7.1 Existing Conditions

7.1.1 Species present

As part of the PER study, URS commissioned Indicus Biological Consultants Pty Ltd (Indicus) to undertake flora surveys of the project areas on behalf of BOPL.

The flora surveys, carried out in May 2006 and March 2007, identified 70 plant species at the Princess Louise mine site, 42 plant species adjacent to the Princess Louise access road, 66 plant species at the North Point mine site, and 72 plant species adjacent to the North Point access road. Overall a total of 136 plant species were recorded. A complete list of the species identified at each site is presented in Table 7.1.

Historical mining and more recent exploration activities have resulted in considerable disturbance to all sites, so there is relatively low species diversity in the area. Several weed species were identified across all sites.

7.1.2 Vegetation communities

The vegetation community on all uncleared sites is described as eucalyptus open forest with grass understorey, dominated by *Eucalyptus tectifica* (northern box) (Wilson *et al* 1990). Mid-storey species include *Petalostigma spp.* (quinine tree), *Gardenia megasperma*, and *Terminalia ferdinandiana* (billygoat plum). This vegetation community is very widely represented in the Top End, covering an estimated total 49,875 km^2 (Wilson *et al* 1990). Other common tree species recorded included *E. miniata* (Darwin woolly butt) and *E. tetrodonta* (stringybark) (Indicus 2007).

7.1.3 Vegetation types to be disturbed

The total proposed areas of disturbance for mining and related site infrastructure are 6.8 ha at Princess Louise and 16.1 ha at North Point, for a total area of 22.8 ha. The vegetation community to be disturbed is eucalyptus open forest, which constitutes the only vegetation community at both Princess Louise and North Point. Photographs of the mine sites are presented in Plates 7.1 and 7.2.

A significant proportion of the vegetation at the mine sites (33%) has already been cleared for exploration purposes. Table 7.2 presents the estimated footprint areas for construction of mine infrastructure, and corresponding estimates of existing vegetation that will be cleared as a result of the proposed development.

The existing access road will need to be widened to improve access between Princess Louise mine site and Grove Hill Road. The width of the road will increase from four to ten metres, for a length of 200 m, an additional disturbance of 0.1 ha. At North Point mine site, a mine access road of ten metres width and 600 m length will be constructed, equating to a disturbance of 0.6 ha.

Table 7-1 Native flora species recorded at the Princess Louise and North Point mining areas (Indicus 2007)

Species	Princess Louise	North Point	Princess Louise access road	North Point access Road
Cheilanthes fragillima	x		x	
Gomphrena sp.	x	x		
Gomphrena canescens		x		
Buchanania obovata	x	x	x	x
Trachymene didiscoides			x	
Wrightia saligna	x	x	x	
Livistona humilis	x	x	x	
Marsdenia viridiflora			x	x
Pterocaulon sp.	x			
Chochlospermum fraseri	x		x	
Erythrophleum chlorostachys	x	x	x	x
Polycarpaea holtzei		x		x
Denhamia obscura			x	
Terminalia ferdinandiana	x	x		
Cartonema spicatum	x	x	x	
Ipomoea eriocarpa	x			
Ipomoea heppleana			x	
Xenostegia tridentata	x			
Cyperus sp.	x	x		
Cyperus pulchella			x	
Rynchospora sp.		x		
Rynchospora heterochaeta	x			
Scleria sphacelata	x			
Drosera burmanni			x	
Erythroxylum ellipticum	x		x	x
Antidesma ghessaembilla	x		x	
Croton arhemicus	x	x	x	
Euphorbia schultzii	x		x	
Petalostigma pubescens		x		x
Petalostigma quadriloculare	x		x	
Phyanthus minutiflorus				x
Alysicarpus sp.	x			
Alysicarpus schomburgkii	x			
Crotalaria montana			x	x
Galactia sp.Litchfield (working	x			

Species	Princess Louise	North Point	Princess Louise access road	North Point access Road
name)				
Galactia tenuiflora				x
Indigofera colutea			x	
Tephrosia bifacialis			x	
Tephrosia polyzyga	x		x	
Uraria lagopodoides				x
Vigna lanceolata			x	x
Goodenia sp.	x			
Goodenia heppleana			x	
Goodenia holtzeana	x			x
Goodenia janamba		x		
Planchonia careya	x	x		
Amyema sanguinea	x	x	x	
Owenia vernicosa	x	x	x	x
Tinospora smilacina			x	
Acacia difficilis		x		x
Acacia hemignosta	x		x	
Acacia holosericea	x		x	
Acacia lamprocarpa			x	x
Acacia sp.	x	x		
Ficus aculeate			x	
Calytrix achaeta	x	x		
Calytrix brownii		x		
Calytrix exstipulata		x	x	
Corymbia bleeseri				x
Corymbia dichromophloia	x			
Corymbia confertiflora	x	x		
Corymbia ferruginea		x		
Corymbia latifolia		x		
Corymbia polysciada				x
Corymbia porrecta			x	x
Corymbia setosa	x	x	x	
Eucalyptus alba	x	x		
Eucalyptus miniata	x	x	x	x
Eucalyptus tectifica	x	x	x	x
Eucalyptus tetrodonta		x	x	x

Species	Princess Louise	North Point	Princess Louise access road	North Point access Road
Eucalyptus tintinnans			x	
Melaleuca nervosa		x		
Xanthostemon paradoxus	x	x		
Desmodium trichostachyum				x
Alloteropsis semialata			x	x
Aristida sp.	x	x		
Aristida holothera			x	
Arundinella nepalensis	x			
Chrysopogon fallax	x	x		
Cymbopogon bombycinus	x	x		
Digitaria sp.				x
Ectrosia sp.	x			
Eulalia mackinlayi	x			
Ectrosia leporina		x	x	x
Eragrostis sp.	x	x	x	x
Eriachne sp.	x	x	x	
Eriachne avenacea	x	x	x	
Eriachne stipacea		x		
Heteropogon triticeus	x	x	x	
Mnesithea formosa		x	x	x
Mnerithea rottboellioides		x	x	x
Panicum mindanaense			x	
Pogonolobus reticulatus	x	x	x	
Pseudopoganatherum contortum	x	x		
Sarga intrans	x	x	x	x
Schizachyrium fragile	x	x		
Sehima nervosum			x	
Shizachrium fragile			x	
Sporolobus sp.			x	
Themeda triandra	x	x	x	x
Urochloa holosericea			x	
Polygala sp. glaucoides (working name)	x			
Polygala longifolia	x	x	x	
Grevillea decurrens		x		
Grevillea dryandrii			x	

Species	Princess Louise	North Point	Princess Louise access road	North Point access Road
Grevillea heliosperma			x	
Grevillea mimosoides		x		
Grevillea pteridifolia		x		
Persoonia falcata	x	x	x	
Gardenia megasperma	x	x	x	x
Pavetta brownii			x	
Pavetta muelleri	x			
Spermacoce sp.	x	x		
Spermacoce leptoloba	x	x	x	
Buchnera asperata	x	x		
Buchnera linearis		x		
Stemodia lathraia		x		
Striga curviflora			x	x
Brachychiton megaphyllus		x	x	x
Brachychiton paradoxus	x			
Helicteres spp. Darwin			x	x
Waltheria indica				x
Stylidium semipartitum	x	x		
Tacca leonpetaloides			x	
Thecanthes punicea		x		x
Cherldendrum floribundum			x	x
Ampelocissus frutescens			x	x
Cayratia trifolia		x	x	x

Plate 7-1 Princess Louise mine site

Plate 7-2 North Point mine site

Table 7-2 Estimated footprint area and corresponding areas to be cleared at Princess Louise and North Point mine sites

Domain	Princess Louise		North Point	
	Footprint area (ha)	New clearing (ha)	Footprint area (ha)	New clearing (ha)
Waste rock dump	3.39	1.70	9.41	7.53
Sediment dam	0.32	0.03	0.56	0.56
Open pit void	1.20	0.18	3.73	2.05
ROM pad	0.39	0.20	0.51	0.10
Water storage tanks	0.01	0.01	0.01	0.01
Amenities area	0.30	0.09	0.30	0.15
Access and haul roads	0.20	0.10	0.60	0.60
Exploration drill holes	0.95	0.95	0.95	0.95
TOTAL (ha)	**6.76**	**3.26**	**16.07**	**11.95**

Data Source: Figures are based on GIS data and mine plans. Where data was not available estimates have been included.

7.1.4 Significant flora species and weeds

No flora species of conservation significance under Commonwealth legislation were recorded in the surveys performed at the mining areas or access roads. According to the Commonwealth *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) Protected Matters Report for the project area (DEH 2006), no EPBC listed plant species are known to occur in the project area. A review of the NRETA database also revealed that no species of conservation significance under Territory legislation have been recorded in the area (NRETA 2006).

Eight weed species were recorded, the details of which are presented in Table 7.3.

The declared weed *Hyptis suaveolens* (hyptis) was identified at Princess Louise (declared weed schedule class B/C (NRETA 2006a)). Hyptis is an upright branched annual or perennial bush that can grow as high as two metres. It is unpalatable to animals, resistant to fire and can form dense thickets on most soil types. Its seeds are spread by attachment to livestock, native animals, people's clothing and vehicles (NRETA, 2006a).

The *Weed Management Act* 2001 (NT) requires that declared weeds such as this be controlled to limit their spread. BOPL has an existing Weed Management Program that is discussed further below (Section 7.3).

Table 7-3 Weed species recorded at the Princess Louise and North Point mining areas (Indicus 2007)

Species name	Princess Louise	North Point	Princess Louise access road	North Point access road	Declared in the NT
Chloris virgata, purple top chloris	X				
Crotalaria goreensis, gambia pea	X	X			
Hibiscus sabdariffa, rosella				X	
Hyptis suaveolens, hyptis	X				✓
Passiflora foetida, wild passion fruit	X	X		X	
Pennisetum pedicellatum, annual mission grass	X	X			
Pennisetum polystachion, perennial mission grass			X		
Stachytarpheta australis, snake weed			X	X	

7.2 Potential Impacts of Mining

Development of the proposed mines at Princess Louise and North Point will involve clearing relatively small areas of vegetation and, as the local flora community is widely represented throughout the NT, the development does not represent a threat to species conservation through habitat clearing.

Weeds are a major threat to native vegetation in many areas of the NT, including this project area. Weeds can displace native vegetation and reduce species diversity, can be poisonous or unpalatable to stock and native animals, and can alter fire regimes by carrying more frequent, hotter fires. Clearing works, construction and mine rehabilitation all involve soil disturbance that could spread weeds.

Open cut mining operations are not expected to impact on local flora through changes in water availability as the natural groundwater table at both sites is greater than 10 m below the surface. Therefore it is expected that most flora in the area is likely to rely on soil moisture rather than the water table for survival.

Parts of the Princess Louise and North Point mine sites have been previously disturbed and cleared. The rehabilitation proposed for these sites by BOPL would have the objective of improving the current state of the local vegetation leaving the land closer to its pre-disturbance state.

7.3 Mitigation of Impacts

BOPL has developed a draft Flora EMP and draft Weed and Pest EMP (presented in Section 18.3 and 18.5 respectively). The EMPs aim to conserve remnant native vegetation around the mine sites, and control the establishment and spread of weed species. The key inclusions in the EMPs are:

- The installation of temporary fencing and bunding around stands of native vegetation and large trees that are to be retained prior to any site or road works;
- Rehabilitate disturbed areas with local native flora species wherever possible.
- Personnel to use existing roads and avoid off-road driving, to minimise damage to native vegetation;
- Education of personnel, through inductions, on the protection of stands of native vegetation and on measures to prevent the spread of weeds, and on weed identification and reporting; and
- Inspection of operational areas, the general lease area and rehabilitation areas annually by environmental staff for weed infestations, and the implementation of necessary weed control measures when required.

7.4 Commitments

Prior to mining, BOPL commits to the installation of temporary fencing or bunding around stands of native vegetation and large trees that are to be retained prior to any road or site works.

On completion of mining, BOPL commits to rehabilitating disturbed area with local native flora species wherever possible.

During operations, BOPL commits to implementing a procedure requiring all personnel use existing roads and avoid off-road driving, where pratical, to minimise damage to native vegetation.

Prior to and during operations, BOPL commits to educating personnel, through inductions, on the protection of stands of native vegetation, and on measures to prevent the spread of weeds, and weed identification and reporting.

During mining, BOPL commits to the inspection of operational areas, the general lease area and rehabilitation areas annually by environmental staff for weed infestations, and the implementation of necessary weed control measures when required.