

EPL343 Monitoring Report

Top Croc NT Crocodile Farm

Reporting period 13 September 2022 – 13 September 2023

Top Organic Enterprises Pty Ltd

27 September 2023

Document Details

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PROJECT LOCATION:	Section 2233 in the Hundred of Cavanagh, 1350 Old Bynoe Road, Berry Springs, NT
PROJECT DESCRIPTION:	Monitoring Report per Condition 51 of EPL 343 covering all water quality monitoring undertaken for the reporting period starting 13 September 2022 and ending 13 September 2022
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DATE PREPARED:	27 September 2023

Confidentiality

This submission has been prepared for Top Organic Enterprises Pty Ltd t/a Top Croc NT. It is presented as 'Commercial and In-Confidence' on the basis that it is to be viewed only by Top Croc NT and their client and those parties who are providing immediate professional advice around this project; and shall not be transmitted to any other party without the prior written consent of ENVR Solutions Pty Ltd.

This submission has been informed by data and documents received from Top Croc NT, information, and material available, such as online and guidelines and policies as issued by NT regulative authorities.

The authors of this proposal take no responsibility for the accuracy of the figures provided by others contained within.

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1 Introduction

Top Organics Enterprises Pty Ltd (Top Organics) operate the Top Croc NT Pty Ltd (TCNT) Crocodile Farm in Berry Springs, comprising of a small crocodile farm and abattoir for the raising and processing of crocodiles for skins and meat. TCNT's operations result in the generation of animal effluent, a listed waste under Schedule 2 of the Waste Management and Pollution Control (Administration) Regulations. In accordance with the requirements of the 'NT Waste Management and Pollution Control Act', TCNT operates under Environmental Protection Licence EPL343 to address the ongoing production and management of animal effluent. As a requirement of this licence, Top Organics has implemented and maintained a Monitoring Plan as shown in Section 7 of Attachment A of EPL343 on commencement date 13 September 2022.

Monitoring Reports are required annually as per Condition 51 of EPL 343, and this Monitoring Report covers all water quality monitoring undertaken for the reporting period starting 13 September 2022 and ending 13 September 2023 herein referred to as the 'reporting period'.

1.1 Purpose and scope

This Monitoring Report is prepared in accordance with the following EPL343 conditions:

Condition 51

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

Condition 52

The licensee must ensure that each Monitoring Report:

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

52.2 includes a tabulation of all monitoring data required as a condition of this licence.

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

52.4 reports on all trigger value exceedances and investigations required as a condition of this licence.

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52.5 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

52.6 includes an assessment of environmental impact from the activity.

1.2 EPL343 compliance monitoring and reporting

EPL343 authorises wastewater discharge to land from the authorised discharge point WSP0 (see Figure 1) on the eastern corner of the onsite Waste Stabilisation Pond (WSP) located centrally along the property's northern boundary (latitude -12.76854 longitude 130.98158). During the wet season, the WSP discharges during heavy rainfall events over the boundary following natural drainage contours towards the Darwin River, 210 m to the east.

In order to monitor for potential environmental impacts from this activity, surface water, groundwater and wastewater quality monitoring has been undertaken in accordance with Attachment A of EPL343 and all monitoring related conditions of the licence (i.e., Conditions 36 to 41).

Furthermore, discharge monitoring from the authorised discharge point has been undertaken during the reporting period in accordance with Conditions 32 to 35, and volumes and timing of discharge events are shown in Table 1.

Water quality monitoring has been undertaken in accordance with the Environmental Monitoring Plan in Section 7 of the *Supporting Information Report* (ENVR 2022), and onsite and offsite monitoring locations are shown in Figures 2 and 3. Tables 3, 4 and 5 lists the required water quality parameters to be measured, the frequency of sampling and the trigger values for determining compliance. All monitoring laboratory analysis results are shown in Tables 6 – 12.





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SITE MONITORING LOCATIONS





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PROJECT : TOP CROC N.T. CROCODILE FARM	DRAWING No: TCN - LN/L - 005. A3 ISSUE: 02	

OFFSITE MONITORING LOCATIONS

2 TCNT Operations Overview

2.1 Farm Operations

The crocodile production process is summarised as follows:

- There is no breeding or hatching program within the site.
- Farming operations source juvenile crocodiles from other farms within the Darwin region, which are raised in large communal hatchling ponds.
- When animals grow to approximately 1.2 m, they are transferred to individual finishing pens where they are housed until they are ready for harvesting.
- Animals are harvested from the finishing pens and euthanised onsite on an ad-hoc, as needed basis. The animal is then taken to the small onsite abattoir where the skin is then removed for export and the carcass filleted of meat which is then sold for restaurant cuisine or as pet meat.
- The farm currently contains approximately 1,000 crocodiles.

The extent of existing crocodile farming operations comprises:

- Three groups of crocodile pens in shallow (less than 0.5 metres deep) PVC-lined channels. Each channel is approximately 24 metres long and 1-2 metres wide, with the channels segmented into individual pens, and the channels completely enclosed, with 5-sided chainmesh and shade cloth covering.
- The pens are located within the existing fenced crocodile enclosure, covered with bird netting from the pre-existing rambutan farm.
- A small ancillary abattoir (11.6m²) which currently process crocodiles from the farm for skins and meat. Skins are the primary product and are processed for wholesale and export, for manufacture into leather goods. Meat is processed for human and animal (pet meat) consumption.
- All ancillary components of the farm including the workshop and storage areas (also associated with the ongoing horticultural components), cold storage and machinery.

2.2 Water Supply

A single domestic bore (RN 034907) provides groundwater for site operations. Top Organics holds a groundwater extraction license (Licence No. BSGS10040) with a total

maximum extraction allowance of 63 ML/year, 60 ML of which is allocated to agriculture and 3 ML to aquaculture.

TCNT manages supply of water into the pens by following a 'drop and fill' process where water is manually fed into each row of pens by use of ball valve control, on an as needed basis.

2.3 Wastewater flows

Wastewater effluent discharged from all pen enclosures flows into an unlined drainage channel running along the northern boundary of the property. The channel drains wastewater east where it is collected in a WSP measures approximately 20 m x 40 m x 2 m deep and has approximately 1 ML of holding capacity. The WSP operates as a facultative treatment pond with distinctive and stratified aerobic and anaerobic zones. The WSP features a floating curtain wall which improves flow distribution and retention time of the wastewater.

Throughout the majority of the year, water is lost from the WSP via high rates of evaporation, and some water is lost to exfiltration. During the wet season, the WSP will discharge during heavy rainfall events from a combination of surface flow water, groundwater infiltration and rainwater entering the WSP and filling up the storage volume. During discharge events, water flows over a concrete open channel on the eastern outfall the WSP into the neighbouring property to the north, and flows through natural drainage contours towards the Darwin River, 210 m to the east. All discharges are passive with a significant proportion of the coming from overland stormwater flow collecting into the WSP. To monitor and record discharge events, the open concrete channel has been fitted with a 'Greyline AVFM 6.1' submersible ultrasonic sensor (manufactured by Pulsar Measurement) secured to the base of the channel which measures discharge flow volume, velocity, level and temperature, and records saves all data in 30 second timestamps.

Wastewater from the abattoir discharges into two separate plastic and concrete septic tanks of a combined volume of 7,000 L allowing for 14 days hydraulic retention time (HRT) on an estimated daily discharge of 500 L/day. Primary clarified effluent exiting the septic tank is gravity fed into two soil absorption trenches where it is percolated into the soil and renovated via naturally occurring biogeochemical processes within the soil matrix.

2.4 Environmental setting

TCNT is located in Berry Springs, in the north of the NT and experiences hot and humid conditions, and annual wet-dry monsoon and is classified as Tropical Savannah. The wet season is from October to April and the dry season spans the remainder of the year. During the wet season, the area comes under the sporadic influence of convective thunderstorms, the monsoon and intense rainfall depressions resulting from decaying tropical cyclones. Convective thunderstorms typically occur in the period from October to December, locally known as the “Build-up” season. The dry season extends from May to September and is characterised by lower humidity and very little rainfall.

Surface water flow on the property generally flows slightly downgradient northeast to east along gently sloping flats and minor pronounced gullies towards the eastern boundary of the property. It is generally assumed that groundwater flow also follows this direction.

Surrounding and nearby land uses include small to medium scale horticulture, rural living development at densities consistent with both Zones R (Rural) and Zone RL (Rural Living), domestic livestock, agriculture (primarily cattle grazing), recreation and accommodation (primarily comprising the Darwin River Tavern and associated retail and camping areas) and natural areas. The site adjoins both Reedbeds and Old Bynoe Roads and is immediately adjacent the western boundary of the Darwin River, described as a perennial stream showing low inter-annual variability and has historically shown no more than occasional zero flow days.

The property's western boundary adjoins a declared quarantine area to manage a Cabomba (*Cabomba caroliniana*) weed outbreak, which extends 5 m landward from the water edge of the Darwin River.

Berry Springs is located within the Darwin and Blackmore Rivers Catchment area, and the major hydrogeological feature of the area is the fault bounded sedimentary basin which has an area of approximately 90 km². The major aquifer in the basin is known as the Berry Springs Dolostone Aquifer System, a small, localised aquifer that underlies parts of the Berry Springs and Darwin River areas.

The Berry Springs Dolomite is a typical karstic aquifer allowing rapid flow of water through fractures, with secondary porosity and permeability through the chemically weathered carbonates. On a local scale, groundwater travels via preferential pathways determined by the presence and extent of fracturing and typically drains to the northeast by both surface flow via springs and subsurface flow.

The major soil classification within the property is kandosols with nil to low level season inundation. Often referred to as red, yellow, and brown earths, these massive and earthy soils are mostly well drained and permeable. Kandosols are important for agricultural and horticultural production in the Berry Springs locale, however grazing lands can be susceptible to surface soil degradation such as hard setting and crusting.

3 Rainfall, Discharges and Water Usage

Figure 4 shows monthly rainfall totals taken from the Noonamah BoM station 14219 for the reporting period. Average monthly rainfall totals have also been shown for comparison. Rainfall was below average for all months of the reporting period.

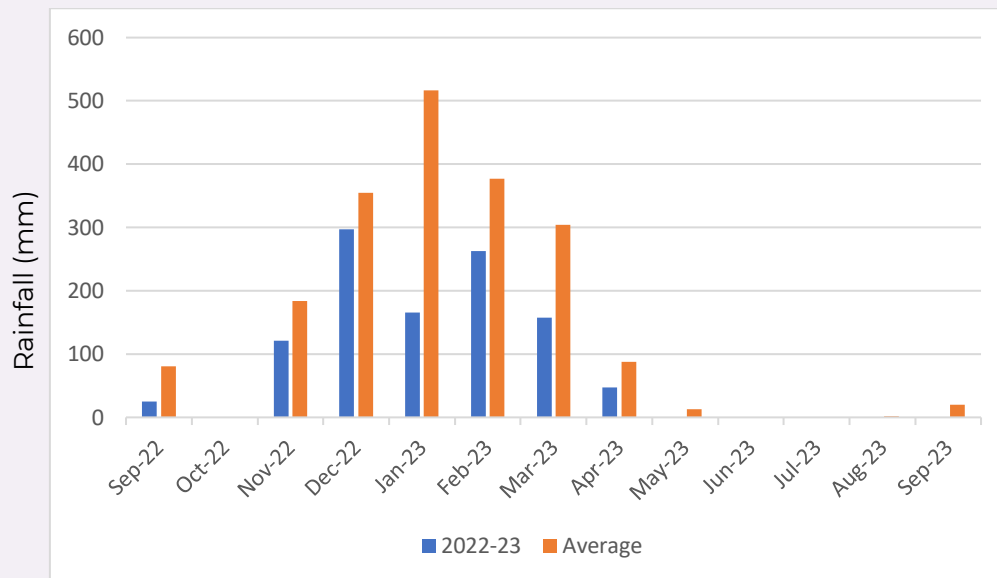


Figure 4 Monthly rainfall totals September 2022 to September 2023 (BoM Station 14080)

3.1 Reporting period discharge details

Table 1 outlines the discharge events from the WSP that occurred during the reporting period.

All discharges were passive in nature and recorded by the Greyline AVFM 6.1 submersible ultrasonic sensor. Total discharge volume during this reporting period was 53,302 L.

Table 1. Recorded discharge events during reporting period.

Date	Discharge Volume (L/24h)	Average Temp (°C)	Average Level (m)	Average Velocity (m/s)
05/01/2023	4,695	27.3	0.019	0.379
02/02/2023	0.004	30.7	0.001	0.087
21/02/2023	0.003	30.1	0.003	0.071
23/02/2023	9,805	28.4	0.013	0.435

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24/02/2023	6,182	27.5	0.009	0.432
25/02/2023	0.7	26.8	0.001	0.220
26/02/2023	1,071	27.2	0.015	0.154
28/02/2023	0.046	29.2	0.012	0.630
02/03/2023	0.11	28	0.001	0.612
06/03/2023	18,349	27.8	0.020	0.280
09/03/2023	13,199	28.9	0.041	0.880
06/04/2023	0.004	30.8	0.001	0.253
15/04/2023	0.12	30.1	0.004	0.651

3.2 Groundwater usage

Top Organics holds a groundwater extraction license (Licence No. BSGS10040) with a total maximum extraction allowance of 63 ML/year, 60 ML of which is allocated to agriculture and 3 ML to aquaculture. Table 2 below provides calculated usage during the reporting period.

Table 1. Groundwater usage

Reading Date	Previous Meter Reading (ML)	Current Meter Reading (ML)	Calculated Usage (ML)
30/08/2023	74.161	76.073	1.912
31/07/2023	72.750	74.161	1.411
04/07/2023	71.024	72.750	1.726
31/05/2023	69.485	71.024	1.539
30/04/2023	68.687	69.485	0.798
31/03/2023	67.703	68.687	0.984
01/03/2023	66.956	67.703	0.747
31/01/2023	66.191	66.956	0.765
03/01/2023	64.425	66.191	1.766
31/10/2022	62.551	64.425	1.874
30/09/2022	59.666	62.551	2.885
31/08/2022	57.391	59.666	2.275
07/08/2022	55.222	57.391	2.169

4 Monitoring Undertaken

During the reporting period, monitoring was undertaken as per EPL343 requirements using the methods outlined in the TCNT *Supporting Information Report* (ENVR 2022)

4.1 Monitoring Locations

The onsite and offsite sampling locations for wastewater and surface water are shown in Figures 2 and 3. Groundwater samples were collected from the single groundwater bore RN 034907 currently supplying water to the farm operations.

Wastewater samples were taken from the outlet of the drainage channel entering the WSP along with the concrete outfall channel containing the Pulsar Greyline AVFM 6.1 ultrasonic flow monitor (latitude -12.76854 longitude 130.98158).

Assess to the Darwin River directly to east of the property for sample collection is prohibited due to the property adjoining a quarantine zone for the management of Cabomba weed. Therefore, samples have been collected from the drainage channel running parallel to the northern boundary of the farm 6 m from the water edge of the Darwin River (SW3). Addition samples were collected from the drainage channel from two further locations: adjacent to the WSP (SW2) and further upgradient near the roadside of Reedbeds Road (SW1).

Surface water samples from the Darwin River were collected on the southern side of the causeway intersecting the river on Old Bynoe Road which is not within the quarantine zone (SW4).

4.2 Monitoring frequency, parameters and trigger values

4.2.1 Surface water

Surface water sampling of the ephemeral stream and Darwin River was undertaken through the wet season when the WSP discharges, site run-off was generated, and the river is flowing.

Table 3. Monitoring parameters, frequencies and trigger values for surface waters

Parameter	Sampling Frequency	Trigger Values
pH	3 times during the wet season (start, during and end)	6.0 – 7.5
EC		<200µS/cm
Total P		<0.01 mg/L
Total N		<0.23 mg/L
NOx		<0.008 mg/L
<i>E. coli</i> , <i>Enterococci</i> , Total coliforms		<200 cfu/100mL

4.2.2 Groundwater

The monitoring parameters, frequencies and trigger values for groundwater of sampling are outlined in Table 4.

Table 4 Monitoring parameters, frequency and trigger values for groundwater

Parameter	Sampling Frequency	
pH	Quarterly	7.0 – 8.5
EC		400 µS/cm
Total P		Any increase from previous monitoring round
Total N		
<i>E. coli</i> , <i>Enterococci</i> , Total coliforms		

4.2.3 Wastewater

Wastewater monitoring was also undertaken during the monitoring period, and the monitoring parameters and frequencies of sampling for both the inlet and outlet of the WSP are outlined in Table 5. The wastewater discharge point GPS co-ordinates are Latitude -12.76854 Longitude 130.98158.

Table 5. Monitoring parameters and frequency for wastewater

Parameter	Sampling Frequency
BOD	Monthly when discharging and quarterly when not discharging
TSS	
pH	
EC	
Total P	
Total N	
<i>E. coli</i> , <i>Enterococci</i> , Total coliforms	

4.3 Sampling procedures

All sampling and handling of samples were undertaken in accordance with the relevant standards and guidelines as outlined below:

- Australian 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)
- Australian Standard on Water Quality Sampling – Part 6: Guidance on sampling of rivers and streams (AS/NZS 5667.6:1998)
- Australian Standard on Water Quality Sampling – Part 10: Guidance on sampling of waste waters (AN/NZS 5667.10:1998)
- ANZECC & ARMCANZ 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 and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.
- ANZECC & ARMCANZ 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 and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

All sampling was carried out by Top Organics who have received onsite training in sampling methods. All laboratory samples were collected into ALS Laboratory-supplied sample bottles/jars; some of which contain preservative where required. Once collected, these samples are 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. until field parameters stabilise. All laboratory results are stored in an Excel database maintained by ENVR Solutions Pty Ltd.

4.4 Water Quality Results

Water quality results from sampling of groundwater, surface water and wastewater are presented in Tables 6 - 12

Table 6. Groundwater quality monitoring results.

Date	pH	EC	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	0.01	0.1	0.1	0.01	1	1	1
Trigger Value	7 – 8.5	400	-	-	Any increase from previous monitoring round	Any increase from previous monitoring round	Any increase from previous monitoring round	Any increase from previous monitoring round	Any increase from previous monitoring round
26/09/2022	7.81	383	0.05	<0.1	<0.1	0.04	<1	<1	<1
03/01/2023	8.09	354	<0.01	<0.1	<0.1	0.03	<1	<1	<1
17/04/2023	7.82	371	0.01	0.2	0.2	0.04	<1	4	<1
23/08/2023	7.81	374	0.01	<0.1	<0.1	0.05	<1	30	<1

Table 7. Monitoring location SW1 – Upgradient from WSPO.

Date	pH	EC	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	0.01	0.1	0.1	0.01	1	1	1
Trigger Value	6 – 7.5	200	0.08	-	0.23	0.01	200	200	200
03/01/2023	6.26	221	0.04	0.4	0.4	0.01	48	1700	70
17/04/2023	5.49	14	0.10	0.5	0.6	0.02	34	5200	15
01/03/2023	4.31	75	0.01	0.3	0.3	0.03	130	33,000	330

Table 8. Monitoring location SW2 – adjacent to WSPO.

Date	pH	EC	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	0.01	0.1	0.1	0.01	1	1	1
Trigger Value	6 – 7.5	200	0.08	-	0.23	0.01	200	200	200
03/01/2023	6.29	22	0.05	0.3	0.4	0.01	28	8900	110
17/04/2023	5.08	14	0.08	0.7	0.8	0.02	73	22000	19000
01/03/2023	6.82	30	0.03	0.4	0.4	0.01	220	38000	370

Table 9. Monitoring location SW3 – downgradient of WSPO adjacent to Darwin River.

Date	pH	EC	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	0.01	0.1	0.1	0.01	1	1	1
Trigger Value	6 – 7.5	200	0.08	-	0.23	0.01	200	200	200
03/01/2023	6.55	28	0.03	0.4	0.4	0.01	28	8900	110
17/04/2023	5.51	42	0.02	0.9	0.9	0.02	27	22000	19000
01/03/2023	4.50	59	0.01	0.8	0.8	0.12	170	42000	410

Table 10. Monitoring location SW4 – Darwin River causeway upstream from SW3.

Date	pH	EC	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	0.01	0.1	0.1	0.01	1	1	1
Trigger Value	6 – 7.5	200	0.08	-	0.23	0.01	200	200	200
03/01/2023	6.71	26	0.01	0.4	0.4	0.01	64	7900	320
17/04/2023	5.76	44	0.02	0.4	0.4	0.02	40	19000	120
01/03/2023	6.80	30	0.01	0.4	0.4	0.03	150	30000	480

Table 11. Wastewater influent entering the WSP.

Date	pH	EC	BOD	TSS	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	2	5	0.01	0.1	0.1	0.01	1	1	1
26/09/2023	9.33	299	2	82	0.01	5.1	5.1	0.87	<2	22	<2
03/01/2023	7.11	112	<2	18	2.32	2.0	4.3	0.36	3200	8900	18000
01/03/2023	7.17	90	2	23	1.87	1.4	3.3	0.42	1000	110000	1100
17/04/2023	7	114	6	14	1.23	1.8	3.0	0.41	520	76000	10
23/08/2023	9.09	305	10	46	0.01	4.2	4.2	0.64	3	29000	1600

Table 12. Wastewater effluent prior to discharging from the WSP.

Date	pH	EC	BOD	TSS	NOx as N	TKN as N	TN	TP	E. coli	Coliforms	Enterococci
Unit	-	µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	cfu/100mL	cfu/100mL	cfu/100mL
LOR	0.01	1	2	5	0.01	0.1	0.1	0.01	1	1	1
26/09/2023	9.74	314	6	81	<0.01	5.3	5.3	0.89	<2	<2	14
03/01/2023	7.12	84	<2	18	1.78	1.6	3.4	0.23	680	4900	2000
01/04/2023	7.23	92	2	20	1.87	1.4	3.3	0.43	970	170000	1500
17/04/2023	6.82	113	2	10	1.23	1.8	1.8	0.41	380	170000	100
23/08/2023	9.09	302	8	48	0.01	3.3	3.3	0.60	10	30000	2400

5 Results and Discussion

5.1 Groundwater quality

Table 6 provides the groundwater quality results of all sampling undertaken during the reporting period. Results of all parameters were mostly all within trigger value limits. TP results have increased slightly on the two last sampling events and should be continued to be monitored for further increases. There was also a slight increase in TN during April however this has since dropped back to typical concentrations. There has been an increase in coliforms from April to August 2023, and this could represent natural coliform release from pipe or sediment biofilms and may be part of the normal flora of the drinking-water distribution system.

Total coliforms (excluding *E. coli*) are not considered useful as indicators of the presence of faecal contamination and enteric pathogens, as there are many environmental coliforms that are not of faecal origin. No guideline value has been set for total coliforms in drinking water. However increased concentrations should be investigated.

5.2 Surface water quality

Tables 7 – 10 provide water quality results from all sampling taken from the offsite monitoring locations during the reporting period.

Surface water samples were collected from SW1 monitoring location to compare water quality of surface runoff coming from outside sources before mixing with wastewater being discharged from the WSPO. The samples generally exhibited a lower pH range across all samples collected which could be attributed to interaction with surface run-off from Reedbeds Road. TN and TP concentrations were also generally over trigger values which could also be attributed to interaction with other sources of runoff from neighbouring properties.

SW2 surface water samples were collected from the drainage channel adjacent to the WSP prior to the WSPO to compare water quality of surface runoff coming from neighbouring property sources before mixing with wastewater being discharged from the WSPO. Concentrations of TN and TP slightly increased in this location along with *E. coli*, Coliforms and Enterococci. As this sampling location is also upstream of the WSPO, it is presumed further interaction with surface runoff was occurring.

To assess water quality of discharge water interacting with offsite surface runoff before entering the Darwin River, SW3 surface water samples were collected from the drainage channel 210 m downstream and 6m prior to entering the Darwin River. Sampling results indicated a drop in pH between SW2 and SW3 monitoring location on the last sampling event. Results of TN were elevated above the trigger value for all sampling events. There was also an increase in TP between SW2 and SW3 on the same sampling event and the reason for this is unknown, however could have been resulted from general interaction with multiple sources of surface runoff and organic material as the water flowed down the channel. Results of E. coli, Coliforms and Enterococci slight increased as water flowed down the channel however generally remained stable.

To assess water quality of the Darwin River upstream before it flowed past the property, samples were collected from SW4 monitoring location which is located on the causeway crossing on Old Bynoe Road. Results of sampling demonstrate the river's water quality is similar to that assessed from SW1, SW2 and SW3 location along the drainage channel and therefore, presumed to have resulted from sources of surface water runoff entering the river prior to it flowing past TCNT property. Therefore, the sporadic and short-lived discharges of water coming from the TCNT property and interacting with offsite sources of surface water before entering the Darwin River is not considered to be causing impact.

5.3 Wastewater quality

Table 11 and 12 provide water quality results from all sampling taken from the inlet and discharge outlet of the WSP during the reporting period.

All results indicate the treatment performance of the WSP is operating adequately and is functioning as a facultative environment. No complaints of odours were received during the reporting period.

5.4 Long-term trend analysis

As this is the first annual monitoring report, long term trend analysis cannot be performed until further annual monitoring is undertaken and results compared with previous years. It is expected that this will be presented in the 2023 – 2024 monitoring report.

6 References

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. Available at www.waterquality.gov.au/anz-guidelines.

Bureau of Meteorology 2023, *Climate Data Online*. [online] Available at: <http://www.bom.gov.au/climate/data> (Accessed 20 September 2023).

ENVR 2022, *Supporting information for the Top Croc NT Crocodile Farm EPL application*, report prepare for Top Orgain Enterprises Pty Ltd by ENVR Solutions Pty Ltd, June 2022.

NHMRC, NRMCMC (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*. National Health and Medical Research Council, National Resource Management Ministerial Council, Commonwealth of Australia, Canberra.

7 Appendix 1 – Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order : **ES2234277**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **TOPCROC NT**
Order number : **----**
C-O-C number : **----**
Sampler : **MATT MCKENNARIEY**
Site : **----**
Quote number : **EN/444**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 27-Sep-2022 06:30
Date Analysis Commenced : 27-Sep-2022
Issue Date : 17-Oct-2022 11:30



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- General Comments
- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW



General Comments

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Where moisture determination has been performed, results are reported on a dry weight basis.

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Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

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Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- CFU = colony forming unit
- MF = membrane filtration
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW007 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TCNT_GW	----	----	----	----
Sampling date / time				26-Sep-2022 08:30	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2234277-001	-----	-----	-----	-----
Result					----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.81	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	383	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	0.05	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.04	----	----	----	----
MW006: Faecal Coliforms & E.coli by MF								
Escherichia coli	----	1	CFU/100mL	<1	----	----	----	----
MW007: Coliforms by MF								
Coliforms	----	1	CFU/100mL	<1	----	----	----	----
MW023: Enterococci by Membrane Filtration								
Enterococci	----	1	CFU/100mL	<1	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2234278**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **TOP CROC NT**
Order number : **----**
C-O-C number : **----**
Sampler : **MATT MCKENNARIEY**
Site : **----**
Quote number : **EN/444**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 27-Sep-2022 07:30
Date Analysis Commenced : 27-Sep-2022
Issue Date : 17-Oct-2022 12:01



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Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW



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~ = Indicates an estimated value.

- CFU = colony forming unit
- MF = membrane filtration
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported as approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW007 is ALS's internal code and is equivalent to AS4276.5.
- According to ALS work instruction for membrane filtration, the suggested volume for filtration of non treated / non-drinking water starts from 10mL or 50mL if the sample is turbid. A result of <10 or <2cfu/100mL is reported when there is no target organism growth from a volume of 10 or 50mL respectively.
- Membrane filtration results for MW007 are reported as an estimate (~) due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- MW023 is ALS's internal code and is equivalent to AS4276.9.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT-WWIN	TCNT-WWOUT	----	----	----
Sampling date / time					26-Sep-2022 09:00	26-Sep-2022 09:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2234278-001	ES2234278-002	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.33	9.74	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		299	314	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		82	81	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		5.1	5.3	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		5.1	5.3	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.87	0.89	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		2	6	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		<2	<2	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		~22	~<2	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		58	~14	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2300071**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Wastewater**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 05-Jan-2023 10:00
Date Analysis Commenced : 05-Jan-2023
Issue Date : 01-Feb-2023 08:52



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Signatories

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Signatories	Position	Accreditation Category
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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~ = Indicates an estimated value.

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: IN	TCNT: OUT	----	----	----
Sampling date / time					03-Jan-2023 10:00	03-Jan-2023 10:00	----	----	----
Compound	CAS Number	LOR	Unit		ES2300071-001	ES2300071-002	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.11	7.12	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		112	84	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		18	18	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		2.32	1.78	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		2.0	1.6	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.3	3.4	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.36	0.23	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		<2	<2	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		3200	680	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		8900	4900	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		18000	2000	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2300073**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Surface Water**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **4**
No. of samples analysed : **4**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 05-Jan-2023 10:00
Date Analysis Commenced : 05-Jan-2023
Issue Date : 01-Feb-2023 08:53



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Signatories	Position	Accreditation Category
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: SW1	TCNT: SW2	TCNT: SW3	TCNT: SW4	----
Sampling date / time					03-Jan-2023 10:00	03-Jan-2023 10:00	03-Jan-2023 10:00	03-Jan-2023 10:00	----
Compound	CAS Number	LOR	Unit		ES2300073-001	ES2300073-002	ES2300073-003	ES2300073-004	-----
				Result	Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		6.26	6.29	6.55	6.71	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		22	22	28	26	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	0.05	0.03	<0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.4	0.3	0.4	0.4	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.4	0.4	0.4	0.4	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		<0.01	0.02	0.01	<0.01	----
MW006: Faecal Coliforms & E.coli by MF									
Escherichia coli	----	1	CFU/100mL		48	34	28	64	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		1700	2900	8900	7900	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		~70	140	110	320	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2300080**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Ground Water**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 05-Jan-2023 10:00
Date Analysis Commenced : 05-Jan-2023
Issue Date : 01-Feb-2023 08:52



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General Comments

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Where moisture determination has been performed, results are reported on a dry weight basis.

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Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported as an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- Membrane filtration results for MW007 are reported as an estimate (~) due to the presence of many non-target organism colonies that may have inhibited the growth of the target organisms on the filter membrane. It may be informative to record this fact.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	TCNT: GW	----	----	----	----
Sampling date / time				03-Jan-2023 10:00	----	----	----	----
Compound	CAS Number	LOR	Unit	ES2300080-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.09	----	----	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	354	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	----	0.1	mg/L	<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	0.03	----	----	----	----
MW006: Faecal Coliforms & E.coli by MF								
Escherichia coli	----	1	CFU/100mL	<1	----	----	----	----
MW007: Coliforms by MF								
Coliforms	----	1	CFU/100mL	~<1	----	----	----	----
MW023: Enterococci by Membrane Filtration								
Enterococci	----	1	CFU/100mL	<1	----	----	----	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2306747**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Surface Water**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **4**
No. of samples analysed : **4**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 02-Mar-2023 08:30
Date Analysis Commenced : 02-Mar-2023
Issue Date : 23-Mar-2023 07:46



Accreditation No. 825
 Accredited for compliance with
 ISO/IEC 17025 - Testing

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- General Comments
- Analytical Results

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Vyoma Tailor	Microbiologist	Sydney Microbiology, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: SW1	TCNT: SW2	TCNT: SW3	TCNT: SW4	----
Sampling date / time					01-Mar-2023 08:00	01-Mar-2023 08:00	01-Mar-2023 08:00	01-Mar-2023 08:00	----
Compound	CAS Number	LOR	Unit		ES2306747-001	ES2306747-002	ES2306747-003	ES2306747-004	-----
				Result	Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		4.31	6.82	4.50	6.80	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		75	30	59	30	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	0.03	0.01	0.01	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.3	0.4	0.8	0.4	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.3	0.4	0.8	0.4	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.03	0.01	0.12	0.03	----
MW006: Faecal Coliforms & E.coli by MF									
Escherichia coli	----	1	CFU/100mL		~130	~220	~170	~150	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		33000	38000	42000	30000	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		330	370	410	480	----

CERTIFICATE OF ANALYSIS

Work Order : **ES2306748**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Wastewater**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 02-Mar-2023 10:30
Date Analysis Commenced : 02-Mar-2023
Issue Date : 23-Mar-2023 07:45



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 ISO/IEC 17025 - Testing

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Vyoma Tailor	Microbiologist	Sydney Microbiology, Smithfield, NSW



General Comments

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: IN	TCNT: OUT	----	----	----
Sampling date / time					01-Mar-2023 08:00	01-Mar-2023 08:00	----	----	----
Compound	CAS Number	LOR	Unit		ES2306748-001	ES2306748-002	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.17	7.23	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		90	92	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		23	20	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.87	1.87	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.4	1.4	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		3.3	3.3	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.42	0.43	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		2	2	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		1000	~970	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		110000	170000	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		~1100	1500	----	----	----



CERTIFICATE OF ANALYSIS

Work Order : **ES2312606**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Ground Water**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **2**
No. of samples analysed : **2**

Page : **1 of 3**
Laboratory : **Environmental Division Sydney**
Contact : **Customer Services ES**
Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**
Telephone : **+61-2-8784 8555**
Date Samples Received : **19-Apr-2023 07:30**
Date Analysis Commenced : **19-Apr-2023**
Issue Date : **15-Jun-2023 08:40**



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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Signatories	Position	Accreditation Category
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: GW	GW - GREY	----	----	----
Sampling date / time					17-Apr-2023 09:00	18-Apr-2023 06:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2312606-001	ES2312606-002	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.82	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		371	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.2	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.2	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.04	----	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		----	<1	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		----	~4	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		----	<1	----	----	----



CERTIFICATE OF ANALYSIS

Work Order : **ES2312607**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Wastewater**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **4**
No. of samples analysed : **4**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 19-Apr-2023 08:30
Date Analysis Commenced : 19-Apr-2023
Issue Date : 15-Jun-2023 08:40



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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Signatories

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Signatories	Position	Accreditation Category
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



General Comments

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- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: IN	TCNT: OUT	IN - GREY	OUT - GREY	----
Sampling date / time					17-Apr-2023 09:00	17-Apr-2023 09:00	18-Apr-2023 06:30	18-Apr-2023 06:30	----
Compound	CAS Number	LOR	Unit		ES2312607-001	ES2312607-002	ES2312607-003	ES2312607-004	-----
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.00	6.82	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		114	113	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		14	10	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		1.23	1.23	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		1.8	1.8	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		3.0	3.0	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.44	0.41	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		6	2	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		----	----	520	380	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		----	----	76000	170000	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		----	----	~10	100	----



CERTIFICATE OF ANALYSIS

Work Order : ES2312608
Client : ENVR SOLUTIONS PTY LTD
Contact : MATT MCKENNARIEY
Address : 18 HUTTON ROAD
ARANA HILLS 4054
Telephone : ----
Project : Top Croc NT Crocodile Farm - Surface Water
Order number : ----
C-O-C number : ----
Sampler : Wayne Kinbacher
Site : ----
Quote number : EN/444
No. of samples received : 8
No. of samples analysed : 8

Page : 1 of 4
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 19-Apr-2023 08:30
Date Analysis Commenced : 19-Apr-2023
Issue Date : 15-Jun-2023 08:41



Accreditation No. 825
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Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: SW1	TCNT: SW2	TCNT: SW3	TCNT: SW4	SW1 - GREY
Sampling date / time					17-Apr-2023 09:00	17-Apr-2023 09:00	17-Apr-2023 09:00	17-Apr-2023 09:00	18-Apr-2023 06:20
Compound	CAS Number	LOR	Unit		ES2312608-001	ES2312608-002	ES2312608-003	ES2312608-004	ES2312608-005
					Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		5.49	5.08	5.51	5.76	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		14	14	42	44	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.10	0.08	0.02	0.02	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.5	0.7	0.9	0.4	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.6	0.8	0.9	0.4	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.02	0.02	0.02	0.02	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		----	----	----	----	~34
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		----	----	----	----	5200
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		----	----	----	----	15



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	SW2 - GREY	SW3 - GREY	SW4 - GREY	----	----
Sampling date / time					18-Apr-2023 06:20	18-Apr-2023 06:20	18-Apr-2023 06:20	----	----
Compound	CAS Number	LOR	Unit		ES2312608-006	ES2312608-007	ES2312608-008	-----	-----
					Result	Result	Result	----	----
MW006: Faecal Coliforms & E.coli by MF									
Escherichia coli	----	1	CFU/100mL		~73	~27	~40	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		28000	22000	19000	----	----
MW023: Enterococci by Membrane Filtration									
Enterococci	----	1	CFU/100mL		22	110	120	----	----



CERTIFICATE OF ANALYSIS

Work Order : **ES2328535**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Wastewater**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 3
Laboratory : Environmental Division Sydney
Contact : Customer Services ES
Address : 277-289 Woodpark Road Smithfield NSW Australia 2164
Telephone : +61-2-8784 8555
Date Samples Received : 24-Aug-2023 08:00
Date Analysis Commenced : 24-Aug-2023
Issue Date : 05-Sep-2023 10:09



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Ankit Joshi	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: IN	TCNT: OUT	----	----	----
Sampling date / time					23-Aug-2023 08:30	23-Aug-2023 08:30	----	----	----
Compound	CAS Number	LOR	Unit		ES2328535-001	ES2328535-002	-----	-----	-----
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		9.09	9.09	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		305	302	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		46	48	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		4.2	3.3	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		4.2	3.3	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.64	0.60	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		10	8	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		~3	~10	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		29000	30000	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		1600	2400	----	----	----



CERTIFICATE OF ANALYSIS

Work Order : **ES2328536**
Client : **ENVR SOLUTIONS PTY LTD**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS 4054
Telephone : **----**
Project : **Top Croc NT Crocodile Farm - Ground Water**
Order number : **----**
C-O-C number : **----**
Sampler : **Wayne Kinbacher**
Site : **----**
Quote number : **EN/444**
No. of samples received : **1**
No. of samples analysed : **1**

Page : **1 of 3**
Laboratory : **Environmental Division Sydney**
Contact : **Customer Services ES**
Address : **277-289 Woodpark Road Smithfield NSW Australia 2164**
Telephone : **+61-2-8784 8555**
Date Samples Received : **24-Aug-2023 08:00**
Date Analysis Commenced : **24-Aug-2023**
Issue Date : **05-Sep-2023 10:04**



Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Dian Dao	Senior Chemist - Inorganics	Sydney Inorganics, Smithfield, NSW
Somlok Chai	Microbiologist	Sydney Microbiology, Smithfield, NSW
Wisam Marassa	Inorganics Coordinator	Sydney Inorganics, Smithfield, NSW



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ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- MF = membrane filtration
- CFU = colony forming unit
- Microbiological Comment: In accordance with ALS work instruction QWI-MIC/04, membrane filtration result is reported an approximate (~) when the count of colonies on the filtered membrane is outside the range of 10 - 100cfu.
- MW006 is ALS's internal code and is equivalent to AS4276.5.
- MW023 is ALS's internal code and is equivalent to AS4276.9.
- MW007 is ALS's internal code and is equivalent to AS4276.5.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	TCNT: GW	----	----	----	----
Sampling date / time					23-Aug-2023 08:30	----	----	----	----
Compound	CAS Number	LOR	Unit		ES2328536-001	-----	-----	-----	-----
					Result	----	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.81	----	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		374	----	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.01	----	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	----	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.05	----	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
<i>Escherichia coli</i>	----	1	CFU/100mL		<1	----	----	----	----
MW007: Coliforms by MF									
Coliforms	----	1	CFU/100mL		30	----	----	----	----
MW023: Enterococci by Membrane Filtration									
<i>Enterococci</i>	----	1	CFU/100mL		<1	----	----	----	----

Prepared by:

Matt McKennarley

Director

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