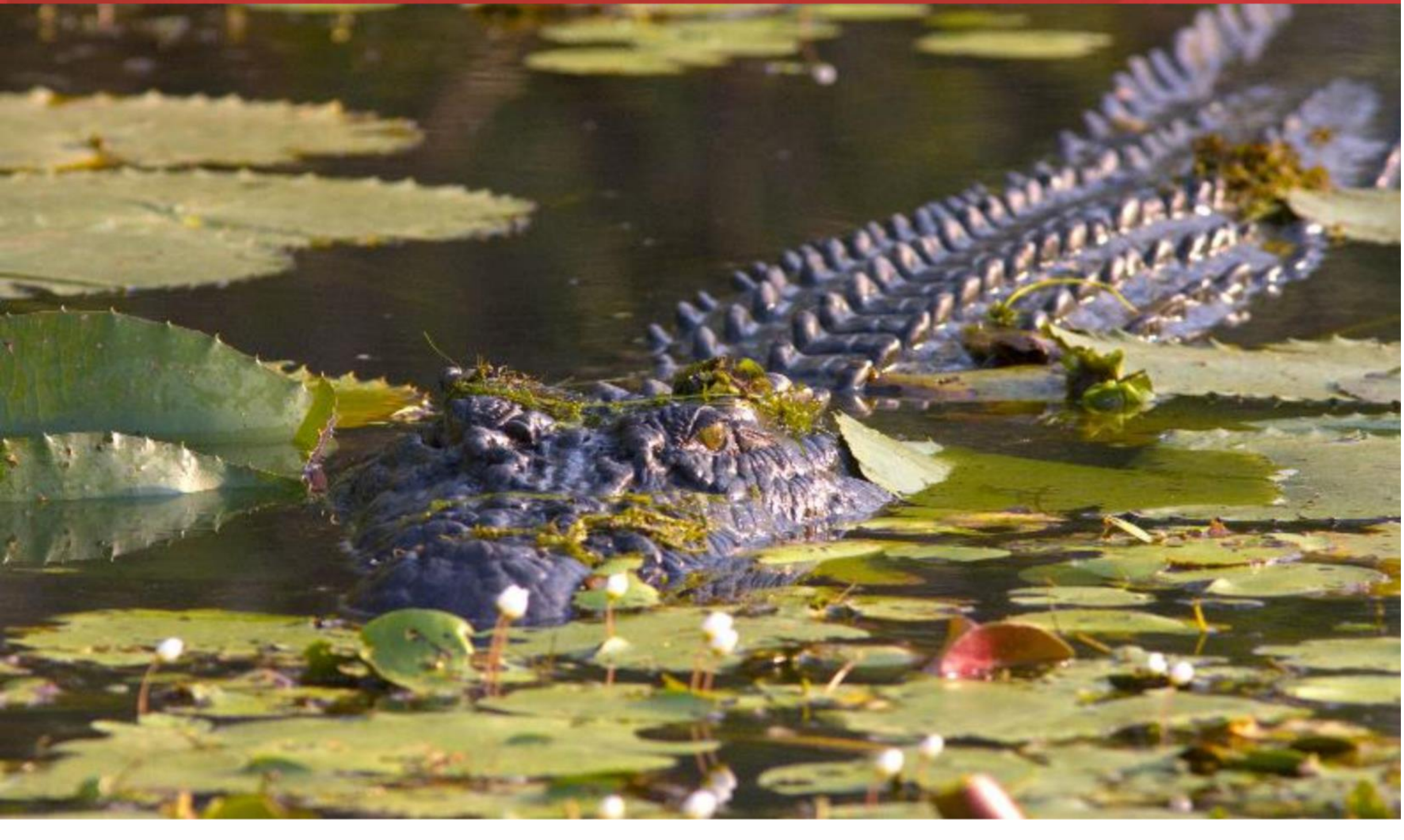
EPL302 Monitoring Report Janamba Crocodile Farm

Reporting period: 1 May 2023 – 31 April 2024

PRI Group Pty Ltd



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Appendix

ACRONYMS

ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines for Fresh and Marine Water Quality
CFU	colony forming units
DO	dissolved oxygen
EC	electrical conductivity
EPL	Environment Protection Licence
JCF	Janamba Crocodile Farm
LOR	limit of reporting
MPN	Most probable number
NATA	National Association of Testing Authorities
NOx	nitrate NO_3 + nitrite NO_2
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
SWL	Standing water level
TN	total nitrogen
TP	total phosphorus
TSS	total suspended solids

1 INTRODUCTION

PRI Group Pty Ltd operate Janamba Crocodile Farm (JCF), located at 630 Anzac Parade, Middle Point in the Northern Territory (NT); location shown in Figure 1-1. Water quality and soil monitoring is undertaken at JCF to ensure that operations do not impact waterways downstream i.e. the Harrison Dam Conservation Area and the Adelaide River. This monitoring is also a requirement of Environment Protection Licence 302 (EPL302), issued to Croc Pac Pty Ltd (now PRI Group Pty Ltd) by the NT Environment Protection Authority (NT EPA) under the *Waste Management and Pollution Control Act.*

Monitoring Reports are required annually, as per Condition 57 of EPL302. These must be prepared in accordance with the NT EPA 'Guideline for Reporting on Environmental Monitoring'. Each report must include all requirements as set out in EPL302 Condition 58.

This particular Monitoring Report covers all water quality and soil monitoring undertaken for the reporting period starting 1 May 2023 and ending 31 April 2024 (herein referred to as the 'reporting period'). This is the updated or comprehensive Monitoring Report for EPL302 since its commencement in August 2021.

1.1 Purpose and scope

This Monitoring Report is prepared in accordance with the following EPL302 conditions:

Condition 57

The licensee must complete and provide to the NT EPA a Monitoring Report, as prescribed by this licence, by 31 May each year.

Condition 58

The licensee must ensure that each Monitoring Report:

58.1 is prepared in accordance with the requirements of the NT EPA 'Guideline for Reporting on Environmental Monitoring';

58.2 includes a tabulation of all monitoring data required as a condition of this licence;

58.3 calculations for maximum total annual loads of Nitrogen and Phosphorus required as a condition of this licence;

58.4 reports on all trigger value exceedances and investigations required as a condition of this licence;

58.5 includes long term trend analysis of monitoring data to demonstrate any environmental impact associated with the activity over a minimum period of three years (where the data is available); and

58.6 includes an assessment of environmental impact from the activity.

1.2 EPL302 compliance monitoring and reporting

EPL302 authorises discharge to land using wastewater from the authorised discharge point, see Figure 1-2 ('irrigation source water'). The authorised discharge point is located in the centre of the farm, downstream of the wastewater treatment system and settling ponds, where all wastewater from farm operations is directed. From here, the water is firstly pumped to two irrigation areas: one is situated in the eastern half of the property, where it is irrigated onto fodder crops via a centre pivot. Secondly, water is used to irrigate a sandalwood plantation on the western end of the property via a drip line system.

In order to monitor for potential environmental impacts from this activity, surface water, groundwater and soil monitoring at JCF is undertaken in accordance with Attachment A of EPL302 and all monitoring-related conditions of the licence; i.e. Conditions 41 to 46. The JCF *Irrigation Management Plan* (EcOz 2020) details the monitoring sites, physical (field) and laboratory parameters measured, sampling methods and procedures. Monitoring site locations are shown below in Figure 1-3 and detailed in Table 4-1. Parameters to be measured, monitoring frequency and trigger values, taken from Attachment A of EPL302, are outlined below in Table 4-2, Table 4-3, Table 4-4 and Table 4-5.

In addition to the above, the volumes and timing of irrigated water application must be recorded; as per EPL302 Condition 39.

1.2.1 Unauthorised discharge

Any off-site discharge of wastewater from JCF is a non-compliance against Conditions 27, 35 and 36 of EPL302. The situation currently is that during the wet season, the volumes of water collected in the lagoons of JCF are in excess of what can be irrigated, and for extended periods, depending on rainfall, water flows offsite at the 'property outlet' (see Figure 1-3). From here, the water then flows into Harrison Dam. This passive discharge contains a component of farm wastewater, along with storm water from the breeding lagoon area of JCF. Incidences of this off-site discharge must be recorded as a non-compliance as per Condition 49, and reported to the NT EPA, as per Condition 50 and 51.

For the unauthorised discharge during the 2023/24 wet season, the NT EPA was informed on:

- 25 January 2024 of detection of a discharge on 24 January 2024.
- 8 February 2024 of the non-compliance investigation undertaken for the discharge started on 18 January 2023 and ended on 8 February 2024. Approximately, 10 ML were discharged through the property outlet boundary.
- 19 March 2024 of detection of a discharge on 13 March 2024.

A non-compliance report was submitted to the NT EPA each time the NT EPA was informed about the discharged. The reports summarised the period of discharge, actual and potential causes and contributing factors to the non-compliance, risk of environmental harm arising from non-compliance and corrective actions that have or will be undertaken to ensure the non-compliance does not reoccur.

The water quality of this unauthorised discharge was measured, with results shown in Table 5-4 and assessed in Section 5.3 of this report. To avoid unauthorised discharges in future wet seasons, a Stormwater Management Plan for the farm is currently under development. In addition, during the reporting period, two of the wastewater ponds were dredge, and the consumption of water has been reduced during the wet season.

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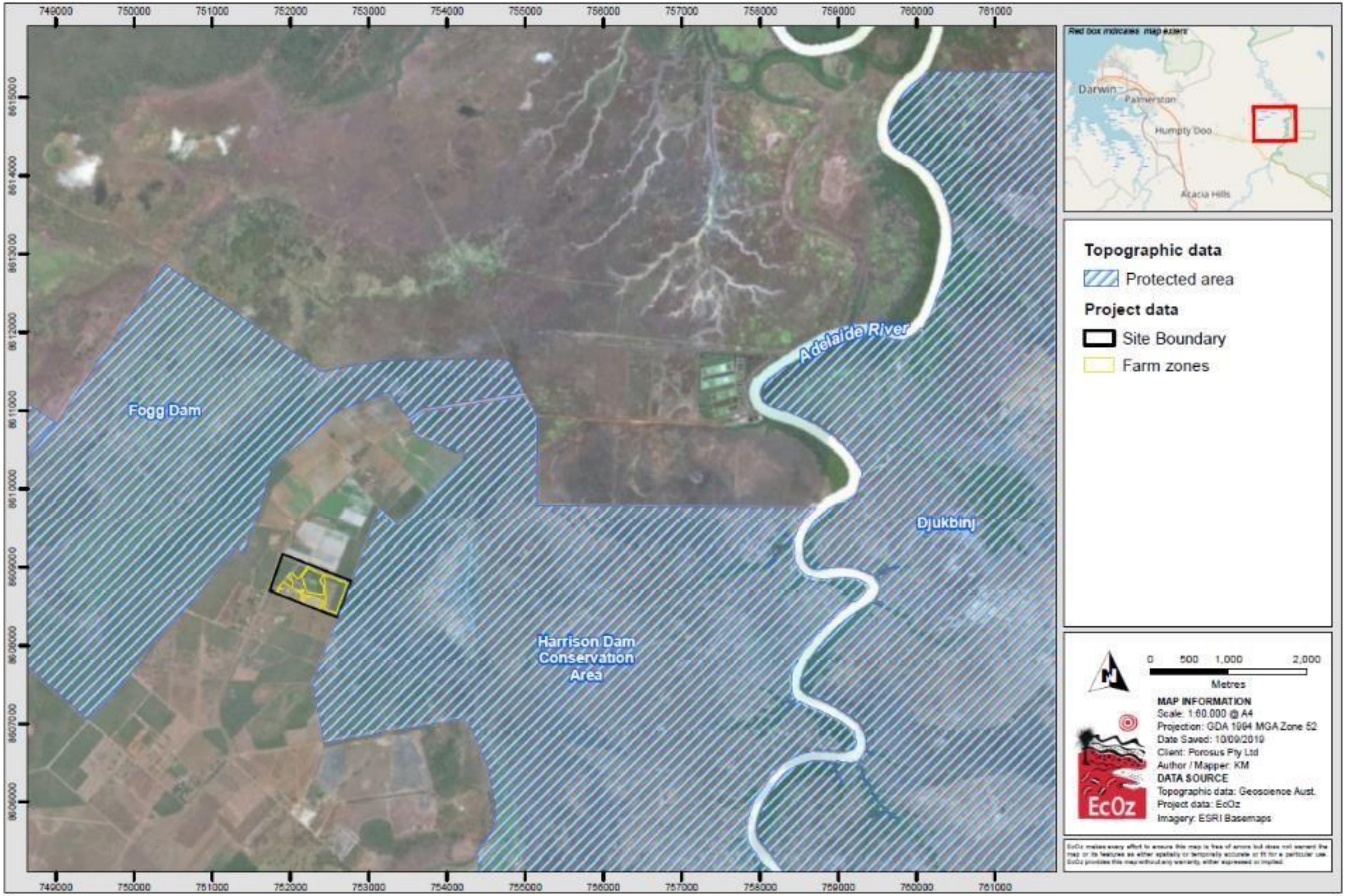
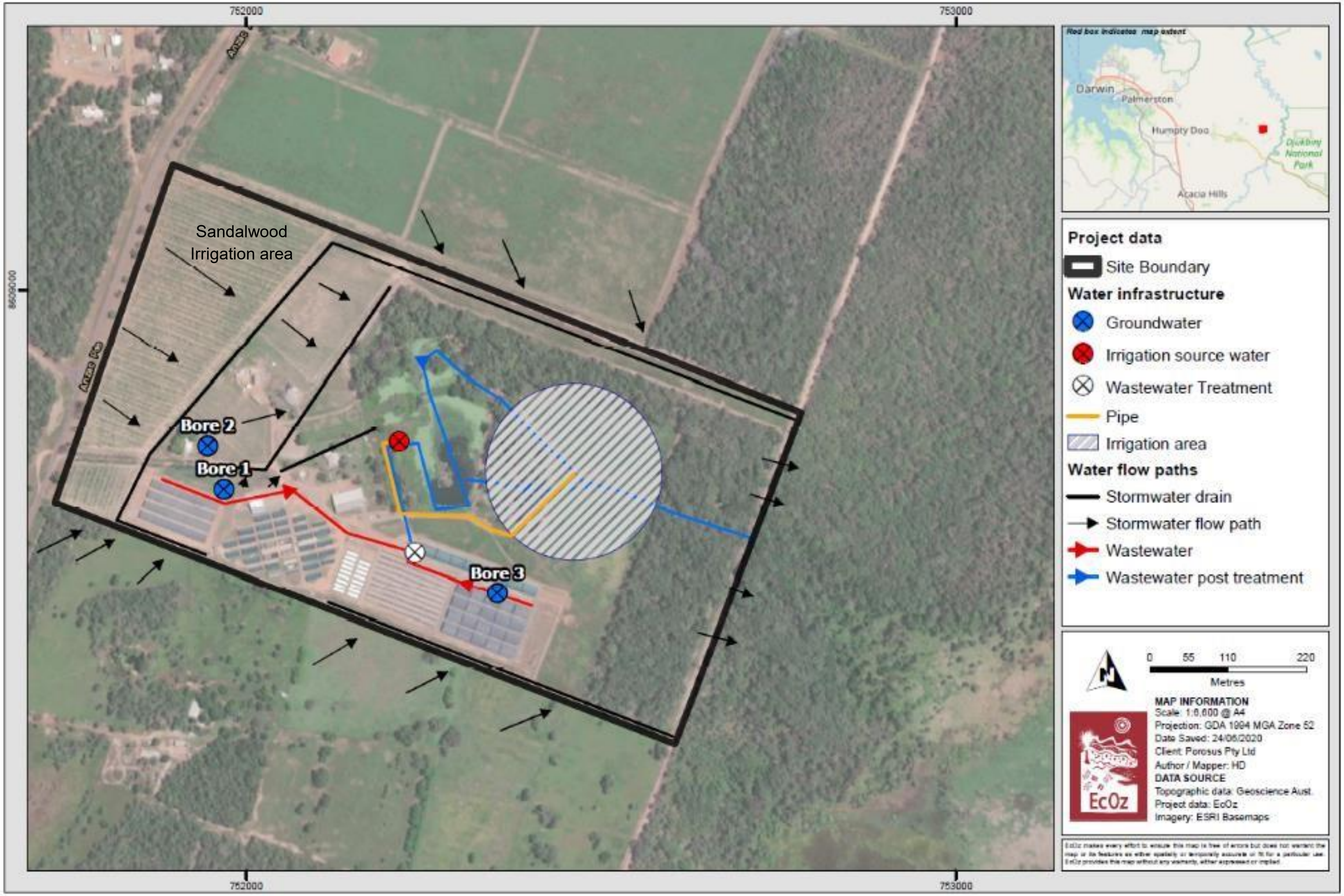

Red box indicates map extent
Darwin
Palmerston
Humpty Doo
Acacia Hills
Topographic data
Protected area
Project data
Site Boundary
Farm zones
Fogg Dam
Adelaide River
Djukbinj
Harrison Dam Conservation Area
0 500 1,000 2,000
Metres
MAP INFORMATION
Scale: 1:60,000 @ A4
Projection: GDA 1994 MGA Zone 52
Date Saved: 10/09/2019
Client: Porosus Pty Ltd
Author / Mapper: KM
DATA SOURCE
Topographic data: Geoscience Aust.
Project data: EcOz
Imagery: ESRI Basemaps
EcOz

Figure 1-1. Map of Janamba Crocodile Farm location



752000
753000
Sandalwood Irrigation area
Bore 2
Bore 1
Bore 3
Darwin
Palmerston
Humpty Doo
Acacia Hills
Djukbinj National Park
Project data
Site Boundary
Water infrastructure
Groundwater
Irrigation source water
Wastewater Treatment
Pipe
Irrigation area
Water flow paths
Stormwater drain
Stormwater flow path
Wastewater
Wastewater post treatment
0
55
110
220
Metres
MAP INFORMATION
Projection: GDA 1994 MGA Zone 52
Date Saved: 24/06/2020
Client: Porosus Pty Ltd
Author / Mapper: HD
DATA SOURCE
Topographic data: Geoscience Aust.
Project data: EcOz
Imagery: ESRI Basemaps
EcOz

Figure 1-2. Water infrastructure, water flow paths and irrigation areas at Janamba Crocodile Farm

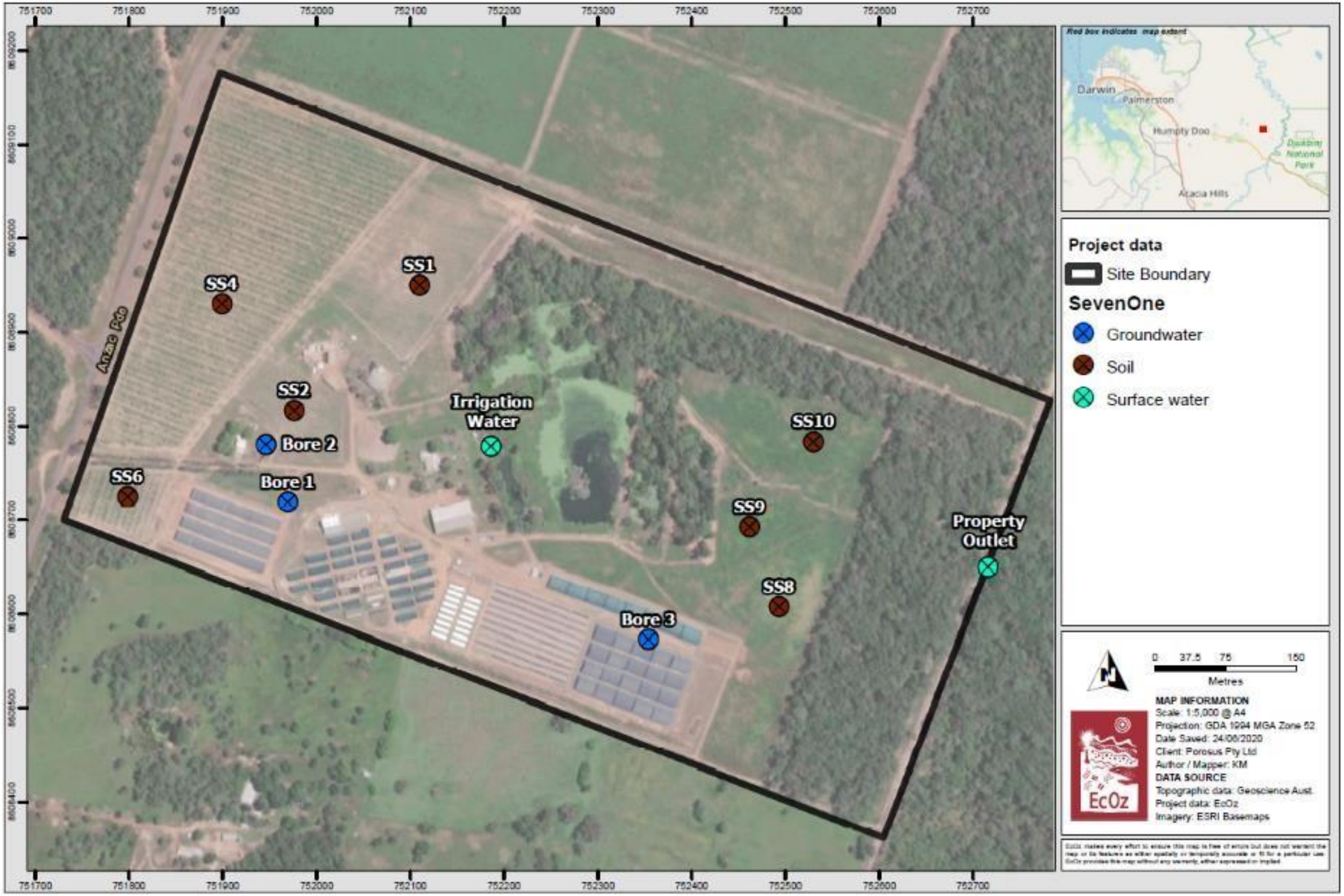
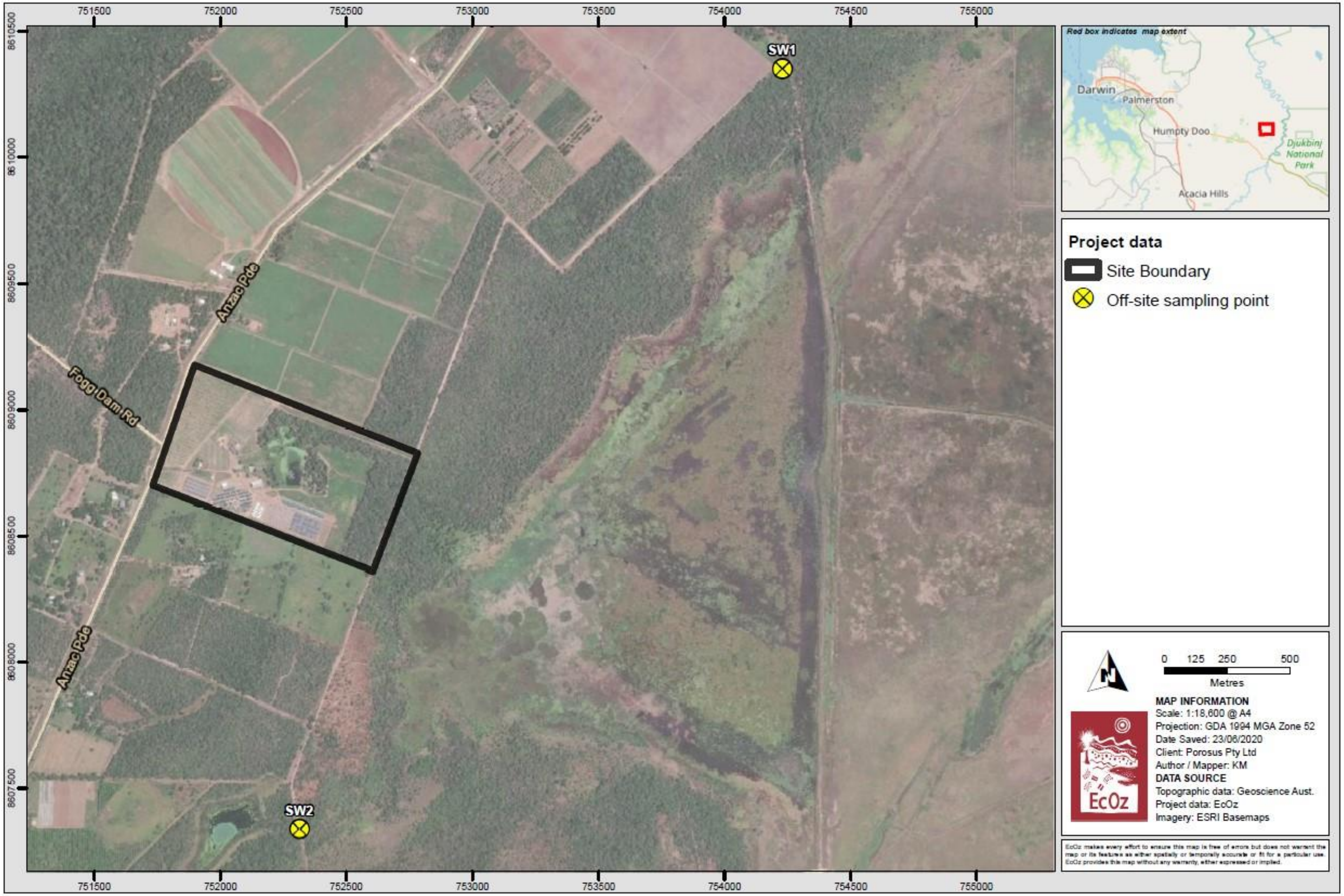

SS1
SS4
SS2
Bore 2
Irrigation Water
SS10
SS6
Bore 1
SS9
Property Outlet
SS8
Bore 3
Anzac Pde
Darwin
Palmerston
Humpty Doo
Djukbinj National Park
Acacia Hills
Project data
Site Boundary
SevenOne
Groundwater
Soil
Surface water
0 37.5 75 150
Metres
MAP INFORMATION
Scale: 1:5,000 @ A4
Projection: GDA 1994 MGA Zone 52
Date Saved: 24/06/2020
Client: Porosus Pty Ltd
Author / Mapper: KM
DATA SOURCE
Topographic data: Geoscience Aust.
Project data: EcOz
Imagery: ESRI Basemaps
EcOz

Figure 1-3. Monitoring site locations on Janamba Crocodile Farm



Path: Z:\01 EcOz_Documents\04 EcOz Vantage GIS\EZ19095 - Janamba Croc Farm EPL\01 Project Files\Figure X-X. Map showing outer sampling sites.mxd

Figure 1-4. Surface water monitoring locations outside the property

2 JCF OPERATIONS OVERVIEW

2.1 Environmental setting

The region has a tropical monsoonal climate, with distinct wet and dry seasons and little variation in temperature. The wet season is characterised by higher humidity and rainfall and occurs between October and April. The dry season extends from May to September and is characterised by lower humidity and very little rainfall.

Climate observations are made by the Bureau of Meteorology (BoM). The closest BoM weather monitoring station to the site is Middle Point (station number No. 14041). Average annual rainfall recorded at this station is 1,379.3 mm, with the highest rainfall occurring in January and the lowest in July (Table 2-1). Over 84 % of annual average rainfall falls between November and March. The average annual regional evaporation is 2,000 mm and exceeds the average annual rainfall. Evaporation is highest in October and lowest in January to March.

Table 2-1. Average rainfall and evaporation (taken from BoM Station No. 14041)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall (mm)	309.2	290.8	244.8	95.1	17.6	0.6	0.3	1.9	15.0	45.8	121.6	236.6
Evaporation (mm)	146	126	146	156	161	156	171	189	204	220	189	161

JCF lies within the Adelaide River catchment, at the top of the sub-catchment area (water on the opposite side of Anzac Parade to JCF, flows to the west towards Fogg Dam which is categorised as another sub-catchment area). Surface water from the operational areas of JCF flows in a south-easterly direction from Anzac Parade towards Harrison Dam.

The land surrounding JCF includes privately-owned lots zoned for horticulture to the north and south (including Koolpinyah Station), where a number of bores exist and groundwater is utilised. To the west of the site on the opposite side of Anzac Parade there is a school and a scientific research village. Surrounding land users (private and commercial) all utilise equipped production bores for water supply.

Directly east of JCF is the Harrison Dam Conservation Area, while north-west is Fogg Dam Conservation Area; both of these conservation areas are supported by groundwater during the dry season. The property is within the Adelaide River coastal floodplain Site of Conservation Significance (NR Maps). Several nearby wetlands including Fogg and Harrison Dams are listed in the Directory of Important Wetlands (NR Maps).

The site contains land units that are characterised by well-drained soils, which is beneficial when considering the site for irrigation purposes. Whilst land unit mapping indicates the presence of hydrosols, the irrigation area is not seasonally inundated or saturated and current and historical soil data (obtained from NR maps) for the irrigation area indicate the soils are predominately well-drained, sandy loam in texture and have moderate to high permeability.

2.2 Farm operations

The crocodile production process at JCF is summarised as follows:

1. Eggs are collected from breeding pens and lagoons (in addition to wild-collected eggs) and are assessed and cleaned in egg laboratory, with viable eggs transferred to the incubator room.
2. Animals hatch in the incubator then are immediately transferred to hatchling pens.
3. When animals are about one-year-old, they are transferred to grow-out pens.

4. Animals approaching a size suitable for market are transferred to finishing pens for 6-12 months to ensure best possible skin and meat condition.
5. Animals are harvested from the finishing pens, prepared for transport using a dedicated trailer and then sent to a separate facility for further processing.

JCF harvests 130 animals per week for off-site processing to produce raw crocodile skins, meat products and other saleable by-products.

2.3 Water supply

JCF has a groundwater extraction entitlement of 600 ML/year (Water Extraction Licence KD17) obtained from three bores (see Table 2-2 and Figure 1-2). The aquifer utilised is in the Koolpinyah Dolomite Formation. On average, Janamba uses approximately 50 ML of water per month predominately from bores 1 and 3.

Table 2-2. Groundwater bore details

Site Name	Bore No.	Year of completion	Depth (m)	SWL (m)	Yield (L/s)	Annual extraction 2023 -24 (ML)
Bore 1	RN040609	2018	45	6	20	194.36
Bore 2	RN027100	1990	42	6	20	5.01
Bore 3	RN038956	2015	40	4	10	303.06

The primary use of water on site is for regular flushing of the animal pens to maintain hygiene and health of the animals. The bores also supply water to the office and site facilities. Bore 1 supplies water to the grower pens, hatchery and office buildings, whilst bore 3 supplies water to the finishing pens.

2.4 Wastewater flows, treatment and irrigation

Bore water is pumped through the hatchery, grower and finishing pens, and the effluent from each stage discharges into a concrete-lined drainage system. The drainage system is currently directed through a wastewater treatment system that consists of a filtration and screening process to remove grit and sludge (Spirac and drum filters). The treated wastewater then flows into a series of interconnected lagoons which are also utilised for housing breeding crocodiles to supply the farm with eggs. The treated wastewater enters the 'first settling pond', which then flows through into the main breeding lagoons. As the lagoons are all interconnected, breeding crocodiles inhabit all areas. This flow of wastewater through the lagoons facilitates a bio-remediation process to reducing the nutrient and microbial levels in the wastewater.

Earthen drainage lines direct excess water from the lagoons (predominately during the wet season) towards the eastern boundary and ultimately discharg off-site.

Surface water from the operational areas of JCF flows in a south-easterly direction from Anzac Parade towards Harrison Dam. JCF have constructed drainage channels on the property boundaries to divert storm water run on from neighbouring properties around the active farm areas and discharging from the eastern boundary towards Harrison Dam (Figure 1-2). Runoff from the farm areas flows as sheet flow towards the eastern boundary and into the Harrison Dam Conservation Area.

Over time, overflows from the breeding lagoon have caused a drainage channel to form from the lagoon towards the eastern boundary. JCF have constructed a discharge outlet on the property boundary to dissipate surface water flows from site. From the property discharge outlet, there are no defined channels or watercourses that the surface water flows into. Surface water flows as sheet flow into the Harrison Dam Conservation Area, which is a wide expanse of waterholes and wetlands. Wet season rainfall dilutes wastewater as it flows off-site, which assists in the bioremediation process.

The sandalwood irrigation area was established in August 2018 and the area increased in 2019 to a total of 9.42 ha. Water for irrigation is extracted from the breeding lagoon ponds post treatment. Depending on the season, between 2,500 KL and 8,000 KL of water is used for irrigation per month through a drip line system.

In the eastern irrigation area of 4.85 ha, Jarrah grass is grown and irrigated using a pierce centre pivot system. In the 2023/24 wet season, Jarrah grass was harvested and used for stock feed.

3 RAINFALL AND DISCHARGES

3.1 Rainfall

Figure 3-1 shows monthly rainfall totals for the reporting period taken from the Middle Point BoM station No. 14041. Average monthly rainfall totals are also shown for comparison. Rainfall from January until March was above average. For all other months during the reporting period, rainfall was below average. The total rainfall for 2023/24 was 1536 mm, which is above the annual average.

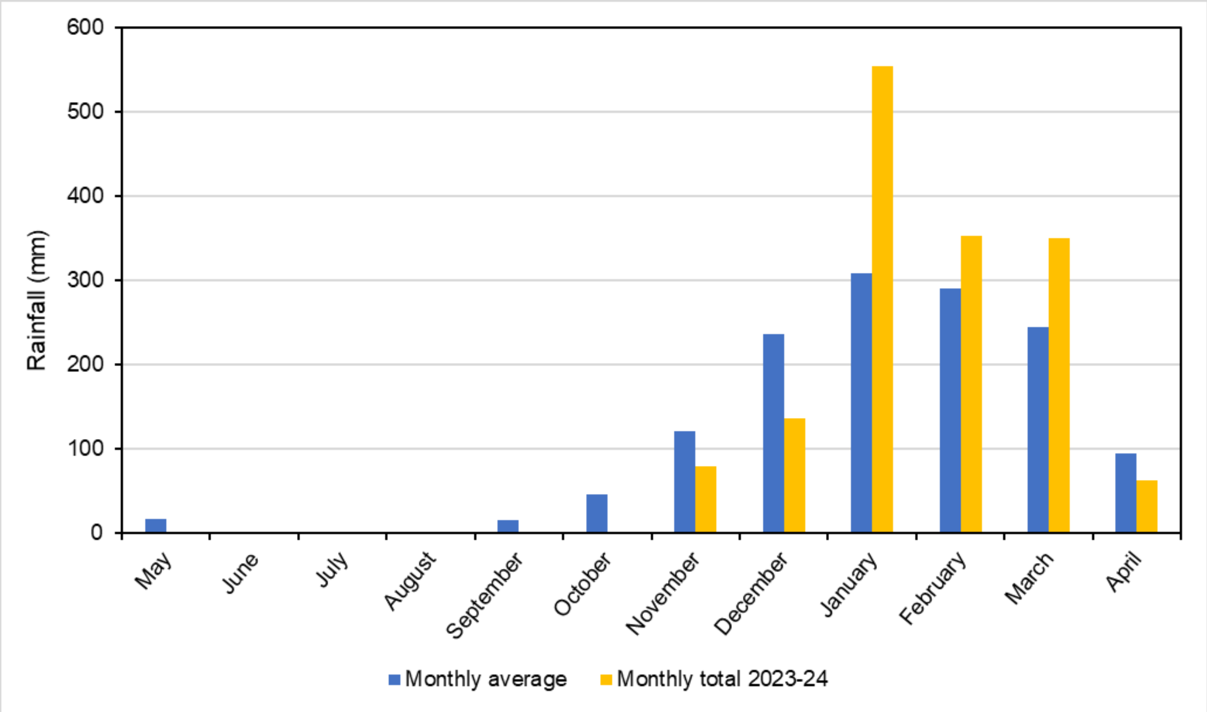


Figure 3-1. Monthly rainfall totals May 2023 to April 2024 (Middle Point BoM station No. 14041)

3.2 Reporting period discharge details

Table 3-1 outlines the discharges that occurred to land i.e. irrigation applied to the two irrigation areas using water pumped from the authorised discharge point. Irrigation was undertaken during the dry season and early wet season period, stopping from January to April 2024 on the eastern irrigation area, and on the sandalwood from December 2023 to April 2024, when irrigation was not appropriate given soils in the irrigation areas were saturated.

Table 3-1. Irrigation discharges during reporting period May 2023 – April 2024

Month	Water reuse sandalwood project (ML)	Water reuse pivot irrigation (ML)
May 2023	27.81	3.02
Jun 2023	18.66	3.81
Jul 2023	12.21	1.91
Aug 2023	13.95	8.26
Sep 2023	11.33	7.15
Oct 2023	20.67	3.18

Month	Water reuse sandalwood project (ML)	Water reuse pivot irrigation (ML)
Nov 2023	10.32	1.88
Dec 2023	10.56	0.00
Jan 2024	0.00	0.00
Feb 2024	0.00	0.00
Mar 2024	0.00	0.00
Apr 2024	0.00	0.00
Total	**121.51**	**29.21**

4 MONITORING UNDERTAKEN

During the reporting period, monitoring was undertaken as per EPL302 requirements using the methods outlined in the JCF *Irrigation Management Plan* (EcOz 2020) and summarised in the following.

4.1 Monitoring sites

Details for surface water, groundwater and soil monitoring sites as listed in EPL302 Appendix A are shown in Figure 1-3 and Figure 1-4 and detailed below in Table 4-1.

Table 4-1. Surface water, groundwater and soil monitoring site details

Site ID	Context and purpose	GPS Coordinates	
		Latitude	Longitude
Surface Water Sites			
Irrigation Source	'Authorised discharge point' listed in EPL302. Located centrally in JCF property. All wastewater from farm operations flows via a wastewater treatment system into a settling lagoon and then to this point. Represents water applied to the irrigation areas occupying the north eastern as well as the north western portions of JCF.	-12.57457	131.32108
Property outlet	Site where outflow from the breeding lagoons leaves the property. During the wet season, this location presently becomes an unauthorised discharge point.	-12.57576	131.32594
SW1	Harrison Dam northern inflow monitoring site – providing comparison surface water quality information.	-12.55997	131.33980
SW2	Harrison Dam southern inflow monitoring site – providing comparison surface water quality information.	-12.59724	131.32234
Groundwater Bores			
Bore 1	RN040609, used to supply water to farm operations (grower pens, hatchery, office buildings).	-12.575289	131.31912
Bore 2	RN027100, mostly unused.	-12.574767	131.318858
Bore 3	RN038956, used to supply water to farm operations (finishing pens).	-12.576533	131.322636
Soil Sites			
SS1 SS2 SS4 SS6 SS8 SS9 SS10	Soil sites are spread across the two irrigation areas.	-12.573196 -12.574417 -12.573395 -12.575261 -12.576264 -12.575499 -12.574680	131.320367 131.619148 131.318432 131.31752 131.323923 131.323628 131.324250

4.2 Monitoring frequency, parameters and trigger values

Table 4-2, Table 4-3, Table 4-4 and Table 4-5 list the parameters to be measured at each site, the sampling frequency and trigger values currently specified in EPL302 Attachment A.

Table 4-2. Monitoring program and trigger values for irrigation water

Monitoring site	Parameter	Sampling frequency	Trigger value
Authorised discharge point (irrigation source water) Latitude: -12.57457 Longitude: 131.32108	pH	Monthly when discharging and quarterly when not discharging	6 – 9[1]
	EC (electrical conductivity)		1,300 µs/cm[1]
	Total P (phosphorus)		12 mg/L[1]
	Total N (nitrogen)		125 mg/L[1]
	E. coli, Enterococci, Total coliforms		1,000 cfu/100mL (fodder)[1]
	Cations and anions (Ca, Mg, Na, K, SO_4, Cl, CO_3 + HCO_3)		N/A

[1]Australian and New Zealand Guidelines for Fresh and Marine Water Quality – Volume 3 – Chapter 9 – Primary Industries (ANZECC, 2000)

Table 4-3. Monitoring program and trigger values for groundwater sites

Monitoring sites	Parameter	Sampling frequency	Trigger value
Bore 1, Bore 2 and Bore 3	Standing water level (SWL)	Monthly	N/A
	pH	Quarterly	7.0 – 8.5[1]
	EC		400 µs/cm[1]
	Total P		Any increase from previous monitoring round
	Total N		
	E. coli, Enterococci, Total coliforms		
	Cations and anions (Ca, Mg, Na, K, SO_4, Cl, CO_3 + HCO_3)		N/A

[1] Darwin Harbour Water Quality Objectives for groundwater (2010)

Table 4-4. Monitoring program and trigger values for surface water sites

Monitoring sites	Parameter	Sampling frequency	Trigger value
Property outlet, SW1* & SW2*	pH	3 times during the wet season (start, during, end)	6.0 – 7.5[1]
	EC		200 µs/cm[1,2]
	Total P		0.01 mg/L[1,2]
	Total N		0.23 mg/L[1,2]
	E. coli, Enterococci, Total coliforms		Any increase from previous monitoring round

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[1] *Darwin Harbour Water Quality Objectives for freshwater rivers and streams*

[2] *If the concentration at SW1 is greater than the trigger value then the concentration at SW1 becomes the trigger value for that monitoring round*

Table 4-5. Monitoring program and trigger values for soil sites

*Trigger values not applicable for SW1 & SW2

Monitoring sites	Parameter	Sampling frequency	Trigger value*
SS1, SS2, SS4, SS6, SS8, SS9 and SS10	pH	Annually	6 – 8
	EC		
Monitoring sites	**Parameter**	**Sampling frequency**	**Trigger value***
	Total P		Any increase from the previous monitoring round
	Total N		
	E. coli, Enterococci, Total coliforms		

** B horizon results*

4.3 Sampling procedures

All sampling is undertaken in accordance with the JCF *Irrigation Management Plan* (EcOz 2020) and the following standards and guidelines:

Australian/New Zealand Standard on Water Quality Sampling - *Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples* (AS/NZS 5667.1:1998), Standards Australia, New South Wales.

Australian Standard/New Zealand Standard on Water Quality Sampling - *Part 4: Guidance on sampling from lakes, natural and manmade* (AS/NZS 5667.4:1998), Standards Australia, New South Wales.

Australian/New Zealand Standard on Water Quality Sampling - *Part 6: Guidance on sampling of rivers and streams* (AS/NZS 5667.6:1998), Standards Australia, New South Wales.

Australian Standard/New Zealand Standard on Water Quality Sampling – *Part 10: Guidance on sampling of waste waters* (AN/NZS 5667.10:1998), Standards Australia, New South Wales.

Australian/New Zealand Standard on Water Quality Sampling – *Part 11: Guidance on sampling of groundwater* (AN/NZS 5667.11:1998), Standards Australia, New South Wales.

Australian Standard on Contaminated Soil Sampling – *Guide to the sampling and investigation of potentially contaminated soil – Part 1: Non-volatile and semi-volatile compounds* (AS4482.1-2005), Standards Australia, New South Wales

ANZECC & AMRCANZ 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality, National Water Quality Management Strategy Paper No 4,* Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.

ANZECC & AMRCANZ 2000, *Australian Guidelines for Water Quality Monitoring and Reporting, National Water Quality Management Strategy Paper No 7*, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ), Canberra.

ANZG (2018): Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.

Department of Environment and Conservation (2004): *Use of Effluent by Irrigation; Environmental Guidelines*, Department of Environment and Conservation (DEC), New South Wales Government, Sydney.

Water sampling was carried out by JCF staff, who have received on-site training in sampling methods from EcOz. Soil sampling was undertaken by EcOz.

All laboratory samples were collected into ALS Laboratory-supplied sample bottles/jars; some of which contain preservative where required. Once collected, these samples were kept cold in an esky with ice bricks until dispatched to the ALS shopfront on the same day as sampling in order to meet holding times.

All surface water monitoring sites were sampled into a laboratory-supplied sample bottle. pH and electrical conductivity (EC) were also measured by the laboratory.

All groundwater bores were equipped, as such, these were turned on and the water run for at least 10 min. Once this occurred the lab samples were collected directly into the lab-supplied bottles. No parameters were measured in-situ.

Soil samples were collected from the B horizon (around 0.4 to 0.5 m below ground surface) using a mechanical augur which was decontaminated between each sample site.

Field and laboratory results are stored in an Excel database updated and maintained by EcOz. All laboratory documentation is stored in an online filing system maintained by EcOz (M-files). PRI also maintain copies of all laboratory documentation.

4.4 Monitoring undertaken during the reporting period

Table 4-6 lists the monitoring undertaken during the reporting period. Compliance against EPL302 monitoring requirements is outlined.

Table 4-6. Monitoring undertaken during the reporting period.

Site ID	Frequency required	Dates sampled	Compliance with sampling frequency	Compliance with parameters measured
Irrigation Source	Monthly during discharge, quarterly when not discharging	09/05/2023 06/06/2023 05/07/2023 15/08/2023 07/09/2023 13/11/2023 12/12/2023 22/01/2024 22/02/2024 25/03/2024	Compliant, except in October, when sampling was not undertaken.	Compliant
Property outlet SW1 SW2	Three times during wet season, start, mid and end	22/01/2024 (property outlet only) 22/02/2024 25/03/2024	Compliant. Sampling of SW1 and SW2 was attempted three times during the wet season; however, the sites were only flowing in February and March. Given that rainfall was below average during the early wet season, samples were only collected from mid to end of wet season.	Compliant

Bore 1 Bore 2 Bore 3	Standing Water Level (SWL) monthly; Water quality quarterly	01/08/2023 07/09/2023 13/11/2023 12/12/2023 22/01/2023 22/02/2024 25/03/2024	Compliant except for Bore 2, which was not sampled in the reporting period. SWLs were also not measured in July 2023. SWLs were measured twice in December 2023.	Compliant
SS1 SS2 SS4 SS6 SS8 SS9 SS10	Annually	06/02/2024	Compliant	Compliant

5 RESULTS AND DISCUSSION

All historical data are presented in tables and plots in Appendix A and Appendix B.

5.1 Authorised discharge point

Table 5-2 provides the water quality results for all sampling undertaken during the reporting period from the authorised discharge point (irrigation source). All parameter concentrations complied with the trigger values listed in EPL302 Appendix A, Table 1, except for total coliforms in all sampling rounds, E. coli in all but two rounds and Enterococci from June to November 2023.

All bacterial parameters were above the guideline frequently, if not always, during the monitoring period, with results being the highest in February 2024. During the reporting period, the highest levels of *E. coli* and enterococci since monitoring began were recorded in September 2023. However, these levels decreased in the following monitoring round.

Despite the spikes in bacterial load and exceedances recorded in the reporting period, no increasing trend is observed. However, as observed in historical data, bacterial loads are high in the settling lagoon, where irrigation water is sourced, and natural disinfection from UV light is mostly ineffective.

Water from the authorised discharge point is used to irrigate pasture grass, which is then harvested and used as fodder. While it is recognised that contamination from crop irrigation can lead to disease outbreaks, this is usually linked to contamination with human or livestock faeces. Crocodiles are reptiles and as cold-blooded animals carry a different composition of faecal flora than the intended warm blooded livestock consumers. This could be a risk reducing factor. On the other hand, crocodiles are recognised for their strong immune system, which could mean that the bacterial flora present in their faeces might pose a greater risk for infection of livestock with less strong immune systems.

Results from the reporting period, as well as historical data, indicate that concentrations of the pathogen indicator *E. coli* was frequently extremely high in the irrigation water and consideration might be given to process the crop in a way that would reduce bacterial numbers prior to using as fodder, for example, drying in the ambient high UV conditions. In any case, the third person farmer harvesting the crop needs to be made aware of the high bacterial numbers in the irrigation water. Jarrah grass harvested onsite was used for stock feed. The third person who made use of the fodder was made aware of the high bacterial load of the water used to irrigate the crop.

The sandalwood irrigation area is much larger than the pasture irrigation area and greater volumes of water are irrigated there. As this crop is not to be used for consumption, bacterial concentrations should not pose a problem.

All other parameters monitored, including total nitrogen (TN) and total phosphorus (TP) were well below the trigger values. However, while these concentrations are well within the applicable trigger values for irrigation water, these concentrations are high in comparison to the environmental trigger values applicable to the receiving environment if this water was to be discharged offsite (see Darwin Harbour Water Quality Objectives for TN and TP in Table 4-4 above).

Overall, no increasing trend is observed in any of the monitoring parameters. Total coliforms have been increasing since March 2023, but further monitoring is necessary to confirm any concentration trend, considering that sampling in the 2023-24 reporting period was limited.

In order to address the exceedances commonly recorded at the authorised discharge point, in April 2024, a floating pontoon with a suction pump was installed to pump water from the surface of the third pond. Previously, water was pumped from the first pond, which served as a sedimentation basin for the sludge. This, along with the low location of the intake point at the lake, frequently led to blockages of the foot valve with sediment. This likely impacted on the quality of the irrigated water, as nutrient levels are typically higher at the bottom of the lake. Additionally, given that bacteria, such as coliforms, strongly attach to sediment, it is probable that higher bacterial loads were also irrigated due to the presence of resuspended sediment in the water pumped. Therefore, it is expected that extracting wastewater from a shallow depth in Pond 3 will reduce the bacteria and nutrient load at the authorised discharge point.

To further reduce the bacterial load in the irrigated water, a hydrogen peroxide dosing unit is proposed for installation. This unit will microdose hydrogen peroxide daily into the water, effectively reducing the bacterial load.

5.2 Groundwater quality

Table 5-3 provides the groundwater quality results for all groundwater sampling undertaken during the reporting period. Overall, pH was close to neutral, although it was below the accepted range at Bore 3 in August 2023, and at Bores 1 and 3 in January and March 2024. This lower pH value is expected for groundwater in this region and not of concern. It is worth noting that pH is not measured in-situ, and as such, its analysis is undertaken out of its recommended holding time, impacting on the accuracy of the results.

EC concentrations were always below the trigger value. In March 2023, Bore 1 recorded its highest concentration since monitoring started; however, the results from this reporting period show levels have decrease since then.

Increases in TP and TN compared to the previous monitoring round were recorded in the reporting period. TP increased in Bores 1 and 3 in August 2023, but decreased the following monitoring rounds. Increases in TP were more frequent during the dry season than in the wet season, likely due to a dilution effect during the wet season. In December 2023, TP at Bore 3 was the highest ever recorded at any bore since monitoring started. The source of this spike is not yet known. No increasing trend in TP levels is observed at Bores 1 and 3.

Spikes in TN levels were more commonly recorded at Bore 1 than at Bore 3, with Bore 1 showing an increasing trend in concentration since November 2022. In March 2024, TN was well above the levels commonly recorded at Bore 3. The source of this spike is not yet known.

Overall, all bacterial concentrations were mostly below the laboratory limit of reporting, or LOR, (1 CFU/100 mL), except in November, when enterococci was slightly above the LOR at Bore 3, and in December and March, when total coliforms were detected at Bore 1 and Bore 3 (only in December). Given that bacteria levels were only slightly above the LOR, no *E. coli* were detected and an increasing trend in concentration was not observed at any bore, the results obtained are not of concern.

5.2.1 Groundwater standing water level

SWLs recorded during the reporting period evidence drawdown over the dry season to early wet season, and recharge throughout the mid-wet season. Lower SWLs were recorded in the dry season at Bore 3, likely influenced by the higher volumes of groundwater extracted from this bore (see Table 2-2). However, levels recovered in the wet season, reaching those observed at Bores 1 and 2.

Table 5-1. Bore SWLs measured in meters below ground level (mbgl).

Date	Bore 1 (mbgl)	Bore 2 (mbgl)	Bore 3 (mbgl)
2/05/2023	4.9	5.5	5.7
31/05/2023	4.8	4.8	5.1
30/06/2023	4.5	4.8	8.2
1/08/2023	5.8	5.8	8.2
1/09/2023	6.4	6.4	6.3
2/10/2023	7.2	7.2	10.7
Date	**Bore 1 (mbgl)**	**Bore 2 (mbgl)**	**Bore 3 (mbgl)**
1/11/2023	6.9	7.2	9.8
1/12/2023	7.4	7.5	8.9
31/12/2023	7.1	7.1	7.8
1/02/2024	3.8	3.8	3.3
1/03/2024	2.1	2.5	2.7
1/04/2024	2.9	2.9	2.9

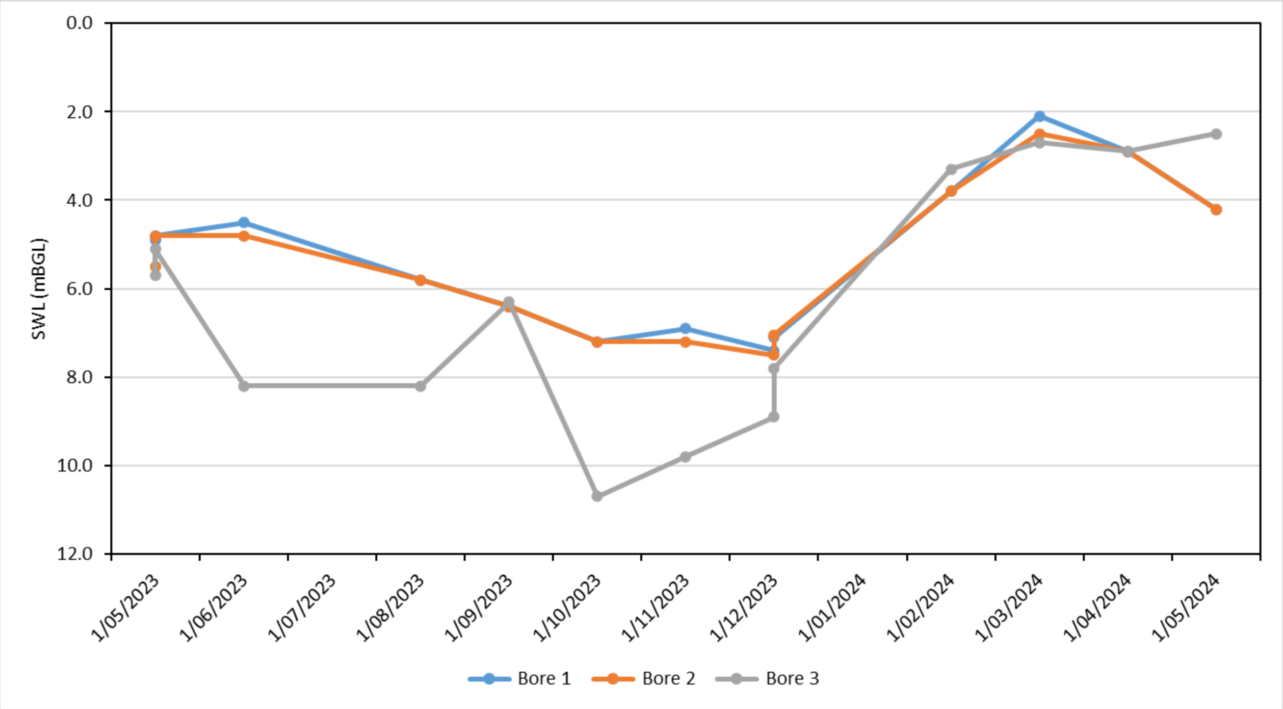

Figure 5-1. Graph of SWLs during the reporting period.

5.3 Surface water sites

Table 5-4 provides the surface water quality results for all sampling undertaken during the reporting period. The EPL302 trigger values only apply to the property outlet (or V Weir) location. The two stream sites outside of the property SW1 and SW2 provide information on the background water quality in the vicinity of JCF.

pH and EC were within the accepted values at the property outlet. Sites SW1 and SW2 were mostly within the trigger values, although SW1 was slightly more acidic (5.93). It is worth noting that pH is not measured in-situ, and as such, its analysis is undertaken out of its recommended holding time, impacting on the accuracy of the results.

TN and TP at the property outlet were always above the concentrations recorded at SW1 in the same monitoring round, except for TN in February. Concentrations were also above the trigger values in January. TN concentrations ranged from 1.9 to 4.8 mg/L, while TP was from 0.54 to 2.18 mg/L. The higher nutrient load at the property outlet would contribute to nutrient enrichment in the receiving environment, which is Harrison Dam. However, it is likely that the nutrient concentrations in this wetland can be naturally seasonally high towards the end of the dry season (Schult & Welch 2006).

The bacterial concentrations are assessed in order to investigate the establishment of an increasing trend at the property outlet. The latter was apparent for *E. coli* and enterococci. However, further monitoring will be required to confirm if an increasing trend exists.

A comparison between sites indicates that historically, total coliforms can sometimes be higher at the SW1 site than at the property outlet. However, *E. coli* and enterococci are always lower at SW1 and SW2 than at property outlet.

Overall, no increasing trend was observed in any of the parameters monitored, with the exception of *E. coli* and enterococci.

5.4 Soils

Table 5-5 provides the soil monitoring results for the reporting period i.e. the annual sampling undertaken in February 2024.

pH was neutral and within the trigger value range at all monitoring sites during the reporting period. These results indicate an increase in pH at all sites with respect to the previous monitoring round, when all samples were acidic.

All EC levels in the reporting period were above those recorded in 2023. It is not yet understood the reason behind this increase, given that changes in EC are not evident in the irrigation water. However, the accumulation of ions from the irrigated water could be causing the observed results.

TN concentrations increased at all but one of the sampled sites. In contrast, TP concentrations only increased at one site. These results likely indicate that the nitrogen uptake by the crops grown onsite is insufficient compared to the nitrogen loads applied to the soils through wastewater irrigation. No increasing trend is evident in the TN results obtained.

In the reporting period, a few sites recorded a higher concentration of enterococci and total coliforms in 2024 compared to 2023. However, most results were below the LOR or lower than those from the previous monitoring round. Historical data indicates that the 2024 results were also below those from 2021, when the highest levels of enterococci and total coliforms were detected at most sites. More importantly, no increasing trend is observed at the sample sites. Therefore, the results from this monitoring round are not of concern.

It is worth noting that the management actions described in Section 5.1 are expected to improve the nutrient and bacterial loads in soils.

Table 5-2. Authorised discharge point (irrigation source) water quality monitoring results for the reporting period *Concentrations exceeding EPL302 trigger values for irrigation water highlighted in red. Concentrations below the laboratory LOR are greyed out.*

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enterococci
			µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	CFU/100mL	CFU/100mL	CFU/100mL
Irrigation water EPL302 trigger values		6.0-9.0	1300	-	-	-	125	12	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	1000	1000
Irrigation	9/05/2023	7.62	355	214	0.16	4.5	4.7	1.06	<1	<1	149	149	4	26	24	20	10	1	3.79	3.64	2.11	5500	350000	860
Irrigation	6/06/2023	7.05	377	209	0.15	6.3	6.4	1.31	<1	<1	151	151	5	29	26	16	16	2	3.94	3.82	1.60	12000	840000	3800
Irrigation	5/07/2023	7.58	358	184	<0.01	5.3	5.3	1.19	<1	<1	145	145	4	26	28	16	14	2	3.71	3.37	4.79	5000	320000	10000
Irrigation	15/08/2023	7.45	388	230	<0.01	3.6	3.6	0.91	<1	<1	146	146	4	31	26	16	17	2	3.87	3.66	2.86	10000	3000000	1900
Irrigation	7/09/2023	7.64	460	224	0.04	14.3	14.3	2.13	<1	<1	180	180	6	35	34	18	17	4	4.71	4.02	7.89	~10000000	32000	450000
Irrigation	13/11/2023	7.76	539	250	0.04	21.7	21.7	3.39	<1	<1	210	210	7	38	27	16	22	5	5.41	5.30	2.1	37000	400000	20000
Irrigation	12/12/2023	7.54	455	228	0.01	18.0	18.0	3.31	<1	<1	171	171	5	32	28	15	18	5	4.42	4.83	4.34	4000	1400000	520
Irrigation	22/01/2024	6.61	258	198	5.59	5.0	10.6	0.86	<1	<1	76	76	4	24	20	9	13	2	2.28	2.36	-	60	610000	1
Irrigation	22/02/2024	6.64	216	142	0.84	5.20	6.0	0.03	<1	<1	70	70	4	22	14	7	12	2	2.10	1.85	-	7400	500000	50
Irrigation	25/03/2024	6.33	164	109	0.36	2.00	2.4	0.54	<1	<1	48	48	3	18	12	5	10	2	1.53	1.50	-	300	100000	29

Table 5-3. Groundwater quality monitoring results for the reporting period

Concentrations outside EPL 302 trigger values for groundwater highlighted in red. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	Water Type	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enterococci
				µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meg/L	%	CFU/100 mL	CFU/100mL	CFU/100mL
Groundwater EPL302 trigger values			7.0-8.5	400	-	-	-	any increase from previous	any increase from previous	-	-	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
Bore 1	9/05/2023	Bore	7.92	287	199	0.47	<0.1	0.5	0.02	<1	<1	130	130	<1	18	22	19	9	<1	3.1	3.05	0.84	<1	2	<1
Bore 3	9/05/2023	Bore	7.62	332	214	0.34	0.2	0.5	0.04	<1	<1	128	128	4	28	21	19	11	1	3.43	3.12	4.81	<1	<1	<1
Bore 1	6/06/2023	Bore	6.73	292	168	0.49	<0.01	0.5	<0.01	<1	<1	120	120	2	22	24	16	10	<1	3.06	2.95	1.84	<1	<1	<1
Bore 3	6/06/2023	Bore	6.74	284	164	0.32	0.1	0.3	<0.01	<1	<1	120	120	2	18	23	15	10	<1	2.95	2.82	-	<1	<1	<1
Bore 1	5/07/2023	Bore	7.04	286	151	0.46	0.2	0.7	0.01	<1	<1	116	116	2	22	25	16	9	<1	2.98	2.96	-	<1	<1	<1
Bore 3	5/07/2023	Bore	7.63	270	144	0.29	0.4	0.7	0.02	<1	<1	120	120	2	18	24	15	9	<1	2.95	2.82	-	<1	<1	<1
Bore 1	1/08/2023	Bore	7.04	322	188	0.50	0.4	0.9	0.03	<1	<1	122	122	2	30	26	17	12	<1	3.32	3.22	-	<1	<1	<1
Bore 3	1/08/2023	Bore	6.97	281	162	0.30	0.1	0.4	0.03	<1	<1	121	121	2	18	24	15	9	<1	2.97	2.82	-	<1	<1	<1
Bore 1	7/09/2023	Bore	7.80	338	200	0.56	0.1	0.7	<0.01	<1	<1	118	118	3	34	29	18	15	<1	3.30	3.58	2.90	<1	<1	<1
Bore 3	7/09/2023	Bore	7.67	243	139	0.25	0.2	0.4	0.03	<1	<1	112	112	<1	12	24	15	6	<1	2.58	2.69	-	<1	<1	<1
Bore 1	13/11/2023	Bore	7.68	349	212	0.62	0.2	0.8	<0.01	<1	<1	128	128	2	57	29	20	16	<1	4.21	3.86	4.51	<1	<1	<1
Bore 3	13/11/2023	Bore	7.73	241	148	0.26	0.1	0.4	0.02	<1	<1	119	119	<1	9	23	15	7	<1	2.63	2.69	-	<1	<1	2
Bore 1	12/12/2023	Bore	7.11	338	176	0.62	0.1	0.7	0.03	<1	<1	121	121	2	32	25	18	14	<1	3.36	3.34	0.36	<1	2	<1
Bore 3	12/12/2023	Bore	7.15	239	144	0.28	<2.0	<2.0	1.10	<1	<1	112	112	<1	10	25	16	6	<1	2.52	2.82	-	<1	2	<1
Bore 1	22/01/2024	Bore	6.87	296	216	0.58	0.2	0.8	0.02	<1	<1	123	123	2	23	30	17	11	<1	3.15	3.37	3.48	1	<1	<1
Bore 3	22/01/2024	Bore	6.96	255	174	0.31	<0.1	0.3	0.03	<1	<1	131	131	<1	10	29	17	6	<1	2.90	3.11	3.46	<1	1	<1
Bore 1	22/02/2024	Bore	7.30	264	167	0.46	0.30	0.8	0.02	<1	<1	122	122	2	16	26	17	8	<1	2.93	3.04	-	<1	<1	<1
Bore 3	22/02/2024	Bore	7.60	291	188	0.25	<0.1	0.2	0.03	<1	<1	126	126	1	26	24	16	8	<1	3.27	2.86	6.67	<1	1	<1
Bore 1	25/03/2024	Bore	6.83	268	162	0.47	0.30	0.8	<0.01	<1	<1	111	111	1	16	25	16	7	<1	2.69	2.87	-	<1	2	<1
Bore 3	25/03/2024	Bore	6.83	244	175	0.29	0.80	1.1	0.02	<1	<1	109	109	<1	9	25	15	5	<1	2.45	2.70	-	<1	<1	<1

Table 5-4. Surface water quality monitoring results for the reporting period

Concentrations in breach of EPL302 trigger values for surface water highlighted in red. Trigger values only apply to the property discharge site. If the concentration at SW1 is greater than the trigger value then the concentration at SW1 becomes the trigger value for that monitoring round. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Magnesium	Sodium	Potassium	Total Anions	Total Cations	E.coli	Total coliforms	Enterococci
			µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	CFU/100 mL	CFU/100 mL	CFU/100mL
Surface water EPL302 trigger values		6.0-7.5	200	-	-	-	0.23	0.01	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
V Weir	22/01/2024	7.17	262	171	0.21	4.6	4.8	2.18	<1	<1	105	105	4	24	11	11	5	2.86	2.61	120	65000	150
V Weir	22/02/2024	7.02	175	134	0.59	1.30	1.9	0.54	<1	<1	54	54	<1	26	7	13	2	1.81	1.79	260	30000	210
SW1 (North)	22/02/2024	6.45	168	159	0.02	2.20	2.2	0.10	<1	<1	26	26	3	37	5	19	5	1.62	1.62	1000	38000	320
SW2 (North)	22/02/2024	6.32	42	66	0.04	1.10	1.1	0.09	<1	<1	14	14	<1	5	2	4	<1	0.42	0.44	100	37000	100
V Weir	25/03/2024	6.49	189	112	0.25	2.30	2.60	0.77	<1	<1	56	56	<1	24	7	12	2	1.80	1.75	500	27000	280
SW1 (North)	25/03/2024	6.12	91	85	<0.01	1.20	1.20	0.03	<1	<1	28	28	<1	14	3	6	6	0.95	0.86	20	110000	510
SW2 (south)	25/03/2024	5.93	41	58	<0.01	0.70	0.70	0.03	<1	<1	13	13	<1	5	2	3	<1	0.40	0.39	15	31000	61

Table 5-5. Soil monitoring results for the reporting period

Concentrations outside of EPL302 trigger values for groundwater highlighted in red. Concentrations below the laboratory LOR are greyed out.

Site ID	Date	Horizon	Moisture	pH	EC	Moisture Content	NOx	TKN	TN	TP	Enterococci	Total coliforms	E. coli
				pH Unit	µS/cm	%	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL302 trigger values				6-8	Any increase from previous				Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous
SS1	06/02/24	2	Wet	7.1	126	20	0.4	590	590	94	360	4700	<12
SS2	06/02/24	2	Moist	7.1	132	15.7	0.9	300	300	89	130	37	<12
SS4	06/02/24	2	Moist	7.6	371	12.1	3.2	350	350	112	550	7900	<11
SS6	06/02/24	2	Moderately Moist	7.2	125	8.5	0.4	320	320	76	<11	22	<11
SS8	06/02/24	2	Moderately Moist	7.3	176	13.6	0.6	300	300	99	180	<11	<11
SS9	06/02/24	2	Moderately Moist	7.8	195	10.3	2	390	390	76	110	22	11
SS10	06/02/24	2	Moderately Moist	7.8	127	11.3	1.2	250	250	84	35	<11	<11

6 TOTAL N AND TOTAL P LOADS

Condition 38 of EPL302 states that:

The licensee must ensure that the total annual loads of Total Nitrogen and Total Phosphorus applied to land from the authorised discharge point do not exceed the calculated maximum total annual loads:

37.1 The total annual load for total nitrogen must be calculated using the equations detailed in the NSW environmental guideline Use of Effluent by Irrigation and be based on the specific soil type and crop present in the irrigation area receiving wastewater from the authorised discharge point.

37.2 The total annual load of total phosphorus must be based on the annual maximum uptake of phosphorus for the specific crop type present as listed in Table 4.2 of the NSW environmental guideline Use of Effluent by Irrigation

Total annual loads of TN and TP applied to the irrigation area using water from the authorised discharge point (irrigation source) are calculated below.

In regard to the total TN and TP load applied to the two irrigation areas during the reporting period, the total volume of irrigated water was 150.72 ML, and the median TN and TP concentrations of the irrigation water were 6.2 mg/L and 1.1 mg/L respectively. This equates to a total load of 934.5 kg of TN and 165.8 kg of TP applied to the two irrigation areas over the reporting period.

The established sandalwood plantation in the western part of JCF received a load of 753.4 kg of TN and 133.7 kg of TP. The pivot irrigation section on the eastern side, where Jarrah grass is grown, received a load of 181.1 kg of TN and 32.1 kg of TP.

Table 4.2 in the *NSW Environmental Guidelines, Use of Effluent by Irrigation* (DEC 2004) lists grain crops only and thus information could only be used for grain sorghum, where the average yield is approx. 2.5 tonnes/ha/dry matter, with a nutrient content of 2.1 % nitrogen and 0.3 % phosphorus.

This equals a nitrogen removal of 52.5 kg/ha/annum and a phosphorus removal of 7.5 kg/ha/annum. The eastern irrigation area has a size of 4.85 ha and thus would be capable of removing 254.6 kg of nitrogen through harvesting per annum and 36.4 kg of phosphorus. This is well above the amount of TN and TP applied to the irrigation area in the irrigated wastewater. Although these calculations suggest that irrigation is sustainable and would not result in excess TN and TP, the TN results from soil samples suggest otherwise. Further monitoring is required to confirm if TN is increasing in soils and to re-assess the crops' capacity to uptake the nutrient loads from irrigation.

A calculation for the sandalwood plantation was not possible based on the information provided in Table 4.2 in the NSW *Environmental Guidelines, Use of Effluent by Irrigation* (DEC 2004).

7 CONCLUSIONS

Unauthorised discharges during the 2023-24 wet season via a V-notch weir were reported to the NT EPA (PRI Group 2020a-c). To avoid unauthorised discharges in future wet seasons, a Stormwater Management Plan for the farm is currently under development. In addition, during the reporting period, two of the wastewater ponds were dredged, and the consumption of water has been reduced during the wet season.

All monitoring was undertaken as per EPL302 Attachment A requirements, except for some minor noncompliances as listed in Table 4-6 above.

At the authorised discharge point, all parameters were compliant with the trigger values, except for bacteria. In the monitoring period, the highest concentration of E. coli and enterococci were recorded in February 2024. However, no increasing trend was observed in the results, except for total coliforms which appear to be increasing since March 2023.

In groundwater, exceedances were recorded in concentrations of TN, TP, total coliforms and enterococci. However, an increasing trend in concentration was only observed in TN at Bore1, where concentrations have been increasing since November 2022. In all other parameters, concentrations decreased in the following sampling rounds.

At the property outlet, exceedances in TN, TP, enterococci and total coliforms were recorded during the reporting period. Concentrations of TN and TP decreased in the monitoring rounds following the recorded spikes. *E. coli* and enterococci appear to have been increasing at this site since January and February 2024. However, further monitoring is required to confirm any concentration trends.

TN levels at most soil monitoring sites increased in 2024 in comparison to the 2023 results. An increasing trend in EC levels is also apparent at the monitoring sites. Despite EC and TN in the irrigated wastewater have not increased, it is likely that the concentration trends observed are a result of the irrigated water and its quality.

Although the estimated loads of TN and TP currently applied to the irrigation areas appear to be sustainable, the TN concentration trends observed in soil samples and Bore 1 indicate otherwise. It is recommended that if an increasing trend is confirmed in the following reporting period, management actions regarding the volumes and characteristics of the wastewater being irrigated should be implemented. However, it is expected that the implementation of the Stormwater Management Plan will result in lower volumes of water being irrigated.

To address the exceedances commonly recorded at the authorised discharge point, in April 2024, the wastewater extraction point was relocated. This change is expected to improve nutrient and bacterial load in the monitoring sites.

In addition, a hydrogen peroxide dosing unit is proposed for installation to further reduce bacterial load in the irrigated water. This unit will microdose hydrogen peroxide daily into the wastewater, effectively reducing the bacterial load.

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APPENDIX A HISTORICAL DATA

Irrigation

Site ID	Date	pH	EC	TDS	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enterococci
			µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meg/L	%	CFU/100mL	CFU/100mL	CFU/100mL
Irrigation water EPL302 trigger values		6.0-9.0	1300	-	-	-	125	12	-	-	-	-	-	-	-	-	-	-	-	-	-	1000	1000	1000
Irrigation Water	24/09/2020	7.31	413	-	0.02	6.3	6.3	1.530	<1	<1	163	163	3	28	31	16	19	2	4.11	3.74	4.68	1000	240000	9000
Irrigation water	20/01/2021	7.50	413	-	-	-	14.3	1.12	-	<1	-	160	4	22	28	12	14	4	-	-	-	>2420	>2420	>2420
Irrigation water	3/02/2021	7.70	201	-	-	-	4.4	1.14	-	<1	-	73	2	14	15	7	8	3	-	-	-	140	>2420	>2420
Irrigation Water	23/03/2021	6.86	220	158	0.95	0.6	1.6	0.04	<1	<1	70	70	4	22	23	4	13	2	2.10	2.09	-	~40	~150	56
Irrigation Water	15/04/2021	6.57	230	138	0.68	0.8	1.5	0.07	<1	<1	87	87	2	21	26	5	12	2	2.37	2.28	-	~170	~2800	~6
Irrigation Water	13/05/2021	7.89	2520	1630	0.05	10.1	10.2	1.92	<1	<1	369	369	30	13	8	10	18	461	8.36	13.80	24.50	56000	~280000	29000
Irrigation Water	9/06/2021	6.65	344	206	<0.01	5.4	5.4	1.38	<1	<1	168	168	8	19	32	17	14	3	4.06	3.68	4.88	320000	~3200000	7100
Irrigation	21/12/2021	7.97 7.73	479	249	<0.01	14.8	14.8	2.91 1.22	<1	<1	183	183	5	37	30	17	22	5	4.80 3.45	3.98 3.35	9.37 1.43	~15000	~36000	5000
Irrigation	7/12/2021		379	228	0.11	5.2	5.3		<1	<1	122	122	8	30	28	15	16	1				220	~1300	~60
Irrigation	1/11/2021	7.93	370	244	0.03	4.9	4.9	1.36	<1	<1	148	148	4	29	30	17	16	2	3.86	3.64	2.87	6300	26000	1700
Irrigation	3/08/2021	7.62	366	198	0.13	6.8	6.9	1.55	<1	<1	149	149	4	26	29	16	15	2	3.79	3.47	4.49	~7500	~28000	760
Irrigation	14/10/2021	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	560000	~980000	7100
Irrigation	5/01/2022	7.96	432	243	0.02	9.2	9.2	1.47	<1	<1	173	173	5	39	27	15	22	2	4.66	4.25	4.68	39000	120000	4400
Irrigation	2/02/2022	6.44	153	118	1.43	2.1	3.5	0.28	<1	<1	72	72	3	16	15	4	9	3	1.95	1.70	-	50	~1000	~4
Irrigation	1/03/2022	6.46	116	68	0.40	0.7	1.1	0.060	<1	<1	45	45	2	18	8	2	8	1	1.45	1.02	-	-	-	-
Irrigation	4/04/2022	7.89	379	210	<0.01	10.7	10.7	1.71	<1	<1	142	142	3	28	27	18	8	<1	3.69	3.18	7.47	2100	63000	130
Irrigation	12/05/2022	7.65	433	222	0.02	7.8	7.8	1.62	<1	<1	157	157	3	31	26	16	20	2	4.07	3.54	7.08	73000	~240000	950
Irrigation	6/06/2022	7.82	423	170	0.02	6.8	6.8	1.55	<1	<1	164	164	4	30	27	16	20	2	4.21	4.07	1.68	1500	~5100	190
Irrigation	6/07/2022	7.35 7.83	343	217	0.22 0.09	5.0	5.2	1.02 1.08	<1	<1	144	144	4	23	29	17	13	2	3.61 3.65	3.46 3.73	2.07	3900	2600000	5600
Irrigation	8/08/2022	7.48	383	201	0.19	5.0	5.1	1.41	<1	<1	140	140	3	28	30	17	18	2	3.80	3.66	-	590	210000	190
Irrigation	5/09/2022		380	194		7.30	7.5		<1	<1	149	149	3	27	32	16	16	2			-	2200	~24000	230
Irrigation	5/10/2022	7.63	554	206	<0.01	22.90	22.9	3.14	<1	<1	218	218	11	31	35	17	15	4	5.46	5.54	-	410000	580000	28000
Irrigation	3/11/2022	7.69	653	264	0.01	28.5	28.5	3.65	<1	<1	267	267	2	43	40	19	21	5	6.59	6.64	-	280000	4600000	12000
Irrigation	20/12/2022	7.84	378	212	-	-	-	-	<1	<1	159	159	4	32	27	14	16	2	4.16	3.25	-	7600	45000	5100
Irrigation	5/01/2023	6.70	202	160	7.14	2.0	9.1	0.42	<1	<1	59	59	3	15	15	6	9	2	1.66	1.68	-	160	19000	11
Irrigation	21/02/2023	6.86	240	133	0.48	8.8	9.3	1.08	<1	<1	91	91	4	21	15	7	11	2	2.49	2.48	-	180	25000	~110
Irrigation	15/03/2023	6.81	140	70	0.24	1.0	1.2	0.12	<1	<1	43	43	2	15	11	4	8	1	1.32	1.25	-	550	15000	8
Irrigation	19/04/2023	7.13	242	115	0.01	5.8	5.8	1.04	<1	<1	94	94	3	22	19	7	11	2	2.56	1.89	-	12000	220000	610
Irrigation	9/05/2023	7.62	355	214	0.16	4.5	4.7	1.06	<1	<1	149	149	4	26	24	20	10	1	3.79	3.64	2.11	5500	350000	860
Irrigation	6/06/2023	7.05	377	209	0.15	6.3	6.4	1.31	<1	<1	151	151	5	29	26	16	16	2	3.94	3.82	1.60	12000	840000	3800
Irrigation	5/07/2023	7.58	358	184	<0.01	5.3	5.3	1.19	<1	<1	145	145	4	26	28	16	14	2	3.71	3.37	4.79	5000	320000	10000
Irrigation	15/08/2023	7.45	388	230	<0.01	3.6	3.6	0.91	<1	<1	146	146	4	31	26	16	17	2	3.87	3.66	2.86	10000	3000000	1900
Irrigation	7/09/2023	7.64	460	224	0.04	14.3	14.3	2.13	<1	<1	180	180	6	35	34	18	17	4	4.71	4.02	7.89	~10000000	32000	450000
Irrigation	13/11/2023	7.76	539	250	0.04	21.7	21.7	3.39	<1	<1	210	210	7	38	27	16	22	5	5.41	5.30	2.1	37000	400000	20000
Irrigation	12/12/2023	7.54	455	228	0.01	18.0	18.0	3.31	<1	<1	171	171	5	32	28	15	18	5	4.42	4.83	4.34	4000	1400000	520
Irrigation	22/01/2024	6.61	258	198	5.59	5.0	10.6	0.86	<1	<1	76	76	4	24	20	9	13	2	2.28	2.36	-	60	610000	1
Irrigation	22/02/2024	6.64	216	142	0.84	5.20	6.0	0.03	<1	<1	70	70	4	22	14	7	12	2	2.10	1.85	-	7400	500000	50
Irrigation	25/03/2024	6.33	164	109	0.36	2.00	2.4	0.54	<1	<1	48	48	3	18	12	5	10	2	1.53	1.50	-	300	100000	29

Groundwater

Site ID	Date	Water Type	pH	EC	TDS	DO	TSS	BOD	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Calcium	Magnesium	Sodium	Potassium	Total Anions	Total Cations	Ionic Balance	E.coli	Total coliforms	Enterococci
				µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	CFU/100 mL	CFU/100mL	CFU/100mL
Groundwater EPL302 trigger values			7.0-8.5	400	-	-	-	-	-	-	any increase from previous	any increase from previous	-	-	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
Bore 1	1/01/2014	Bore	7.90	-	-	7	10	1.0	-	-	0.37	0.075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/01/2014	Bore	7.90	-	-	6	10	1.0	-	-	0.35	0.075	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/02/2014	Bore	7.90	-	-	10	10	1.0	-	-	0.29	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/02/2014	Bore	8.00	-	-	10	10	1.0	-	-	0.29	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/03/2014	Bore	7.80	-	-	9	10	1.0	-	-	0.32	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/03/2014	Bore	7.70	-	-	9	10	1.0	-	-	0.56	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/04/2014	Bore	7.90	-	-	10	10	1.0	-	-	0.27	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/04/2014	Bore	7.70	-	-	9	10	1.0	-	-	0.49	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/05/2014	Bore	7.90	-	-	9	10	1.0	-	-	0.27	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/05/2014	Bore	7.60	-	-	9	10	1.0	-	-	0.45	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/06/2014	Bore	7.90	-	-	9	-	1.0	-	-	0.30	0.050	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/06/2014	Bore	7.70	-	-	9	-	1.0	-	-	0.58	0.060	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/07/2014	Bore	7.90	-	-	10	10	1.0	-	-	0.31	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/07/2014	Bore	7.90	-	-	9	10	1.0	-	-	0.30	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/08/2014	Bore	7.70	-	-	10	10	1.0	-	-	0.30	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/08/2014	Bore	7.70	-	-	10	10	1.0	-	-	0.64	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/09/2014	Bore	8.00	-	-	10	10	1.0	-	-	0.31	0.080	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/09/2014	Bore	7.80	-	-	10	10	1.2	-	-	0.65	0.065	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/10/2014	Bore	7.80	-	-	6	10	-	-	-	0.31	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/10/2014	Bore	7.70	-	-	5	10	-	-	-	0.66	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/11/2014	Bore	7.80	-	-	9	10	1.0	-	-	0.29	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/11/2014	Bore	7.70	-	-	9	10	1.0	-	-	0.41	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/12/2014	Bore	8.00	-	-	9	10	1.0	-	-	0.32	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/12/2014	Bore	8.00	-	-	9	10	1.0	-	-	0.69	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/01/2015	Bore	8.10	-	-	7	10	-	-	-	0.27	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/01/2015	Bore	8.00	-	-	8	10	-	-	-	0.56	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/03/2015	Bore	8.00	-	-	11	10	1.0	-	-	0.31	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/03/2015	Bore	7.80	-	-	10	10	1.0	-	-	0.62	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/04/2015	Bore	7.90	-	-	8	10	1.0	-	-	0.29	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/04/2015	Bore	7.90	-	-	8	10	1.0	-	-	0.28	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/05/2015	Bore	7.90	-	-	9	<10	1.2	-	-	0.31	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/05/2015	Bore	7.70	-	-	9	<10	1.1	-	-	0.64	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/06/2015	Bore	7.80	-	-	9	<10	<1	-	-	0.29	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/06/2015	Bore	7.70	-	-	10	<10	<1	-	-	0.57	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/07/2015	Bore	8.40	-	-	7	10	<1	-	-	0.30	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/07/2015	Bore	8.40	-	-	7	<10	<1	-	-	0.28	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/01/2016	Bore	8.40	-	-	9	<10	<1	-	-	0.33	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/01/2016	Bore	8.40	-	-	9	<10	<1	-	-	0.32	0.01.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/02/2016	Bore	8.40	-	-	9	30	<1	-	-	0.33	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/02/2016	Bore	8.30	-	-	9	40	<1	-	-	0.32	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/03/2016	Bore	8.00	-	-	9	30	<1	-	-	0.32	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/03/2016	Bore	7.80	-	-	9	30	<1	-	-	0.39	<.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/04/2016	Bore	7.80	-	-	8	<10	<1	-	-	0.32	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/04/2016	Bore	7.80	-	-	7	10	<1	-	-	0.31	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/05/2016	Bore	7.70	-	-	9	<10	1.6	-	-	0.29	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/05/2016	Bore	7.70	-	-	8	<10	4.0	-	-	0.28	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/05/2016	Bore	7.80	-	-	9	<10	4.4	-	-	0.27	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/06/2016	Bore	7.70	-	-	8	<10	<1	-	-	0.29	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/06/2016	Bore	8.00	-	-	7	<10	<1	-	-	0.30	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/06/2016	Bore	8.00	-	-	7	<10	1.6	-	-	1.71	0.405	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/07/2016	Bore	7.90	-	-	8	<10	<1	-	-	0.31	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/07/2016	Bore	7.90	-	-	7	<10	<1	-	-	0.31	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/07/2016	Bore	8.00	-	-	9	<10	<1	-	-	0.33	0.035	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/08/2016	Bore	7.90	-	-	8	<10	<1	-	-	0.31	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/08/2016	Bore	7.80	-	-	7	<10	<1	-	-	0.30	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/08/2016	Bore	8.00	-	-	9	<10	<1	-	-	0.28	0.040	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/09/2016	Bore	7.80	-	-	8	<10	1.1	-	-	0.33	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/09/2016	Bore	7.80	-	-	10	<10	1.6	-	-	1.66	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/09/2016	Bore	7.80	-	-	10	10	1.5	-	-	0.27	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/01/2017	Bore	7.80	-	-	10	<10	<1	-	-	0.34	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/01/2017	Bore	7.90	-	-	9	<10	<1	-	-	0.37	0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/01/2017	Bore	7.70	-	-	13	<10	<1	-	-	0.30	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/04/2017	Bore	7.80	-	-	7	10	<1	-	-	0.31	0.015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/04/2017	Bore	7.70	-	-	11	10	<1	-	-	0.38	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/04/2017	Bore	8.00	-	-	6	30	<1	-	-	0.26	0.025	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/09/2017	Bore	7.90	-	-	9	30	<1	-	-	0.33	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 2	1/09/2017	Bore	7.90	-	-	8	10	<1	-	-	0.35	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/09/2017	Bore	8.00	-	-	9	40	<1	-	-	0.31	0.020	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	1/05/2019	Bore	7.70	-	-	7	<10	1	-	-	0.59	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 3	1/05/2019	Bore	7.60	-	-	6	<10	17	-	-	0.75	0.010	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Bore 1	4/07/2019	Bore		-	159	-	-	<2	0.58	<0.1	0.6	<0.01	<1	<1	123	123	2	19	27	16	9	<1	3.04	3.06	0.34	<1	-	<1
Bore 3	4/07/2019	Bore		-	140	-	-	<2	0.33	<0.1	0.3	<0.01	<1	<1	115	115	<1	10	24	15	5	<1	2.58	2.65	-	<1	-	<1
Bore 1	24/09/2020	Bore	7.74	336	-	-	-	-	0.78	0.4	1.2	0.030	<1	<1	134	134	2	24	29	17	11	<1	3.40	3.32	1.06	<1	14	<1
Bore 2	24/09/2020	Bore	7.77	253	-	-	-	-	0.35	<0.1	0.4	0.040	<1	<1	116	116	<1	9	24	14	5	<1	2.57	2.57	-	23	190	10
Bore 3	24/09/2020	Bore	7.36	288	-	-	-	-	0.34	0.2	0.5	0.020	<1	<1	134	134	1	11	27	15	6	<1	3.01	2.84	2.83	<1	<1	<1
Bore 2	20/01/2021	Bore	8.00	290	-	-	-	-	-	-	0.7	<0.005	-	<1	-	117	2	18	25	16	9	1	-	-	-	<1	<1	<1
Bore 3	20/01/2021	Bore	7.80	255	-	-	-	-	-	-	0.3	0.01	-	<1	-	119	1	8	24	15	5	1	-	-	-	<1	1	<1
Bore 1	15/04/2021	Bore	6.95	266	165	-	-	-	0.44	<0.1	0.4	<0.01	<1	<1	131	131	<1	12	27	16	4	<1	2.96	2.84	-	<1	<1	<1
Bore 2	15/04/2021	Bore	6.98	248	153	-	-	-	0.37	<0.1	0.4	0.01	<1	<1	126	126	2	10	25	15	4	<1	2.84	2.66	-	<2	~6	<1
Bore 1	21/12/2021	Bore	7.50	346	196	-	-	-	0.68	0.1	0.8	<0.01	<1	<1	148	148	3	34	29	19	14	<1	3.98	3.62	4.72	<1	<1	<1
Bore 3	21/12/2021	Bore	7.44	233	150	-	-	-	0.28	0.2	0.5	<0.01	<1	<1	129	129	<1	11	22	14	6	<1	2.89	2.51	-	<1	<1	<1
Bore 1	7/12/2021	Bore	7.57	290	126	-	-	-	0.57	<0.1	0.6	<0.01	<1	<1	117	117	2	26	25	15	10	<1	3.11	2.92	3.24	~1	16	<1
Bore 3	7/12/2021	Bore	7.67	251	152	-	-	-	0.30	<0.1	0.3	0.01	<1	<1	122	122	<1	12	22	14	5	<1	2.78	2.47	-	<1	<1	<1
Bore 1	1/11/2021	Bore	7.91	335	238	-	-	-	0.49	<0.1	0.5	<0.01	<1	<1	145	145	2	33	29	18	11	<1	3.87	3.41	-	<1	<1	<1
Bore 3	1/11/2021	Bore	7.84	252	172	-	-	-	0.25	<0.1	0.2	0.01	<1	<1	111	111	2	13	25	15	6	<1	2.63	2.74	2.18	<1	<1	<1
Bore 1	3/08/2021	Bore	6.95	254	158	-	-	-	0.43	<0.1	0.4	0.02	<1	<1	115	115	1	13	26	16	6	<1	2.68	2.88	-	~2	~11	<2
Bore 3	3/08/2021	Bore	7.30	252	141	-	-	-	0.35	<0.1	0.4	0.02	<1	<1	120	120	1	13	26	16	7	<1	2.78	2.92	-	~<2	~<1	<2
Bore 1	14/10/2021	Bore		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<1
Bore 3	14/10/2021	Bore		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<1	<1
Bore 1	2/02/2022	Bore	7.00	279	184	-	-	-	0.56	<0.1	0.6	<0.01	<1	<1	141	141	3	24	28	17	10	<1	3.56	3.23	4.79	<1	~5	~2
Bore 3	2/02/2022	Bore	7.03	298	166	-	-	-	0.35	<0.1	0.4	0.01	<1	<1	142	142	<1	20	27	16	13	<1	3.40	3.23	2.59	~<1	~<1	<1
Bore 1	1/03/2022	Bore	7.48	234	166	-	-	-	0.41	<0.1	0.4	<0.01	<1	<1	118	118	1	12	21	14	5	<1	2.72	2.42	-	-	-	-
Bore 2	1/03/2022	Bore	7.67	258	169	-	-	-	0.34	<0.1	0.3	0.030	<1	<1	122	122	2	18	22	14	8	<1	2.99	2.62	-	-	-	-
Bore 1	4/04/2022	Bore	8.11	275	191	-	-	-	0.38	<0.1	0.4	<0.01	<1	<1	122	122	1	15	27	18	7	<1	2.88	3.13	-	<1	<1	<1
Bore 3	4/04/2022	Bore	8.07	265	186	-	-	-	0.28	0.1	0.4	0.07	<1	<1	117	117	2	15	25	17	4	<1	2.80	2.82	-	~<1	~<1	<1
Bore 1	12/05/2022	Bore	7.50	262	143	-	-	-	0.38	<0.1	0.4	<0.01	<1	<1	112	112	<1	11	22	15	5	<1	2.55	2.55	-	~7	42	~1
Bore 3	12/05/2022	Bore	7.73	236	126	-	-	-	0.29	<0.1	0.3	0.01	<1	<1	111	111	<1	8	23	13	9	<1	2.44	2.61	-	~<1	~<1	<1
Bore 1	6/06/2022	Bore	7.69	273	150	-	-	-	0.48	0.1	0.6	<0.01	<1	<1	122	122	1	12	23	16	7	<1	2.80	2.77	-	~1	29	<1
Bore 3	6/06/2022	Bore	7.75	314	176	-	-	-	0.32	<0.1	0.3	<0.01	<1	<1	122	122	3	21	24	16	13	1	3.09	3.10	0.21	<1	<1	<1
Bore 1	6/07/2022	Bore	7.40	251	178	-	-	-	0.40	0.1	0.5	0.02	<1	<1	119	119	1	13	25	16	6	<1	2.76	2.82	-	<1	<1	<1
Bore 3	6/07/2022	Bore	7.35	256	169	-	-	-	0.30	<0.1	0.3	0.05	<1	<1	118	118	2	15	26	16	8	<1	2.82	2.96	-	~<1	~1	<1
Bore 1	8/08/2022	Bore	7.79	292	171	-	-	-	0.43	0.1	0.5	<0.01	<1	<1	124	124	1	17	27	17	8	<1	2.98	3.09	1.92	<1	<1	<1
Bore 3	8/08/2022	Bore	7.60	274	150	-	-	-	0.29	0.1	0.4	0.02	<1	<1	106	106	1	14	24	16	8	<1	2.53	2.86	-	<1	~4	<1
Bore 1	5/09/2022	Bore	7.44	310	184	-	-	-	0.48	0.10	0.6	<0.01	<1	<1	121	121	1	24	31	17	10	<1	3.12	3.38	-	<1	~3	<1
Bore 3	5/09/2022	Bore	7.57	264	160	-	-	-	0.30	0.10	0.4	<0.01	<1	<1	121	121	<1	13	29	16	7	<1	2.78	3.07	-	<1	<1	<1
Bore 1	5/10/2022	Bore	7.76	319	171	-	-	-	0.45	<0.1	0.4	0.02	<1	<1	121	121	2	25	27	17	9	<1	3.16	3.14	-	<1	<1	<1
Bore 3	5/10/2022	Bore	7.86	296	152	-	-	-	0.34	<0.1	0.3	0.11	<1	<1	147	147	<1	11	28	18	5	<1	3.25	3.10	-	~2	~5	<1
Bore 1	3/11/2022	Bore	7.89	244	164	-	-	-	0.40	<0.1	0.4	0.01	<1	<1	116	116	<1	9	22	14	5	<1	2.57	2.47	-	56	680	28
Bore 3	3/11/2022	Bore	7.93	259	163	-	-	-	0.33	<0.1	0.3	0.12	<1	<1	127	127	<1	11	24	15	5	<1	2.85	2.65	-	<1	11	<1
Bore 1	20/12/2022	Bore	7.95	300	226	-	-	-	0.52	0.1	0.6	0.02	<1	<1	148	148	5	24	27	16	10	<1	3.74	3.10	-	<1	~9	20
Bore 3	20/12/2022	Bore	7.92	260	178	-	-	-	-	-	-	-	<1	<1	126	126	1	15	24	14	7	<1	2.96	2.65	-	<1	~1	<1
Bore 1	5/01/2023	Bore	7.60	309	213	-	-	-	0.46	<0.1	0.5	0.02	<1	<1	128	128	2	27	24	14	13	<1	3.36	2.92	-	<1	<1	<1

Bore 3	5/01/2023	Bore	7.62	316	206	-	-	-	0.31	0.1	0.4	0.03	<1	<1	134	134	4	28	24	14	14	<1	3.55	2.96	-	<1	~2	<1
Bore 1	21/02/2023	Bore	7.41	240	154	-	-	-	0.42	0.2	0.6	0.01	<1	<1	119	119	1	13	23	14	6	<1	2.76	2.56	-	~1	38	<1
Bore 3	21/02/2023	Bore	7.31	278	190	-	-	-	0.35	0.4	0.8	0.01	<1	<1	116	116	3	24	26	15	13	<1	3.06	3.10	-	<1	~1	<1
Bore 1	15/03/2023	Bore	7.89	261	136	-	-	-	0.43	0.4	0.8	<0.01	<1	<1	119	119	1	12	20	14	6	<1	2.74	2.41	-	<1	10	<1
Bore 3	15/03/2023	Bore	7.75	283	138	-	-	-	0.33	0.2	0.5	0.06	<1	<1	74	74	2	18	21	14	10	<1	2.03	2.64	-	<1	1	<1
Bore 1	19/04/2023	Bore	7.73	489	178	-	-	-	0.43	0.2	0.6	0.02	<1	<1	128	128	1	17	23	16	8	<1	3.06	2.81	-	<1	50	~1
Bore 3	19/04/2023	Bore	7.63	298	174	-	-	-	0.32	0.2	0.5	0.02	<1	<1	126	126	3	24	22	16	13	<1	3.26	2.98	-	<1	11	<1
Bore 1	9/05/2023	Bore	7.92	287	199	-	-	-	0.47	<0.1	0.5	0.02	<1	<1	130	130	<1	18	22	19	9	<1	3.1	3.05	0.84	<1	2	<1
Bore 3	9/05/2023	Bore	7.62	332	214	-	-	-	0.34	0.2	0.5	0.04	<1	<1	128	128	4	28	21	19	11	1	3.43	3.12	4.81	<1	<1	<1
Bore 1	6/06/2023	Bore	6.73	292	168	-	-	-	0.49	<0.01	0.5	<0.01	<1	<1	120	120	2	22	24	16	10	<1	3.06	2.95	1.84	<1	<1	<1
Bore 3	6/06/2023	Bore	6.74	284	164	-	-	-	0.32	0.1	0.3	<0.01	<1	<1	120	120	2	18	23	15	10	<1	2.95	2.82	-	<1	<1	<1
Bore 1	5/07/2023	Bore	7.04	286	151	-	-	-	0.46	0.2	0.7	0.01	<1	<1	116	116	2	22	25	16	9	<1	2.98	2.96	-	<1	<1	<1
Bore 3	5/07/2023	Bore	7.63	270	144	-	-	-	0.29	0.4	0.7	0.02	<1	<1	120	120	2	18	24	15	9	<1	2.95	2.82	-	<1	<1	<1
Bore 1	1/08/2023	Bore	7.04	322	188	-	-	-	0.50	0.4	0.9	0.03	<1	<1	122	122	2	30	26	17	12	<1	3.32	3.22	-	<1	<1	<1
Bore 3	1/08/2023	Bore	6.97	281	162	-	-	-	0.30	0.1	0.4	0.03	<1	<1	121	121	2	18	24	15	9	<1	2.97	2.82	-	<1	<1	<1
Bore 1	7/09/2023	Bore	7.80	338	200	-	-	-	0.56	0.1	0.7	<0.01	<1	<1	118	118	3	34	29	18	15	<1	3.30	3.58	2.90	<1	<1	<1
Bore 3	7/09/2023	Bore	7.67	243	139	-	-	-	0.25	0.2	0.4	0.03	<1	<1	112	112	<1	12	24	15	6	<1	2.58	2.69	-	<1	<1	<1
Bore 1	13/11/2023	Bore	7.68	349	212	-	-	-	0.62	0.2	0.8	<0.01	<1	<1	128	128	2	57	29	20	16	<1	4.21	3.86	4.51	<1	<1	<1
Bore 3	13/11/2023	Bore	7.73	241	148	-	-	-	0.26	0.1	0.4	0.02	<1	<1	119	119	<1	9	23	15	7	<1	2.63	2.69	-	<1	<1	2
Bore 1	12/12/2023	Bore	7.11	338	176	-	-	-	0.62	0.1	0.7	0.03	<1	<1	121	121	2	32	25	18	14	<1	3.36	3.34	0.36	<1	2	<1
Bore 3	12/12/2023	Bore	7.15	239	144	-	-	-	0.28	<2.0	<2.0	1.10	<1	<1	112	112	<1	10	25	16	6	<1	2.52	2.82	-	<1	2	<1
Bore 1	22/01/2024	Bore	6.87	296	216	-	-	-	0.58	0.2	0.8	0.02	<1	<1	123	123	2	23	30	17	11	<1	3.15	3.37	3.48	1	<1	<1
Bore 3	22/01/2024	Bore	6.96	255	174	-	-	-	0.31	<0.1	0.3	0.03	<1	<1	131	131	<1	10	29	17	6	<1	2.90	3.11	3.46	<1	1	<1
Bore 1	22/02/2024	Bore	7.30	264	167	-	-	-	0.46	0.30	0.8	0.02	<1	<1	122	122	2	16	26	17	8	<1	2.93	3.04	-	<1	<1	<1
Bore 3	22/02/2024	Bore	7.60	291	188	-	-	-	0.25	<0.1	0.2	0.03	<1	<1	126	126	1	26	24	16	8	<1	3.27	2.86	6.67	<1	1	<1
Bore 1	25/03/2024	Bore	6.83	268	162	-	-	-	0.47	0.30	0.80	<0.01	<1	<1	111	111	1	16	25	16	7	<1	2.69	2.87	-	<1	2	<1
Bore 3	25/03/2024	Bore	6.83	244	175	-	-	-	0.29	0.80	1.10	0.02	<1	<1	109	109	<1	9	25	15	5	<1	2.45	2.70	-	<1	<1	<1

Surface water

Site ID	Date	pH	EC	TDS	DO	TSS	BOD	NOX-N	TKN	TN	TP	Hydroxide Alkalinity	Carbonate Alkalinity	Bicarbonate Alkalinity	Total Alkalinity	Sulfate	Chloride	Magnesium	Sodium	Potassium	Total Anions	Total Cations	E.coli	Total coliforms	Enterococci
			µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meg/L	CFU/100 mL	CFU/100 mL	CFU/100mL
Surface water EPL302 trigger values		6.0-7.5	200	-	-	-	-	-	-	0.23	0.01	-	-	-	-	-	-	-	-	-	-	-	any increase from previous	any increase from previous	any increase from previous
Property outlet	1/01/2014	7.30			6	70	2.2			4.02	1.060														
Property outlet	1/02/2014	7.30			9	10	1.7			3.98	0.530														
Property outlet	1/03/2014	7.70			8	10	1.4			6.65	0.875														
Property outlet	1/04/2014	7.60			8	20	2.2			8.03	1.220														
Property outlet	1/07/2014	7.90			5	30				5.55	0.970														
Property outlet	1/08/2014	9.40			9	40	16.0			6.08	1.190														
Property outlet	1/09/2014	8.00			9	460				9.07	1.980														
Property outlet	1/11/2014	7.50			8	120	16.0			8.94	0.930														
Property outlet	1/12/2014	8.20			8	70	4.6			4.84	0.875														
Property outlet	1/01/2015	7.80			5	10				7.98	1.480														
Property outlet	1/03/2015	7.90			10	20	4.1			5.56	1.500														
Property outlet	1/05/2015	8.00			8	30	4.8			8.08	2.000														
Property outlet	1/06/2015	8.90			4	40	23.0			7.93	2.200														
Property outlet	1/07/2015	8.40			11	100	13.0			7.87	2.470														
Property outlet	1/08/2015	8.00			8	30	8.3			6.00	1.670														
Property outlet	1/09/2015	7.90			8	50	8.4			5.08	1.460														
Property outlet	1/10/2015	6.00			6	90	39.0			0.62	1.410														
Property outlet	1/11/2015	7.90			4	30	9.3			6.44	1.240														
Property outlet	1/01/2016	8.30			<1	10	3.3			4.36	1.190														
Property outlet	1/02/2016	8.30			8	20	11.0			6.79	1.960														
Property outlet	1/03/2016	7.60			9	30	1.7			8.59	1.230														
Property outlet	1/06/2016	8.00			7	10	3.8			4.29	1.460														

Property outlet	1/08/2016	7.40			6	<10	2.2			4.15	1.480														
Property outlet	1/09/2016	7.40			11	10	6.8			5.64	1.780														
Property outlet Property Discharge (outlet)	4/07/2019 20/01/2021	7.80	238	220			<2	2.50	1.9	4.4 5.4	1.490 1.76	<1	<1 <1	143	143 82	<1 2	36 16	17 10	23 9	2 2	3.87	4.00	3400 248	>2420	~200 >2420
Property Discharge (outlet) Property Discharge (outlet)	3/02/2021 23/03/2021	6.90 7.35	50 249	163				0.54	1.8	1.0 2.3	0.11 0.66	<1	<1 <1	76	15 76	1 <1	4 24	3 10	2 12	1 2	2.20	2.24	52 ~30	>2420 ~11000	345 ~90
SW1	23/03/2021	6.77	134	133				<0.01	0.9	0.9	0.04	<1	<1	20	20	<1	25	4	11	5	1.10	1.18	~600	2600	600
SW2	23/03/2021	6.39	24	37				<0.01	0.5	0.5	0.05	<1	<1	7	7	<1	2	<1	2	<1	0.20	0.19	~60	~530	42
Property Discharge (outlet)	15/04/2021	7.24	283	156				1.05	4.8	5.8	1.25	<1	<1	117	117	3	20	12	10	2	2.96	2.62	~830	~3600	~80
Property Discharge (outlet) Property Discharge (outlet)	5/01/2022 2/02/2022	7.93 6.80	265 205	175 148				0.42 0.46	3.0 2.2	3.4 2.7	1.27 0.75	<1 <1	<1 <1	111 90	111 90	2 <1	28 23	10 10	15 12	2 3	3.05 2.45	2.77 2.22	~20 3300	~2000 ~19000	88 580
SW1	10/02/2022	6.39	125	98				0.01	0.8	0.8	0.03	<1	<1	46	46	<1	26	4	12	4	1.65	1.20	~8	~100	~2
SW2	10/02/2022	5.99	52	61				<0.01	1.1	1.1	0.05	<1	<1	29	29	<1	6	2	4	2	0.75	0.54	53	~64	~8
Property Discharge (outlet)	1/03/2022	7.21	239	158				0.36	3.3	3.7	1.04	<1	<1	92	92	<1	31	9	13	2	2.71	2.34			
V WEIR V Weir	5/01/2023 21/02/2023	7.42 7.49	236 302	156 198				0.37 0.05	2.9 5.7	3.3 5.8	1.58 1.94	<1 <1	<1 <1	94 124	94 124	<1 2	21 28	8 14	9 16	2 2	2.47 3.31	1.85 3.10	900 5100	12000 590000	~600 4000
SW1	21/02/2023	6.29	46	54				0.01	0.6	0.6	0.02	<1	<1	18	18	<1	4	2	2	<1	0.47	0.40	110	31000	85
V WEIR SW1	15/03/2023 15/03/2023	7.66 6.67	285 52	132 44				0.33 <0.01	2.9 1.0	3.2 1.0	1.11 0.04	<1 <1	<1 <1	110 18	110 18	1 <1	29 5	11 2	17 4	2 <1	3.04 0.50	2.82 0.54	1800 60	82000 13000	380 19
SW2 V Weir	15/03/2023 19/04/2023	6.77 7.68	109 342	70 190				<0.01 0.36	1.90 6.1	1.9 6.5	0.21 1.51	<1 <1	<1 <1	27 136	27 136	<1 2	17 30	3 13	6 16	8 2	1.02 3.60	0.91 0.20	36 1800	20000 35000	24 1200
V Weir V Weir	22/01/2024 22/02/2024	7.17 7.02	262 175	171 134				0.21 0.59	4.6 1.30	4.8 1.9	2.18 0.54	<1 <1	<1 <1	105 54	105 54	4 <1	24 26	11 7	11 13	5 2	2.86 1.81	2.61 1.79	120 260	65000 30000	150 210
SW1 (North)	22/02/2024	6.45	168	159				0.02	2.20	2.2	0.10	<1	<1	26	26	3	37	5	19	5	1.62	1.62	1000	38000	320
SW2 (North)	22/02/2024	6.32	42	66				0.04	1.10	1.1	0.09	<1	<1	14	14	<1	5	2	4	<1	0.42	0.44	100	37000	100
V Weir SW1 (North)	25/03/2024 25/03/2024	6.49 6.12	189 91	112 85				0.25 <0.01	2.30 1.20	2.60 1.20	0.77 0.03	<1 <1	<1 <1	56 28	56 28	<1 <1	24 14	7 3	12 6	2 6	1.80 0.95	1.75 0.86	500 20	27000 110000	280 510
SW2 (south)	25/03/2024	5.93	41	58				<0.01	0.70	0.70	0.03	<1	<1	13	13	<1	5	2	3	<1	0.40	0.39	15	31000	61

Soil

Site ID	Date	Horizon	Moisture	pH	EC	Moisture Content	NOx	TKN	TN	TP	Enterococci	Total coliforms	E. coli
				pH Unit	µS/cm	%	mg/kg	mg/kg	mg/kg	mg/kg	MPN/g dry wt	MPN/g dry wt	MPN/g dry wt
EPL302 trigger values				6-8	Any increase from previous				Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous	Any increase from previous
SS1 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS1 - 0-0.4m	05/07/19	2	Slightly Moist	8.0	32	4.0	1.1	300	300	93			
SS1 - 0.4-1m	05/07/19	2	Moist	5.8	15	14.2	3.9	170	170	96			
SS2 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS2 - 0-0.4m	05/07/19	2	Dry	5.6	14	6.4	1.6	260	260	75			
SS2 - 0.4-1m	05/07/19	2	Dry	5.5	14	7.6	1.6	180	180	86			
SS3 - Surface	05/07/19	1	Very Slightly Moist	-	-	-	-	-	-	-			
SS3 - 0-0.4	05/07/19	2	Moist	5.5	41	8.0	9.0	320	330	110			
SS3 - 0.4-1	05/07/19	2	Moist	5.4	28	9.9	5.3	140	140	78			
SS4 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS4 - 0-0.4m	05/07/19	2	Moist	5.4	26	11.2	2.6	370	370	104			
SS4 - 0.4-1m	05/07/19	3	Moist	5.0	53	12.0	9.6	180	190	78			
SS5 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS5 - 0-0.4m	05/07/19	2	Moist	5.8	17	10.2	2.8	290	290	92			
SS5 - 0.4-1m	05/07/19	2	Moist	5.3	24	12.0	6.7	160	170	90			
SS6 - Surface	05/07/19	1	Moist	-	-	-	-	-	-	-			
SS6 - 0-0.4m	05/07/19	2	Moist	5.6	21	10.6	3.9	380	380	102			
SS6 - 0.4-1m	05/07/19	3	Moist	5.6	16	10.4	2.8	250	250	83			
SS7 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS7 - 0-0.4m	05/07/19	2	Dry	8.0	91	8.8	2.5	300	300	68			
SS7 - 0.4-1m	05/07/19	3	Dry	6.0	12	4.4	0.9	190	190	62			
SS8 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS8 - 0-0.4m	05/07/19	2	Slightly Moist	6.4	19	7.2	1.9	200	200	65			
SS8 - 0.4-1m	05/07/19	2	Slightly Moist	5.9	21	10.0	1.6	290	290	85			
SS9 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS9 - 0-0.4	05/07/19	2	Slightly Moist	8.1	136	9.3	3.8	780	780	84			
SS9 - 0.4-1	05/07/19	3	Moist	8.0	149	12.0	2.8	920	920	115			
SS10 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS10 - 0-0.4m	05/07/19	1	Moist	7.0	35	8.1	3.8	350	350	72			
SS10 - 0.4-1m	05/07/19	2	Moist	7.1	40	11.4	4.2	280	280	94			
SS11 - Surface	05/07/19	1	Dry	-	-	-	-	-	-	-			
SS11 - 0-0.4m	05/07/19	2	Moist	7.1	35	7.4	3.7	240	240	81			
SS11 - 0.4-1m	05/07/19	2	Moist	7.0	26	11.9	3.8	210	210	100			

SS1 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS1 - 0-0.4m	21/01/21	2	Moist	5.1	17	12.1	2.2	640	640	151			
SS1 - 0.4-1m	21/01/21	2	Moist	5.0	22	14.6	6.2	180	190	131			
SS2 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS2 - 0-0.4m	21/01/21	2	Moist	4.9	17	9.6	2.7	260	260	87			
SS2 - 0.4-1m	21/01/21	2	Moist	5.0	9	11.7	1.0	190	190	123			
SS3 - Surface	21/01/21	1	Slightly Moist	-	-	-	-	-	-	-			
SS3 - 0-0.4	21/01/21	2	Slightly Moist	5.0	22	16.2	6.9	410	420	132			
SS3 - 0.4-1	21/01/21	2	Slightly Moist	4.8	26	16.1	7.5	240	250	126			
SS4 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS4 - 0-0.4m	21/01/21	2	Moist	4.7	43	13.9	6.8	310	320	137			
SS4 - 0.4-1m	21/01/21	3	Moist	4.9	24	14.6	5.0	160	160	99			
SS5 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS5 - 0-0.4m	21/01/21	2	Moist	5.5	20	13.4	1.0	610	610	166			
SS5 - 0.4-1m	21/01/21	2	Moist	5.1	15	13.4	0.7	200	200	120			
SS6 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS6 - 0-0.4m	21/01/21	2	Moist	5.3	13	12.4	0.8	300	300	107			
SS6 - 0.4-1m	21/01/21	3	Moist	5.2	8	12.1	1.4	190	190	92			
SS7 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS7 - 0-0.4m	21/01/21	2	Moist	5.7	6	7.3	0.2	120	120	47			
SS7 - 0.4-1m	21/01/21	3	Moist	6.0	9	12.6	0.2	390	390	69			
SS8 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS8 - 0-0.4m	21/01/21	2	Moist	6.4	14	11.9	1.1	270	270	83			
SS8 - 0.4-1m	21/01/21	2	Moist	7.0	26	16.7	0.5	180	180	99			
SS9 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS9 - 0-0.4	21/01/21	2	Moist	4.4	98	13.0	<0.1	210	210	91			
SS9 - 0.4-1	21/01/21	3	Moist	6.2	34	16.4	<0.1	120	120	108			
SS10 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS10 - 0-0.4m	21/01/21	1	Moist	7.8	43	9.5	0.3	290	290	86			
SS10 - 0.4-1m	21/01/21	2	Moist	7.6	46	12.2	0.6	310	310	128			

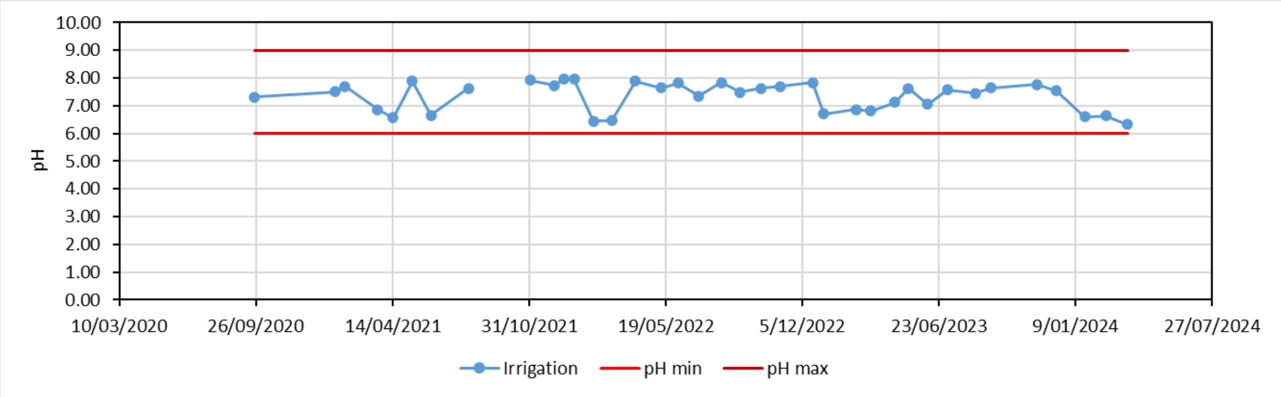
SS11 - Surface	21/01/21	1	Moist	-	-	-	-	-	-	-			
SS11 - 0-0.4m	21/01/21	2	Moist	6.4	16	10.9	1.6	280	280	73			
SS11 - 0.4-1m	21/01/21	2	Moist	5.5	13	13.9	<0.1	170	170	97			
SS1	09/06/21	1	-	-	-	-	-	-	-	-	1000	23000	<12
SS2	09/06/21	1	-	-	-	-	-	-	-	-	8700	26000	<11
SS4	09/06/21	1	-	-	-	-	-	-	-	-	2000	16000	<13
SS6	09/06/21	1	-	-	-	-	-	-	-	-	2300	9500	<12
SS8	09/06/21	1	-	-	-	-	-	-	-	-	1100	28000	<12
SS9	09/06/21	1	-	-	-	-	-	-	-	-	2400	27000	390
SS10	09/06/21	1	-	-	-	-	-	-	-	-	500	100	<11
SS1	15/02/22	2	Moist	5.2	85	15.3	2.1	550	550	119	910	1200	100
SS2	15/02/22	2	Moist	4.8	42	14.6	0.9	290	290	92	800	1500	140
SS4	15/02/22	2	Moist	4.9	34	18.3	4.0	160	160	86	160	280	<13
SS6	15/02/22	2	Moist	5.0	43	14.6	0.4	210	210	78	320	31000	<13
SS8	15/02/22	2	Moist	6.0	98	11.2	1.1	260	260	86	360	1600	490
SS9	15/02/22	2	Moist	7.2	153	9.9	0.7	470	470	75	230	210	<11
SS10	15/02/22	2	Moist	6.0	107	10.5	0.8	220	220	80	1600	59	<11
SS1	07/02/23	2		4.6	35	14.1	1	210	210	108	36	60	<11
SS2	07/02/23	2		5.1	37	16.7	0.5	250	250	92	140	1200	<12
SS4	07/02/23	2		5	30	15.9	0.4	210	210	97	450	470	23
SS6	07/02/23	2		5.1	44	14.6	2.5	280	280	112	500	420	<11
SS8	07/02/23	2		5.8	94	11.7	1.5	230	230	208	34	45	<11
SS9	07/02/23	2		5.3	73	15.5	0.2	260	260	96	470	200	<12
SS10	07/02/23	2		5.2	60	15	1.2	340	340	106	86	<12	<12
SS1	06/02/24	2	Wet	7.1	126	20	0.4	590	590	94	360	4700	<12
SS2	06/02/24	2	Moist	7.1	132	15.7	0.9	300	300	89	130	37	<12
SS4	06/02/24	2	Moist	7.6	371	12.1	3.2	350	350	112	550	7900	<11
SS6	06/02/24	2	Moderately Moist	7.2	125	8.5	0.4	320	320	76	<11	22	<11
SS8	06/02/24	2	Moderately Moist	7.3	176	13.6	0.6	300	300	99	180	<11	<11
SS9	06/02/24	2	Moderately Moist	7.8	195	10.3	2	390	390	76	110	22	11

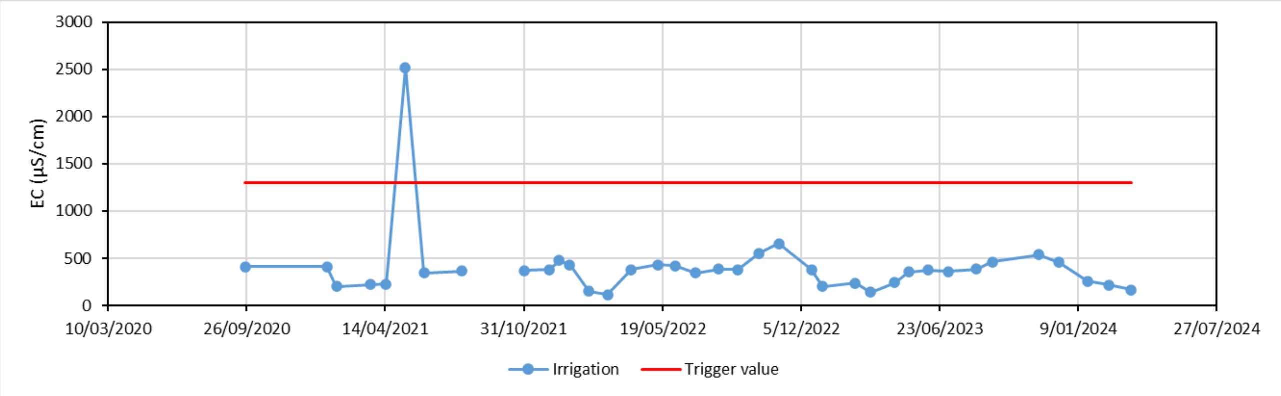
SS10
06/02/24 2
Moderately Moist 7.8
127 11.3
1.2 250
250 84
35 <11

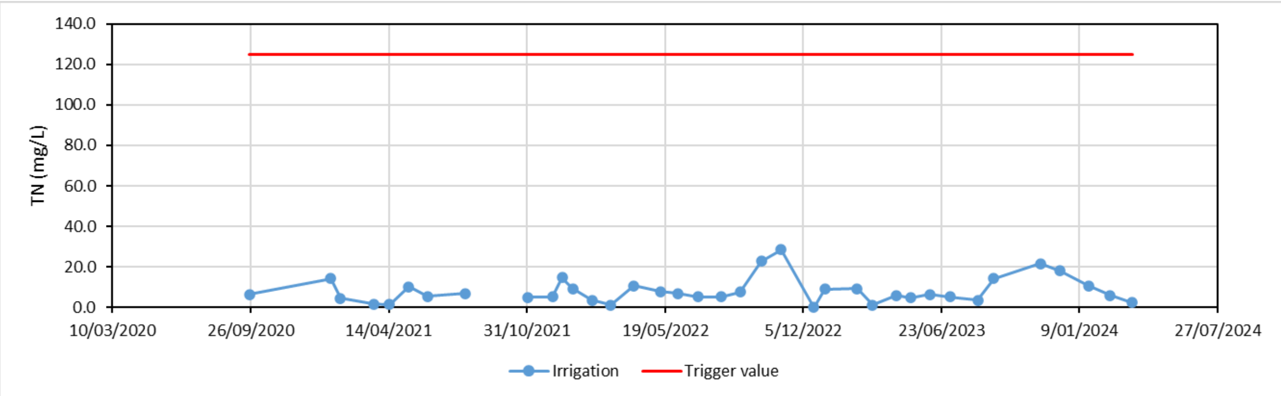
<11

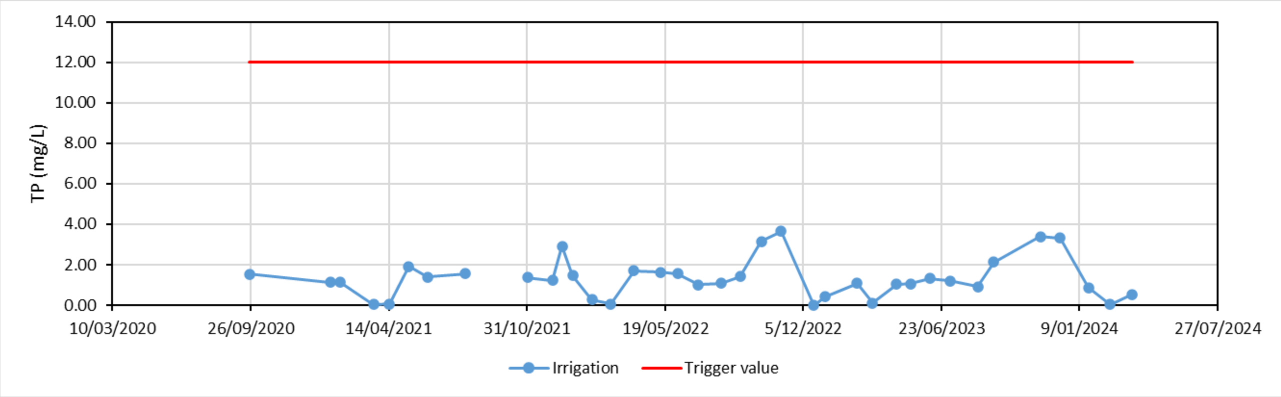
APPENDIX B HISTORICAL DATA PLOTS

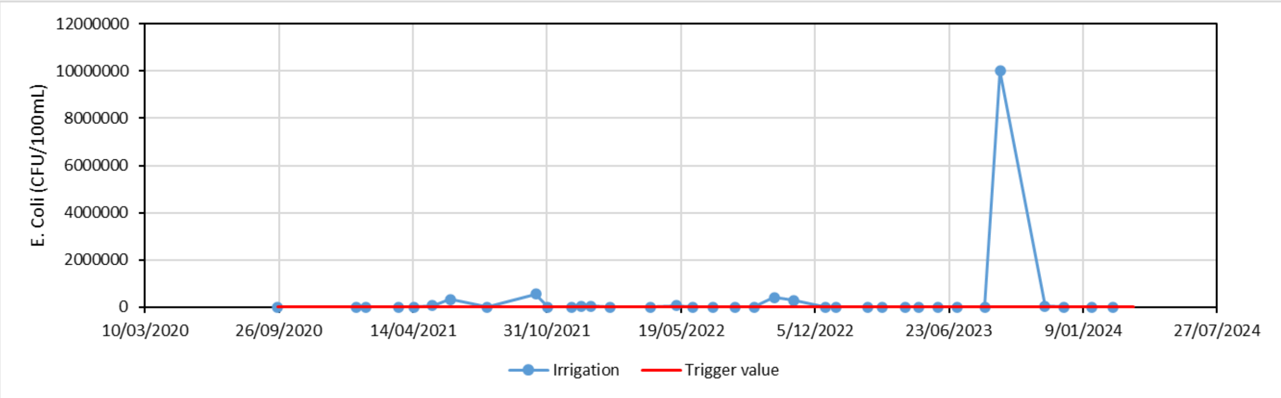
Irrigation

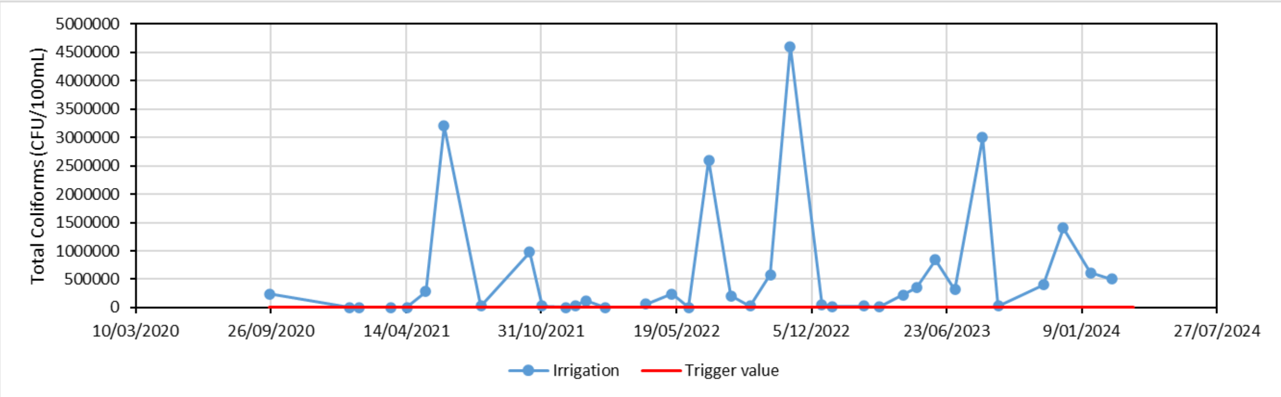

pH
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
pH min
pH max

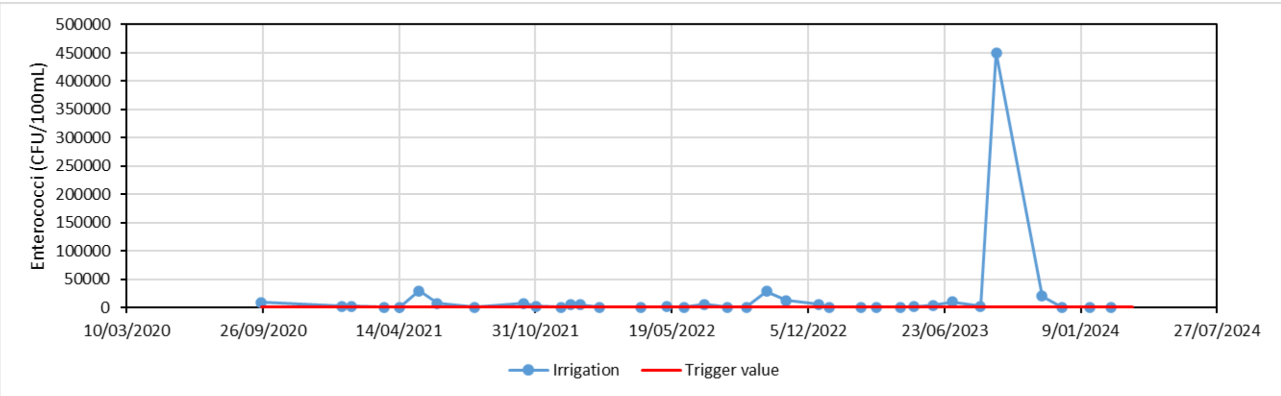

EC (µS/cm)
3000
2500
2000
1500
1000
500
0
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value


TN (mg/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value

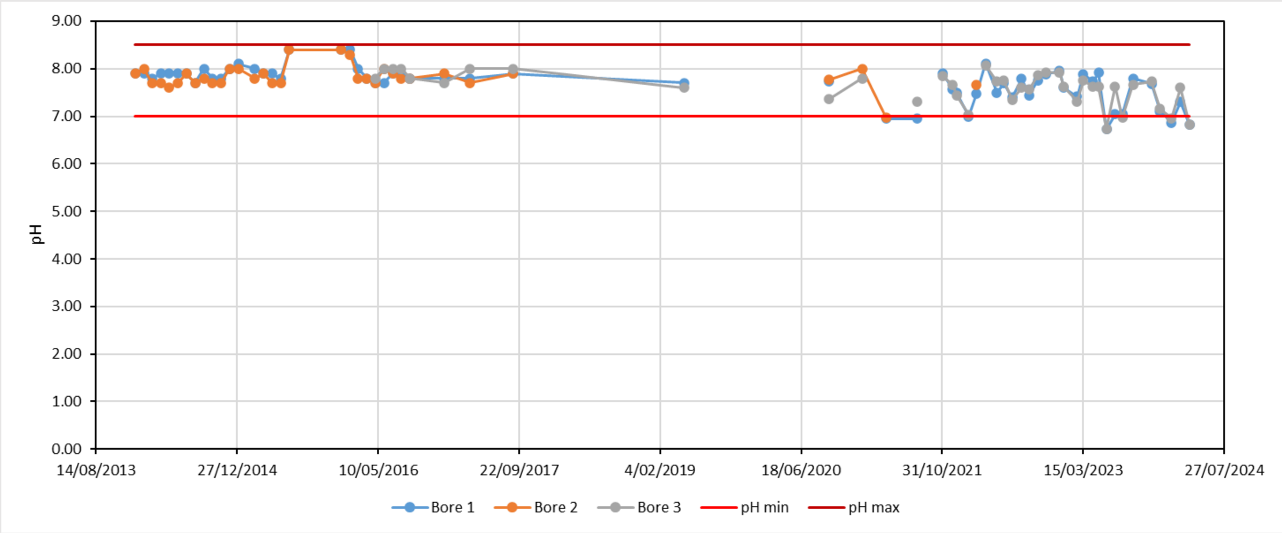

TP (mg/L)
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value

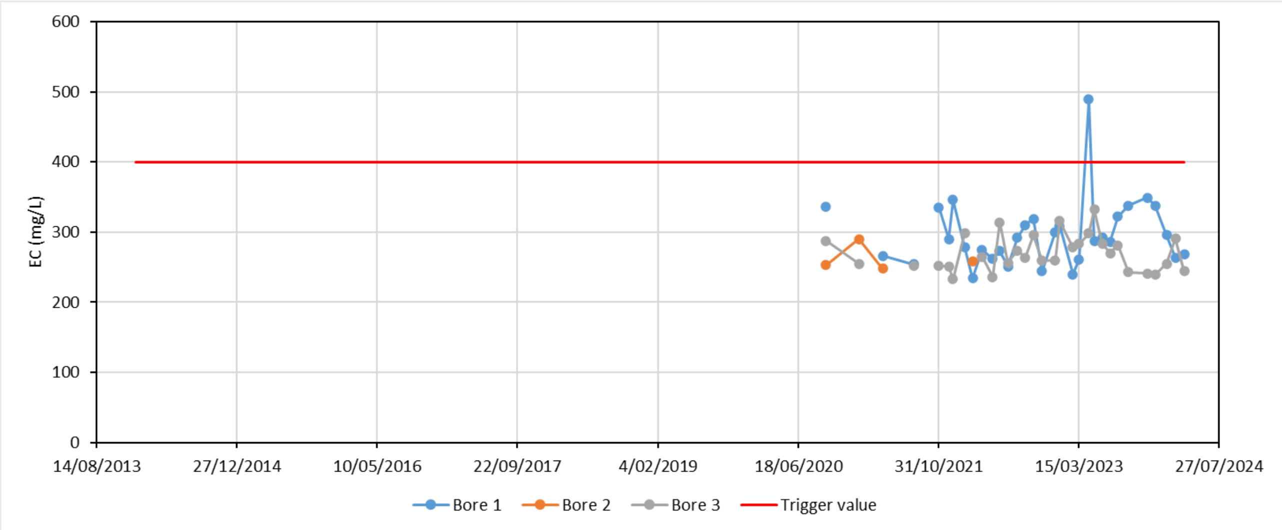

E. Coli (CFU/100mL)
12000000
10000000
8000000
6000000
4000000
2000000
0
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value

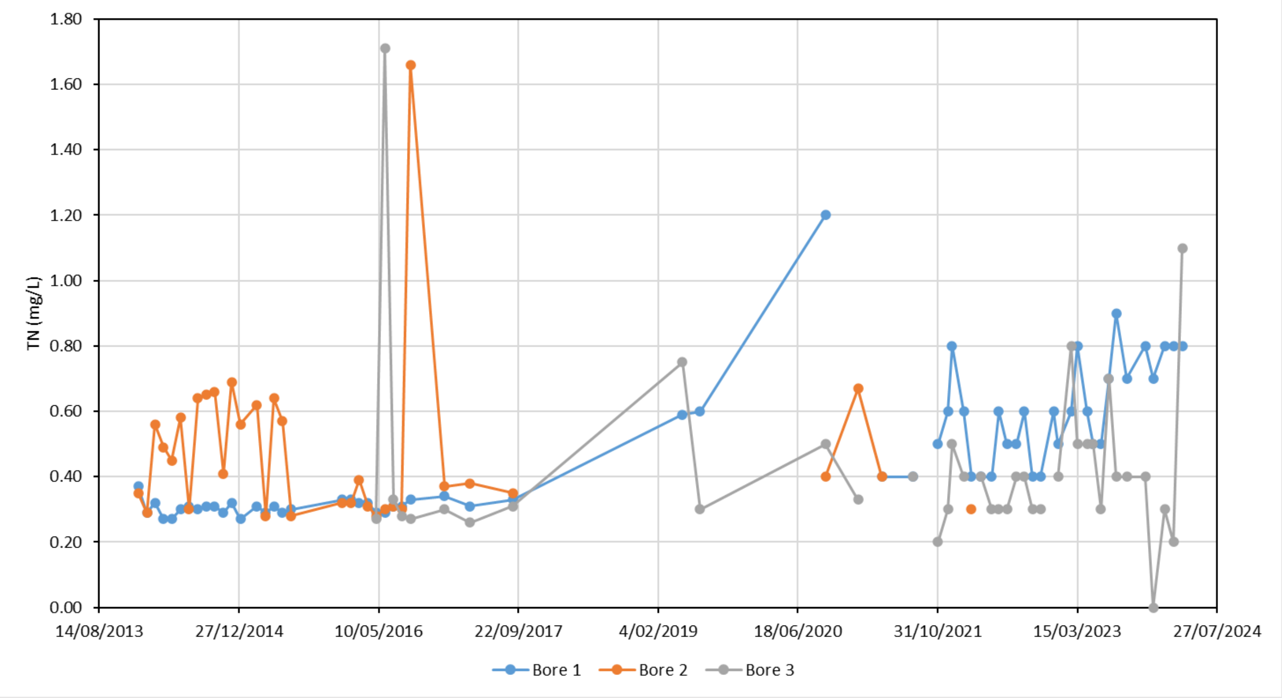

Total Coliforms (CFU/100mL)
5000000
4500000
4000000
3500000
3000000
2500000
2000000
1500000
1000000
500000
0
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value


Enterococci (CFU/100mL)
500000
450000
400000
350000
300000
250000
200000
150000
100000
50000
0
10/03/2020
26/09/2020
14/04/2021
31/10/2021
19/05/2022
5/12/2022
23/06/2023
9/01/2024
27/07/2024
Irrigation
Trigger value

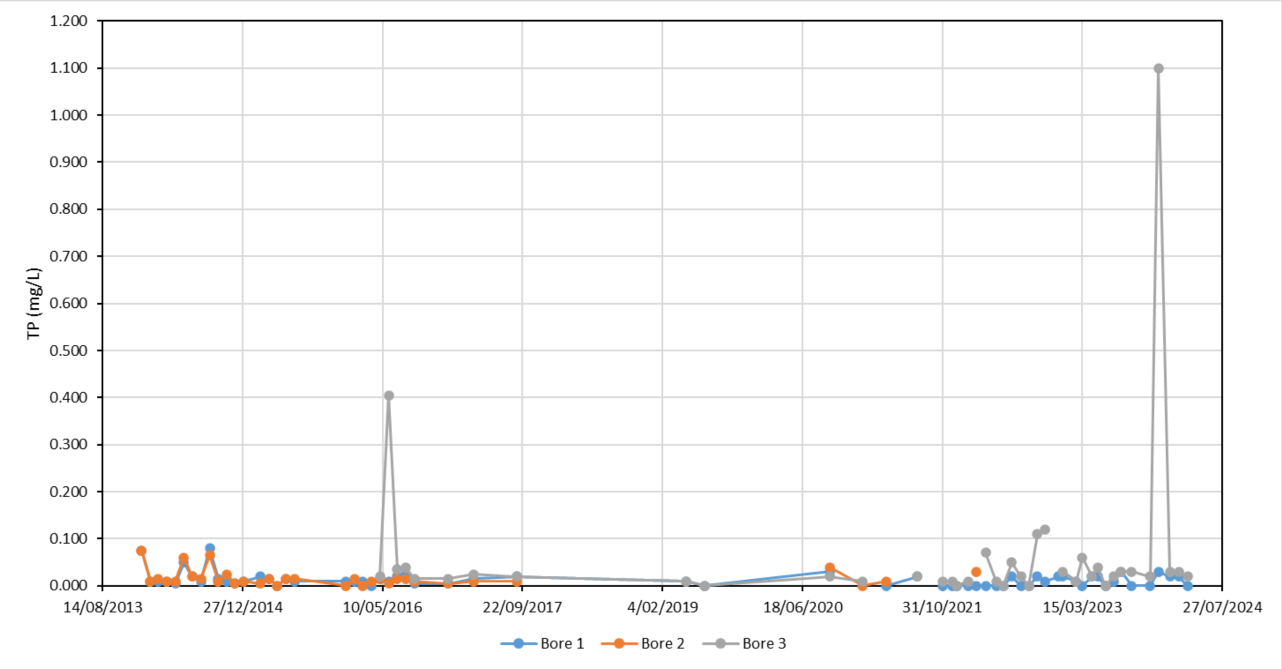
Groundwater



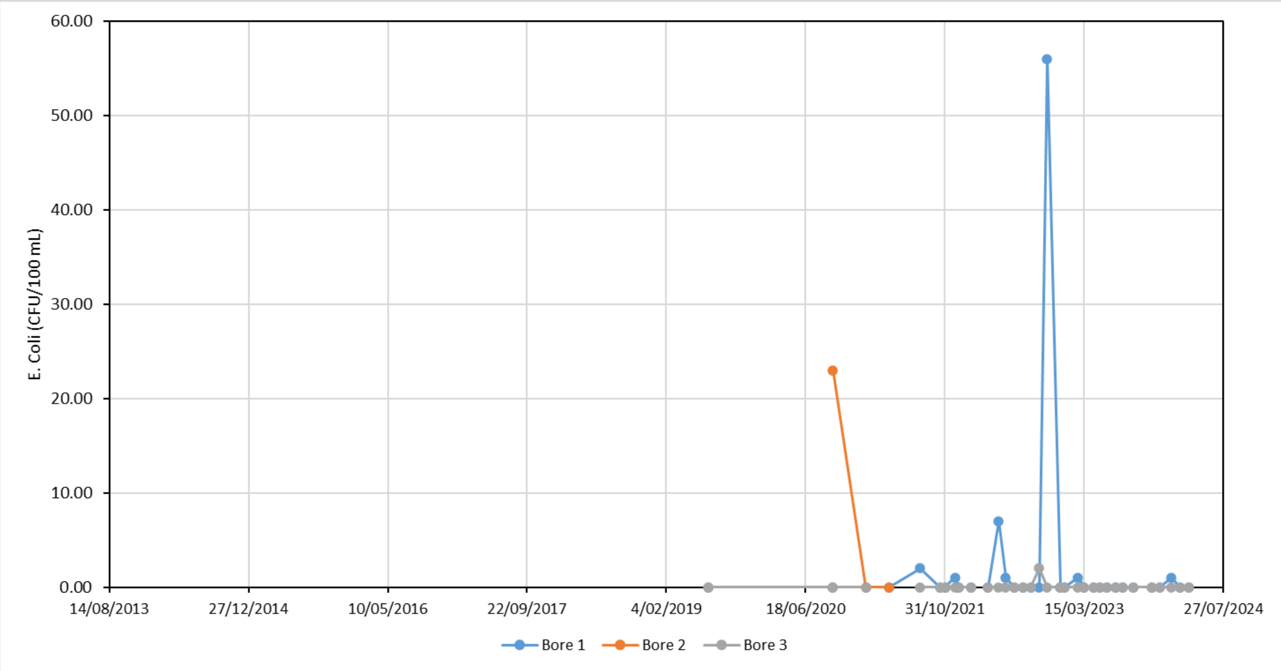


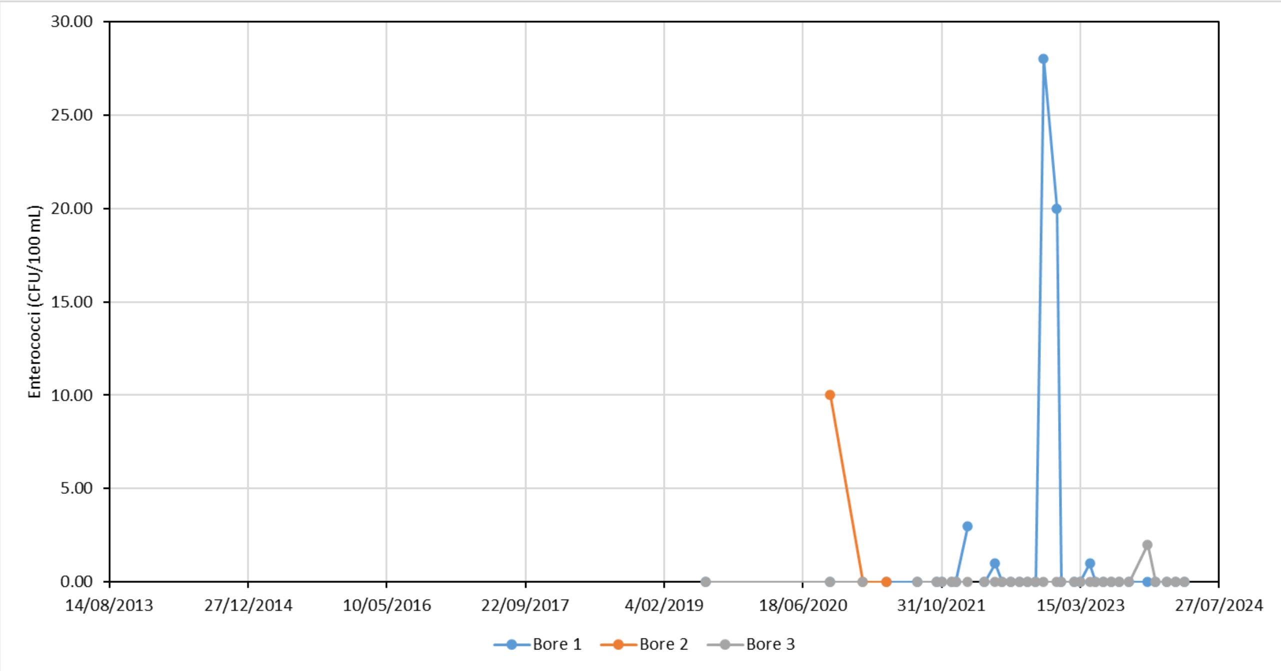


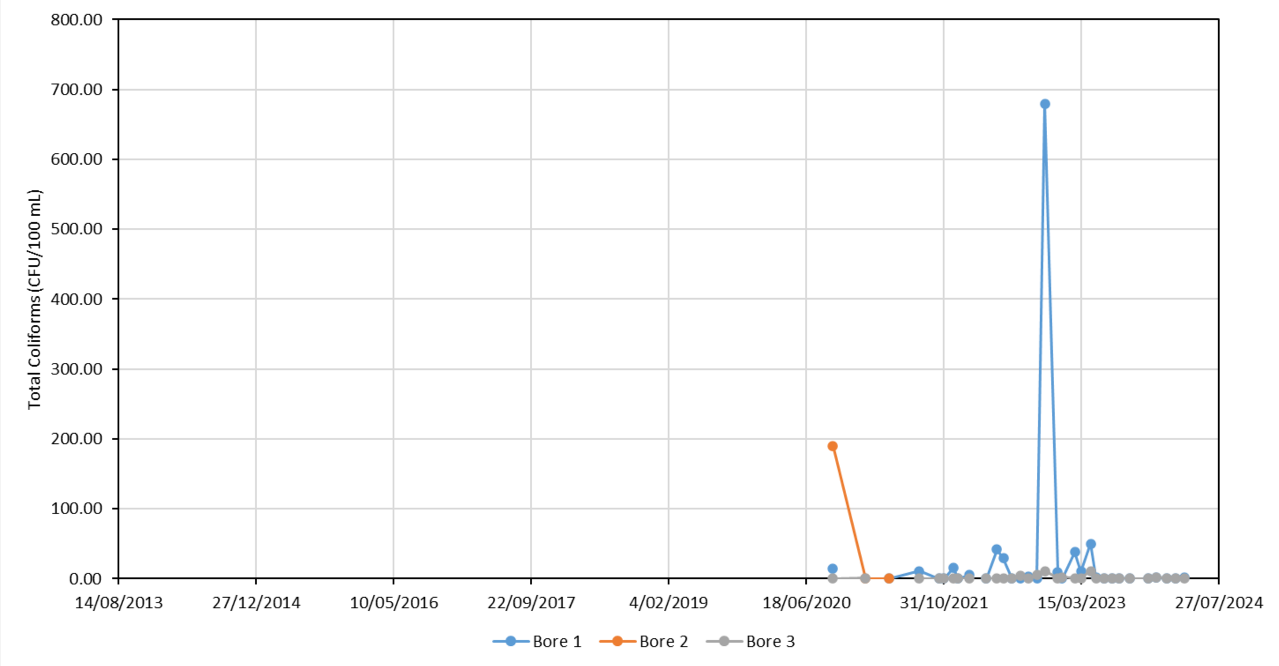
TN (mg/L)
1.80
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Bore 1
Bore 2
Bore 3



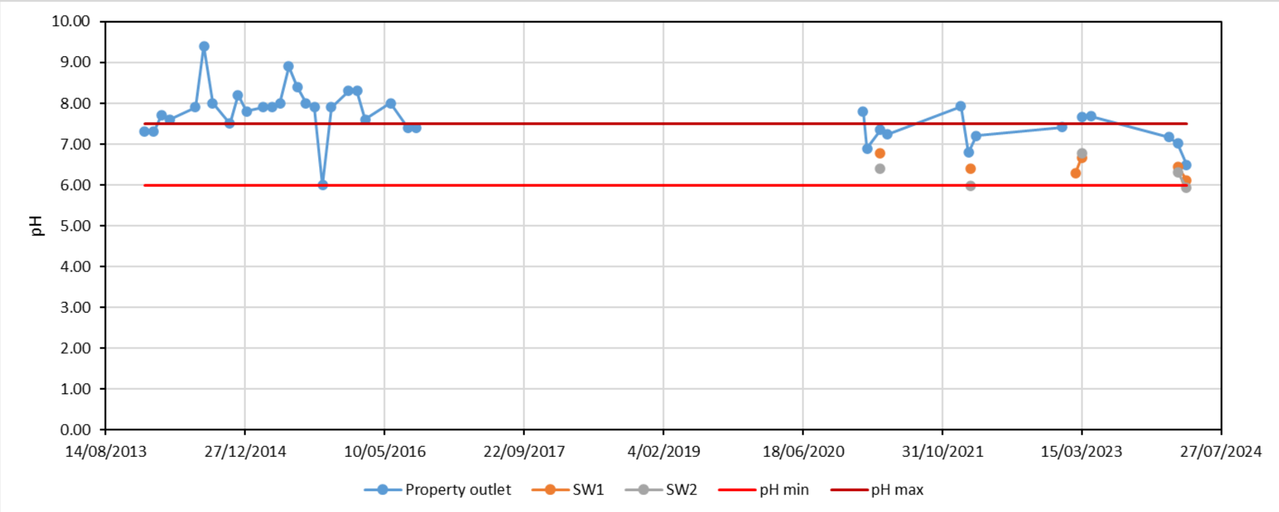
TP (mg/L)
1.200
1.100
1.000
0.900
0.800
0.700
0.600
0.500
0.400
0.300
0.200
0.100
0.000
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Bore 1
Bore 2
Bore 3

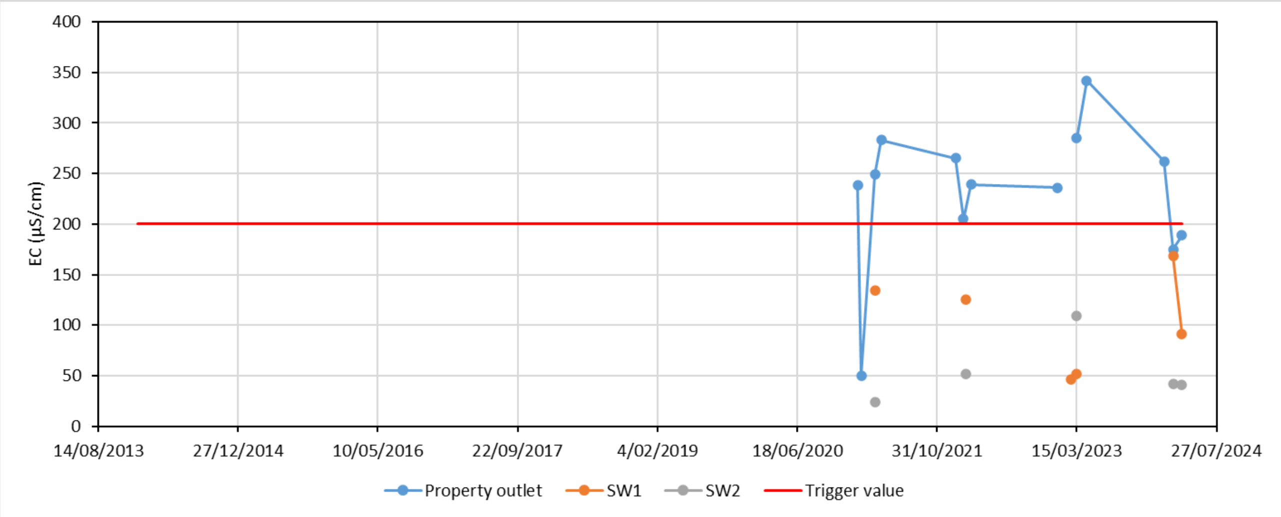

60.00
50.00
40.00
30.00
20.00
10.00
0.00
E. Coli (CFU/100 mL)
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Bore 1
Bore 2
Bore 3


30.00
25.00
20.00
15.00
10.00
5.00
0.00
Enterococci (CFU/100 mL)
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Bore 1
Bore 2
Bore 3

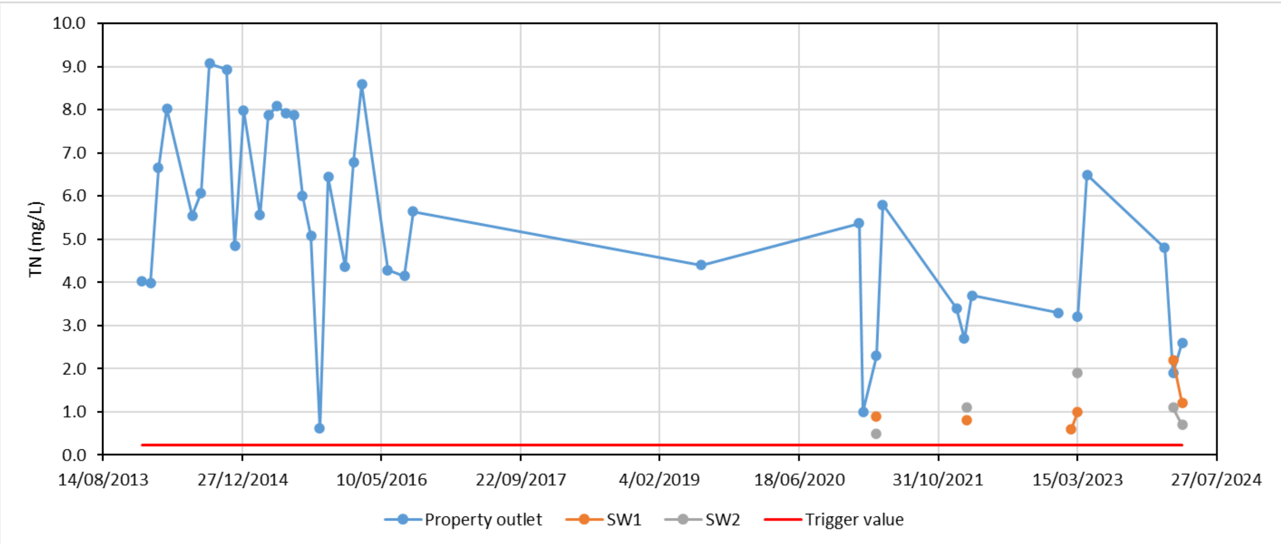


Surface water

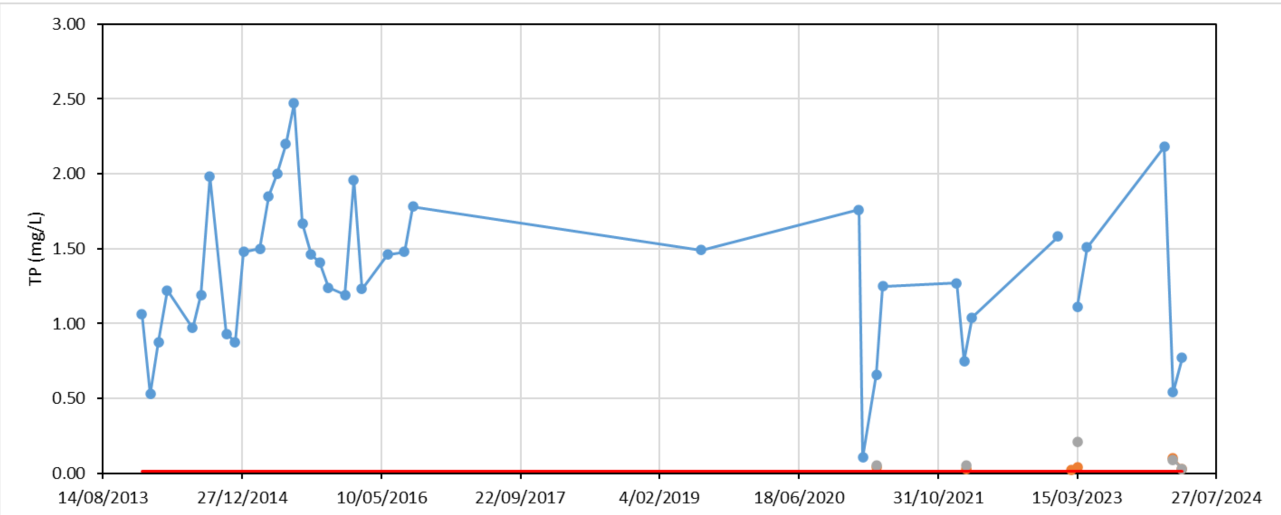




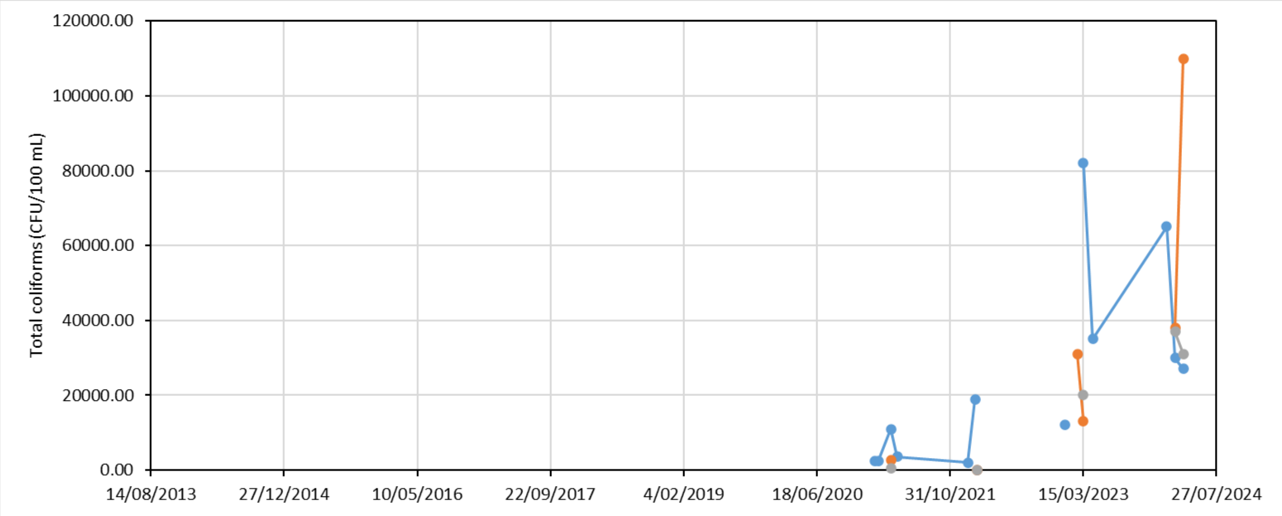
EC (µS/cm)
0
50
100
150
200
250
300
350
400
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Property outlet
SW1
SW2
Trigger value



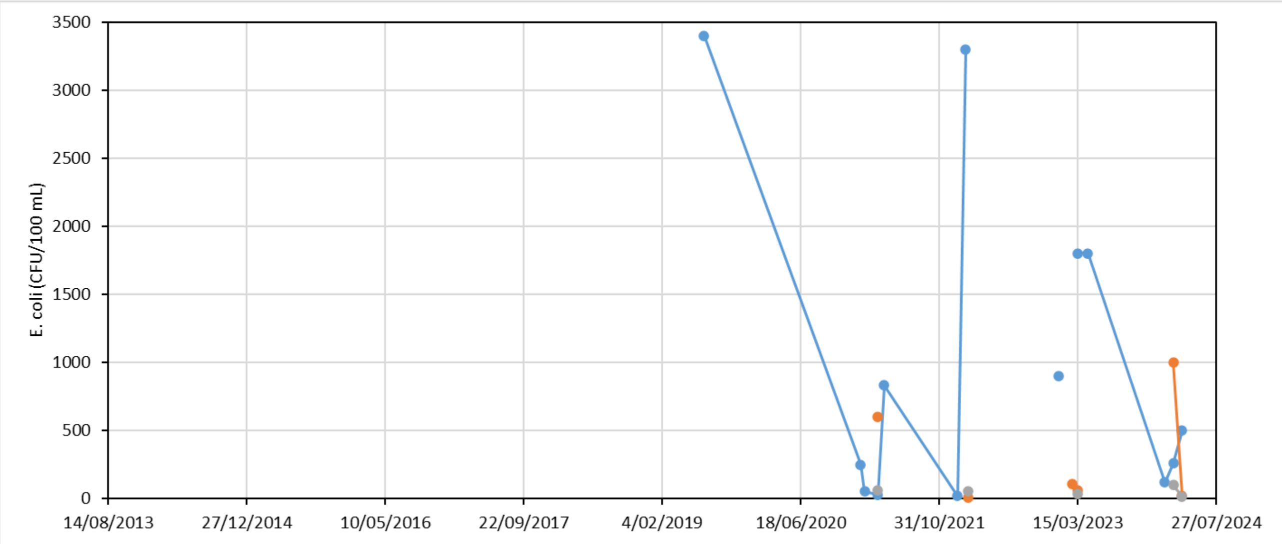
TN (mg/L)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024
Property outlet
SW1
SW2
Trigger value



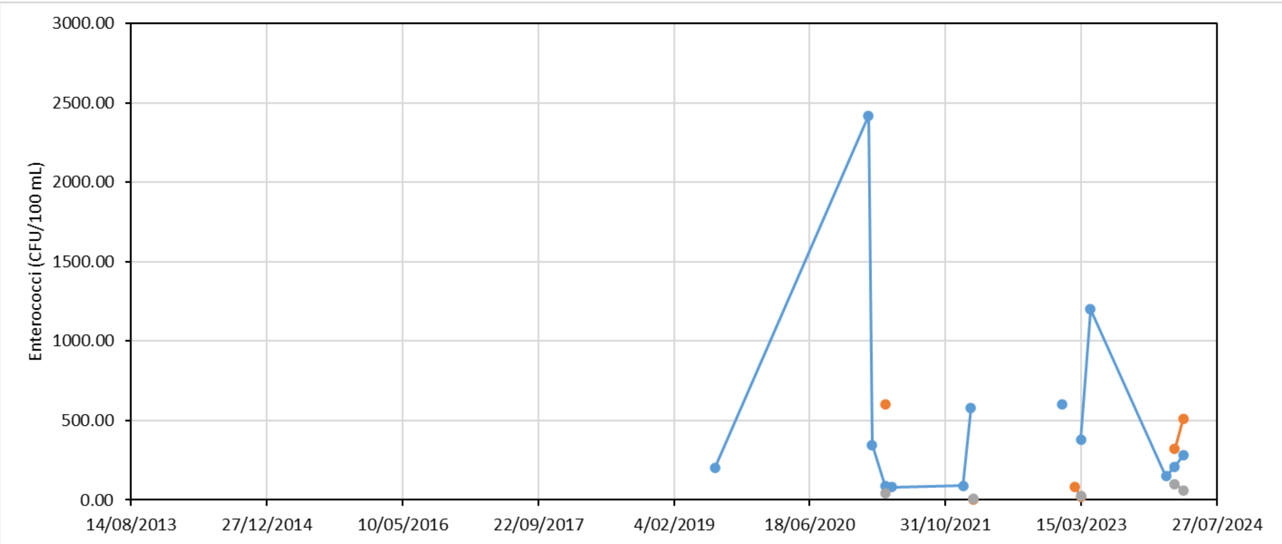
TP (mg/L)
0.00
0.50
1.00
1.50
2.00
2.50
3.00
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024



120000.00
100000.00
80000.00
60000.00
40000.00
20000.00
0.00
Total coliforms (CFU/100 mL)
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024

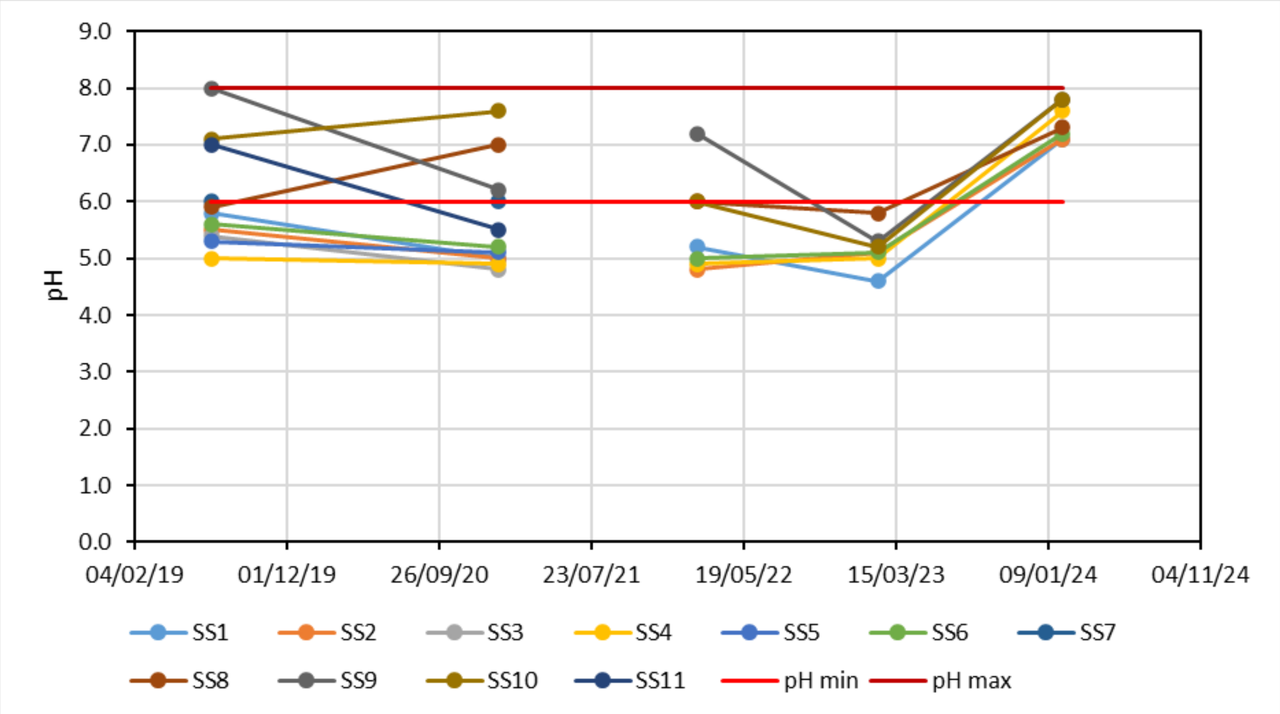


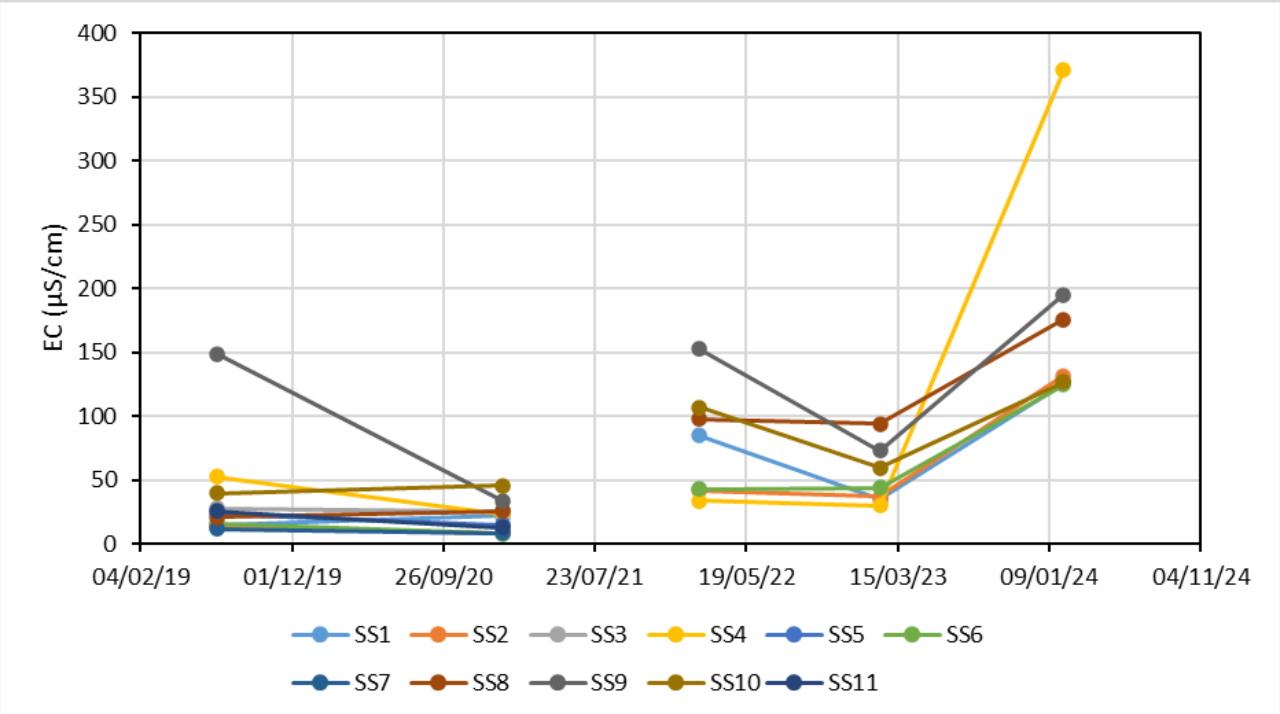
3500
3000
2500
2000
1500
1000
500
0
E. coli (CFU/100 mL)
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024

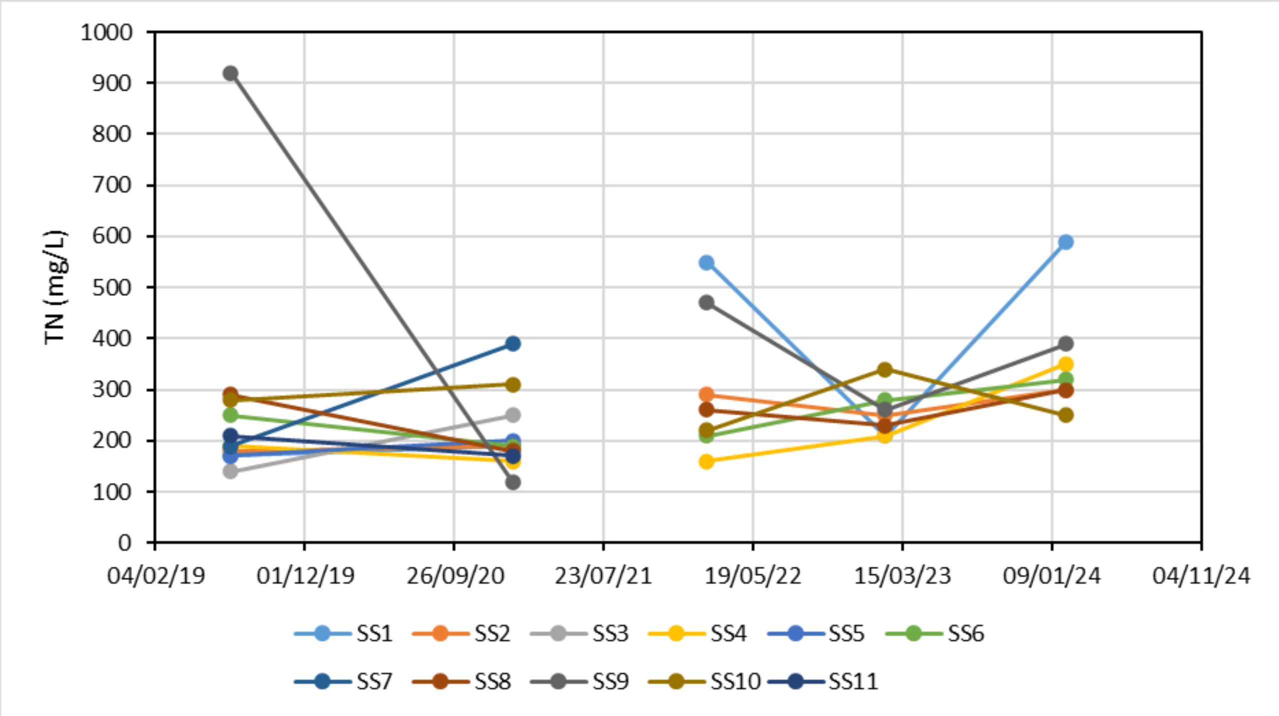


3000.00
2500.00
2000.00
1500.00
1000.00
500.00
0.00
Enterococci (CFU/100 mL)
14/08/2013
27/12/2014
10/05/2016
22/09/2017
4/02/2019
18/06/2020
31/10/2021
15/03/2023
27/07/2024

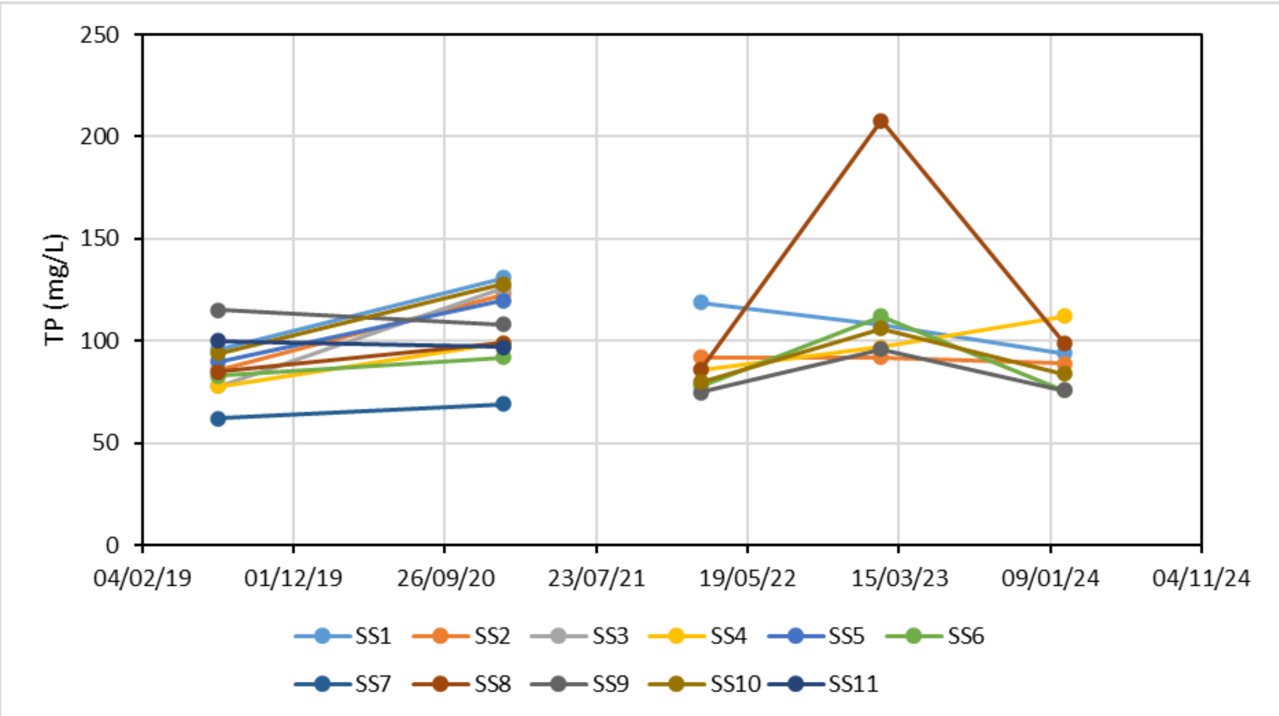
Soil


9.0
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
pH
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11
pH min
pH max

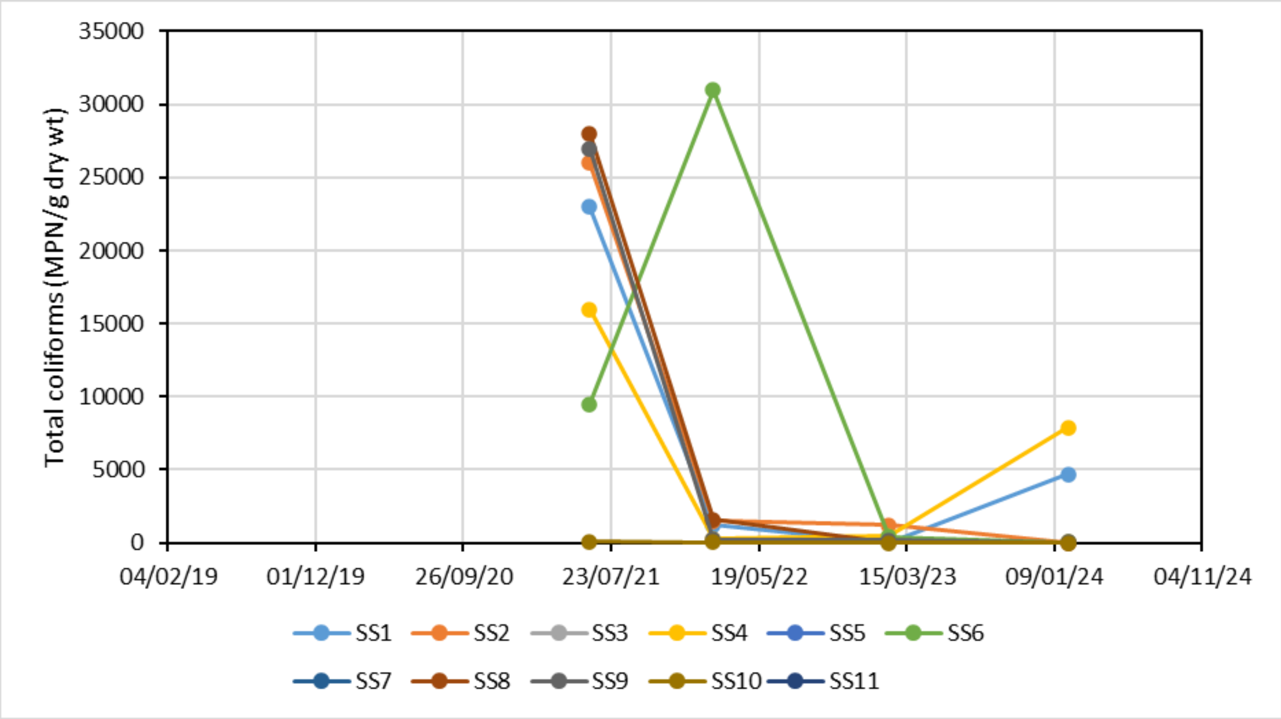

400
350
300
250
200
150
100
50
0
EC (µS/cm)
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11

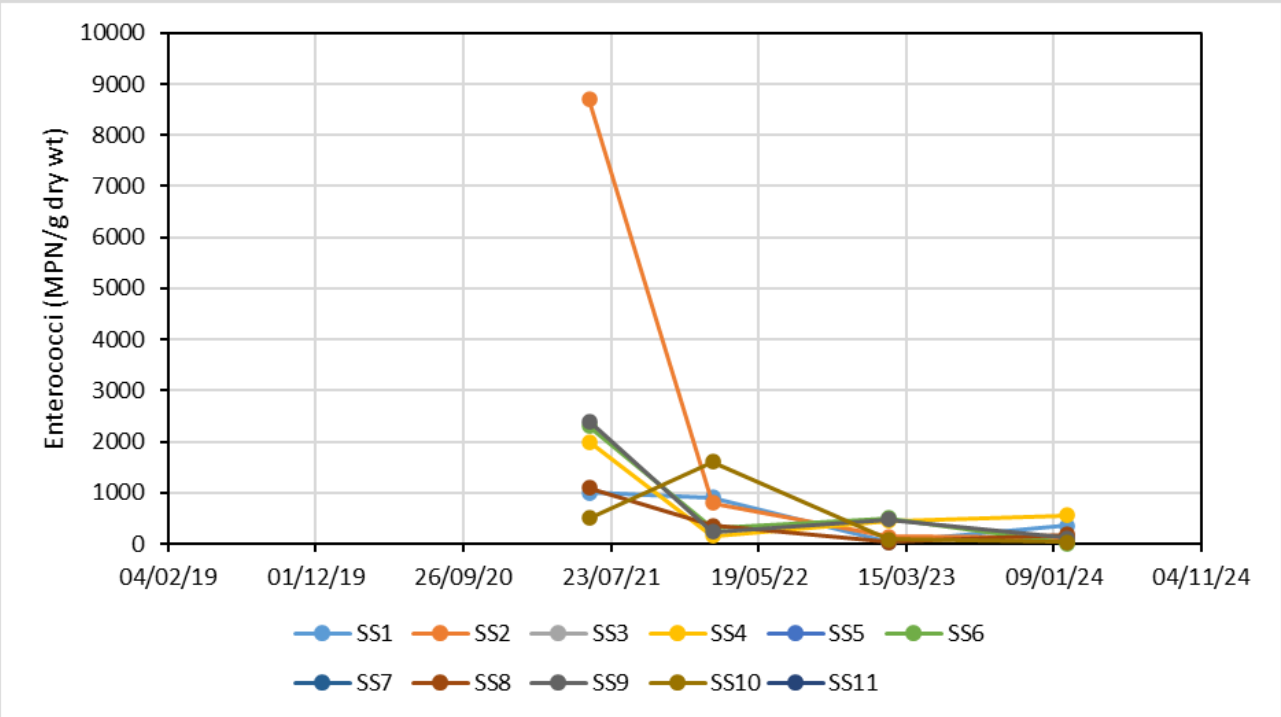


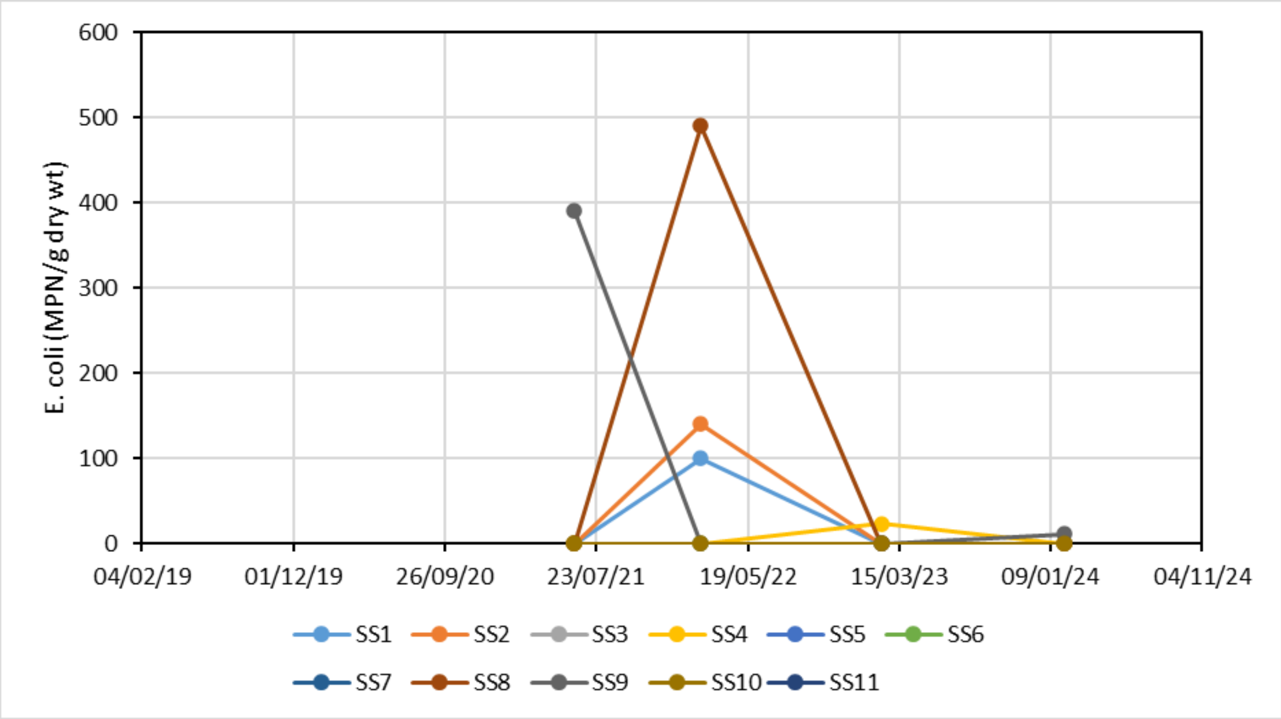
TN (mg/L)
1000
900
800
700
600
500
400
300
200
100
0
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11



TP (mg/L)
250
200
150
100
50
0
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11


Total coliforms (MPN/g dry wt)
35000
30000
25000
20000
15000
10000
5000
0
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11


Enterococci (MPN/g dry wt)
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11


600
500
400
300
200
100
0
E. coli (MPN/g dry wt)
04/02/19
01/12/19
26/09/20
23/07/21
19/05/22
15/03/23
09/01/24
04/11/24
SS1
SS2
SS3
SS4
SS5
SS6
SS7
SS8
SS9
SS10
SS11

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QMS Certification Services

APPROVED COMPANY AS/NZS 4801 Occupational Health & Safety Management Systems
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APPROVED COMPANY ISO 9001 Quality Management Systems
QMS Certification Services