

Section 7

Terrestrial Flora and Fauna

7. TERRESTRIAL FLORA AND FAUNA

7.1 Vegetation Communities

At the request of DERM Appendix 7B of the EIS was updated to include the type of sites ('secondary' or 'tertiary') undertaken for each vegetation type. The updated Appendix 7B has been provided to DERM and is available from RTA upon request. The DERM submission also requested further information on the representation of protected areas in the vicinity of the Project. This information has been provided in **Table 7-5(sup.)**.

As described in **Section 2.3**, the existing Beagle Camp and Pera Head Access Roads (partially off-lease on the former MDL378) would be upgraded if required. This road mostly traverses the bauxite plateau and contains Darwin Stringybark open woodland. The crossing of Coconut Creek would need to be upgraded and may need to be realigned. This would involve clearing of approximately less than 1ha of riparian vegetation. Surveys have not been undertaken in this area, however they will be undertaken as soon as access permits in 2012.

As described in **Section 2.4**, further investigations and an increase in the startup production to 22.5Mdtpa have resulted in minor changes to the overall mine plan. Mining areas over the duration of the life of the mine would increase slightly (refer **Figure 1-3(sup.)**). However, this increase in area is partially offset by a decrease in disturbance due to the relocation of the Norman Creek tailings storage facility into an area that has been mined. The area of Dam C has increased slightly with the addition of the spillway, for which design progressed since the EIS. The revised disturbance of regional ecosystems is presented in **Table 7-10(sup.)**, **Figure 7-6(sup.)**, and **Figures 7-6a(sup.) to 7-6d(sup.)**. Minor changes to the REs presented in the EIS have occurred as a result of the use of a different projection, however the data still provide a robust indication of the spatial extent of impact of mining and Project infrastructure on vegetation.

In the Project area, disturbance would comprise 27,709ha within mining areas; 778ha within the footprint of Dam C; and 1,171ha within the footprint of Project infrastructure established on non-mining

areas (including an estimate for haul roads and borrow pits). The total 29,658ha of remnant vegetation to be disturbed is comprised entirely of "Least concern" REs, apart from approximately 0.4ha of RE 3.2.6a (*Casuarina equisetifolia* woodland on foredunes) to be disturbed for the ship loading facility and the temporary seaborne access. Following construction of the Port, vegetation within the 20m corridor would be allowed to regenerate (subject to fire risk assessment) beneath the 12m wide deck of the approach jetty which would be approximately 12–15m above the ground surface. Similarly, once the temporary seaborne access is no longer required, these areas would be rehabilitated. It is envisaged that, provided the original dune surface is reinstated, these areas would still be suitable to support RE 3.2.6a.

RE 3.5.2 (Darwin Stringybark woodland) would be the most extensively disturbed vegetation type within the Project area as it occurs on the bauxite plateau where mining occurs. Approximately 29,366ha, or 33.6%, of the area of this vegetation type within the Project area would be disturbed, representing 4.4% and 3.7% of its subregional and bioregional distribution respectively. Small areas of RE 3.5.11, RE 3.5.22c, and RE 3.7.3 are also mapped within the mining area but occur on the lower slopes of the plateau edge and would most likely be avoided during mining. Minor construction laydown areas (described in **Section 2.3** and shown on **Figure B**) predominantly fall within areas of Darwin Stringybark woodland which would later be disturbed by mining or infrastructure. Any temporary facilities would be removed and disturbed areas that are no longer required would be rehabilitated once the construction period is complete.

Apart from RE 3.5.2, the disturbance to most REs would be much less than 10% (0.01% to 7.5%) of their total extent in the Project area except for RE 3.3.5a (18.7%). The total area of RE 3.3.5a within the Project area is small (43ha) but a relatively substantial proportion (7.9ha) occurs within the footprint of Dam C and associated infrastructure; however, in a subregional and bioregional context, the disturbance to RE 3.3.5a would be negligible.

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project (ha) ¹	VMA Status	Bio-diversity Status	Ecological Values/ Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
Land Zone 1 – Marine Deposits										
3.1.1a	Closed forest of <i>Rhizophora stylosa</i> ± <i>Bruguiera gymnorhiza</i> . Occurs as outer mangroves. <i>Rhizophora stylosa</i> (Red Mangrove) often completely dominates, forming a very even, closed canopy (5–30m tall).	0.04	Least concern	No concern at present	Estuarine wetland	Medium representation, which includes: <ul style="list-style-type: none">• Cape Melville NP,• Endeavour River NP,• Iron Range NP,• Jardine River NP,• Lakefield NP.	5,071	482	29,051	68,365
3.1.1c	Tall, buttressed trees of <i>Heritiera littoralis</i> (Looking Glass Mangrove) dominate a fairly even canopy (21–28m tall). Other tree species are frequently present in the canopy and a shrub layer (1.5–3.5m tall) is often present. In places, <i>Melaleuca cajuputi</i> (Cajuput Tree) is the most frequent canopy species.	0.0	Least concern	No concern at present	Estuarine wetland	Sub-type 3.1.1c only occurs in small areas throughout the bioregion. Representation includes: <ul style="list-style-type: none">• Endeavour River National Park.	13	123	155	170
3.1.3	<i>Ceriops tagal</i> ± <i>Avicennia marina</i> low closed forest. Extensive on intertidal areas.	0.0	Least concern	No concern at present	Estuarine wetland	Medium representation, which includes: <ul style="list-style-type: none">• Cape Melville NP,• Endeavour River NP,• Heathlands RR,• Iron Range NP,• Iron Range RR,• Jardine River NP,• Lakefield NP.	3,728	473	22,076	50,351

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project (ha) ¹	VMA Status	Bio-diversity Status	Ecological Values/Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
3.1.5	<i>Sporobolus virginicus</i> closed tussock grassland. Occurs on coastal plains.	0.0	Least concern	No concern at present	Estuarine wetland	Low representation, which includes: • Lakefield NP.	744	4	2,345	11,536
3.1.6	Sparse herbland or bare salt pans. Associated with salt plains and saline flats.	0.0	Least concern	No concern at present	Estuarine wetland	High representation, which includes: • Cape Melville NP, • Endeavour River NP, • Iron Range NP, • Jardine River NP, • Lakefield NP.	19,146	669	16,336	84,687
Land Zone 2 – Coastal Sand Dunes and Swales										
3.2.2	Semi-deciduous vine thicket on coastal dunes and beach ridges	0.0	Least concern	Of concern		No representation in protected areas on mainland within bioregion.	0	381	510	510
3.2.3	<i>Melaleuca dealbata</i> ± <i>Acacia crassica</i> open forest. Occurs in dune swales on the west coast.	0.0	Of concern Remnant extent >30% remains <10,000ha	Of concern	Palustrine wetland (e.g. vegetated swamp)	Low representation, which includes: • 22ha in National Parks.	59	230	2,631	9,270
3.2.5a	<i>Acacia crassica</i> ± <i>Syzygium suborbiculare</i> ± <i>Parinari nonda</i> woodland. On beach ridges.	0.0	Least concern	No concern at present		Low representation, which includes: • Cape Melville NP, • Lakefield NP.	2,255	171	7,780	58,087
3.2.6a	<i>Casuarina equisetifolia</i> woodland. Occurs on foredunes.	0.4	Of concern >30% remains Remnant extent <10,000ha	Of concern		Low representation, which includes: • Cape Melville NP, • Iron Range NP.	3	145	420	1,499

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project (ha) ¹	VMA Status	Bio-diversity Status	Ecological Values/ Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
3.2.10c	<i>Eucalyptus tetradonta</i> , <i>Corymbia clarksoniana</i> ± <i>E. brassiana</i> woodland on stabilised dunes.	0.0	Least concern	Of concern		High representation, which includes: • 7,213ha in National Parks (including Cape Melville NP), • 611ha in Resource Reserves.	8,652	526	9,065	11,227
3.2.25	Sparse hermland of mixed herbaceous species on foredunes and beach ridges.	0.0	Of concern >30% remains Remnant extent <10,000ha	Of concern		High representation, which includes: • 1,025ha in National Parks (including Cape Melville and Lakefield NPs).	1,237	33	2,384	9,040
Land Zone 3 – Alluvial Plains and Piedmont Fans										
3.3.5a	Evergreen notophyll vine forest. Occurs on alluvia on major watercourses.	7.9	Least concern	No concern at present	Riverine wetland or fringing riverine wetland	High representation, which includes: • Cape Melville NP, • Iron Range NP, • Jardine River NP, • Lakefield NP, • Mungkan Kandju NP, • Starcke NP.	20,400 ⁵	43	22,603	58,227
3.3.9	<i>Lophostemon suaveolens</i> open forest. Occurs on streamlines, swamps and alluvial terraces.	55.3	Least concern	No concern at present	Riverine wetland or fringing riverine wetland	High representation, which includes: • Heathlands RR, • Iron Range NP, • Jardine River NP, • Lakefield NP, • Mungkan Kandju NP.	8,269	1,595	24,815	47,323

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project Area (ha) ¹	VMA Status	Bio- diversity Status	Ecological Values/ Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project Area (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
3.3.14a	<i>Melaleuca saligna</i> ± <i>M. viridiflora</i> , <i>Lophostemon suaveolens</i> woodland on drainage swamps.	0.0	Least concern	No concern at present	Palustrine wetland (e.g. vegetated swamp)	Medium representation, which includes: • Cape Melville NP, • Jardine River NP, • Lakefield NP, • Mungkan Kandju NP.	5,768	434	12,118	27,970
3.3.21	<i>Corymbia clarksoniana</i> ± <i>Syzygium eucalyptoides</i> woodland. Lower slopes of sand ridges and in drainage depressions.	120.6	Least concern	No concern at present	Floodplain (other than floodplain wetlands)	Low representation, which includes: • Mungkan Kandju NP.	9,266	1,601	11,688	38,360
3.3.49b	<i>Melaleuca viridiflora</i> low open woodland on low plains	0.0	Least concern	No concern at present	Widely distributed on floodplains	High representation, which includes: • Lakefield NP, • Mungkan Kandju NP.	116,382	0	129,418	702,523
3.3.50a	<i>Melaleuca viridiflora</i> ± <i>Petalostigma pubescens</i> low open woodland on low plains.	2.7	Least concern	No concern at present	Palustrine wetland (e.g. vegetated swamp)	High representation, which includes: • Iron Range NP, • Jardine River NP, • Lakefield NP, • Mungkan Kandju NP.	142,100 ⁵	1,302	2,435	42,455
3.3.60a	<i>Themeda arguens</i> , <i>Dichanthium sericeum</i> closed tussock grassland on marine plains.	0.0	Least concern	No concern at present	Floodplain (other than floodplain wetlands).	High representation, which includes: • Lakefield NP.	37,400 ⁵	191	9,117	57,030
3.3.61	<i>Panicum spp.</i> , <i>Fimbristylis spp.</i> tussock grassland on coastal alluvial plains.	0.0	Least concern	No concern at present	Floodplain (other than floodplain wetlands)	Low representation, which includes: • Lakefield NP.	1,828	7	825	825

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project (ha) ¹	VMA Status	Bio-diversity Status	Ecological Values/Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
3.3.63	Closed sedgeland dominated by <i>Eleocharis dulcis</i> . Occurs on seasonally flooded marine plains.	0.0	Least concern	No concern at present	Palustrine wetland (e.g. vegetated swamp).	No representation.	0	185	6,534	15,938
3.3.64	<i>Baloskion tetraphyllum</i> subsp. <i>meiostachyum</i> open sedgeland in drainage swamps in dune fields.	0.0	Least concern	No concern at present	Palustrine wetland (e.g. vegetated swamp).	High representation, which includes: • Cape Melville NP, • Heath lands RR, • Iron Range NP, • Jardine River NP, • Mungkan Kandju NP.	20,710 ⁵	185	185	185
3.3.65	Ephemeral lakes and lagoons on alluvial plains and depressions.	0.0	Least concern	No concern at present	Palustrine wetland (e.g. vegetated swamp).	Medium representation, which includes: • Lakefield NP, • Mungkan Kandju NP.	9,160	66	3,960	22,019
Land Zone 5 – Sand Deposits Forming Gently Undulating Plains (Includes Laterite Plateau)										
3.5.2	<i>Eucalyptus tetradonta</i> , <i>Corymbia nesophila</i> tall woodland on deeply weathered plateaus and remnants.	29,366	Least concern	No concern at present	Associated with bauxite plateaus. Significant areas near Weipa cleared for bauxite mining. One of the most widespread REs in the bioregion.	Low representation, which includes: • Jardine River NP, • Mungkan Kandju NP • Holroyd River NR.	59,135	87,446	671,476	794,330

Table 7-5(sup.) Regional Ecosystems Identified within the Project Area

RE	Description	Area Disturbed in Project (ha) ¹	VMA Status	Bio-diversity Status	Ecological Values/Comments	Extent in Reserves or Protected Areas in Cape York Bioregion ²		Area Mapped ³ in Project (ha) ⁴	Area Mapped ³ on Weipa Plateau (ha) ⁴	Area Mapped ³ in Cape York Bioregion (ha) ⁴
						Description	Area (ha) ¹			
3.5.4	Semi-deciduous notophyll vine forest. Occurs as small patches on northern plateaus.	0.0	Least concern	No concern at present	Great variability in species composition between patches.	High representation, which includes: • Heathlands RR, • Iron Range NP, • Jardine River NP, • Mungkan Kandju NP.	5,675	54	5,575	14,479
3.5.11	<i>Eucalyptus tetradonta</i> , <i>Corymbia nesophila</i> woodland on lower slopes of plains and rises.	1.3	Least concern	No concern at present		Low representation, which includes: • Lakefield NP, • Mungkan Kandju NP.	3,843	601	101,769	179,972
3.5.22c	<i>Corymbia clarksoniana</i> + <i>Erythrophleum chlorostachys</i> + <i>Corymbia</i> spp. + <i>Eucalyptus</i> spp. woodland on plains.	102.3	Least concern	No concern at present		High representation, which includes: • Lakefield NP, • Cape Melville NP, • Starcke NP, • Mungkan Kandju NP.	6,933	3,128	42,202	83,536
Land Zone 7 – Duricrusts Formed on a Variety of Rock Types										
3.7.3	<i>Eucalyptus cullenii</i> ± <i>E. tetradonta</i> woodland on erosional escarpments and plains. Occurs on erosional escarpments and plains on the edge of the bauxite plateaus.	1.6	Least concern	No concern at present		Medium representation, which includes: • Mungkan Kandju NP.	4,950 ⁵	245	61,679	71,354
Total							393,154	100,319	1,199,152	2,461,268

Abbreviations: RE = Regional Ecosystem; VMA = Vegetation Management Act 1999 (Qld); NP = National Park; RR = Resources Reserve; NR = Nature Refuge

- Notes:
- Areas within the Project area and Cape York protected areas were calculated using the GDA94 MGA projection.
 - Reserved extent based on data from RE Description Database and data from Accad *et al.* (2008), which relies on 2005 remnant mapping. Note that the RE mapping is incomplete for Cape York Bioregion and thus actual hectare values are not available for all REs.
 - According to revised mapping prepared for this Project (refer Figure 7-6(sup.)).
 - Regional area calculations made using the GDA94 Lat Long projection.
 - For these RE types, significant areas of protected vegetation exist on the Coen Sheet which is not covered by published RE mapping. The area of protected vegetation was therefore taken from Sattler & Williams (1999) who include the protected vegetation on the Coen Sheet. Since this reference is now dated, it is likely that the current area of protected vegetation exceeds the figure quoted.

Table 7-10(sup.) Regional Ecosystem Disturbance

RE	Description	VMA Status	Approx. Area to be Disturbed¹ (ha)			Total Mapped Area in Project Area (ha)	Proportion Disturbed in Project Area	Area in Weipa Plateau Subregion² (ha)	Proportion of Area in Subregion to be Disturbed	Area in Cape York Bioregion² (ha)	Proportion of Area in Bioregion to be Disturbed	Projected Remnant Extent in Bioregion as Proportion of Current Extent²,³	
			Mining Area	Dam C	Infra-structure								Total
Land Zone 1 – Marine Deposits													
3.1.1a	Closed forest of <i>Rhizophora stylosa</i> ± <i>Bruguiera gymnorhiza</i> . Occurs as outer mangroves.	L	–	–	0.04	0.04	482	0.01%	29,051	<0.01%	68,365	<0.01%	>99.9%
Land Zone 2 – Coastal Sand Dunes and Swales													
3.2.6a	<i>Casuarina equisetifolia</i> woodland. Occurs on foredunes	O	–	–	0.4	0.4	145	0.28%	420	0.10%	1,499	0.03%	>99.9%
Land Zone 3 – Alluvial Plains and Piedmont Fans													
3.3.5a	Evergreen notophyll vine forest. Occurs on alluvia on major watercourses	L	–	7.9	0.05	7.9	43	18.67%	22,603	0.04%	58,227	0.01%	>99.9%
3.3.9	<i>Lophostemon suaveolens</i> open forest. Occurs on streamlines, swamps and alluvial terraces	L	–	52.8	2.5	55.3	1,595	3.47%	24,815	0.22%	47,323	0.12%	99.9%

Table 7-10(sup.) Regional Ecosystem Disturbance

RE	Description	VMA Status	Approx. Area to be Disturbed ¹ (ha)				Total Mapped Area in Project Area (ha)	Proportion to be Disturbed in Project Area	Area in Weipa Plateau Subregion ² (ha)	Proportion of Area in Subregion to be Disturbed	Area in Cape York Bioregion ² (ha)	Proportion of Area in Bioregion to be Disturbed	Projected Remnant Extent in Bioregion as Proportion of Current Extent ^{2,3}
			Mining Area	Dam C	Infra-structure	Total							
3.3.21	<i>Corymbia clarksoniana</i> ± <i>Syzygium eucalyptoides</i> woodland. Lower slopes of sand ridges and in drainage depressions	L	–	116.9	3.7	120.6	1,601	7.54%	11,688	1.03%	38,360	0.31%	99.7%
3.3.50a	<i>Melaleuca viridiflora</i> ± <i>Petalostigma pubescens</i> low open woodland on low plains	L	–	–	2.7	2.7	1,302	0.20%	2,435	0.11%	42,455	0.01%	>99.9%
Land Zone 5 – Sand Deposits Forming Gently Undulating Plains (Includes Laterite Plateau)													
3.5.2	<i>Eucalyptus tetradonta</i> , <i>Corymbia nesophila</i> tall woodland on deeply weathered plateaus and remnants	L	27,706	511.8	1,148 ⁴	29,366	87,446	33.58%	671,476	4.37%	794,330	3.70%	96.3%
3.5.11	<i>Eucalyptus tetradonta</i> , <i>Corymbia nesophila</i> woodland on lower slopes of plains and rises	L	1.3	–	–	1.3	601	0.21%	101,769	0.00%	179,972	0.00%	>99.9%

Table 7-10(sup.) Regional Ecosystem Disturbance

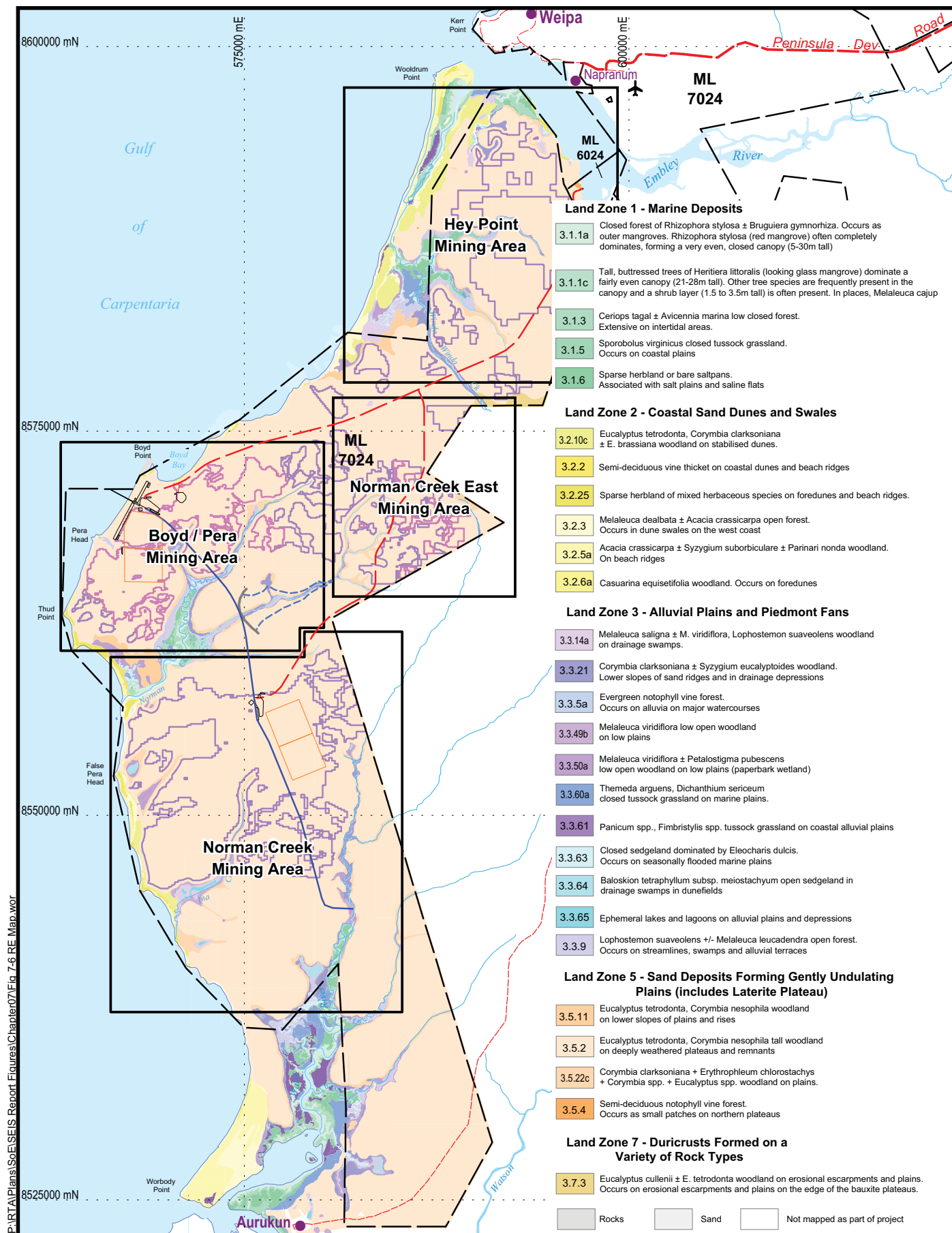
RE	Description	VMA Status	Approx. Area to be Disturbed ¹ (ha)			Total Mapped Area in Project Area (ha)	Proportion to be Disturbed in Project Area	Area in Weipa Plateau Subregion ² (ha)	Proportion of Area in Subregion to be Disturbed	Area in Cape York Bioregion ² (ha)	Proportion of Area in Bioregion to be Disturbed	Projected Remnant Extent in Bioregion as Proportion of Current Extent ^{2,3}
			Mining Area	Dam C	Infra-structure							
3.5.22c	<i>Corymbia clarksoniana</i> + <i>Erythrophleum chlorostachys</i> + <i>Corymbia</i> spp. + <i>Eucalyptus</i> spp. woodland on plains.	L	-	89.2	13.1	102.3	3.27%	42,202	0.24%	83,536	0.12%	99.9%
3.7.3	<i>Eucalyptus cullenii</i> ± <i>E. tetradonta</i> woodland on erosional escarpments and plains	L	1.6	-	-	1.6	0.65%	61,679	0.00%	71,354	0.00%	>99.9%
Total Area to be Disturbed for all Zones			27,709	778	1,171	29,658						

Key to Vegetation Management Act Status Codes:

L Least concern
O Of concern

Note: Only REs likely to be disturbed are listed.

1. All RE spatial data based on analysis of V6 RE data and adjusted with ground-surveyed mapping by RTA within and adjacent to the Project area. Project areas calculated using GDA94 MGA projection.
2. All regional areas calculated using GDA94 Latitude Longitude projection.
3. Pre-clearing extent data are not yet available for the version 6 RE mapping. The pre-clearing extent data used for this analysis are based on 2006 imagery and therefore do not reflect any recent losses of REs elsewhere in the bioregion nor increased mapping areas.
4. Includes an allowance for haul roads and borrow pits.



South of Embley Project

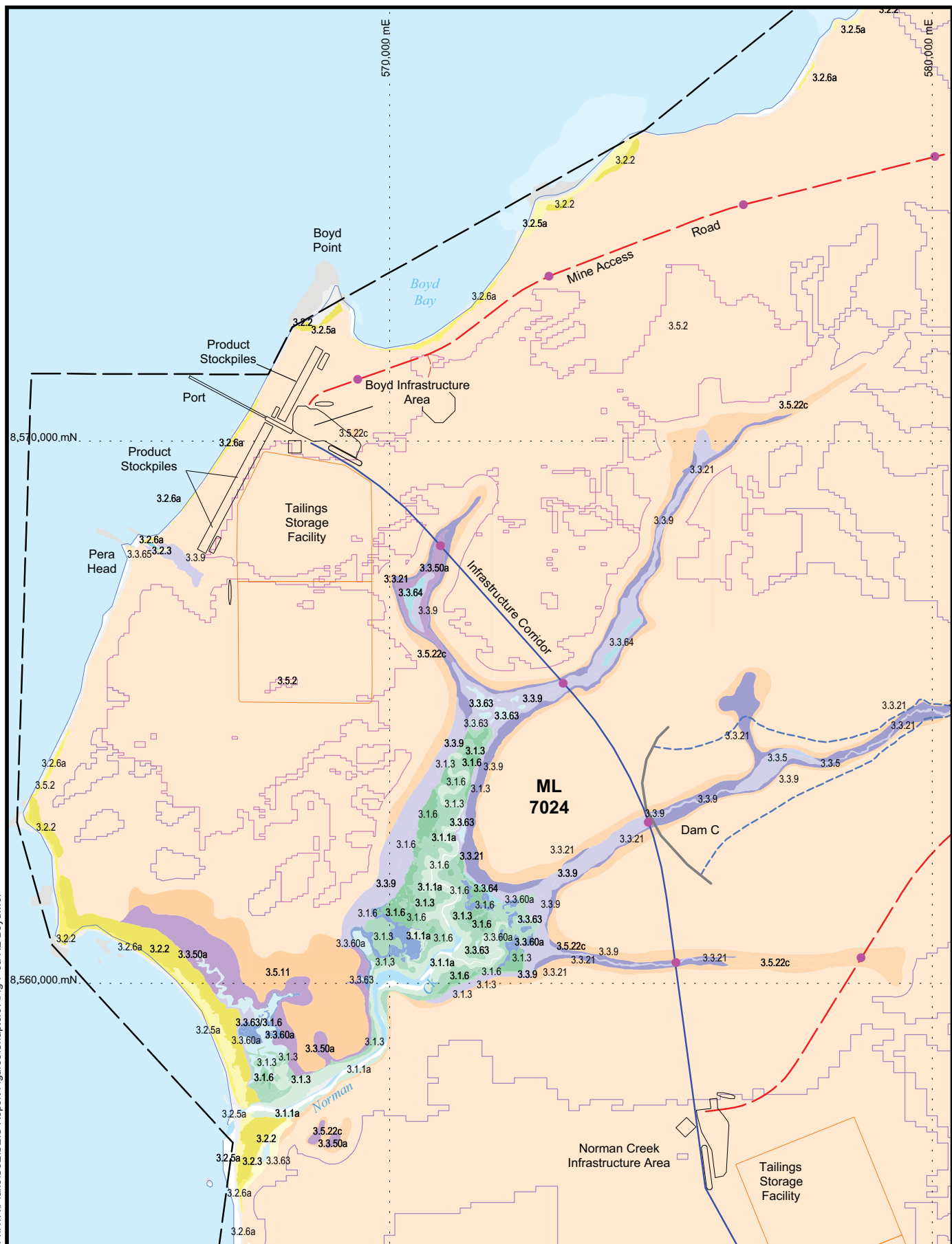
Fig. 7-6(sup): Regional Ecosystems (Ground Surveyed)



5 0 5km

Datum/Projection: GDA94/MGA Zone 54

Date: 12/12/2011



Rio Tinto Alcan

- RTA Mining Lease boundary
- - - Freshwater dam
- Tailings storage facility
- Mining Years 1- 13
- Mining Years 14- 40
- Drainage line crossings

For RE Descriptions See Fig 7-6(sup.)

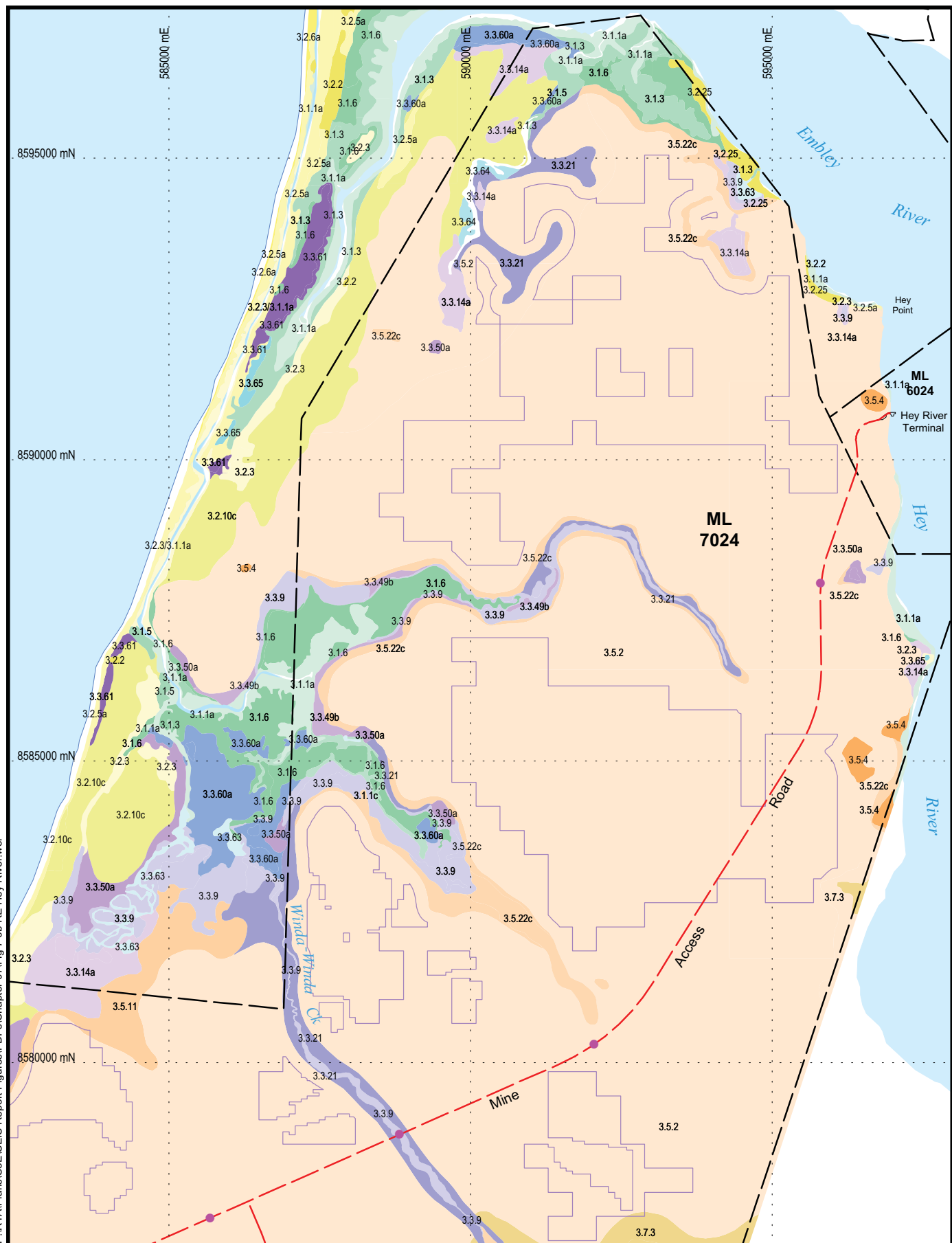
South of Embley Project

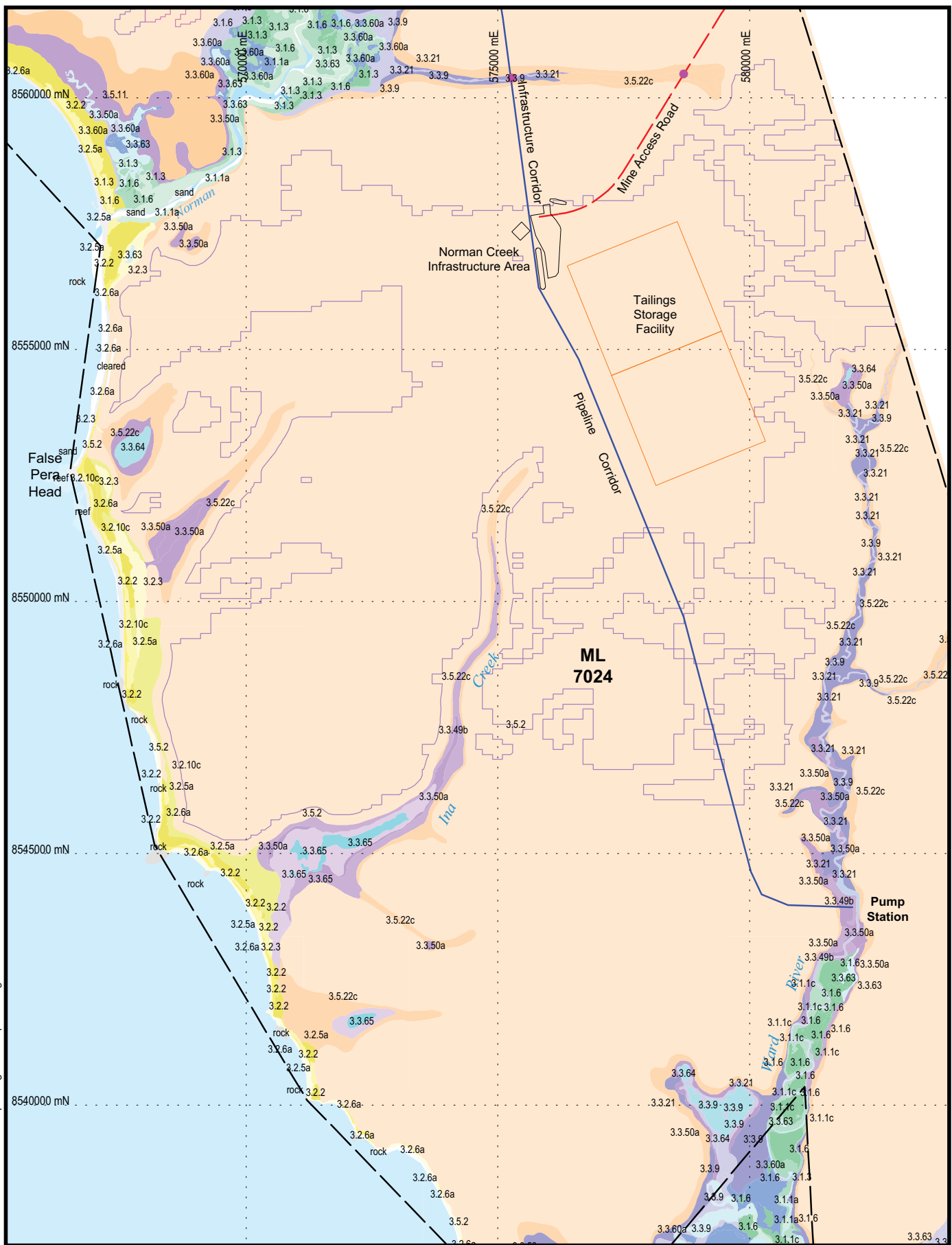
**Fig. 7-6a(sup.):
Regional Ecosystems
(Boyd/Pera Mining Area)**



1 0 1 2km

Datum/Projection: GDA94/MGA Zone 54 Date: 13/12/2011





South of Embley Project

**Fig. 7-6d(sup.):
Regional Ecosystems
(Norman Creek Mining Area)**

- RTA Mining Lease boundary
- Mining Years 1- 13
- Mining Years 14- 40
- Drainage line crossings

For RE Descriptions See Fig. 7-6(sup.)



1 0 1 2km

Datum/Projection: GDA94/MGA Zone 54 Date: 13/12/2011

7.2 Flora

Figure 7-7(sup.) has been updated to show where and when the 12 survey days targeting threatened flora were spent at the request of DERM.

The DERM submission identified a number of errors in Appendix 7D of the EIS. The appendix was reviewed and the following four species were found to have been incorrectly included:

- *Austrosteenisia blackii* which is a rare west coast species. This appears to be an unconfirmed or misidentified record and has been removed.
- *Hibbertia dealbata* which is a rare Queensland species. This species was misidentified and has subsequently been confirmed as *H. candicans* by the Queensland Herbarium.
- *Zanthoxylum rhetsa* which is a rare Queensland species. This taxa was assumed from the RE description, and is most likely a misidentification of *Z. parviflorum*.
- *Corymbia polycarpa* which is an important range extension. This species was misidentified on the basis of matches with the RTA herbarium and the repeated reference to this species as the characteristic tree of this vegetation community in historical references of the Weipa Region (Gunnness *et al.* 1987, Godwin 1988, etc), all of which were

undertaken prior to the taxonomic splitting of *C. polycarpa* with *C. clarksoniana*. Specimens from the Weipa area have subsequently been confirmed as *C. clarksoniana* by the Queensland Herbarium.

A number of other species are awaiting confirmation by the Queensland Herbarium. An update of the species list has been provided to DERM and is available from RTA upon request. Relevant text from Section 7.6.1 the EIS has been updated below.

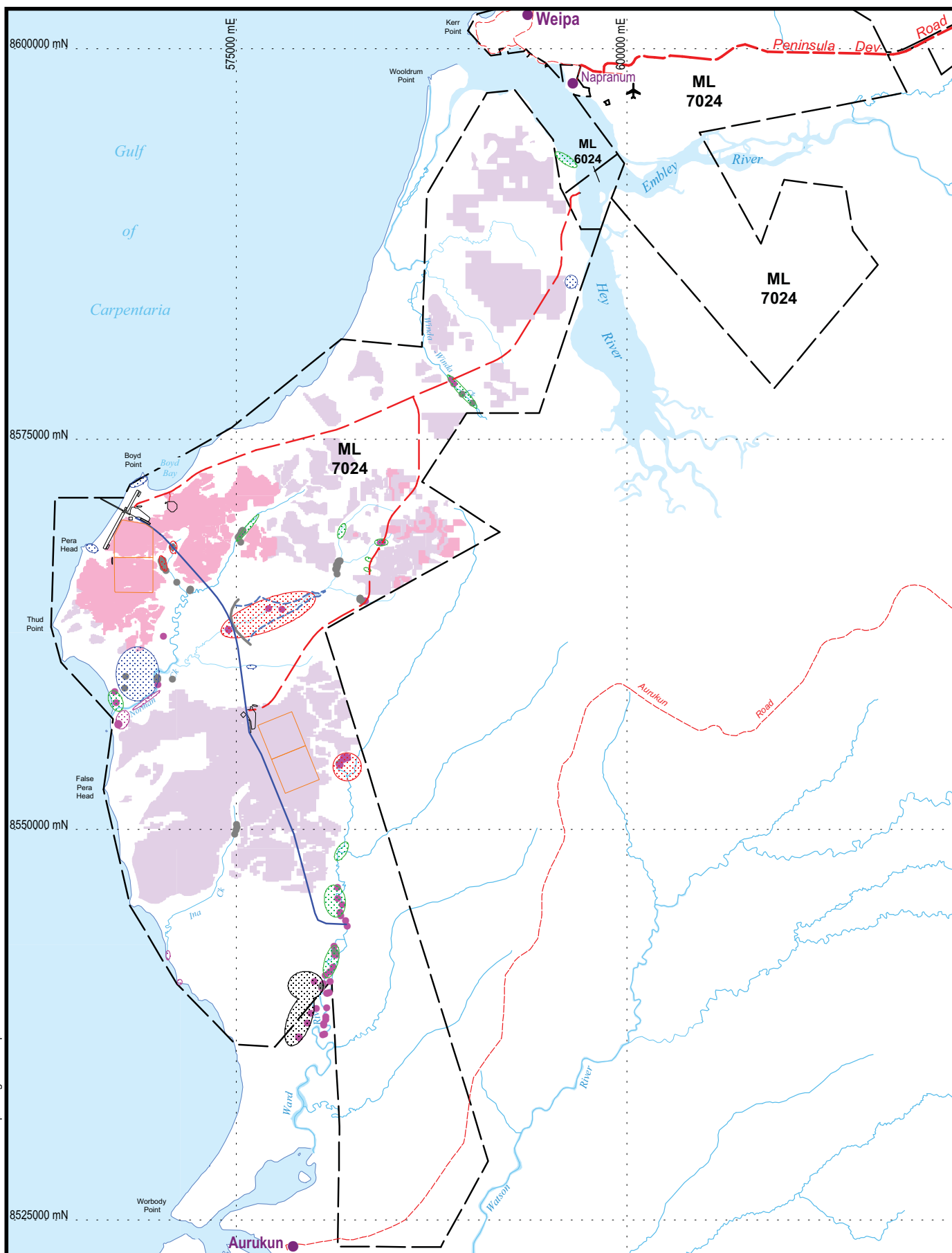
A total of 485 plant taxa has been recorded from all vegetation types within the Project area based on results of preliminary and EIS surveys. This constitutes approximately 55% of the 887 species of vascular plant taxa currently known to occur over all of RTA's Weipa mining leases.

Table 7-6(sup.) summarises the data at different taxonomic levels and indicates there is considerable floristic diversity within the Project area, reflecting the diversity of vegetation types and habitats present including closed forest, woodland, and a range of stream and wetland habitats. A total of 199 (or approximately 41% of the total complement of species from the Project area) has been identified from *Eucalyptus tetrodonta* dominated vegetation (unit 2b), which is the vegetation type occurring where mining is proposed. This vegetation type comprises approximately 85% of the Project area.

Table 7-6(sup.) Floristic Diversity of the Project Area at Different Taxonomic Levels

Taxonomic Level	All Vegetation Types	<i>Eucalyptus tetrodonta</i> Vegetation Types	<i>Eucalyptus tetrodonta</i> Vegetation Types as Proportion of Total
Family	111	64	58%
Genus	327	143	44%
Species	485	199	41%

Particularly well represented families comprised *Poaceae* (49 species), *Fabaceae* (38), *Myrtaceae* (31), *Cyperaceae* (18), *Rubiaceae* (18), *Mimosaceae* (13), *Phyllanthaceae* (12), and *Euphorbiaceae* (11). Particularly well represented genera comprised *Melaleuca* (12), *Acacia* (9), *Corymbia* (5), *Marsdenia* (5), *Eriocaulon* (5), *Crotalaria* (5), *Mallotus* (5) and *Spermacoce* (5).



South of Embley Project

**Fig. 7-7(sup.)
Threatened Flora**

- RTA Mining Lease boundary
- Township
- Road/track
- - - Freshwater dam
- Tailings storage facility
- Mining Years 1 - 13
- Mining Years 14 - 40

Threatened Flora

- Cooktown Orchid [*Dendrobium bigibbum*] (69 locations)
- Chocolate Tea Tree Orchid [*Dendrobium johannis*] (76 locations)

Targeted Threatened Flora survey (other surveys in RTA (2011))

- December 2008
- December 2008 and May 2009
- May 2008
- May 2008 and December 2009
- May 2009



5 0 5km

Datum/Projection: GDA94/MGA Zone 54

Date: 13/12/2011

7.3 Fauna

Comments regarding impacts on terrestrial and migratory fauna and mitigation measures were received from DERM. Additional information is provided in the following sections in response to these comments.

7.3.1 Beach Stone Curlew

Terrestrial fauna surveys conducted during the EIS found the beach stone curlew (*Esacus magnirostris*), pied oystercatcher (*Haematopus longirostris*) and the red-capped dotterel (*Charadrius ruficapillus*) to be present in coastal habitats (refer Section 7.15.6 and Appendix 7F of the EIS). The beach stone curlew is listed as vulnerable under the *Nature Conservation Act 1992* (Qld) (NC Act). These species typically lay eggs on the sand in a shallow scrape above high tide level. There are limited opportunities for this type of nesting in the Boyd Bay/Pera Head area as high tides frequently reach the base of the bauxite cliffs abutting the back of the beaches, inundating this area and making it unsuitable for successful nesting. This is especially the case for the proposed Port location and the main beach habitat located between Pera Head and the northern end of Boyd Bay.

Sandy deposits above high tide level occur in the vicinity of Pera Swamp and more substantially at Boyd Point. None of the proposed temporary seaborne access points (described in **Section 2.3**) will directly disturb potential breeding habitat in these areas as the temporary barge landing area is located more than 200m north of Pera Swamp (Head), and the two temporary Passenger Jetty options are located adjacent to bauxite cliff shoreline habitat to the east of sandy deposits at Boyd Point. Machinery and personnel associated with these landing points will be confined to the landing points to prevent disturbance of eggs, nests or hatchlings in potential breeding habitat. Temporary disturbance of breeding individuals may occur due to movement and noise when landing points are being used but this will represent a minor proportion of each day/night and it is not anticipated to permanently alienate potential foraging habitat for these species. Overall significant impacts on breeding activity of these species are not anticipated to occur.

7.3.2 Estuarine Crocodile

The Estuarine Crocodile was recorded in all freshwater and marine habitats in the Project area, including freshwater swamps and streams well inland. Overall the species is widespread and numerous within the study area (Section 7.15.5 of the EIS).

Crocodiles are relocated regularly (approximately 2-3 per year) from residential areas near Weipa due to the proximity to their key habitat and the risk posed to residents. However, mature crocodiles are rarely removed from the existing Weipa operational areas. The Project construction camp and infrastructure areas are at least two kilometres from primary crocodile habitat and vegetation buffers would be retained between crocodile habitat and mining areas. Section 18.5.3 of the EIS describes the safe work procedures utilised to manage risks associated with wildlife hazards. Given the widespread nature of the species within the Project area, impact to the overall reproductive rates and population of the species within the Project area from the infrequent removal of a mature crocodile would be minimal. In the rare event that a mature crocodile needs to be relocated, RTA would consult with DERM on appropriate relocation method.

7.3.3 Recreational Impacts

DERM also sought clarification on the potential for impact on seabirds and shore birds resulting in recreational activities in the Project area. This was also a concern raised by Traditional Owners during the preparation of the EIS as described in Section 16.3.2 of the EIS. In response to issues raised by Traditional Owners in relation to damage currently being done in the area by recreational users, RTA has committed to working with Traditional Owners and other relevant stakeholders to develop an effective permit system to protect significant cultural heritage sites and environmental values and allow controlled access for recreational purposes. The administration of such a system by Traditional Owners would be subject to discussions between Traditional Owners, RTA and other stakeholders and would be implemented from the commencement of construction. This would effectively assist in managing the existing risks from recreational use to seabirds and shorebirds.

7.4 Assessment of Hornibrook Ferry Terminal Site

The vegetation of the proposed Hornibrook Terminal area reflects the disturbed nature of the area both in respect of the artificial shoreline topography, dredge spoil substrate, and the use of the area as a recreational area in recent years.

The dryland areas (i.e. dumped dredge spoil sitting above the mean high water level) have been colonised by a limited number of individuals of a small variety of endemic native and introduced species, and a grove of mango trees has been planted on the northern section. Tree species (native species indicated by *) observed on site in dryland areas comprised cottonwood (*Hibiscus tiliaceus**),

beach she-oak (*Casuarina equisetifolia**), fig. (possibly *Ficus benjamina*), coral tree (*Erythrina* sp.), mango (*Mangifera indica*), leucaena (*Leucaena leucocephala*) and neem tree (*Azadirachta indica*). Ground cover vegetation in this area was sparse and weedy and did not reflect any native ground cover communities from the local area.

To the north east of the proposed car park and landing, a mangrove community has developed within the tidally inundated low area situated within bunds constructed by NQBP in the 1980's for retaining dredge spoil from the Port of Weipa. This community is most similar to land unit 3d of Godwin (1985) and includes club mangrove (*A. annulata*), spotted-leaved red mangrove (*R. stylosa*), tall stilted mangrove (*Rhizophora apiculata*), cottonwood (*H. tiliaceus*), grey mangrove (*Avicennia marina* subsp. *eucalyptifolia*), and blind-your-eye mangrove (*Excoecaria agallocha*). The mangrove community is most similar to RE 3.1.1a.

A dedicated fauna survey was not undertaken at the site but an assessment was made of the habitat available and its suitability for native fauna. Fauna utilisation of the dryland area where the car park and access road will be located is likely to be minimal and of a seasonal nature.

The mangrove community is likely to host a full suite of native fauna typically encountered in this habitat type including mangrove specialist birds and reptiles and birds from nearby woodland habitats. Flying-foxes were heard within the mangrove one afternoon but despite repeat visits back to the site the species present could not be determined. It is likely that the Black Flying-fox (*Pteropus alecto*) is the main species present although Little red Flying-fox may also be present from time to time. It is unlikely that the Spectacled Flying-fox inhabits this area. Based on the amount of noise being made by Flying-foxes during visits to the site it is unlikely that the number of individuals present at that time exceeded 100; however numbers may fluctuate widely throughout the year and less or more individuals may be present at different times.

The mangrove community is most dependent on the regular tidal flushing received through the inlet. Freshwater discharge presumably from the seasonal aquifer contained within the bauxite section of the laterite also occurs along the northern boundary of the mangroves along the pre-disturbance natural bauxite shoreline. It is not anticipated that

disturbance of the dryland area to the west of the mangroves to accommodate construction of the car park would have any adverse effect on these key processes and any subsequent adverse effect on the mangrove community. Stormwater drainage from the car park would be directed away from the mangrove area wherever practicable. It is also unlikely that proposed dredging in the vicinity of the floating pontoon area would affect the mangrove community.

Potential interaction between the proposed terminal development and Flying-foxes camped in the mangrove area may occur with respect to noise and lighting associated with the car park and pontoon. Significantly, Flying-foxes that roost in the mangroves are likely to be away foraging during the night and therefore not particularly exposed to night time lighting or noise. Furthermore the nearby existing loading facility, stockpile, conveyor and road are existing sources of both noise and light with which the Flying-foxes currently co-exist. As a precaution, flood lighting of the car park would be oriented such that it does not directly illuminate the mangrove area. Overall it is not anticipated that the level of noise and lighting associated with operation of the ferry terminal would lead to adverse impacts on the Flying-fox camp.

Other fauna that currently inhabit the shoreline and mangrove community adjacent to the car park are also unlikely to be adversely affected by the development given the existing background levels of noise, lighting and movement, and the minimal extra contribution to these disturbance factors that operation of the terminal is likely to produce. Significant impacts on terrestrial fauna are not anticipated.

7.5 Assessment of Queensland Offset Requirements

7.5.1 Queensland Biodiversity Offset Policy

The *Queensland Biodiversity Offset Policy (version 1)* (BOP) was introduced on 3 October 2011, after the EIS was published. The policy specifically states that it does not apply to development that is a significant project declared under section 26(1)(a) of the *State Development and Public Works Organisation Act 1971*. However, the Coordinator-General may consider the policy for such projects. **Table 7-A** presents an analysis of the SoE Project in terms of the triggers that would otherwise apply to the Project were it not a significant project.

Table 7-A State Significant Biodiversity Values

State Significant Biodiversity Values	Status
Regional Ecosystems	
Remnant endangered regional ecosystems	Not present in Project area
Remnant endangered grassland regional ecosystems	Not present in Project area
Remnant of concern regional ecosystems	A very small area of RE3.2.6a <i>Casuarina equisetifolia</i> woodland on foredunes would be disturbed by port-related construction activities. The disturbance area would be up to 0.4ha and the affected area would be able to be regenerated. Under the <i>Regional Vegetation Management Code for Western Bioregions</i> (S.7.1), clearing less than 0.5ha is acceptable without an offset.
Remnant of concern grassland regional ecosystems	Not present in Project area
High value regrowth vegetation containing endangered regional ecosystems	Not present in Project area
High value regrowth vegetation containing of concern regional ecosystems	Not present in Project area
Threshold regional ecosystems	Not present in Project area
Critically limited regional ecosystems	Not present in Project area
Essential Habitat	
Essential Habitat	Not present in Project area
Essential Regrowth Habitat	Not present in Project area
Wetlands	
Wetland (<i>Vegetation Management Act 1999</i>)	Field survey identified no wetlands (including swamps, marshes, lakes and alike) to be disturbed by the Project. RE3.3.9 (<i>Lophostemon suaveolens</i> open forest on streamlines, swamps and alluvial terraces) is identified as a “wetland regional ecosystem” in the <i>Regional Vegetation Management Code for Western Bioregions</i> . 52.8ha would be disturbed in Dam C footprint and 2.5ha disturbed due to infrastructure. The total disturbance area would be 55.3ha.
Significant Wetland (<i>Vegetation Management Act 1999</i>)	Not present in Project area
Watercourses	
Approximately 69ha of vegetation associated with a stream order 2 watercourse as defined in the <i>Regional Vegetation Management Code for Western Bioregions</i> (S3.1) is present in Dam C footprint.	
Connectivity	
Project has an impact on a patch of remnant vegetation in Dam C greater than 5 hectares which has State significant biodiversity values (see Wetland, Protected Animals, Protected Plants in this Table).	
Protected Animals (<i>Nature Conservation Act</i>)	
Three protected animal species were found in riparian vegetation in the footprint of Dam C (Rufous Owl, Palm Cockatoo, and Estuarine Crocodile). Note, other protected species occur in the Project area but are not affected by the Project (see Section 7.15.3 of the EIS).	
Legally Secured Offset Area	
Not present in Project area	
Protected Plants (<i>Nature Conservation Act</i>)	
Two pockets of a vulnerable plant species occur in the footprint of Dam C (Cooktown Orchid). Depending on the precise alignment, it and another vulnerable species (Chocolate Tea Tree Orchid) could potentially be disturbed by linear infrastructure where it crosses Norman and Winda Winda Creeks.	
Wetland Protection Areas under SPP 2/11	
Not present in Project area	

In situations where the Policy applies, offsets for clearing of regional ecosystems may be provided in the form direct land-based offsets of ecological equivalence, indirect offset or offset payments. Under the Policy, offsets for protected animals are to be provided in the form of an equivalent area of suitable habitat for the animal. For vulnerable plants, the Policy, were it to be applicable, would require an offset within the known distribution of the plants equivalent to 3.5 plants be replanted to replace one plant cleared.

7.5.2 Queensland Policy for Vegetation Management Offsets

The *Policy for Vegetation Management Offsets (Version 3)* was introduced on 30 September 2011, after the EIS was published. The Policy's purpose is to guide the conditioning of offsets that may be required under the *Vegetation Management Act 1999*. The clearing of remnant native vegetation for mining and mining-related activities on ML7024 and ML6024 is not assessable development under Schedule 3 of the *Sustainable Planning Regulation 2009*. Were the *Policy for Vegetation Management Offsets* to be applicable, compliance with the *Regional Vegetation Management Code for Western Bioregions* would be assessed. Such a comparison would give rise to two triggers that are identical to the BOP (see **Section 7.5.1** above):

- Wetlands (55.3ha of RE 3.3.9 mainly associated with Dam C); and

- Watercourses (approximately 69ha of vegetation associated with a stream order 2 watercourse in Dam C footprint);

In situations where the Policy applies, offsets for clearing of regional ecosystems may be provided in the form of direct land-based offsets of ecological equivalence, indirect offsets or offset payments.

7.5.3 Offset Proposal

RTA proposes a set of offsets that would meet the requirements of the BOP, were it to be applied. This proposal would also meet the requirements of the *Policy for Vegetation Management Offsets*, were it to be applied, due to the overlap between the two policies. The triggers for offsets and the offset proposal is set out in **Table 7-B**. The offset triggers are all substantially associated with Dam C and the various offset elements are therefore able to be co-located. An offset proposal to meet requirements under the Commonwealth *Environmental Protection and Biodiversity Conservation Act* is being prepared separately and is likely to overlap with aspects of the proposal for Queensland offsets. The riparian regional ecosystems of the type to be disturbed by the SoE Project are generally in similar condition to those elsewhere in ML7024 and likely to be of similar ecological equivalence on a per unit area basis. Where the offset area is in the same condition as the cleared area, the offset: disturbance ratio would be 1:1. RTA proposes a 2:1 offset: disturbance ratio to ensure requirements are met.

Table 7-B Offset Proposal

Offset Trigger	Requirement	Element of Proposed Offset
Wetland: 55.3ha of RE 3.3.9 (Dam C and linear infrastructure)	<ul style="list-style-type: none"> • ≥ area; and • ecological equivalence* 	2:1 ratio of RE 3.3.9 (110.6ha)
Watercourse: 69ha of vegetation associated with stream order 2 watercourse (Dam C)	<ul style="list-style-type: none"> • ≥ area; and • ecological equivalence*; and • watercourse vegetation 	2:1 ratio of riparian vegetation comprising one or more of RE 3.3.5, RE 3.3.9, RE 3.3.21, (138ha)
Protected animal species: 177.6ha of riparian habitat (RE 3.3.5, RE 3.3.9, RE 3.3.21) for Rufous Owl, Palm Cockatoo, Estuarine Crocodile (Dam C)	<ul style="list-style-type: none"> • ≥ area; and • suitable habitat 	2:1 ratio of riparian habitat comprising one or more of RE 3.3.5, RE 3.3.9, RE 3.3.21 (355.2ha)
Protected plant species: Cooktown Orchid (Dam C)	<ul style="list-style-type: none"> • 3.5 replaced for each plant cleared; and • suitable habitat 	Translocate and/or propagate a total of 3.5 plants for each plant within footprint of disturbance

Consolidated Offset Proposal

- 2:1 ratio of riparian habitat comprising one or more of RE 3.3.5, RE 3.3.9, RE 3.3.21 (355.2ha), of which 110.6ha must be RE3.3.9; and
- Cooktown Orchid establishment within the above offset area(s); and
- Offset area(s) located on ML7024
- area(s) managed to protect and enhance environmental values by use of ecologically appropriate fire protection and feral animal controls

* Ecological Equivalence Methodology Guideline (DERM2011)

Under the BOP, land-based offsets must be legally secured by either:

- gazetted as a protected area (e.g. nature refuge) under the *Nature Conservation Act*; or
- declaration as high nature conservation value under the *Vegetation Management Act*; or
- use of a covenant under *Land Title Act* or *Land Act*; or
- another mechanism administered and approved by the State.

RTA shall consult with DERM and Traditional Owners regarding the location of the proposed offset area(s) on ML7024 and the appropriate legal mechanism to secure the offset. ML7024 is located on State land.

7.5.4 Mitigation and Compensation for Marine Works

The Fish Habitat Management Operational Policy FHMP005 (2002) guides the development of mitigation and compensation measures for fish habitat loss for approvals required under the *Fisheries Act 1994*. Loss of fish habitat for mining and mining-related activities on ML7024 and ML6024 is not assessable development under Schedule 3 of the *Sustainable Planning Regulation 2009*. The only potential loss of fish habitat outside of ML7024 and

ML6024 is a thin band of seagrass in or adjacent the Humbug terminal dredge footprint. The boundary of this patch shall be re-surveyed to determine more precisely the area that may be removed, if any. Up to 4,400m² of unvegetated tidal land shall be reclaimed to enable the construction of the Hey River barge/ferry terminal on ML6024. RTA also proposes to remove up to 400m² of mangroves to construct the Hey River barge/ferry terminal. The loss of mangroves and seagrass (if any) and unvegetated tidal land constitute loss of marine fish habitat under FHMP005. Under the guidelines, the options for mitigation and compensation are:

- mitigation by way of restorative or rehabilitative works or proposal to provide community fisheries benefits, or
- contribution to a Statewide compensation program to fund research or extension on fish habitats.

The provision of community fisheries benefits in the form of artificial reefs is proposed as an offset. RTA proposes to support the establishment of a local recreational fishing reference group to provide a forum to develop and help implement the establishment of artificial reefs. The reference group would comprise representatives from charter operators and the Weipa Sportsfishing Club (see Section 6.4.5). RTA would cover the costs of materials, transport and placement at sea.