

Figure 1 shows python fatality from cane toad induced toxins, sourced from DLRM (2014).

Cane Toads of East Point Reserve Project Report

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1. Introduction

1.1 Background

The ability of cane toads to reproduce in large numbers, their short development time, the toxicity of the species throughout all life stages and predation is why the toad is listed as a key threatening process under the Environment Protection and Biodiversity Conservation Act 1999 (DE 2010). Each female can produce up to 35 000 eggs at one time and up to twice a year in favourable conditions. Egg development lasts between 1-3 days, and 15-70 days for tadpole development at a permanent water source (Shanmuganathan et al 2009). This means that sexual maturity of the toad can occur within one year. The toad toxin throughout all life stages, as found in Shanmuganathan et al (2009) study, leads to cardiovascular constriction and heart failure in most predator species. Small mammals, birds, invertebrates and reptiles within East Point Reserve and Lake Alexander are all at risk.

Artificial water points (WP) within the reserve provide the only permanent fresh water source for many local species. The isolated Agile Wallaby (*Macropus agilis*) population, Common Brushtail Possum (*Trichosurus vulpecula*), threatened shorebirds species and the threatened Floodplain Monitor (*Varanus panotpes*) (EOES 2013) could be many of the species utilising these water sources. Anecdotal evidence suggests that WP are also supporting a cane toad population within the reserve and potentially allowing toad reproduction. Figure 2 shows the location WP and allocation of WP numbers.



Figure 2 indicating location of each wallaby water point and its WP number allocation.

Spread rates of the cane toad studied by Phillips et al (2007), revealed that cane toads can travel as far as 1km within a 24hr period during the wet season due to large quantities of water available for rehydration. A study in the Victoria River region in the Northern Territory (Letnic et al 2014) found that when water is contained within permanent fresh water bodies in the dry months, toads must access water every 1-3 days to prevent desiccation. Cane toads during the dry season within the Northern Territory lose approximately 28% of their body mass within 2 days, with desiccation occurring >40% loss of body mass. Cane toads can absorb water from their underside (DEWHA 2010), enabling hydration from irrigation systems and dew. Cane Toad expert Graeme Sawyer noted that dew subjected to increased wind speeds during the dry season, in particular October until the first rainfall of the wet season, is most likely insufficient to prevent desiccation. Currently toads are able to enter the WP as they can jump up to 50cm high into water troughs (Letnic et al 2014). WP and irrigation systems within East Point Reserve are creating a toad refuge from dehydration during the dry season.

East Point Reserve includes three (3) leased areas, The Fannie Bay Equestrian Club, Pee Wees Restaurant, the Darwin Military Museum. The availability of food scraps and lighting will increase invertebrate abundance (Cameron 2014), their main food source. This combined with irrigation systems (Letnic et al 2014) attracts cane toads and enables toad populations to withstand dry seasons and potentially reproduce, providing opportunity for toads to migrate into the monsoon forest of East Point Reserve.

Cane toad populations at East Point Reserve and Lake Alexander have been well managed in the past with considerable exclusion measures via the establishment of fencing, although these have not been sufficiently maintained as shown in Figure 11, possibly explaining the anecdotal increased toad abundance within the reserve.

1.2 Purpose

This study aims to assess the extent of cane toads within East Point Reserve and Lake Alexander, review current cane toad control devices in place and develop a strategy to exclude cane toads from the wallaby water points and within the reserve. As mentioned, cane toad populations are driven to water sources in the dry season allowing thorough assessment of the current cane toad situation in the reserve and an opportune time to implement a cane toad eradication management plan. Nocturnal surveying of the WP on foot and using digital infrared cameras, spotlight cane toad capture (SCTC), and surveying of irrigation systems at the leaseholders' properties will determine WP and resources toads are accessing. Assessment of current cane toad control devices and recommendations for modifications of systems in place and the trial of a modified WP excluding the toads from access will aid in developing an effective cane toad management plan.

1.3 Scope

The study consisted of three components:

- 1. A desktop review of the phenology of cane toads and their past distribution within East Point Reserve.
- 2. Astudy of current toad distributions within the East Point region focused on:
 - a) Available hydration to sustain a toad population.
 - b) Method of toad entry to wallaby WP.

- c) Current condition of existing toad management devices in place.
- 3. Recommendations and costings for future cane toad management devices.

All three components listed above and production of the report was limited to one month's vocational employment with City of Darwin.

2. Methodology

2.1 Wallaby Water Point Design and Inspection

Dimensions of WP and potential for modification were assessed 25 June 2014. Each WP was also inspected for the presence of tadpoles.

2.2 Camera Nocturnal Wallaby Water Point Survey

Nocturnal surveying for cane toads accessing WP in East Point Reserve commenced 22 June 2015. An infrared digital scanning camera UV565HD was set up to detect movement, with 3 photo bursts within 12m of each water point or set to take images every 10 minutes in 3 photo bursts. Cameras were set up at least 1 hour before dusk and retrieved at least one hour after dawn. Images were later reviewed and data of toad usage of water points quantified. Each water point was surveyed for at least two nights to improve estimates of toad utilisation of water points.

2.3 Lake Alexander and East Point Reserve Nocturnal Field Survey

Nocturnal field surveying of East Point Reserve commenced at 19:15 on 25 June 2015. Each WP was checked for toad presence, excluding the two water points that were currently being monitored by cameras. The Lake Alexander survey commenced at 21:30, with two City of Darwin staff using spotlights.

2.4 Lease Holders Survey

Fannie Bay Equestrian Club Inc., the Darwin Military Museum and Pee Wees restaurant were surveyed to evaluate possible cane toad attractants and populations within each

property. Permanent water bodies available for toad reproduction, irrigation regimes, other possible water sources, food availability, overnight lighting and current cane toad management plans noted.

2.5 East Point Reserve, Lake Alexander and Lease Holders Fencing Survey

The current and potential fencing utilised for cane toad exclusion in East Point Reserve and Lake Alexander were surveyed and mapped to show holes in fences due to drainage, fence damage, current mesh/rubber boundaries including holes within the border and the location of gates.

2.6 Trial Cane Toad Exclusion from Wallaby Water Points

WP 2 was modified by increasing the height of water access to 69cm. Forty (40) bricks in total were used to raise the water trough, a metal reinforced table was placed on one end of the raised water trough with two wire ladders, one secured at an angle of 30°, the other at 45°. A Poly Riser and elbow were fitted to enable auto filling of trough. This design ensured accessibility for juvenile wallabies, small mammals or reptiles to the WP. See figure 3 for scaled diagram of the design. This WP was then surveyed using two infrared digital scanning cameras capturing 3 images every 2 minutes for 3 consecutive days.



Figure 3 left shows scaled diagram of WP modification design, right image of design built at WP 2.

This design was further modified by placing one wire ladder over the table to sit directly in line with the two table legs and securing the other wire ladder onto the table top as shown in Figure 4 to allow possums to climb onto the table to access water. This WP was then surveyed using the same camera settings as previous survey for 4 consecutive days. Cane Toads of East Point Project Report Daisy Lippiatt



Figure 4 is an image of altered design concept, and is currently still in place at WP 2.

2.7 Cane Toad Manual Capture

SCTC was performed with the assistance of cane toad expert Graeme Sawyer within the Fannie Bay Equestrian Club, the Darwin Military Museum and Lake Alexander commencing at 20:00 on 2 July 2015. Time limitations did not allow Pee Wees restaurant to be included.

SCTC was again performed with the assistance of Mr Sawyer on 9 July 2015, commencing at 19:15. Toads near WP 1-5 within East Point reserve, Lake Alexander and the Equestrian Club were captured and placed into plastic bags to be later frozen and disposed of. Mr Sawyer on later examination determined toad sex and maturity, also providing approximate SCTC and trap capture data between years 2010-2014 performed within East Point Reserve.

2.8 Trial Cane Toad Trapping

Two cane toad UV lights and 12V solar panelled traps were repaired and borrowed from Mr Sawyer and set up on 10 July 2015 with approximately 2L of water available inside. One trap was placed near cane toad accessible WP4 and one near the empty WP1 without an accessible water source for over 500m, as shown in Figure 5. Traps were checked daily for two evenings.

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Figure 5 shows cane toad trap position in relation to canopy cover and position.

2.9 Irrigation Survey of East Point region

Field based knowledge from Assistant Team Leader of Urban Bushland Stewart Grant and Technical Officer Jamie Lewis enabled a map to be created indicating areas of daily irrigation in East Point Reserve, northern recreation area adjacent to the main entrance and Lake Alexander. Mr Lewis also indicated that irrigation systems could be easily shut down any time of the year within the City of Darwin Operations Centre using a computer to switch systems to 'off'. The Manager of Infrastructure Maintenance Kerry Smith was consulted for the possible effects of an irrigation shut down of up to 5 consecutive days and events scheduled for this period were considered. Cane Toads of East Point Project Report Daisy Lippiatt

3. Results

3.1 Wallaby Water Point Inspection

Water Point 1, 2, 3 and 5 are Rapid Plas Pty Sweep Troughs. All poly extra heavy duty water trough, 250cm L x 55cm W x 47cm H, 140 Litres capacity, 1" float valve - fully protected, double walled trough shown in Figure 6. WP 1, 2, 3 and 5 are in good condition and can be easily modified.



Figure 6 shows the Rapid Plas Sweep water trough in place at WP 1, 2, 3 and 5 in East Point reserve.

Wallaby Water Point 4 is not be suitable for modification standing approximately 23cm high, as shown in Figure 7.



Figure 7 is an image of WP 4 in East Point reserve, constant moist soil due to leaks in trough. As shown in Figure 8, Wallaby Water Point 6 stands 21cm above ground level. Water point may potentially be able to be modified, further investigation is needed.



Figure 8 shows the design of WP 6 in East Point reserve.

Wallaby Water Point 7 is in good condition and could be easily altered, standing 25cm high, shown in Figure 9.



Figure 9 indicates the design of WP 7 in East Point reserve.

No cane toad tadpoles were detected in all seven WP.

3.2 Camera Nocturnal Wallaby Water Point Survey

Camera footage shows wallabies, possums and cane toads are utilising all WP within East Point reserve. Only mature Agile Wallabies were drinking water from the troughs. Example footage captured shown in Figure 10.



Figure 10 left shows a female Agile wallaby accessing WP 6, right showing six cane toads utilising WP 2 in East Point reserve.

3.3 Lake Alexander and East Point Reserve Nocturnal Field Survey

Cane toads were not detected whilst moving in a vehicle. WP3, WP4, WP5, WP6 and WP7 were spotlighted on foot, with cane toads found within 1m of WP3, WP4, WP6 and WP7.

3.4 Lease Holders Cane Toad Attractant Survey

There is a total of five water troughs for husbandry completely flushed daily within the Fannie Bay Equestrian Club. The horses habitually slush water out of the troughs creating small semi-permanent pools below most water troughs. The equestrian club encompasses a residential house with tenants eradicating cane toads identified within their property. Lawns adjacent to the property are watered every 3 days in the evening in close proximity to the well maintained concrete closed septic system. Surveying revealed large invertebrate abundance due to horse feed and manure spread throughout the property. Property manager Allison O'Neill noted that there have recently been 5 mostly juvenile resident goannas sighted within the property regularly, averaging every 2 months for the past year, and are supportive of other cane toad management possibilities.

The Darwin Military Museum's main structures include; a carpark and large grassy area are leased off the Northern Territory Government, and an occupied house with a private lease and the utility artefacts are leased off the Royal Australian Military Museum. The large grass area is watered on a daily basis overnight with irrigation systems throughout the gardens surrounding the property. The air conditioner and sump are leaking within the bunker on site, creating large very damp areas on the property. The septic system in the southern end of the property in close proximity to the Equestrian Club is leaking, with all top soil very moist. The light on the road side of the property runs all hours, creating a minimal food source for cane toads. Internal fencing adjacent to the Equestrian club is well maintained and has potential for mesh to contain cane toads within their property. Property manager John O'Connell is very supportive of cane toads busts to be held on the property with sufficient notice.

Survey of Pee Wees restaurant indicated on site fresh water drainage and large irrigated grass and garden areas watered daily. Due to the usage of the property, many invertebrates and food scraps were noted to be accessible for cane toads with no current cane toad management procedures in place. Events manager Zofia Urbanski is very supportive of cane toads busts to be held on the property with sufficient notice after 23:00.

3.5 East Point Reserve, Lake Alexander Fencing Survey and Lease Holders Fencing Survey

The inner boundary of the fencing between Lake Alexander and East Point Reserve have potential for application of mesh fencing although most of the fencing is raised over one inch from the soil. The north eastern and eastern side of Lake Alexander fencing has inadequately maintained rubber fencing 60cm high and approximately 500m in length with approximately 100m damaged. The fencing on the south eastern and south of Lake Alexander has mesh 60cm high, also inadequately maintained. In areas where mesh is buried approximately 5cm in depth, mesh is still intact. Figure 11 shows why cane toads will be able to evade the fence line.



Figure 11 shows examples of fence damage. Top left is fence line behind Lake Alexander shed, top middle is a damaged reptile entry point, left is drain from Lake Alexander run off in the middle of fence line behind Lake Alexander shed, bottom right example of rubber mesh damage and bottom middle is example mesh damage surrounding Lake Alexander.

There are three small reptile entry points using black wire mesh fencing on the Lake Alexander fence line, all damaged, approximately 20cm in length, 10cm high with 2.5cm cross hatches. The East Point reserve fence line runs for 850m, whilst the Lake Alexander fence line runs for 650m indicated in Figure 12.



Figure 12 shows mapped fence damage along East Point reserve and Lake Alexander fence line.

The cane toad fence running approximately 110m in length on the northern side of Lake Alexander shown in Figure 13 is inadequately maintained as illustrated in Figure 10. There is a large drain, possible serving as overflow from Lake Alexander, in the centre of this fence line 10m wide.



Figure 13 is a map showing approximate location of the cane toad fence behind the Lake Alexander shed.

Survey indicated that the boundary of the Fannie Bay Equestrian Club is completely enclosed with suitable fencing for mesh application. As indicated in Figure 14, the western end of the boundary is not well maintained. The Darwin Military Museum has insufficient fencing and 3 main gates that will require modification for mesh application with a fence line boundary running 500m long. The boundary enclosing the Equestrian Club and Military Museum is 1750m long.



Figure 14 with legend shows areas of fence line in need of repair for cane toad exclusion.

3.6 Trial Cane Toad Exclusion from Wallaby Water Points

The initial WP modification design still enabled cane toads to enter the WP. Readjustment of the angled wire ladders to sit at a 90 ° angle on one side of the table in the second trial excluded cane toads from the WP. Camera footage shown in Figure 15 revealed both large and small wallabies drinking from the modified WP. Possums were seen to regularly use the table to access water, although possums climbed up the table legs instead of using the ladder. Possums were also seen accessing the water from climbing up the trough itself. No reptiles were observed attempting to access any WP. Initial footage showed a decline in wallaby usage of the WP after modification, although after seven days of surveillance, wallabies were frequenting the water source regularly.



Figure 15 shows on left a male Agile wallaby accessing water on the modified WP, top left possums and wallabies accessing WP and bottom middle and bottom right the size of a presumably female wallaby accessing WP.

3.7 Spotlight Cane Toad Manual Capture

The first SCTC on 2 July 2015 totalled 52 cane toads, including 22 males, 21 females and 9 juveniles shown in Figure 16.



Figure 16 shows cane toads caught from SCTC on 2 July 2015.

Twenty seven toads were captured within the Fannie Bay Equestrian Club, 15 captured within the Darwin Military Museum and 10 within Lake Alexander as represented in Figure 17.



Figure 17 presents the total of cane toads captured per property on 2 July 2015 in a column graph.

The Second SCTC on 9 July 2015 totalled 64 cane toads, including 30 males, 17 female and 17 juveniles. Three toads were found near WP 1-5 within East Point reserve, 11 within the Equestrian Club and 50 surrounding Lake Alexander, shown in Figure 18.



Figure 18 is a column graph showing the total of cane toads captured per property on 9 July 2015.

Mr Sawyers' approximate annual total of SCTC between years 2010-2014 averaged at 107 cane toads within East Point per year. SCTC was performed 8 times in 2010, 7 in 2011, 11 in 2012, 6 in 2013 and 15 in 2014. Figure 19 highlights the doubled average

cane toad population within the reserve in 2014, and an almost tripled population from the year prior. See Appendix 1 for raw data.



Figure 19 is a column graph showing the approximate total of cane toads captured using SCTC by Mr Sawyer between years 2010-2014.

3.8 Trial Cane Toad Trapping

Mr Sawyers' data indicates that the total of 19 cane toads were captured in traps along the Lake Alexander fence line between April- August in 2010 on four occasions. No cane toads were captured on the first evening in either traps and two toads were captured in the WP1 trap (see Figure 20) on the second evening. Two bandicoots were caught in the WP4 trap on the second evening.



Figure 20 shows the successful capture of two cane toads on 12 July 2015 near WP 1.

3.9 Irrigation Survey of East Point region

Consultancies with Mr Smith, Mr Grant, Mr Lewis and Assistant Team Leader Central Precinct Martinho Soares, support the shutdown of all irrigation systems within East Point reserve and re-vegetation sites within, Lake Alexander and the roadside recreation area opposite, and confirm it will have minimal effect on vegetation. Grass may cure moderately, although will not cause irreparable damage. Council events booking sheets indicate that there are no upcoming events booked within the region during the proposed period in October, although databases will need to be checked for event booking within a fortnight before shutdown as advised by Senior Climate Change & Environment Officer Jade Leask. It has also been advised from the mentioned City of Darwin employees, that irrigation shut downs could potentially take place more frequently than an annual basis. Figure 21 indicates areas irrigated on a daily basis.



Figure 21 is a map indicating approximate area irrigated within East Point reserve on a daily basis, as directed by Mr Grant.

4. Discussion

4.1 Cane Toad Abundance in East Point Reserve

In order to study toad resource use within the region and trial various cane toad control devices, toad populations needed to remain intact and undisturbed. Insufficient time was allocated to this study for this reason to estimate current toad abundance within East Point reserve.

Review of data indicates a threefold increase in cane toad populations in 2014 since 2013 within East Point reserve. For this reason it is vital that cane toad populations are controlled with suitable management strategies in place.

Inspection of WP using camera imagery and spotlight inspection has proven cane toads are accessing all WP except for WP5 for hydration every 1-2 days. The highest WP sits 35cm above ground level enabling easy toad access, consistent with Letnic et al (2014)

study in Northern Australia. Raising the troughs 30cm increased the jump height required for toad entry to 65cm, well beyond their capabilities, and still allowed small female wallabies and possums to access water. Two cameras were available for use for the duration of this study, restricting quantity of nocturnal data. The scope of this project did not allow thorough investigation of juvenile agile wallaby weaned height, although recommendations from Territory Wildlife Park employees and camera footage of the WP indicate that weaned juveniles height is approximate to an adult size.

The application of UV solar lighted cane toad traps with a contained water source have proven to be successful. A total of two toads were caught in two consecutive nights in one trap over 500m from an accessible water source. The other trap proved unsuccessful when placed within 10m of cane toad accessible WP4. Yeager et al (2014) study highlights the ability of cane toads to detect a water source from over 2kms away, possibly explaining their ability to find the trap isolated from a water source due to the enclosed 2L container of water inside. The toads may show favouritism over a small water source and minimal invertebrate abundance created from the UV light, to a larger, accessible water source for confirmation.

Irrigation systems within the reserve will most likely be hydrating local cane toads, although were not investigated in this study due to time limitations. Large areas of the reserve are watered on a daily basis, capable of providing a large refuge for toads during the dry season recommended Mr Sawyer.

4.2 Cane Toad Abundance in Lake Alexander

Daily irrigation in Lake Alexander is supporting a large population of cane toads. Within one week, sixty cane toads were captured in this study. Over three quarters of the toads caught were located on the northern side of the lake, in between the fence and lake. Toads were frequently sighted amongst the mulch in the various gardens, most likely used as their refuge stated Mr Sawyer consistent with Letnic et al (2014) study. Fencing of this area has been inadequately maintained, enabling easy toad access to permanent fresh water from Lake Alexander's irrigation systems.

4.3 Cane Toad Abundance in Leaseholders' Property

Two SCTC resulted in 38 cane toads within the Fannie Bay Equestrian Club. This large abundance is most likely due to high invertebrate population and large quantities of water available for hydration, consistent with Yeager et al (2014) study on cane toad attractants. As all water bodies are flushed on a regular basis, it is unlikely that reproduction is possible as cane toads require a permanent water body for development for approximately 73 days. The fence line enclosing the equestrian club is largely intact and suitable for mesh application to minimise cane toads entering the reserve.

One SCTC in the Darwin Military Museum resulted in 15 toads to be caught. Nightly irrigation of large areas and a leaking sump and septic system are creating large moist areas on the property. The overnight lighting could aid in attracting invertebrates; increasing food resources, although no increased abundance was observed. The fencing near the front gates is not suitable for mesh application, although the rest of the fencing on the property remains intact.

Although the migration of cane toads from the leaseholders' property was not included in the scope of this study, it can be presumed from expert opinions of Mr Sawyer consistent with Yeager et al (2014) study that cane toads will most likely migrate into the East Point reserve from lease holders' property during the wet season. During this period, large permanent shallow pools will be produced, allowing reproduction (Cane Toad Control Strategies 2014) for the local population, with each female capable of producing up to 200 individuals in a lifetime (Phillips et al 2007). This will negate all efforts in place for cane toad management onto the peninsula.

4.4 Current Cane Toad Control Devices in East Point Reserve

There is very little adequately maintained cane toad prevention fencing in place to protect cane toad migration into East Point reserve. Five gates and five drains on the eastern end near Lake Alexander create large entry points for cane toads, and fencing does not isolate the reserve from toads entering via Lake Alexander. Fencing between Fannie Bay Equestrian Club, Pee Wees restaurant and the Darwin Military Museum allow cane toad entry into the reserve. There are currently no cane toad traps in place and SCTC occurs between 6-15 times annually when time permits, conducted by Mr Sawyer. The increasing cane toad abundance could indicate that SCTC used independently from other management devices is insufficient in maintaining cane toad populations.

4.5 Current Cane Toad Control Devices in Lake Alexander

Mr Sawyers' past cane toad trapping totalled 19 toads, set up on four occasions. Whilst successful when in place, trapping only occurred in 2010. The Lake Alexander fence line mesh and reptile gates are in need of replacing/repair, to minimise toad entry (Cane Toad Control Strategies 2014). This report did not investigate toad populations outside of Lake Alexander which limited understanding of toad populations outside of the lake and knowledge of toad migrations into the area. Mr Sawyer postulated that cane toads may be migrating from a well irrigated sporting field in close proximity to the lake adjacent to the unmaintained cane toad fencing, and that residential areas such as the eastern side of Lake Alexander sustain a low population of toads. This explains, combined with less disruption in the area, why the majority of toads have been found in the eastern side of the lake.

4.6 Current Cane Toad Control Devices in Leaseholders' Property

The Fannie Bay Equestrian Club is the only property within the region with any cane toad management in place. Mrs O'Neill allows Mr Sawyer to conduct regular SCTC on her property, although this is only conducted when volunteered time permits. All property managers seem willing to adopt cane toad management regimes.

5. Recommendations

5.1 Modify and Raise all Wallaby Water Points to above 60cm

All WP should be raised at least 60cm above ground level to prohibit cane toad access to water troughs. A wire ladder will need to be attached, folding over the top of the trough to allow possum and possible reptile access to WP. See Figure 22 for design. Time limitations did not allow this design to be tested and is recommended that further camera

surveying of one modified WP for at least 3 consecutive days is undertaken before implementation.



Figure 22 is a scaled diagram of the recommended WP modification for all six remaining WP.

Three water points (WP 4, WP 6 and WP 7) may be able to be modified in the same manner without replacing, although costing will include replacement of old WP with Rapid Plas Pty Sweep Troughs.

Costings are listed below:

Item	Description	Units	\$/Unit	Cost (\$)
Rapid Plas Pty	2500mm L x	3	471.20	1,413.60
Sweep Trough	550mm W x			
	475mm H			
Besser Block	140mm W x	24	6.30	151.20
	190mm H x			
	390mm L			
Mesh Panel	120cm W x	1	40.79	40.79
	180cm H x			
	25mm			
Needle Point	100 Box	1	7.88	7.88
Screws				
Poly Riser	1,000mm x	6	6.00	36.00
	25mm			

Table 1. Costings for modification of 6 wallaby water points within East Point reserve.

Poly Elbow	25mm	6	2.00	12.00
				1,661.47

5.2 Implement Cane Toad Traps

Five UV light, solar powered cane toad traps should be purchased off Mr Sawyer, ensuring each trap contains at least 1L of water. Recommended use of traps is as listed below:

- Traps be strategically rotated around various WP and irrigation systems within the reserve.
- One trap should remain permanently within 100m of the Northern Lake Alexander drain inside the proposed cane toad fence to capture toads entering the peninsula.
- Traps should be placed in areas of irrigation during the recommended irrigation shut down to lure any surviving toads to capture.

Figure 23 shows a suggested cane toad trap placement strategy.



Figure 23 indicates a recommended cane toad trap placement strategy within East Point reserve. Blue circles show each WP and red rectangles represent cane toad traps.

It is recommended that two East Point Reserve field staff obtain a permit for handling wildlife to release any captured native fauna. Mr Sawyer is able to supply specifications for the City of Darwin enabling construction of cane toads traps internally, alternatively prices of assembled traps sourced from Mr Sawyer are listed below:

Table 2.	Costings	for purchase of	cane toad	traps either	brand nev	w or re-furbished	d off Mr Sawyer.
							· · · / ·

Item	Description	Units	\$/Unit	Cost (\$)
New Trap	UV Light, Solar	5	360.00	1,800.00
	panelled, Trap			
	doors and			
	Cover			
Re-	UV Light, Solar	5	250.00	1, 250.00
Conditioned	panelled, Trap			
Trap	doors and			
	Cover			

East Point field staff already patrol around the inner boundary of the reserve on a daily basis minimising inconvenience for checking traps. Traps should be checked every second day.

5.3 Scheduled Irrigation shut down

All irrigation systems within East Point Reserve, Lake Alexander and the recreational area opposite should be shut down for five consecutive days at least twice a year. The first shut down should commence as soon as soil dries from the previous wet season rains. The second shut down should be between September and October when toad populations are strained for hydration.

Shut down of irrigation systems within East Point reserve can be manually turned off at irrigation points. Irrigation systems for Lake Alexander and the recreational area opposite can be turned off by computer in the Bishop Street Operations Centre. It is recommended

that the systems are switched off on a Saturday, allowing two full days of watering to rehydrate the grass for the oncoming weekend.

5.4 Fence repairs and Mesh Application

Fence line repairs at East Point reserve and Lake Alexander will require:

- Mesh application for approximately 850m along East Point reserve fence line and 650m length of mesh for repairs and replacement of rubber mesh along Lake Alexander fence line. Mesh to be clipped to existing fences. Installation of three reptile entry points along East Point Reserve fence line.
- Replacement of existing reptile entry points along Lake Alexander fence line as per Cane Toad Proof Your Backyard (2010) design.
- Use of a tractor/grader to strip at the base of the fences above, regrade to deposit the soil on top of the trailing cloth skirt of at least 20cms deep and sitting 60cms above ground level.
- Re-use rubber mesh from Lake Alexander fence line and replace fencing behind sheds in Lake Alexander. Star pickets will be placed every 2m and rubber alternately placed to one side of a picket to secure rubber in place.
- Pedestrian gate on Lake Alexander and East Point reserve fence lines to be installed with spring loaded shutting mechanisms and re-use rubber mesh to be clipped below gates to block cane toad access.
- Regular maintenance of fencing using re-cycled mesh from Lake Alexander fence line.

Costings are listed below:

Table 3. Costings of totalled fence repair of East Point reserve, Lake Alexander fence line and fence line behind Lake Alexander at the back of the shed.

ltem	Description	Units	\$/Unit	Cost (\$)
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High Density	3.6m W x 50m	8	730.00	5,840.00
Shade Cloth	L			
Shade Cloth	Clips to join	160	0.20	32.00
Clips	cloth sections			
Clips	Clips to join	3,000	.20	600.00
	mesh to			
	existing fence			
	and gates			
Star Pickets	Pickets to	30	3.86	11.58
900mm	secure rubber		(pack	
	mesh		of 10)	
Tractor/ Grader	Bury mesh	1		Not
	installation			included
				in cost
Gutter guard	80m x 180 mm	1	10.29	10.29
	roll for reptile			
	gates			
Spring Loaded	Steel	2	32.00	64.00
Gate Latch				
				6,557.87

5.5 Regular Cane Toad Manual Capture to Estimate Cane Toad Population

SCTC should be conducted once in February, May, and after irrigation shut down between September – October to estimate cane toad populations and lower cane toad population reproduced from the previous wet season.

Cane toads captured should be placed into plastic bags and euthanized. Waste Management Officer Sandrine Ricardo directed that less than two garbage bags of cane toads can be disposed of at the skip bin at the transfer station at no charge. Two garbage bags or over will cost \$163.00 for disposal.

5.6 Changes in Leaseholders Agreements to Implement Cane Toad Control Strategies

It is recommended that the boundary of the Fannie Bay Equestrian Club fence line is applied with mesh and adequately maintained. The fence line is approximately 2km long and only in need of minor sections of repair. The front gate will need specified rubber mesh application re-using the rubber mesh listed and reptile gates installed every 200m along fence line using left over resources from 5.4.

The Fannie Bay Equestrian Club, Pee Wees restaurant and the Darwin Military Museum should also agree for scheduled SCTC to be conducted on their property following the regime listed in 5.5, to estimate cane toad populations and eliminate majority of the cane toad population reproduced from the previous wet season.

ltem	Description	Units	\$/Unit	Cost (\$)
High Density	3.6m W x 50m	14	730.00	10,220.00
Shade Cloth	L			
Shade Cloth	Clips to join	300	0.20	60.00
Clips	cloth sections			
Clips	Clips to join	5,500	.20	1,100.00
	mesh to			
	existing fence			
	and gates			
Tractor/ Grader	Bury mesh	1		Not
	installation			included
				in cost
				11,380.00

Costings for fence repairs at the Fannie Bay Equestrian Club are listed below:

6. References

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7. Appendix 1

Table 4 shows raw data provided by Mr Sawyer of SCTC between years 2010-2014.

Date	Location	People	Male	Female Si	ub Adult	Total
29 January 2010	East Point Fence	1	2	00		2
30 January 2010	East Point Fence	1	0	10		1
3 February 2010	East Point Fence	1	0	20		2
5 February 2010	East Point Fence	1	1	00		1
22 February 2010	East Point	2	0	0	0	0
15 March 2010	East Point Fence	2	2	0	0	2
28 April 2010	East Point	trap	4	6		10
30 April 2010	East Point	trap	2	2		4
31 May 2010	East Point - stables	1	0	3	0	3
27 June 2010	East Point	trap	1	3		4
4 July 2010	East Point Fence	1	1	1	0	2
24 August 2010	East Point	trap	1			1
3 February 2011	East Point	3	3	5		8
21 September 2011	East Point	2	14	13	1	28
7 November 2011	East Point	2	4	6	1	11
9 December 2011	East Point		5	14		19
10 December 2011	East Point		3	7		10
11 December 2011	East Point		1	3		4
29 December 2011	East Point		6	10		16
29 January 2012	East Point		1	2		3
3 February 2012	East Point	1	3	6		9
16 February 2012	East Point		4	6		10
28 February 2012	East Point		12	7		19
16 April 2012	East Point		4	5		9
15 May 2012	East Point		7	4		11
16 May 2012	East Point		12	13		25
6 July 2012	East Point		4	4		8
20 October 2012	East Point		5	3		8
22 November 2012	East Point		0	0		0
15 December 2012	East Point		1	2		3

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10 February 2013	East Point		2	2	4
6 March 2013	East Point		6	1	7
13 August 2013	East Point	1	4	3	7
22 October 2013	East Point	1	7	4	11
7 November 2013	East Point	3	6	4	10
8 November 2013	East Point	1	10	8	18
7 December 2013	East Point		7	9	16
14 December 2013	East Point		3	5	8
3 February 2014	East Point		3	5	8
6 February 2014	East Point		3	6	9
14 February 2014	East Point		8	12	20
18 February 2014	East Point		9	8	17
6 March 2014	East Point		6	11	17
5 April 2014	East Point	6	11	11	22
25 April 2014	East Point Bikes	3	3	7	10
25 April 2014	East Point	3	7	8	15
10 May 2014	East Point Bikes	1	4	4	8
10 May 2014	East Point	1	7	8	15
2 July 2014	East Point		8	14	22
28 August 2014	East Point		6	7	13
18 September 2014	East Point		9	10	19
28 September 2014	East Point Bikes		10	9	19
12 October 2014	East Point		10	15	25