



SUPPORTING INFORMATION REPORT

To Accompany an Application for an Environmental
Protection License

Top Croc NT Crocodile Farm

Section 2233 Hundred of Cavanagh
1350 Old Bynoe Road, Berry Springs, Northern Territory

Version 2, June 2022

Document Control

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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.

The findings of this report are based on the objectives and scope of work outlined above. ENVR Solutions performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties or guarantees, express or implied, are made.

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The results of this assessment are based upon site inspection and field work conducted by ENVR Solutions personnel and information provided by the client and site management. All conclusions regarding the property area are the professional opinions of ENVIRA personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, ENVR Solutions assumes no responsibility or liability for errors in any data obtained from regulatory agencies, information from sources outside of ENVR Solutions, or developments resulting from situations outside of the scope of this project.

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1 INTRODUCTION

Top Organics Pty Ltd operate the Top Croc NT (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, and a processing facility for the packaging and sale of pet meat. The farm has been operating since 2016 and is a commercial production 'grow out' farm containing approximately 1,000 saltwater crocodiles (*Crocodylus porosus*).

TCNT does not operate a breeding or hatching program on the farm. Instead, juvenile crocodiles are sourced from other farms within the Darwin region, which are raised on site to approximately 2 years of age before being processed onsite to produce crocodile skins for export and corresponding manufacture into crocodile leather products. Crocodile meat is then produced for both human consumption and pet meat. Non-crocodile meat is also sold onsite which comprises the receipt and processing for sale as pet meat products under *Berry Springs Pet Meat*, to wholesalers, retail outlets and 'direct to public'.

In the future, TCNT wishes to expand production by constructing additional crocodile pens within the existing enclosure, with the same layout / design as the existing pens. The additional group of pens will increase the maximum capacity of the farm to approximately 2,000 animals. TCNT would also like to investigate the feasibility of a future effluent treatment and recycling scheme, whereby effluent would be treated to a high quality and recycled back into the crocodile pens for flushing. This would involve the installation of a new advanced secondary treatment plant, which will draw off effluent captured in an existing Waste Stabilisation Pond (WSP) and polish the effluent to a Class A quality to ensure it is suitable for reuse within the crocodile pens.

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 is applying for and Environmental Protection Licence (EPL) to address the ongoing production and management of animal effluent.

This document presents information to support the EPL application for the current farming activities of 1,000 crocodiles and operation of the WSP and will be included within the online EPL application process.

2 PROJECT DESCRIPTION

2.1 Siting, design, and layout

TCNT is located on Section 2233 in the Hundred of Cavanagh, 1350 Old Bynoe Road, Berry Springs as shown in Figure 2.1. The subject land is situated in the locality of Berry Springs, approximately 8.2 kilometres south-south-west of the Berry Springs centre. Surrounding and nearby land uses include horticulture (generally at small to medium scale), 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 of 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 (situated on lot 16 Hundred of Cavanagh adjacent the site).

The property is an 8.96 ha rural allotment on the north-eastern corner of Old Bynoe Road and Reedbeds Road, in the locality of Berry Springs. The site is accessed from the northern side of Old Bynoe Road, with a formed driveway leading to a secondary dwelling in the south-eastern corner of the allotment, then onto the main dwelling, maintenance and implement area, abattoir and cold room. The driveway loops around through an existing mango plantation into the main crocodile farm compound (a separated area of approximately 1.8 hectares).

The site was previously used for horticulture, comprising mangoes and rambutans. Given its high-water usage, rambutan farming ceased approximately 4 years ago, and the trees within and immediately south of the current crocodile compound have been removed. The pre-existing bird netting has also been removed, however the steel support structures remain.

Crocodiles are housed in shallow PVC-lined earthen channels extending through individual crocodile pens, with each pen approximately 1-2 metres wide and 24 metres long, running east-west. Ponds are segregated with wire fencing of approximately 1.5 metres high, with shade cloth covering. The crocodile enclosures are contained within a fenced compound, behind chainmesh fencing to approximately 1.8 metres high with three-stand barb topping. The ponds are divided into three groups – one adjacent the eastern boundary of the enclosure, one adjacent the western site boundary (adjacent Reedbeds Road) and a smaller group immediately east. The layout of the existing crocodile enclosure is shown in figure 2.2.

Legend

 Site Location



ENVR21.008A_EPL Application_Report_Top Croc NT_ Berry Springs_V2



Figure 2.2 Map showing site layout and infrastructure



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SITE LAYOUT

2.2 Site operations and activities

2.2.1 Overview

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.



Image 1: Finishing pens

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. Whilst all skins are produced for export and meat is primarily sold off-site (direct to wholesalers), the proponent does offer both pet meat and meat for human consumption for sale from the subject land in a 'direct to the public' arrangement. These sales occur in the driveway adjacent to the abattoir/cold room area and are a minor ancillary component to the primary use. The proponent has advised that the number of direct sales varies between 0 and 10 transactions per day, across the course of the entire day.
- All ancillary components of the farm including the workshop and storage areas (also associated with the ongoing horticultural components), cold storage and machinery.



Image 2: An individual finishing pen

The extent of existing non-crocodile farming operations comprises:

- The receipt, processing, and sale of other pet meat products as Berry Springs Pet Meat. Meat is delivered to the site dressed, frozen and packaged from licensed shooters (wrapped and boxed), then shredded/minced, mixed, packaged and frozen. No slaughter, dressing, skinning, or boning is undertaken on site (other than to crocodiles – referred above).
- Sale of pet meat via direct delivery to wholesalers, retail outlets (i.e. hardware stores) and 'direct to the public' (in a manner identical to the sale of crocodile meat referred above). The total

number of direct sales, together with direct sale of crocodile meat for human or animal consumption, is estimated between 0 and 10 transactions per day, across the course of the entire day.

- Horticulture, comprising the remaining mango plantation.

The operations at TCNT are permitted under a Parks and Wildlife Commission Permit to Keep Protected Wildlife in the Northern Territory, To Bring Protected Wildlife (Import) and take Protected Wildlife out of (Export) the Northern Territory (Permit No. 5816) pursuant to section 56 of the Territory Parks and Wildlife Conservation Act. A copy of the permit is provided in Appendix A.



Image 3: The hatchling pens

2.2.2 Water supply

There is a small domestic bore adjacent to the front boundary, with the primary bore (RN 034907) providing groundwater for site operations. TCNT holds a groundwater extraction license (Licence No. BSGS10040) with a total maximum electrician allowance of 63 ML/year, 60 ML of which is allocated to agriculture and 3 ML to aquaculture.

RN034907 currently yields approximately 13 litres per second to an overhead (approximately 10,000 L) storage tank in turn servicing all uses within the site. Meters readings provided by the proponent indicate a usage of approximately 4,340 kL/month averaged across both wet and dry seasons, with an annual usage of just over 52 ML.

TCNT proposes to explore options to install an advance secondary wastewater treatment plant that will treat and 'polish' effluent from the existing Waste Stabilisation Pond (WSP) so that it can then be

recirculated through the crocodile pens (subject to further regulatory approvals) and on the mangos. Accordingly, and despite the intended increase in crocodile numbers, any additional water use will be offset by the water recycling program and the additional water under the existing licence.



Image 4: Inlet works to improve water distribution into the finishing pens

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. To improve the efficiency of this process, TCNT has recently completed improvements to inlet water supply infrastructure, as shown in Image 4 above.

2.2.3 Farming routine

As the animals move through the different growth stages, the farming routine changes accordingly. Table 2.1 outlines the water, food, and cleaning schedules for the two types of growth pens.

Feed consists of horse meat for hatchlings and juvenile crocodiles (1-2 years) then finally chicken heads for mature crocodiles. To ensure optimal growth of hatchlings when they are first brought onto the farm, growth vitamins specifically made for the crocodile farming industry are added to the first feeding immediately after release into the hatchling pens.

A description of the farming routine has been provided in Table 2.1 below.

Table 2.1. TCNT Farming Routine

	Hatchling Pens	Finishing Pens
Water input	Top up pens every 14 days (depending on wet and dry season)	Top up pens every 14 days (depending on wet and dry season)
Cleaning (drain, clean and refill)	Every 14 days	Every 14 days
Chlorine	Chlorine dosed at low concentrations (3-4 ppm) on bore water supply after cleaning of pens	
Food	Every second day	Every fourth day

Antibiotics and probiotics may be administered to juvenile crocodiles requiring treatment as opposed to blanket inoculations to the whole cohort. It is very rare that antibiotics are administered to animals in the grow-out or finishing pens as illness is not common and the antibiotics impact on the ability to process the animal for meat products.

2.2.4 Wastewater and current treatment

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.



Image 5: Waste stabilisation pond showing discharge outlet in foreground

TCNT recently enacted improvements on the WSP including installing a floating curtain wall to improve flow distribution and retention time of the wastewater, whilst also preventing against short-circuiting. Other improvements recently made include augmentation of the WSP walls and embankments and removal of accumulated benthic sludge.



Image 6: Wastewater drainage channel from crocodile pens into the WSP

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. The concrete tank incorporates an 'Effluent Filter' on the outlet of the tank which prevent solids over 3mm in diameter from exiting the tank. This ensures the bulk of solids and organic material remain in the tank and digested anaerobically. Primary clarified effluent is then gravity fed into two soil absorption trenches running where it is percolated into the soil and renovated via naturally occurring biogeochemical processes within the soil matrix.

A Site and Soil Assessment conducted on in August 2021 classified the soil within the proposed soil absorption area as a Category 4 soil with a design loading rate of 10 mm/day as per Table L1 in AS/NZ 1547:2012 (refer Appendix E for report). Utilising the soil absorption design criteria in *NT Code of Practice for Wastewater Management 2020*, an area of 50 m² is required.

The soil absorption system at TCNT incorporates two trenches at 25 m long by 1 m wide giving a total area of 50 m². Therefore, the trenches are compliant with *AS/NZ 1547:2012* and *NT Code of Practice for Wastewater Management 2020*.

Groundwater interaction with the soil absorption trenches is not considered an issue as record of the nearest water bore indicates water-bearing beds of >28m below ground level (bgl).

The residences on the property are serviced by individual septic tanks and soil absorption trenches. In the NT, residential wastewater management systems are regulated by Building Advisory Services, of the Department of Infrastructure, Planning and Logistics (DIPL).



Image 7: Construction of soil absorption trenches

On 22 June 2021, ENVIRA collected samples from the inlet and outlet side of the WSP. Results shown in Table 2.2 below demonstrate the WSP is efficiently treating wastewater to an acceptable quality. It should be noted the water quality of the WSP had not been influenced by rainwater dilution due to the samples being collected in the middle off the dry season.

Table 2.2. Water quality results from TCNT WSP collected 22nd June 2022

Quality Characteristic	Units	WSP Inlet	WSP Outlet
Turbidity	NTU	32.4	25.4
Electrical Conductivity	µS/cm	306	310
Total Dissolved Solids	mg/L	172	179
<i>E. coli</i>	cfu/100 mL	1	2
Faecal Coliforms	cfu/100 mL	1	2
Biochemical Oxygen Demand	mg/L	6	8
Total Suspended Solids	mg/L	68	44
pH	scale	7.55	7.82
Alkalinity	mg/L	104	120
Total Nitrogen as N	mg/L	3.3	3.1
Ammonia as N	mg/L	0.02	0.01
Total Kjeldahl Nitrogen as N	mg/L	3.3	3.1
Nitrite + Nitrate as N	mg/L	0.04	0.02
Total Phosphorus as P	mg/L	0.74	0.74
Calcium	mg/L	21	22
Magnesium	mg/L	16	16
Sodium	mg/L	11	11
Potassium	mg/L	3	4
Chloride	mg/L	36	36
Sulfate	mg/L	2	2

2.2.5 WSP Discharge and Monitoring

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. However, due to surface and groundwater intrusion, it is expected that environmental impact would be minimal from wastewater and freshwater shandying. During a discharge event, water will exit the eastern corner of the WSP (latitude -12.76854 longitude 130.98158) where it flows over the property boundary, following an ephemeral stream and natural drainage contours towards the Darwin River, 210 m to the east. Prior to contact with the Darwin River, some renovation of the wastewater would be expected as it passes through and over vegetated landscape and sub-soil hydraulic pathways.

To improve discharge control and monitoring during high rainfall events in the wet season, future works have been scheduled to install a concrete open channel on the eastern outfall the WSP. The channel will measure 4.8m L x 0.6m H x 1.2m W and be fitted with a 'Greyline AVFM 6.1 submersible ultrasonic sensor (manufactured by Pulsar Measurement) secured to the base of the concrete channel. The

sensor will capture volume, velocity, and duration data of each discharge event and safely store the information in a large backlit LCD controller allowing streamlined review and reporting back to NTEPA when required. A Greyline AVFM 6.1 ultrasonic flow monitor technical brochure is provided in Appendix E.

2.2.6 Future wastewater treatment and recycling scheme investigation

TCNT intends to investigate the economic feasibility of a future effluent treatment and recycling scheme whereby effluent would be treated to a high quality and recycled back into the crocodile pens for flushing, along with being used to irrigate bamboo hedging that will be planted to 'screen' the fenced 1.8 ha farm area.

This would involve the installation of a new advanced secondary treatment plant to draw off effluent captured in the existing WSP and polish it to a Class A quality, ensuring it is suitable for reuse within the crocodile pens. The existing wastewater drainage channel will also be upgraded to improve water flow and prevent seepage.

2.2.7 Waste

After the skinning and filleting process, any remaining animal by-products not suitable for pet meat sale are transported to a 'raised bed' dry composting area where it is mixed and covered with soil and organic material and allowed to breakdown naturally. The dry composting area has been raised to avoid surface water contact and constructed on an impermeable 10 m x 4 m clay pan and located in the middle of the farm as shown in Image 8.

Solids captured and contained within the septic tanks are removed every 8 – 10 years by a licenced contractor.

Waste oils and chemicals from equipment servicing on site are stored in appropriate sealed containers and removed by a licenced contractor.

2.2.7 Hazardous materials storage and handling

Chemicals stored on-site for use in farming operations include:

- Diesel (maximum of 5,000 L)
- Granulated chlorine (maximum of 300 L)
- Herbicide for weed treatment (maximum of 100 L)
- Oils/lubricants for farm equipment (maximum of 200 L)
- Lime for treatment of odour in dry composting area (maximum of 1 tonne)

TCNT maintain a hazard substance register for the site, which includes storage location, summary of hazardous/dangerous goods status and links to the Safety Data Sheets (SDSs). All hazardous substances, chemicals and other farm products are stored, used, and managed in accordance with their SDSs (including appropriate bunding requirements).



Image 8: Raised bed dry composting area



Image 9: Looking towards the northern boundary



Figure 2.3 Map showing bore and water flow paths

3 SURROUNDING ENVIRONMENTS, LAND USERS AND ACTIVITIES

3.1 Climate

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.

Climate observations are made by the Bureau of Meteorology (BoM). The closest BoM weather monitoring station to the site is Noonamah (station number 14080). Average annual rainfall recorded at this station is 1,939 mm with the highest rainfall occurring over December to February and the lowest over June to August. The average annual regional evaporation is 2,276 mm and exceeds the average annual rainfall. Evaporation is highest in October and lowest in January to March (see Table 3-1).

Table 3.1. Monthly rainfall and temperature summary

MONTHLY	J	F	M	A	M	J	J	A	S	O	N	D	Year
Rainfall (mm)	517	377	304	88	13	0	0	2	20	81	184	355	1939
Evaporation (mm)	178	160	167	178	187	182	202	217	189	229	208	179	2276

3.2 Surrounding land and sensitive receptors

The subject land is situated in the locality of Berry Springs, approximately 8.2 kilometres south, southwest of the Berry Springs centre. 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 also 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. A map detailing the quarantine area is provided in Figure 3.1 and Appendix B.

The Berry Springs National Park (BSNP) is situated approximately 7.5 km northeast of the TCNT property and is administered by Parks and Wildlife Division (P&W) of Natural Resources, Environment, the Arts and Sport (NRETAS). The park features multiple large and small pools fed by natural springs

which are popular with visitors attracting up to 200,000 per year. The pools are generally open for swimming during the dry season, between May and October, as there is a crocodile and flooding risk in the wet season.

Immediately adjacent to BSNP is the Territory Wildlife Park (TWP), administered by P&W within NRETAS, and exhibits a variety of native animals. The TWP shares a boundary with BSNP, and number of the springs contributing water to the swimming pools at BSNP originate from within the TWP.

The other dominant land use in the area is agriculture and there are multiple properties located on the Berry Springs Dolostone, which are obliged to use groundwater for consumption as there is no reticulated system. In addition to requiring a bore, each property is assumed to have a septic system for the treatment and disposal of wastewater as there is no mains sewer.

3.3 Surface and groundwater

Berry Springs is located within the Darwin and Blackmore Rivers Catchment area and a map is provided in Appendix C. The two major watercourses which cross the Berry Springs Area are the Darwin River to the west and Berry Creek to the east. The Blackmore River also intersects the western boundary of the Berry Springs region. Lake Deane which is fed by groundwater discharge is a large lagoon in the 5.8 km northeast of the property and Woodford Lagoon is 1.08 km southwest of the property. There is also another smaller artificial surface water body (Goose Lagoon) within the TWP, and the man-made Lake Barden is located adjacent to Lake Deane.

Five major perennial springs which are known discharge points from the aquifer system (Parson Springs, Twin Farm Springs and three vents at Berry Springs) and several other intermittent springs that have been recorded off the Darwin and Blackmore Rivers as well as Berry Creek. Berry Creek usually flows from November to July in response to wet season runoff and ceases to flow for the remainder of the year. The upper reaches of Berry Creek and Darwin River become disconnected pools of water in the late dry season and their upper catchments dry out although they remain more continuous systems to the north where they flow towards Darwin Harbour. Other streams within the immediate region are relatively small, predominantly ephemeral and are highly responsive to the annual wet/dry cycle of rainfall, (i.e. they tend to dry out in a similar pattern over the dry season). The proportion of total wet season rainfall runoff that flows in these streams can vary between 19% and 70% depending on local conditions.

The major hydrogeological feature of the Berry Springs 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 aquifer naturally discharges at Parson Springs, Twin River Farm Springs and the BSNP, and currently provides reliable, good quality water supply for many rural residents and horticultural activities and maintains ecosystem health by contributing to base flows in Darwin River and

Berry Creek. Unique ecosystems within the TWP are sustained by the aquifer system, including the monsoon vine forest. Water from the aquifer system also maintains the condition of places that are culturally important to the Kungarakana and Larrakia people.

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.

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. Surface water runoff does not impact activities inside the abattoir cold rooms.

3.4 Soils and land units

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.

3.5 Weeds

The majority of the property is grassed and maintained by mowing, slashing and routine spraying with glyphosate herbicide in accordance with the *NT Weed Management Handbook* (Weed Management Branch, 2018). There is also a herd of goats (approx. 15) that are allowed to graze within the fenced farm area for weed control.

The property backs on to the Darwin River and a declared quarantine area to manage a Cabomba (*Cabomba caroliniana*) outbreak, which is a highly invasive Class A weed and can rapidly infest waterways.

The Cabomba Eradication Program, which is administered by the Northern Territory Government, aims to eradicate all known infestations of cabomba from the Northern Territory, and to prevent all future introductions of plants within the genus, to the Northern Territory.

A quarantine order has been established under section 21 of the 'Weeds Management Act 2001' and will remain in place until it is revoked or extended by the Minister for Land Resource Management. The Quarantine Area comprises the section of Darwin River between Cox Peninsula and Old Bynoe Road. The order prohibits the movement of people or any object, including boats, vehicles, and fishing equipment into or out of this section of river and the 5 metres of land adjacent to the water's edge, unless an appropriate permit has been obtained from the Department. However, it is highly unlikely that any movement or use of cabomba would be supported given the level of risk posed by this weed.



Figure 3.1 Map showing Cabomba quarantines area on the Darwin Area



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MONITORING + CABOMBA
QUARANTINE
AREA

4 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) has been developed to identify key sources, pathways and receptors of potential contaminants and include the following considerations:

- Potential contaminants
- Inferred sources
- Pathways and mechanisms for transport
- Potential sensitive receptors.

4.1 Potential contaminants

The contaminants of concern that could result from the operations of TCNT include:

- Nitrates, phosphates, ammonia, bacteria, and pathogens (i.e. *E. coli*, enterococci, or faecal coliforms) from the farming of animals.
- The use of cleaning products in the pens include multipurpose cleaners and disinfectant sanitisers which contain chlorine and ammonium-based compounds.
- The storage of bulk hazardous chemicals such as diesel and granular chlorine.
- The generation of airborne contaminants and nuisance odour.

The release of these contaminants could result in an increased biochemical oxygen demand, reduced dissolved oxygen, changes in pH, increased electrical conductivity, turbidity or total suspended solids, an increase in chlorophyll-a and/or an increase in hydrocarbons.

4.2 Sources

Sources of potential contaminants include feed inputs, faecal matter, cleaning products used in pens, and the storage of bulk hazardous chemicals.

4.3 Pathways and Transport

Nuisance odours carried by wind, controlled and uncontrolled discharges to surface waters, and vertical migration through watercourses and soil into groundwater.

4.4 Receptors and fate

Receptors include the receiving surface water, groundwater, and neighbouring properties. Those receptors affected by discharges include adjacent properties, Darwin River, sites of conservation significance, wetlands, and recreational users; as well as terrestrial and aquatic organisms along the river such as fish and shellfish.

Those receptors affected by migration of potential contaminants to groundwater include neighbouring properties that utilise groundwater for agriculture and potentially drinking water. Neighbouring properties could also be impacted by nuisance odour from the farm activities.

The use of large volumes of groundwater can potentially have drawdown effects on the Berry Springs Dolomite aquifer and could impact on neighbouring users and ecosystems.

5 ENVIRONMENTAL RISK ASSESSMENT

The potential environmental risks associated with operational activities of the TCNT have been assessed, and the likelihood and consequence categories adopted in the aspects and impacts register are provided in Table 5-1 and Table 5-2. This has then been combined to derive an overall risk rating using the matrix in Table 5-3. The environmental risk assessment table is included as Table 5-4.

Table 5.1. Likelihood categories

Categories	Score	Likelihood Description
Remote	1	Never heard of, but not impossible
Rare	2	Highly unlikely; will only occur in exceptional circumstances
Unlikely	3	Could occur at some time, but unlikely
Moderate	4	Might occur at some time stage; has previously occurred
Likely	5	Known to occur or will probably occur; has occurred several times
Almost certain	6	Common or repeating occurrence; is expected to occur in most circumstances

Table 5.2. Consequence categories

Categories	Score	Consequence Description
Negligible	0	No/low measurable impact on the environment
Insignificant	1	Some, minor, temporary environmental impact
Minor	2	Contained temporary, or permanent minor, localised environmental damage
Moderate	3	Wider and longer-term environmental impacts
Major	4	Very serious impact with long-term environmental damage
Catastrophic	5	Environmental disaster

Table 5.3. Risk matrix

		Consequences					
Likelihood		0	1	2	3	4	5
	6	Negligible (0)	Low (6)	Moderate (12)	High (18)	Extreme (24)	Extreme (30)
	5	Negligible (0)	Low (5)	Moderate (10)	High (15)	Extreme (20)	Extreme (25)
	4	Negligible (0)	Low (4)	Moderate (8)	Moderate (12)	High (16)	Extreme (20)
	3	Negligible (0)	Low (3)	Low (6)	Moderate (9)	Moderate (12)	High (15)
	2	Negligible (0)	Low (2)	Low (4)	Low (6)	Moderate (8)	Moderate (10)
	1	Negligible (0)	Low (1)	Low (2)	Low (3)	Low (4)	Low (5)

Table 5.4. Environmental Risk Assessment

Aspect	Potential impact	Initial risk			Management and mitigation controls (overview)	Residual risk		
		L/hood	Cons	Risk		L/hood	Cons	Risk
Extraction of groundwater	Reduction in groundwater availability	3	3	Mod (9)	- Extract water within permitted volumes - Meter and monitor water extraction rates to ensure volumes are within permit.	2	2	Low (4)
Treatment of wastewater	Inadequate treatment of water quality Generation of contaminated by-products Generation of excessive odours Creation of mosquito breeding habitat	6	3	High (18)	- Ensure WSP is properly designed to allow for facultative treatment of the peak hydraulic discharge of wastewater from the pens - Ensure WSP is operating effectively and not generating odour - Ensure WSP is designed to minimise biting insect breeding habitat - Investigate sludge accumulation in WSP on annual basis to determine if desludging is required - Commence regular observations and record keeping of the WSP including, storage levels, water quality data and general observations - Install appropriately sized baffling walls/curtains (typically 70% of pond width) within the WSP to ensure an even distribution of flows within the pond, reducing dead volumes and enhancing the hydraulic performance of the pond - Periodically inspect the soil absorption system of the abattoir to determine no ponding, pooling or run-off of effluent is occurring - Periodically inspect sludge accumulation in Abattoir septic tanks to confirm when sludge removal will be required - Remove excessive sludge build up from septic tanks and WSP by a licenced contractor on an as-needed basis.	4	2	Mod (8)
Discharge of wastewater to neighbouring properties (active or passive) and receiving waterways.	Reduction in water quality downstream of discharge point (addition of nutrients), and subsequent impacts on aquatic ecosystem health downstream of discharge point.	4	3	Mod (12)	- Provide adequate wastewater storage for wet season runoff events - Treat wastewater prior to discharge/reuse - Only discharge from authorised discharge point - Establish a monitoring program and record the duration and volume of all discharges via Pulsar Greyline AVFM 6.1 Ultrasonic flow monitor.	3	2	Low (6)
Discharge of wastewater into groundwater aquifers	Reduction in water quality of underlying aquifers.	4	3	Mod (12)	Provide adequate wastewater storage for wet season runoff events	2	2	Low (4)

					• Treat wastewater prior to discharge/reuse • Only discharge from authorised discharge point • Establish a monitoring program • Ensure adequate bunding around discharge point of WSP to ensure wastewater is directed away from the groundwater bore.			
Spills of chemicals, hydrocarbons, or hazardous substances	Uncontrolled discharge of dangerous goods or hazardous substances. Contamination of pens, and discharge of contaminated water into receiving environment. Reduction in water quality downstream of discharge or spill point, and subsequent impacts on aquatic ecosystem health downstream of discharge point. Reduction in water quality of underlying aquifers.	3	2	Low (6)	• Training and site inductions provided to all employees • Appropriate hazardous substance storage and handling procedures • Spill kits will be onsite, adequately sized and stocked to respond to a spill if required. • Chemical register is kept up to date for all chemicals, their volumes and storage locations • Following the 3 C's (contain, communicate, clean-up).	2	2	Low (4)
Storage of wastes	Poorly managed site attracting native fauna and pests Contamination to land/soils	3	1	Low (3)	• Ensure waste is stored/disposed of in appropriate containers for waste type prior to disposal • Removal of waste products by licenced waste contractors • Monitoring of waste disposal areas.	2	1	Low (2)
Desludging and disposal of sludge material	Impacts on water quality (turbidity and nutrients) and consequential impacts on aquatic ecosystem health.	3	1	Low (3)	• Adherence to pen cleaning schedule • Sludge and solid waste pumped from pens into the WSP and removed by a licenced waste contractor • Sludge from WSP removed during the dry season only removed by a licenced waste contractor • Sludge from Septic tanks removed when required by a licenced waste contractor • Appropriate sediment controls installed around any stockpiles during the wet season	2	1	Low (2)
Operating farm equipment	Degradation of air quality, including dust and emissions	3	1	Low (3)	• Maintenance of equipment to minimise air emissions as far as possible • Avoid activities generating excessive dust and if required, implement dust mitigation measures.	2	1	Low (2)
Excessive odours	Disturbance to neighbouring properties	3	1	Low (3)	• Adherence to pen cleaning schedule • All putrescible waste to be stored appropriately prior to removal from site by a licenced waste contractor	2	1	Low (2)

					• Ensure wastewater treatment system is operating effectively and not generating excessive odour • Achievement of adequate treatment to reduce odour • Ensure dry composting area is covered adequately with a layer of soil and organic material.			
Movement of vehicles and equipment	Spread of weeds	3	1	Low (3)	• Regular inspections of farm for weed occurrence • Control weeds by running flock of goats within crocodile pen area along with spraying with herbicide • Regular slashing.	2	1	Low (2)
Creating mosquito breeding habitat	Impacts on comfort of employees/neighbours and increased disease risk	3	1	Low (3)	• Minimise any stagnant water by ensuring containers are kept out of rain • Adherence to pen cleaning schedule • Regular inspections of site to identify areas of ponding water and subsequent rectification • Design of wastewater treatment systems to minimise biting insect breeding habitat (i.e. steep banks and prevention of aquatic weeds) in accordance with the <i>Guidelines for preventing mosquito breeding associated with wastewater treatment and disposal in the Northern Territory</i>.	2	1	Low (2)
Mortality	Quarantine issues or spread of diseases	3	1	Low (3)	• Established quarantine practices • Established monitoring and surveillance program to identify any potential disease outbreak.	1	1	Low (1)
Continued use of poor condition WSP	Impacts on output and treatment of water Contamination to soils/groundwater	3	2	Mod (8)	• Control vegetation that grows on treatment pond embankments • Reinforce embankments to strengthen bank material.	2	2	Low (4)

6 ENVIRONMENTAL MANAGEMENT PLAN

This Environmental Management Plan (EMP) provides a consolidated plan for environmental management to mitigate the environmental risks identified in Section 5. Table 6.1 identifies the potential impacts of the TCNT operations on the environment and includes environmental objectives, management and mitigation measures, performance criteria and target indicators, corrective actions, and contingencies, monitoring and reporting and record-keeping mechanisms for each aspect.

Table 6.1. Environmental Management Plan

Activity	Potential Impact	Objective / Outcome	Management Action	Target / Performance Indicator	Monitoring	Corrective Actions and Contingencies	Reporting and Record Keeping
Filling and replenishing pens	Reduction in groundwater availability due to extraction.	No reduction in groundwater availability due to extraction.	Extract water within permitted volumes.	No exceedance of licenced groundwater extraction volumes.	Meter and monitor water extraction rates to ensure volumes are with licence.	Revise meter monitoring procedure and introduce a more frequent meter reading schedule. Investigate options to treat wastewater and recycle back into the pens for reuse. Assess extraction limits and investigate potential to increase extraction volumes.	Water usage is recorded in the Waste Database. Groundwater usage detailed in Annual Report.
Treatment of Wastewater	Inadequate treatment of water quality.	No discharge or reuse of water above the treatment criteria limits.	Ensure WSP is maintained and operating efficiently. Engage pump out contractor to remove water from the WSP if water does not meet the approved criteria for reuse or discharge.	No exceedance of approved criteria in reuse or discharge water.	Establish a monitoring program, which incorporates monitoring of treated wastewater quality prior to discharge.	Review treatment methods. Review water quality and implement additional treatment methods if required.	Reporting to be undertaken through Monitoring Report and Annual Return.
	Generation of excessive odours.	No impacts on neighbouring properties from odour during treatment process.	Ensure WSP is operating effectively and not generating excessive odour.	No complaints received in relation to odour.	Establish a monitoring plan which incorporates odour monitoring. Establish a monitoring program which incorporates monitoring of treated wastewater quality prior to discharge/reuse.	Review treatment methods. Review water quality and implement additional treatment methods if required (e.g. to reduce odour from BOD, oil and grease, bacteria).	Record and respond to any complaints received. Reporting to be undertaken through Monitoring Report and Annual Return.
	Creation of mosquito breeding habitat.	To prevent mosquito breeding opportunities. To reduce the potential for contact between mosquitos and people.	Design of the WSP to minimise biting insect breeding habitat (i.e. constant flow, steep banks, and maintenance to remove algae regularly) in accordance with the <i>Guidelines for preventing mosquito breeding associated with</i>	No increase in biting insects as a result of the operation of the WSP. No incidence of mosquito born disease.	Regular inspections of the WSP to identify breeding sites.	Review design of the WSP. Rectify any areas supporting breeding habitat.	Inspection records. Record and respond to any received complaints.

			<i>wastewater treatment and disposal in the Northern Territory</i>				
Discharge wastewater (effluent)	Reduction in water quality downstream of discharge point (addition of nutrients), and subsequent impacts on aquatic ecosystem health downstream of discharge point.	No reduction of water quality in the receiving environment.	Ensure WSP is maintained and operating efficiently. Engage pump out contractor to remove water from the WSP if water does not meet the approved criteria for reuse or discharge.	No exceedance of approved criteria in reuse or discharge water.	Establish a monitoring program, which incorporates monitoring of treated wastewater quality prior to discharge. Monitor and record discharge volumes and duration via Pulsar Greyline AVFM 6.1 Ultrasonic flow monitor. .	Review WSP treatment capabilities and opportunities for improvement, expansion, or addition of new advanced secondary treatment system. Review potential for effluent recycling and reuse. Review monitoring program to allow for further detection of potential contaminants.	Record all water quality results in a database and compare to guideline values. Record and respond to any complaints received regarding discharges. Discharge reporting to be undertaken through the Monitoring Report and Annual Return.
	Reduction in water quality of underlying aquifers.	No reduction of water quality in underlying aquifer.	Ensure WSP is maintained and operating efficiently Engage pump out contractor to remove water from the WSP if water does not meet the approved criteria for reuse or discharge.	No change in quality of inlet water from bores in comparison to historical data.	Establish a monitoring program which incorporates monitoring of groundwater to determine any impacts. Monitoring of wastewater quality prior to and following discharge. Monitor and record discharge volumes and duration via Pulsar Greyline AVFM 6.1 Ultrasonic flow monitor	Review WSP treatment capabilities and opportunities for improvement, expansion, or addition of new advanced secondary treatment system. Review potential for effluent recycling and reuse. Review monitoring program to allow for further detection of potential contaminants.	Record all water quality results in a database and compare to guideline values. Record and respond to any complaints received regarding discharges. Discharge reporting to be undertaken through the Monitoring Report and Annual Return.
Storage and use of chemicals, hydrocarbons, and hazardous substances	Uncontrolled discharge of dangerous goods or hazardous substances. Contamination of WSP and discharge of contained water into receiving environment. Reduction in water quality downstream of discharge or spill point, and subsequent impacts on aquatic ecosystem health downstream of discharge.	No contamination to farm water, sediments, or surface water as a result of chemical, hydrocarbon, or hazardous substance spills.	All refilling of vehicles occurs within a designated area. No hazardous chemicals are added to the WSP from which discharge occurs. Fuel storage within a self-bunder container.	No indication of spills of chemicals or hazardous substances. Any spill of stored product is contained and remediated through the spill response procedure. No leaks form equipment.	Regular inspections of chemical and hazardous substance storage areas through operational activities. Water quality performance will be monitored through the monitoring program.	Review storage and handling practices for chemicals and hazardous substances. Increase the amount of bunding and containment for chemical and hazardous substance storage areas.	Record all incidents. Reporting to be undertaken through Monitoring Report and Annual Return. Chemical and SDS register maintained. Hazardous material tracking undertaken

	Reduction in water quality of underlying aquifers.		All other chemicals stored in a designated bunded area. Training and site induction provided to all employees. Appropriate spill kits kept onsite and stored in chemical storage refilling areas.			Increase the number, capacity, and type of spill kit materials.	through invoicing process.
Waste generation	Poorly managed site attracting native fauna and pests. Contamination to land/soils.	No introduction of pest species or increase in native fauna as a result of poor waste management practices. No contamination as a result of poor waste management practices.	Ensure waste is stored/disposed of in appropriate containers for waste type prior to disposal. Removal of waste products by licenced waste contractors.	No recorded incidents of pests or native fauna accessing waste. No indication of land/soil contamination.	Monitoring of waste disposal areas.	Review waste handling and disposal practices.	Incident records. Incident reporting records.
Pen and pond maintenance (desludging and disposal of sludge material)	Impacts on water quality (turbidity and nutrients) and consequential impacts on aquatic ecosystem health).	No release of sediments or sediment and nutrient laden water to the receiving environment.	Adherence to pen cleaning schedule. Sludge and solid waste pumped from pens into solid waste pits (septics) and removed by a licenced contractor. Appropriate sediment controls installed around any stockpiling during the wet season.	No indication of sediment release into the environment.	Undertake daily pen inspections. Undertake visual inspections of sediment storage areas and sediment controls after rain events.	Review sludge handling and removal procedures.	Record all water quality results in a database and compare to guideline values. Record and respond to any complaints received regarding discharges.
Farming of live animals	Quarantine issues or spread of diseases.	No introduction or spread of disease across the farm or into the receiving environment.	Established quarantine practices within TCNT.	No recorded incidents of disease spread/outbreak.	Established monitoring and surveillance program to identify any potential disease outbreak.	Review quarantine practices. Review monitoring program.	Inspection records. Incident reporting records.
General farm operations	Degradation of air quality, including dust and emissions from operating farm equipment.	Minimise air emissions.	Maintenance of equipment to minimise air emissions as far as possible. Avoid activities generating excessive dust and if required, implement dust mitigation measures.	No complaints in relation to air quality.	Maintenance regime for all plant and equipment. Visual monitoring during periods of dry weather	Review maintenance regime. Review dust control measures and implementation.	Record and respond to any complaints received.

	Disturbance to neighbouring properties associated with excessive odours.	Minimise odour.	Adherence to pen cleaning schedule. General housekeeping around farm to reduce odour sources. All putrescible waste to be stored appropriately prior to removal from site by a licenced waste contractor.	No complaints in relation to odour.	Daily pen inspections. Inspections of waste management areas.	Review of cleaning schedule. Review of waste management practices	Record and respond to any complaints received.
	Spread of weeds.	To prevent spread of established weeds within and off the property. To prevent introduction of new weed species to the property.	Regular control of weeds by herbicide spraying. Regular slashing.	No increase in the distribution of existing weed species. No introduction of new weed species.	Undertake regular weed outbreak inspections.	Review weed control activities and frequency.	Inspection records. Incident reporting records.
	Creation of mosquito breeding habitat impacting on comfort of employees/neighbours and increased disease risk.	To prevent mosquito breeding opportunities To reduce the potential for contact between mosquitoes and people.	Minimise any stagnant water by ensuring containers are kept out of rain. Adherence to pen cleaning schedule.	No prolonged areas of ponding water on-site. No incidence of mosquito borne disease.	Regular inspections of site to identify areas of ponding water and subsequent rectification.	Review stormwater controls and site flow paths. Review inspection regime.	Inspection records. Record and respond to any complaint received.

6.1 Roles and responsibilities

Unless otherwise specified, the provisions within the EMP are the responsibility of the Farm Manager

6.2 Induction, communication, and training

All new site personnel, contractors, and unaccompanied visitors will be required to undergo a site induction where the essential environmental management information will be communicated. Induction and training activities will be reviewed regularly to ensure they contain the most up-to-date information and procedures.

Induction and training activities will be reviewed regularly to ensure they contain the most up-to-date information and procedures.

Scheduled regular toolbox meetings will keep employees informed of environmental issues, as well as safety awareness and hazards in the workplace. This will ensure that personnel are continually aware of environmental management activities on the site and enable any issues to be identified and resolved.

Relevant staff will have training provided so that they are able to undertake the environmental management and monitoring activities specified in this plan. In-house training will be provided by relevant contractors (consultants) in specific environmental monitoring tasks.

6.3 Non-conformance and corrective actions

The specific environmental actions stipulated in this section provide the overarching performance indicators for the site, against which management methods can be assessed. If it is identified that the safeguards are not being met, or unexpected issues arise, a process must be in place to implement corrective actions and adapt management methods.

Any non-conformance will be documented through site inspections/audits stating the nature of the nonconformance and the mechanisms implemented to correct the incident.

The Farm Manager should be notified of any non-conformance within 24 hours of it occurring. Corrective/preventative action should be completed within a timely manner (e.g. within seven days of the event occurring) to ensure that the incident is addressed. Records will be kept of all environmental incidents that occur, and corrective actions implemented. If management controls are not implemented and completed in the designated manner, additional training may be required for the Farm Manager, employees and/or subcontractors.

7 ENVIRONMENTAL MONITORING PLAN

7.1 Inspections and audits

Pen areas are inspected daily, and any issues are recorded in a daily report. Inspections include the following environmental aspects:

- Water levels in pens and input requirements
- Food waste build-ups and cleaning requirements
- Wastewater outbreaks or leaks
- Animal health and potential disease outbreaks
- Chemical and fuel volumes
- Visual inspections of the WSP for odour issues and outbreaks of aquatic weeds
- Visual inspection of the Abattoir soil absorption system for ponding, pooling of run-off of effluent.

Internal and external audits are undertaken on a yearly basis to review, assess and document all aspects of environmental management systems. This will identify any major changes required to the site operations and activities to ensure compliance with best management and welfare practices for crocodile farming. These audits will also include a review of the Occupational Health & Safety practices and general farm operation methodologies.

7.2 Water Monitoring

7.2.1 Sampling Locations

The onsite and offsite sampling locations for wastewater and surface water are shown in Figures 7.1 and 7.2.

Groundwater samples will be taken from the only operational bore (RN 034907) on the property currently supplying water to the farm operations. This will detect any potential migration of contaminants from the irrigation areas and farm operations.

Wastewater samples will be 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). Reductions in contaminants will be compared between the samples results to assess WSP treatment performance against Class C recycled water quality criteria.

The property adjoins a quarantine zone for the management of Cabomba weed on the Darwin River, which prevents access to the river for sample collection. Alternatively, a sample of the ephemeral drainage channel running parallel to the northern boundary of the farm will be collected 6 m from the water edge of the Darwin River. This will give an indication of the mixed stream water quality passing through the landscape before entering the Darwin River. To monitor for offsite influences that may affect the discharge monitoring point, the drainage channel will be monitored from two further locations: adjacent to the WSP and further upgradient near the roadside of Reedbeds Road.

A surface water sample from the Darwin River will be collected on the southern side of the causeway intersecting the river on Old Bynoe Road which is not within the quarantine zone. This will provide an indication of the upstream water quality of the river before it flows passed the property.

7.2.2 Sampling methodology and quality assurance

All sampling and handling of samples is to be 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 samples are to be analysed at a National Association of Testing Authorities (NATA) approved laboratory.

7.2.3 Monitoring parameters and frequencies

Surface water

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

Table 7.1. Monitoring parameters and frequencies for surface waters

Parameter	Sampling Frequency
pH	3 times during the wet season (start, during and end)
EC	
Total P	
Total N	
<i>E. coli</i> , <i>Enterococci</i> , Total coliforms	



Figure 7.1 Map showing onsite monitoring locations



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SITE MONITORING LOCATIONS



Figure 7.2 Map showing offsite monitoring locations



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OFFSITE
MONITORING
LOCATIONS

Groundwater

The monitoring parameters and frequencies of sampling for groundwater are outlined in Table 7.2.

Table 7.2. Monitoring parameters and frequency for groundwater

Parameter	Sampling Frequency
Groundwater usage	Monthly
Standing water level (SWL)	
pH	Quarterly
EC	
Total P	
Total N	
<i>E. coli</i> , <i>Enterococci</i> , Total coliforms	

Wastewater

The monitoring parameters and frequencies of sampling for both the inlet and outlet of the WSP are outlined in Table 7.3. The wastewater discharge point GPS co-ordinates are Latitude -12.76854 Longitude 130.98158.

Table 7.3. 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	

7.3 Assessment criteria

Surface water

The Darwin Harbour Water Quality Objectives for freshwater rivers and streams will be used as guidance for trigger values (Table 7.4) for water that is monitored in the ephemeral stream, and Darwin River.

Table 7.4. Water quality objectives for treatment for offsite discharge

Parameter	Trigger value
pH	6.0 – 7.5
EC	<200 µS/cm
Total P	<0.01 mg/L
Total N	<0.23 mg/L
NOx	<0.008 mg/L
<i>E. coli</i>	<200 cfu/100mL

Groundwater

Groundwater quality will be compared against the trigger values in Table 7.5. The listed trigger values have been adopted from the Darwin Harbour Water Quality Objectives for Groundwater. where there are significant increases in the parameters measured, further assessment will be undertaken to determine potential sources of contamination.

Table 7.5. Groundwater trigger levels

Parameter	Trigger value
pH	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	
Major cations and anions	<200 cfu/100mL

7.4 Reporting and records

7.4.1 Internal

The EMP will be reviewed annually to reflect any changes in operations at TCNT.

Details of environmental incidents, non-conformances or other relevant information are included in daily reports, and records of all incidents, inspections and reports are maintained through an electronic filing system.

All environmental monitoring records will be maintained in a water quality database.

An annual report is also prepared which details and reviews annual water usage and waste generation use across the farm.

7.4.2 External

TCNT will report any non-compliance with the EPL by completing a Non-Compliance Notification via the NT EPA website within 24 hours of the event.

An annual return will be submitted to the NT EPA on the anniversary date of the EPL to summarise the activities and outcomes of the previous 12 months. Additionally, a Monitoring Report will be prepared and submitted with the Annual Return that includes a trend analysis of the water quality monitoring data, total volume of discharge from the WSP during wet season and an assessment of any environmental impacts from TCNT operations.

8 EMERGENCY RESPONSE PLAN

Emergency response planning includes responses to environmental emergencies, and operational actions that cause an environmental incident. This Emergency Response Plan (ERP) outlines the environmental emergency risks, emergency preparedness, mitigation and reporting requirements specifically relating to environmental incidents for TCNT.

8.1 Emergency incidents

Emergency incidents that may occur within TCNT include:

- Extreme weather event (i.e. cyclone) resulting in damage to farm facilities, and/or flooding that leads to uncontrolled discharges to the surrounding properties.
- Flooding as a result of high rainfall events leading to uncontrolled discharges to the surrounding properties.
- Lightning strike that may disrupt power sources and impact on farm operations.
- Disease outbreak that leads to crocodile mortalities and large-scale quantities of biological wastes
- Fuel or chemical spill that may contaminate water or soils.
- Fire as a result of bushfire or accidental fire as a result of operations.

8.2 Emergency contacts

The Farm Manager is the contact person for all emergencies and environmental incidents. All incidents which cause or have the potential to cause material or serious environmental harm, will be reported to the NT Environment Protection Authority (NT EPA) within 24 hours as required under Section 14 of the 'NT Waste Management and Pollution Control Act'.

The details of the designated contact persons responsible for on-site environmental management are included in Table 8.1. Also included are emergency contacts for reporting pollution incidents (including non-urgent problems such as dust/noise) or advice.

Table 8.1. Emergency contact details

Contact	Details
Farm Manager	Wayne Kinbacher 04028 886 818 toporganicnt@gmail.com
NT EPA Pollution Hotline / Pollution Reporting	GPO Box 3675, Darwin NT, 0801 Pollution Hotline: 1800 064 567 pollution@nt.gov.au
ENVIRA Holdings Pty Ltd	18 Hutton Road, Arana Hills Queensland, 4054 0402 524 033
NT Police	131 444

Environmental conditions are monitored as part of the Environmental Monitoring Plan presented in Section 7, as well as by the Farm Manager through the Bureau of Meteorology website, NT Police, Fire and Emergency Services announcements, social media, and local radio emergency.

8.3 Objectives, targets, and indicators of the ERP

The objectives, targets and indicators of this ERP are summarised in Table 8.1.

Table 8.2. Emergency contact details

Objectives	Targets	Indicators
Protect people, property, and the environment	No incidents of harm to people, property or the environment from activities associated with an environmental emergency	Number of incidents recorded
Identify potential environmental emergency risks	All risks identified and management controls are in place	Audits and inspection findings
Identify and implement management and mitigation controls to reduce the residual risk		
Ensure emergency response equipment requirements are able to be identified and are available	All risks are identified, and management controls are in place. Emergency response scenarios have been identified	Audits and inspection findings
Ensure a high level of preparedness is maintained		
Facilitate efficient response to emergencies to limit the impacts to the environment		
Ensure emergency response training is relevant for the types of emergencies that TCNT may experience	Training for all employees	Training records

8.4 Emergency response procedures

8.4.1 General emergency preparedness

TCNT commit to continuous emergency preparedness through the following actions:

- Ensure that all personnel including management have received a site induction that specifically covers emergency response procedures.
- The Farm Manager will regularly liaise with staff to ensure that they are competent in responding to emergencies.
- Conduct regular inspections on all emergency response equipment and ensure that all equipment is in good working order.

- Following an emergency event, undertake an incident debrief and provide all staff with training into improved emergency response procedures or actions.

When advice is issued by authorities (i.e. cyclone watch, cyclone warning, evacuation order, etc.), the Farm Manager will ensure that the following steps will be undertaken:

- All employees and contractors will report to the designated evacuation point and receive further instructions regarding preparations for the emergency or evacuation.
- Where there is sufficient preparation time (i.e. in the event of a cyclone watch issued by the Bureau of Meteorology).
- All essential vehicles will be fuelled, if required to evacuate employees, and nonessential vehicles will be parked and secured.
- All potentially mobile items will be secured, tied down and/or stored and locked in the site office.

8.4.2 Spills response procedure

In the case of any spills the following procedure is to be implemented:

- Locate the source to identify volume and type of spill.
- Assess the risk to workers and environment to ensure appropriate PPE and measures to be implemented.
- Control and contain the spill by isolating or removing source.
- Clean the spill using spill kit and absorbent material or installing bunds.
- Dispose of contaminated spill control material appropriately.
- Report significant spills or spills that have entered stormwater to NT EPA Pollution Hotline (1800 064 567).

Spill containment equipment kits will be available in works areas. All personnel on site will be trained how to use these spill kits.

9 CONSULTATION AND COMMUNICATION PLAN

9.1 Relevant stakeholders and consultation

TCNT engages regularly with a broad range of stakeholders and interested parties. The stakeholders relevant to this EPL and their relationship to TCNT are summarised in Table 9.1.

Should any further stakeholders or interested parties arise, they will be added to the list of relevant stakeholders and included in future communications and consultations.

Table 9.1. Summary of relevant stakeholders

Stakeholder	Relationship to TCNT
Government	
Department of Environment and Natural Resources – Water Resources	Groundwater usage regulation
NT EPA	Issuer and regulator of the EPL and its compliance
Parks and Wildlife commission	Issuer and regulator of wildlife permits
TCNT	
Employees	TCNT workforce
Partnering contractors	TCNT workforce
Neighbours	
Robert Gough 1355 Old Bynoe Road (opposite southern boundary)	Neighbour
Michael and Jane Nicolls 470 Reedbed Road (parallel to western boundary)	Neighbour
Industry Bodies	
Crocodile Farmers Association NT	Crocodile farming industry body for NT

Consultation with stakeholders is undertaken directly through written (letters, emails) or verbal communication (meetings, phone calls).

9.2 Complaint management

For any complaints received regarding the operations of the farm, a register of complaints will be kept that records:

- Date and time of complaint
- Method by which complaint was made (i.e. telephone, letter, meeting, etc.)
- Name, address, contact telephone number of complainant
- Details of complaint

- Action taken in response to the complaint, including follow up contact with the complainant
- Any monitoring to confirm the complaint has been satisfactorily resolved
- If no action was taken, the reason for no action being taken.
- An example of the complaints register is included in Table 9.2.

Table 9.1. Example complaints register

Complaint number	Name of recorder	Personnel responsible for responding to complaint	Date/time complaint received	Complainant contact details	Details of complaint	Corrective action summary	Reasons for no action taken

10. References

Gough, T, 2010. Berry Springs Water Quality Investigation. Department of Natural Resources, Environment, the Arts and Sport. Technical Report 30/2010D.

Knapton, A, 2016. Development of a Groundwater Flow Model – Berry Springs. Department of Land Resource Management, Report 17/2016D

Appendix A: Permit No. 5816

Permits Office, Goyder Building
Chung Wah Terrace, Palmerston
PO Box 496
Palmerston NT 0831

Telephone: +61 08 8999 4486
Facsimile : +61 08 8999 4524
Email: pwpermits@nt.gov.au
Website: <http://parksandwildlife.nt.gov.au>

PERMIT

TO KEEP PROTECTED WILDLIFE IN THE NORTHERN TERRITORY TO BRING PROTECTED WILDLIFE INTO (IMPORT) AND TAKE PROTECTED WILDLIFE OUT OF (EXPORT) THE NORTHERN TERRITORY (Crocodile Farming)

pursuant to section 56 of the Territory Parks and Wildlife Conservation Act

Permit Details		
Item	Description	Details
1.	Permit Number	58186
2.	Commencement Date	26 February 2016
3.	Expiry Date	31 January 2026
4.	Permit Holder	
	(a) Permit Holder's Name	Top Organic Enterprises Pty Ltd
	(b) Permit Holder's ACN	23 127 292 184
	(c) Permit Holder's Residential or Business Address	1350 Old Bynoe Road, Berry Springs NT 0838
	(d) Permit Holder's Postal Address	PO Box 146, Darwin River NT 0841
	(e) Location Protected Wildlife to be Kept	Top Organic Enterprises, 1350 Old Bynoe Road, Berry Springs NT 0838
5.	Protected Wildlife which is the subject of this Permit	
	(a) Scientific Name	<i>Crocodylus porosus</i>
	(b) Common Name	Saltwater Crocodile
6.	Permitted Part	Live and dead Crocodile

Permit Details (continued)		
7.	Nominee	
	Nominee's Name	Nominee's Address
	Mr Wayne John Kinbacher, Owner/Manager of the Permit Holder	1350 Old Bynoe Rd, Berry Springs NT 0838 PO Box 146, Darwin River NT 0841
	Ms Charmaine Carter, Owner/Administrative Officer of the Permit Holder	1350 Old Bynoe Rd, Berry Springs NT 0838 PO Box 146, Darwin River NT 0841
8.	Authorised Persons	
	Authorised Persons are those persons employed or contracted or otherwise agreed by the Permit Holder and/or Nominees to carry out activities under this Permit for or on behalf of the Permit Holder and Nominees.	

**This Permit comprises the above Permit Details
and the attached Schedules 1 to 3**

Granted/Issued By



William Keith Saalfeld
Delegate of the
Director of Parks and Wildlife, Northern Territory

Date of Issue

11 / 02 / 2016

SCHEDULE 1 TERMS AND CONDITIONS

1. DEFINITIONS AND INTERPRETATION

1.1 Defined Terms

(a) In this Permit, unless the contrary intention appears:

Act	<i>Territory Parks and Wildlife Conservation Act</i>
Code of Practice	is the <i>Code of Practice on the Humane Treatment of Wild and Farmed Australian Crocodiles</i> , Department of Environment, Australian Government http://www.environment.gov.au/biodiversity/wildlife-trade/publications/code-practice-humane-treatment-wild-and-farmed-australian-crocodiles
Commencement Date	is specified at item 2 of the Permit Details
Commercial Crocodile Farming	means the Keeping of crocodiles for a Commercial Purpose.
Commercial Purpose	has the meaning it has in the Act
Conservation Officer	has the meaning it has in the Act
Crocodile	Means the species known as <i>Crocodylus porosus</i> (Saltwater Crocodile)
Director, or Director of Parks and Wildlife	has the meaning it has in the <i>Parks and Wildlife Commission Act</i>
Expiry Date	is specified at item 3 of the Permit Details
Export	means to take the Permitted Part(s) out of the Northern Territory
Honorary Conservation Officer	has the meaning it has in the Act
Import	means to bring the Permitted Part(s) into the Northern Territory
Import/Export Report	Is defined in clause 4(b) of these Terms and Conditions
Keep or Keeping	means to have possession or control of.
Nominees	are specified at item 9 of the Permit Details
Permit Details	means the table of Permit Details commencing on page 1 of this Permit
Permit Holder	is specified at item 4 of the Permit Details
Permit Location	is defined in clause 2.2(a) of these Terms and Conditions

Permit Number	is specified at item 1 of the Permit Details
Permit Period	is defined in clause 2.1 of these Terms and Conditions
Permit Return	Is defined in clause 5.1(a) of these Terms and Conditions
Permitted Part	is specified at item 6 of the Permit Details
Product Label	has the meaning it has in the <i>Wildlife Trade Management Plan for the Saltwater Crocodile in the Northern Territory of Australia, 2016-2020</i> .
Protected Wildlife	is specified at item 5 of the Permit Details

1.2 Interpretation

- (a) In this Permit, unless the contrary intention appears:
 - (i) words importing the singular number include the plural number and vice versa;
 - (ii) words importing any gender include all other genders;
 - (iii) "person" includes a corporation;
 - (iv) the word "including" is not a word of limitation, and is to be interpreted as though it were immediately followed by the words "but not limited to";
 - (v) all references to statutes also refer to statutes amending or re-enacting or replacing the statutes referred to and include a reference to all proclamations, orders in council, regulations, rules by-laws, ordinances and any other instruments and directions (if any) made hereunder;
 - (vi) all covenants, warranties, undertakings and Permits herein are, if entered into by more than one (1) person, deemed to be joint and several;
 - (vii) headings and sub-headings have been included for ease of reference only and this Permit is not to be construed or interpreted by reference to such headings or sub-headings; and
 - (viii) the Schedules to this Permit are to be read and construed as part of this Permit.

2. PERMIT PERIOD AND PERMIT LOCATION

2.1 Permit Period

This Permit will come into force on the Commencement Date and expire on the Expiry Date, unless cancelled earlier by the Director of Parks and Wildlife (or their delegate) pursuant to section 59 of the *Territory Parks and Wildlife Conservation Act* (the **Permit Period**).

2.2 Permit Location

- (a) The Permitted Part(s) may only be Kept at the location specified at Item 4(e) of the Permit Details.

- (b) The Permit Holder or a Nominee must seek the Director's approval to relocate the Permitted Part(s) that are Kept under this Permit to a location other than the Permit Location whilst the Permitted Part(s) continue to be Kept under this Permit.

3. KEEPING OF PROTECTED WILDLIFE

- (a) The Permit Holder or a Nominee may Keep the Permitted Part(s) for the purpose of Commercial Crocodile Farming.
- (b) The Permit Holder or a Nominee must Keep the Permitted Part(s) at the Permit Location in accordance with the Code of Practice.
- (c) The Permit Holder or a Nominee must Keep the permitted Part(s) at the Permit Location in facilities that are secured in a manner which prevents the escape of the Permitted part(s) from the facilities and prevents access to or removal from the facilities of the Permitted Part(s) by unauthorised persons.
- (d) The Permit Holder or a Nominee shall attach a Product Label to all manufactured products derived from the Permitted Part(s).
- (e) Pursuant to section 57(2) of the Act, the Permit Holder or a Nominee carrying out an activity authorised by the Permit must:
 - (i) have the Permit or a duplicate of the Permit issued under section 61 of the Act in his possession; and
 - (ii) if required by a Conservation Officer or an Honorary Conservation Officer to do so, show the Permit or a duplicate of the permit to the Officer.
- (f) Pursuant to section 57(3) of the Act, the Permit Holder and any Nominees, as well as each person employed or otherwise engaged by the Permit Holder or any Nominee, must comply with this permit and the Act.

4. IMPORT/EXPORT OF THE PERMITTED PART(S)

- (a) Subject to this clause, the Permit Holder or a Nominee may bring the Permitted Part(s) into (Import) and take the Permitted Part(s) out of (Export) the Northern Territory.
- (b) The Permit Holder or a Nominee must not undertake any Import or Export unless:
 - (i) an Import/Export Report has been submitted to the Director a minimum of 72 hours prior to the time that it is proposed to Import or Export the Permitted Part(s) in electronic form in the format set out at Schedule 2 (**Import/Export** Report); and
 - (ii) the Permit Holder or Nominee has been advised by the Director that the Import/Export Report has been received.
- (c) The Permit Holder or a Nominee must notify the Director of any changes to the number or amount of the Permitted Part(s) in the Import/Export Report post submission of the Import/Export Report to the Director.
- (d) The Permit Holder or a Nominee must not undertake the Import or Export of the Permitted Part(s) if the Permit Holder or Nominee is

advised by the Director that the Import or Export is not to proceed until such time as the Permit Holder or Nominee receives advice from the Director that the Import or Export may proceed.

- (e) The Permit Holder must Import or Export the Permitted Part(s) in accordance with the Code of Practice.
- (f) The Import/Export Report, and any associated correspondence, must be submitted to the Director, by email to:

The Director,
Permits Office,
Parks and Wildlife Commission of the Northern Territory,
PO Box 496,
Palmerston NT 0831
Email: pwpermits@nt.gov.au

5. PERMIT RETURNS

5.1 Permit Returns

- (a) The Permit Holder or Nominee must provide Permit Returns to the Director in electronic form as follows:
 - (i) within 21 days of each anniversary of the Commencement Date during the Permit Period; and
 - (ii) within 21 days of the Expiry Date; and
 - (iii) in the format set out at Schedule 3.(the **Permit Return**).
- (b) The Permit Return must be submitted to the Director by email to:

The Director,
Permits Office,
Parks and Wildlife Commission of the Northern Territory,
PO Box 496,
Palmerston NT 0831
Email: pwpermits@nt.gov.au
- (c) The Director may request in writing, at any time, that the Permit Holder or Nominee submit a Permit Return. Upon receiving such a request, the permit Holder or Nominee must submit a Permit Return to the address provided in clause 5.1(b) within seven days of the request, and the Permit Return must contain information that is accurate up to the date of the request.

6. COMPLIANCE WITH LAWS

- (a) The Permit Holder will comply with all laws in force in the Northern Territory from time to time affecting or relating to the carrying out of activities under this Permit, including the *Territory Parks and Wildlife Conservation Act*, *Territory Parks and Wildlife Conservation Regulations* and the *Territory Parks and Wildlife Conservation By-Laws*.

7. LIABILITY

7.1 Risk

- (a) The Permit Holder or Nominee acts entirely at their own risk in undertaking any activities under this Permit, and the Parks and Wildlife Commission of the Northern Territory, the Conservation Land Corporation and the Northern Territory of Australia accept no liability for any loss or damage to property, or injury or death of any person occurring as a result of, or in connection with, these activities, including (but not limited to):
- (i) any breach of this Permit by the Permit Holder or any Nominee; and
 - (ii) any negligent acts of the Permit Holder or any Nominee in connection with this Permit.

7.2 Indemnity

- (a) The Permit Holder will indemnify, and keep indemnified the Parks and Wildlife Commission of the Northern Territory, the Conservation Land Corporation, and the Northern Territory of Australia and their officers, employees, servants, contractors and agents, against all claims, demands, loss or damage to property, or injury or death of any person arising as a result of, or in connection with, activities undertaken under this Permit and including (but not limited to):
- (i) any breach of this Permit by the Permit Holder or any Nominee; and
 - (ii) any negligent acts of the Permit Holder or any Nominee in connection with the Permit.

SCHEDULE 2
IMPORT/EXPORT REPORT
Permit to Import/Export Protected Wildlife

(Saltwater Crocodile *Crocodylus porosus*)

Permit Holder: Top Organic Enterprises Pty Ltd

Permit Number: 58186

Proposed date of Import/Export: ____ / ____ / 20____ (Shipment is valid for up to 14 days after this date).

Shipment Type: Import / Export (Delete whichever does not apply)

Shipment Method: Road / Rail / Air / Sea (Delete whichever does not apply)

For Import the Name and Postal Address of the Supplier of the Permitted Part(s) and for Export the Name and Postal Address of the Recipient of the Permitted Part(s):

Name:

Address:

Phone:

Email:

Part and Quantity of Permitted Part(s):

Part	Sex	Quantity
Live Adult (> 2200 mm)		
Live Juvenile (60 mm <= 2200 mm)		
Live Hatchling (<= 60 mm)		
Egg		
Dead Adult		
Dead Juvenile		
Dead Hatchling		
Skin Belly		
Horn-back		
Cape		
Back-strap		
Skull		
Teeth		

Permit Holder Signature: _____ Date: ____ / ____ / 20____

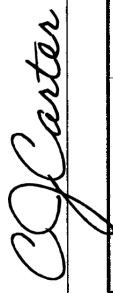
SCHEDULE 3
PERMIT RETURN
Permit to Keep Protected Wildlife

(Saltwater Crocodile *Crocodylus Porosus*)

Permit Holder: Top Organic Enterprises Pty Ltd

Permit Number: 58186

Return Period: 16 / 2 / 20 17 to 16 / 2 / 20 18

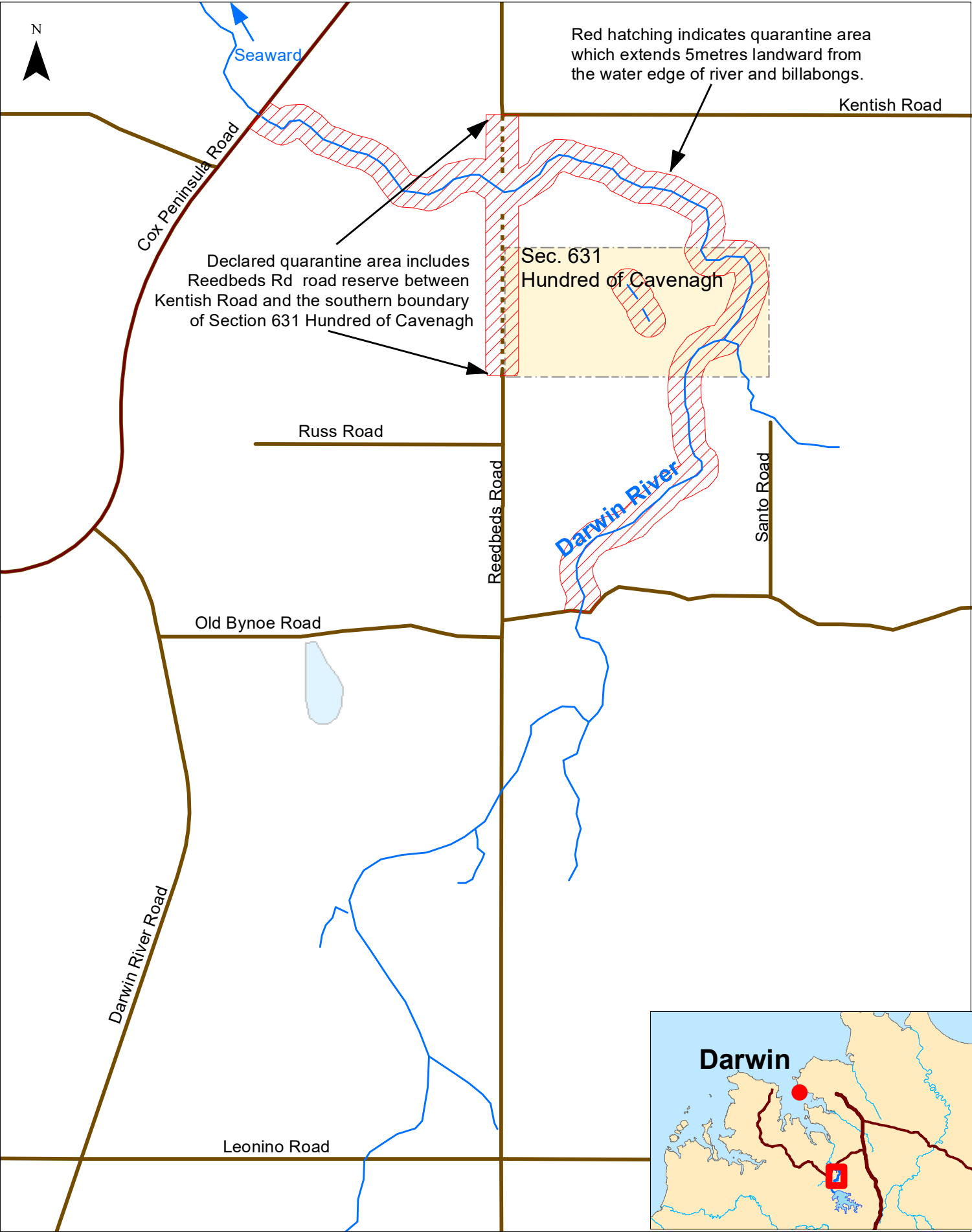
Permit Holder Signature: 

Permitted Part	Total Start Period	Purchase / Transfer In	Take / Problem Crocodile Permit	Other Acquire	Process / Hatch	Sale / Transfer Out	Escape / Mortality	Total End Period
Breeders (>Y5)								
Raisers (Y2-Y5)	238	18 OCT 2016	0	0	0	0	0	238
Hatchlings (Y1)								
Farm Eggs								
Wild Eggs								

Y1 → <1 year of age Y2-Y5 → 1 to 4 years of age >Y5 → > 4 years of age

Appendix B: NT Cabomba Quarantine Area Map

Quarantine Area to Manage Cabomba (*Cabomba caroliniana*)



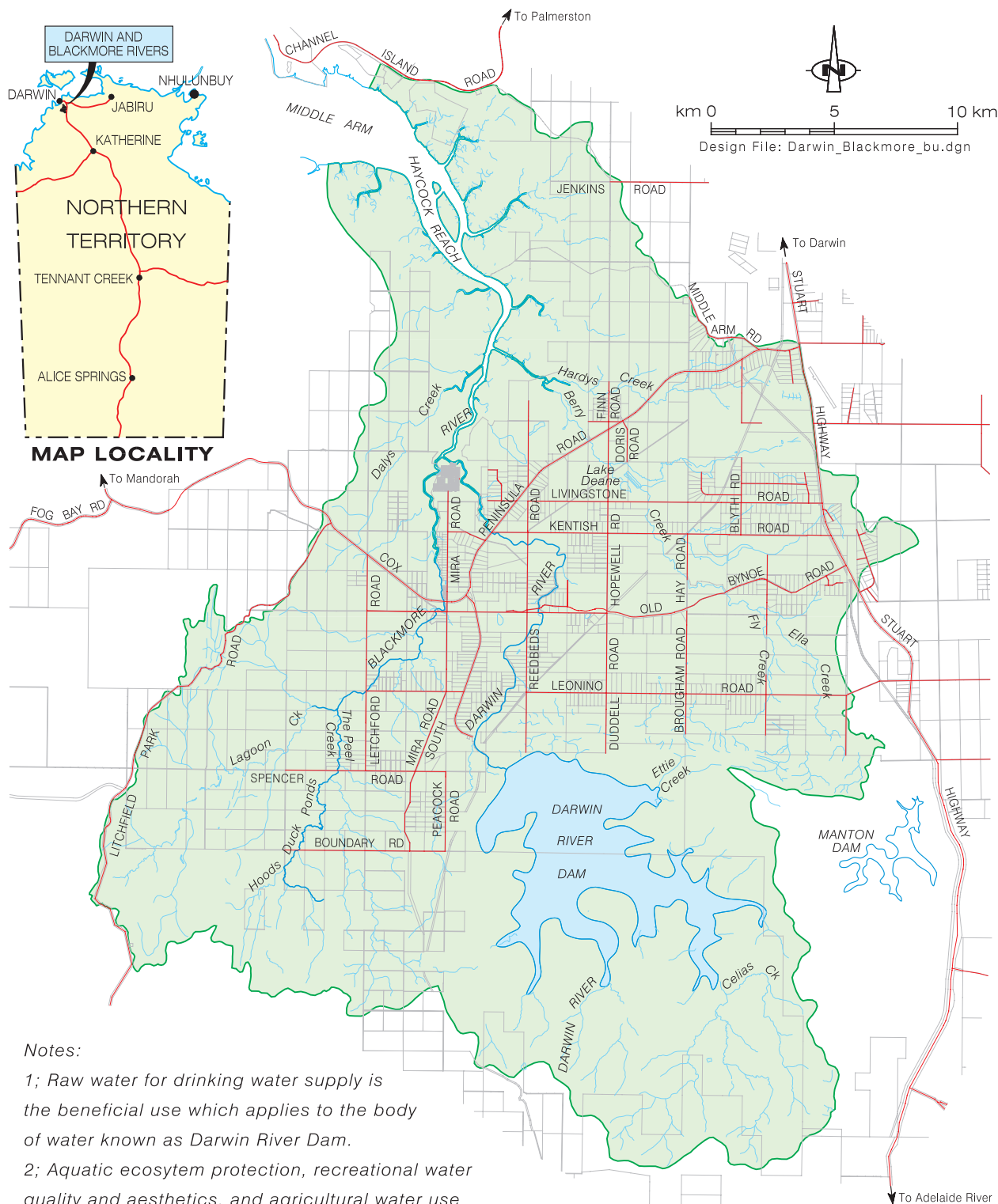
0 0.5 1 1.5 KM

Quarantine Area

Darwin River
Roads



Appendix C: NT Map of Darwin and Blackmore Rivers Catchment Area



Notes:

- 1; Raw water for drinking water supply is the beneficial use which applies to the body of water known as Darwin River Dam.
- 2; Aquatic ecosystem protection, recreational water quality and aesthetics, and agricultural water use are the beneficial uses in the waterways known as Darwin River and Blackmore River and all tributaries that enter those waterways.
- 3; For declaration and description see Northern Territory Government Gazette No. G40, 14 October 1998.
- 4; Prepared by Natural Resources Division, September 1999.

NATURAL RESOURCES



LEGEND

- Catchment area/boundary
- Road
- River or creek

DECLARATION OF BENEFICIAL USES AND OBJECTIVES OF WATER DARWIN & BLACKMORE RIVERS CATCHMENT AREA SURFACE WATER

Appendix D: Laboratory Certificates

CERTIFICATE OF ANALYSIS

Work Order : **ES2126901**
Client : **ENVIRA HOLDINGS PTY LIMITED**
Contact : **MATT MCKENNARIEY**
Address : **18 HUTTON ROAD**
ARANA HILLS QLD 4054
Telephone : **----**
Project : **NT Croc Farm**
Order number : **----**
C-O-C number : **----**
Sampler : **MATT MCKENNARIEY**
Site : **----**
Quote number : **EN/333**
No. of samples received : **2**
No. of samples analysed : **2**

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 : 23-Jul-2021 06:30
Date Analysis Commenced : 23-Jul-2021
Issue Date : 29-Jul-2021 19:39



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.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Ankit Joshi	Inorganic Chemist	Sydney Inorganics, Smithfield, NSW
Ivan Taylor	Analyst	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 Contact for details.

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

LOR = Limit of reporting

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

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- 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.
- Membrane filtration results for MW006 for sample #2 are reported as an estimate (~) due to the growth of bacteria on the filter membrane being counted <10cfu and/or >100cfu and 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.
- Membrane filtration results for MW006 for sample 1 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.
- MW006 is ALS's internal code and is equivalent to AS4276.7.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Croc.Pond.IN	Croc.Pond.OUT	----	----	----
Sampling date / time					22-Jul-2021 09:30	22-Jul-2021 09:45	----	----	----
Compound	CAS Number	LOR	Unit		ES2126901-001	ES2126901-002	-----	-----	-----
					Result	Result	----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.55	7.82	----	----	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		306	310	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		172	179	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		68	44	----	----	----
EA045: Turbidity									
Turbidity	----	0.1	NTU		32.4	25.4	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		104	120	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		104	120	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2	2	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		36	36	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		21	22	----	----	----
Magnesium	7439-95-4	1	mg/L		16	16	----	----	----
Sodium	7440-23-5	1	mg/L		11	11	----	----	----
Potassium	7440-09-7	1	mg/L		3	4	----	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		0.02	0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.04	0.02	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		3.3	3.1	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		3.3	3.1	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.74	0.74	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Croc.Pond.IN	Croc.Pond.OUT	----	----	----
Sampling date / time					22-Jul-2021 09:30	22-Jul-2021 09:45	----	----	----
Compound	CAS Number	LOR	Unit		ES2126901-001	ES2126901-002	-----	-----	-----
				Result	Result	Result	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		3.14	3.45	----	----	----
∅ Total Cations	----	0.01	meq/L		----	3.16	----	----	----
∅ Total Cations	----	0.01	meq/L		2.92	----	----	----	----
∅ Ionic Balance	----	0.01	%		----	0.29	----	----	----
∅ Ionic Balance	----	0.01	%		3.55	----	----	----	----
EP030: Biochemical Oxygen Demand (BOD)									
Biochemical Oxygen Demand	----	2	mg/L		6	8	----	----	----
MW006: Faecal Coliforms & E.coli by MF									
Faecal Coliforms	----	1	CFU/100mL		~<1	~2	----	----	----
<i>Escherichia coli</i>	----	1	CFU/100mL		~<1	~2	----	----	----

Appendix E: Site and Soil Evaluation

AUGUST 27, 2021

Leamac

Site and Soil Evaluation for 1350 Old Bynoe Road, Berry Springs, Northern Territory

Dear Sirs

Introduction

This report by WANT Geotechnics details the findings of a Site and Soil Evaluation for **1350 Old Bynoe Road** in Berry Springs, Northern Territory. The aim of the assessment is to establish the suitability of the soils for the installation of a wastewater disposal system

Scope of Work

A site and soil evaluation has been undertaken by WANT Geotechnics in general accordance with Appendix D (Site and Soil Evaluation for Individual Lots) and E (Site and Soil Properties) of Australian Standard AS / NZS1547 *On-site domestic wastewater management*. The scope of the work completed comprised:

- Excavation of a test hole and in-situ permeability test where the proposed system enters the site
- Excavation of a test hole and in-situ permeability test where the ReIn drain is proposed
- Completion of site and soil observations in general accordance with Appendix D and E of AS/NZS1547

The following tables detail the findings of the field investigation, observations, and desktop study broadly in line with the requirements of Tables D1 and D3 in AS/NZS1547.

Site Factor	Observation(s)
Slope	Fall of 2 to 5 degrees across the site with a central step down of around 1m
Shape	Stepped
Aspect	No predominant aspect
Exposure (sun, wind)	Site has largely been cleared in building area, pan evaporation in the area is around 2400-2800mm
Erosion, mass movement, land slip	None observed
Boulders, rock outcrops	None observed
Vegetation	Cleared, some remnant trees (mango)
Watercourse	Ephemeral waterway 70-100m to the east
Soil Water Regime	3 water bores marked as current on the property indicate water bearing beds 28m to 48m bgl
Fill	None observed in either test pit
Run-off / Flooding	Run-off and flooding limited as the system will be constructed at the top of an east facing slope that falls gently in elevation away from site
Channeled (concentrated) run-off	None evident
Soil Surface Condition	Signs of surface cracking (around AH2), ground is dry and hard see photographs in Tables 4 and 5
Salinity	Dryland salinity unlikely to ever occur (NT Government Dryland Salinity Map)
Other site-specific factors	See Table 2

Table 1: Site Assessment Factors

Leamac

SSE for 1350 Old Bynoe Road, Berry Springs, NT

Site Evaluator(s)	
Name	Stephen Flux BSc MSc CGeol AffilIEAust
Company	WANT Geotechnics Pty Ltd
Address	PO Box 36906 Winnellie Northern Territory 0821
Phone	0499 996 659
Email	steve@ntgeotechnics.com
On-site Evaluation	
Work Undertaken	
Details	2 x mechanically excavated test holes
Date	20 August 2021
Weather	Dry and hot, typically 34-37°C with 0.0mm rainfall in last 7 days
Topography	
Slope	Overall slope to the east around 5-10 degrees
Ground Cover	Grassed Area with a few mango trees, cleared of natural vegetation
Geology	Sandstone plains
Soils	Sandstone plains and rises of Rumwaggon Land System with sandstone plains and rises, lithosols on rises, yellow podzolics on alluvial areas (www.nrmmaps.nt.gov.au)
Climate	Annual Rainfall: 1295mm Annual Evaporation: 2000-2400mm Monsoonal climate, rainfall predominantly December to April (www.BOM.gov.au)
Drainage Pattern	Not evident from Google Earth imagery
Site Plan	See attached
Clearance	Proposed disposal area is largely cleared
Boundaries	Fenced
Waterways	Ephemeral waterway 70-100m to the east
Stands of trees / shrubs	Vegetation associated with Bend Land System typically tropical tall grass and eucalypt trees
Water Bores	See attached record from www.nrmmaps.nt.gov.au
Embankment	None, but system will sit at the top of a slope
Buildings	Residential dwelling 75m south
Other	Residential dwellings on adjoining blocks typically 100-150m distant
History (land use)	None known, currently occupied by pet meat company
Site Exposure	
Site Aspect	Easterly sloping
Predominant Wind Direction	East in Dry Season, West in Wet Season (www.weatherspark.com)
Presence of Shelter Belts	Eastern boundary is well vegetated with mature trees
Topographical Features	Fall to the east of 1-2m
Environmental Concerns	
Plants, high water table etc.	None identified
Site Stability	
Is expert assessment necessary	No
Drainage Controls	
Depth of Seasonal Water Table	Not ascertained, record of nearest water bore indicates water-bearing beds >28m bgl
Need for cut-off drains	No
Need for surface water collector	No
Availability of reserve / setback areas	Subject to design by others

Table 2: Site Evaluation

Soil Investigation	
Soil Profile Determination	2 x mechanically excavated test holes
Reporting	See <i>Field Investigation</i> section
Estimated Soil Category	See Table 7
Recommended DLR	See Table 7
General Comments	
Groundwater Quality Issues	None identified
Type of Land Application System	Recommendations and design by others
Overall Evaluation of Minimum Land-application area for the site	Design by others
Results of Consultation with other interested parties	None
Other comments	None

Table 3: Soil Evaluation

Field Investigation

Fieldwork comprised the excavation of 2 test holes, in the base of each excavation an in-situ soil permeability test was undertaken with a Decagon mini-disk infiltrometer. Prior to undertaking the test, the soil was soaked with water. Groundwater was not encountered in either test hole, but groundwater levels will vary throughout the year due to seasonal and other factors. The following tables present photographs taken during the works.

			
Looking North, East, South and West at TP1			
			
AH1 Excavation	AH1 Surface Condition		

Table 4: Test Pit AH1 Photographs

Looking North, East, South and West at TP2			
AH2 Excavation	AH2 Surface Condition		

Table 5: Test Pit AH2 Photographs

Strata	Photo of excavation
Auger Hole 1 0.00-0.55m: CLAY trace sand and gravel, intermediate plasticity, light yellow brown mottled red, hard, dry 0.50m: Base of test hole	
Auger Hole 2 0.00-0.45m: CLAY trace sand and gravel, intermediate plasticity, light yellow brown, hard, dry (roots in upper 100mm) 0.45m: Base of test hole	

Table 6: Ground Conditions

Recommended Design Loading Rate (DLR)

Based on the ground conditions encountered, the following table provides a Site and Soil Evaluation in general accordance with AS1547.

Table 7: Soil Evaluation

Location	Lower depth (mm)	Horizon	Moisture Conditions	Colour (moist)	Field texture	Coarse fragments	Structure	Soil Category	Hydraulic Conductivity
AH1	550	A2	Dry	Light red brown and brown	Clay trace gravel and sand	Few 2-10%	Apedal / Massive	4/5	0.33m/day
AH2	450								0.23m/day

The subsoils have been assessed to have an estimated permeability around 0.23m to 0.33m per day. Reference to the Table L1 of AS/NZS1547 *On-site domestic wastewater management* indicates that for such soils a DLR of 6mm to 10mm/day would be appropriate.

Yours faithfully,

WANT Geotechnics

Mary Flux

Mary Flux BSc Hons
Engineering Geologist



Stephen Flux BSc MSc CGeol AffilIEAust
Director / Engineering Geologist

Attachments

Permeability Work Sheets

References

1. Australian Standard AS / NZS1547 *On-site domestic wastewater management*
2. Northern Territory Geological Survey, N Doyle, 2001, *Extractive Minerals Within the Outer Darwin Area*
3. www.weatherspark.com
4. www.BOM.gov.au
5. www.nrmmaps.nt.gov.au

Limitations

SCOPE OF SERVICES

This geotechnical report has been prepared in accordance with the scope of services set out in the agreement between WANT Geotechnics and their client and is subject to any qualifications and assumptions set out in the report. In some circumstances the scope of services may have been limited by a range of factors such as time, budget, access and/or site disturbance constraints.

RELIANCE ON DATA

In preparing the report, WANT Geotechnics has relied upon data, surveys, and plans provided by the client. WANT Geotechnics has not verified the accuracy or completeness of the data, to the extent that the any statements, opinions, facts, conclusions and/or recommendations in the report (conclusions) are based in whole or part on the data, those conclusions are contingent upon the accuracy and completeness of the data. WANT Geotechnics will not be liable in relation to incorrect conclusions should any data, information or condition be incorrect or have not been fully disclosed to WANT Geotechnics.

GEOTECHNICAL INVESTIGATION

This report was prepared expressly for the client and expressly for purposes indicated by the client or his representative. Use by any other persons for any purpose, or by the client for a different purpose, is not recommended. The client should not use this report for other than its intended purpose without seeking additional geotechnical advice.

LIMITATIONS OF SITE INVESTIGATION

In making an assessment from the features and materials exposed in an excavation means there is the possibility that variations may occur below the surface that could not be anticipated. Actual conditions at the site might differ from those inferred to exist from the surface inspection, since no subsurface exploration was undertaken to assist with our understanding of subsurface details and potential anomalies.

SUBSURFACE CONDITIONS ARE TIME DEPENDENT

Surface and subsurface conditions may be modified by changing natural forces or man-made influences. A geotechnical engineering report is based on conditions which existed at the time of subsurface exploration. Construction operations, at or adjacent to the site, and natural events, such as floods or groundwater fluctuations may also affect subsurface conditions and thus the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events and should be consulted to determine if additional tests are necessary.

OTHER LIMITATIONS

WANT Geotechnics will not be liable to update or revise the report to consider any events or emergent circumstances or facts occurring or becoming apparent after the date of the report.

WANT Geotechnics



North ↑

	Client: Leamac		Site Plan 1350 Old Bynoe Road Berry Springs, Northern Territory	Project No.	NTG20212231
		Drawn by: S Flux		Drawing No.	1
	Scale: NTS	Date: 24 Aug 2021		Revision:	0

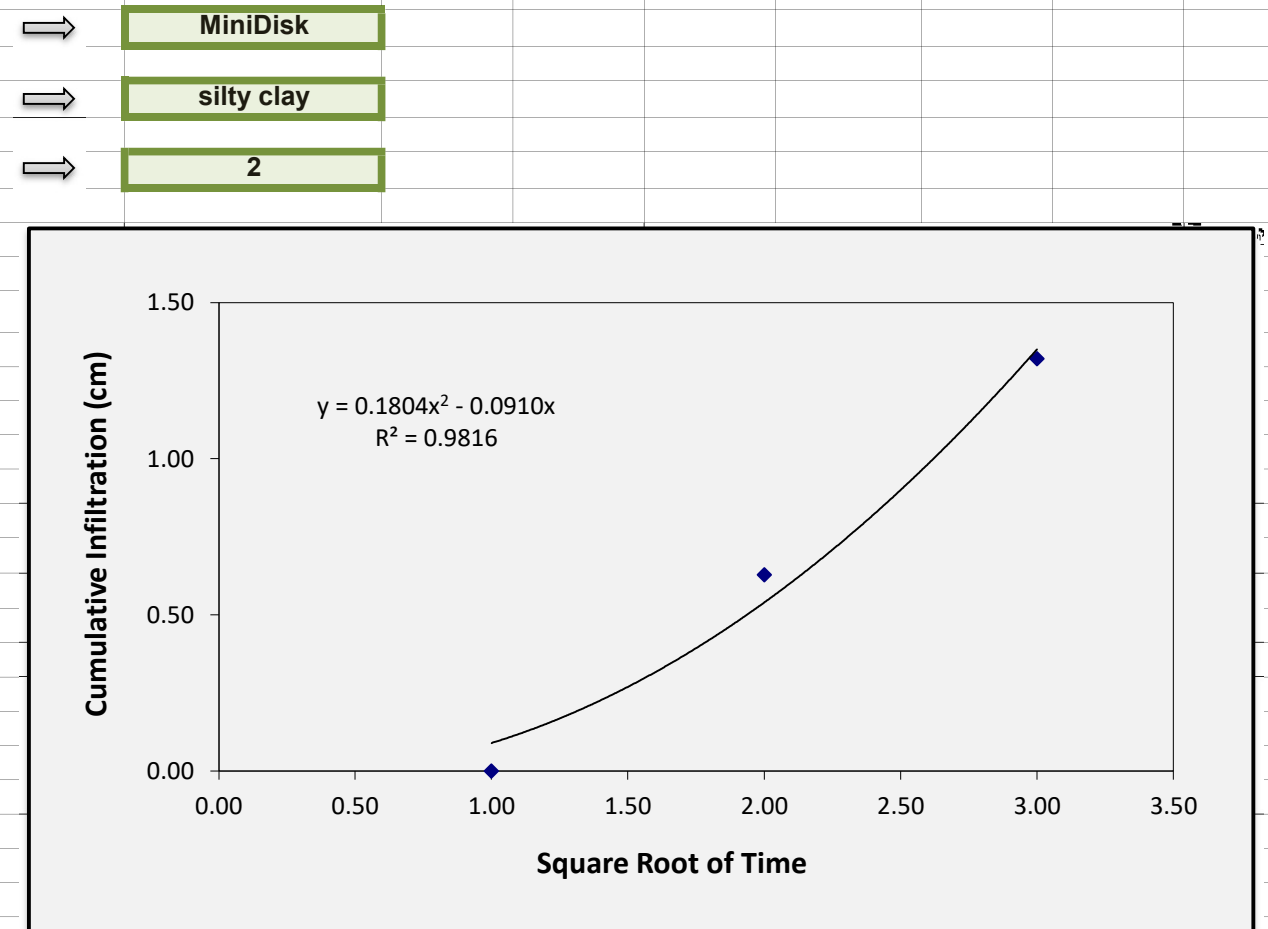
Instructions	
Step 1:	Enter measurement times beginning with zero
Step 2:	Enter corresponding volume measurements
Step 3:	Adjust selection field on graph to fit data

[illegible]

Step 4:	Select Infiltrometer Type
Step 5:	Select Soil Type
Step 6:	Select Suction

Radius	2.25 cm/s
alpha	0.005
n/h _o	1.09
Suction	-2 cm/s

A	6.359574636
C1	0.002453655 cm/s
K	0.000385821 cm/s



Instructions

Step 1: Enter measurement times beginning with zero

Step 2: Enter corresponding volume measurements

Step 3: Adjust selection field on graph to fit data

[illegible]

Step 4:	Select Infiltrometer Type
---------	---------------------------

MiniDisk

Step 5: Select Soil Type

silty clay

Step 6: Select Suction

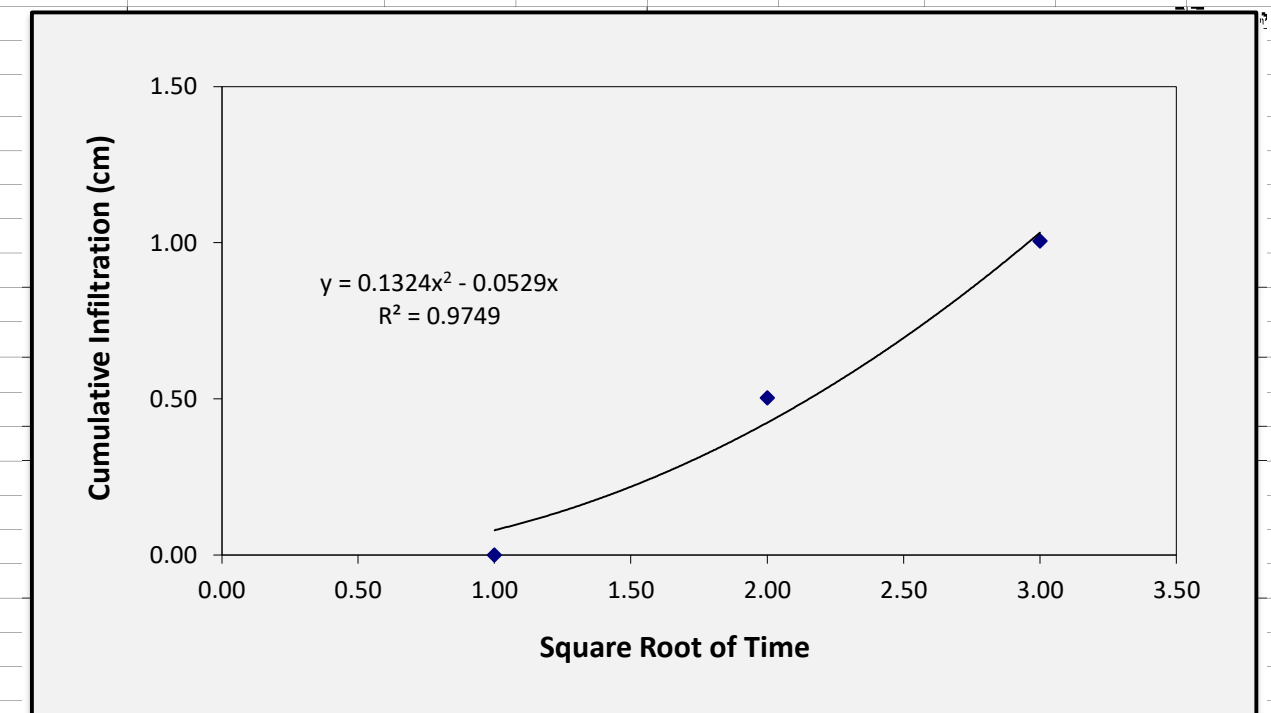
2

Radius	2.25 cm/s
alpha	0.005
n/h _o	1.09
Suction	-2 cm/s

A	6.359574636
---	-------------

C1 0.001676694 cm/s

K	0.000263649 cm/s
---	------------------



Appendix F: Pulsar Measurement: Greyline AVFM 6.1 Submersible Ultrasonic Flow Monitor Brochure



Greyline

AVFM 6.1

Ultrasonic flow monitor for partially filled pipes & open channels.

Measures Velocity & Level to Monitor Flow with a Single Ultrasonic Sensor

Area-Velocity Flow Meter

Measure flow through open channels, partially full pipes, and surcharged pipes without a flume or weir. Ideal for wastewater, stormwater, effluent, industrial wastewater, and irrigation water.

Submersible Ultrasonic Sensor

The AVFM 6.1 uses a submerged ultrasonic sensor to continuously measure both velocity and level in the channel. The sensor resists fouling, corrosion, and abrasion. The flow meter can be configured with the standard submerged velocity-level sensor, or with submerged velocity plus a separate non-contacting ultrasonic level sensor, for highly aerated fluids or those with a high concentration of suspended solids.

View flow rate and total flow on the large backlit LCD display and connect to external devices with three 4-20mA outputs and two control relays. Flow rate, volume, run hours, and diagnostic information available through the optional Modbus RTU serial communications.

Ultrasonic Flow Monitor for Partially Filled Pipes & Open Channels

Easy to Use

The AVFM 6.1 Area-Velocity Flow Meter measures both level and velocity to calculate flow in an open channel or pipe. Configuration is simple: enter the pipe diameter or channel dimensions and the AVFM 6.1 automatically computes and displays flow volume.



THE RIGHT METER FOR

- Wastewater
- Industrial Effluent
- Stormwater
- Combined Sewers
- Natural Streams
- Irrigation Water

The ultrasonic sensor mounts inside the pipe or on the bottom of a channel with a stainless steel mounting bracket (included) and a single screw into the bottom of the pipe or channel. No special compounds, tools, or hardware are required. The sensor is completely sealed with no orifices or ports.

Recommended Pipe or Channel Conditions

Careful selection of sensor mounting location results in the best performance and maintenance-free operation. Avoid locations where sediment builds up.

The best possible accuracy will result when the water is not highly turbulent and where velocity is evenly distributed across the channel. The channel should not have drops or direction changes immediately upstream of the sensor mounting location. Pipe or channel slope should not exceed 3%. See the installation manual for specific installation recommendations.



The AVFM 6.1 can measure forward flow velocity up to 6 m/s (19.7 ft/s) and reverse flow up to 1.5 m/s (5 ft/s). The electronics and software sample and average flow rates continuously to provide stable readings. The submerged velocity / level sensor will measure flow in partially full and surcharged pipes with pressure up to 10 psi. No special setup or adjustment is required. The minimum recommended pipe diameter is 150 mm (5.9 in).



Alternate Sensor Configurations

Alternate sensor models are available for special applications: a separate non-contacting ultrasonic level sensor with a submerged velocity sensor. The sensor cable can be extended up to 152.4 m (500 ft). Use this configuration for pipes or channels with a high concentration of air or suspended solids.

Custom Channel Shapes

Configure the AVFM 6.1 for installation in irregular or compound channel shapes by entering the channel width at multiple level points through a simple menu. Channels of virtually any shape can be monitored with your choice of measurement units.



Standard 26 Million Point Data Logger

The AVFM 6.1 will store time and date-stamped flow values at 10-second to 60-minute intervals. Daily flow reports are automatically created where total, minimum, maximum, and average flow rates are displayed on the LCD display. Transfer log files and daily flow reports to any USB flash drive just by connecting to the logger's USB output. Windows software is included to display log files in graph and table formats, change measurement units, and generate flow reports. Or, download data as .csv file format for import directly to Microsoft Excel.

Greyline AVFM 6.1 Area-Velocity Flow Meter

- Digitally Measure flow in pipes and open channels of any shape
- Ideal where flumes or weirs are difficult to install
- Works with water level from 25.4 mm to 4.5 mm (1 in to 15 ft)
- Auto-detects field installation of options, serial communications, and control relays

The AVFM 6.1 Area-Velocity Flow Meter includes a submerged ultrasonic sensor that is installed at the bottom of an open pipe or channel. Exposed materials are stainless steel so the sensor resists fouling and corrosion, and has no moving parts, orifices, ports, or electrodes.



The AVFM 6.1 displays and totalizes flow. It includes three 4-20mA outputs (flow, level, and velocity), plus two control relays for level alarms or flow proportionate pulse output for samplers and chlorinators. It is easy to calibrate with the built-in keypad and menu system. A built-in 26 million point data logger with USB output is standard. Intrinsic safety barriers for sensor and cable installation in hazardous rated channels are also optional.

Technical Specifications

GENERAL SPECIFICATIONS

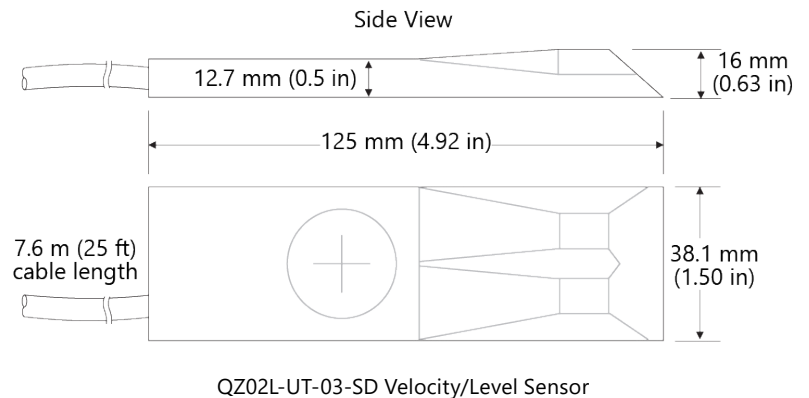
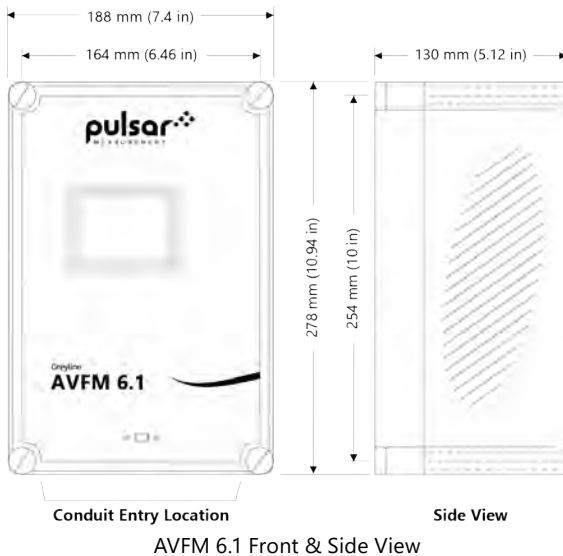
Operating Parameters:	Round pipe, rectangular, trapezoid, egg, or custom shapes
Programming:	Built-in 5-key calibrator with English, French, or Spanish language selection
Electronics Enclosure:	NEMA4X (IP66) polycarbonate with clear, shatterproof cover
Accuracy:	- Level: $\pm 0.25\%$ of reading or ± 2.03 mm (0.08 in), whichever is greater. Repeatability & Linearity 0.1%. - Velocity: $\pm 2\%$ of reading or ± 0.012 m/s (0.04 ft/s), whichever is greater. Requires solids or bubbles minimum size of 100 microns, minimum concentration 75 ppm. Repeatability & Linearity 0.5%
Display:	White, back-lit matrix — displays flow rate, totalizer, relay states, operating mode, and calibration menu
Power Input:	100-240 V AC 50/60 Hz, 10 V A maximum - Optional: 9-32 V DC, 10 W maximum
Analog Output:	3 Isolated 4-20mA, 1 k Ω , (flow, level, and velocity) or 0-5 V DC by menu selection
Control Relays:	2 Relays, form 'C' dry contacts rated 5 A SPDT; programmable flow alarm and/or flow proportional pulse (sampler/totalizer), flow and/or level alarm
Data logger:	Programmable 26 million point data capacity, time and date stamped plus formatted flow reports including total, average, minimum, maximum, and times of occurrence. Includes USB output to Flash Drives and Windows software.
Operating Temp. (Electronics):	-20 °C to 60 °C (-5 °F to 140 °F)
Approximate Shipping Weight:	4.5 kg (10 lb)
Approvals:	CE, CSA/UL/EN 61010-1

TRANSDUCER SPECIFICATIONS

Transducer:	QZ02L submersible sensor measures level and velocity
Level Measurement Range:	- Minimum Head: 25.4 mm (1 in) - Maximum Head: 4.6 m (15 ft)
Velocity Measurement Range:	0.031 m/s to 6.2 m/s (0.1 ft/s to 20 ft/s) and reverse flow to -1.5 m/s (-5 ft/s) in fluids containing bubbles or solids with a minimum size of 100 microns and a minimum concentration of 75 ppm to act as acoustic reflectors
Operating Temperature:	-15 °C to 80 °C (5 °F to 175 °F)
Exposed Materials:	316 stainless steel, epoxy resin, polyurethane
Transducer Cables:	7.6 m (25 ft) submersible polyurethane jacket, shielded, 3-coaxial
Transducer Mounting Kit:	Includes MB-QZ stainless steel mounting bracket
Temperature Compensation:	Automatic, continuous

POPULAR OPTIONS

Industrial Automation Protocols:	Modbus RTU via RS485
Transducer Cables:	15.2 m or 30.5 m (50 ft or 100 ft) submersible, continuous from sensor — or splice up to a total of 152.4 m (500 ft) lengthlength
Sensor Cable Junction Box	Watertight NEMA4 polycarbonate with connection terminal strip
Enclosure Heater:	Thermostatically controlled to -40 °F/°C — recommended for temperatures below 0 °C (32 °F)
Intrinsic Safety Barriers:	For sensor mounting in Class I, II, III, Div. I, II, Groups C, D, E, F, G hazardous locations
Transducers:	Separate non-contacting ultrasonic level sensor and submerged velocity sensor
Sensor Mounting Bands:	Stainless steel sensor mounting bands for pipes 152.4 mm to 1.8 m (6 in to 6 ft) diameter



Delivering the Measure of Possibility

Pulsar Measurement offers worldwide professional support for all of our products, and our network of global partners all offer full support and training. Our facilities in Malvern, UK and Largo, USA are home to technical support teams who are always available to answer your call or attend your site when required. Our global presence, with direct offices in the UK, USA, Canada, and Malaysia, allows us to create close relationships with our customers and provide service, support, training, and information throughout the lifetime of your product.

By taking a step forward in echo processing technology, Pulsar Measurement addresses applications previously thought to be beyond the scope of ultrasonic measurement. This technology improves signal processing at the transducer head which has made it possible to increase resistance to electrical noise, enabling the transducer to 'zone in' on the true echo.

For more information, please visit our website:

www.pulsarmeasurement.com



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