

# APPENDIX F

## Assessment of threatened and migratory species

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- Table 1: Applying EPBC Act significant impacts criteria for vulnerable species to potential impacts from the proposed action
- Table 2: Applying EPBC Act significant impacts criteria for critically endangered and endangered species to potential impacts from the proposed action
- Table 3: Applying EPBC Act significant impacts criteria for migratory species to potential impacts from the proposed action
- Table 4: Potential impacts of the proposed action to Northern Territory threatened (critically endangered and endangered) species
- Table 5: Potential impacts of the proposed action on Northern Territory threatened (vulnerable) mammals and reptiles of the area
- Table 6: Potential impacts of the proposed action to Northern Territory threatened (vulnerable) birds of the area
- Table 7: Potential impacts of the proposed action to Northern Territory threatened plants of the area

## OVERVIEW

Tables 1 to 3 provide an assessment of the potential impacts of the proposed action on the following MNES under the EPBC Act:

- listed threatened species and ecological communities;
- Commonwealth marine environment; and,
- migratory species protected under international agreements.

The assessment criteria is derived from those defined in the EPBC Act *Significant impact guidelines 1.1* (DEWHA 2010). Terminology used in the assessment reflects the known state of species' existence within the immediate vicinity of, and/or on, the Ranger Project Area. For example: "not possible" indicates species that are known not to occur on the Ranger Project Area.

Tables 4 to 7 provide an assessment of the potential impacts of the proposed action on listed Northern Territory threatened species<sup>1</sup> not previously addressed under the EPBC Act (e.g. critically endangered, endangered and vulnerable). The threatened species criteria are sourced from the revised Northern Territory Threatened Species List (DLRM 2012) and the International Union for Conservation of Nature Red List Guidelines (IUCN 2012.2). Distribution and ecological descriptions are sourced from the revised Northern Territory Threatened Species List (DLRM 2012), Woinarski, *et al.* (2007), and the International Union for Conservation of Nature Red List Guidelines (IUCN 2012.2).

Species listed as threatened under both jurisdictions are identified and the subsequent status provided.

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<sup>1</sup> Only threatened species known to occur in Kakadu National Park have been assessed.

Table 1: Applying EPBC Act significant impacts criteria for **vulnerable species** to potential impacts from the proposed action

Taxa	PLANTS		MAMMALS				BIRDS			FISH		REPTILES		
	<i>Hibiscus brennani</i> <sup>2</sup>	<i>Sauropus filicinus</i>	Arnhem Rock Rat ( <i>Zyromys maini</i> ) <sup>2</sup>	Brush-tailed Rabbit-rat ( <i>Conilurus penicillatus</i> ) <sup>2</sup>	Golden-backed Tree-rat ( <i>Mesembriomys macrurus</i> ) <sup>3</sup>	Northern Brush-tailed Phascogale ( <i>Phascogale tapoatafa pirata</i> ) <sup>4</sup>	Masked Owl ( <i>Tyto novaehollandiae kimberli</i> ) <sup>2</sup>	Partridge Pigeon ( <i>Geophaps smithii smithii</i> ) <sup>2</sup>	Yellow Chat ( <i>Epthianura crocea tunneyi</i> ) <sup>4</sup>	Red Goshawk ( <i>Erythrotriorchis radiatus</i> ) <sup>2</sup>	Freshwater sawfish ( <i>Pristis microdon</i> ) <sup>2</sup>	Dwarf sawfish ( <i>Pristis clavata</i> ) <sup>2</sup>	Green turtle ( <i>Chelonia mydas</i> )	Hawksbill turtle ( <i>Eretmochelys imbricata</i> ) <sup>2</sup>
Main context	Restricted to one population on the Mt Brockman outlier of the western Arnhem Land sandstone massif.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Restricted to 7 localities on the Mt Brockman outlier and northern outliers in Kakadu National Park, with one record from Arnhem Land.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Restricted to sandstone massif of western Arnhem Land (including Jabiluka lease).  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Preferred habitat is tall eucalypt forests where there is less cover of annual grass, less cover of bare ground, a smaller basal area of dead trees and where the impact of fires is less severe.  Their preferred habitat described above, is not present on the Ranger Project Area.  No further assessment undertaken.	Very little is known of the ecology of this species. The only information from the Northern Territory is that all three recordings were from riverine vegetation in upper McArthur River (1901); upper Mary River (1903); and Deaf Adder Gorge (1969) (Woinarski, <i>et al.</i> 2007). No recorded sighting on or within the vicinity of the Ranger Project Area during surveys undertaken in 2007, 2008 and 2010 across over 40 sites.	Prefers tall open forests dominated by <i>Eucalyptus miniata</i> and <i>E. tetradonta</i> .  Limited distribution and ecological information available on this species.	Prefer tall open forests dominated by <i>Eucalyptus miniata</i> and <i>E. tetradonta</i> but also roosts in monsoon rainforests, and forages in more open vegetation types, including grasslands.  This habitat does not occur in the area proposed to be disturbed.	They primarily occur in lowland eucalypt open forests and woodlands, with grassy understoreys.  Does occur – common in the undisturbed parts of the Ranger Project Area and in parts of Kakadu National Park.	Most records of this subspecies are from floodplain depressions and channels, concentrating around wetter areas at the end of the dry season.  This habitat does not occur in the area proposed to be disturbed.	Favours coastal and sub-coastal areas. Prefers a mix of vegetation types including tall open forest, woodland, lightly treed savannah and the edge of rainforest and riparian forests.  Surveys of the Ranger Project Area have not detected its presence.	Prefers muddy bottoms of freshwater areas and upper reaches of estuaries.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Usually inhabits shallow (2-3 m) coastal waters and estuarine habitats; does not utilise any purely freshwater areas; restricted to brackish and salt water.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Occur in tropical and subtropical waters. Nationally significant breeding sites in the Northern Territory include Cobourg Peninsula, the mainland from Gove to the northern edge of Blue Mud Bay, the southeast of Groote Eylandt, and the northern beaches of islands in the Sir Edward Pellew group.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	In Australia, there are two main genetically isolated populations: on the west coast, and in the Top End and north-eastern Queensland. In the Northern Territory, most nesting occurs on islands. Principal sites are concentrated around north-eastern Arnhem land and Groote Eylandt.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.
<b>Significant impact criteria</b>														
Potential for the project to:														
Lead to a long-term decrease in the size of an important population of a species					Highly unlikely: No recorded sighting on or within the vicinity of the Ranger Project Area. Last recorded sighting in Kakadu was at Deaf Adder Gorge in 1969.  Any disturbances associated with Ranger 3 Deeps	Highly unlikely - No recorded sighting on or within the vicinity of the Ranger Project Area during surveys undertaken in 2006, 2007, 2008 and 2010 across over 40 sites.	Highly unlikely – the surface infrastructure for the proposed action will be restricted to the heavily disturbed areas of the Ranger Project Area, and is unlikely to lead to long term impacts on species populations.	Unlikely – this species is common in the undisturbed parts of the Ranger Project Area and occurs in abundance throughout parts of Kakadu National Park.  Surface infrastructure for	Highly unlikely - this habitat does not occur in the area proposed to be disturbed.	Highly unlikely – Infrastructure for the proposed action will be restricted to the heavily disturbed areas of the Ranger Project Area, and is unlikely to lead to long term impacts on species populations.				

<sup>2</sup> Listed as vulnerable under Northern Territory legislation.  
<sup>3</sup> Listed as critically endangered under Northern Territory legislation.  
<sup>4</sup> Listed as endangered under Northern Territory legislation.

Taxa	PLANTS		MAMMALS				BIRDS				FISH		REPTILES	
	<i>Hibiscus brennanii</i> <sup>2</sup>	<i>Sauropus filicinus</i>	Arnhem Rock Rat ( <i>Zyomys maini</i> ) <sup>2</sup>	Brush-tailed Rabbit-rat ( <i>Conilurus penicillatus</i> ) <sup>2</sup>	Golden-backed Tree-rat ( <i>Mesembriomys macrurus</i> ) <sup>3</sup>	Northern Brush-tailed Phascogale ( <i>Phascogale tapoatafa pirata</i> ) <sup>4</sup>	Masked Owl ( <i>Tyto novaehollandiae kimberli</i> ) <sup>2</sup>	Partridge Pigeon ( <i>Geophaps smithii smithii</i> ) <sup>2</sup>	Yellow Chat ( <i>Epthianura crocea tunneyi</i> ) <sup>4</sup>	Red Goshawk ( <i>Erythrotriorchis radiatus</i> ) <sup>2</sup>	Freshwater sawfish ( <i>Pristis microdon</i> ) <sup>2</sup>	Dwarf sawfish ( <i>Pristis clavata</i> ) <sup>2</sup>	Green turtle ( <i>Chelonia mydas</i> )	Hawksbill turtle ( <i>Eretmochelys imbricata</i> ) <sup>2</sup>
					will have no impact on this species.			the proposed action will be restricted to the heavily disturbed areas of the Ranger Project Area, and is unlikely to lead to long term impacts on species populations.						
Reduce the area of occupancy of an important population					Highly unlikely – Populations of this spp. have not been recorded within the vicinity of the Ranger Project Area.	Highly unlikely – the Magela Land Application Area does not contain this habitat; and species has not been recorded on the Ranger Project Area since prior to 1995.	No important populations have been identified on the Ranger Project Area.  Further, this species has never been recorded on, or within close vicinity of the Ranger Project Area.	Unlikely – this species is common in the undisturbed parts of the Ranger Project Area and occurs in abundance throughout parts of Kakadu National Park.  In addition, infrastructure for Ranger 3 Deeps will be restricted to the heavily disturbed areas of the Ranger Project Area.	No important populations have been identified on the Ranger Project Area.  Furthermore it has not been recorded despite significant survey effort on the Ranger Project Area which would further corroborate its absence.  The area to be disturbed is not known to be preferred habitat for this species.	Highly unlikely as no important populations have been identified on the Ranger Project Area.  Widespread surveys of the Ranger Project Area historical or recent have not detected it.				
Fragment an existing important population into two or more populations					Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.					
Adversely affect habitat critical to the survival of a species: <ul style="list-style-type: none"> <li>for activities such as foraging, breeding, roosting, or dispersal</li> <li>for the long-term maintenance of the species or ecological community (including the</li> </ul>					Highly unlikely – The Ranger Project Area does not contain recognised critical habitat, nor has the species been recorded on the Ranger Project Area.	<ul style="list-style-type: none"> <li>Highly unlikely – as the Ranger Project Area does not contain recognised critical habitat, nor has the species been recorded on the Ranger Project Area in recent history despite the considerable number of surveys that</li> </ul>	<ul style="list-style-type: none"> <li>Highly unlikely – important populations have not been recorded or identified on the Ranger Project Area.</li> <li>The Ranger Project Area does not contain recognised critical habitat, nor has the species been recorded on the Ranger Project Area.</li> <li>The national</li> </ul>	Highly unlikely – activities associated with the proposed action do not correspond with key threatening processes: <ol style="list-style-type: none"> <li>Inappropriate fire regimes – ERA's fire management controls will be applied.</li> <li>Invasion of weed grasses – ERA's weed</li> </ol>	<ul style="list-style-type: none"> <li>Highly unlikely – the Ranger Project Area does not contain recognised critical habitat, nor has the species been recorded on the Ranger Project Area.</li> <li>The proposed action will not have an adverse impact on the established monitoring program.</li> <li>Species and habitats are not</li> </ul>	<ul style="list-style-type: none"> <li>Highly unlikely as the Ranger 3 Deeps Project will occur within the heavily disturbed footprint of the Ranger Project Area.</li> <li>Ranger Project Area does not contain recognised critical habitat, nor has the species been recorded on the</li> </ul>				

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<p>maintenance of species essential to the survival of the species or ecological community, such as pollinators)</p> <ul style="list-style-type: none"> <li>to maintain genetic diversity and long term evolutionary development, or</li> <li>for the reintroduction of populations or recovery of the species or ecological community.</li> </ul> <p>Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act</p>					<p>have been undertaken.</p> <ul style="list-style-type: none"> <li>There is no existing recovery plan or management program for this species.</li> <li>Species and habitats are not listed on the Register of Critical Habitat.</li> </ul>	<p>recovery plan which lapsed in 2009, lists Kakadu National Park as a conservation area containing small habitat ranges for the recovery of this species (Woinarski 2004). Kakadu National Park covers an area of 19,804 km<sup>2</sup>.</p>	<p>management controls will be applied.</p> <p>Species and habitats are not listed on the Register of Critical Habitat.</p>	<p>listed on the Register of Critical Habitat.</p>	<p>Ranger Project Area.</p> <ul style="list-style-type: none"> <li>Kakadu National Park is listed as a conservation area for the recovery of this species (DEWHA 2010) and covers an area of 19,804 km<sup>2</sup>.</li> <li>Species and habitats are not listed on the Register of Critical Habitat.</li> </ul>					

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Disrupt the breeding cycle of an important population					Highly unlikely – the Ranger Project Area does not correspond with known areas of distribution and subsequent breeding populations have not been recorded on the Ranger Project Area.	Highly unlikely – there has only been on recorded sighting of this this species on the Ranger Project Area pre-1995. Subsequent breeding individuals or populations have not been recorded on the Ranger Project Area despite a significant number of surveys.	Highly unlikely – this species and subsequent breeding individuals or populations have never been recorded on the Ranger Project Area despite a significant number of surveys.	Highly unlikely – as habitat availability will not be significantly reduced by land clearing for the proposed action. The small areas required for clearing occur within the heavily disturbed Magela Land Application Area.	Highly unlikely - no individuals or populations have been identified on the Ranger Project Area.  Disturbance will not occur in areas of preferred habitat.	Highly unlikely – as habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within the heavily disturbed Magela Land Application Area.				
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline					Highly unlikely – as this species has never been recorded on the Ranger Project Area. In addition, the Ranger Project Area does not correspond with known areas of distribution.	Highly unlikely – disturbance will be restricted to small footprints for the construction and operation of the ventilation shafts within the existing Magela Land Application Area, which is already heavily disturbed.	Highly unlikely – as habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within heavily disturbed areas of the Ranger Project Area.	Highly unlikely – as the small areas required for clearing occur within heavily disturbed areas of the Ranger Project Area. Impacts on this species from the proposed project are thus considered to be insignificant particularly with respect to the population as a whole in the Top End.	Highly unlikely – as the small areas required for clearing occur within heavily disturbed areas of the Ranger Project Area. For example, the areas to be cleared for the ventilation shafts occur within the heavily disturbed Magela Land Application Area.	Highly unlikely – as habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within heavily disturbed areas of the Magela Land Application Area.				
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat					The proposed action is highly unlikely to introduce a species that would impact the Golden-backed Tree-rat.  Ranger has established pest management systems and procedures for the Ranger Project Area.	The proposed action is highly unlikely to introduce a species that would impact the Northern Brush-tailed Phascogale.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Masked Owl.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Partridge Pigeon.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Yellow Chat.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Red Goshawk.  Current operational pest management systems and procedures will apply.				
Introduce disease that may cause the species to					The proposed action is highly unlikely to introduce a	The proposed action is highly unlikely to introduce a	The proposed action is highly unlikely to introduce a disease that would impact this	The proposed action is highly unlikely to introduce a	The proposed action is highly unlikely to introduce a disease that would impact this	The proposed action is highly unlikely to introduce a disease that				

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decline.					disease that would impact this species.	disease that would impact this species.	species.	disease that would impact this species.	species.	would impact this species.				
Interfere substantially with the recovery of the species.					Highly unlikely, as the project area does not correspond with known areas of distribution.  In addition, specific recovery management activities have yet to be established due to the limited data and recorded sightings of this species.	Highly unlikely as the project does not correspond with key threatening processes for the species.	Highly unlikely as the project does not correspond with key threatening processes for the species.	Highly unlikely as this species is common in the undisturbed parts of the Ranger Project Area and occurs in abundance throughout parts of Kakadu National Park.	Highly unlikely as the project does not correspond with key threatening processes for the species.	Highly unlikely as the project does not correspond with key threatening processes for the species.				

Table 2: Applying EPBC Act significant impacts criteria for **critically endangered and endangered species** to potential impacts from the proposed action

Taxa	MAMMALS	BIRDS	REPTILES				FISH	
	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
Main context	They occur in many habitats including eucalypt open forests, but the most suitable appears to be rocky areas.	Migratory: A colourful, nomadic finch that occupies two different habitats on an annual cycle. During the dry season they inhabit wooded hills that contain snappy or salmon gums, which provide nest sites. During the wet season they move from the hills to lowlands that support perennial grasses.	Marine; feeding is known to occur in Northern Territory waters from Fog Bay around to north-east Arnhem Land.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Shallow protected tropical and subtropical waters throughout the world. Nesting populations in the Northern Territory have been recorded from Melville Island to Groote Eylandt with the highest nesting occurring on Melville Island, islands to the east of Croker Island and some islands off north-east Arnhem Land.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Endemic to the Northern Territory and is known from only a few locations. It has been recently discovered on the Wildman Reserve (proposed Mary River National Park) and Mt Bundy Training Area. Previous records were limited to only three specimens, all from the north-west of Kakadu National Park. More recently recorded at Annaburroo.	Restricted to the western Arnhem Land plateau and outliers such as Jabiluka.  Substrate, habitat and the species do not occur on Ranger Project Area.  No further assessment undertaken.	Prefers estuarine habitat. Only recorded in the Adelaide River, South, East and West Alligator Rivers, Murganella Creek and Marrakai Creek.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.	Prefers estuarine habitat. Known from few records, including in the Northern Territory from the Adelaide and East and South Alligator River systems.  Habitat and species does not occur on Ranger Project Area.  No further assessment undertaken.
<b>Significant impact criteria</b>								
Potential for the project to:								
Lead to a long-term decrease in the size	Highly unlikely –this species has	Highly unlikely - historically the			Highly unlikely – The literature indicates			



Taxa	MAMMALS	BIRDS	REPTILES				FISH	
	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
of a population.	<p>undergone rapid collapse to local extinction throughout Kakadu National Park due to cane toads.</p> <p>It has not been recorded on the Ranger Project Area since 1998, despite recent surveys (2007, 2008, 2010).</p>	<p>Gouldian Finch has been recorded in the general area; however there have been no recorded sightings on, or within close vicinity of, the Ranger Project Area.</p>			<p>that the Yellow-snouted Gecko has a restricted range, known from only a few locations in the Top End. Neither individual species nor important populations have been recorded on the Ranger Project Area.</p> <p>No further assessment undertaken.</p>			
Reduce the area of occupancy of the species.	<p>Highly unlikely – as extensive surveys of the Ranger Project Area have failed to record this species since 1998.</p> <p>In addition, habitat availability will not be significantly reduced by land clearing for the proposed action.</p> <p>The small areas required for clearing occur within heavily disturbed areas of the Ranger Project</p>	<p>Highly unlikely, as extensive historical and recent surveys of the Ranger Project Area have failed to record or detect the presence of this species.</p>			.			

Taxa	MAMMALS	BIRDS	REPTILES				FISH	
	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
	Area.							
Fragment an existing population into two or more populations.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.	Highly unlikely – as the proposed action will not create a dividing barrier that could split population groups.						
Adversely affect habitat critical to the survival of a species: <ul style="list-style-type: none"> <li>for activities such as foraging, breeding, roosting, or dispersal</li> <li>for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)</li> <li>to maintain genetic diversity and long term evolutionary development, or</li> <li>for the reintro-</li> </ul>	<p>Highly unlikely – the activities associated with the proposed action do not correspond with key threatening processes:</p> <p>1) Inappropriate fire regimes – ERA's fire management controls will be applied.</p> <p>2) Spread of cane toads– ERA's feral animal management controls will be applied.</p> <p>A recovery plan for this species has not been completed.</p> <p>Species and habitats are not listed on the</p>	<p>A series of national recovery plans have been implemented for the Gouldian Finch.</p> <p>The project will not have an adverse impact on the management priorities for this species across its range.</p> <p>Species and habitats are not listed on the Register of Critical Habitat.</p>						

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	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
duction of populations or recovery of the species or ecological community. Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/ or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act	Register of Critical Habitat.							
Disrupt the breeding cycle of a population.	Highly unlikely - no important populations have been identified on the Ranger Project Area.  Disturbance will not occur in areas of preferred habitat.	Highly unlikely - no important populations have been identified on the Ranger Project Area.  Disturbance will not occur in areas of preferred habitat.						
Modify, destroy, remove, isolate or decrease the	Highly unlikely, as the proposed action will affect a very	Highly unlikely, as the proposed action will affect a						

Taxa	MAMMALS	BIRDS	REPTILES				FISH	
	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
availability or quality of habitat to the extent that the species is likely to decline.	small part of extensive area of similar habitat, which is already heavily disturbed. Area does not correspond with critical processes – breeding, feeding, etc.	very small part of extensive area of similar habitat, which is already heavily disturbed. Area does not correspond with critical processes – breeding, feeding, etc.						
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat.	The proposed action is highly unlikely to introduce a species that would impact the Northern Quoll.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Gouldian Finch.  Current operational pest management systems and procedures will apply.						
Introduce disease that may cause the species to decline.	The proposed action is highly unlikely to introduce a disease that would impact this species.	The proposed action is highly unlikely to introduce a disease that would impact this species.						
Interfere with the recovery of the species.	Highly unlikely –this species has undergone rapid	Highly unlikely – as extensive historical and						

Taxa	MAMMALS	BIRDS	REPTILES				FISH	
	Northern Quoll ( <i>Dasyurus hallucatus</i> ) <sup>3</sup>	Gouldian Finch ( <i>Erythrura gouldiae</i> ) <sup>2</sup>	Loggerhead turtle ( <i>Caretta caretta</i> ) <sup>2</sup>	Olive Ridley turtle ( <i>Lepidochelys olivacea</i> ) <sup>2</sup>	Yellow-snouted Gecko ( <i>Lucasium occultum</i> ) <sup>2</sup>	Arnhem Land Skink ( <i>Bellatorias obiri</i> ) <sup>4</sup>	Speartooth shark ( <i>Glyphis glyphis</i> )	Northern river shark ( <i>Glyphis garricki</i> ) <sup>4</sup>
	collapse to local extinction throughout Kakadu National Park due to cane toads.  It has not been recorded on the Ranger Project Area since 1998, despite recent surveys (2007, 2008, 2010).	recent surveys of the Ranger Project Area have failed to record or detect the presence of this species.						

Table 3: Applying EPBC Act significant impacts criteria for **migratory species** to potential impacts from the proposed action

Genus and species	Saltwater Crocodile, Esturine ( <i>Crocodylus porosus</i> )	Barn Swallow ( <i>Hirundo rustica</i> )	Cattle Egret ( <i>Ardea ibis</i> )	Common Sandpiper ( <i>Actitis hypoleucos</i> )	Derby White-browed Robin ( <i>Poecilodryas superciliosa cerviniventris</i> )*	Fork-tailed Swift ( <i>Apus pacificus</i> )	Great Egret, White Egret ( <i>Ardea modesta</i> )	Grey Plover ( <i>Pluvialis squatarola</i> )	Marsh Sandpiper, Little Greenshank ( <i>Tringa stagnatilis</i> )	Melville Cicadabird ( <i>Coracina tenuirostris melvillensis</i> )	Oriental Plover, Oriental Dotterel ( <i>Charadrius veredus</i> )	Oriental Pratincole ( <i>Glareola maldivarum</i> )	Rainbow Bee-eater ( <i>Merops ornatus</i> )	Rufous Fantail ( <i>Rhipidura rufifrons</i> )	Terek Sandpiper ( <i>Xenus cinereus</i> )	Whimbrel ( <i>Numenius phaeopus</i> )	White-bellied Sea Eagle ( <i>Haliaeetus leucagaster</i> )
Main context	Species occurs on the Ranger Project Area, incidental sightings	Species could occur on the Ranger Project Area	Species occurs on the Ranger Project Area, incidental sightings	Species has been recorded during early surveys (1994-1997)	Species could occur on the Ranger Project Area	Species could occur on the Ranger Project Area	Species could occur on the Ranger Project Area	Species has been recorded during early surveys (1994-1997)	Species has been recorded during early surveys (1994-1997)	Species could occur on the Ranger Project Area	Species could occur on the Ranger Project Area	Species could occur on the Ranger Project Area	Species occurs on the Ranger Project Area	Species could occur on the Ranger Project Area	Species could occur on the Ranger Project Area	Species has been recorded during early surveys (1994-1997)	Species occurs on the Ranger Project Area, recorded incidental sightings
<b>Significant impact criteria</b>																	
Potential for the project to:																	
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species: a)habitat utilised by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, and/or b)habitat that is of critical importance to the species at particular life-cycle stages, and/or c)habitat utilised by a	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species; however there have been incidental sighting of the species on the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species; however there have been incidental sighting of the species on the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, although it has been recorded during earlier surveys of the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, although it has been recorded during earlier surveys of the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, although it has been recorded during earlier surveys of the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, although incidental sighting of the species occur within the operational area of the Ranger Project Area.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.	Highly unlikely, as surface disturbance will be restricted to a very small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species, although it has been recorded during earlier surveys of the Ranger Project Area.	Highly unlikely, as the project will disturb only a small portion of habitat within the heavily disturbed Magela Land Application Area.  The proposed area of disturbance has not been identified as important habitat for this species; however there have been incidental sighting of the species on the Ranger Project Area.

Genus and species	Saltwater Crocodile, Esturine ( <i>Crocodylus porosus</i> )	Barn Swallow ( <i>Hirundo rustica</i> )	Cattle Egret ( <i>Ardea ibis</i> )	Common Sandpiper ( <i>Actitis hypoleucos</i> )	Derby White-browed Robin ( <i>Poecilodryas superciliosa cerviniventris</i> )*	Fork-tailed Swift ( <i>Apus pacificus</i> )	Great Egret, White Egret ( <i>Ardea modesta</i> )	Grey Plover ( <i>Pluvialis squatarola</i> )	Marsh Sandpiper, Little Greenshank ( <i>Tringa stagnatilis</i> )	Melville Cicadabird ( <i>Coracina tenuirostris melvillensis</i> )	Oriental Plover, Oriental Dotterel ( <i>Charadrius veredus</i> )	Oriental Pratincole ( <i>Glaucopis maldivarum</i> )	Rainbow Bee-eater ( <i>Merops ornatus</i> )	Rufous Fantail ( <i>Rhipidura rufifrons</i> )	Terek Sandpiper ( <i>Xenus cinereus</i> )	Whimbrel ( <i>Numenius phaeopus</i> )	White-bellied Sea Eagle ( <i>Haliaeetus leucagaster</i> )
migratory species which is at the limit of the species range, and/or d)habitat within an area where the species is declining.																	
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species.	The proposed action is highly unlikely to introduce a species that would impact the Estuarine Crocodile.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Barn Swallow.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Cattle Egret.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Common Sandpiper.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact this species.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact this species.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Great Egret.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Grey Plover.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Marsh Sandpiper.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Melville Cicadabird.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Oriental Plover.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Oriental Pratincole.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Rainbow Bee-eater.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Rufous Fantail.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact the Terek Sandpiper.  Current operational pest management systems and procedures will apply.	The project is highly unlikely to introduce a species that would impact the Whimbrel.  Current operational pest management systems and procedures will apply.	The proposed action is highly unlikely to introduce a species that would impact this species.  Current operational pest management systems and procedures will apply.
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	Highly unlikely, as the species is widespread across northern Australia. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely as the species is widespread across northern Australia.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely, as the species is widespread along all coastlines of Australia, and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	This species has been split into two spp. <i>P. superciliosa</i> and <i>P. cerviniventris</i> . Suspect that <i>P. superciliosa</i> is the relevant sp.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely, the species is widespread in Australia, southern and eastern Asia and Australasia.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely as the project area has not been identified as a key habitat for the species.	Highly unlikely, the species has widespread global distribution across seasons.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely, the species is widespread in Australia, breeding from eastern Europe to eastern Siberia.  The proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely as the proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely as the proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely as the proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely, as the species is widespread across northern Australia. No breeding sites have been identified on the Ranger Project Area.	Highly unlikely as the proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely as the proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely, the species is a regular migrant to Australia and NZ, with a primarily coastal distribution.  The proposed area of disturbance has not been identified as a key habitat for the species.	Highly unlikely, as the species is widespread along all coastlines of Asia, Australia, and Oceania.  It is not globally threatened; however declines in numbers have been recorded in Australia, Thailand and south-east Asia.  No breeding sites have been identified on the Ranger Project Area.

Table 4: Potential impacts of the proposed action to Northern Territory threatened (**critically endangered and endangered**) species

Genus and species	Fawn antechinus ( <i>Antechinus bellus</i> )	Golden Bandicoot ( <i>Isoodon auratus</i> )	Leatherback Turtle ( <i>Dermochelys coriacea</i> )
Status	Endangered	Endangered	Critically Endangered
Threatened species criteria sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	<p><b>A2a:</b> An observed, estimated, inferred or suspected population size reduction of <math>\geq 50\%</math> over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of the following:  <b>(a) direct observation</b></p>	<p><b>B1ab+B2ab; C2:</b></p> <ul style="list-style-type: none"> <li>• extent of occurrence <math>&lt; 5\,000\text{ km}^2</math>;</li> <li>• known to exist at <math>&lt; 5</math> locations;</li> <li>• continuing decline, observed, inferred or projected;</li> <li>• area of occupancy <math>&lt; 500\text{ km}^2</math>;</li> <li>• population size <math>&lt; 2,500</math> mature individuals; and</li> <li>• <math>&gt; 95</math> per cent of mature individuals in one subpopulation.</li> </ul>	<p><b>A1abd:</b> Population reduction in the form of either of the following:            1) An observed, estimated, inferred or suspected reduction of at least <math>80\%</math> over the last 10 years or three generations, whichever is the longer, based on (and specifying) any of the following:            a) direct observation            b) an index of abundance appropriate for the taxon            d) actual or potential levels of exploitation.</p>
Distribution/ecology sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	Usually inhabits savannah woodland and tall open forest of the Top End of the Northern Territory (IUCN 2012.2). This species does occur on the Ranger Project Area.	<p>In the Northern Territory, it is restricted to Marchinbar Island off the north-east Arnhem Land coast.</p> <p>The presence of this species has not been recorded in Kakadu National Park, post 1970.</p>	Marine; it is found from tropical to sub-polar oceans (IUCN 2012.2).
Potential for the proposed action to impact on the species:	<p>Unlikely – this species has been recorded on several occasions on the Ranger Project Area (Brady, <i>et al.</i> 2006; Corbett 1999; Firth 2008). However, surface disturbance for the proposed action will be restricted to a few discrete areas within the heavily disturbed Magela Land Application Area and current operational footprint.</p> <p>Kakadu National Park is listed as a conservation area for this species; however there is no existing recovery plan or management program for this species.</p>	<p>Does not occur – the habitat and species is not present on the Ranger Project Area.</p> <p>However, Kakadu National Park is listed as a conservation area for this species based on historical records of its former presence in the region (Palmer, <i>et al.</i> 2003).</p>	<p>Does not occur - habitat and species is not present on the Ranger Project Area.</p> <p>However, Kakadu National Park is listed as a conservation area for the monitoring and recovery of this species (Marine Species Section Approvals, <i>et al.</i> 2003).</p>



Table 5: Potential impacts of the proposed action on Northern Territory threatened (**vulnerable**) mammals and reptiles of the area

Taxa	MAMMALS					REPTILES				
	Arnhem Leaf-nose Bat ( <i>Hipposideros didema inornata</i> )	Northern Leaf-nosed Bat ( <i>Hipposideros stenotis</i> )	Black-footed Tree-rat ( <i>Mesembriomys gouldii</i> )	Nabarlek ( <i>Petrogale concinna</i> )	Pale Field-rat ( <i>Rattus tunneyi</i> )	Plains death adder ( <i>Acanthopsis hawkei</i> )	Oenpelli Python ( <i>Morelia oenpelliensis</i> )	Merten's Water Monitor ( <i>Varanus mertensi</i> )	Mitchell's Water Monitor ( <i>Varanus mitchelli</i> )	Yellow-spotted Monitor ( <i>Varanus panoptes</i> )
Significant impact criteria sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	<b>B2ab(i, ii, iii, iv, v):</b> Area of occupancy <2,000 km <sup>2</sup> <b>AND</b> (a) Severely fragmented, <b>OR</b> number of locations ≤ 10 (b) Continuing decline in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or sub-populations; (v) number of mature individuals.	<b>A2ab:</b> Population reduction of >30 per cent over the last three generations (c. 30 years); based on both direct observation and an index of abundance appropriate to the taxon.	<b>A2ab:</b> Population reduction of >30 per cent over the last three generations (c. 30 years); based on both direct observation and an index of abundance appropriate to the taxon.	<b>A2bc:</b> Population reduction of >30 per cent over the last three generations (c. 15 years); based on both an index of abundance appropriate to the taxon and declines in area of occupancy and extent of occurrence.	<b>A2abc:</b> Population reduction of >30 per cent over the last ten years; based on direct observation, an index of abundance appropriate to the taxon and declines in area of occupancy and extent of occurrence.	<b>A4e:</b> An observed population reduction (over ten years or three generations) where the time period includes both the past and the future, and where the causes of reduction have not ceased, due to the effects of an introduced taxon (cane toad).	<b>C2a(i):</b> A continuing decline <b>AND (ai)</b> Number of mature individuals in each sub-population < 1,000.	<b>A4e:</b> An observed, estimated, inferred, projected or suspected population reduction <sup>5</sup> (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased <b>OR</b> may not be understood <b>OR</b> may not be reversible, based on: (e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.	<b>A2e:</b> Population reduction based on: • An observed, estimated, inferred, projected or suspected population reduction (over ten years or three generations); and • the time period includes both the past and the future, and the causes of reduction have not ceased, due to effects of an introduced taxon (cane toad).	<b>A4e:</b> An observed, estimated, inferred, projected or suspected population reduction <sup>5</sup> (up to a maximum of 100 years) where the time period must include both the past and the future, and where the causes of reduction may not have ceased <b>OR</b> may not be understood <b>OR</b> may not be reversible, based on: (e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.
Distribution/ecology sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	Known from only a few remote locations in the Arnhem Land sandstone massif (Deaf Adder Gorge and upper South Alligator River area and one site in Litchfield (Tolmer Falls). It roosts in caves or abandoned mine adits in cool drafty areas close to water.	Found in areas of sandstone cliffs, escarpments and boulder country, gorges, and waterholes bordered by paperbark trees (IUCN 2012.2).	A nocturnal animal inhabiting tropical woodlands and open forests in coastal areas.	Two or three subspecies known to occur in the Northern Territory.  This species is restricted to rocky sandstone or granite areas on steep slopes but known to forage in adjacent flat areas.	A nocturnal animal found in the higher rainfall areas of the Top End of the Northern Territory.	Highly venomous ambush forager, known to occur on the flat, treeless cracking soils and floodplains of the Adelaide, Mary and Alligator Rivers.	Restricted to the western Arnhem Land plateau and outliers such as Jabiluka.	This species is semi-aquatic and as such rarely seen far from water, e.g. creeks and billabongs.	This species is semi-aquatic and arboreal, inhabiting the margins of watercourses swamps and lagoons in Northern Australia.	Usually inhabits shallow (2–3 m) coastal waters and estuarine habitats; does not utilise any purely freshwater areas; restricted to brackish and salt water.
Potential for the proposed action to impact on the species:	Unlikely – this species could occur on the Ranger Project Area. However habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within heavily disturbed areas of the Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Unlikely – this species could occur on the Ranger Project Area. However habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within heavily disturbed areas of the Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Unlikely – this species could occur on the Ranger Project Area. However habitat availability will not be significantly reduced by land clearing for the proposed action. In addition, the small areas required for clearing occur within heavily disturbed areas of the Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Unlikely – this species has never been recorded on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Unlikely – this species has been recorded during recent field surveys (2008) on the Ranger Project Area. However, surface disturbance associated with the proposed action will be restricted to a few discrete areas within the heavily disturbed Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Unlikely – preferred habitat (e.g. black soil plains) are not present on the Ranger Project and this species has not been recorded in previous field surveys.  There is no existing recovery plan or management program for this species.	Does not occur – substrate and habitat is not present on the Ranger Project Area.  A sustainable use program has been established for this species (DLRM 2012).	Unlikely – this species has been recorded on several occasions on the Ranger Project Area (2008) and incidentally while conducting biodiversity surveys during 2007 and 2008. However; surface disturbance will be restricted to a few discrete areas within the heavily disturbed Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Unlikely – this species could occur on the Ranger Project Area but has not been recorded in previous field surveys. In addition, habitat availability will not be significantly reduced by land clearing for the proposed action, as the small areas required for clearing occur within heavily disturbed areas of the Magela Land Application Area.  There is no existing recovery plan or management program for this species.	Does not occur - habitat is not present on the Ranger Project Area.  There is no existing recovery plan or management program for this species.

<sup>5</sup> Population reduction ≥30 %.

Table 6: Potential impacts of the proposed action to Northern Territory threatened (**vulnerable**) birds of the area

Genus and species	White-throated grasswren ( <i>Amytornis woodwardi</i> )	Red Knot ( <i>Calidris canutus</i> )	Curlew Sandpiper ( <i>Calidris ferruginea</i> )	Great Knot ( <i>Calidris tenuirostris</i> )	Greater Sand Plover ( <i>Charadrius leschenaultii</i> )	Lesser Sand Plover ( <i>Charadrius mongolus</i> )	Grey Falcon ( <i>Falco hypoleucos</i> )	Bar-tailed Godwit ( <i>Limosa lapponica</i> )
Significant impact criteria sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	<b>B2ab(ii,iii)</b> and <b>C2a(i)</b> , based on: <ul style="list-style-type: none"> <li>• area of occupancy &lt;2,000 km<sup>2</sup>;</li> <li>• severely fragmented;</li> <li>• continuing decline, observed, inferred or projected;</li> <li>• population size &lt;10 000 mature individuals; and</li> <li>• no subpopulation estimate to contain more than 1,000 mature individuals.</li> </ul>	<b>A2a</b> , based on : <ul style="list-style-type: none"> <li>• population reduction of &gt;30 per cent over three generations (c. 30 years) observed in the past; and</li> <li>• where the causes of reduction have not ceased and may not be reversible.</li> </ul>	<b>A2ac</b> and <b>4c</b> : <ul style="list-style-type: none"> <li>• observed reduction of the migratory population visiting Australia of &gt;50 per cent over the last three generations (c. 23 years), expected to continue in the future;</li> <li>• causes of reduction have not ceased and may not be reversible; and</li> <li>• decline in habitat quality of northern hemisphere breeding grounds.</li> </ul>	<b>A2a</b> : Based on : <ul style="list-style-type: none"> <li>• population reduction of &gt;30 per cent over three generations (c. 22 years) observed in the past; and</li> <li>• where the causes of reduction have not ceased and may not be reversible.</li> </ul>	<b>A2a</b> , based on : <ul style="list-style-type: none"> <li>• population reduction of &gt;30 per cent over three generations (c. 22 years) observed in the past; and</li> <li>• where the causes of reduction have not ceased and may not be reversible.</li> </ul>	<b>A2a</b> , based on : <ul style="list-style-type: none"> <li>• global population reduction of &gt;50 per cent over three generations (c. 16 years) observed and continuing; and</li> <li>• the causes of reduction have not ceased and may not be reversible.</li> </ul>	<b>D1</b> , based on: <ul style="list-style-type: none"> <li>• a very small total population size (&lt;1,000).</li> </ul>	<b>A2ac</b> ; <b>3c</b> ; and <b>4c</b> : <ul style="list-style-type: none"> <li>• observed reduction of the migratory population visiting Australia of &gt;50 per cent over the last three generations (c. 27 years) and expected to continue in the future;</li> <li>• causes of reduction have not ceased and may not be reversible; and</li> <li>• decline in habitat quality of northern hemisphere breeding grounds.</li> </ul>
Distribution/ecology sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	A ground-welling grass wren restricted to the sandstone massif of western Arnhem Land, extending through to Nitmiluk National Park and Mann River.  Preferred habitat includes bare, flat plateaux and stepped or terraced hillsides along broad valleys, with or without narrow rocky gullies, characterised by mature <i>Triodia microstachya</i> and bare rock, sometimes with shrubland or woodland overstorey	A migratory shorebird; prefers intertidal mudflats and sand flats close to the coast during the non-breeding season.	A migratory shorebird; prefers to forage on intertidal mudflats and sand flats close to the coast; brackish lagoons, salt marshes and estuaries, and occasionally on inland freshwater wetlands.	A migratory shorebird; prefers intertidal mudflats and sand flats close to the coast.	A migratory shorebird; prefers sheltered sandy beaches, intertidal mudflats and sand flats close to the coast.	A migratory shorebird; prefers sheltered mudflats, sandy beaches, estuaries and mangroves.	Native to Australia and vagrant to Papua New Guinea. Generally inhabits areas of lightly timbered lowland plains, typically on inland drainage systems, where average annual rainfall is <500 mm.	A migratory shorebird; prefers predominantly coastal habitats, intertidal mud flats or in shallow water.
Potential for the proposed action to impact on the species:	Unlikely – the proposed area of disturbance has not been identified as important habitat for this species, which has not been recorded on the Ranger Project Area historically nor in recent surveys.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.	Unlikely – the preferred habitat does not occur on the Ranger Project Area. In addition, this species has not been recorded on the Ranger Project Area historically or in recent surveys.  There is no existing recovery plan or management program for this species.	Highly unlikely, as the species is widespread and common across Australia and broadly distributed internationally.  The proposed area of disturbance has not been identified as a key habitat for the species. No breeding sites have been identified on the Ranger Project Area.  There is no existing recovery plan or management program for this species.

Table 7: Potential impacts of the proposed action to Northern Territory threatened plants of the area

Genus and species	<i>Acacia</i> sp. Graveside Gorge	<i>Bolbitis quoyana</i>	<i>Cycas armstrongii</i>	<i>Freycinetia excelsa</i>	<i>Hibbertia brennanii</i>	<i>Hibbertia pancerea</i>	<i>Hibbertia</i> sp. South Magela	<i>Hibbertia tricornis</i>	<i>Jacksonia divisa</i>	<i>Lithomyrtus linariifolia</i>	<i>Malaxis latifolia</i>	<i>Monochoria hastate</i>	<i>Utricularia dunstaniae</i>
Status:	Critically endangered	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable
Significant impact criteria sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	<b>B1a+c(iv)</b> and <b>B2a+c(iv)</b> based on having: <ul style="list-style-type: none"> <li>an extent of occurrence estimated to be less than 100 km<sup>2</sup>; and</li> <li>a known area of occupancy of less than 10 km<sup>2</sup>, in just two isolated populations where the number of mature plants undergoes extreme fluctuations.</li> </ul>	<b>D1</b> and <b>D2</b> , based on: <ul style="list-style-type: none"> <li>number of mature individuals &lt;1,000;</li> <li>number of locations is &lt;5; and an observed threat from stochastic, albeit natural, events (extreme flood damage) that could drive the taxon to Critically Endangered or Extinct in a very short time period.</li> </ul>	<b>A4ce</b> based on a predicted >30% reduction in population size over a 100 year period (≤ generations), commencing a decade ago.	<b>D1</b> and <b>D2</b> based on: <ul style="list-style-type: none"> <li>the total number of individuals is estimated to be &lt;1,000; and</li> <li>a restricted area of occupancy estimated to be &lt;20 km<sup>2</sup>.</li> </ul>	<b>D2</b> , based on: <ul style="list-style-type: none"> <li>Restricted to an area of less than 20 km<sup>2</sup>;</li> <li>Known from a single location; and</li> <li>Threats from human activities and in-appropriate fire regimes.</li> </ul>	<b>D2</b> , based on: <ul style="list-style-type: none"> <li>Restricted to an area of less than 20 km<sup>2</sup>;</li> <li>Fewer than 5 known locations; and</li> <li>Threats from human activities and in-appropriate fire regimes.</li> </ul>	<b>D2</b> , based on: <ul style="list-style-type: none"> <li>Restricted to an area of less than 20 km<sup>2</sup>;</li> <li>Fewer than 5 known locations; and</li> <li>Threats from human activities and in-appropriate fire regimes.</li> </ul>	<b>D2</b> , based on: <ul style="list-style-type: none"> <li>Restricted to an area of less than 20 km<sup>2</sup>;</li> <li>Fewer than 5 known locations; and</li> <li>Threats from human activities and in-appropriate fire regimes.</li> </ul>	<b>D1</b> and <b>D2</b> , based on: <ul style="list-style-type: none"> <li>number of mature individuals &lt;1,000;</li> <li>restricted to a very small area (&lt;2 km<sup>2</sup>), with fewer than 5 locations; and</li> <li>a plausible threat from inappropriate fire regimes that could drive the taxon to Critically Endangered or Extinct in a very short time period.</li> </ul>	<b>D1</b> , based on: <ul style="list-style-type: none"> <li>a small population size estimated to be &lt;1,000 mature individuals.</li> </ul>	<b>D1</b> and <b>D2</b> , based on: <ul style="list-style-type: none"> <li>a restricted distribution estimated to be &lt;20 km<sup>2</sup>; and</li> <li>A small population.</li> </ul>	<b>B1ab(iii,iv)</b> and <b>B2ab(iii,iv)</b> ; <b>D2</b> , based on: <ul style="list-style-type: none"> <li>an inferred decline in quality of habitat and population numbers as a result of invasion by exotic weeds;</li> <li>a population estimated to be approx. 5,000; and</li> <li>an area of occupancy of known populations estimated to be &lt;20 km<sup>2</sup> and an extent of occurrence of 3487 km<sup>2</sup>.</li> </ul>	<b>B1ab(iii,iv)</b> and <b>C2a(i)</b> ; <b>D1</b> and <b>D2</b> , based on: <ul style="list-style-type: none"> <li>an estimated population size of &lt;1,000 mature individuals;</li> <li>area of occupancy &lt;2,000 km<sup>2</sup>;</li> <li>an inferred decline in area and extent and quality of habitat; and</li> <li>an inferred decline in numbers of mature individuals.</li> </ul>
Distribution/ ecology sourced from the IUCN Red List (IUCN 2012) and Northern Territory Threatened Species List (DLRM 2012)	Known only from Graveside Gorge, Kakadu National Park, approximately 77 km south-west of Jabiru.	Known only from Dinner Creek, Kakadu National Park, approximately 100 km south-west of Jabiru. Grows in a protected, wet gorge on sandstone rocks.	It is known from Gunn Point to Hayes Creek, west to within 50 km of the coast and east to the Wildman River catchment, and also occurs on the Tiwi Islands and Cobourg Peninsula.	Species is only known from 7 localities across the Top End. It occurs in wet lowland rainforest and spring-fed rainforests in sandstone gullies.	Known from only one location of the western Arnhem Land escarpment.	Known from only one location of the western Arnhem Land Plateau.	Known only from one branch of the upper Magela Creek Gorge on the escarpment of the Western Arnhem Land Plateau.	Known only from one location at Mt Brockman, on the central western escarpment of the Arnhem Land Plateau (south of the Ranger Mine).	Restricted to the edges of a gorge on the eroding western margin of the Marrawal Plateau at Bloomfield Springs in southern Kakadu National Park.	Known from approximately 14 localities in Kakadu National Park and Arnhem Land. It is found in heaths or eucalypt woodlands on sandstone, in sandy or skeletal soils, often along the margins of <i>Allosyncarpia temata</i> forest and almost always growing amongst <i>Triodia microstachya</i> .	Known to a single location in a wet (spring) rain-forest near Munmarlary, in Kakadu National Park approx. 50 km north-west of Ranger on the South Alligator River.	Known only from the floodplains on the Finnis, Reynolds and Wildman Rivers.	Known from 9 collection points in the Northern Territory including one near Jabiru, at the foot of the Arnhem Land escarpment.
Potential for the proposed action to impact on the species:	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Unlikely – species has not been recorded on the Ranger Project Area historically or in recent surveys.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on, or in the vicinity of the Ranger Project Area.	Species does not occur on the Ranger Project Area or downstream of the proposed action.	Species does not occur on the Ranger Project Area or downstream of the proposed action.

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- **Highlighted documents** are available to the public, including web references if relevant.

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