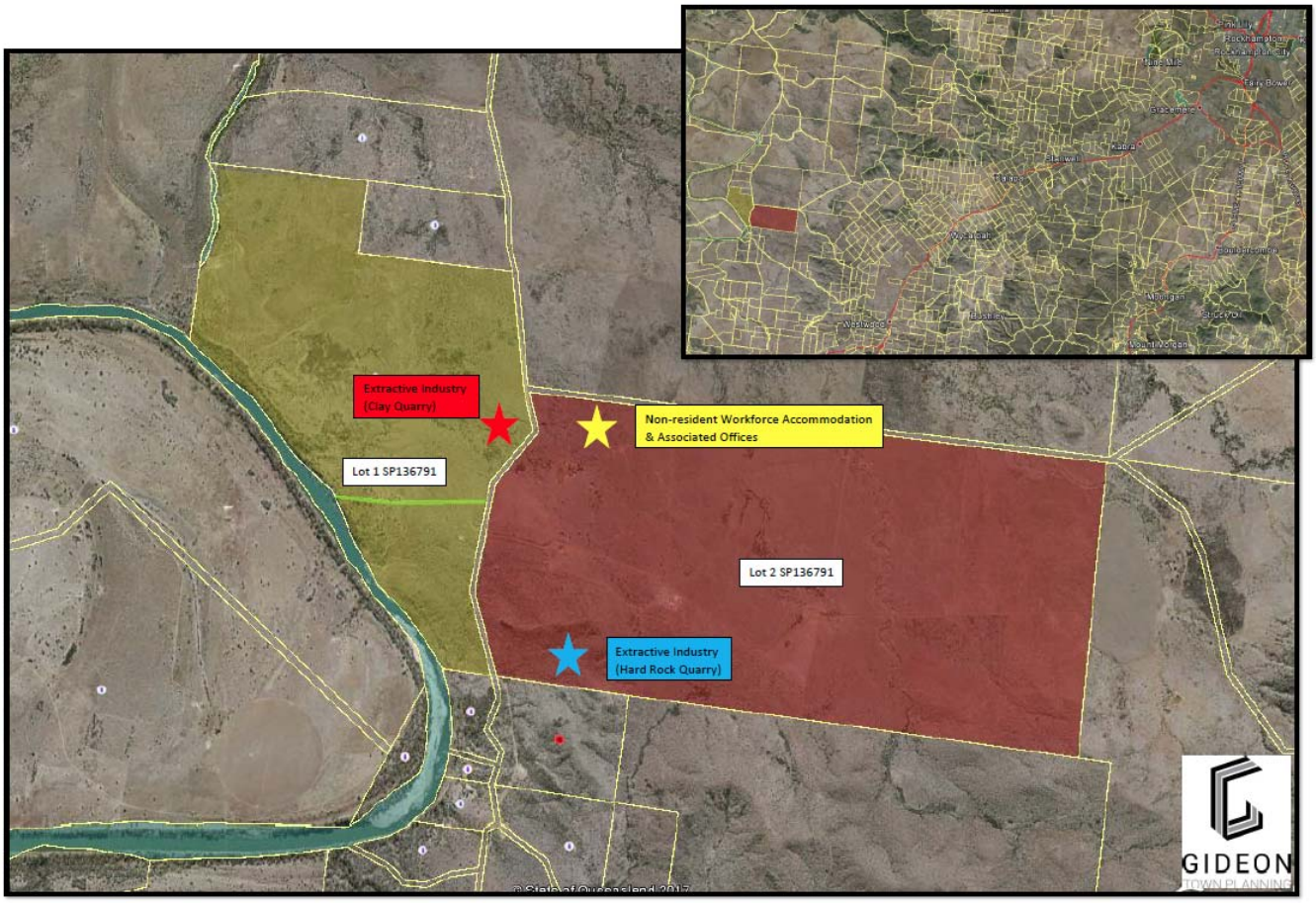


Figure 2 – Camp Location in relation to other site facilities

TRAFFIC IMPACT

To provide a comprehensive and conservative analysis, it has been assumed that the majority of workers will be transported to site by bus and that bus movements for shift changeover will occur on the same day. It is assumed that only 10% of these bus movements will occur in the peak hour. It is also assumed that 90% of construction/office personnel will be transported to the site by bus (48 seater buses) and the remaining 10% will utilise private vehicles at a rate of 2 persons per private vehicle. This results in 5 buses and 13 worker vehicle trips for a shift changeover day with the assumption that 10% of these movements occur in the peak hour.

It is understood that additional specialist contractors and other miscellaneous trips by light vehicles will be made during a typical project day. Based on 90% of workers bussing to site and the remaining workers sharing vehicles an additional 20 extra external contractor vehicle trips have been allowed for as well as 20 site vehicles/4WD trips and 5 visitor trips per day.

As such up to 40 additional light vehicle trips plus 5 visitor trips will occur per day and this has been adopted with a conservative estimate of 50% of these trips being undertaken during peak times. A summary of peak hour workforce trip generation is provided in Table 1.

Table 1

Trips	Total Trips in a peak day	Peak Hour In	Peak Hour Out	Total Peak Hour
Bus trips	5in/5out	1	1	2
Workers Vehicle trips	13in/13out	1	1	2
Site Vehicle/4WD trips	10in/10out	5	5	10
External Contractor trips	10in/10out	5	5	10
Vistor trips	5in/5out	2	1	3
TOTAL		14	13	27

Additional heavy vehicles that will service the site will include:

- 2 semi-trailers per week for supplies
- 1 single unit truck per week for supplies to office
- 3 refuse truck collections/week

It has been assumed that any service vehicles will attend site outside of any peak times and will not likely impact peak hour intersection operation. In any case if service vehicles do occasionally coincide with the peak hour movements the volumes are considered very low and unlikely to influence the site access intersection form and location.

The existing section of Thirsty Creek Road will provide access to the Workers Camp and it carries very low traffic volumes - essentially a single lane track that provides access to the adjacent property and as such peak hour volumes have been assumed as 1vph in each direction for the purposes of analysis.

An agreement has been reached previously with RRC in relation to the upgrading of Thirsty Creek Road in association with the Rookwood Weir Project and this upgrading takes into account the project traffic including daily worker transport (which will be reduced due to the presence of a Workers Camp) as per Table 16-7 of the Transport Section of the Project EIS. For reference, Council's Design Brief is attached as Attachment 2. This Design Brief should cover the section of Thirsty Creek Road up to the Workers Camp access and it involves the widening and gravel re-sheeting of the formation to 6.5m.

The proposed Workers Camp and Site Offices access will be located as shown in Attachment 1 and the design speed has been assumed to be 60kph for this section of road and associated speed signage should be erected as part of Operational Works for the access construction.

As shown in Figure 3 visibility from the proposed site access is good in both directions and easily exceeds SISD for a design speed of 60kph.

Figure 3 – Workers Camp Access Sight Distance in both Directions

Access peak hour traffic distribution can therefore be derived as per Figure 4.

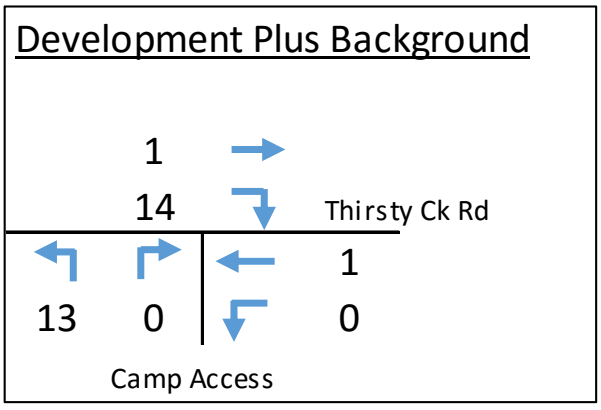


Figure 4 – Traffic Distribution at Camp Access

As such, in accordance with the DTMR Road Planning and Design Manual (RPDM) Figure 4A-1 turn warrants are only going to require BAR/BAL treatment as highlighted in Figure 5.

This access form can accommodate significantly more traffic as shown in Figure 5 and as such no further analysis is warranted.

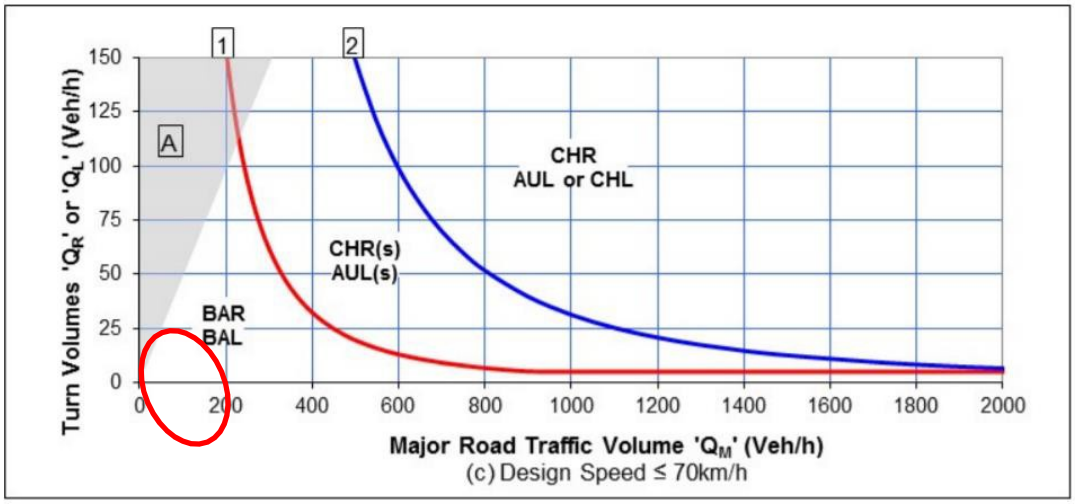


Figure 5 – Turn Warrants Chart DTMR RPDM

Access should therefore be provided in accordance with standard plan CMDG-R-040 for access along gravel roads for ADT< 300 vpd subject to detailed engineering design to cater for the largest design vehicle as part of Operational Works.

Construction of the Workers Camp and Site Offices will increase traffic on Thirsty Creek Road for a short period of 2 months however this will occur prior to the commencement of the main construction activities onsite and volumes will not exceed those forecast in Table 16-7 of the Transport Section of the EIS document for Phase 1 of the project. As such provided the works on Thirsty Creek Road are completed any temporary impact will be mitigated.

RAIL INTERFACE

There is an existing rail crossing on Riverslea Road in Gogango township however this crossing has full active control and therefore provides no impediment to the slight increase in traffic volumes associated with this proposed use.

ONSITE OPERATIONS

Parking Requirements – Under the RRC Planning Scheme Table 9.3.1.3.2 — Parking requirements, the scheme identifies car parking number requirements for defined uses. In regard to a "Rural Workers Accommodation" use the scheme states that one space per "accommodation unit" must be provided for the proposed development. The unique nature of this development suggests that it does not fit strictly into the category of "Rural Workers Accommodation", especially given the proposed remote nature of the development with bus transport being provided for workers.

The specification of one space per accommodation unit is therefore not considered to be appropriate for an isolated location where residents will be bussed to and from work. Noting that, performance outcome PO5 is applicable to the proposal and PO5 states the following: "Provision is made for on-site vehicle parking:

(a) to meet the demand likely to be generated by the development; and

(b) to avoid on-street parking where that would adversely impact on the safety or capacity of the road network or unduly impact on local amenity".

This performance outcome outlined in the scheme allows for a reasonable provision of parking provision to be provided based on the intended operation and use of the site. In consultation with GAWB and in accordance with their requirements, it is proposed to provide a total of 58 sealed car parking spaces plus necessary disabled spaces located opposite the communal buildings. Five dedicated bus parking spaces will also be provided as part of the proposed camp designs.

Car parking numbers are based on 90% of workers bussing to site and the remaining workers sharing vehicles at a rate of 2 per vehicle. Additionally, 20 extra external contractor vehicles have been allowed for as well as 20 site vehicles/4WD's and 5 visitors.

An unsealed overflow parking area is also proposed to be provided that is capable of accommodating various vehicle types that will be used to access and service the camp. It is noted that the overflow car park could also accommodate excess heavy vehicles and buses. The main car parking areas, to the west of the accommodation village, will be used for parking of site management vehicles, four-wheel drives, visitor parking and other vehicles used to transfer workers to and from the construction site. These vehicles will not be used to access the external road network on a day to-day basis, but will instead simply be used to get to and from the camp to the job site along roads or tracks leading to various parts of the site.

It is important to note that site car parking is not likely to be significantly used to accommodate workers personal vehicles. All parking spaces within the car parks will be designed to comply with Australian Standard AS2890.1 Off-Street Parking. Parking spaces and aisle width will be specified for User Class 1, suitable for daylong employee and commuter parking. Parking for disabled users will be designed to comply with AS2890.6, Off-Street Parking for People with Disabilities. This entails a standard space 2.4 metres wide, with a 2.4 metre wide dedicated shared area provided alongside. Footways will be provided between the parking rows in each aisle, this will minimise pedestrian-vehicle interaction within each car park.

Please refer to the attached swept path plan in Attachment 3.

Yours sincerely

Chris Hewitt
Principal Civil Engineer
RPEQ NO. 5141

ATTACHMENTS
Attachment 1 – Design Architecture Site Plans
Attachment 2 – RRC Project Design Brief for the Upgrading of Thirsty Ck. Rd.
Attachment 3 – Swept Path Analysis

63 Charles Street
North Rockhampton Q 4700
PO Box 2149
Wandal Q 4701
P (07) 4921 1780
E mail@mcmengineers.com

TECHNICAL MEMORANDUM

To:	Gideon Genade Gideon Town Planning
From	Chris Hewitt McMurtrie Consulting Engineers
Date:	11/12/2018
Project No:	0181718
Re:	Preliminary Stormwater Assessment for Proposed Workers Camp and Site Offices 1486 Thirsty Creek Road (Lot 2 on SP136791) GOGANGO QLD

Dear Gideon,

Please find below our Preliminary Stormwater Assessment for the Proposed Workers Camp and Site Offices to service the Rookwood Weir construction project. The Proposed Workers Camp and Site Offices will be located at Thirsty Creek Road, Gogango. We have made an assessment based upon the layout and change to the existing catchment characteristics required by the new proposed use.

It is understood that this Technical Memorandum will accompany a development application to Rockhampton Regional Council (RRC), as Assessment Manager, by Gideon Town Planning

EXISTING USE

The existing approved use for the site is for rural pursuits. The proposed site is located adjacent to the proposed Rookwood Weir construction site. The Rookwood Weir construction site in relation to surrounding features is shown in Figure 1.

The proposed Workers Camp and Site Offices will be located on Lot 2 on SP136791 and will be a permanent facility for the life of the project only – assuming 2 to 3 years.

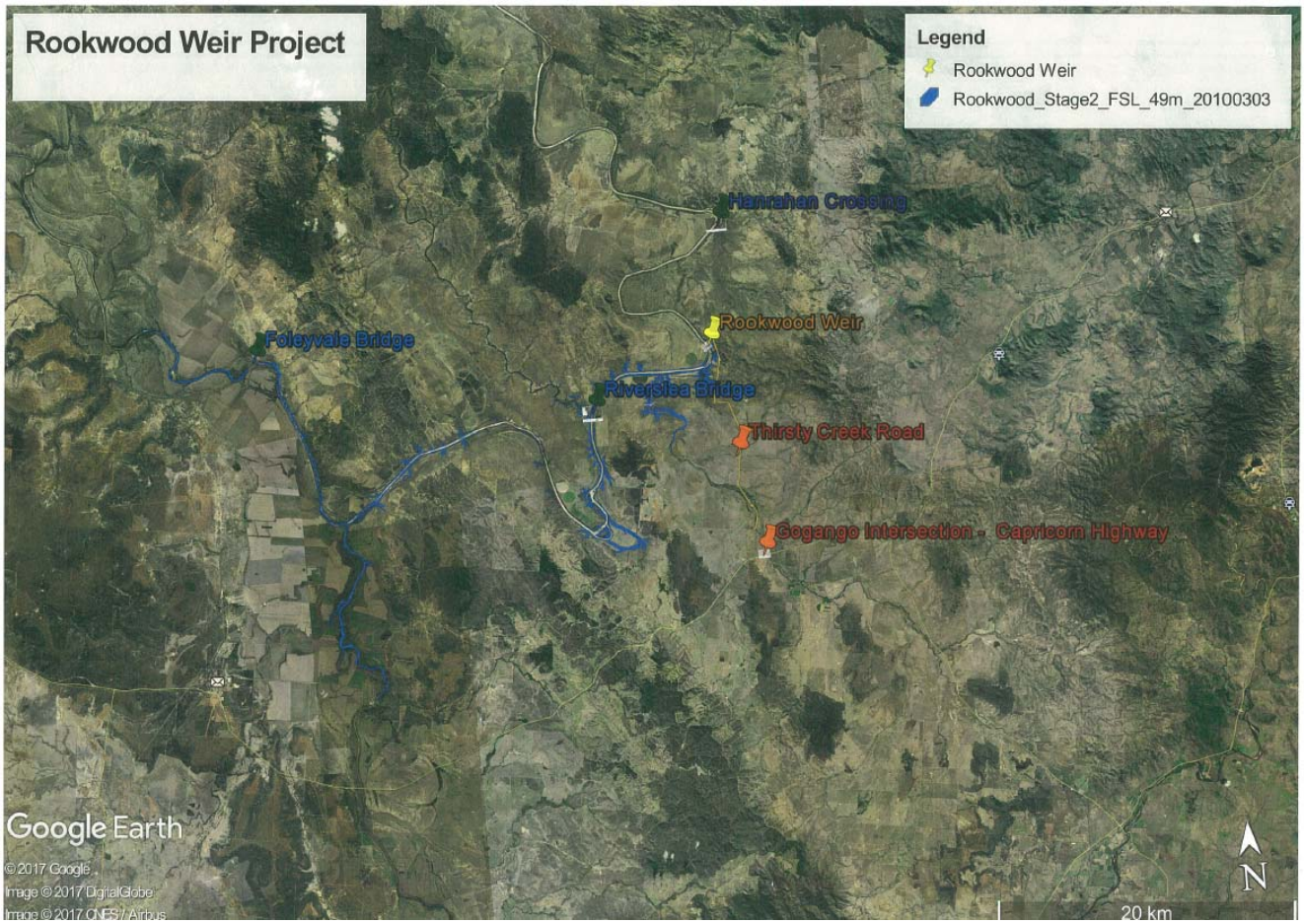


Figure 1 – Rookwood Weir Site

PROPOSED USE

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- Car park
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The proposed camp layout will be as per Design Architecture plans attached in Attachment 1 and the camp location in relation to other site facilities will be as per Figure 2.

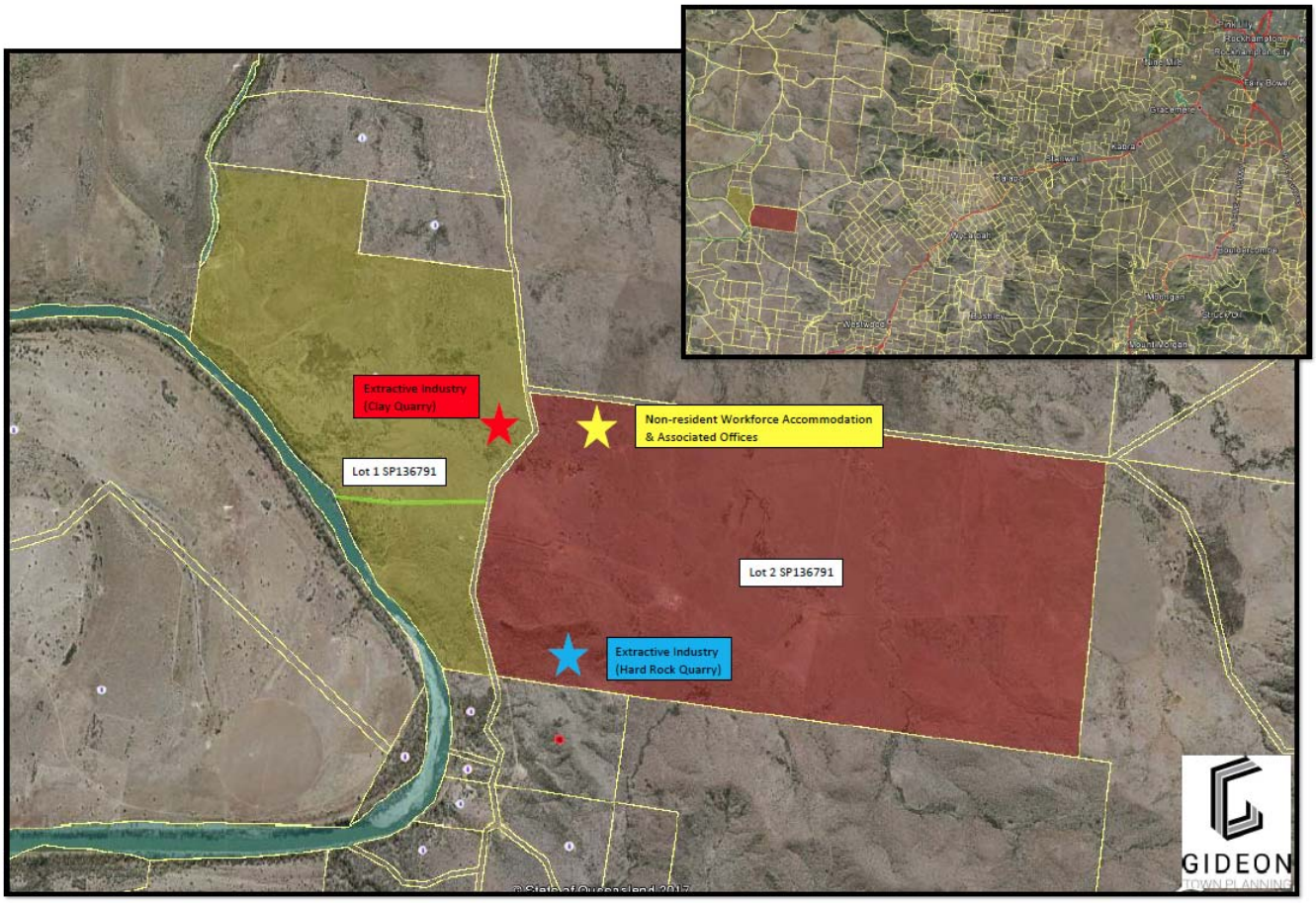

Figure 2 – Camp Location in relation to other site facilities

CATCHMENT CONDITIONS

The proposed camp site is located on gently grading terrain that ranges in elevation between RL 67.5m AHD down to RL 62.5m AHD upstream of the observed drainage line that exists within the property. As identified above, the site is rural in nature and has no impervious component in the existing condition.

The proposed works will change the site fraction impervious by adding approximately 1.5ha of impervious surfaces in the form of temporary buildings, carpark and access pathways. In terms of the overall allotment this represents an effective fraction impervious of 0.15% given that the site area is approximately 1,016ha.

We do note that the site is however in close proximity to the site legal point of discharge, which is the existing road corridor and associated cross road drainage infrastructure to the west. To ensure that this infrastructure remains serviceable throughout the estimated 2 to 3 year life of the project a review of the performance of the cross road culverts will be undertaken as part of the future detailed design of the site infrastructure. As part of this process, a review of the local site impact of the increase in the fraction impervious area will be undertaken with the intention of sizing a detention facility to the south of the proposed carpark area near the RL 62.5m AHD contour line. It is expected that the detention basin will take the form of an earthen bund with low flow pipe outlets to mitigate the minor increase in catchment discharges that are directed towards the cross road culverts.

STORMWATER QUALITY

The proposed site is expected to be temporary in nature and is limited to the life of the construction phase of the weir. Therefore, the key element with respect to stormwater quality is the management of sediment during the construction phase and during the brief operational phase.

To comply with the State Planning Policy 2016 requirements for erosion and sediment control a management plan will be prepared as part of the future detailed design process – and will likely include a requirement for a high efficiency sediment (HES) basin.

During the operational phase, the site will have limited potential to export sediment. The main area that has the potential to export sediment is the carpark area to the south and west of the workers camp buildings. We propose, however, to ensure that the entire site is provided with coarse sediment screening in the form of rock sediment forebays upstream of the bunded detention area. The sediment forebays will be sized in accordance with the provisions of the South-East Queensland Technical Design Guidelines for Water Sensitive Urban Design (Healthy Waterways, 2006). Given that the site has an operational lifetime of approximately 3 years, the calculations will be based on an 18 month maintenance period (i.e. mid and end of life).

In addition to the sediment treatment measures that are to be designed as part of the detailed design phase, there is the potential to include rainwater harvesting tanks for the workers camp buildings. Rainwater harvesting tanks provide the benefit of managing the atmospheric deposition of sediment on the roof areas as well as reducing the discharge volumes from the site. In particular, rainwater harvesting tanks address the impact of frequent flows from development. The sizing of rainwater tanks will be undertaken in conjunction with the assessment of potable water demands and supply to the site to ensure that they are optimised for their functional requirement.

SUMMARY

The details provided above highlight that the proposed workers camp at Thirsty Creek Road is not limited with respect to stormwater quantity or quality management. It is anticipated that a minor detention basin will be designed to address the localised impacts of runoff from the site, offline from the drainage path that is directed towards the legal point of discharge to the west of the site.

Additionally, the site will address its requirements for stormwater quality treatment by ensuring sediment controls are designed and implemented during the construction and operation phases of the forecast 2 to 3 year life of the site.

Yours sincerely

Chris Hewitt
Principal Civil Engineer
RPEQ NO. 5141

mcmurtrie
CONSULTING ENGINEERS

P (07) 4921 1780
F (07) 4921 1790
E mail@mcmengineers.com
mcmengineers.com
ABN 69 958 286 371

PO Box 2149, Wandal Q 4700
63 Charles Street
North Rockhampton Q 4701

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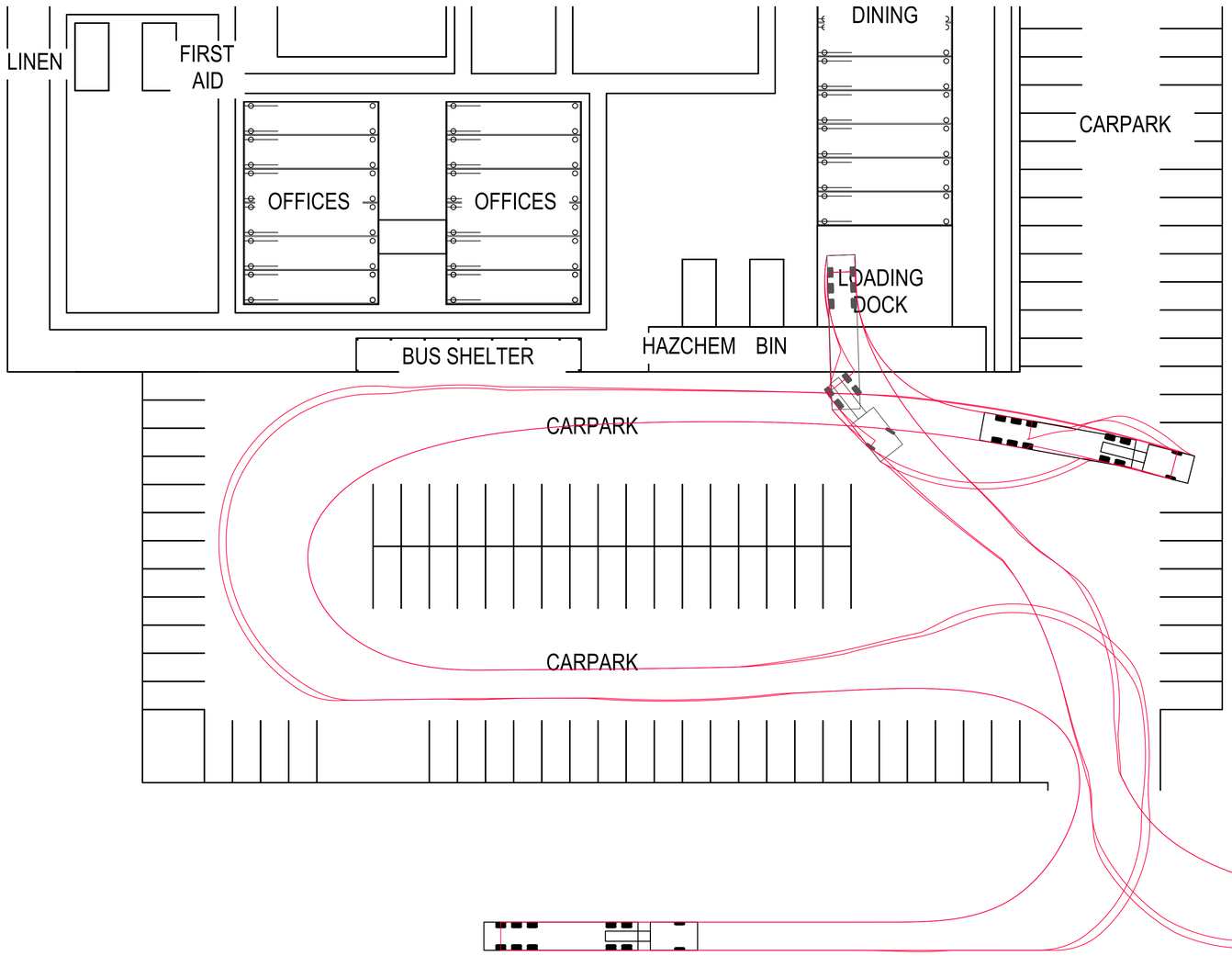

LAYOUT PLAN
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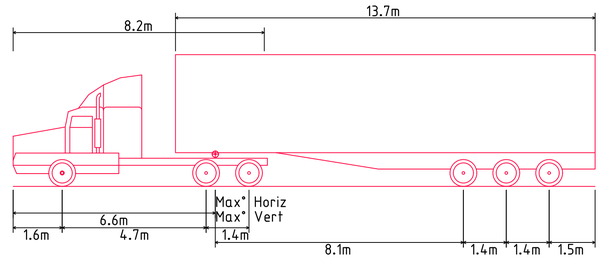

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OVERALL BODY HEIGHT	4.301m
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LOCK-TO-LOCK TIME	6.00s
CURB TO CURB TURNING RADIUS	12.500m

AV - ARTICULATED VEHICLE (19.0m)
SCALE: 1:100(A1) 1:200(A3)

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/32-2020

Dated: 9 November 2020

5 0 5 10 15 20 25m
SCALE 1:250 @ A1 SCALE 1:500 @ A3

2 0 2 4 6 8 10m
SCALE 1:100 @ A1 SCALE 1:200 @ A3

INFORMATION ONLY

REV	DATE	REVISION DESCRIPTION	DRAFT	DESIGN
A	17.11.2017	SUBMITTED FOR INFORMATION	RC	RC

SURVEYOR
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HEIGHT DATUM

	BY	DATE
REVIEWED		
RPEQ ENG		

RPEQ No:

CLIENT

SCALE: AS SHOWN

PREPARED BY 018-17-18

mcmurtrie CONSULTING ENGINEERS
Address: 63 Charles Street, NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

CLIENT
PROJECT ROOKWOOD WEIR
TITLE PRELIMINARY WORKERS CAMP SWEPT PATH ANALYSIS
SHEET 1 OF 3

A1 | DRAWING NUMBER 0181718-SK001 | REVISION A

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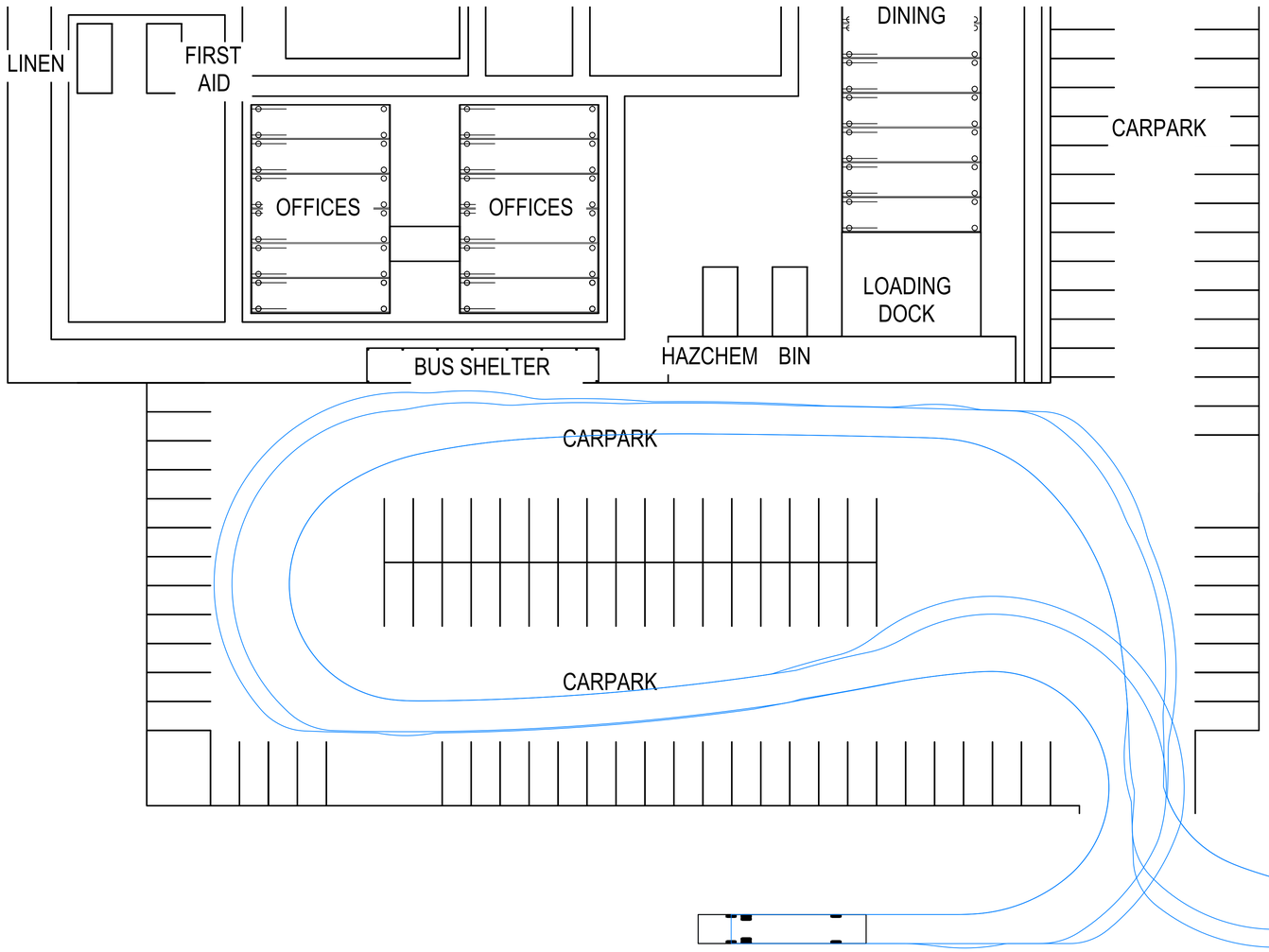

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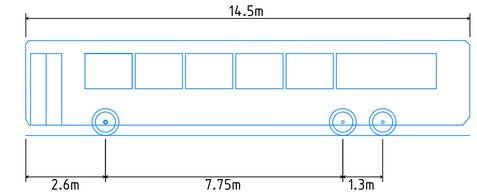

LONG RIGID BUS (14.5 M)	
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TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
CURB TO CURB TURNING RADIUS	15.000m

LONG RIGID BUS (14.5 m)
SCALE: 1:100(A1) 1:200(A3)

ROCKHAMPTON REGIONAL COUNCIL

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5 0 5 10 15 20 25m
SCALE 1:250 @ A1 SCALE 1:500 @ A3

2 0 2 4 6 8 10m
SCALE 1:100 @ A1 SCALE 1:200 @ A3

LAYOUT PLAN
SCALE 1:250(A1) 1:500(A3)

INFORMATION ONLY

SURVEYOR

ADDRESS:

CO-ORDINATE DATUM

HEIGHT DATUM

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A	17.11.2017	SUBMITTED FOR INFORMATION	RC	RC

	BY	DATE
REVIEWED		
RPEQ ENG		

RPEQ No:

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SCALE: AS SHOWN

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mcmurtrie CONSULTING ENGINEERS
Address: 63 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

CLIENT
PROJECT ROOKWOOD WEIR
TITLE PRELIMINARY WORKERS CAMP SWEPT PATH ANALYSIS
SHEET 2 OF 3

A1

DRAWING NUMBER 0181718-SK002

REVISION A

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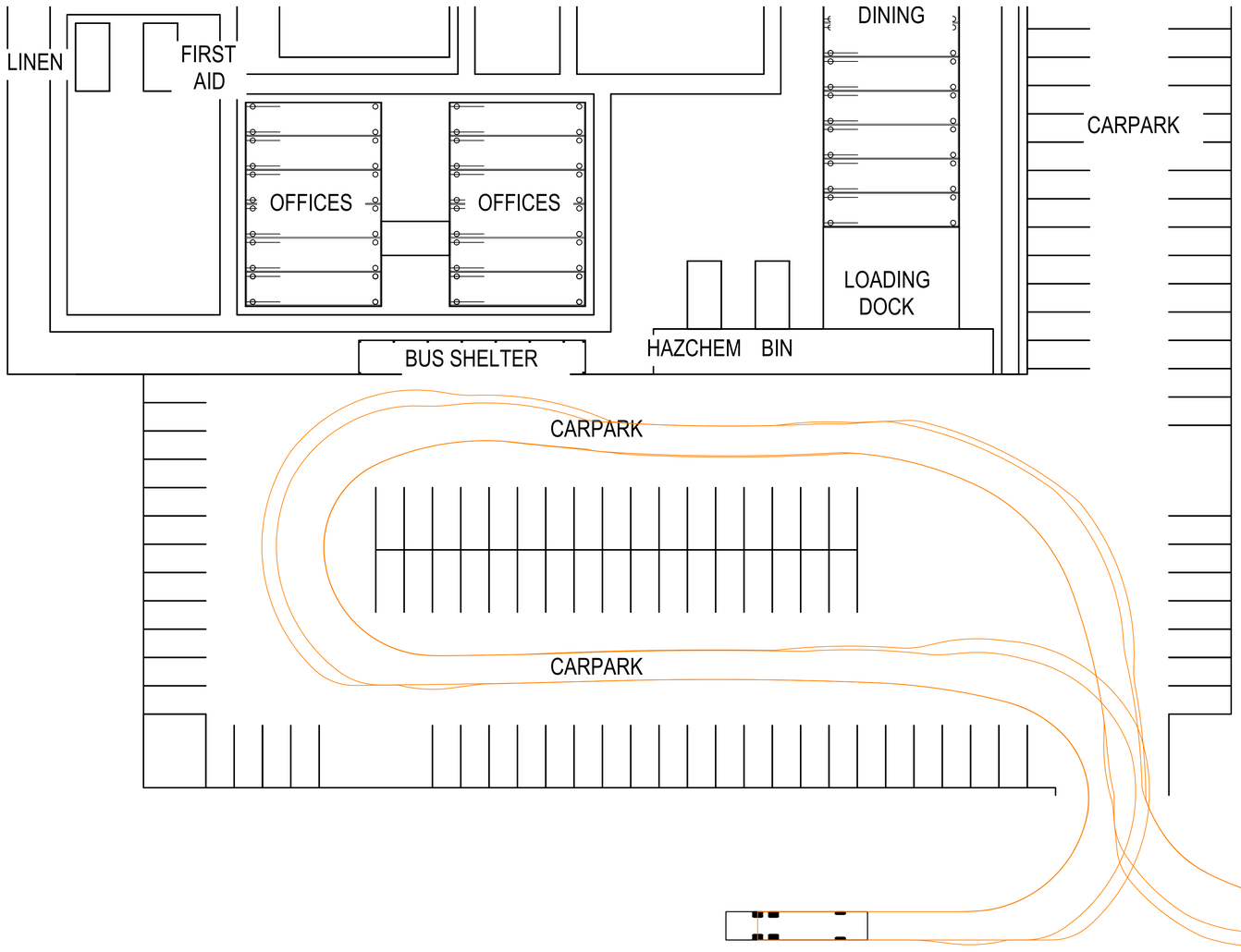

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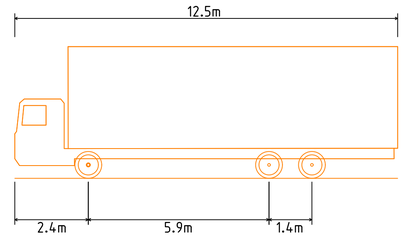

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OVERALL BODY HEIGHT	4.500m
MIN BODY GROUND CLEARANCE	0.150m
TRACK WIDTH	2.500m
LOCK-TO-LOCK TIME	6.00s
CURB TO CURB TURNING RADIUS	12.500m

HRV - VERTICAL CLEARANCE (12.5m)
SCALE: 1:100(A1) 1:200(A3)

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/32-2020

Dated: 9 November 2020

5 0 5 10 15 20 25m
SCALE 1:250 @ A1 SCALE 1:500 @ A3

2 0 2 4 6 8 10m
SCALE 1:100 @ A1 SCALE 1:200 @ A3

LAYOUT PLAN
SCALE 1:250(A1) 1:500(A3)

INFORMATION ONLY

REV	DATE	REVISION DESCRIPTION	DRAFT	DESIGN
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SURVEYOR
ADDRESS:
CO-ORDINATE DATUM
HEIGHT DATUM

	BY	DATE
REVIEWED		
RPEQ ENG		

RPEQ No:

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SCALE: AS SHOWN

PREPARED BY 018-17-18
mcmurtrie CONSULTING ENGINEERS
Address: 63 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
E-mail: mail@mcmengineers.com
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790

CLIENT
PROJECT ROOKWOOD WEIR
TITLE PRELIMINARY WORKERS CAMP SWEPT PATH ANALYSIS
SHEET 3 OF 3

A1 | DRAWING NUMBER 0181718-SK003 | REVISION A

018-17-18

Date: 19 December 2017

Rookwood Weir – Flood Hazard Assessment
(1486 Thirsty Creek Road, Gogango QLD (Lot 2 on SP136791) & Lot 1 Thirsty Creek Road, Gogango QLD (Lot 1 on SP136791)

Flood Hazard Assessment

McMurtrie Consulting Engineers have been commissioned by Gladstone Area Water Board to prepare a Flood Hazard Assessment for proposed quarry activities and associated workers accommodation located at the Rookwood Weir site on Thirsty Creek Road.

The subject site has been identified as a floodplain investigation area by the Queensland Reconstruction Authority (QRA) and the purpose of this assessment is to demonstrate that the proposed development can comply with the current Rockhampton Regional Council (RRC) Flood Overlay Code.

The proposed location of each activity is shown on the below image

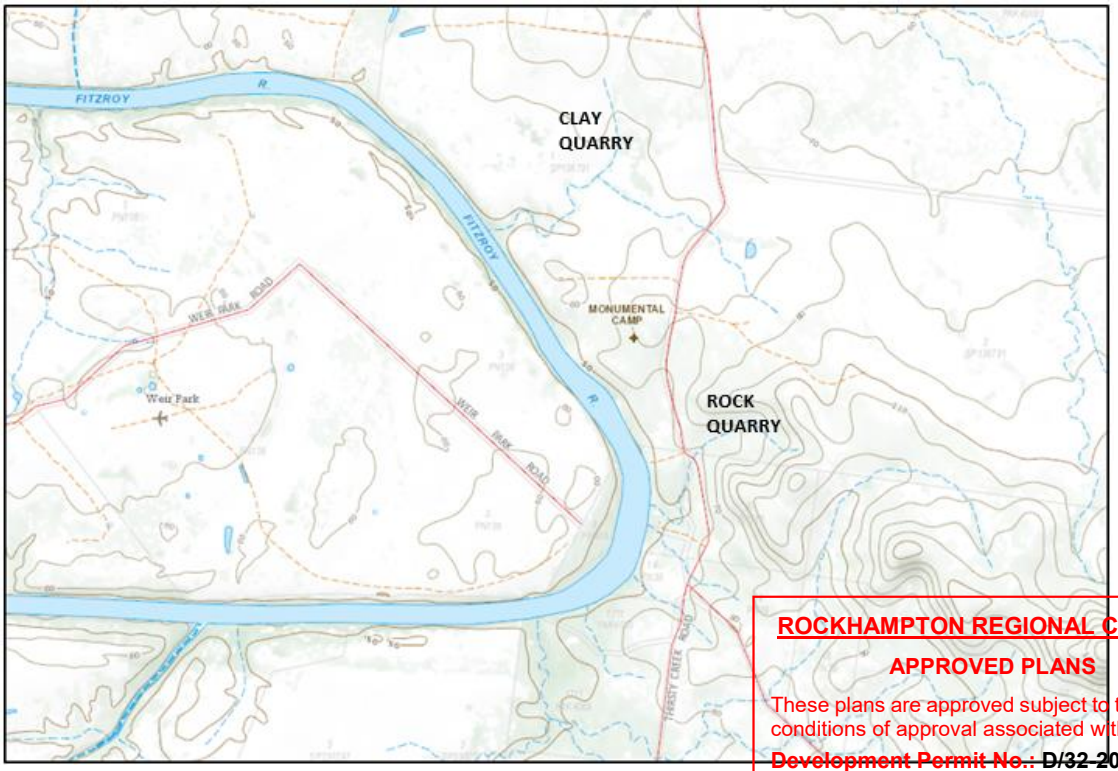


Figure 1: Proposed Location

Evaluation

Potential inundation and risk assessment has been based QRA mapping and historic flood event information.

Upon review of the QRA online mapping it is noted that the flood investigation area overlay adopted by Rockhampton Regional Council is rough guide used for trigger purposes only and does not reflect the actual 1 percent AEP flood line.

The 1 percent AEP flood line provided by QRA for the subject site is shown on the following page.

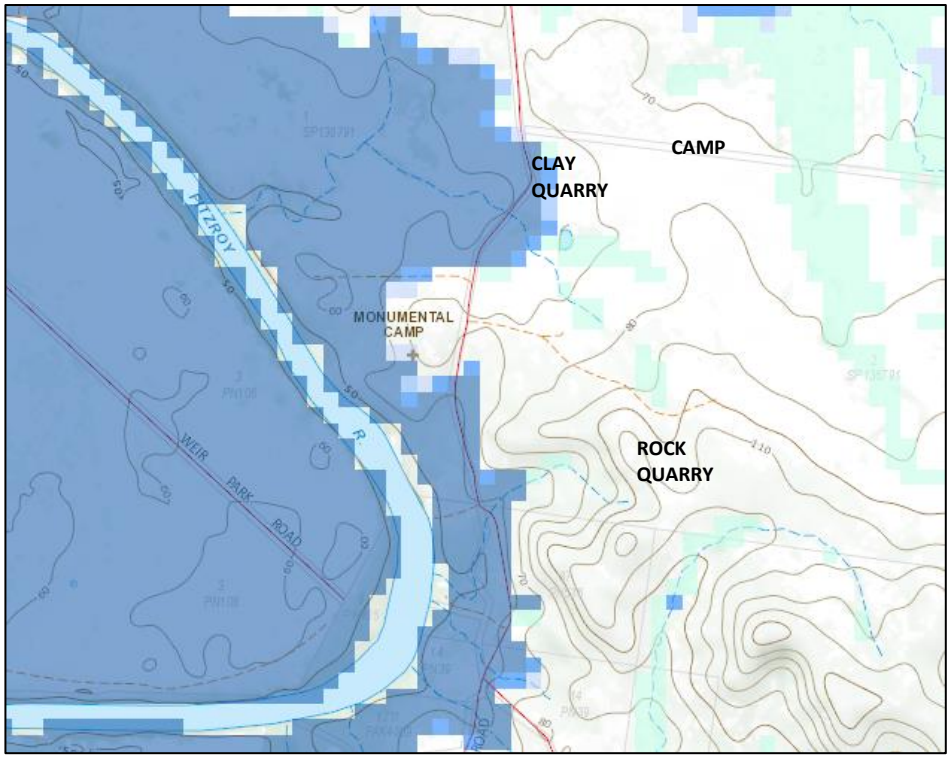


Figure 2: 1 Percent AEP Flood – QRA Mapping Extract

For the subject site the 1 percent AEP flood line provided by QRA is shown to be lower than the flood investigation area overlay adopted by Rockhampton Regional Council. The flood line is consistently located between 60m AHD and 70m AHD and corresponds to numerous existing ground locations known to be approximately 64m AHD.

Further investigation of historic flood events revealed that the Riverslea guage located approximately 10km upstream of the subject site reached 28.0m in the major 2010/2011 flood event translating to an approximate level of 63m AHD.

Given the above information a 1 percent AEP level of 64m AHD has been adopted for the subject site.

Hard Rock Quarry

The proposed Rock Quarry will involve extraction of material from the side of a hill located between 65m AHD and 95m AHD. The extraction activity itself is not located below the 1 percent AEP flood level, however the associated stockpile area is. The proposed quarry will not be operational during a flood event and all equipment and material will be stored above the 1 percent AEP flood level.

Clay Quarry

The proposed Clay Quarry will involve extraction of material from a lower lying area between 53m AHD and 57m AHD. The extraction activity is only proposed for a short period of time during the dry season and will not be operational during a flood event. No equipment or material will be stored within this area during a flood event.

Accommodation Camp

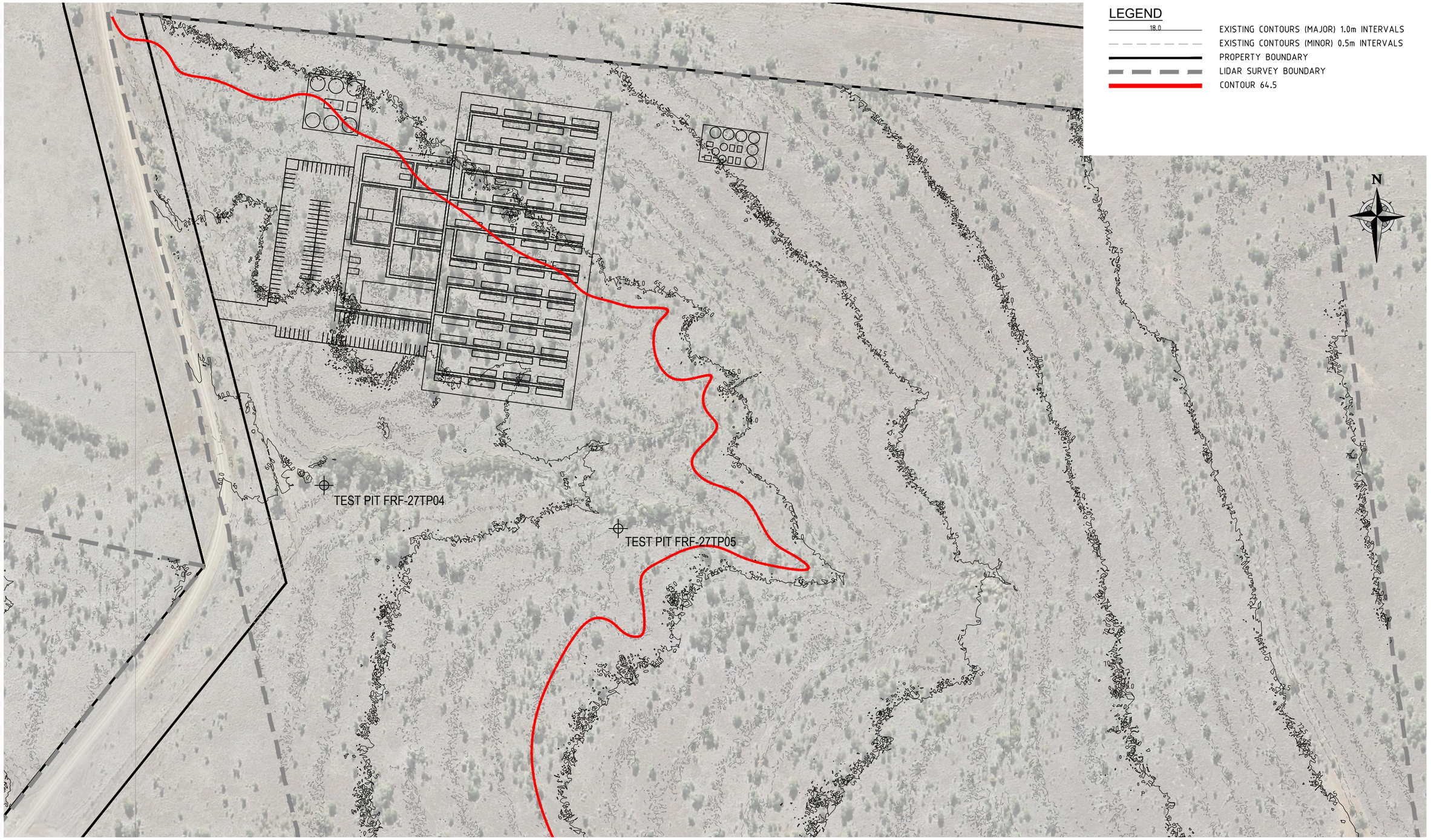
The proposed workers accommodation is partially located within the flood investigation area and is between 63m AHD and 67m AHD. Normally it would be proposed that all habitable structures are located 500mm above the adopted 1 percent AEP flood level of 64m AHD. Attached MCE Plan No. 0181718-P-2001 shows the 64.5 contour which is 500mm above the 1 percent AEP level of 64m AHD. In this case it is proposed that given the temporary nature of the construction accommodation camp and that no filling is proposed to be associated with the camp site that it be located as per attached MCE Plan No. 0181718-P-2001.

Recommendations

1. The temporary construction accommodation camp be located as per attached MCE Plan No. 0181718-P-2001.
2. All machinery, plant and equipment should be stored above the 1 percent AEP flood level of 64m AHD during flood event
3. Proposed quarry activities should cease operations during major flood events

Prepared by **Jamie Lee**

Checked by **Chris Hewitt**
RPEQ 05141



20 0 20 40 60 80 100m

SCALE 1:1 000 @ A1 SCALE 1:2 000 @ A3

LAYOUT PLAN

SCALE 1:1000(A1) 1:2000(A3)

INFORMATION ONLY

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PREPARED BY 018-17-18

mcmurtrie CONSULTING ENGINEERS
Address: 63 Charles Street NORTH ROCKHAMPTON QLD 4701
Postal: PO BOX 2149, WANDAL QLD 4700
Phone: (07) 4921 1780
Mobile: 0407 631 066
Fax: (07) 4921 1790
E-mail: mail@mcmengineers.com

CLIENT

PROJECT ROOKWOOD WEIR

TITLE PRELIMINARY WORKERS CAMP SITE LAYOUT

SHEET 1 OF 1

A1

DRAWING NUMBER 0181718-P-2001

REVISION A

DRAWING LOCATION: S:\PROJECT RECORDS\17-18\018-17-18\ACAD\DRAWINGS (SHEET SETS, AND\INDIVIDUAL DRAWINGS\INDIVIDUAL DRAWINGS\0181718 - ROOKWOOD WEIR LAYOUT PLANS.DWG

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SunWater Limited
Rookwood Weir Construction Project
Workers Camp / Sewage Treatment Plant
Environmental Report

STEER
ENVIRONMENTAL CONSULTING

SunWater Limited – Rookwood Weir Construction Project – Workers Camp / Sewage Treatment Plant - Material Change of Use and Environmental Authority - Environmental Report - 1486 Thirsty Creek Road, Gogango - 2/SP136791

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/32-2020
Dated: 9 November 2020

Applicant Name: SunWater Limited
AR #: N/A
Project #: SEC001
EA Application #: N/A
Existing EA Permit #: **N/A**

Report Prepared by: STEER Environmental Consulting

20 December 2018

Document Status

Report Type: DA & EA Application Report – STP ERA

Project: Rookwood Weir Construction, Thirsty Creek Road, Gogango

Client: SunWater Limited

Document Version	Date	Author	Checked	Approved
Final v3	**20 December 2018**	**PS/SB**	**PS**	**PS**
Signed				

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Table of Contents

1 Abbreviations

- DA - Development Approval
- DES - Department of Environment and Science
- EA - Environmental Authority
- EP Act - *Environmental Protection Act 1994*
- EP Reg *Environmental Protection Regulation 2008*
- EP - Equivalent Person
- ERA - Environmentally Relevant Activity
- LFRIP - Lower Fitzroy River Infrastructure Project
- MCU - Material Change of Use
- MEDLI - Model for Effluent Disposal Using Land Irrigation
- MSW Municipal Solid Waste
- QWRC - Queensland Water Recycling Guidelines, December 2009
- RRC - Rockhampton Regional Council
- STEER EC - STEER Environmental Consulting
- STP - Sewage Treatment Plant
- WAS Waste Activated Sludge
- WTP - Water Treatment Plant
- WWMP - Waste Water Management Plan

2 Executive Summary

This "Material Change of Use & Environmental Authority – Environmental Report" has been prepared to support an application for development approval (DA) and an environmental authority (EA) to operate a sewage treatment plant (STP) environmentally relevant activity (ERA), and workers construction camp on land located at 1486 Thirsty Creek Road, Gogango QLD, on Lot 2/SP136791. The report is intended to serve two purposes, primarily supporting an application to the Department of Environment and Science (DES) for an EA to operate the STP ERA, but to also provide support for the material change of use (MCU) application to Rockhampton Regional Council (RRC).

SunWater Limited is planning for the Lower Fitzroy River Infrastructure Project (LFRIP), located west of Rockhampton in Central Queensland. The project includes construction of a new weir in the vicinity of Rookwood Crossing. Construction of the weir will be supported by a proposed 250 person workers camp in close proximity to the weir construction site. This camp will be the major accommodation provider for the weir construction and will remove the need for workers to travel to and from the construction site to their homes during the construction period.

Services that will need to be provided in support of the workers camp will include:

- Sewage treatment
- Potable water treatment and supply
- Waste management

Sewage management for the camp will be provided by a proposed 250 equivalent persons (EP) STP located adjacent to the camp, with a treated effluent irrigation field located a short distance from the camp. The specific ERA that is proposed to be conducted in association with the camp is:

- "ERA 63(1)b(i) – Sewage treatment – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme"

This environmental report investigates all likely environmental impacts that the proposed activities may have on the environmental values of the receiving environment, and provides mitigation measures where required. The report is broadly separated into an assessment of environmental values, and addressing the requirements of Rockhampton Regional Council planning scheme development codes associated with environmental management/impact.

All environmental impacts (and risks of impacts) presented by the proposed activity can be mitigated to an acceptable level.

3 Background

3.1 Report structure and intent

This report has been structured to serve two general purposes:

- Provide supporting information for an environmental authority (EA) application for an environmentally relevant activity (ERA), *"ERA 63(1)b(i) – Sewage treatment – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme"*.
- Provide supporting environmental management information for a material change of use (MCU) application to Rockhampton Regional Council (RRC) for the proposed workers camp and associated infrastructure.

Effectively, this report combines two separate reports into a single document. This will allow both the Department of Environment and Science (DES) and RRC to gain an understanding of the overall proposed workers camp, while also focusing upon their respective areas of authority.

Generally, sections 4 and 5 are intended to assist DES with assessment of the EA application associated with the STP and treated effluent irrigation field, while section 6 is intended to assist RRC with assessment of the MCU application for the workers camp.

3.2 Project description

SunWater Limited is planning for the Lower Fitzroy River Infrastructure Project (LFRIP), located west of Rockhampton in Central Queensland (see Figure 1 & 2). The project involves construction of a new weir in the vicinity of Rookwood Crossing on the Fitzroy River, and/or the raising of Eden Bann Weir to meet short, medium and long term water supply requirements in the Lower Mackenzie-Fitzroy sub-region. The proposed Rookwood Weir could provide up to 42,000 ML of high priority water to support regional agricultural and industrial development. The proposed weir is located on the Fitzroy Weir approximately 66 km south-west of Rockhampton, and is accessed from Thirsty Creek Road, Gogango.

Key features of the project are:

- raising of Eden Bann Weir
- construction of Rookwood Weir
- associated infrastructure
- augmentation of access roads and river crossings affected by the project.

The project will require a range of associated infrastructure to be constructed, including the operation of quarries and a workers camp within the vicinity of the weir construction.

It is intended that the weir construction will be undertaken over an approximate two year construction time, with construction occurring during the "dry" seasons, with only minimal activity being undertaken during the "wet" seasons.

Figure 1. Location of Rookwood Weir construction project in relation to Rockhampton and Gogango.

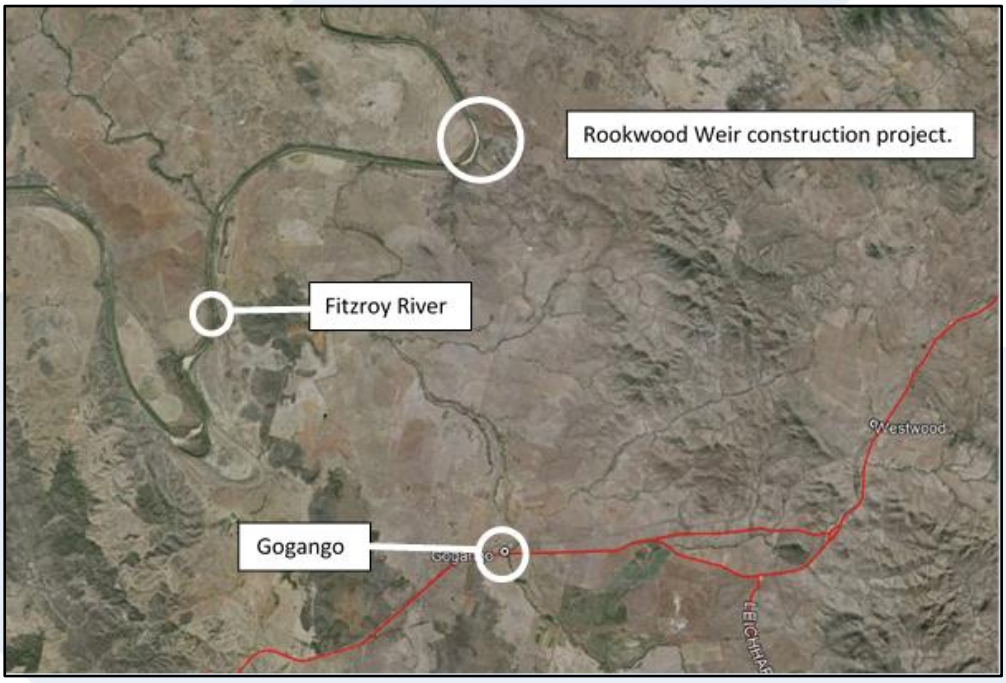


Figure 2. Location of Rookwood Weir on the Fitzroy River in relation to Gogango.

3.3 Proposed workers camp

A major component of the supporting infrastructure required by the weir construction will be a 250 person workers camp in close proximity to the weir construction site. This camp will be the major accommodation provider for the weir construction and will remove the need for workers to travel to and from the construction site to their homes during the construction period. The camp will provide all basic necessities that would be expected of a construction camp, including well-appointed rooms, showering and toilet facilities, meal preparation and dining facilities, and basic recreational areas.

Although the workers camp will be designed to accommodate a maximum of 250 persons, the camp population will vary across the approximate two year life of the project, with the population of the camp expected to peak in the dry season months and only a "skeleton" crew being present during the wet seasons.

Services that will be provided in support of the workers camp will include (see Appendix A):

- Sewage treatment
- Potable water treatment and supply
- Waste management

3.4 Location of proposed workers camp

The proposed location for the camp is 1486 Thirsty Creek Road, Gogango on Lot 2/SP136791 (see Figure 3 & Appendix A). Lot 2/SP136791 is located within RRC's local government area and is freehold land.

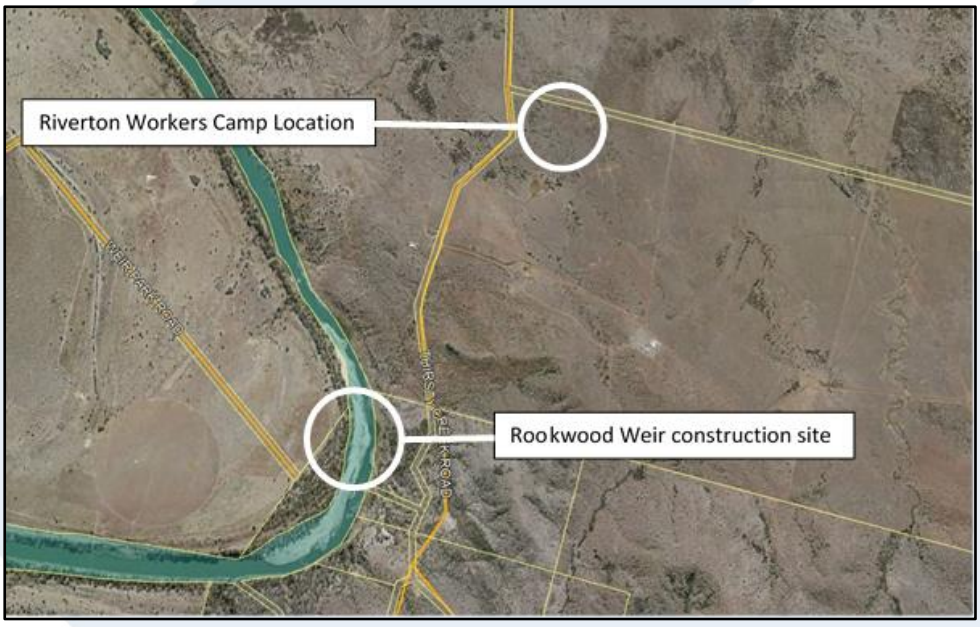


Figure 3. Location of proposed workers camp in relation to Rookwood Weir construction site.

4 On-Site STP and Treated Effluent Irrigation Field

4.1 Sewage treatment

A review of existing sewerage infrastructure in the area of the proposed workers camp has confirmed that there is currently no RRC sewerage infrastructure in the vicinity of the site. SunWater Limited proposes to service the sewage management requirements of the camp with an on-site STP and associated treated effluent irrigation field.

4.2 Environmentally Relevant Activity (ERA)

The ERA that is proposed to be triggered by employing an on-site STP and associated treated effluent irrigation field in this instance would be:

"ERA 63(1)b(i) – Sewage treatment – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme".

This ERA requires the operator to gain the following approvals:

- Suitable Operator Registration
- Environmental Authority under the *Environmental Protection Act 1994*
- Material Change of Use under RRC Planning Scheme

4.3 Sewage Treatment Plant Influent

The proposed STP will be servicing influent from the following:

- 250 workers camp residents
- Workers camp kitchen facility
- Workers camp recreational facilities

The methodology that has been used to identify the likely maximum volume of effluent produced by the workers camp is as follows:

- Identification of expected maximum number of workers to be accommodated.
- Use of this maximum number for a direct conversion to equivalent persons (EP). This is a conservative method as it is likely that each worker generates considerably less than one EP of effluent in any day.
- Calculation of likely maximum EP for the facility. One EP is considered as 200 L/day in accordance with the *Environmental Protection Regulation 2008* (EP Reg)

Using the methodology above, the likely maximum EP value associated with the Workers Camp = **250 EP**

Therefore, the maximum volume of raw effluent (influent) that will need to be treated by an on-site STP and associated treated effluent irrigation field

= 250 x 200 L/day

= **50,000 L/day**

As a result of the total EP value for the proposed workers camp, the proposed STP will be designed to a 250 EP total daily peak design capacity, which equates to approximately 50,000 L/day of effluent being treated. In accordance with the EP Reg, an STP with a design capacity of 250 EP will fit within the following threshold:

"ERA 63(1)b(i) – Sewage treatment – operating sewage treatment works, other than no-release works, with a total daily peak design capacity of more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme".

The EP Reg describes this threshold as a non-concurrence ERA and therefore the STP does not require development approval (from the State), other than against the RRC planning scheme.

4.4 Proposed Sewage Treatment Plant

The exact STP to be proposed for the activity has not been determined at this stage, however a number of "package plant" options that are commercially available have been identified as suitable for this type of total daily peak design capacity. These STPs are commonly either activated sludge (AS) systems, or biological contactor systems.

4.4.1 Treatment Standard of Effluent for Irrigation

To use treated effluent for irrigation, it must be treated to an appropriate standard for the intended use. The Queensland Water Recycling Guidelines, December 2009 (QWRG), Table 6.2b identify recommended water quality specifications for five classes of recycled water. These classes are identified as classes A – D, and are reproduced here in Table 1.

Table 1. Queensland Water Recycling Guidelines Table 6.2b - Specifications for recycled water classes A - D.

Class	*E. coli* (median) cfu/100mL[2]	BOD5 mg/L median	Turbidity NTU 95% ile (max.)	SS, mg/L median	TDS, mg/L or EC, µS/cm medians TDS / EC[3]	pH
A	< 10	20	2 (5)[4]	5	1000/1600	6-8.5
B	< 100	20	—	30	1000/1600	6-8.5
C	< 1000	20	—	30	1000/1600	6-8.5
D	< 10,000	—	—	—	1000/1600	6-8.5

[1] Use of any of these classes of recycled water should involve development and implementation of a Recycled Water Management Plan incorporating risk management. The location of the sampling point for these parameters will depend on the outcome of the Recycled Water Management Plan (see Chapter 4 of these guidelines).

[2] As these values are medians, for each of these guideline values a response value should be set (e.g. 50% above the guideline value). If the response value is exceeded, another sample should be immediately taken. If this exceeds the response value again, the supply of recycled water should be suspended, and the non-conformance and corrective action process implemented, with supply not being re-established until conforming product can be guaranteed.

[3] For sustainable irrigation, salinity should be kept as low as possible. For example, if TDS >1000 mg/L or EC >1600 µS/cm, a salinity reduction program should be implemented. However, there may be some uses where salinity reduction is not required, or where other salinity management options are more practical. This should be determined during the risk assessment.

[4] Turbidity would generally be measured before the disinfection point at the treatment plant as this is the point at which low turbidity is essential. Monitoring at the treatment plant should be continuous with an alarm activated at an NTU of 2, and automatic shut-off of supply at an NTU of 5. If disinfection of Class A recycled water is achieved partly through processes that are less dependent on turbidity, an indicator other than turbidity should be used. For example, extended lagooning would use detention time in the storage as the critical limit (typically 40 days), rather than turbidity. Ozonation may use an oxidation-reduction potential (ORP) sensor, with the critical limit (in millivolts) determined by the quality of the feed water.

Particular intended uses of recycled water trigger the appropriate treatment class (A+, A – D) of the water in Table 6.3b of the QWRG. Table 6.3b is reproduced here at Table 2. Treated effluent produced from the proposed STP is intended to be discharged through a treated effluent irrigation field that is not accessed by anyone other than authorised personnel, and is used for grazing cattle. In accordance with the QWRG, sewage effluent for this purpose will be treated to a Class C standard, which is suitable for agricultural pasture.

Table 2. Queensland Water Recycling Guidelines, Table 6.3b, identifying appropriate treatment levels for particular uses.

Recycled water use	Class[1]	Recommended monitoring
Domestic and commercial property use		
• toilet *flushing*, outdoor hosing and washdown, above ground garden watering	A+	See Table 6.2a
Irrigating public open space and golf courses		
• above ground open space irrigation, uncontrolled access	A	*E. coli* weekly, turbidity[2] continuous, disinfection[3] continuous, pH weekly
• controlled access or subsurface irrigation	C	*E. coli* weekly, SS monthly, disinfection[3], pH monthly
Irrigating food crops and retail nurseries		
• food crops consumed raw or minimally processed	A+	See Table 6.2a
• sugar cane and grapes for wine production	C	*E. coli* weekly, SS weekly, pH weekly
• other above ground food crops with above ground irrigation	A+[4]	See Table 6.2a
• other above ground food crops with below ground irrigation	C	*E. coli* weekly, disinfection[3] weekly, SS weekly, pH weekly
• root crops	A+[4]	See Table 6.2a
• retail nurseries irrigating ready to eat crops	A+	See Table 6.2a
Irrigating pasture/fodder and agricultural washdown		
• pasture/fodder for dairy animals without withholding period	B	*E. coli* weekly, disinfection[3] weekly, SS weekly, pH weekly
• pasture/fodder for dairy animals with withholding period of five days	C	*E. coli* weekly, disinfection[3] weekly, SS weekly, pH weekly
• pasture/fodder for other grazing animals except pigs with withholding period of four hours	C	*E. coli* weekly, disinfection[3] weekly, SS weekly, pH weekly
• washdown of hard surfaces in agricultural industries	B	*E. coli* weekly, disinfection[3] weekly, SS weekly, pH weekly
Irrigating non-food crops		
• retail nurseries not irrigating ready to eat products	A	*E. coli* weekly, turbidity[2] continuous, disinfection[3] continuous, pH weekly
• silviculture, turf, cotton, wholesale nurseries with controlled access and other safeguards to protect the health of workers or neighbours	D	*E. coli* monthly, pH monthly
Industrial purposes		
• open system (potential for high human contact) e.g. car wash or quarry where aerosol generation is constant	A+	See Table 6.2a
• open system (potential for occasional human contact, but with safeguards in place)	A	*E. coli* weekly, turbidity[2] continuous, disinfection[3] continuous, pH weekly
• closed system (low human contact)	C	*E. coli* weekly, disinfection[3] weekly, pH weekly
• irrigation of "no public access" areas		
• fire fighting	A+	See Table 6.2a
Supplementing drinking water supplies		
• surface water or direct injection to aquifer	N/A[5]	See section 7.6 of these guidelines
Recreational purposes		
• fountains and water features (no primary or secondary contact recreation)	A[6]	*E. coli* weekly, turbidity[2] continuous, disinfection[3] continuous, pH weekly
• water features for amenity purposes only (controlled access)	C	*E. coli* weekly, disinfection[3] weekly, pH weekly
• natural or artificial wetlands		Site specific, depending on the environmental values and water quality objectives of the receiving waterway

[1] In this table a recommendation for use of any particular class of recycled water includes higher classes as well. In other words, if Class C is recommended, Classes A and B could also be used, but Class C is the minimum recommended standard.
[2] See footnote 4 to Table 6.2b. Turbidity should be monitored at the stage in the production process for recycled water that is most relevant. In other words, if turbidity levels are important to the disinfection process, turbidity should be measured immediately before disinfection.
[3] See comments on chlorine disinfection in section 6.6.3 of these guidelines.
[4] See section 7.3.6 of these guidelines for exceptions to this recommendation.
[5] Not applicable, as no specific recycled water quality has yet been determined for this use. See section 7.6 of these guidelines.
[6] An alternative class of recycled water may be used depending on the outcome of the Recycled Water Management Plan (see section 7.7 of these guidelines).

4.5 Proposed Treated Effluent Irrigation

Treated effluent produced by the proposed STP is intended to be disposed of through a treated effluent irrigation field. Initial calculations for the required area for irrigation have been undertaken using the Queensland State Government preferred "Model for Effluent Disposal Using Land Irrigation" (MEDLI) modelling software.

Initial MEDLI modelling run data has indicated that irrigation areas of 2 ha or greater with treated effluent wet weather storage tank capacity of 160,000 L will achieve:

- **100% reuse of treated effluent (see Appendix B)**
- **0 instances of overtopping of treated effluent storage tank. This equates to 0 instances of irrigation occurring during wet weather events.**

Therefore, a treated effluent irrigation area of at least 2 ha up to a maximum of 5 ha is proposed. The proposed location of this area has been identified in Figure 3 and Appendix A. MEDLI modelling run data has been provided for areas of both 2 ha and 5 ha at Appendix B.

5 STP and Treated Effluent Irrigation Area - Possible Impacts on Environmental Values and Mitigation Measures

This section addresses possible impacts of the proposed STP and associated treated effluent irrigation area on environmental values, and proposes mitigation measures for implementation where required.

5.1 Environmental Values – Air

5.1.1 Dust

The impact of the proposed activity on surrounding sensitive uses in relation to dust has been assessed, and it is not considered that the activity will have any impact upon these uses. There are no dust generating activities associated with the proposed STP and treated effluent irrigation field.

5.1.2 Odour

The impact of the proposed activity on surrounding sensitive uses in relation to odour has been assessed, and it is not considered that the activity will have any impact upon these uses.

The proposed STP and treated effluent irrigation field can present a risk of odour generation if the activities are not operated in an appropriate manner. However, the factors that were taken into account when considering the potential impact of odour upon nearby sensitive uses are:

- The proposed STP will produce no identifiable odour when operating correctly to manufacturers specifications. Modern package plant STPs are fully enclosed, thus minimising any potential nuisance impact upon surrounding sensitive uses.
- The area is very sparsely populated, with very few sensitive uses near the proposed workers camp. The nearest sensitive uses (sensitive receptors) are residential premises (agricultural homesteads) associated with the property on which the STP and treated effluent irrigation field will be located, and neighbouring properties. The sensitive use located on the same property as the proposed workers camp is approximately 1.4 km from the nearest point of the treated effluent irrigation field, while the nearest neighbouring sensitive use is located approximately 3.1 km to the northwest. The next nearest sensitive use is located approximately 5.8 km to the south of the workers camp (see Figure 4). The distance of these sensitive uses from the proposed STP and treated effluent irrigation field make it extremely unlikely that any potential odour will impact on these sensitive uses. In addition, the sensitive use located upon the same property as the proposed workers camp is the residence of the property owners, and the project is being undertaken with their agreement and involvement in deciding the location of the workers camp.

- The STP and treated effluent irrigation field will only be operated for the life of the workers camp and Rookwood Weir construction project, which will be approximately two years. At completion of the project the workers camp, STP and associated treated effluent irrigation field will be deconstructed and removed. All land disturbed by the workers camp will be rehabilitated.
- The STP will be operated under a set of written management procedures that will include daily inspection of the STP and treated effluent irrigation field. Operational malfunctions in the activity that may cause odour will be identified and rectified in a timely manner.

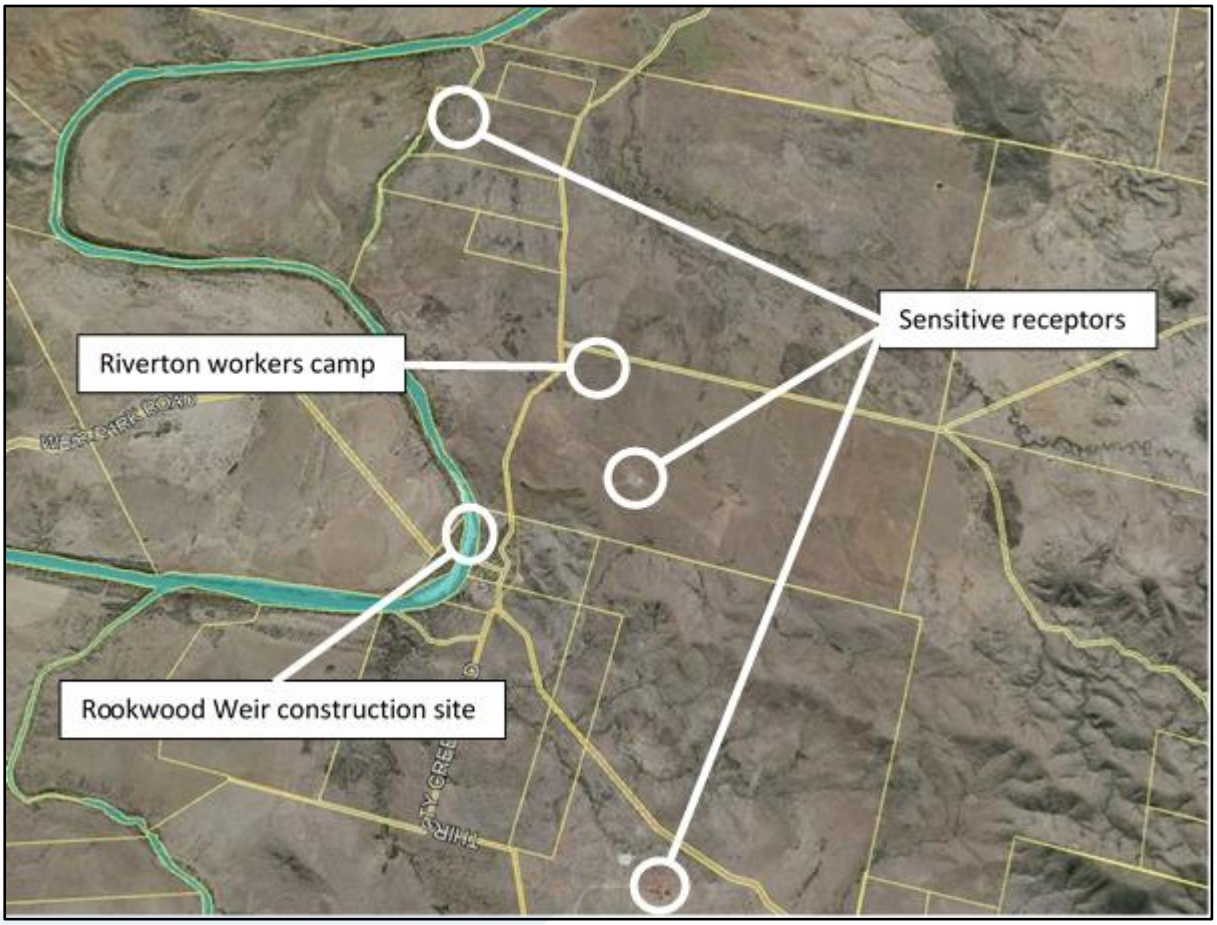


Figure 4. Location of proposed workers camp in relation to nearby sensitive receptors.

5.2 Environmental Values - Noise

The impact of the proposed activity on surrounding sensitive uses has been assessed in relation to noise impacts, and it is not considered that the activity will be audible to these uses.

The factors that were taken into account when considering the impact from noise on the surrounding sensitive uses are:

- The proposed STP will produce extremely low levels of noise. Modern package plant STPs contain all pumps and blowers inside the plant, thus minimising any potential nuisance impact upon surrounding sensitive uses.
- The area is very sparsely populated, with very few sensitive uses near the proposed workers camp. The nearest sensitive uses (sensitive receptors) are residential premises (agricultural homesteads) associated with the property on which the STP and treated effluent irrigation field will be located, and neighbouring properties. The sensitive use located on the same property as the proposed workers camp is approximately 1.4 km from the nearest point of the treated effluent irrigation field, while the nearest neighbouring sensitive use is located approximately 3.1 km to the northwest. The next nearest sensitive use is located approximately 5.8 km to the south of the workers camp (see Figure 4). The distance of these sensitive uses from the proposed STP and treated effluent irrigation field make it extremely unlikely that any potential noise generation will impact on these sensitive uses. In addition, the sensitive use located upon the same property as the proposed workers camp is the residence of the property owners, and the project is being undertaken with their agreement and involvement in deciding the location of the workers camp.
- The STP and treated effluent irrigation field will only be operated for the life of the workers camp and Rookwood Weir construction project, which will be approximately two years. At completion of the project the workers camp, STP and associated treated effluent irrigation field will be deconstructed, removed and rehabilitated.
- The STP will be operated under a set of written management procedures that will include daily inspection of the STP and treated effluent irrigation field. Operational malfunctions that may cause an increase in noise production will be identified and rectified in a timely manner.

Noise mitigation measures for the proposed development include:

- Ensuring all equipment and plant on-site is maintained in sound working order to manufacturer's specifications. Any mechanical failures will be repaired immediately to ensure no unnecessary noise is generated.
- Except for emergency repairs, undertaking all servicing of the STP (eg. removal of waste activated sludge by "sucker truck") in daylight hours.

5.3 Environmental Values - Water

5.3.1 Surface Water

The proposed STP and treated effluent irrigation field is located approximately 2 km from the Fitzroy River (see Figure 4). Small drainage lines within the vicinity of the proposed STP and treated effluent irrigation field ultimately direct overland stormwater flow into the river. Although the proposed STP and treated effluent irrigation field are not in the immediate vicinity of any drainage lines, if not managed appropriately the activity presents a low risk that contamination of this waterbody through overland flow and runoff may result.

The design of the proposed development has located the treated effluent irrigation field so that:

- The irrigation field is located in an agricultural paddock that will be grazed by cattle.
- There is a very slight fall away from the workers camp area and immediate water catchment.
- The field is above RRC's flood investigation area.

To minimise the risk of contamination of surface water from the STP, the following measures have/will be implemented:

- The STP capacity has been identified using MEDLI (see Appendix B). The use of MEDLI provides a reliable assurance the proposed STP will be fully capable of treating the expected peak daily flow of influent from the workers camp. MEDLI calculations have identified that the proposed STP will result in only very minimal risk of overland flow (runoff).
- The STP will be managed under a set of written procedures that will require the facility to be inspected on a daily basis for any malfunctions or leaks. In addition, the STP will be fitted with high level alarms to warn of possible impending overflow in the case of a malfunction.
- Treatment of effluent to Class C quality will minimise the risk of contamination of nearby waterways in the event of a discharge event.
- During wet weather events, treated effluent will be stored in the wet weather storage tanks. The required volume of these tanks has been determined to be 160 kL using MEDLI modelling (see Appendix B).

5.3.2 Groundwater

A review of existing groundwater bores in the area of the proposed development has identified no bores within 1 km of the proposed STP and associated treated effluent irrigation field, however there are a number of bores further afield that may assist in providing some insight into the groundwater environment in the immediate area of the proposed activity (see Figure 5). Three groundwater bores have been investigated that may provide an insight into local groundwater aquifers (see Table 3). Locations of the groundwater bores in Table 3 are identified in Figure 5. The bore most likely to represent a similar groundwater environment to that in the area of the STP and treated effluent irrigation field is bore RN151721. This bore appears to be most likely to be located over a similar aquifer to the proposed STP and treated effluent irrigation field. Bore RN151721 is located over an undefined quarternary aquifer at a depth of 25.4 m to the top bed. At this depth it is unlikely that any unforeseen deep drainage from irrigation would interact with the aquifer.

Table 3. Aquifer details for bores in the area of the proposed STP and treated effluent irrigation field.

Registration Number	Aquifer Top Bed (m)	Aquifer Bottom Bed (m)	Aquifer Formation Name
151721	25.4		Quarternary - undefined
97633	18.29	30.48	Moah creek beds
111521	11.58	12.20	Rookwood volcanics

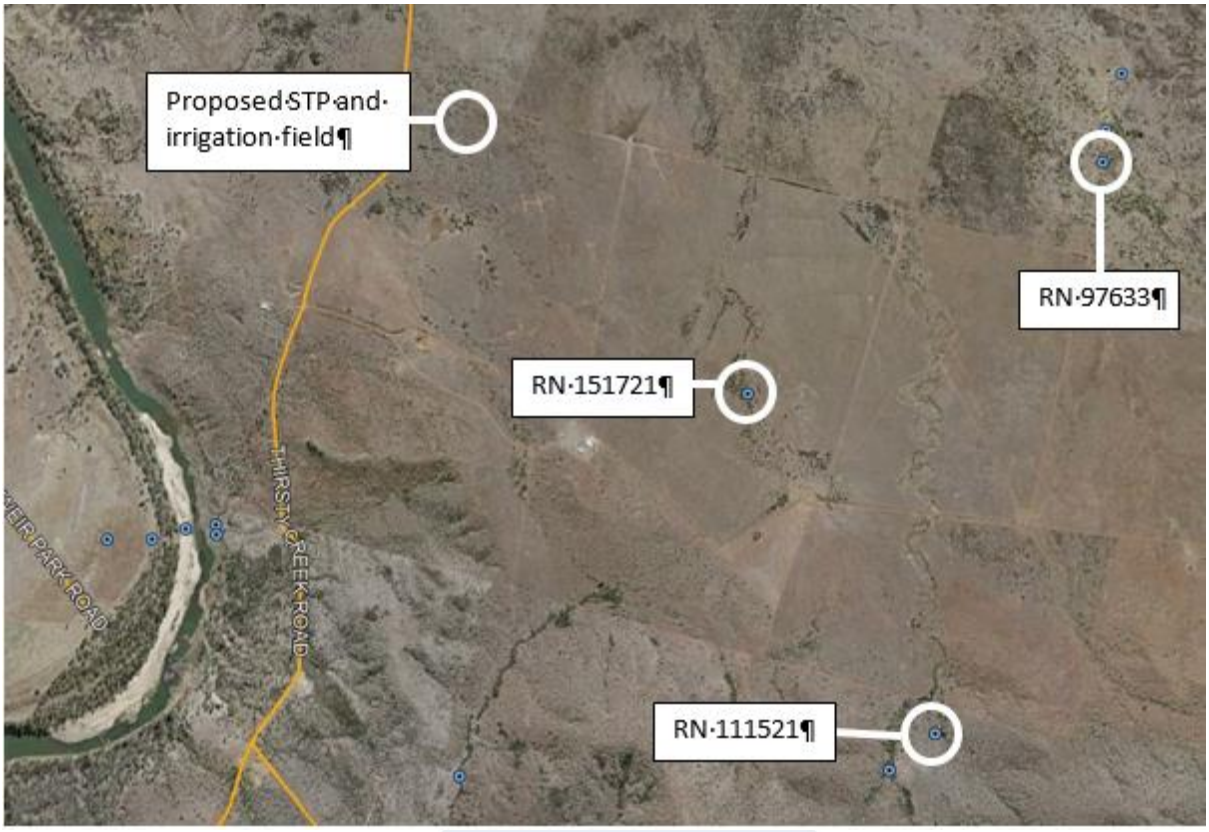


Figure 5. Location of groundwater bores in relation to proposed STP and treated effluent irrigation field.

To minimise any possible risk of contamination of the groundwater aquifers in the vicinity of the proposed STP and treated effluent irrigation area, effluent will be treated to a Class C standard and MEDLI modelling has been employed to identify the irrigation area required to minimise any deep drainage of treated effluent.

5.4 Environmental Values - Waste

The proposed activity aims to minimise generation of waste wherever possible. However, it is inevitable that some waste will be produced, including:

- Waste packaging from chemicals used in the treatment process.
- Waste activated sludge (WAS). The STP will occasionally require removal of WAS.

All waste materials will be managed in accordance with the requirements of the local authority (RRC) and DES.

Waste packaging will be disposed of appropriately either as recycling, municipal solid waste (MSW), or as a regulated waste where required.

WAS will only be disposed of through a licensed regulated waste transporter, to an appropriate facility such as a municipal STP or composting facility.

5.5 Environmental Values - Land

The proposed STP and treated effluent irrigation field presents two primary areas of risk for land contamination:

- Release of contaminants from the STP
- Release of contaminants in the treated effluent irrigation field

The risk of release of contaminants will be minimised by storing all chemicals associated with the STP within secondary containment systems. In the case of a spill, spill management systems such as a spill kit will be on-hand. Staff will be trained in the use of spill kits.

The risk of release of contaminants into the treated effluent irrigation field will be minimised through the treatment of effluent to Class C standard and the regular monitoring of the water quality of treated effluent to ensure compliance with EA release limits.

The risk of long-term contamination of land has been minimised through the use of MEDLI modelling to assist in identifying an appropriately sized irrigation area.

5.6 Environmental Values - Other

5.6.1 Biodiversity

No biodiversity impacts have been identified as a result of the proposed development.

The site of the proposed STP and associated treated effluent irrigation area has been historically cleared, with only agricultural grass/pasture populations and scattered examples of *Acacia salicina* (Sally wattle) (see Figures 6 & 7). The proposed area is currently being grazed by the landholder. The predominant grass species occurring in the area of the proposed STP and associated treated effluent irrigation is Buffel grass (*Cenchrus ciliaris*). Buffel grass is an introduced, deep-rooting, summer-growing, erect tussocky grass.

Figure 6. Site of proposed workers camp, STP and treated effluent irrigation field. Note Buffel grass pasture and scatted Sally wattle.

Figure 7. Site of proposed workers camp, STP and treated effluent irrigation field. Note Buffel grass pasture and scattered Sally wattle.

6 Planning Scheme Codes – Rockhampton Regional Council

The proposed workers camp triggers assessment under the RRC planning scheme. The following codes and assessment criteria that are associated with environmental impacts and management are addressed in this section:

- 6.7.4 - Rural zone code
  - PO12 – Outdoor lighting.
- 9.3.7 - Waste management code
  - PO1 – On-site waste collection.
  - PO3 – Waste storage minimises adverse impacts on adjoining properties.
  - PO4 – Waste storage areas are designed for ease of maintenance.
  - PO5 – Waste storage areas are designed to separate stormwater and wash-down water.
- 9.3.8 - Water and sewer code
  - PO1 - A water supply is provided that is adequate for the current and future needs of the intended development.
  - PO3 – Sewage treatment and disposal is provided that is appropriate for the level of demand generated, protects public health and avoids environmental harm.
  - PO5 - The waste water management plan provides that waste water is managed in accordance with a waste management hierarchy

6.1 Rural zone code

6.1.1 Rural zone code - PO12

Performance outcomes	Acceptable outcomes
Effects of development	
PO12 Outdoor lighting maintains the amenity of any adjoining residential zoned premises and does not adversely impact the safety of vehicles or pedestrians on the adjoining streets as a result of light emissions, either directly or by reflection.	**AO12.1** Outdoor lighting is designed, installed and maintained in accordance with the parameters and requirements of the Australian Standard AS 4282 — Control of the obtrusive effects of outdoor lighting, as updated from time to time.

Outdoor lighting associated with the workers camp, including the potable water treatment plant, STP and associated treated effluent irrigation field will be designed, installed and maintained in accordance with the parameters and requirements of the Australian Standard AS 4282 – Control of the obtrusive effects of outdoor lighting, as updated from time to time.

Note that there will be no lighting provided to the treated effluent irrigation field.

The impact of the proposed activity on surrounding sensitive uses has been assessed in relation to light spillage impacts, and it is not considered that the activity will have any adverse impacts upon these uses.

The factors that were taken into account when considering the impact from light spillage on the surrounding sensitive uses are:

- The area is very sparsely populated, with very few sensitive uses near the proposed workers camp. The nearest sensitive uses (sensitive receptors) are residential premises (agricultural homesteads) associated with the property on which the workers camp will be located, and neighbouring properties. The sensitive use located on the same property as the proposed workers camp is approximately 1.4 km from the camp, while the nearest neighbouring sensitive use is located approximately 3.1 km to the north west of the proposed camp. The next nearest sensitive use is located approximately 5.8 km to the south of the workers camp (see Figure 4). The distance of these sensitive uses from the proposed workers camp make it extremely unlikely that any potential light spillage would be identified at the sensitive uses. In addition, the sensitive use located upon the same property as the proposed workers camp is the residence of the property owners, and the project is being undertaken with their agreement and involvement in the location of the workers camp.
- The proposed workers camp will only be operated for the life of the workers camp and Rookwood Weir construction project, which will be approximately two years. At completion of the project the workers camp, STP and associated treated effluent irrigation field will be deconstructed, removed and rehabilitated.

6.2 Waste management code

6.2.1 Waste management code - PO1

Performance outcomes	Acceptable outcomes
Design of waste storage areas	
PO1 For on-site waste collection, waste storage areas are located and designed so that: a) they are easily accessed and convenient to use; b) sufficient space is provided for safe entry and exit and servicing by service vehicles without the need for manual handling; c) sufficient height clearance is provided for the safe operation of both front and side bin lifting operations; d) they are clear of car parking bays, loading bays and similar areas; and e) they are clear of footpaths and pedestrian access.	**AO1.1** Waste storage areas are designed and maintained in accordance with SC6.20 — Waste management planning scheme policy.

Waste collection and storage areas will be designed and maintained in accordance with SC6.20 – Waste management planning scheme policy. The initial design of the proposed workers camp allows ample room for inclusion of waste storage areas.

6.2.2 Waste management code PO3

Performance outcomes	Acceptable outcomes
Kerbside waste servicing	
PO3 Waste storage minimises adverse impacts on adjoining properties.	**AO3.1** Waste storage areas are: a) integrated with the building design; or b) set back a minimum of two (2) metres from any boundary; and c) screened from neighbouring properties and the street by a fence of 1.8 metres minimum height; and d) not located directly adjoining dwelling units on the site and on neighbouring properties. **AND** **AO3.2** Waste bins are fitted with lids.

Waste storage areas will meet the requirements of AO3.1 and AO3.2. The initial concept design for the workers camp has ample available space for waste storage areas to be located in a manner that is:

- integrated with the building design; or
- set back a minimum of two (2) metres from any boundary; and
- screened from neighbouring properties and the street by a fence of 1.8 metres minimum height; and
- not located directly adjoining dwelling units on the site and on neighbouring properties.

Waste bins will also be fitted with lids.

6.2.3 Waste management code PO4

Performance outcomes	Acceptable outcomes
Kerbside waste servicing	
PO4 Waste storage areas: a) have a level area on impermeable, durable materials so that they are easily cleaned; and b) have adequate clearance between and around waste storage bins to allow for manoeuvring and washing of bins.	No acceptable outcome is nominated.

Waste storage areas will meet the requirements of PO4. The initial concept design for the workers camp has ample available space for waste storage areas to:

- have a level area constructed of impermeable, durable materials so that they are easily cleaned; and
- have adequate clearance between and around waste storage bins to allow for manoeuvring and washing of bins.

Washdown areas for bins will be connected to the on-site STP where required.

6.2.4 Waste management code PO5

Performance outcomes	Acceptable outcomes
Water management	
PO5 Waste storage areas are designed to separate stormwater and wash-down water.	**AO5.1** Wash-down water drains to either the reticulated sewerage system or an on-site sewerage facility if not in a sewer area. **AND** **AO5.2** Wash-down areas are: a) provided with a tap and water supply; and b) provided with a stormwater diversion valve and arrestor trap.

Waste storage areas will meet the requirements of AO5.1 and AO5.2.

Detailed plumbing and sewage designs will identify that the washdown areas for bins will be connected to the on-site STP where required and will be provided with:

- tap and water supply; and
- stormwater diversion valve and arrestor trap.

6.3 Water and sewer code

6.3.1 Water and sewer code PO1

Performance outcomes	Acceptable outcomes
Water	
PO1 A water supply is provided that is adequate for the current and future needs of the intended development.	**AO1.1** AO1.1.1 Where within a water supply planning area, the development is connected to Council's reticulated water supply system in accordance with SC6.21 — Water supply infrastructure planning scheme policy and the Capricorn Municipal Development Guidelines. Editor's note—A network analysis may be required to demonstrate compliance with this acceptable outcome. Editor's note—Where development is located outside of the water supply planning area to refer to the requirements under the Plumbing Code of Australia.

Water supply for the proposed workers camp will meet the requirements the Plumbing code of Australia.

The proposed workers camp will employ an on-site potable water treatment plant (WTP) capable of treating approximately 62,500 L/day. This figure has been calculated by using a generous volume of 250 L/person/day (ordinarily these types of camps use a maximum of approximately 200 L/person/day) multiplied by the maximum camp population of 250 persons. The concept location of the WTP has been included on the workers camp concept plan at Appendix A. The source of raw water is still to be determined, but will either be from a water allocation from the nearby Fitzroy River, or from groundwater.

6.3.2 Water and sewer code PO3

Performance outcomes	Acceptable outcomes
Sewer	
PO3 Sewerage treatment and disposal is provided that is appropriate for the level of demand generated, protects public health and avoids environmental harm.	**AO3.1** Where within a sewer planning area, the development is connected to Council's reticulated waste water system in accordance with SC6.17 — Sewerage infrastructure planning scheme policy and the Capricorn Municipal Development Guidelines. Editor's note—A network analysis may be required to demonstrate compliance with this acceptable outcome. Editor's note—Where development is located outside of the sewer planning area to refer to the requirements under the Plumbing Code of Australia.

Waste water treatment for the proposed workers camp will meet the requirements of the Plumbing Code of Australia.

The proposed development is not within a waste water area and will therefore be serviced by an on-site STP with associated treated effluent irrigation field. Sections 5 and 6 detail the proposed STP and associated treated effluent irrigation field, and mitigation measures for potential environmental impacts.

The on-site STP and associated treated effluent irrigation field will:

- complies with the Queensland Plumbing and Wastewater Code and the *Plumbing and Drainage Act 2002*; and
- have a site evaluation report to be prepared by a qualified person in accordance with the Queensland Plumbing and Waste Water Code.

6.3.3 Water and sewer code PO5

Performance outcomes	Acceptable outcomes
Point source waste water management	
PO5 The waste water management plan provides that waste water is managed in accordance with a waste management	**AO5.1** A waste water management plan (WWMP) is prepared by a suitably qualified person. The waste water management plan accounts for: a) waste water type;

hierarchy that: a) avoids waste water discharge to waterways; or b) minimises waste water discharge to waterways by reuse, recycling, recovery and treatment for disposal to sewer, surface water and groundwater if it is agreed waste water discharge to waterways can not practically and reasonably be avoided.	b) climatic conditions; c) water quality objectives; and d) best practice environmental management.

A waste water management plan (WWMP) will be developed for the operation of the STP and associated treated effluent irrigation field that complies with the requirements of AO5.1.

The WWMP will be developed as the project progresses and the specific treatment plant type has been identified in greater detail.

7 Conclusion

This environmental report for the workers camp has presented and investigated:

- Proposed STP and associated treated effluent irrigation field.
- Potential environmental risks/impacts and mitigation measures associated with proposed STP and treated effluent irrigation field.
- Acceptable outcomes to meet development outcomes for environmentally related planning scheme codes for the RRC planning scheme.

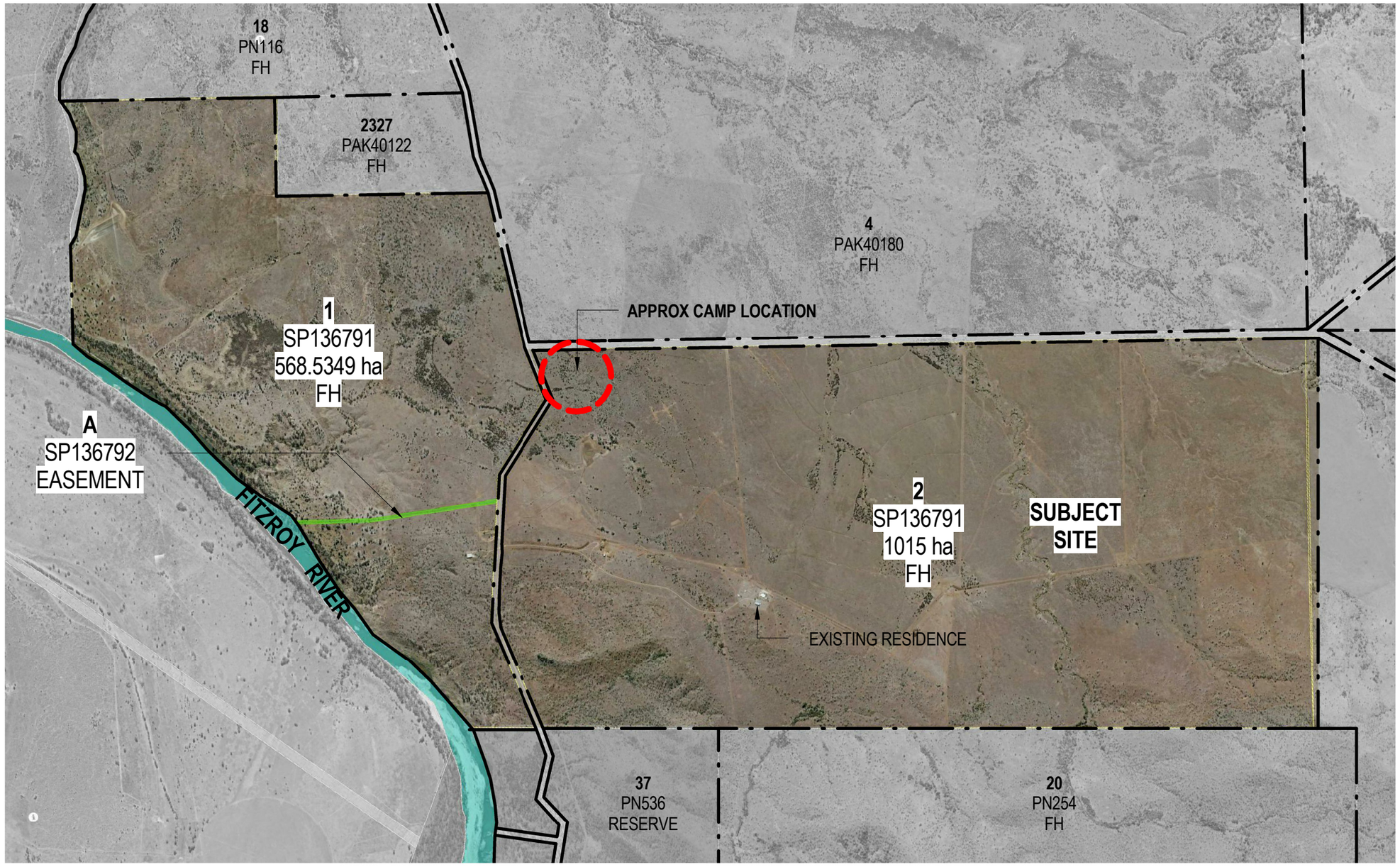
Specific risks to environmental values associated with the proposed STP and associated treated effluent irrigation field that have been considered are in relation to:

- Air
  - Dust
  - Odour
- Noise
- Water
  - Surface water
  - Groundwater water
- Waste
- Land
- Other
  - Biodiversity

Overall, the proposed activity will have a minimal impact on the surrounding receiving environment, and it is believed that mitigation strategies will achieve highly acceptable environmental outcomes.

8 Appendices

Appendix A –Workers Camp – Concept Plans



INDICATIVE CONCEPT

IN ASSOCIATION WITH: GIDEON TOWN PLANNING

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drawing title:
LOCATION PLAN

drawing no: SK-001

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
SUNWATER LIMITED

REVISIONS

REVISION	DESCRIPTION	DATE
1	PRELIMINARY	17-09-13
2	PRELIMINARY	17-10-27
3	PRELIMINARY	17-11-16
4	PRELIMINARY	17-11-17

Design + Architecture
abn: 80167978832 Pty.Ltd.
044 968 2924 design@designaa.com.au
www.designaa.com.au reg no:4610

ISSUED FOR
PRELIMINARY

project no: GG-008
scale 1 : 25000
date NOV 17
drawn CC
rev 5

AREA SCHEDULE

OVERALL SITE:	1015HA
TOTAL ACCOMMODATION AREA	8.45HA
CARPARKING:	0.47HA
CAMP:	1.8HA
STP DISCHARGE:	3HA - 5HA

4
PAK40180
FH

344

ROAD RESERVE

BOUNDARY

WORKER'S ACCOM CAMP

POTABLE WTP

50

35

20

STP

20 setback

20 setback

FENCED

69 APPROX

THIRSTY CREEK ROAD

162

195

186

ACCOMMODATION AREA (FENCED)

ACCESS

350 approx

STP DISCHARGE
3 - 5 HA approx

ACCOMMODATION AREA (FENCED)

271

1
SP136791
568.5349 ha
FH

BOUNDARY

2
SP136791
1015 ha
FH

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SCALE 1 : 3000

INDICATIVE CONCEPT

IN ASSOCIATION WITH:
GIDEON TOWN PLANNING

ISSUED FOR
PRELIMINARY

drawing title:
CONCEPT SITE PLAN

drawing no: SK-002

project:
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

cIIENT:
SUNWATER LIMITED

REVISIONS

REVISION	DESCRIPTION	DATE
2	PRELIMINARY	17-10-27
3	PRELIMINARY	17-11-16
4	PRELIMINARY	17-11-17

PRELIMINARY SKETCH PLANS:
If the drawings are labelled and issued 'preliminary', below, they are not suitable for Building Application, tender or construction purposes!
The intent of preliminary sketch plans are only for presenting the concept for the specific project to the client as nominated in the title sheet.

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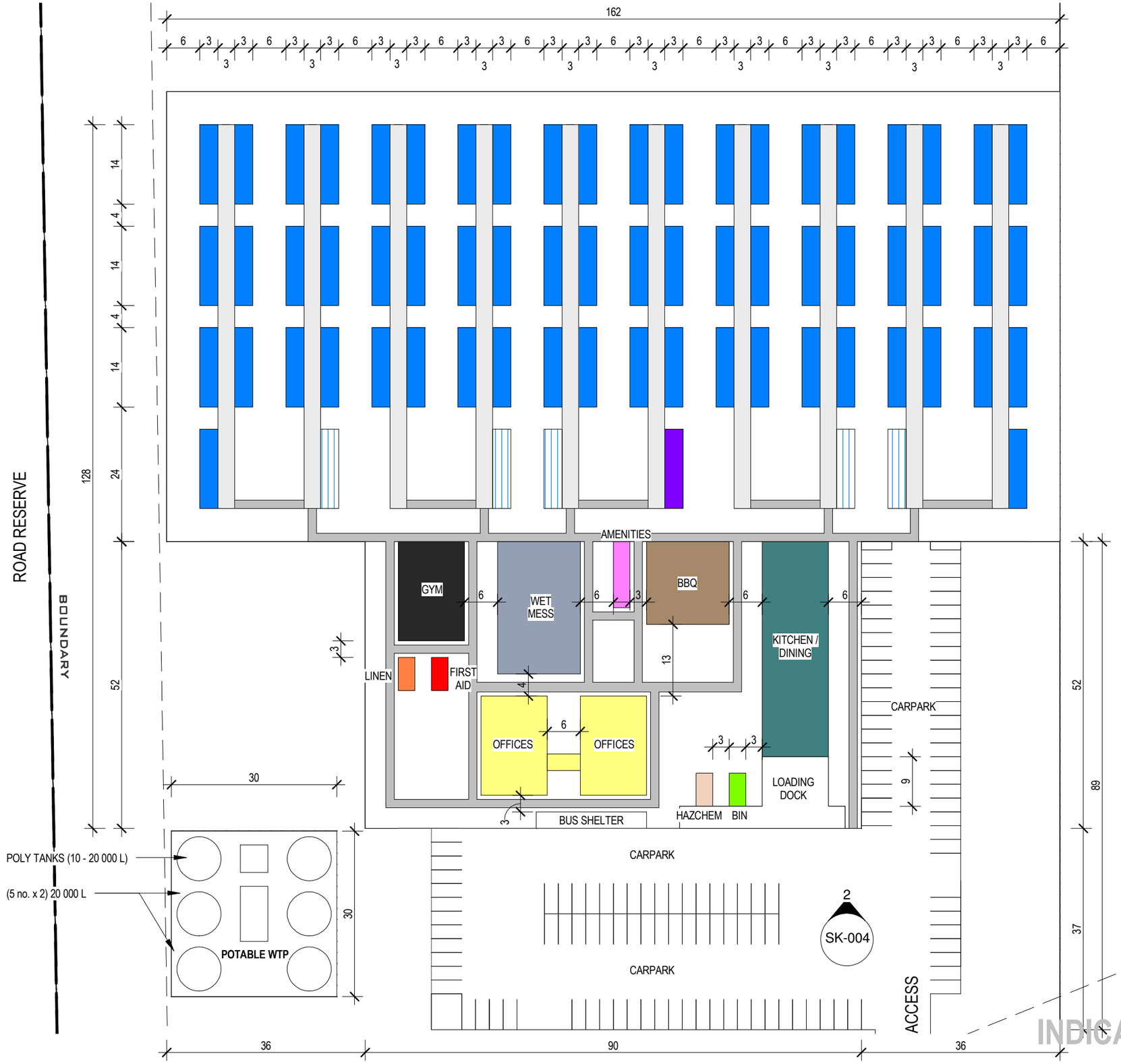
NEVER SCALE OF DRAWINGS, IF IN DOUBT, ASK!

Design + Architecture
abn: 80167978832 Pty.Ltd.
044 968 2924 design@designaa.com.au
www.designaa.com.au reg no:4610

project no: GG-008
scale: As indicated
date: NOV 17
drawn: CC
rev: 5



AREA SCHEDULE

OVERALL SITE:	1015HA
TOTAL ACCOMMODATION AREA	8.45HA
CARPARKING:	0.47HA
- 120 CARPARKING SPACES.	
CAMP:	1.8HA

Legend:

UNITS (4 BEDROOM)	62 x	14.4 x 3.3 m
UNIT PWD (3 BEDROOM)		14.4 x 3.3 m
LAUNDRY	5 x	14.4 x 3.3 m
GYM		18 x 12 m
LINEN		3 x 6 m
FIRST AID		3 x 6 m
WET MESS		15 x 24 m
OFFICES	2 x	12 x 18 m
AMENITIES		12 x 3 m
BBQ		15 x 15 m
KITCHEN / DINING		12 x 39 m
HAZCHEM		3 x 6 m
BIN STORE		3 x 6 m
PATH 1500mm wide		
PATH 3000mm wide (breezeway over)		

250 ROOMS
(INCLUDING 3 ROOMS FOR PERSONS WITH DISABLITIES)

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SCALE 1 : 750

INDICATIVE CONCEPT

IN ASSOCIATION WITH:
GIDEON TOWN PLANNING

drawing title:
CONCEPT CAMP PLAN

drawing no: SK-003

project: **A3 DRAWING** NOTED SCALES RELATE TO A3 DRAWINGS
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
SUNWATER LIMITED

REVISIONS

REVISION	DESCRIPTION	DATE
1	PRELIMINARY	17-09-13
2	PRELIMINARY	17-10-27
3	PRELIMINARY	17-11-16
4	PRELIMINARY	17-11-17

Design + Architecture
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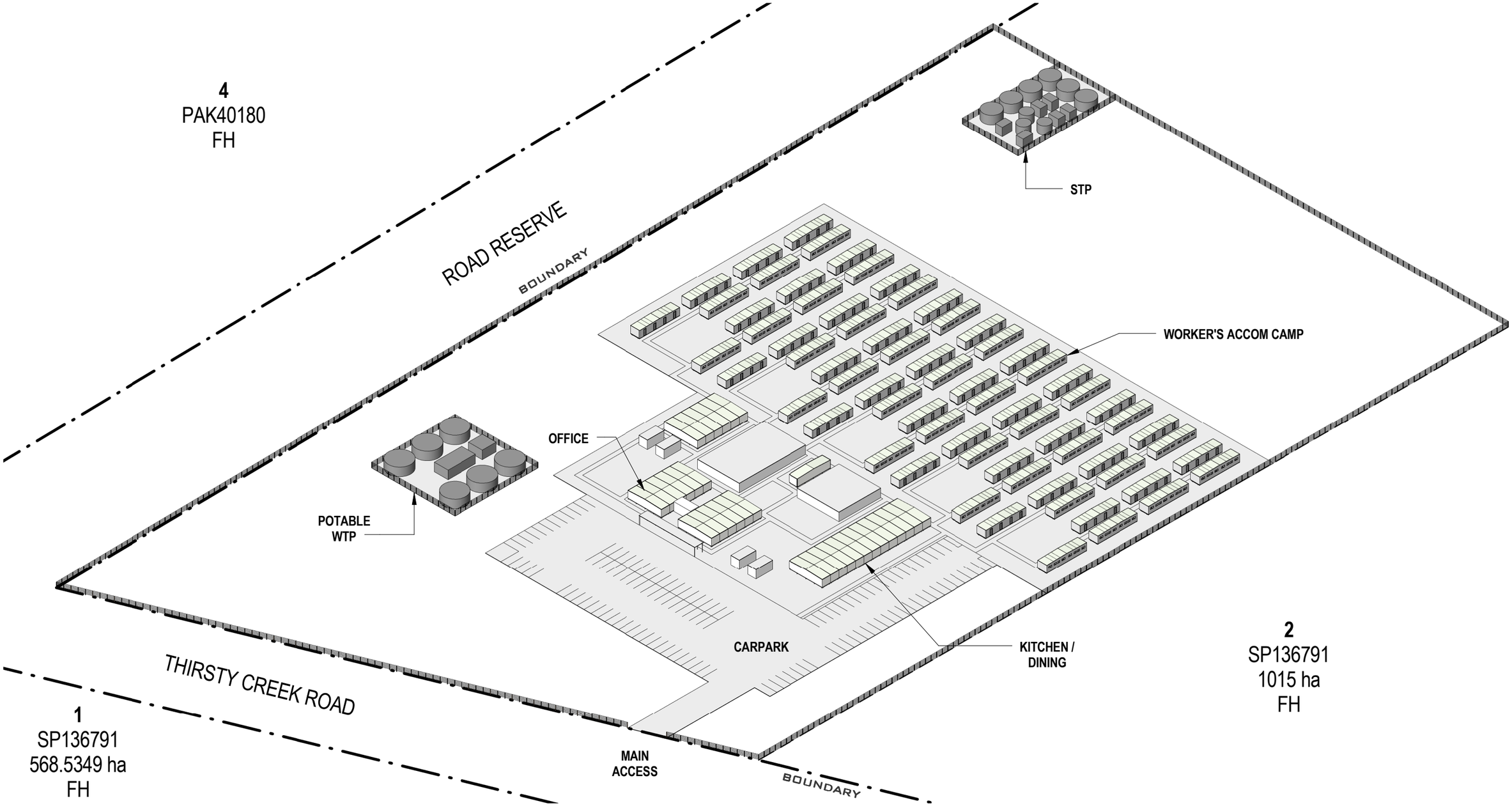
044 968 2924 design@designaa.com.au
www.designaa.com.au reg no:4610

ISSUED FOR
PRELIMINARY

project no:	scale	rev
GG-008	As indicated	5
	date: NOV 17	
	drawn: CC	



TYPICAL FRONTAGE ELEVATION

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drawing title:
CONCEPT 3D VIEW

drawing no: SK-004

project:
LOWER FITZROY INFRASTRUCTURE PROJECT- NON-RESIDENT WORKFORCE ACCOMMODATION

A3 DRAWING NOTED SCALES RELATE TO A3 DRAWINGS

location:
1486 THIRSTY CREEK ROAD
LOT 2, SP136791

client:
SUNWATER LIMITED

REVISIONS

REVISION	DESCRIPTION	DATE
4	PRELIMINARY	17-11-17

PRELIMINARY SKETCH PLANS:
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IN ASSOCIATION WITH:
GIDEON TOWN PLANNING

ISSUED FOR
PRELIMINARY

project no: GG-008

scale 1 : 750
date NOV 17
drawn Author

rev 5

Appendix B – MEDLI Modelling Run Data Reports

MEDLI REPORT - FULL RUN

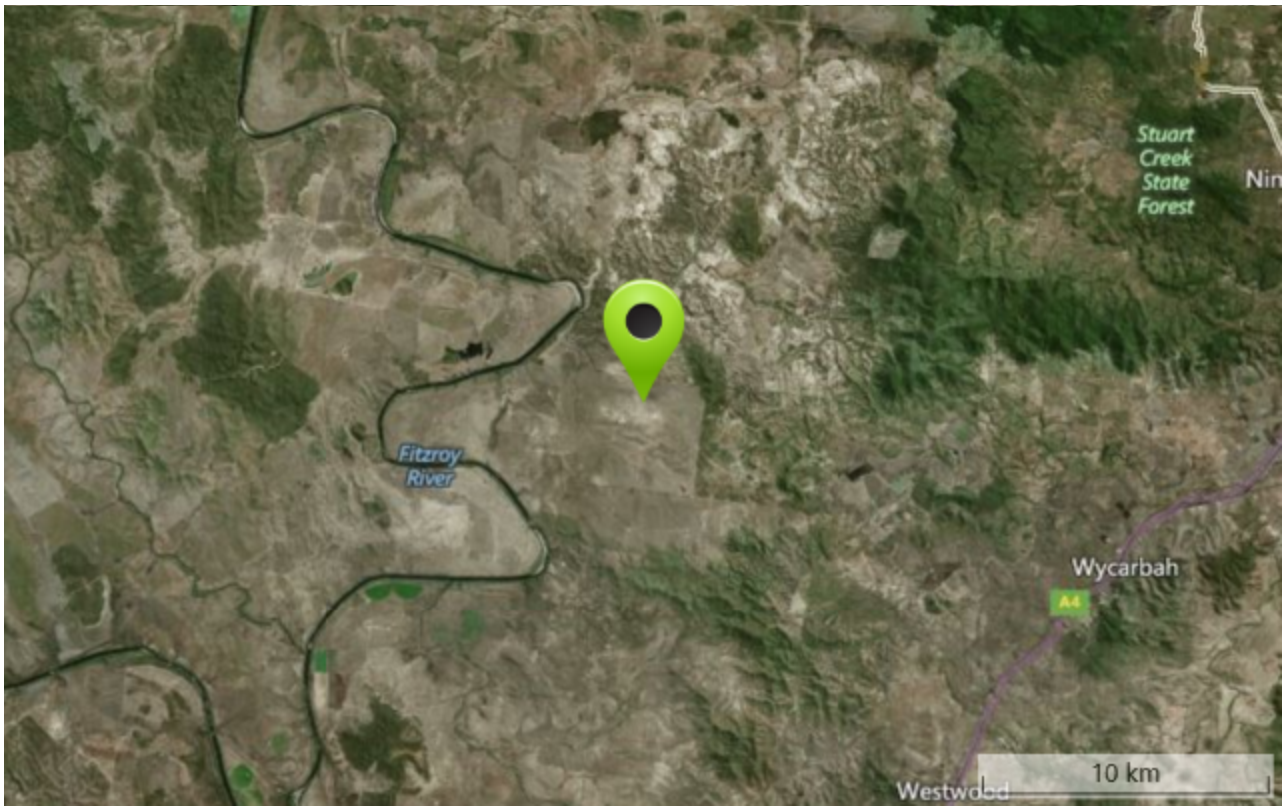
Enterprise: SunWater Rookwood Weir - Riverton Workers Camp 20000

Description:
Rookwood Weir, Riverton Workers Camp STP with treated effluent discharge

Client: SunWater

MEDLI User: STEER Environmental Consulting

Scenario Details:
250 person workers camp with on-site STP and treated effleunt discharge onto an irrigation field (20000 m2).



DESCRIPTION

Climate Data: Riverton, -23.5°, 150.05°

Run Period: 01/01/1967 to 31/12/2016 50 years, 0 days

Climate Statistics:

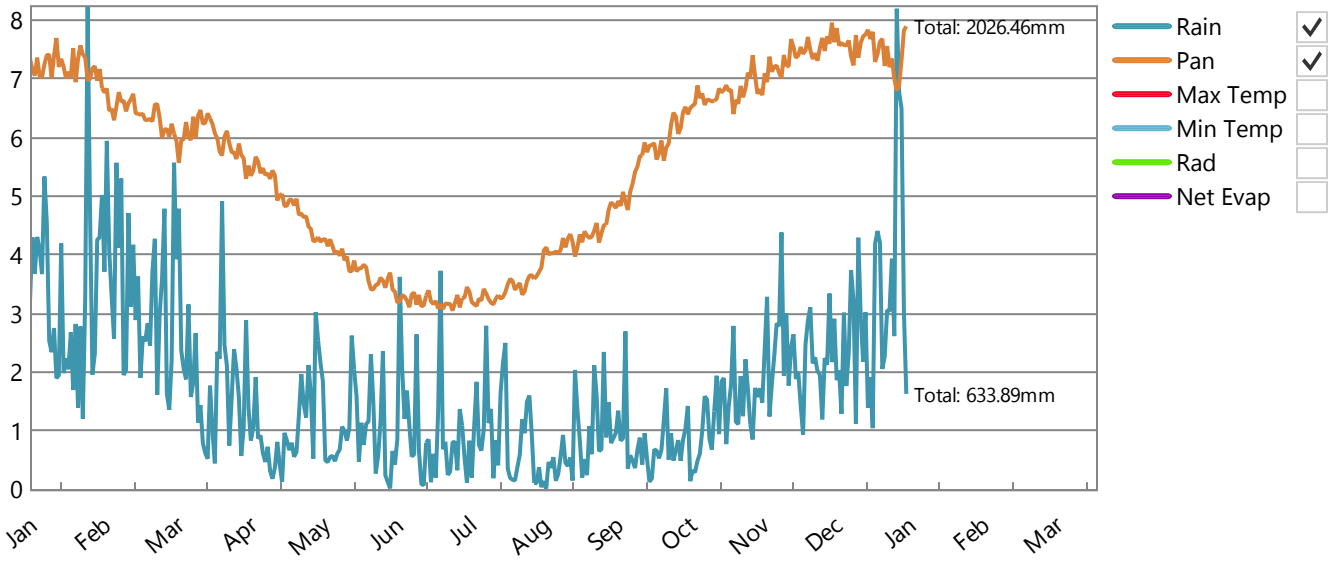
	5th Percentile	50th Percentile	95th Percentile
Rainfall (mm/year)	348	616	969
Pan Evaporation (mm/year)	1792	2037	2208

Climate Data:

Chart Table

Monthly Daily

Daily Average Across Run Period

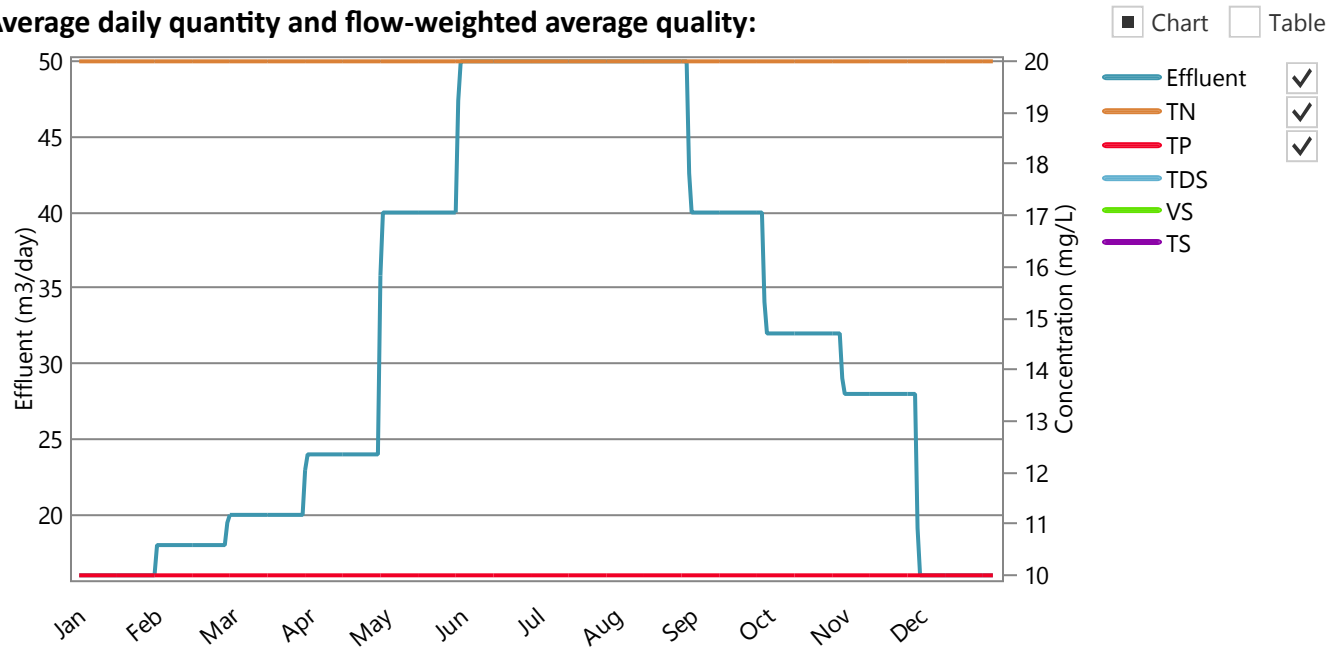


DESCRIPTION

Effluent type: New Sewage Treatment Plant

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: **11712.68 m3/year** or 32.07 m3/day (Min-Max: 16.00 - 50.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

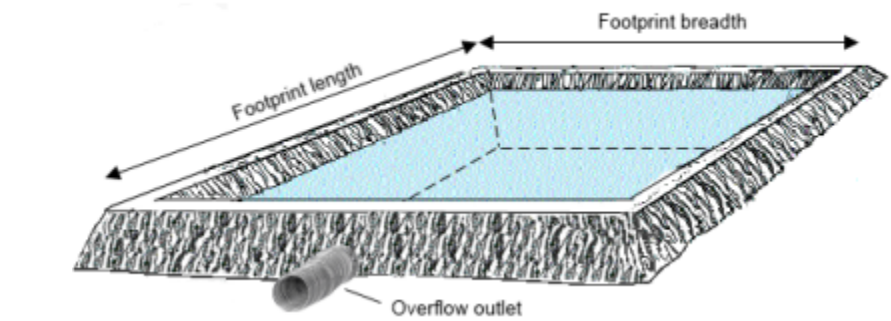
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	234.25 (234.16 - 234.52)
Total Phosphorus	10.00 (10.00 - 10.00)	117.13 (117.08 - 117.26)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

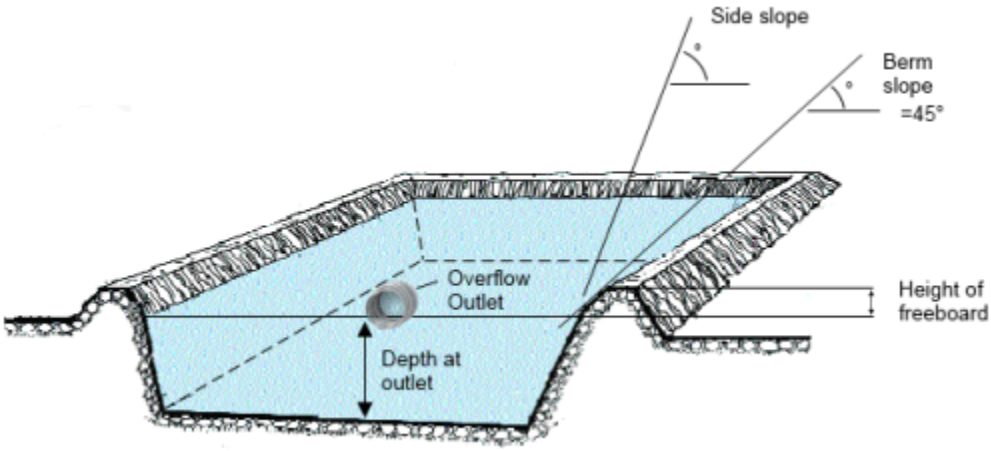
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	160.00
Minimum allowable pond volume (m3)	106.67
Pond depth at overflow outlet (m)	3.00
Maximum water surface area (m2)	53.33
Pond footprint length (m)	7.30
Pond footprint width (m)	7.30
Pond catchment area (m2)	53.33
Average active volume (m3)	106.65





Irrigation pump limits:

Minimum pump rate per area limit (L/day/m2)	0.00
Maximum pump rate per area limit (L/day/m2)	100.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (L/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

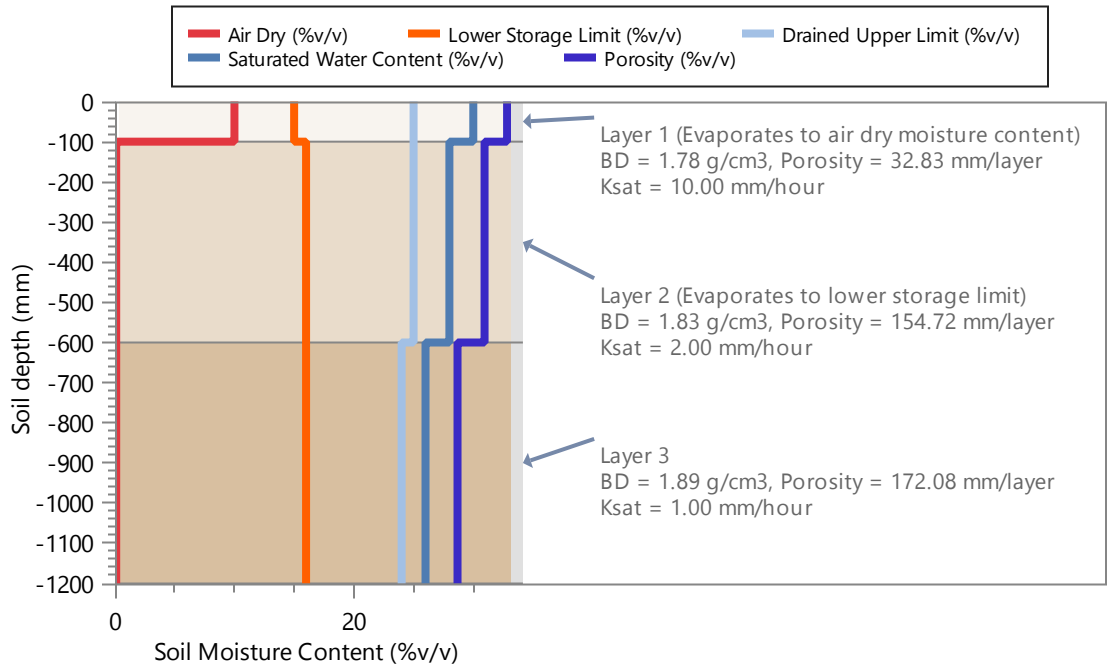
DESCRIPTION

Land: Default Paddock

Area (m2): 20000.00

Soil Type: Medium Permeability Red Brown Ea, 1200.00 mm defined profile depth

Profile Porosity (mm)	359.62
Profile saturation water content (mm)	326.00
Profile drained upper limit (or field capacity) (mm)	294.00
Profile lower storage limit (or permanent wilting point) (mm)	191.00
Profile available water capacity (mm)	103.00
Profile limiting saturated hydraulic conductivity (mm/hour)	1.00
Surface saturated hydraulic conductivity (mm/hour)	10.00
Runoff curve number II (coefficient)	80.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Rhodes Grass Pasture

Average monthly cover (fraction) (minimum - maximum)	0.72 (0.67 - 0.78)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.9 x Pan coefficient 1)	0.90
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	Tolerant
Salinity threshold EC sat. ext. (dS/m)	7.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

DESCRIPTION

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Pathogens Present:

Pathogen	Type	Irrigation Water Concentration (org/m3)	Organism Unit
Escherichia coli O111	Bacteria	2	cfu

Receptor attributes: (Accidental drinking)

Maximum Volume Ingested per Event Resulting From Activity (mL)	100.00

Exposures: Number of identical exposures for each month

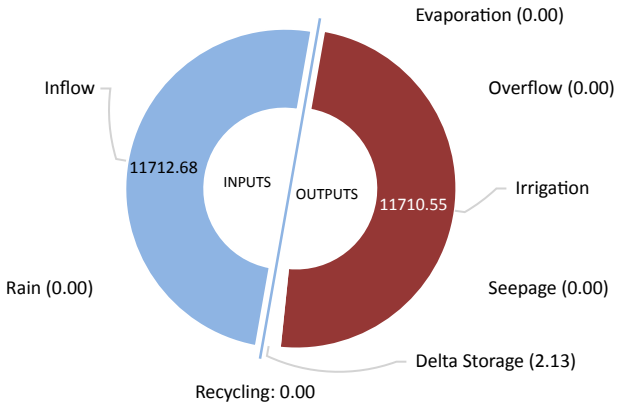
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **160 m3**

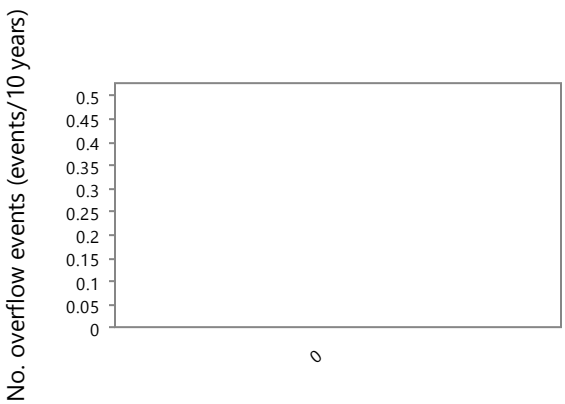
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	11712.68
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	11710.55
Seepage	0.00
Delta Storage	2.13

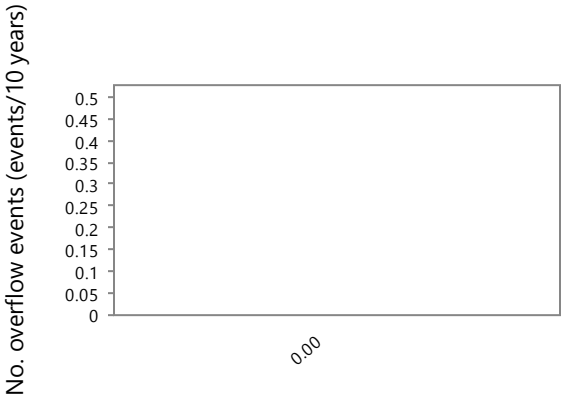
Overflow Diagnostics

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



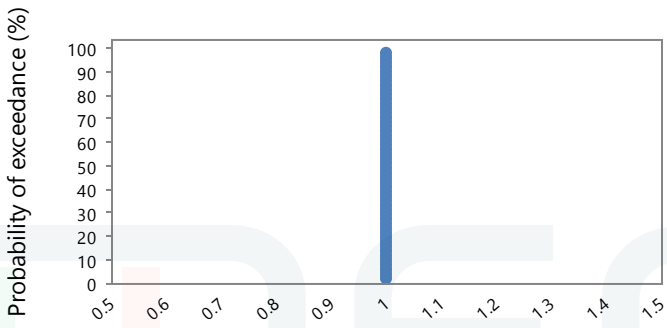
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

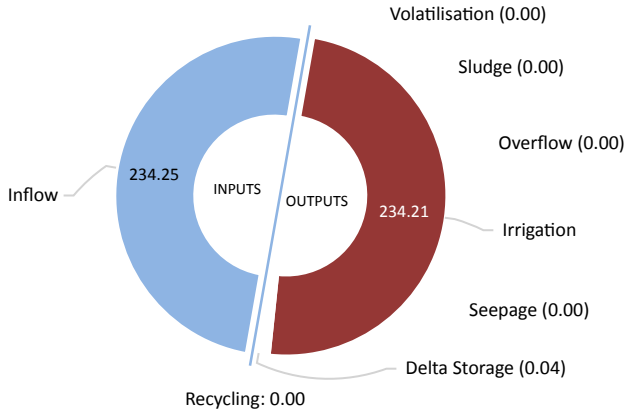
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

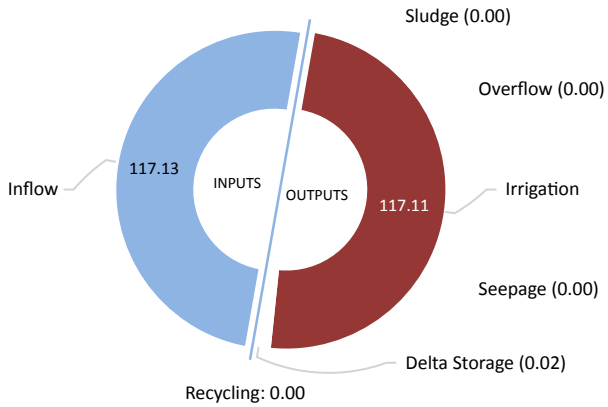
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



Name	Value
Inflow	234.25
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	234.21
Seepage	0.00
Delta Storage	0.04

Phosphorus Balance (kg/year)



Name	Value
Inflow	117.13
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	117.11
Seepage	0.00
Delta Storage	0.02

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)	20.00
Average phosphorus concentration of pond liquid (mg/L)	10.00
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)	20.00
Final phosphorus concentration of pond liquid (mg/L)	10.00
Final salinity of pond liquid (dS/m)	0.00

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	11710.55
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	11710.55
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)	20.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	18.80
Average phosphorus concentration of irrigation water (mg/L)	10.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

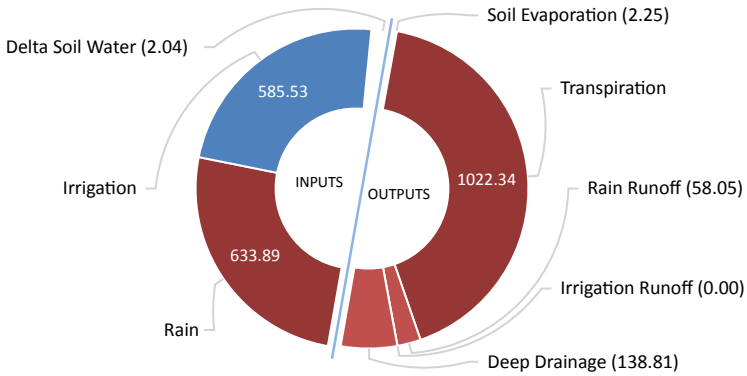
PERFORMANCE

Land Performance - Soil Water

Paddock: Default Paddock, 20000 m2
Soil Type: Medium Permeability Red Brown Ea, 103.00 mm PAWC at maximum root depth

Land Water Balance (mm/year):

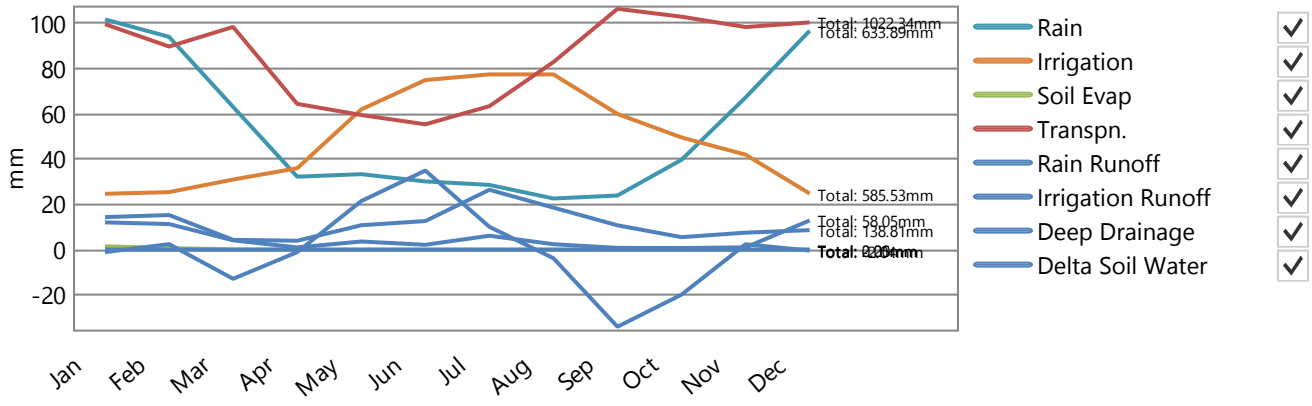
mm/year % Total inputs



Name	Value
Rain	633.89
Irrigation	585.53
Soil Evaporation	2.25
Transpiration	1022.34
Rain Runoff	58.05
Irrigation Runoff	0.00
Deep Drainage	138.81
Delta Soil Water	-2.04

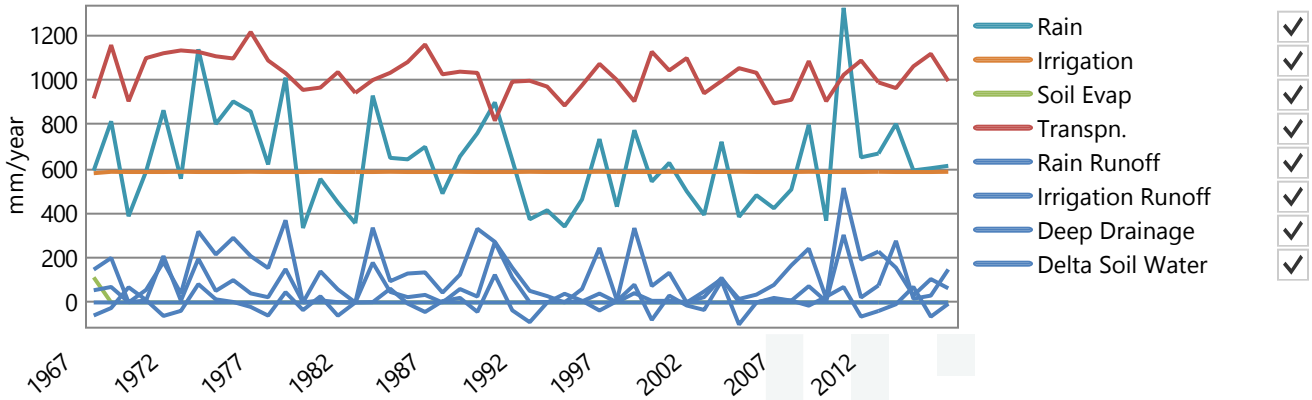
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

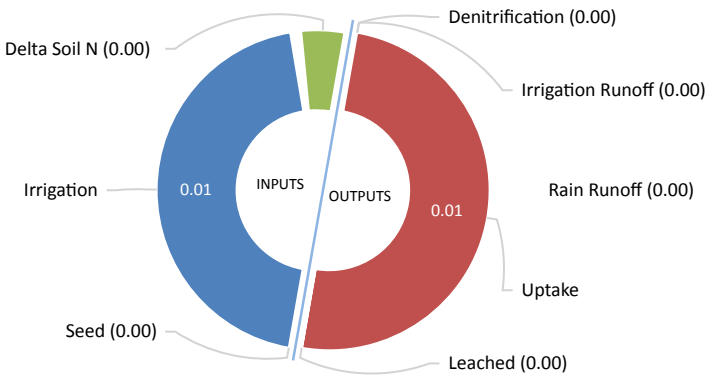
Land Performance - Soil Nutrient

Paddock: Default Paddock, 20000 m2 Ea

Soil Type: Medium Permeability Red Brown

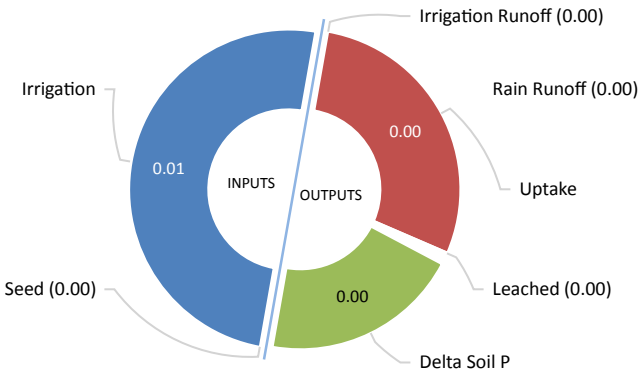
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.30

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.20E-06
Irrigation	0.01
Denitrification	4.63E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	9.04E-06
Delta Soil N	-1.07E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	1.80E-07
Irrigation	0.01
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	3.44E-03
Leached	1.84E-05
Delta Soil P	2.40E-03

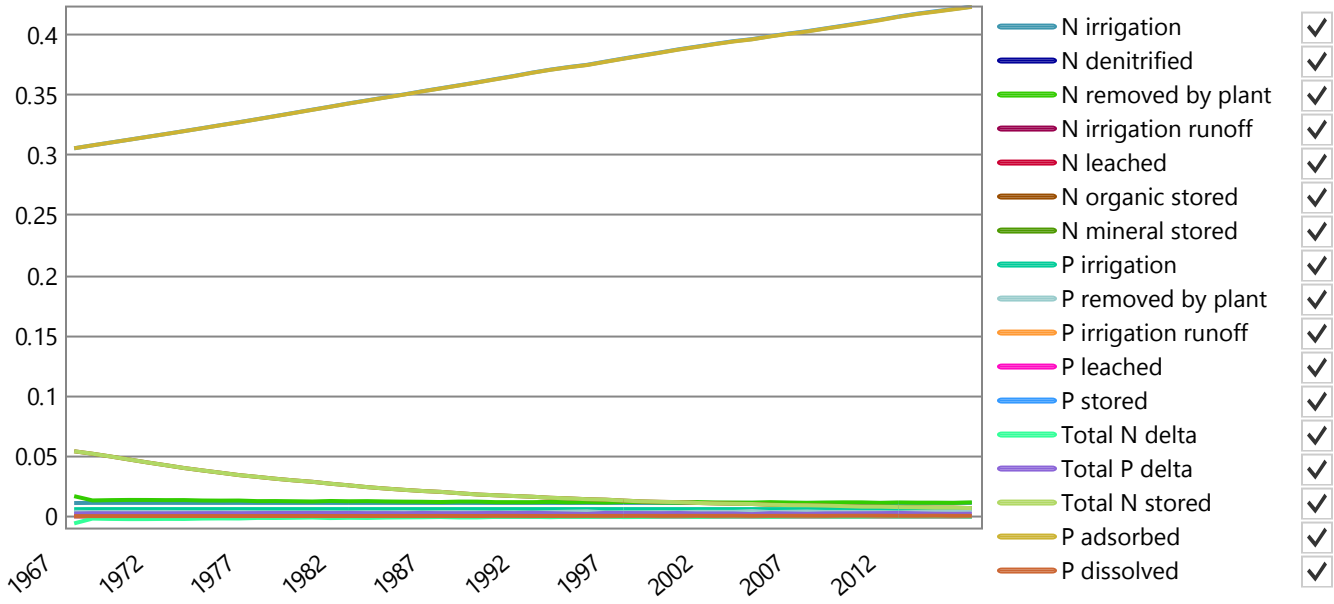
PERFORMANCE

Land Performance - Soil Nutrient

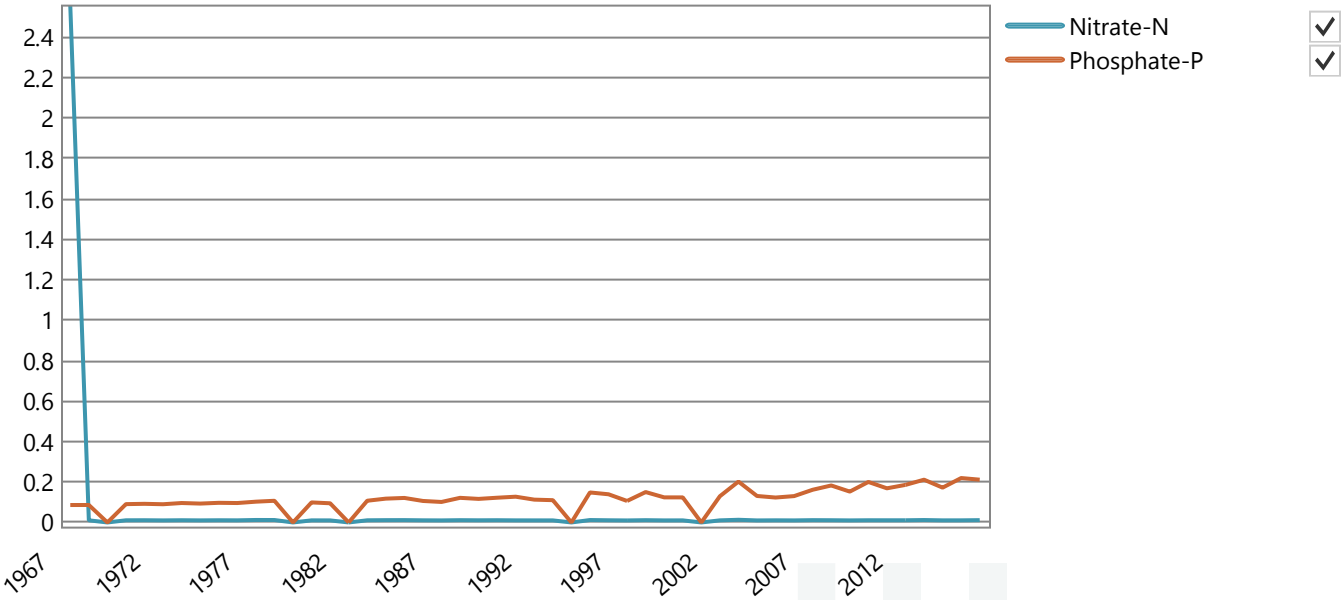
Paddock: Default Paddock, 20000 m2 Ea

Soil Type: Medium Permeability Red Brown

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Default Paddock, 20000 m2 Ea

Soil Type: Medium Permeability Red Brown

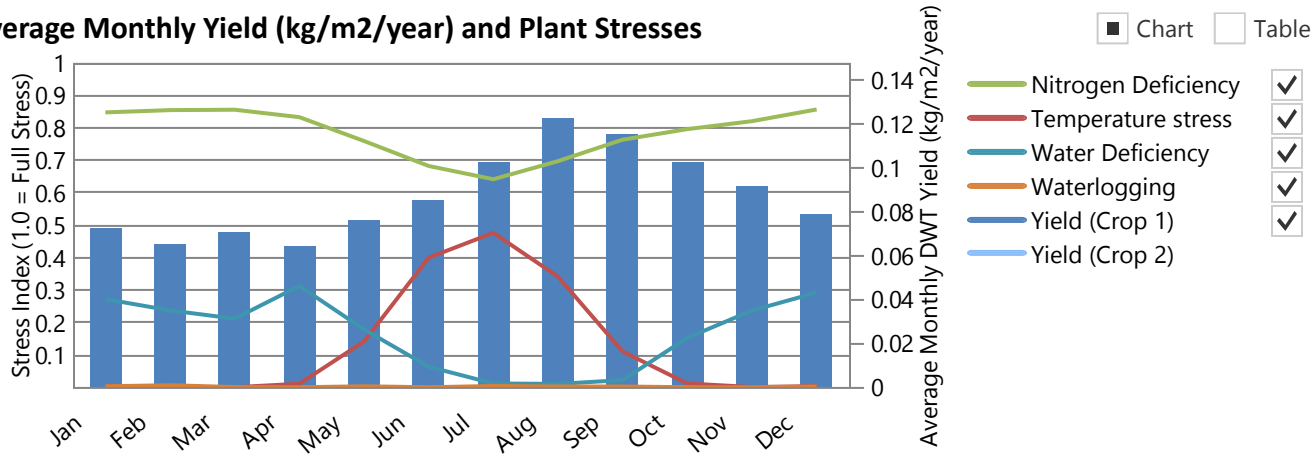
Plant: Continuous Rhodes Grass Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.05 (0.96 - 1.46)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.72 (0.67 - 0.78)
Average monthly root depth (mm) (minimum - maximum)	1198.35 (1185.51 - 1200.00)

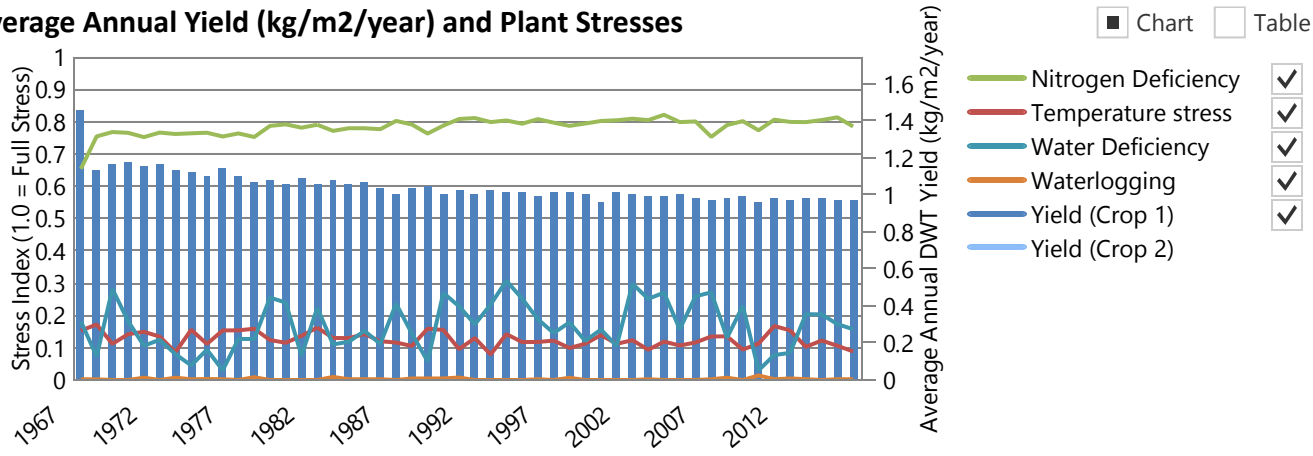
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.01 (0.01 - 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)	0.01 (0.01 - 0.01)
Average annual shoot phosphorus concentration (fraction dwt)	0.003 (0.003 - 0.004)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 1.82 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Default Paddock, 20000 m2 Ea

Soil Type: Medium Permeability Red Brown

Plant: Continuous Rhodes Grass Pasture

Salt tolerance	Tolerant
Salinity threshold EC sat. ext. (dS/m)	7.00
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

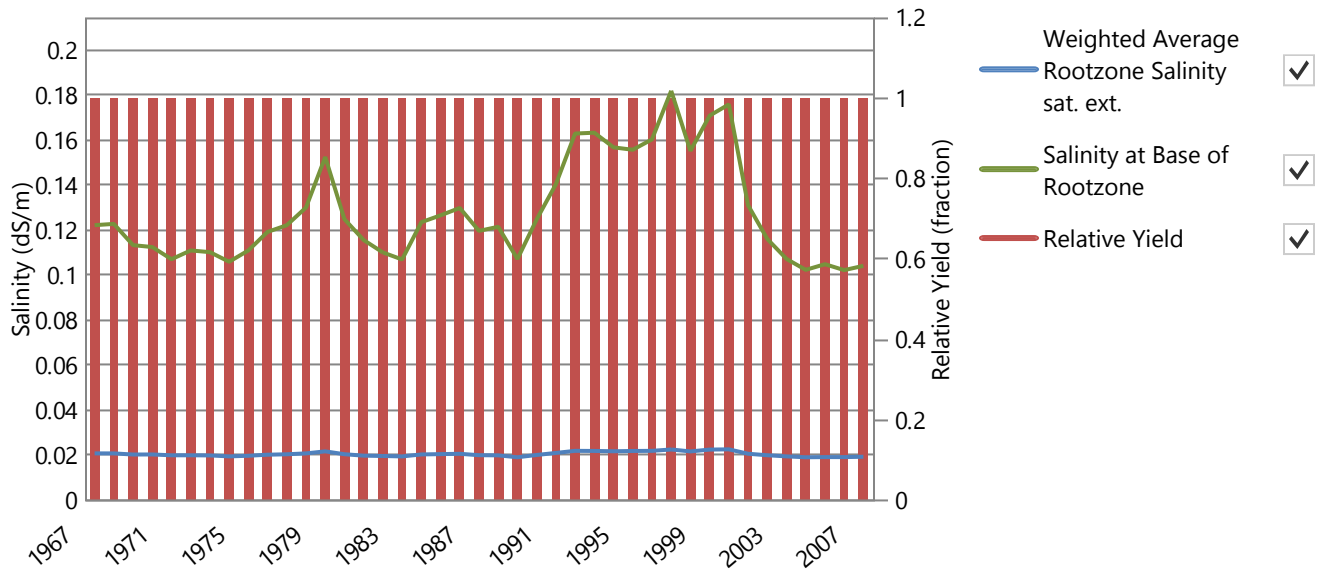
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.01
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	0.01
Average leaching fraction based on 10 year running averages (fraction)	0.33
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.02
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.13
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



PERFORMANCE

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Activity: Accidental drinking **Liquid Ingested (mL):** 100

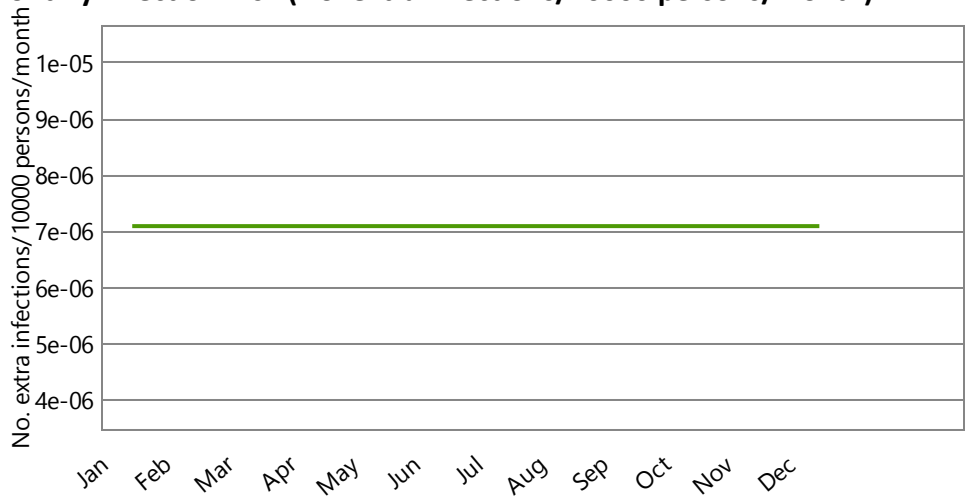
Health risk threshold: 1.0 extra infections/10000 persons/year

Pathogen Risk:

	Escherichia coli O111
Pathogen Type	Bacteria
No. Ingested per Event (Organisms) (minimum - maximum)	0.0002 - 0.0002
Infection Risk per Event (No. extra infections/10000 persons) (minimum - maximum)	0.00 - 0.00
Infection risk per year of 12 events (extra infections/10000 persons/ year)	0.00
Organism Unit	cfu

Monthly Infection Risk (No. extra infections/10000 persons/month):

Chart Table



Escherichia coli O111 (1) ☑

PERFORMANCE

Groundwater

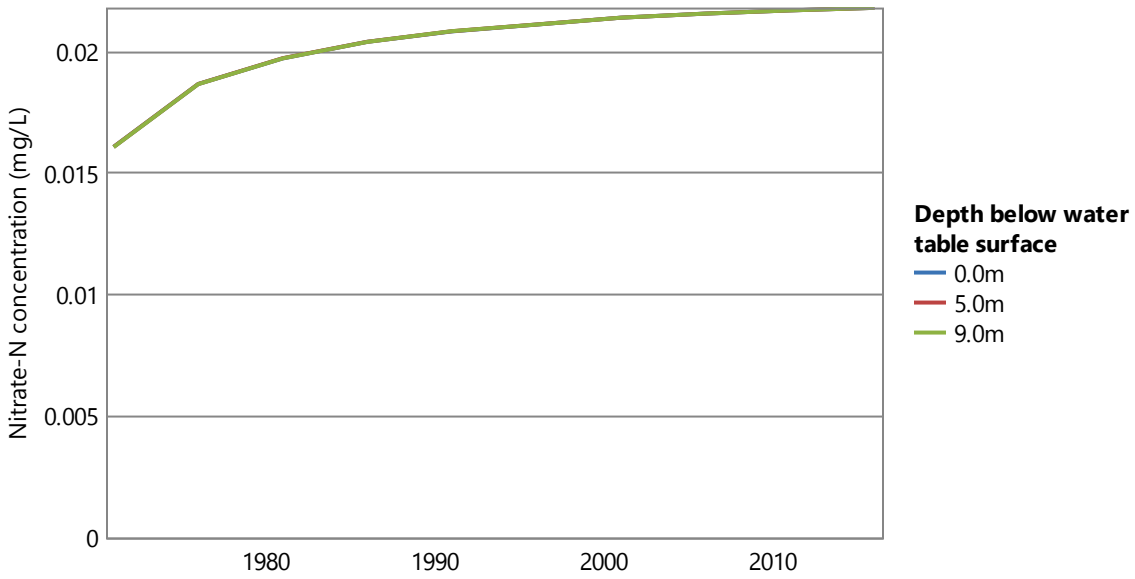
Recharge:
Average groundwater recharge (m3/day): 7.60
Average nitrate-N concentration of recharge (mg/L): 0.07

Aquifer characteristics:

Thickness (m)	12.0
Porosity (fraction)	0.1
Specific flux (mm/hour)	0.4
Vertical dispersion coefficient (m2/day)	0.1
Longitudinal dispersion coefficient (m2/day)	100.0
Retardation factor due to adsorption (multiplier)	1.0

Groundwater Nitrate-N concentration (mg/L) at property boundary, 300 m from effluent irrigation area:

Chart Table



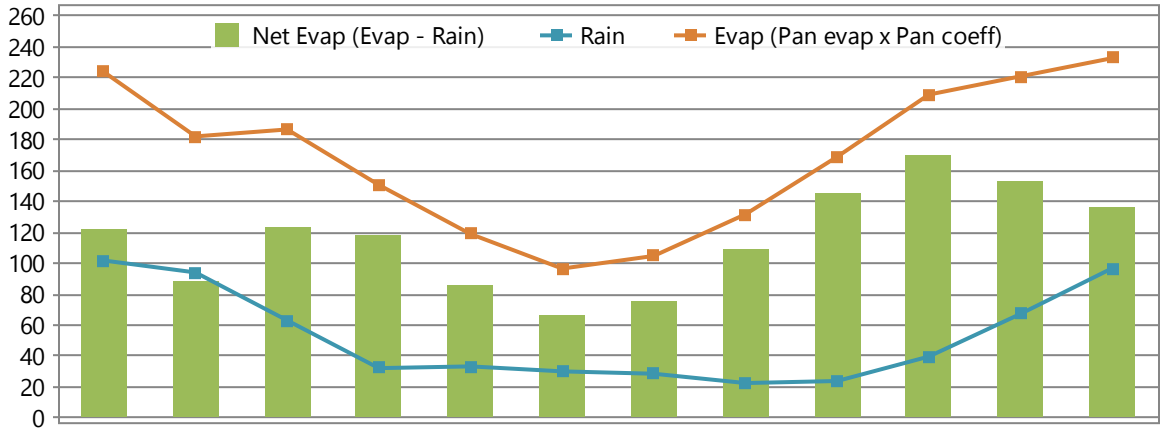
DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 20000

Averaged Historical Climate Data Used in Simulation (mm)

Location: Riverton, -23.5°, 150.05°

Run Period: 01/01/1967 to 31/12/2016 50 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	101.8	94.1	63.1	32.3	33.4	30.2	28.6	22.6	23.9	39.7	67.3	96.8	633.9
Evap	223.7	182.0	186.5	150.7	119.0	96.6	104.8	131.7	168.9	209.1	220.9	232.6	2026.5
Net Evap	121.9	87.9	123.4	118.4	85.6	66.4	76.2	109.1	144.9	169.3	153.6	135.8	1392.6
Net Evap/day	3.9	3.1	4.0	3.9	2.8	2.2	2.5	3.5	4.8	5.5	5.1	4.4	3.8

DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 20000

Pond System: 1 closed storage tank

New Sewage Treatment Plant - 11712.68 m3/year or 32.07 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.26 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	234.25 (234.16 - 234.52)
Total Phosphorus	10.00 (10.00 - 10.00)	117.13 (117.08 - 117.26)
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)

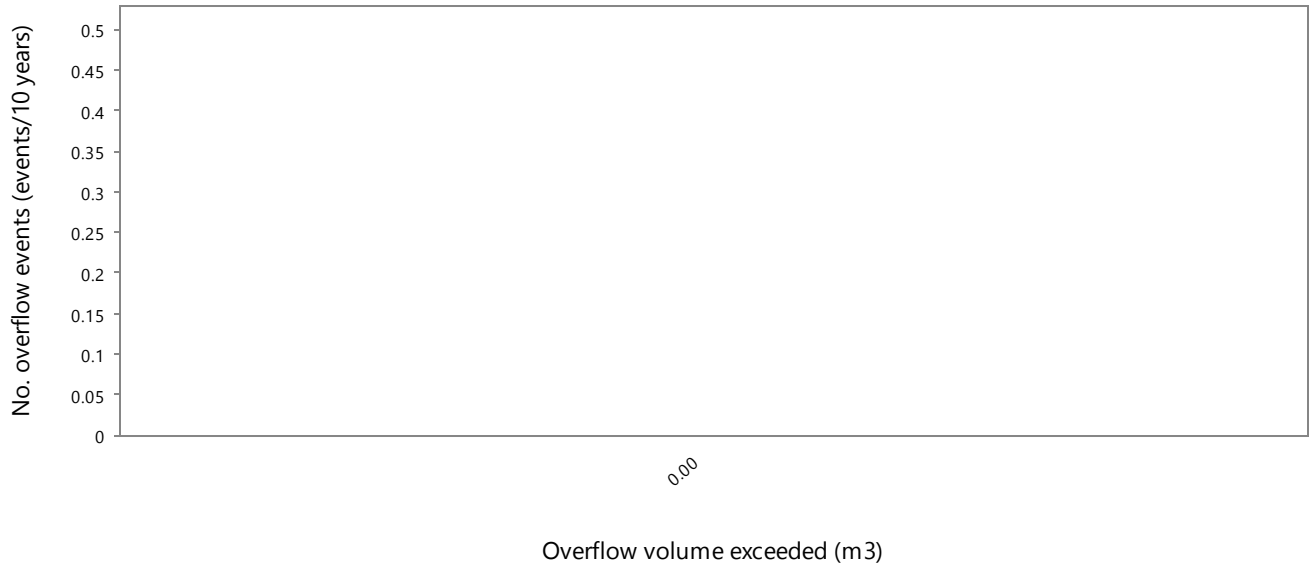
Last pond (Wet weather store): 160.00 m3

Theoretical hydraulic retention time (days)	4.99
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.05 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)	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: SunWater Rookwood Weir - Riverton Workers Camp 20000

Irrigation Information

Irrigation: 20000 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	11710.55	0.59
Total nitrogen applied (kg)	220.16	0.01
Total phosphorus applied (kg)	117.11	0.01
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 prevented when triggered (fraction)	0.00
Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 20000

Paddock Land: Default Paddock: 20000 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 20.00 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): Medium Permeability Red Brown Ea, 103.00 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	101.8	94.1	63.1	32.3	33.4	30.2	28.6	22.6	23.9	39.7	67.3	96.8	633.9
Irrigation	24.7	25.4	31.0	36.0	62.0	75.0	77.5	77.5	60.0	49.6	42.0	24.8	585.5
Soil Evap	1.5	0.7	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.3
Transpn.	99.7	89.8	98.5	64.5	59.5	55.4	63.5	83.0	106.5	103.0	98.4	100.5	1022.3
Rain Runoff	12.0	11.3	4.1	1.0	3.6	2.1	6.1	2.4	0.8	0.7	1.0	12.9	58.0
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	14.4	15.3	4.3	3.9	10.8	12.6	26.5	18.6	10.7	5.5	7.5	8.6	138.8
Delta	-1.1	2.4	-12.9	-1.1	21.5	35.0	10.1	-3.8	-34.1	-19.9	2.4	-0.4	-2.0

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	0.01
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.01
Average annual soil nitrogen removed by denitrification (kg/m2/year)	4.63E-07
Average annual soil nitrogen leached (kg/m2/year)	9.04E-06
Average annual nitrate-N loading to groundwater (kg/m2/year)	9.04E-06
Soil organic-N kg/m2 (Initial - Final)	0.05 - 0.01
	0.01 - 1.92E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.07
Max. annual nitrate-N concentration of deep drainage (mg/L)	2.56

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	0.01
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	3.44E-03
Average annual soil phosphorus leached (kg/m2/year)	1.84E-05
Dissolved phosphorus (kg/m2) (Initial - Final)	2.94E-05 - 2.59E-04
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.30 - 0.42
Average phosphate-P concentration in rootzone (mg/L)	0.72
Average phosphate-P concentration of deep drainage (mg/L)	0.13
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.22
Design soil profile storage life based on average infiltrated water phosphorus concn. of 5.04 mg/L (years)	73.79

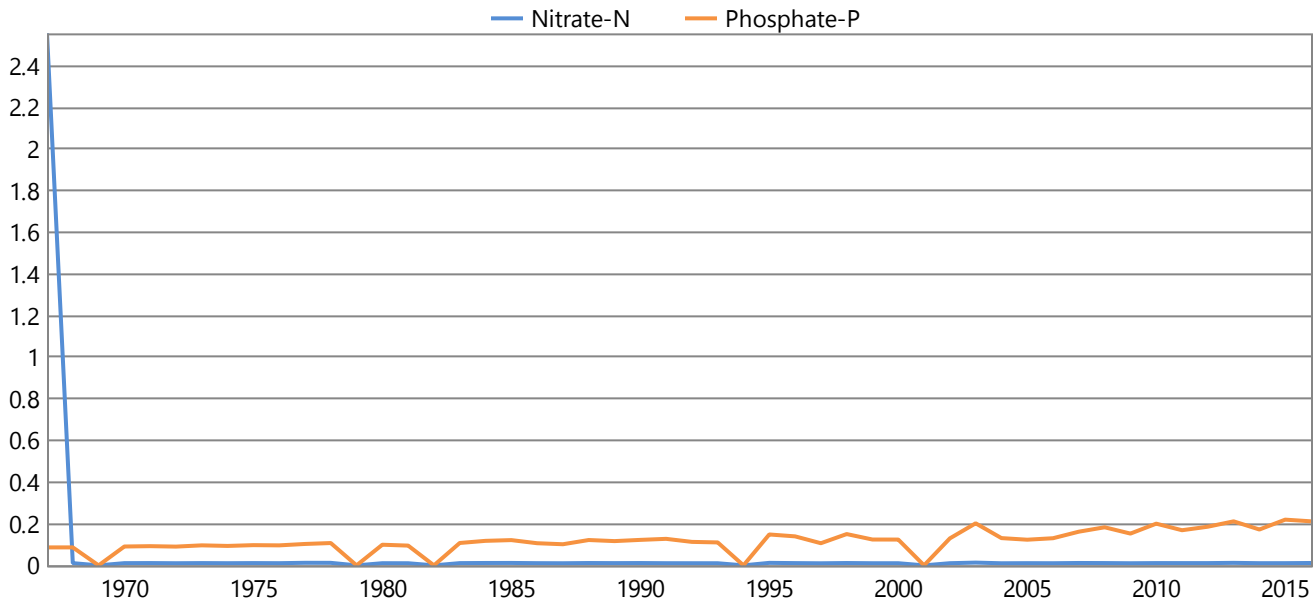
DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 20000

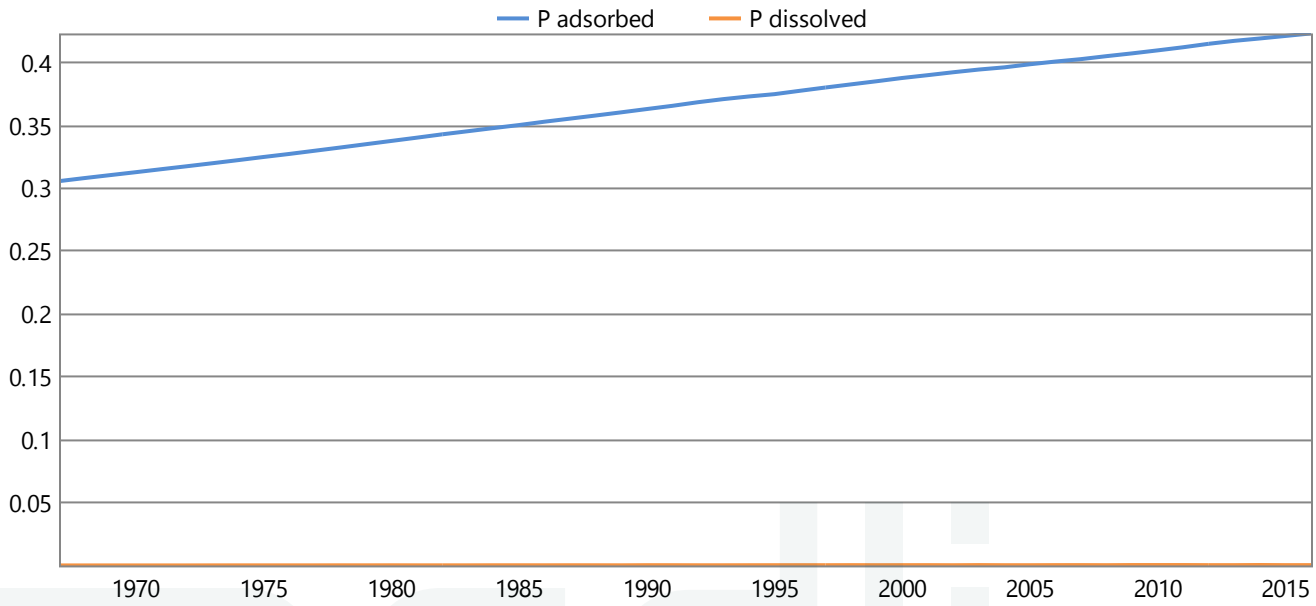
Paddock Land: Default Paddock: 20000 m2

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: SunWater Rookwood Weir - Riverton Workers Camp 20000

Paddock Plant Performance: Default Paddock: 20000 m2

Average Plant Performance (Minimum - Maximum): Continuous Rhodes Grass Pasture

Average annual shoot dry matter yield (kg/m2/year)	1.05 (0.96 - 1.46)
Average monthly plant (green) cover (fraction)	0.72 (0.67 - 0.78)
Average monthly crop factor (fraction)	0.65 (0.61 - 0.70)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1198.35 (1185.51 - 1200.00)
Average number of normal harvests per year (no./year)	1.82 (1.00 - 2.00)
Average number of normal harvests for last five years only (no./year)	1.60
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)	0.78 (0.65 - 0.82)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.04)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.48 (0.19 - 0.66)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.17 (0.01 - 0.31)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: 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)	0.01
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	0.01
Average leaching fraction based on 10 year running averages (fraction)	0.33
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.02
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.13
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

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 20000

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Activity: Accidental drinking **Liquid Ingested (mL):** 100

Health risk threshold: 1.0 extra infections/10000 persons/year

Pathogen infection risk for year of 12 exposures (extra infections/10000 persons/year)

Escherichia coli O111	0.00

Nitrate concentration in groundwater

Average Nitrate-N concentration of recharge (mg/L)	0.07
Maximum Groundwater Nitrate-N concentration at property boundary in final year of run (mg/L)	0.02

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen

MEDLI REPORT - FULL RUN

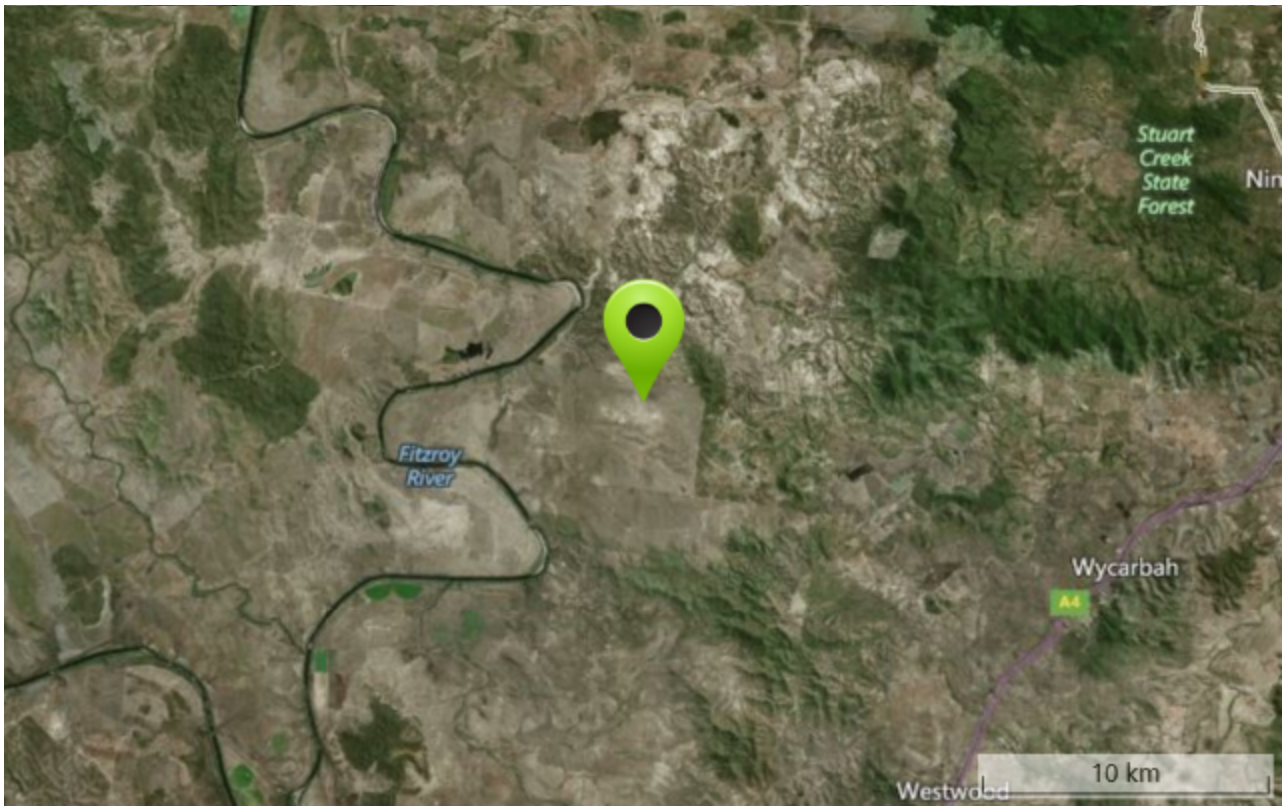
Enterprise: SunWater Rookwood Weir - Riverton Workers Camp 50000

Description:
Rookwood Weir, Riverton Workers Camp STP with treated effluent discharge

Client: SunWater

MEDLI User: STEER Environmental Consulting

Scenario Details:
250 person workers camp with on-site STP and treated effleunt discharge onto an irrigation field (50000 m2).



DESCRIPTION

Climate Data: Riverton, -23.5°, 150.05°

Run Period: 01/01/1967 to 31/12/2016 50 years, 0 days

Climate Statistics:

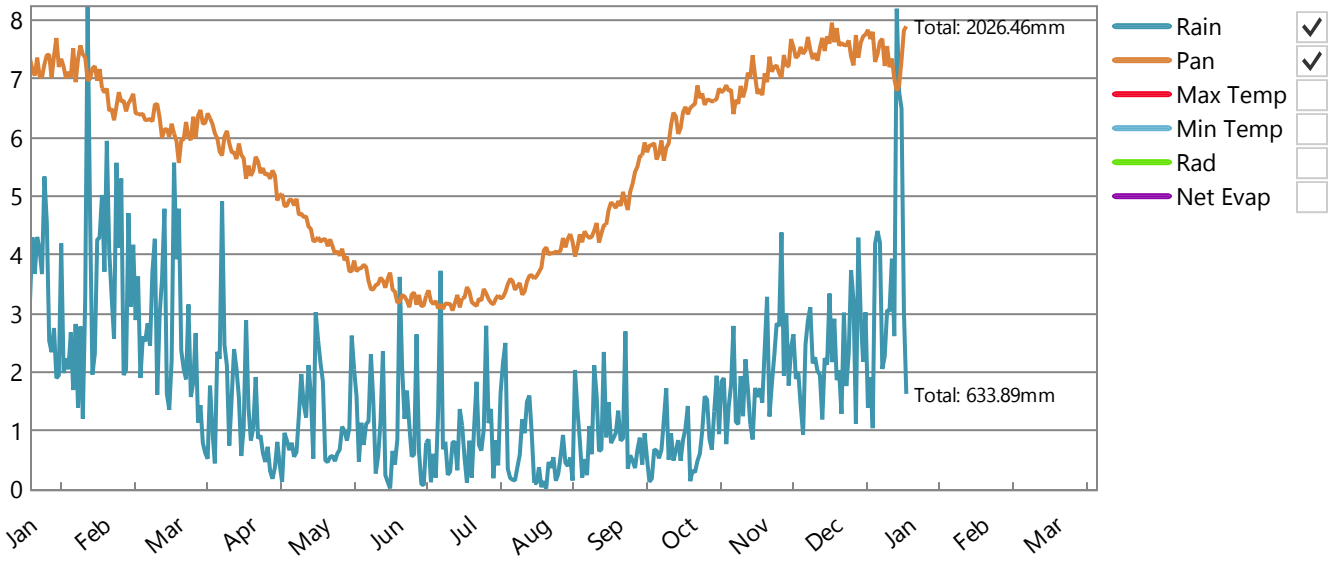
	5th Percentile	50th Percentile	95th Percentile
Rainfall (mm/year)	348	616	969
Pan Evaporation (mm/year)	1792	2037	2208

Climate Data:

Chart Table

Monthly Daily

Daily Average Across Run Period

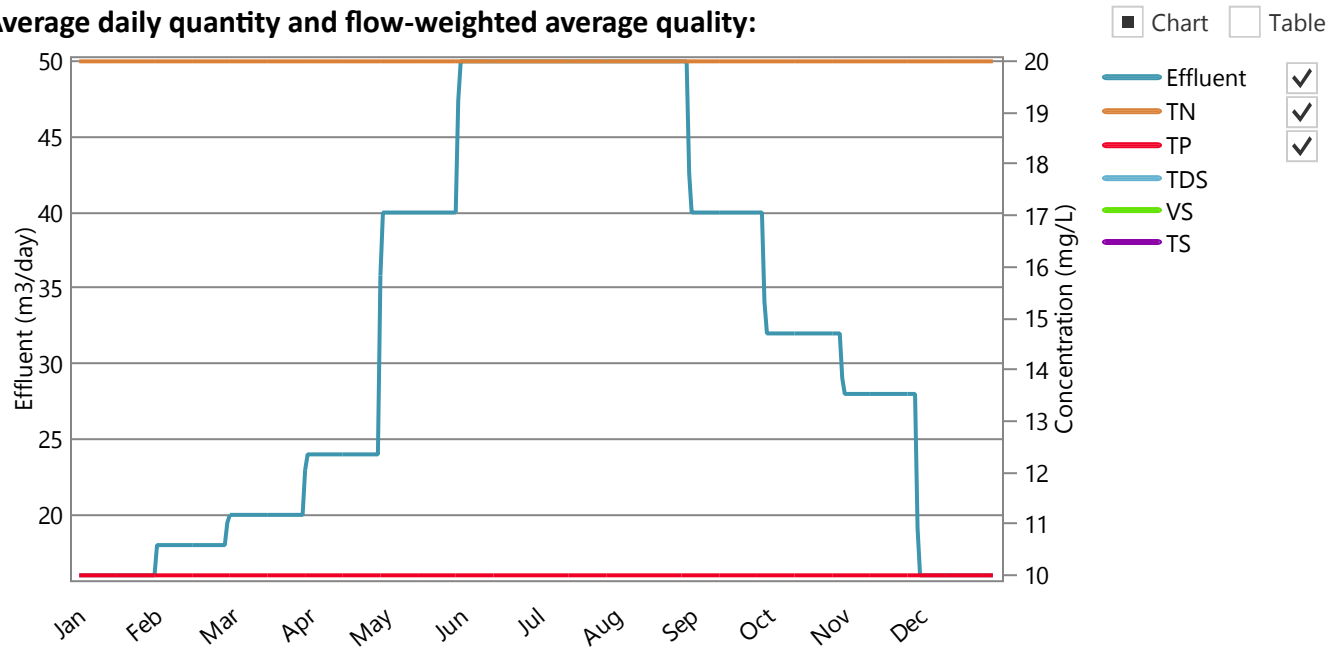


DESCRIPTION

Effluent type: New Sewage Treatment Plant

Wastestream before any recycling or pretreatment

Average daily quantity and flow-weighted average quality:



Wastestream after any recycling and pretreatment if applicable

Effluent quantity: 11712.68 m3/year or 32.07 m3/day (Min-Max: 16.00 - 50.00)

Flow-weighted average (minimum - maximum) daily effluent quality entering pond system:

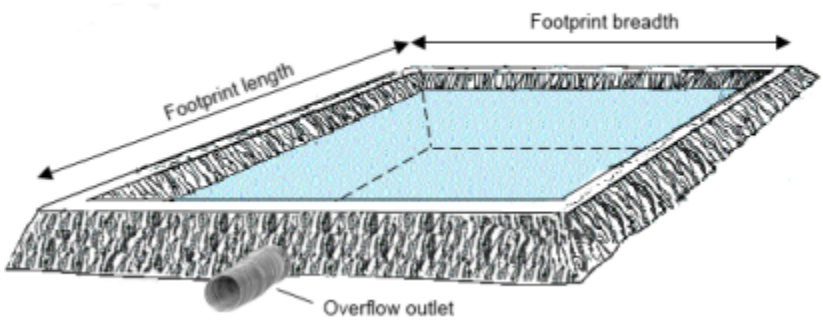
	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	234.25 (234.16 - 234.52)
Total Phosphorus	10.00 (10.00 - 10.00)	117.13 (117.08 - 117.26)
Total Dissolved Salts	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Volatile Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)
Total Solids	0.00 (0.00 - 0.00)	0.00 (0.00 - 0.00)

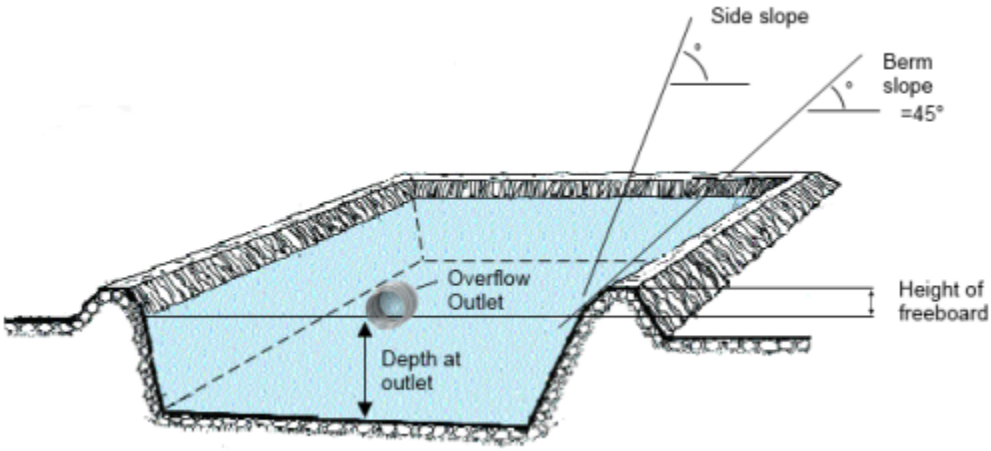
DESCRIPTION

Pond system: 1 closed storage tank

Pond system details:

	Pond 1
Maximum pond volume (m3)	160.00
Minimum allowable pond volume (m3)	106.67
Pond depth at overflow outlet (m)	3.00
Maximum water surface area (m2)	53.33
Pond footprint length (m)	7.30
Pond footprint width (m)	7.30
Pond catchment area (m2)	53.33
Average active volume (m3)	106.65





Irrigation pump limits:

Minimum pump rate per area limit (L/day/m2)	0.00
Maximum pump rate per area limit (L/day/m2)	100.00

Shandying water:

Annual allocation of fresh water available for shandying (m3/year)	0.00
Maximum rate of application of fresh water (L/day)	0.00
Nitrogen concentration (mg/L)	0.00
Salinity (dS/m)	0.00
Minimum shandy water is used	False

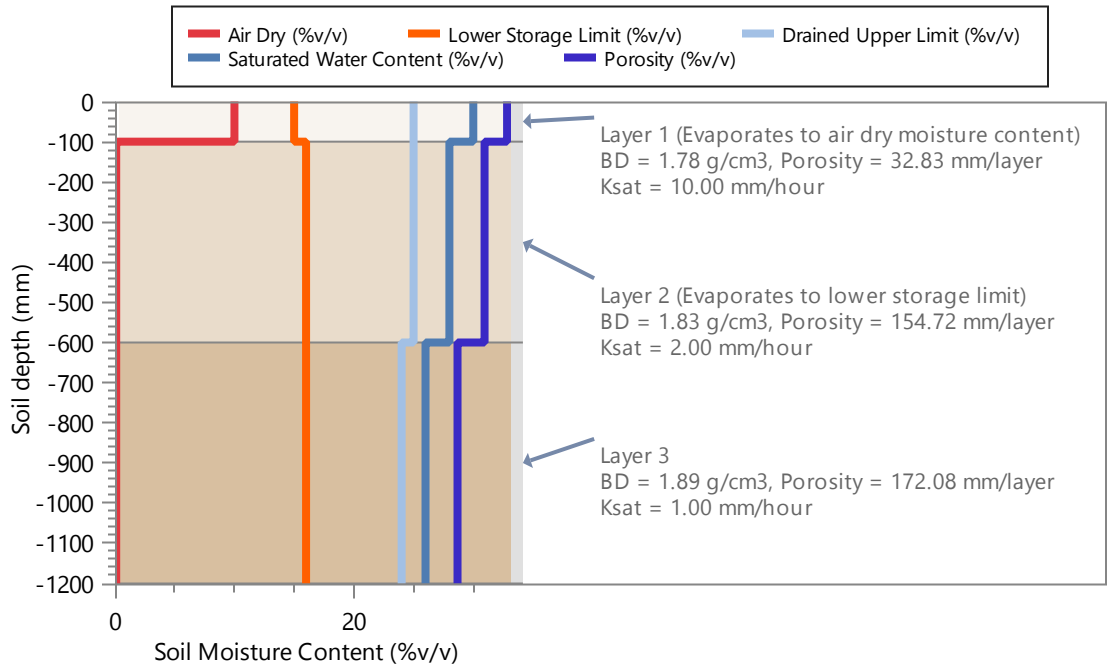
DESCRIPTION

Land: Default Paddock

Area (m2): 50000.00

Soil Type: Medium Permeability Red Brown Ea, 1200.00 mm defined profile depth

Profile Porosity (mm)	359.62
Profile saturation water content (mm)	326.00
Profile drained upper limit (or field capacity) (mm)	294.00
Profile lower storage limit (or permanent wilting point) (mm)	191.00
Profile available water capacity (mm)	103.00
Profile limiting saturated hydraulic conductivity (mm/hour)	1.00
Surface saturated hydraulic conductivity (mm/hour)	10.00
Runoff curve number II (coefficient)	80.00
Soil evaporation U (mm)	10.00
Soil evaporation Cona (mm/sqrt day)	4.00



Plant Data: Continuous Rhodes Grass Pasture

Average monthly cover (fraction) (minimum - maximum)	0.72 (0.69 - 0.77)
Maximum crop factor at 100% cover (mm/mm) (Maximum crop coefficient 0.9 x Pan coefficient 1)	0.90
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	Tolerant
Salinity threshold EC sat. ext. (dS/m)	7.00
Proportion of yield decrease per dS/m increase (fraction/dS/m)	0.03

DESCRIPTION

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Pathogens Present:

Pathogen	Type	Irrigation Water Concentration (org/m3)	Organism Unit
Escherichia coli O111	Bacteria	2	cfu

Receptor attributes: (Accidental drinking)

Maximum Volume Ingested per Event Resulting From Activity (mL)	100.00

Exposures: Number of identical exposures for each month

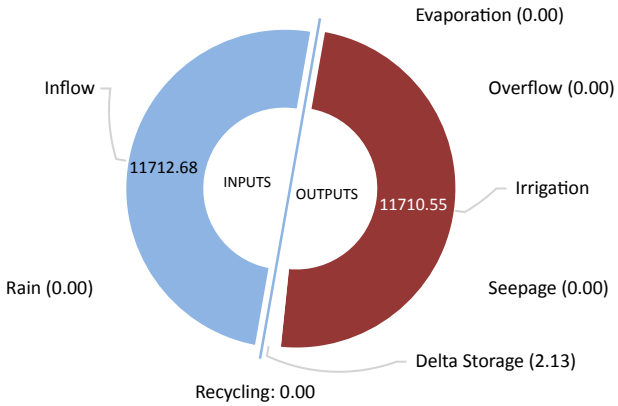
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

PERFORMANCE

Pond System Water Performance - Overflow: 1 closed storage tank

Capacity of wet weather storage pond: **160 m3**

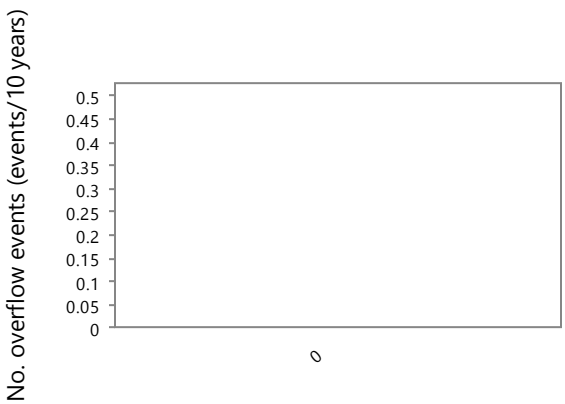
Pond System Water Balance (m3/year)



Name	Value
Rain	0.00
Inflow	11712.68
Recycling	0.00
Evaporation	0.00
Overflow	0.00
Irrigation	11710.55
Seepage	0.00
Delta Storage	2.13

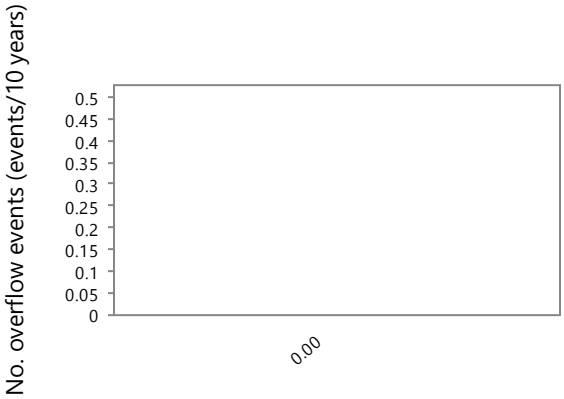
Overflow Diagnostics

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



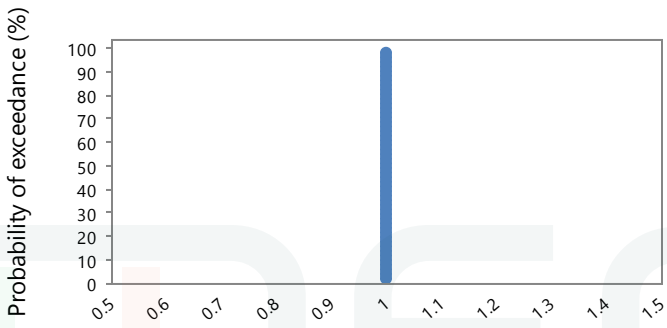
Overflow event duration exceeded (days)

Export plot



Overflow volume exceeded (m3)

Export plot



Annual reuse (fraction)

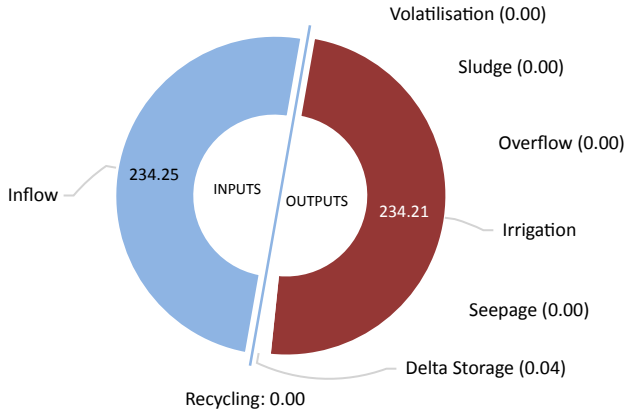
Export plot

PERFORMANCE

Pond System Performance - Nutrient: 1 closed storage tank

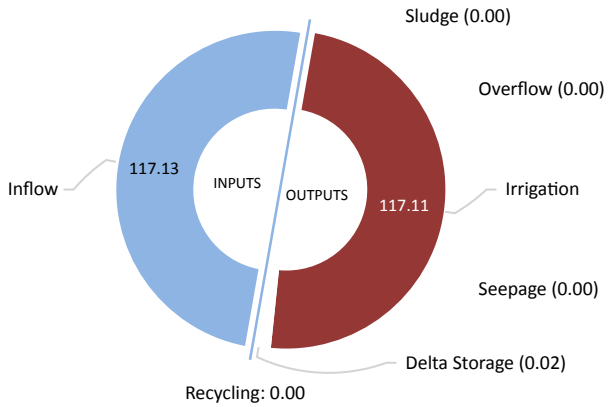
Pond System Nutrients and Salt Balance:

Nitrogen Balance (kg/year)



Name	Value
Inflow	234.25
Recycling	0.00
Volatilisation	0.00
Sludge	0.00
Overflow	0.00
Irrigation	234.21
Seepage	0.00
Delta Storage	0.04

Phosphorus Balance (kg/year)



Name	Value
Inflow	117.13
Recycling	0.00
Sludge	0.00
Overflow	0.00
Irrigation	117.11
Seepage	0.00
Delta Storage	0.02

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)	20.00
Average phosphorus concentration of pond liquid (mg/L)	10.00
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)	20.00
Final phosphorus concentration of pond liquid (mg/L)	10.00
Final salinity of pond liquid (dS/m)	0.00

PERFORMANCE

Irrigation Performance:

Water Use: (assumes 100% Irrigation Efficiency)

Pond water irrigated (m3/year)	11710.55
Average Shandy water irrigation (m3/year) (minimum - maximum)	0.00 (0.00 - 0.00)
Total water irrigated (m3/year)	11710.55
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)	20.00
Average nitrogen concentration of irrigation water - after ammonia loss during irrigation (mg/L)	18.80
Average phosphorus concentration of irrigation water (mg/L)	10.00
Average salinity of irrigation water (dS/m)	0.00

Irrigation Diagnostics:

Proportion of Days irrigation occurs (fraction)	1.00

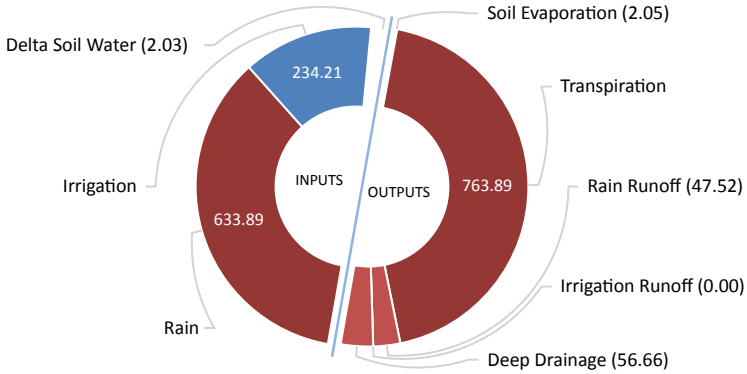
PERFORMANCE

Land Performance - Soil Water

Paddock: Default Paddock, 50000 m2
Soil Type: Medium Permeability Red Brown Ea, 103.00 mm PAWC at maximum root depth

Land Water Balance (mm/year):

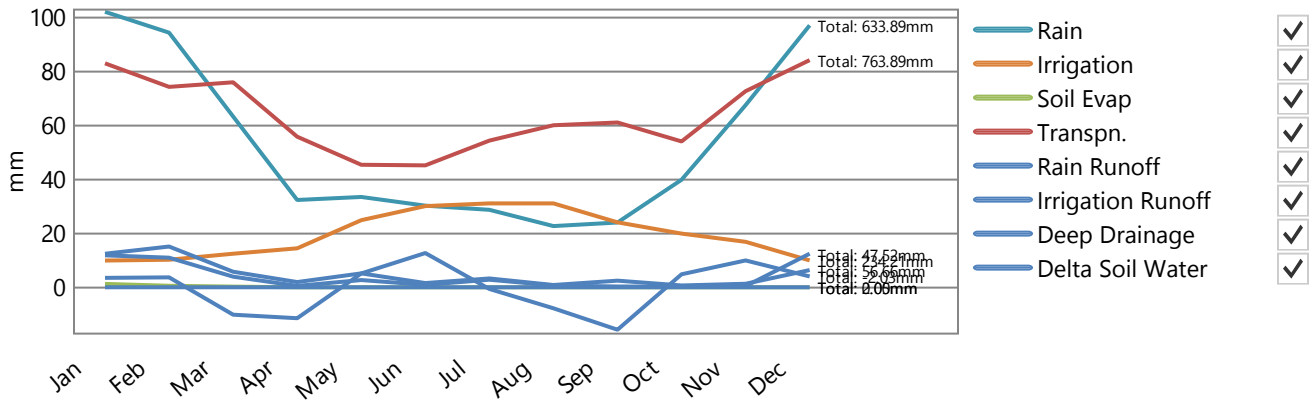
mm/year % Total inputs



Name	Value
Rain	633.89
Irrigation	234.21
Soil Evaporation	2.05
Transpiration	763.89
Rain Runoff	47.52
Irrigation Runoff	0.00
Deep Drainage	56.66
Delta Soil Water	-2.03

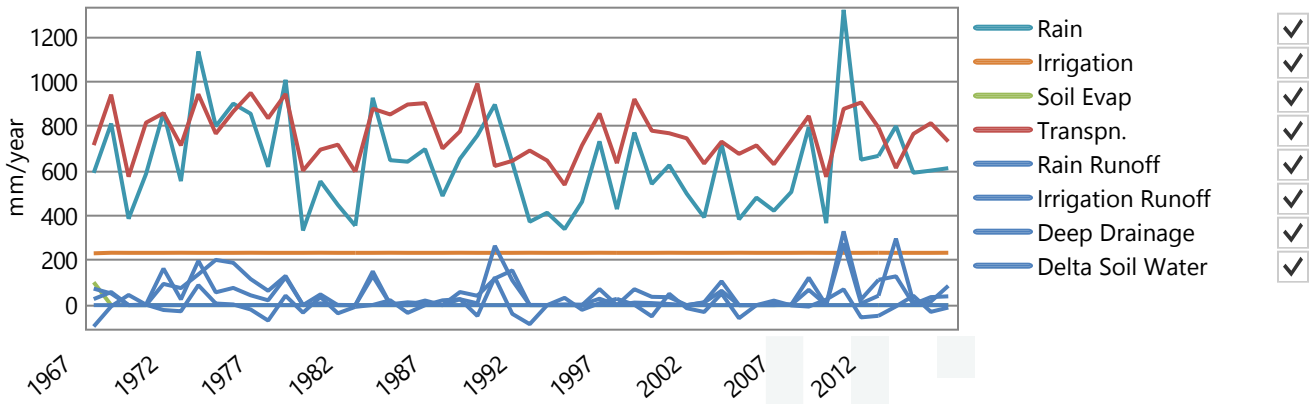
Average Monthly Totals (mm):

Chart Table



Average Annual Totals (mm/year):

Chart Table



PERFORMANCE

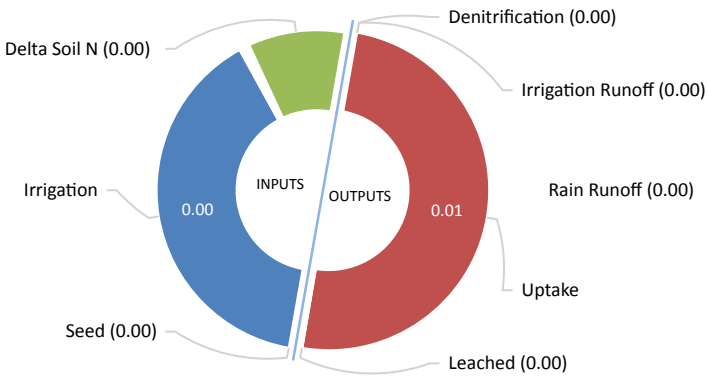
Land Performance - Soil Nutrient

Paddock: Default Paddock, 50000 m2 Ea

Soil Type: Medium Permeability Red Brown

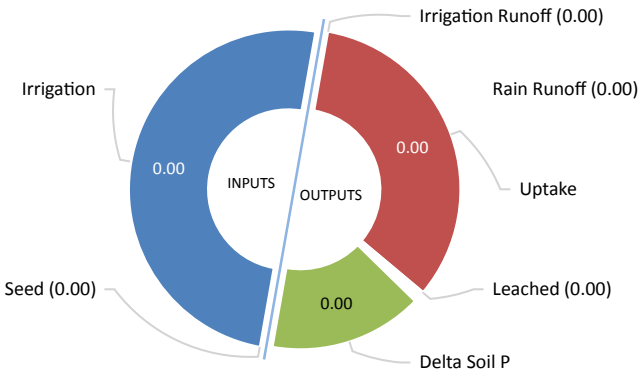
Irrigation ammonium volatilisation losses (kg/m2/year): 0.00
Proportion of total nitrogen in irrigated effluent as ammonium (fraction): 0.30

Land Nitrogen Balance (kg/m2/year)



Name	Value
Seed	1.20E-06
Irrigation	4.40E-03
Denitrification	2.12E-07
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	0.01
Leached	8.11E-06
Delta Soil N	-1.09E-03

Land Phosphorus Balance (kg/m2/year)



Name	Value
Seed	1.80E-07
Irrigation	2.34E-03
Irrigation Runoff	0.00
Rain Runoff	0.00
Uptake	1.60E-03
Leached	5.48E-06
Delta Soil P	7.41E-04

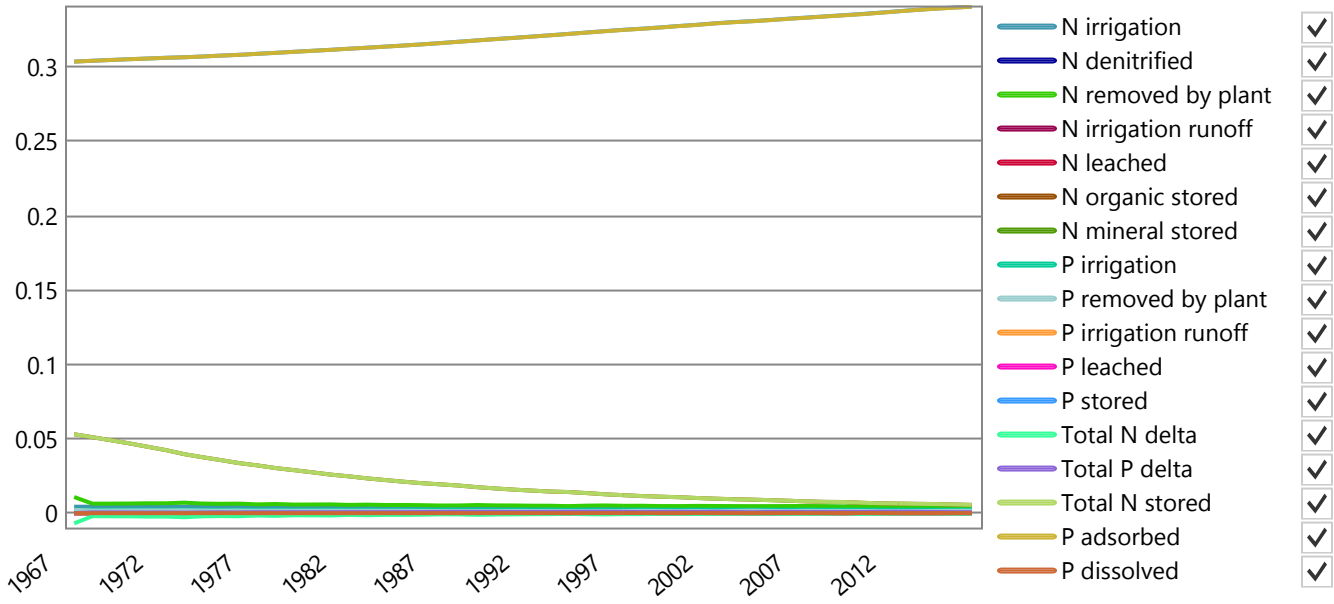
PERFORMANCE

Land Performance - Soil Nutrient

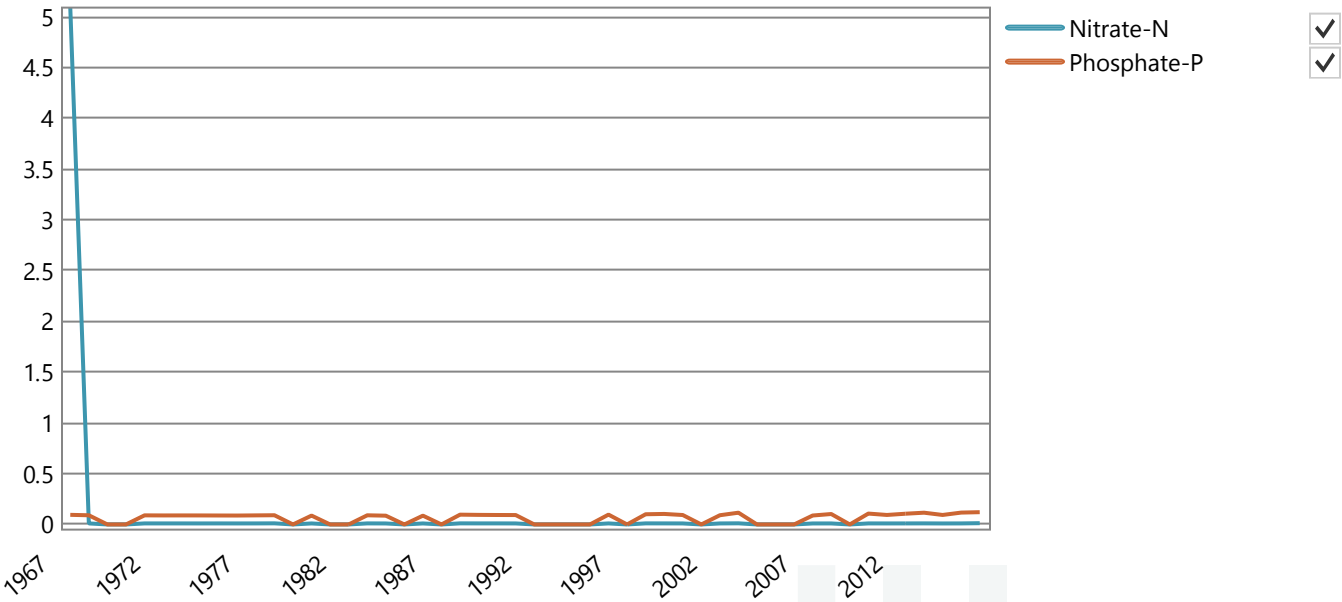
Paddock: Default Paddock, 50000 m2 Ea

Soil Type: Medium Permeability Red Brown

Annual Nutrient Totals (kg/m2):



Annual Nutrient Leaching Concentration (mg/L):



PERFORMANCE

Plant Performance and Nutrients

Paddock: Default Paddock, 50000 m2 Ea

Soil Type: Medium Permeability Red Brown

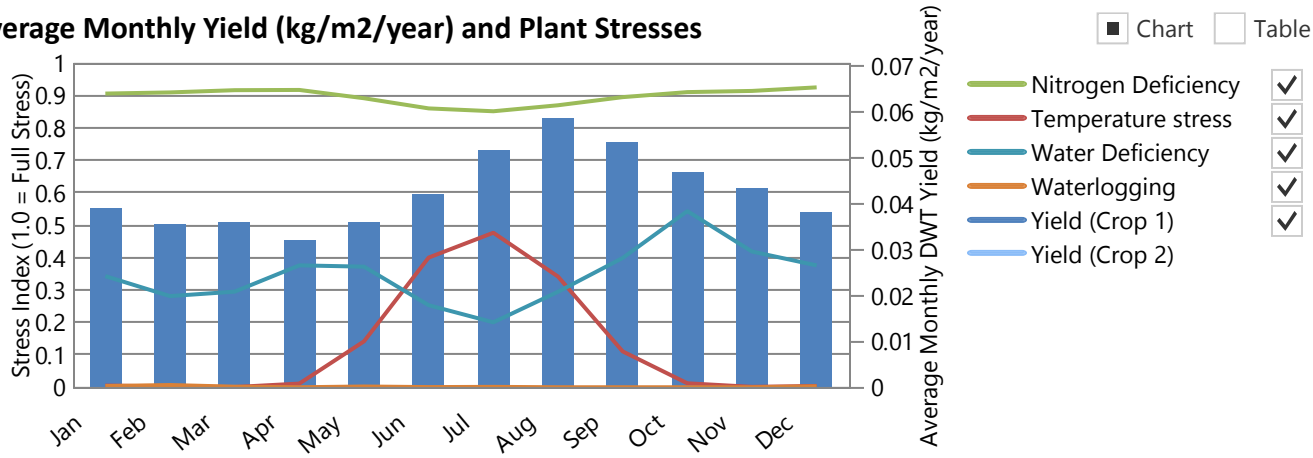
Plant: Continuous Rhodes Grass Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.51 (0.41 - 1.01)
Average monthly plant (green) cover (fraction) (minimum - maximum)	0.72 (0.69 - 0.77)
Average monthly root depth (mm) (minimum - maximum)	1198.26 (1185.50 - 1200.00)

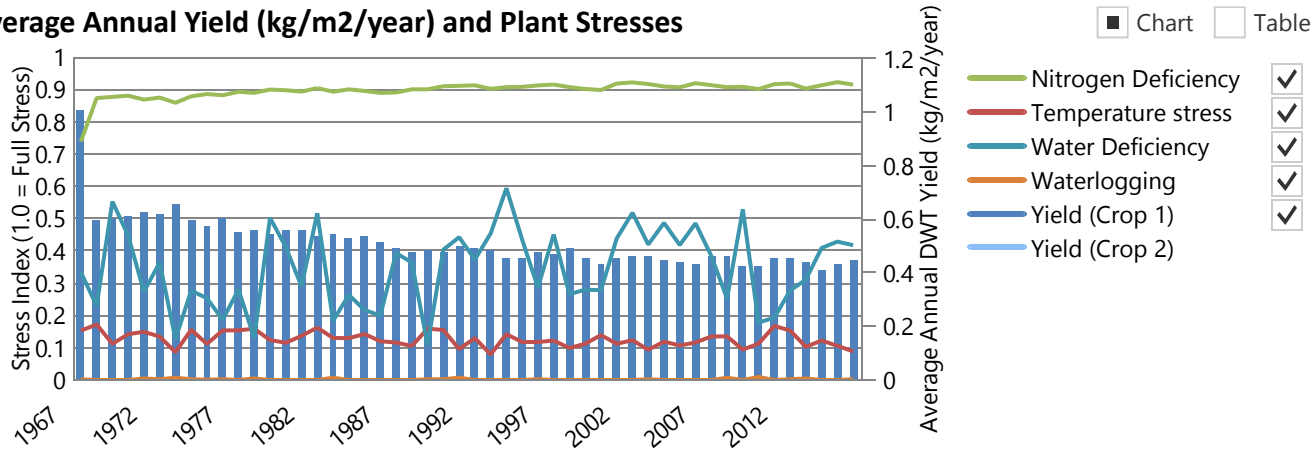
Nutrient Uptake (minimum - maximum):

Average annual net nitrogen removed by plant uptake (kg/m2/year)	0.01 (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 (0.002 - 0.004)

Average Monthly Yield (kg/m2/year) and Plant Stresses



Average Annual Yield (kg/m2/year) and Plant Stresses



No. of harvests/year: 0.90 (normal)

No. days without crop/year (days/year): 0.00

PERFORMANCE

Land Performance

Paddock: Default Paddock, 50000 m2 Ea

Soil Type: Medium Permeability Red Brown

Plant: Continuous Rhodes Grass Pasture

Salt tolerance	Tolerant
Salinity threshold EC sat. ext. (dS/m)	7.00
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

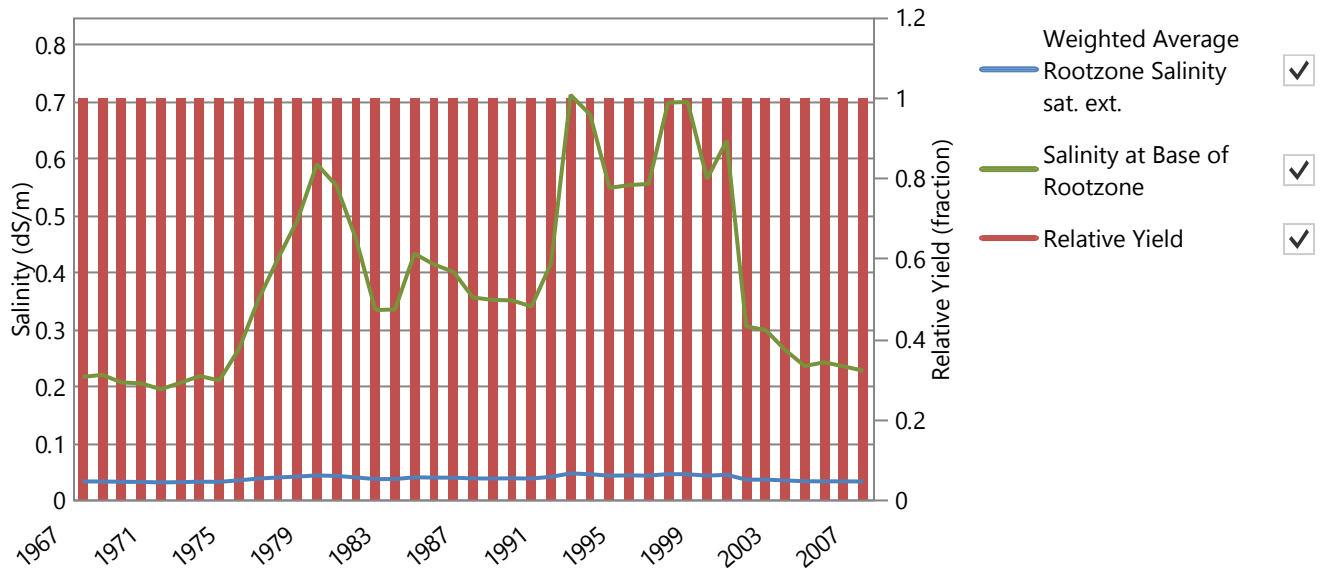
Soil Salinity:

Salinity of infiltrated water (Average salinity of rainwater = 0.03 dS/m) (dS/m)	0.02
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	0.01
Average leaching fraction based on 10 year running averages (fraction)	0.25
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.04
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.39
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



PERFORMANCE

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Activity: Accidental drinking **Liquid Ingested (mL):** 100

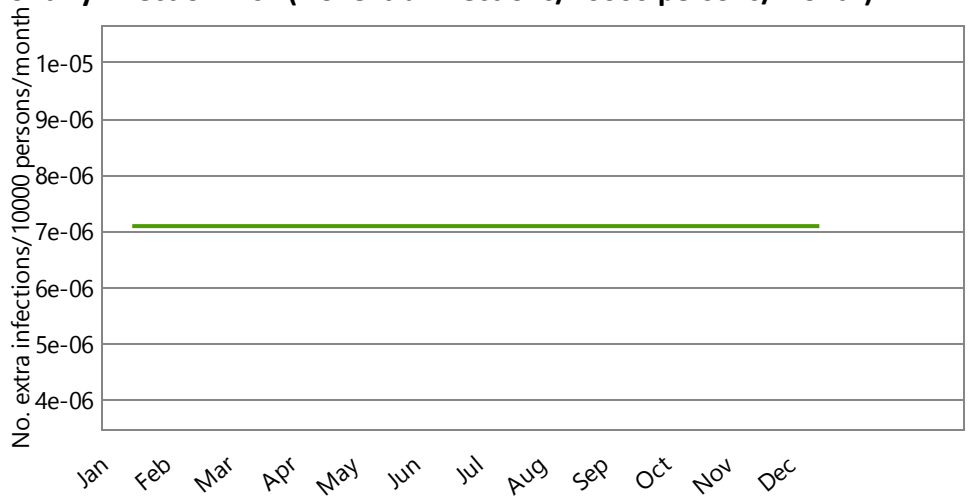
Health risk threshold: 1.0 extra infections/10000 persons/year

Pathogen Risk:

	Escherichia coli O111
Pathogen Type	Bacteria
No. Ingested per Event (Organisms) (minimum - maximum)	0.0002 - 0.0002
Infection Risk per Event (No. extra infections/10000 persons) (minimum - maximum)	0.00 - 0.00
Infection risk per year of 12 events (extra infections/10000 persons/ year)	0.00
Organism Unit	cfu

Monthly Infection Risk (No. extra infections/10000 persons/month):

Chart Table



Escherichia coli O111 (1) ☑

PERFORMANCE

Groundwater

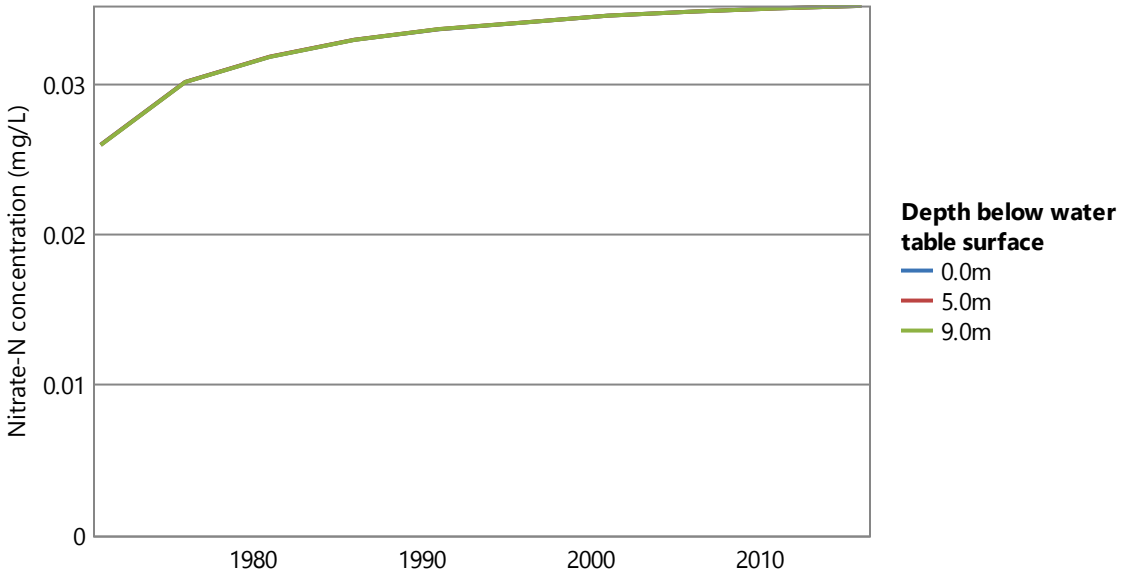
Recharge:
Average groundwater recharge (m3/day): 7.76
Average nitrate-N concentration of recharge (mg/L): 0.14

Aquifer characteristics:

Thickness (m)	12.0
Porosity (fraction)	0.1
Specific flux (mm/hour)	0.4
Vertical dispersion coefficient (m2/day)	0.1
Longitudinal dispersion coefficient (m2/day)	100.0
Retardation factor due to adsorption (multiplier)	1.0

Groundwater Nitrate-N concentration (mg/L) at property boundary, 300 m from effluent irrigation area:

Chart Table



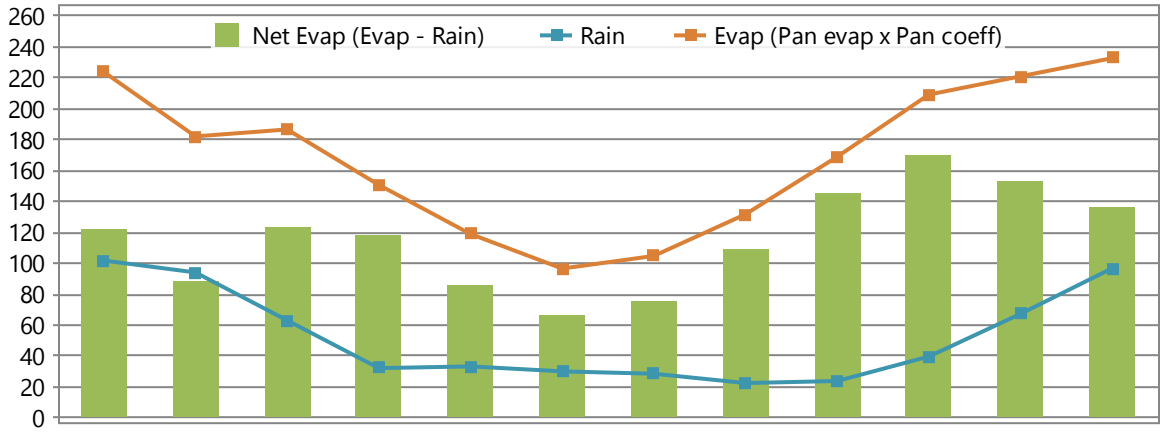
DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 50000

Averaged Historical Climate Data Used in Simulation (mm)

Location: Riverton, -23.5°, 150.05°

Run Period: 01/01/1967 to 31/12/2016 50 years, 0 days



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	101.8	94.1	63.1	32.3	33.4	30.2	28.6	22.6	23.9	39.7	67.3	96.8	633.9
Evap	223.7	182.0	186.5	150.7	119.0	96.6	104.8	131.7	168.9	209.1	220.9	232.6	2026.5
Net Evap	121.9	87.9	123.4	118.4	85.6	66.4	76.2	109.1	144.9	169.3	153.6	135.8	1392.6
Net Evap/day	3.9	3.1	4.0	3.9	2.8	2.2	2.5	3.5	4.8	5.5	5.1	4.4	3.8

DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 50000

Pond System: 1 closed storage tank

New Sewage Treatment Plant - 11712.68 m3/year or 32.07 m3/day generated on average

Effluent entering pond system after any pretreatment and recycling

Average (Minimum-Maximum) influent quality calculated for 365.26 non-zero flow days, after any pretreatment and recycling.

Constituent	Concentration (mg/L)	Load (kg/year)
Total Nitrogen	20.00 (20.00 - 20.00)	234.25 (234.16 - 234.52)
Total Phosphorus	10.00 (10.00 - 10.00)	117.13 (117.08 - 117.26)
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)

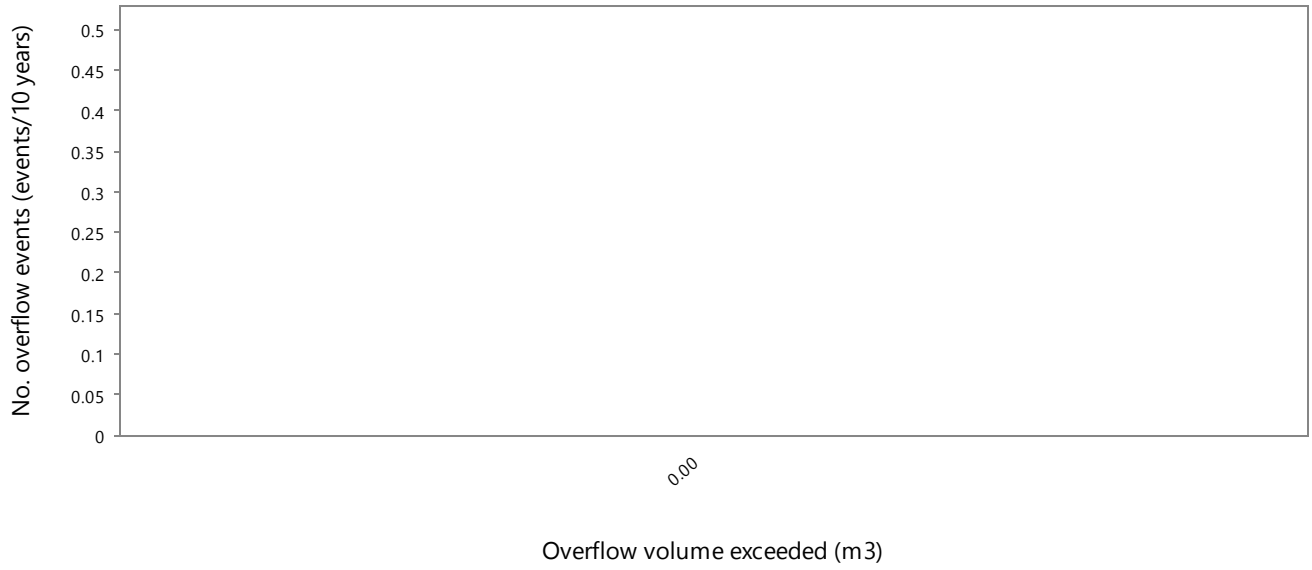
Last pond (Wet weather store): 160.00 m3

Theoretical hydraulic retention time (days)	4.99
Average volume of overflow (m3/year)	0.00
No. overflow events per year exceeding threshold* of 0.05 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)	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: SunWater Rookwood Weir - Riverton Workers Camp 50000

Irrigation Information

Irrigation: 50000 m2 total area (assumed 100% irrigation efficiency)

	Quantity/year	Quantity/m2/year
Total irrigation applied (m3)	11710.55	0.23
Total nitrogen applied (kg)	220.16	0.00
Total phosphorus applied (kg)	117.11	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 prevented when triggered (fraction)	0.00
Proportion of Days irrigation occurs (fraction)	1.00

DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 50000

Paddock Land: Default Paddock: 50000 m2

Irrigation: Fixed Sprinkler with 0.2% ammonium loss during irrigation

Irrigation triggered every 1 days
Irrigate a fixed amount of 20.00 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): Medium Permeability Red Brown Ea, 103.00 mm PAWC at maximum root depth

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rain	101.8	94.1	63.1	32.3	33.4	30.2	28.6	22.6	23.9	39.7	67.3	96.8	633.9
Irrigation	9.9	10.2	12.4	14.4	24.8	30.0	31.0	31.0	24.0	19.8	16.8	9.9	234.2
Soil Evap	1.2	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0
Transpn.	82.8	74.1	75.8	55.7	45.3	45.1	54.2	59.9	60.9	53.9	72.5	84.0	763.9
Rain Runoff	11.8	10.9	3.9	0.5	2.7	0.9	2.8	0.7	0.3	0.2	0.4	12.4	47.5
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	12.4	15.1	5.7	1.9	5.1	1.6	3.3	0.8	2.4	0.7	1.3	6.4	56.7
Delta	3.5	3.7	-10.1	-11.4	5.1	12.7	-0.6	-7.8	-15.7	4.8	9.9	4.0	-2.0

Soil Nitrogen Balance

Average annual effluent nitrogen added (kg/m2/year)	4.40E-03
Average annual soil nitrogen removed by plant uptake (kg/m2/year)	0.01
Average annual soil nitrogen removed by denitrification (kg/m2/year)	2.12E-07
Average annual soil nitrogen leached (kg/m2/year)	8.11E-06
Average annual nitrate-N loading to groundwater (kg/m2/year)	8.11E-06
Soil organic-N kg/m2 (Initial - Final)	0.05 - 0.01
	0.01 - 1.92E-06
Average nitrate-N concentration of deep drainage (mg/L)	0.14
Max. annual nitrate-N concentration of deep drainage (mg/L)	5.09

Soil Phosphorus Balance

Average annual effluent phosphorus added (kg/m2/year)	2.34E-03
Average annual soil phosphorus removed by plant uptake (kg/m2/year)	1.60E-03
Average annual soil phosphorus leached (kg/m2/year)	5.48E-06
Dissolved phosphorus (kg/m2) (Initial - Final)	2.94E-05 - 8.63E-05
Adsorbed phosphorus (kg/m2) (Initial - Final)	0.30 - 0.34
Average phosphate-P concentration in rootzone (mg/L)	0.26
Average phosphate-P concentration of deep drainage (mg/L)	0.10
Max. annual phosphate-P concentration of deep drainage (mg/L)	0.12
Design soil profile storage life based on average infiltrated water phosphorus concn. of 2.85 mg/L (years)	145.90

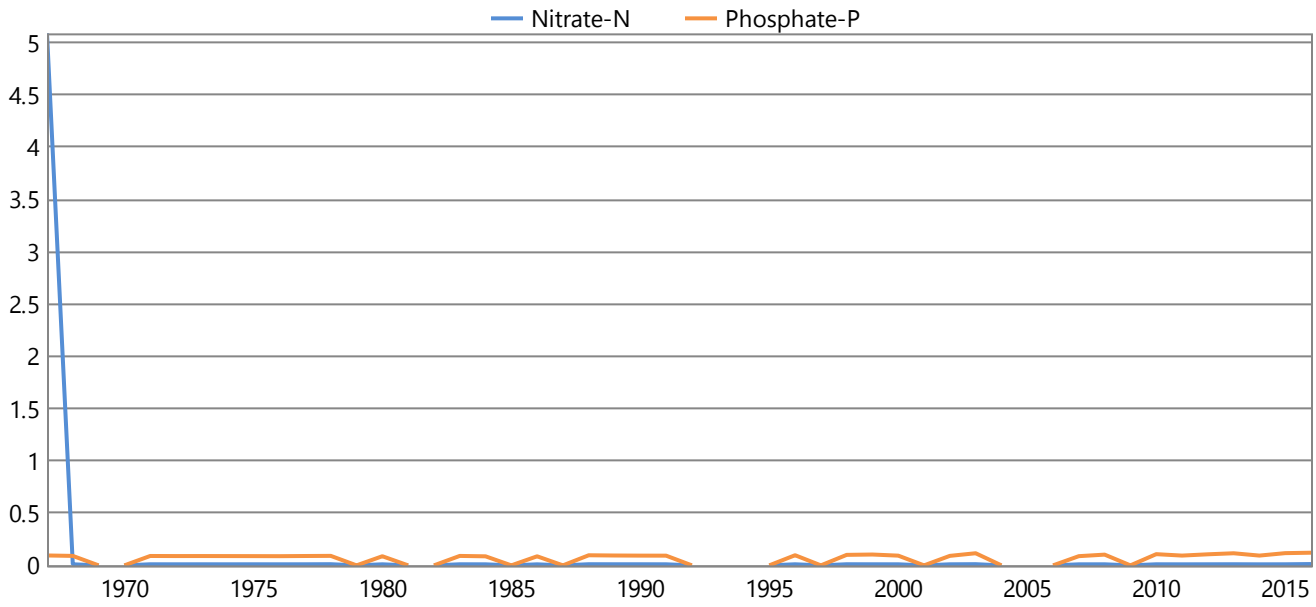
DIAGNOSTICS

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 50000

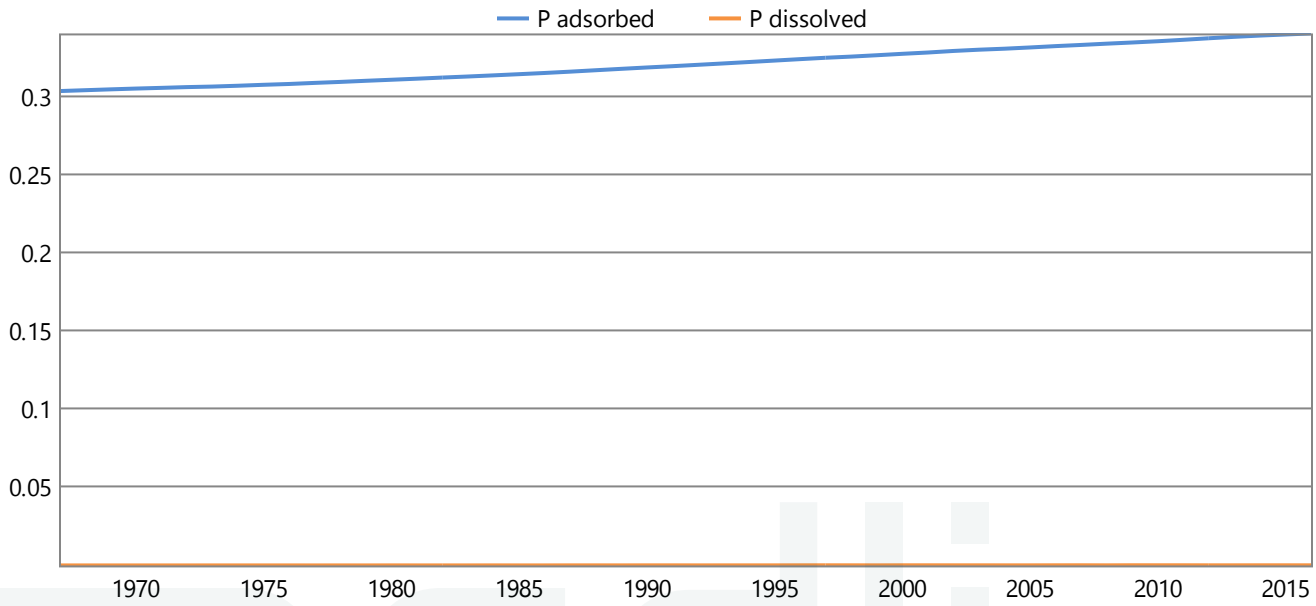
Paddock Land: Default Paddock: 50000 m2

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: SunWater Rookwood Weir - Riverton Workers Camp 50000

Paddock Plant Performance: Default Paddock: 50000 m2

Average Plant Performance (Minimum - Maximum): Continuous Rhodes Grass Pasture

Average annual shoot dry matter yield (kg/m2/year)	0.51 (0.41 - 1.01)
Average monthly plant (green) cover (fraction)	0.72 (0.69 - 0.77)
Average monthly crop factor (fraction)	0.65 (0.62 - 0.69)
Total plant cover (both green and dead) left after harvest (fraction)	1.00
Average monthly root depth (mm)	1198.26 (1185.50 - 1200.00)
Average number of normal harvests per year (no./year)	0.90 (0.00 - 2.00)
Average number of normal harvests for last five years only (no./year)	0.80
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)	0.90 (0.74 - 0.92)
Average January temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.01 (0.00 - 0.04)
Average July temperature stress index (0 = no stress, 1 = full stress) (coefficient)	0.48 (0.19 - 0.66)
Average monthly water stress index (0 = no stress, 1 = full stress) (coefficient)	0.35 (0.20 - 0.54)
Average monthly waterlogging index (0 = no stress, 1 = full stress) (coefficient)	0.00 (0.00 - 0.01)
No. days without crop/year (days)	0.00

Soil Salinity - Plant salinity tolerance: 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)	0.02
Salt added by rainfall (kg/m2/year)	0.01
Average annual effluent salt added & leached at steady state (kg/m2/year)	0.01
Average leaching fraction based on 10 year running averages (fraction)	0.25
Average water-uptake-weighted rootzone salinity sat. ext. (dS/m)	0.04
Salinity of the soil solution (at drained upper limit) at base of rootzone (dS/m)	0.39
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

Sustainability Diagnostics: SunWater Rookwood Weir - Riverton Workers Camp 50000

Pathogen Data: Direct ingestion of effluent with calculation of annual risk using monthly data

Risk: Annual Risk using Monthly Data

Activity: Accidental drinking **Liquid Ingested (mL):** 100

Health risk threshold: 1.0 extra infections/10000 persons/year

Pathogen infection risk for year of 12 exposures (extra infections/10000 persons/year)

Escherichia coli O111	0.00

Nitrate concentration in groundwater

Average Nitrate-N concentration of recharge (mg/L)	0.14
Maximum Groundwater Nitrate-N concentration at property boundary in final year of run (mg/L)	0.04

DIAGNOSTICS

Run Messages

Messages generated when the scenario was run:

Full run chosen