

nhulunbuy corporation

CROCODILE MANAGEMENT PLAN TOWN LAGOON AND SEWAGE PONDS



Title	Crocodile Management Plan
Type	Animal Management
Owner	Chief Executive Officer
Responsible Officer	Animal Control Officer
Approval date	March 2021
Review date	March 2023

1. Overview

North East Arnhem Land is home to the saltwater crocodile (*Crocodilus porosus*) or “Baru” in local languages. Crocodiles are very dangerous animals and are protected, native, and important to our regions ecology. From the local Yolngu point of view, they are a clan totem, and belong to the Yirritja moiety, and are powerful representatives of Yolngu mythology. Because of this, Nhulunbuy Corporation (NC) and any authorised stake holders must respect local Yolngu traditions when handling crocodiles. They are a large predator capable of attacking people and pets and as such they are a significant threat in the Nhulunbuy Crocodile Management Zones.

Saltwater crocodiles occur in water ways and water bodies across the entire Top End of Northern Australia. Any body of water in the Top End has always had the potential to contain large and potentially dangerous saltwater crocodiles. Despite their common name, saltwater crocodiles can, and have been found in freshwater systems hundreds of kilometres inland.

Crocodile management can reduce the risk of attack in strategic locations but *cannot* eliminate the risk of crocodile attack and therefore public education concerning the very real danger that crocodiles pose, is a critical element of the NC’s crocodile management strategy. This plan sets out a comprehensive and coordinated framework for managing the risks crocodiles pose to people.

The plan responds to the public’s support for a balanced approach between crocodile conservation and public safety by setting out how the NC animal control (NCAC) will manage crocodiles in the town lagoon, sewer ponds and where needed on the Special Purpose Lease area, including removal in certain circumstances, in accordance with the level of risk posed. The plan also highlights the key safety messages that everyone needs to keep in mind when in croc country.

2. Objective

The overarching objective of the Nhulunbuy Crocodile Management Plan, is to reduce the risk of crocodile attack to the public.

Crocodiles located within *management zones* will be monitored regularly and those considered to be a *problem will be targeted* and NC’s Animal Control Officer (NCACO) or approved stake holders will endeavour to trap and remove them. Continual full time trapping of the Nhulunbuy town lagoon is a constant and integral part of the crocodile management plan.

3. Purpose

The *Nhulunbuy Crocodile Management Plan* has been prepared by the NC, using advice from the N.T P&W Service and the Queensland Conservation and Biodiversity Policy Unit, (Department of Environment and Heritage Protection). This is the overarching framework for the Nhulunbuy town lagoon and sewer ponds, and the management of public safety risks

associated with crocodiles.

This management plan requires endorsement by the NC Board of Directors. The purpose of this management plan is to outline a consistent approach to crocodile management for Nhulunbuy and outlines:

- The risks posed by crocodiles in all of the crocodile management zones
- A collaborative and consistent approach to crocodile management
- How the NC responds to and manages crocodiles in each crocodile management zone
- The knowledge and behaviours that can help minimise risks of crocodile attack
- *Estuarine crocodiles (Crocodylus porosus)* are a protected species in the Northern Territory and are also protected nationally under Commonwealth legislation and internationally under the Convention on the International Trade of Endangered Species (CITES). These arrangements effect how crocodiles are managed, farmed and traded. All crocodile management must be carried out in accordance with NT Parks and Wildlife regulations.

4. Crocodile Habitat and Behaviour

Estuarine crocodiles range from India to northern Australia, and across to Vanuatu and the Solomon Islands. Crocodiles most commonly live in the tidal reaches of rivers and associated inlets and wetlands. However, they also occur along beaches and offshore islands and in freshwater lagoons, rivers, and swamps up to hundreds of kilometres inland from the coast.

As a result, there is a possibility that a crocodile may be present in or near almost any water body along the coastline of the Northern territory.

Juvenile estuarine crocodiles feed on small insects, crabs, prawns and shrimps.

As an adolescent of up to 2mt they hunt and eat an increasing number of vertebrates such as fish, frogs, birds, small turtles and rats.

An adults (over 2mt long) prey may include sea turtles, goannas, wallabies, cats, pigs, dogs, kangaroos, cattle, horses, buffalo, other crocodiles, and very occasionally, people.

To capture prey, estuarine crocodiles typically wait in ambush at the water's edge and lunge or snap sideways at animals which come to feed or drink. Their well-developed sense of smell will also lead them some distance in search of prey.



5. Risks Associated with Crocodiles in Nhulunbuy

Crocodiles are opportunistic feeders that can feed on any sized animal they can overpower. They can also be highly territorial, particularly during breeding seasons, and will attack anything in their habitat that they perceive is a threat.

Furthermore, since the cessation of crocodile hunting in the 1970's, and the continuing growth of the human population in the Northern Territory communities, there is an ever-increasing likelihood of contact between people and crocodiles.

It is imperative that each person takes responsibility for staying safe in croc country. A common misconception is that it's safe to swim if no crocodiles have been sighted recently in an area and if someone is 'on lookout' for crocodiles.

6. Crocodile Removal

The Nature (Estuarine Crocodile) Conservation Plan 2007 outlines the limited circumstances under which a crocodile may be considered as problem crocodile and therefore targeted for removal from the wild. These circumstances include where:

- a. the crocodile has attacked, is about to attack, or is behaving aggressively towards, a person
- b. the nature of the crocodile's location or behaviour makes the crocodile a threat, or a potential threat, to the safety or wellbeing of humans
- c. a crocodile has passed over, through or under a crocodile prevention barrier on land, on which civil works are carried out (e.g. sewer ponds), or infrastructure damage could occur

Circumstances A and B above relate to public safety, and this crocodile management plan provides detailed guidance in Appendix C – Problem Crocodile Determination Flowchart, on when the authorised officer may consider a crocodile as a problem crocodile under these circumstances. Circumstance C relates to problem crocodiles in specific settings, such as the sewer ponds, to which the NC routinely responds, and crocodiles are targeted and removed.

7. Dangerous Crocodile Behaviour

While all crocodiles can be dangerous, some crocodiles display particular dangerous behaviours around or towards humans. A crocodile displaying dangerous behaviour can pose a significant risk to public safety as once a crocodile has learned a dangerous behaviour, the behaviour is likely to be repeated, and this represents a much higher threat or potential threat to human's safety and wellbeing.

While each management zone provides different criteria for determining whether a crocodile is a problem crocodile, in the Nhulunbuy town lagoon, crocodiles are targeted for removal where they display certain dangerous behaviours, as listed in section 6, around or towards humans.

Importantly any crocodile that develops an association between humans and food availability is likely to be considered a crocodile displaying dangerous behaviour. Any crocodile displaying certain territorial behaviours are also likely to be considered a crocodile displaying dangerous behaviour.

8. Large Crocodiles

For the purposes of management, a crocodile that is larger than 2m in length may be considered a large crocodile. While most crocodiles are highly territorial and can attack humans, large crocodiles are more capable of injuring or killing people. The vast majority of attacks are carried out by crocodiles larger than 2m.

This criterion is used in the relevant targeted management zone, to determine if a crocodile is a

problem crocodile (crocodiles less than 2m in length are also targeted for removal in the zones) if they display dangerous behaviour or poses a threat, or a potential threat, to the safety or wellbeing of humans.

The NC's approach to the management of crocodiles is based on crocodile management zones. Different parts of the town lease are located within different management zones. The particular zone is determined by the overall risk to public safety that is present there.

9. Nhulunbuy Corporation's 5 Point Approach to being Proactive

The NC is taking a proactive approach to manage the risks that crocodiles pose to people and to reduce the likelihood of crocodile - human interaction. The five-key strategies that the NC have implemented are:

1. Signage and barriers - Be Crocwise signage has been installed in strategic position around the management zones. Physical barriers will be provided if necessary
2. Community advertising and awareness - delivery of public awareness programs using various media formats including radio, social media (Facebook), website
3. Education in schools - presentations in school education programs including Be Crocwise
4. Trapping and removal - regular monitoring, trapping and removal of crocodiles will be ongoing
5. Continual monitoring by the NC staff and by members of the public through the 'Be Crocwise' reporting system

10. Reactive Management Actions

Once the sighting has been confirmed, the most effective removal actions specific to the location are deployed. Often more than one of these reactive management actions will be utilised to reduce the risk as quickly as possible.

11. Being 'Be Crocwise' in Nhulunbuy

The NC is committed to the safety of the community through sensible management and removal of crocodiles in each management zone.

Regardless of the number of crocodiles that are removed the best way to avoid a crocodile attack is for people to be aware of the risks posed by crocodiles and for individuals to stay safe when they are in and around waterways that may be inhabited by crocodiles.

The Northern Territory Government has developed a campaign to educate people about crocodiles and reduce the risk of attacks. Information can be found on the NT.GOV.AU website under <https://nt.gov.au/emergency/community-safety/crocodile-safety-be-crocwise>

In Nhulunbuy we follow and endorse the Northern Territory Government's Crocwise strategy.

The Key principles of Crocwise are:

- Saltwater crocodiles are common in the NT and pose a significant risk to human life
- People live and recreate in or near areas where saltwater crocodiles occur
- In areas where saltwater crocodiles occur, no amount of management can guarantee that a natural waterway is 100% safe
- Only swim where there are signs recommending swimming; No Sign- No Swim
- It is possible to safely live and recreate in areas where saltwater crocodiles occur



- The NT Government has a strategic approach to saltwater crocodile management
- Personal safety is the concern of the Government but the responsibility of the person
- Know that crocodiles are ambush predators and evidence of their presence may not be obvious
- Pay attention to any warning signs at the locations you visit
- Be aware that crocodiles can attack people in boats and the smaller the boat the greater the risk
- Whenever you see a crocodile in the town lagoon or surrounding town lease area, report it to the NC by calling 08 8939 2200

Avoid incidental or deliberate feeding, e.g. leaving food scraps near the water, or disposing of bait at boat ramps.

The following guide is designed to help you reach an ethical decision based on the relevant facts and circumstances of a situation.

12. Evaluating the Risk

Factors used in evaluating the risks to public safety in different parts of the crocodile management zone include:

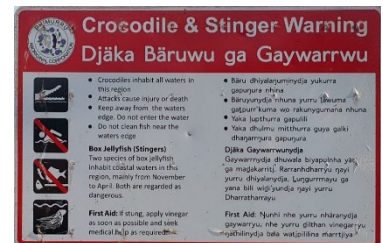
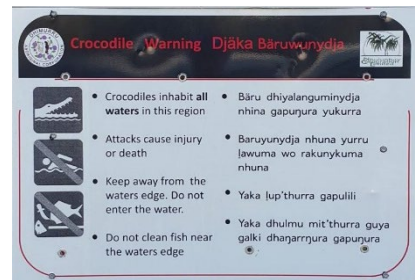
1. the size of the human population in an area
2. the size of the crocodile population in an area
3. **The physical size of the crocodiles in that zone.**
4. whether crocodiles are resident or transitory in an area
5. the viability of various management options in an area



The process to determine the risk level is contained in this management plan under Appendix A.2 - NCL Risk Matrix.

13. Cultural Values

The importance of crocodiles in Aboriginal culture is reflected in a complex system of totems and ceremonies which is still evident among most coastal Aboriginal communities in northern Australia (Laynhapuy 1987). Aboriginal communities also regard saltwater crocodiles as dangerous animals. The non-Indigenous community has a diversity of views on saltwater crocodiles from being reviled as dangerous pests to being admired and recognised as a significant component of the environment.



14. Nhulunbuy Corporation Crocodile Warning Signs





The NC approach to the management of crocodiles is based on crocodile management zones. The particular zone is based on the overall risk to public safety that is present there.

- Frequent traffic town lagoon **BLUE ZONE - A**
- Low traffic town lagoon **RED ZONE - B**
- Sewer ponds **YELLOW ZONE - C**

14. Making and Amending a Crocodile Management Zone Map

Crocodile management zones are defined by the crocodile management zone maps which are approved by the Chief Executive Officer (CEO) and may be amended by the CEO from time to time.

In making decisions about amending a map, the CEO may consider:

- Matters relevant to the conservation of crocodiles
- Matters relevant to the overall public safety
- The zone rationale
- Any other matter that the CEO considers appropriate

15. Frequently Trafficked Town Lagoon Zone (Zone A)

This zone is a popular recreation area that is frequented by large numbers of people due to its proximity to an urban centre. In this zone the inherent risk of human–crocodile interaction is **Very High**.

This is due to the significant number of people living in the area and the high likelihood of crocodiles entering the area from surrounding crocodile habitat.

Management Response

The management objective for this zone is to significantly reduce the number of crocodiles near large urban areas, with a particular focus on large crocodiles.

The management approach changes from time to time, but generally involves a combination of the use of permanent, regularly monitored traps in the town lagoon, and patrolling to detect and target crocodiles for removal. Crocodiles are also targeted for removal if they are regularly seen by the public. In this ZONE Crocodiles are targeted for removal regardless of size or behaviour. Although management of this zone should help reduce the total number of crocodiles (particularly large crocodiles), it is not possible to make this ZONE completely free of crocodiles or to entirely remove the risk of a crocodile attack. Crocodiles are wild animals that can be difficult to detect and capture and can swim long distances. At any given time, there may be undetected crocodiles already within the zone, known crocodiles yet to be removed, or new crocodiles entering the zone. Even when a crocodile has been removed, it leaves a vacated territory for another crocodile to fill.

The implementation of mitigating controls of patrolling, detecting and removing crocodiles along with installation of signage, barriers, public education reduces the likelihood of crocodile – human interaction to **Moderate**.

Crocwise Knowledge and Behaviour in Zone A are:

Understand that while regular removal of crocodiles in this zone is the responsible action to take to reduce the immediate risk of a negative interaction with a person, it will not eliminate the overall risk that crocodiles pose to humans in the area.

Understand that removal of crocodiles often creates vacant territory that is quickly filled by the next most dominant animal and that crocodiles are still likely to be present in the zone, so it is important to comply with Crocwise safety messaging, including warning signs.

Know how to look for signs of a crocodile before going near the water (for example, slide marks & Bubble trails), and check each time you go near the water.

If crocodiles are seen in this area, report it to the NC Animal Control by calling 08 8939 2200.



16. Low Traffic Town lagoon Zone (Zone B)

This zone is an area that is typical habitat for crocodiles but does not have frequent public traffic and the water body is further away from the town population centre and frequently used

trails. In this zone the inherent risk of human–crocodile interaction is Moderate to High.

This is due to crocodiles living in close proximity to urban populations or large towns. It should be noted that large crocodiles are often likely to be living in this zone.

Management response

The management objective for this zone is to reduce the likelihood of a crocodile attack.

Management involves targeting the removal of all large crocodiles longer than 2 metres and any crocodile displaying dangerous behaviour (following a problem crocodile determination). It is not possible, nor the intent of management, to make this zone free of crocodiles. Crocodiles will be present, and the chance of attack remains. The removal of a large crocodile or a crocodile displaying dangerous behaviour, may reduce the likelihood of a crocodile attack but also can make space for another crocodile to fill. People living in or visiting areas in this zone need to practise Crocwise behaviour and assume that crocodiles may be present to reduce the likelihood of a crocodile attack.

The mitigating controls of patrolling, detecting and removing crocodiles along with installation of signage, barriers, public education reduces the likelihood of crocodile – human interaction to **Medium - Low**.

Key Crocwise knowledge and behaviours in ZONE B are:

Understand that while the removal of a large crocodile or a crocodile displaying dangerous behaviour in this zone is the responsible action to take to reduce the immediate risk of a negative interaction with a crocodile, it is unlikely to eliminate the overall risk that crocodiles pose to humans in the area.

Always adhere to safety messages, which may be targeted at typical activities undertaken in the area (e.g. bush walking, fishing, birdwatching etc).

Remember that the removal of crocodiles often creates vacant territory that may be filled by the next most dominant animal.

Even when crocodiles are removed, other crocodiles are still likely to be present within the zone, so it is important to comply with Crocwise safety messages, including warning signs.



Know how to look for signs of a crocodile before going near the water (for example, slide marks and bubbles and trails in the water).

If a crocodile is present in the area, report it to NC Animal Control by calling 08 8939 2200.

17. Sewer Pond Zone (Zone C)

This Zone is restricted to authorised personnel and is fenced off. This zone can attract crocodiles because of the abundant water bird and fish food source and constant water supply when the town lagoon shrinks back during the dry season. In this zone the inherent risk of human–crocodile interaction is **Low**.

Management response

The management objective for this zone is to make the area free of crocodiles so authorised persons can be in or near the water with a very low likelihood of crocodile attack.

Management involves using physical barriers (generally existing barriers such as fences and gates) to prevent crocodiles entering the area and targeting for immediate removal any crocodiles reported to have passed the barrier. There are limited areas where physical barriers capable of preventing crocodile access exist. While crocodiles are generally unlikely to be present in this zone, people should be aware that safety cannot be guaranteed given crocodiles are wild animals that can be difficult to detect in water bodies. To reduce the likelihood of a crocodile attack, people working in or visiting areas in this zone need to practise Crocwise behaviour and follow any warning signs.

The mitigating controls of patrolling, detecting and removing crocodiles along with installation of signage, barriers, public education reduces the likelihood of crocodile – human interaction to Low.

Key Crocwise knowledge and behaviours in ZONE C are:

Understand that even when barriers are used in conjunction with crocodile removal, the area may not be free of crocodiles given the site is within crocodile habitat and crocodiles are highly mobile.

Obey any warning signs and practise Crocwise behaviours if a crocodile has been sighted in the area.

Regardless of the number of crocodiles that are removed the best way to avoid a crocodile attack is for people to be aware of the risks posed by crocodiles, and for individuals to stay safe when they are in and around waterways that may be inhabited by crocodiles.



If a crocodile is present in the area, report it to NC Animal Control, by calling 08 8939 2200.

Likelihood, Consequence, Risk and Mitigation

The following information provides a brief description of the location, background and history of crocodile - human interaction within this management ZONE And an assessment of the likelihood of a potential fatal crocodile attack. The Nhulunbuy Crocodile Management Plan has been developed based on this information.

Although there have not been any reported crocodile attacks on people within the township of Nhulunbuy, there have been deaths and attacks in the Nhulunbuy Peninsula area. From 2001 to the end of 2017 there have been four crocodile attacks. In 2013 a French worker was swimming out to his Dinghy in shallow water at the Gove Boat Club, when he was bitten on the back of the neck and head by an estimated 2 – 3 metre crocodile. Recent sightings at the time confirmed the size of the crocodile.

Saltwater crocodiles have always inhabited the Town Lagoon and surrounding **coastal areas** and creeks. Crocodiles breed and nest in the town lagoon and this fresh water lagoon is near breeding areas such as North River, Latram River, Giddies River, and other small creeks that

flow into Melville Bay. The Nhulunbuy town lagoon has observed a steady rise in the number of crocodiles over the past few years.

News.com.au wrote 16/1/2016 - *"In 1979, Rainbow Cliffs was the scene of the Northern Territory's first fatal crocodile attack in living memory when a Victorian tourist was taken by a "Saltie" as he snorkelled around reefs at the foot of the cliffs. The attack shattered the illusion that the only dangerous things in Top End waters were box jellyfish, aka "stingers". Thirty-five years on, crocodiles cast a shadow over many of Gove's outdoor pursuits."*

The news.com article went on to say: *"A lagoon across the road from Nhulunbuy's primary school was our favourite play-space as kids. We spent hours and hours collecting tadpoles, guppies, building tree houses and exploring this tranquil spot. I wouldn't dare do that now. When I amble down to the lagoon in the late afternoon a large sign warns me in no uncertain terms that death and dismemberment await the unwary."*

18. Nhulunbuy Crocodile Management Zone

The Nhulunbuy Crocodile Management Zone includes the town sewer treatment ponds and the entire town lagoon that runs adjacent to the township of Nhulunbuy. It also includes the drainage channels that flow from the township into the lagoon, as well as the seasonal opening of the lagoon to the ocean, during some wet seasons. NC do not manage crocodiles along the coastline and beaches around Nhulunbuy. That role is undertaken by the Dhimurru



Aboriginal Corporation and other authorised stakeholders. The town Lagoon runs from its Eastern point, near the Gove Surf Lifesaving Club, to the western end adjoining the Nhulunbuy Golf Club. The town lagoon's southern boundary is the township of Nhulunbuy and its northern boundary, are the sand dunes running adjacent to the Arafura sea. It is approximately 2.2 kilometres in length and 1.4 kilometre at its widest point and is 6kms in circumference. The area within this boundary varies in its habitat, seasonality of water bodies, and populations of people in proximity to crocodiles. A map showing the three (3) zones is contained in Part B - Crocodile Management Zones of the NCL Crocodile Management Plan.

19. Likelihood, Consequence, Risk and Mitigation

Risk assessment of crocodile management considers the likelihood of an event occurring (human – crocodile interaction) and the consequences (injury – death) should that event occur. It is broadly acknowledged that the potential consequences of a crocodile attack are severe and for this reason, a fatal crocodile attack is considered a high to extreme risk in most Top End waterways.

The NC will endeavour to reduce any risk to the lowest level practicable. The NC Animal Control Officer (NCACO) and / or an NC approved stakeholder will employ a suite of intensive management actions in the management zone.

When determining the likelihood of a human - crocodile interaction occurring within any

allocated zone, the NC will utilise the Crocodile Management Risk Matrix contained Appendix A.2 in this Plan and will take into consideration a number of criteria in relation to its management zones, including;

- a. **Frequency of sightings**, capture and removal (How often crocodiles are found and caught in the management zones)
- b. **Proximity** (How close a management zone is to known crocodile breeding areas)
- c. **Accessibility** (How accessible is a management zone to the public and to staff to manage)
- d. **Size** (The average size of crocodiles removed from the management zones)
- e. **Crocodile Awareness** (Is there suitable signage and education provided)
- f. **Physical Barriers** (Are there barriers to minimise human – crocodile interaction)
- g. **Frequency of Attacks** - number of interactions in since establishing Nhulunbuy

a) Frequency of sightings, capture and removal (How often are crocodiles sighted and captured in the area?)

From August 2015 to February 2016 there were 15 crocodiles trapped and euthanized in Nhulunbuy town lagoon December 2017 four crocodiles were removed from the town sewage ponds. Most of these crocodiles were trapped using just one trap or controlled shooting. Night time spotlight surveys conducted in December 2016 exposed up to 18 crocodiles each night, within a single town lagoon pool. A crocodile audit that was carried out in December 2017 by the NCACO, concluded that the town lagoon had dozens of crocodiles living in it, with some over 3 metre long. Day time patrols conducted by the NCACO have reported sightings of a 3-metre crocodile attacking ducks in the town lagoon and very large crocodile tracks left by a crocodile larger than 4 metres travelling between the beach and the fresh water town lagoon. The NCACO has reported seeing a crocodile over 4 metres in length during night time spotlight surveys. **When crocodile management commenced again in November 2018, there were thirty one crocodiles trapped and removed from Zones A, B, & C by February 2020 (15 months). Prior to that,** reports of crocodiles in these areas were increasing. This is likely to reflect an increase in crocodile populations in nearby areas following the cessation of hunting in 1970 and the fact that NT Parks and Wildlife withdrew their Ranger from Nhulunbuy in 2014 due to funding cuts. There has also been an increase in human population living in these areas. After this management plan was approved on the 23/5/2018, there has been a noticeable decrease in crocodile sightings both in the crocodile management zones and the surrounding coastal areas.

b) Proximity (How close are the breeding sites to a populated or recreational area)

The presence of large numbers of crocodiles in adjacent coastal rivers and beaches, provides an ongoing source of crocodiles moving into the management area. Saltwater crocodiles are highly mobile animals and their strong territorial behaviour puts ongoing pressure on individuals to migrate away from resident populations. Removing animals from the management area reduces long term occupancy by particular animals, but also provides vacant areas of habitat for new individuals to occupy.

The township of Nhulunbuy is located within 200 metres of the town lagoon and within 5 kilometres of Crocodile creek, **less than 1km from Buffalo Creek and 3 km's from East Woody Creek.** These locations are known breeding locations and a constant source of juvenile animals or displaced adults moving from crowded locations to less populated areas. Locals usually post photos and warnings of crocodiles they see around the local beaches and estuaries, to the Gove Notice Board. The NCACO has observed dozens of crocodiles in the town lagoon and a

small number in the sewage ponds over the years. The local Aboriginal land council promote Crocodile awareness with radio advertisements but stopped actively trapping in the town lagoon in February 2016.

The number of people residing in or visiting areas adjacent to crocodile habitats increases the risk of a crocodile attack occurring.

The Northern Territory Government (NTG) and Developing East Arnhem Land (DEAL) in their 2017 Tourism Development Plan, stated that the township of Nhulunbuy comprised of approximately 3,500 residents with an estimated 10,000 visitors per year. Based on the NT Parks and Wildlife Risk assessment matrix, if the visitation rate per year to the Crocodile Management Zone is between 50 and 100 visitors, the risk level will be HIGH.

c) Accessibility (Recreational activities and unrestricted access to areas)

The probability of human – crocodile interaction happening is a factor of both the human and crocodile populations of an area and the types of activities that occur in that area. An area that has a large population of crocodiles and high usage and visitation rates for recreational water-based activities such as boating, crabbing, diving, canoeing, fishing, paddle boarding, kite surfing, jet ski and swimming has a higher probability of a crocodile attack occurring.

There are many regular activities that occur in the Nhulunbuy town Lagoon Management Zone. Some of these include, fishing, bird watching, yabby trapping, bike riding, bush walking, swimming, dog exercising, photography, weed control, guided town lagoon tours, mosquito fogging patrols and local schools conduct nature excursions along the lagoon tracks at times. During the Wet Season, the lagoon expands to full capacity and water covers most of the walking trails. People have been known to walk and ride their bikes through this water and when the lagoon breaks out into the ocean, kids have been seen swimming, and people spear fish, at the mouth.

d) Size of Crocodile

Crocodiles that inhabit the management zones vary in size. Records are maintained by NCL and reports provided to NT Parks and Wildlife.

e) Crocodile Awareness

Crocodile Awareness education is a strategy that has been included in the NC 5 Point plan.

f) Physical Barriers

These are existing natural or engineered barriers that reduce human – crocodile interaction.

g) Frequency of Attacks

There have not been any reported crocodile – human interactions within the crocodile zones.

20. Practicality (The accessibility of an area, the difficulty to monitor and the likelihood of the public entering the area)

There are often areas within a management zone that the wet season dramatically changes

and can reduce the accessibility and practicality of conducting trapping programs and regular monitoring in some of these locations. It can also create a greater risk to staff if they tried to continue trapping in some of these areas. The Nhulunbuy Town Lagoon is accessible from every side, even in the wet season when trapping can be difficult. Quite a number of the public still venture into the management zone for various reasons. In some cases, even with "Croc Wise" signage, people still expose themselves to extreme risk and swim at the opening to the fresh water lagoon during the height of the wet season, when the lagoon breaks its banks and flows into the ocean. Intensity of management in the Nhulunbuy Crocodile Management Zone is centred around high use areas, major population centres and locations where sightings have occurred. Locations that are less frequented and further away from possible human interaction are managed with less intensity. Whilst the NCACO attempts to manage the whole management zone, it is not possible to stop crocodiles from entering from outside the management zone, nor to immediately remove all crocodiles once they enter the ZONE and so there will always remain a residual risk of attack. Most areas within the management ZONE Are practical and easy to access for the public and staff during the dry season but pose access problems for crocodile monitoring during the wet season.

21. Mitigation - Proactive and Reactive Management Action

The NCACO has many different management actions that can be initiated, deployed and used to reduce the risk of crocodile attack in the management zones. Some management actions are far more resource intensive than others.

These different actions can be broadly classified as proactive and reactive management actions as detailed in Appendix B - Proactive and Reactive Management Action. The NC have implemented a five-key strategy to minimise the likelihood of human - crocodile interactions and risks posed by crocodiles:

The NC promotes the Northern Territory Government's 'Be Crocwise' campaign to educate people about crocodiles and reduce the risk of attacks throughout the schools in Nhulunbuy and on various modes of media. Information can be found on the NT.GOV.AU_website under <https://nt.gov.au/emergency/community-safety/crocodile-safety-be-crocwise>

This plan will be reviewed two years from the date of adoption.

Date 02 September 2022	Director (Name) Sophie Szytkarski	Signature <i>Sophie Szytkarski</i>
Chief Executive Officer (Name) Ali Mills		Signature <i>Ali Mills</i>

APPENDIX A.1 - NT Parks and Wildlife Risk Guidance Table for Crocodile Attack

LIKELIHOOD	FREQUENCY OF SIGHTING AND CAPTURE	PROXIMITY TO BREEDING SOURCE AREAS	ACCESSIBILITY FOR PUBLIC AND STAFF	AVERAGE SIZE OF CROCODILE SIGHTED / CAUGHT	AWARENESS	PHYSICAL BARRIERS	FREQUENCY OF ATTACKS
VERY HIGH 3	Confirmed sighting >10 animals per annum confirmed sightings, regularly caught.	Located within or immediately adjacent to known breeding area	Fully accessible area, no tenure restrictions	>3m	No signage, No Crocwise, No education program.	No barriers High water levels <5m from walkway, road etc	1 IN 5 YEARS
HIGH 2	Confirmed sighting in last 5 years. 3 - 10 animals sighted and/or caught in this time.	<100kms away	Limited access to area by boat, portage, road etc	2.5 – 3m	Signposted at >500m intervals. Crocwise.	No barriers Low water level > 5m from walkway, road etc	1 IN 10 YEARS
MEDIUM 1	Confirmed sighting in last 5 years. 1 - 2 animals sighted and/or caught during this time.	100-150kms away	Very limited access, seasonal constraints	1 – 2.5m	Signposted at <500m intervals, Crocwise, education	Barriers or fencing. High water level >5m from walkway, road	1 IN 50 YEARS
LOW 0	None or only freshwater crocs seen.	>150km away	No access: extremely difficult conditions	0 – 1m	Clearly signposted, crocwise, education program	Provision of fencing or, structural barriers, low water level	NONE
NOTE: the above table has been modified to include Awareness, Physical Barriers and Frequency of Attacks columns. The table in NT Parks and Wildlife Crocodile Plan shows only Frequency of Sighting and Capture, Proximity to breeding source areas, Accessibility for Public and Staff and Average size of crocodile sighted / caught.							

APPENDIX A.2 - NCL Risk Matrix

Likelihood	Consequence				
	Minor	Medium	Serious	Major	Catastrophic
Rare	1 – Low	1 – Low	2 - Moderate	2 - Moderate	2 - Moderate
Unlikely	1 – Low	1 – Low	2 - Moderate	2 - Moderate	3 - High
Possible	1 – Low	2 - Moderate	3 - High	3 - High	4 – Very High
Likely	2 - Moderate	3 - High	3 - High	4 – Very High	4 – Very High
Almost certain	2 - Moderate	3 - High	4 – Very High	4 – Very High	4 – Very High

Consequence	Likelihood	Ranking
Minor	Rare	1 – Low
Medium	Unlikely	2 - Moderate
Serious	Possible	3 - High
Major	Likely	4 – Very High
Catastrophic	Almost Certain	

Area/ Process	Activity / Task (Description)	Unplanned / Unwanted Event (Risk event)	Potential Causes - Root Causes - Latent Causes - Direct Causes	Impact	Likelihood	Consequence	Ranking	Current Controls	Likelihood	Consequence	Ranking	New Actions / Further Requirements
Town Operations	Wild animal control	Member of public taken by crocodile at town lagoon	Increasing number of crocodiles (>10 sightings per year) Public access to lagoon Known breeding area Large crocodiles in vicinity Limited signage Lack of awareness of public	Fatality	Likely	Major	4 – Very High	Crocodile management plan Trapping and culling program Lagoon access closed when water level high or inspections identify problem crocodile Regular inspections by animal control officer (including night patrols)	Possible	Major	3 - High	Additional signage Public crocodile education campaign (schools/ facebook etc.) Raised walkway Increased monitoring and trapping

VERY HIGH	<p>BOD, CEO and Management approval required to accept immediate action necessary.</p> <p>The proposed task or process activity must not proceed. Steps must be taken to lower the risk level to as low as reasonably practicable using the hierarchy of controls.</p> <p>Immediate action required.</p> <p>The proposed activity can only proceed provided that:</p> <ul style="list-style-type: none"> • Strategies are introduced to reduce risk to as low as reasonable practicable using the hierarchy or controls. • The risk controls must include those identified in legislation and Standards. • The risk assessment has been reviewed and approved by the manager. • A SOP or procedure has been developed. • Manager has reviewed and documented the effectiveness of the implemented risk controls.
HIGH	<p>Senior and Service Management approval required to accept immediate action necessary</p> <p>Management responsibility must be specified.</p> <p>The proposed activity can proceed provided that:</p> <ul style="list-style-type: none"> • Strategies are introduced to reduce risk to as low as reasonable practicable using the hierarchy or controls. • The risk controls must include those identified in legislation and Standards. • The risk assessment has been reviewed and approved by the manager. • A SOP or procedure has been developed. • Manager has reviewed and documented the effectiveness of the implemented risk controls.
MODERATE	<p>Manage risk by routine procedures</p> <p>The proposed task or process can proceed provided that:</p> <ul style="list-style-type: none"> • The risk level has been reduced to as low as reasonably practicable using the hierarchy of controls. • The risk assessment has been reviewed and approved by the Manager. • A SOP has been developed.
LOW	<p>Business as usual - no approval required</p> <p>Managed by local documented routine procedures which must include application of the hierarchy of controls.</p>

APPENDIX B**Proactive Management Approach**

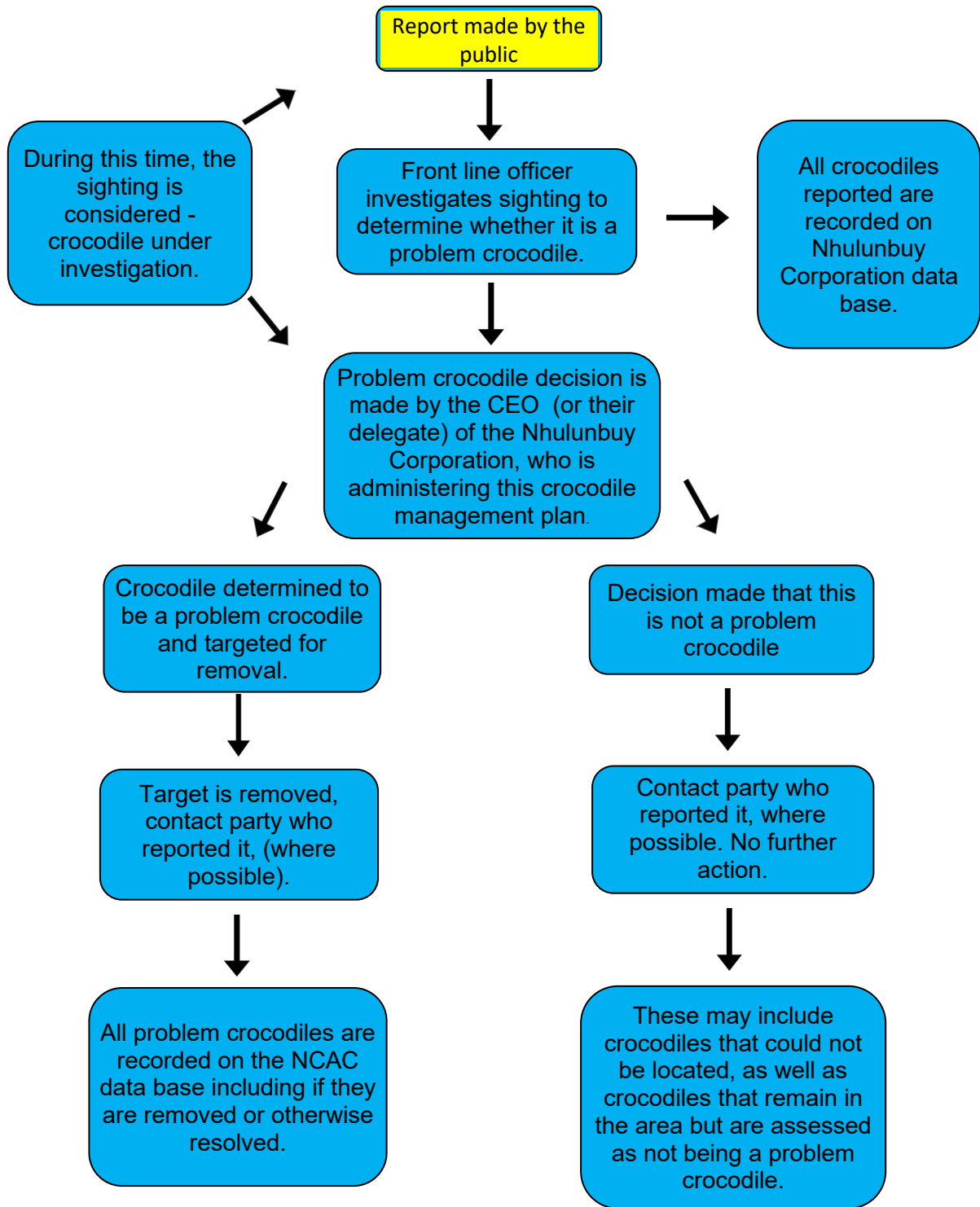
<u>PROACTIVE MANAGEMENT ACTIONS</u>	<u>DESCRIPTION</u>	<u>RESPONSIBILITY</u>
General awareness raising Through public campaigns.	Continual media public safety awareness raising through Be Crocwise Program, radio, social media (Facebook), crocwise signage, crocwise school programs and visitor information.	NC Animal Control (NCLACO) and authorised stakeholders.
Crocodile Management Plans	Strategic, risk-based assessment of management actions in specific zones	NCLACO
Crocodile monitoring and indicator floats	Regular inspections of locations for signs of crocodiles. Foam floats are located in strategic areas and bite marks indicate the presence of saltwater crocodiles.	NCLACO
Crocodile barriers constructed	Where feasible and economic, barriers are constructed to reduce the likelihood of crocodiles entering a management zone, eg: Sewer Ponds, viewing platforms on the town lagoon.	NC Infrastructure team
Site access restricted through signs, barriers and enforcement	Where possible by land tenure, access to sites can be restricted permanently or seasonally when tracks are flooded.	NCLACO
Warning signage	Warning signs erected at high risk locations with high usage and limited ability to reduce risk	NCLACO
Crocodile night surveys	Scheduled night surveys to determine crocodile numbers in chosen areas	NCLACO
Crocodiles managed to minimise entry	Crocodile traps are maintained at strategic locations and baited and checked regularly	NCLACO
Permanent trapping program	Annual crocodile management trapping program	NCLACO
Removal by shooting	Where location appropriate, problem crocodiles once detected can be shot	NCLACO
Public informed when crocodiles are detected	Through media release where problem crocodiles are reported in high risk areas	NCLACO

Reactive Management Approach

<u>REACTIVE MANAGEMENT ACTION</u>	<u>DESCRIPTION</u>	<u>RESPONSIBILITY</u>
Public informed when crocodiles are detected	Through media release where problem crocodiles are reported in high risk areas	NCACO
General awareness raising	Continual media public safety awareness raising through Be Crocwise Program	NCACO
Site access restricted through signs, barriers and enforcement	the NC will restrict access to sites where problem crocodiles have been reported.	NCACO
Public reported sightings	Respond to reported sightings to confirm and remove problem crocodile	NCACO
Crocodile night surveys;	Night surveys to confirm reported sightings	NCACO
Crocodile monitoring and indicator floats;	Foam floats are located in reported sighting areas and bite marks indicate the presence of saltwater crocodiles.	NCACO
Trapping Program	Mobile traps are positioned in reported sighting area	NCACO
Removal by shooting;	Where location appropriate, problem crocodiles once detected can be shot (sewer ponds)	NCACO
Removal by shooting only	Where location appropriate, problem crocodiles once detected can be shot, (sewer ponds only) and removed from the ponds for burial.	NCACO
<u>Removal and Storage of Crocodiles</u>	<u>Once crocodiles have been trapped, euthanised and prepared for transport, they will be stored in a freezer or cool room until Dhimurru Aboriginal Corporation can bury the crocodile.</u>	<u>NCACO</u>
<u>Burial of Crocodiles</u>	<u>Dhimurru will collect and conduct burial ceremony and bury crocodiles according to the EPA and local custom's.</u>	<u>NCACO</u>

APPENDIX C

Problem Crocodile Determination Flowchart



APPENDIX D.1

Crocodile Management Action Plan - Responsibility Assignment Matrix (RAM)

LOCATION Town Lagoon & Sewage Ponds	Wet (JANUARY – APRIL)	Cool - dry (MAY - OCTOBER)	Hot - dry (NOVEMBER - JANUARY)	SCHEDULE OF ACTIVITIES	RESPONSIBLE OFFICER	STAFF REQUIRED & FREQUENCY	HOURS REQUIRED / YEAR 560 hrs
Education	YES	YES	YES	Be Crocwise presentations, radio, social media, NCL website	NCACO & DAC	1 - as needed	32
Installation of signage	YES			Install Be Crocwise signage	NCL	2 staff	66
Daily crocodile monitoring, and indicator floats.	YES	YES	YES	Monitor and all known crocodile areas.	NCACO	1- staff	360
Crocodile barriers constructed where needed. e.g - viewing platforms & bird watching hide.	YES	YES	YES	Regular maintenance, repair if needed.	NCL Depot or contractor	Assessment made when needed. Maintenance on structures as needed.	16
Site access restricted through signs, barriers and enforcement, where reasonable.	YES	NO	NO	When the water level is high and covering the lagoon tracks, the lagoon will be closed off and have restricted access.	NCACO	1 – staff - Town Lagoon tracks chained/blocked off during wet season. To minimise vehicle entry.	included
Warning signage in all locations	YES	YES	YES	Maintain all signage and replace if necessary.	NCACO	1 – staff maintain signage	included
Crocodile night surveys in the management zones	At least twice a month	Twice a month	Twice a month	Incorporate crocodile monitoring into my night buffalo and wild dog patrols.	NCACO	1 - staff	28
Trapping program	YES	YES	YES	Traps and baits checked daily, traps closed temporarily if unable to be checked ie on leave and weekends.	NCACO	1 staff or contractor	included
Removal by shooting (Euthanising in traps)	YES	YES	YES	Follow SOP for euthanising trapped crocodiles.	NCACO + spotter	2 – staff always, when a crocodile is over 1.7mt long .	12
Minimise crocodile entry into sewage ponds	YES	YES	YES	Town lagoon crocodile trapping and maintenance of sewer pond fences and gates.	NCACO / ASH & NCL depot staff - fence maintenance	2 – depot staff, contractor	included
Dredging mouth of waterway at Town beach	NO	YES	NO	Allow water from lagoon to flow into ocean lowering level in lagoon	NCACO / NCL Depot / contractor	1 staff member once per year	8

Burial at the NCL waste facility	YES	YES	YES	Organise backhoe to dig burial pit and DAC to conduct ceremony	DAC to conduct burial ceremony.	1 NCL employee & DAC staff	30
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APPENDIX D.2**Crocodile Management Action Plan - Monitoring of Crocodile Activity**

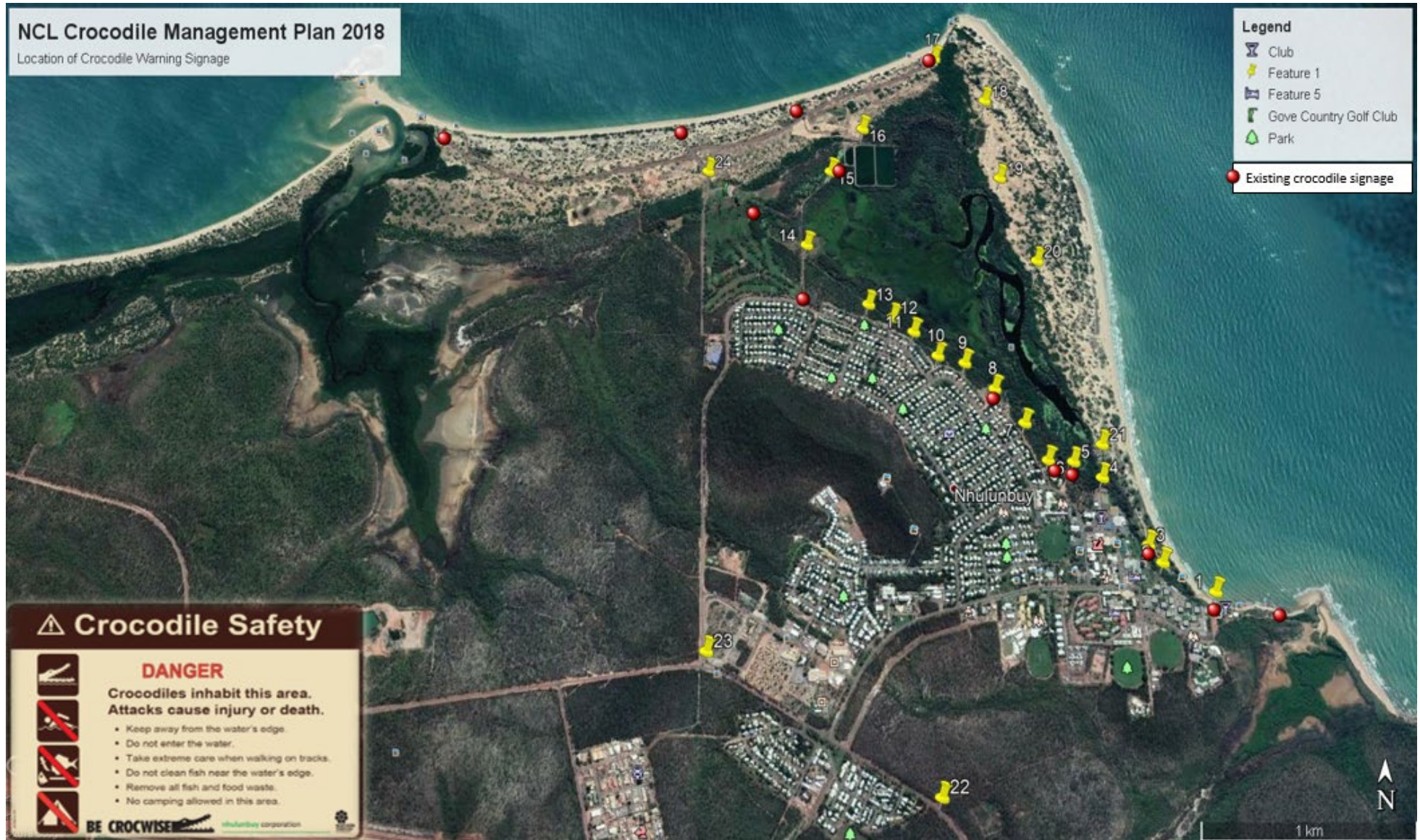
AREA	WET SEASON (January – April)	May to October	November to January	STAFF REQUIRED & FREQUENCY	STAFF HOURS REQUIRED FOR YEAR - 516
Nhulunbuy Town Lagoon and Sewage Ponds Crocodile Management Zones	Check crocodile trap and floats. Daily Patrol (Mon-Fri)	Check crocodile trap and floats. Daily Patrol (Mon-Fri)	Check crocodile trap and floats. Daily Patrol (Mon-Fri)	1 person for 1.5 hours	Based on Daily patrols except when on leave. (360 hours)
	Less frequent spotlight surveys. 2 – survey every month.	More frequent spotlight surveys if needed. 3 surveys every month.	Very frequent spotlight surveys if needed. 1 – survey every week	1 person for 1 hour	36 hours.
	Maintain signage	Maintain signage	Maintain signage	1 person as required	16 hours.
	Monitor crocodile barriers and fences	Monitor crocodile barriers and fences	Monitor crocodile barriers and fences	1 person during daily patrol	Incorporated in daily patrols.
	Educate towns people where necessary and enforce “NO GO” Zones.	Educate towns people where necessary and enforce “NO GO” Zones.	Educate towns people where necessary and enforce “NO GO” Zones.	Enforcement action during Daily Patrols.	Incorporated in daily patrols
	Promote Be Crocwise through education	Promote Be Crocwise through education	Promote Be Crocwise through education	1 person – 4 school terms, social media as required	1 person - 32 hours
	Monitor any indicators that would suggest crocodiles nesting in the lagoon. Daily Patrol (Mon-Fri)	Monitor Lagoon banks and sand dunes for crock slides and tracks as they move in and out of the lagoon. Daily Patrol (Mon-Fri)	This is our busiest time of the year. More chance of crocodiles pushing under crocodile barriers and into the sewage ponds. Daily Patrol (Mon-Fri)	1 person during daily patrol	Incorporated in daily patrols.
	Data entry Daily diary observations. Data entry when trapped crocodiles are processed	Data entry Daily diary observations. Data entry when trapped crocodiles are processed	Data entry Daily diary observations. Data entry when trapped crocodiles are processed	1 - staff member.	12 hours – half hour per crocodile. Based on 2 crocodiles trapped per month.

AREA	WET SEASON (January – April)	May to October	November to January	STAFF REQUIRED & FREQUENCY	STAFF HOURS REQUIRED FOR YEAR - 516
	Crocodile processing after being trapped. Including digging hole with backhoe and burial.	Crocodile processing after being trapped. Including digging hole with backhoe and burial.	Crocodile processing after being trapped. Including digging hole with backhoe and burial.	At least 2 staff members if crocodile is over 1.8mt long	60 processing hours. Based on 2 crocodiles per month, including burial.

APPENDIX E - Definitions

ASH	NCL Approved Stakeholder
Conservation Plan	The Nature Conservation (Estuarine Crocodile) Conservation Plan 2007
DAC	Dhimurru Aboriginal Corporation - <i>Dhimurru</i> Aboriginal Corporation is a community-based natural and cultural resource management agency established in 1992 by the Yolngu traditional owners of land and sea estates in the Gove Peninsula
NC Act	The Nature Conservation Act 1992
NCACO	NCL Animal Control Officer
NCL	NC - The NC was established under the Mining (Gove Peninsula Nabalco Agreement) Ordinance of 1968 and is a not for profit company which receives its authority from a service agreement with Rio Tinto.
NT P&W	Northern Territory Parks and Wildlife Service
	.
RTA	Rio Tinto Australia
Signage	NCL Approved sign
Sighting	Public observation of a crocodile
Nhulunbuy Town Lease	Special Purpose Lease 214 (SPL214)

APPENDIX F – Crocodile Warning Sign Locations



Traditional Owner Permission to Euthanase and Bury Crocodiles on the Nhulunbuy Town Lease as per Dhimurru MOU



Memorandum of Understanding (MOU) Between Nhulunbuy Corporation and Dhimurru Aboriginal Corporation

nhulunbuy corporation

Background

Dhimurru Aboriginal Corporation aims to protect and sustain Yolgnu landscapes/seascapes, including biodiversity, ecosystems and associated ceremonies, cultural sites, and all cultural values and practices that Yolŋu have nurtured for thousands of years. Dhimurru manages land within the Dhimurru Indigenous Protected Area.

Nhulunbuy Corporation Ltd aims to promote a community that is strong, safe and enterprising, where the Corporation recognise Yolŋu culture, are committed to the community, celebrate our unique lifestyles, and serve as a hub to the East Arnhem Region.

Nhulunbuy Corporation and Dhimurru Aboriginal Corporation manage adjoining boundaries. There are some aspects of both organisation's land management and conservation practices that align, for example, the management of crocodile (baru) and other feral animals, weed management and waste management. It is in these areas that the two organisations have agreed to work together when and as appropriate.

Aim:

- To strengthen the relationship between Nhulunbuy Corporation and Dhimurru Aboriginal Corporation, outside of their respective relationships with Rio Tinto Gove Operations.
- Both organisations will work together to help deliver culturally and scientifically appropriate outcomes, whilst recognising community safety as an important factor in how land is managed.
- To facilitate regular, open and honest communication between the partners.
- Collaborate in areas where we have common outcomes or activities.
- Recognise that both parties come with a level of skill, experience and knowledge.
- That there are opportunities for shared training and reciprocal learning experience.
- That both organisations have specific focus and vision that may not always align.

Outcomes:

To develop and maintain meaningful and transparent relations that benefit both organisations role in the Nhulunbuy community.

Communications

Day to day communications between relevant officers (i.e. Dhimurru Project Officer and Nhulunbuy Corporation Animal Management and others as required).

Regular meetings between the Executive Officer Dhimurru/Managing Director and Chief Executive Officer of Nhulunbuy Corporation will take place to decide strategic directions, resolve issues and maintain links between the Boards.

Working Together

There will be opportunities for the organisations to work together on specific projects or activities. During these times, staff will be responsible to the organisation with which they are attached for the purposes of insurance.

In the field staff will be responsible to the organisational leader of the activity in regard to safety and activity management.

Dhimurru will provide cultural guidance for the purposes of the projects or as set out in the schedules.

Dispute Resolution Mechanisms

This MOU has no legal basis and cannot be used by either party to direct legal actions against the other party.

Disputes in relation to this MOU should in the first instance be worked through with relevant officers to identify a solution to the problem.

Issues that cannot be resolved will be raised with CEO and EO of the organisations for consideration, mediation and resolution.

There may be times when disputes cannot be resolved, however both organisations recognise that the partnership is an important mechanism to deliver outcomes for both parties and will use their best endeavours to find mutually agreeable outcomes.

Review of this MOU

It is recognised that this agreement relies heavily on the relationships that have been built within the two organisations and any changes in key personnel may prompt a review of this MOU.

This MOU and the activities delivered under it should be reviewed annually.



Ali Mills
Chief Executive Officer
Nhulunbuy Corporation

02/07/2019



Christine Burke
Executive Officer
Dhimurru Aboriginal
Corporation

02/07/2019



Mandaka Marika
Managing Director
Dhimurru Aboriginal
Corporation

/07/2019

APPENDIX H

**NT Parks and Wildlife Template
Request to Remove Problem Crocodile**

Date:

Permits office

RE: Crocodile Collection Report

In accordance with **permit no: 62197** I hereby submit my request to remove problem crocodiles.

Between the dates of _____ and _____, I (name of permit holder) plan on removing _____ (quantity) problem crocodiles from the Nhulunbuy Crocodile management zone.

There are _____ (Quantity) Problem crocodiles, and they are estimated at being _____ meters long. The method of collection will be Trapping and then shooting, and the vehicle used to carry out this exercise will be the white Toyota Hilux twin cab, registration no: 924327 as per permit.

Yours sincerely

Nhulunbuy Corporation
Animal management & Compliance Officer
exampleonly@ncl.net.au
phone: 08 8939 2200

APPENDIX I



Permits Office
Jape Homemaker Village
Level 1 JHV2
365 Bagot Road, Millner NT 0810
PO Box 1448
Darwin NT 0801



DEPARTMENT OF
TOURISM AND CULTURE

Telephone: +61 08 8999 4486
Facsimile : +61 08 8999 4524
Email: pwpermits@nt.gov.au
Website: www.nt.gov.au/parks

PERMIT

TO TAKE PROTECTED WILDLIFE (Problem Crocodile Removal)

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

Permit Details		
Item	Description	Details
1.	Permit Number	62197
2.	Commencement Date	8 December 2017
3.	Expiry Date	31 January 2020
4.	Permit Holder	
	(a) Permit Holder's Name	Nhulunbuy Corporation Nhulunbuy Corporation
	(b) ABN/ACN	57 009 596 598
	(c) Permit Holder's Address	5 Wilqa Close Nhulunbuy NT 0880 PO Box 345 Nhulunbuy NT 0881
5.	Protected Wildlife	
	(a) Scientific Name	<i>Crocodylus porosus</i>
	(b) Common Name	Saltwater Crocodile
6.	Permitted Part	Adult animal only
7.	Maximum Quantity	3
8.	Royalties	
	(a) Royalty per Unit	Revenue Units
	(b) Unit	N/A