Primary Gold Limited

Toms Gully Mine

Biodiversity Report

September 2015

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1. Introduction

1.1 Purpose of this report

The scope of work for the Biodiversity reporting for the Toms Gully site included the following:

- Undertake desktop assessment of potential biodiversity values on the mineral lease
- Provide desktop analysis of likelihood of occurrence and extent of impact with regard to listed, threatened species on the site, based on desktop assessment of vegetation and habitat
- Undertake vegetation mapping including site visit for ground-truthing vegetation types
- Document vegetation condition and weed occurrence on the mine site.

1.2 Scope and limitations

This report: has been prepared by GHD for Primary Gold Limited and *may only be used and relied on by Primary Gold Limited for the purpose agreed between GHD and the Primary Gold Limited as set out Section 1.1 of this report.*

GHD otherwise disclaims responsibility to any person other than Primary Gold Limited arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Primary Gold Limited and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

2. Biophysical Environment

2.1 Bioregional context

The Toms Gully Mine site lies within the Pine Creek bioregion (Figure 1). The Pine Creek bioregion comprises foothill environments below and to the west of the western Arnhem Land sandstone massif. This relatively small bioregion has not been divided into subregions. Its main defining feature is the highly mineraliferous Pine Creek Geosyncline, which hosts a variety of mineral commodities including gold.

Land types of the Pine Creek bioregion are mainly hilly to rugged ridges with undulating plains. The major vegetation types are tall open eucalypt forests typically dominated by Darwin Woollybutt (*Eucalyptus miniata*) and Darwin Stringybark (*E. tetradonta*), and woodlands (dominated by a range of Eucalyptus species); with smaller areas of monsoon rainforest. Listed, threatened fauna species that are known to occur in the bioregion include granivorous birds such as Gouldian finch (*Erythrura gouldiae*), hooded parrot (*Psephotus dissimilis*) and partridge pigeon (*Geophaps smithii*) (DOTE 2008).

There is significant fire activity in the bioregion (particularly in the late dry season) due to large tracts of grazing land that have nil to low levels of pastoral development and consequent minimal firebreaks and control measures. Feral animals (pigs, cattle, horses and buffalo) and weeds (especially mission grass and gamba grass) are widespread (DOTE 2008).

2.2 The Mary River Catchment

The Toms Gully Mine site lies within the Mary River catchment (Figure 1). The headwaters of the Mary River are located near Douglas Springs, approximately 60 km to the east of Pine Creek Township. The river flows generally north-west, until meeting the main tributary, the McKinlay River, 155 km downstream and just 2 km south of the Arnhem Highway crossing.

Geologically, the Mary River catchment is dominated by the mineral rich Pine Creek Geosyncline (Schultz *et al* 2002). More recent volcanic and intrusive events have formed the rugged granite hills of the southernmost part of the catchment. Erosion and weathering of the rugged plateau have produced the foothills of the middle parts of the catchment, including the Toms Gully site.

The Mary River crossing at the Arnhem Highway is a convenient delineation between the upper (southern) catchment and the floodplains of the lower (northern) catchment. The crossing marks the approximate change in patterns of wet season river flow from channel to sheet flow (Schultz et al 2002). The mine site is situated to the geographical north of the Mary River crossing, and thus lies within that (lower) northern catchment

Floodplains associated with the middle and upper catchment, the Pleistocene floodplains, are not flooded for long periods during the wet season and contain sandy and clayey sediments. Further downstream, and north of the Arnhem Highway , the seasonally inundated flood basins (alluvial floodplains) have typically clay soils with some silts and sands, and broad, shallow, largely unchannelled flow during the wet season (Schultz et al 2002).

The Mary River catchment is not considered to be under intensive use, but it does support a wide range of land and water uses including pastoralism (63%), conservation (31%) and defence training (6%). Other land uses include mining, tourism and recreation, wildlife harvesting, commercial fishing and horticulture (Schultz et al 2002). Pervasive land management issues that affect biodiversity values in the Mary River Catchment include feral animals, weeds and inappropriate fire regimes.

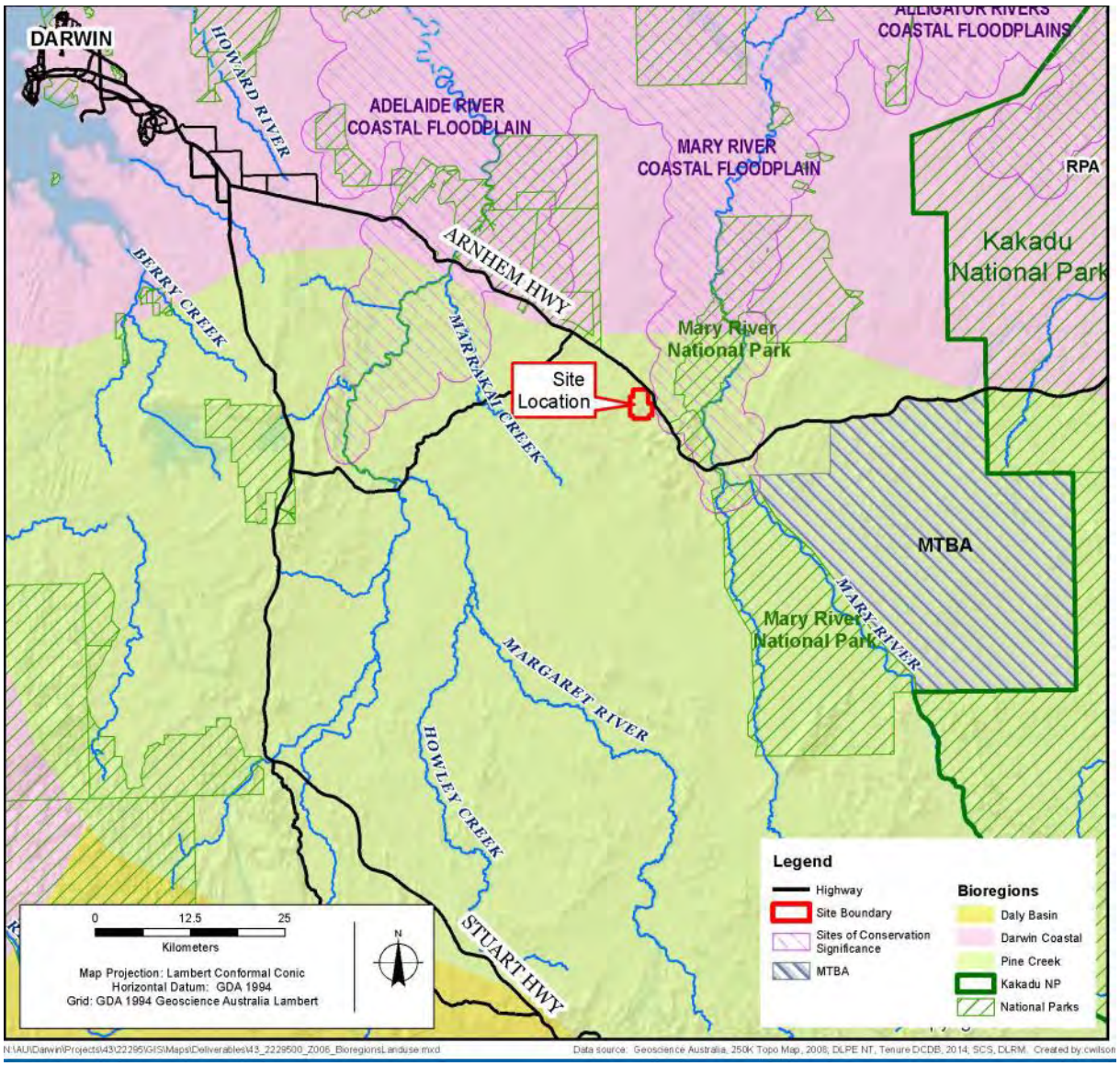


Figure 1 Project Location

2.3 Northern Territory Sites of Conservation Significance

Scientists from the Northern Territory Department of Land Resource Management have identified areas that are recognised as areas of national or international significance for biodiversity conservation. One of these sites, the Mary River Coastal Floodplain site of conservation significance (SOCS) is shown in Figure 1. This SOCS is connected to the mine site via Mt Bundey Creek

Most of the Mary River Coastal Floodplain site lies within the Darwin Coastal bioregion, except in the upper reaches, where the floodplain intersects the Arnhem Highway and the Mt Bundey hills, at which point the SOCS intersects the Pine Creek Bioregion.

The Mary River Coastal Floodplain SOCS extends from south of the junction of the Mary and McKinlay Rivers near the Arnhem Highway in the south, to Point Stuart in the east (including Swim Creek Plain), and Lake Finniss and the Adelaide River floodplain in the west. The SOCS encompasses an area of 1674 km² and is predominantly a seasonally inundated freshwater floodplain. The SOCS shares boundaries with the Adelaide River Coastal Floodplain SOCS to the west and the Alligator Rivers Coastal Floodplains SOCS to the east, and the floodplains of the Adelaide, Mary and Alligator Rivers form one very large interconnected wetland system each wet season (DLRM 2015).

The Mary River Coastal Floodplain SOCS is listed as a wetland of national significance in the Directory of Important Wetlands in Australia (DIWA: NT026 Mary Floodplain system). The floodplain is the most significant and reliable breeding site for the Magpie Goose in the Northern Territory, and numbers exceed 400,000 birds in some years. The floodplain environments also provide a major breeding area for many fish species, notably Barramundi (DLRM 2015).

The Mary River Coastal Floodplain is unusual in the Top End in lacking a single major river channel through the floodplain to the ocean. As a result the floodplain is poorly drained and the inflow channel diffuses into vast seasonal swamps before reaching the sea through a number of tidal channels. Compared to other coastal floodplains in the Northern Territory, this feature results in greater areas of wetland habitats flooded over extended periods and an extremely complex and productive system (DLRM 2015).

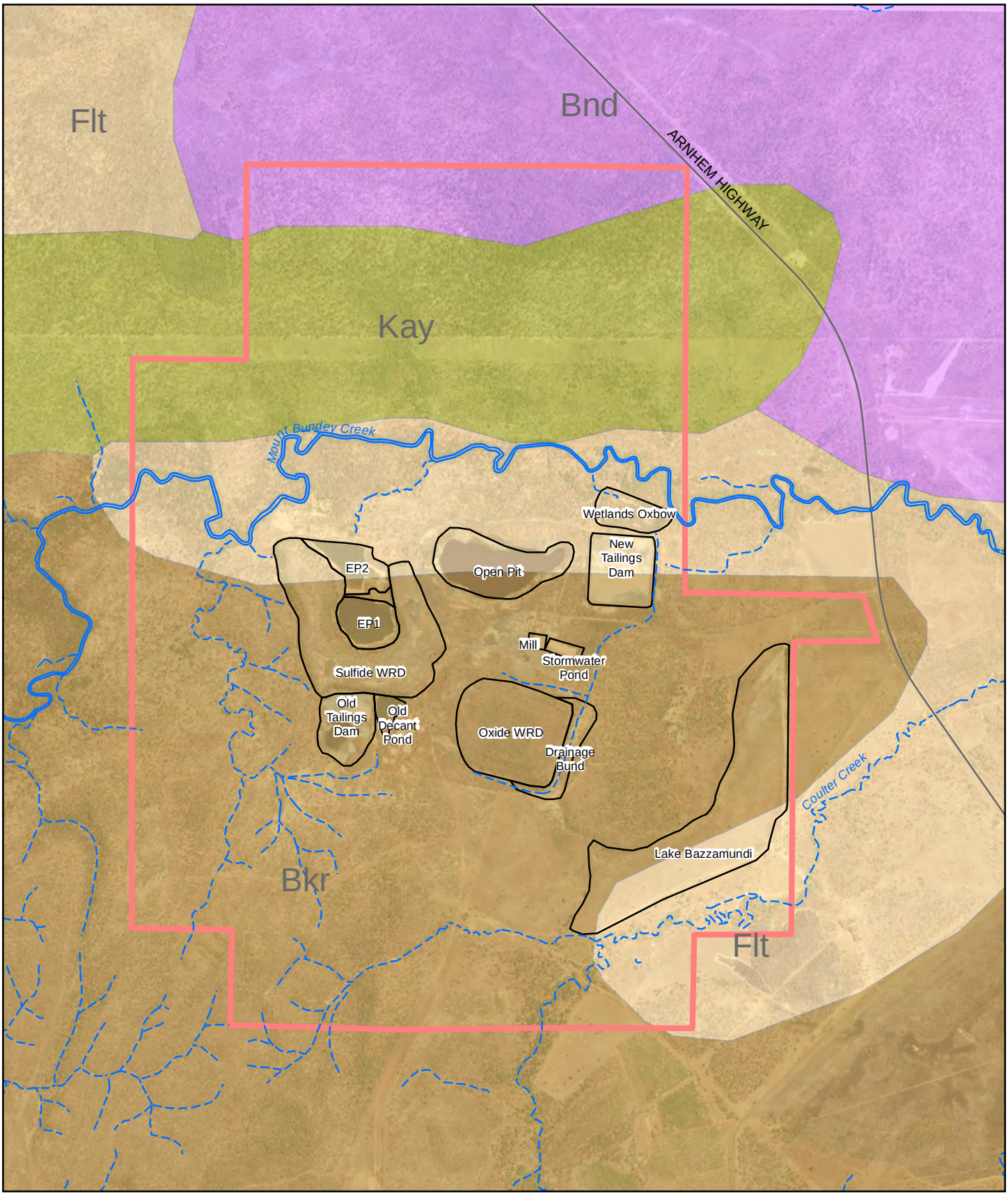
The Mary River floodplain is dominated by a mix of sedge and grass communities and large paperbark forests in the north, and fringed by open eucalypt woodland and pockets of monsoon forest. The Mt Bundey hills and Mount Goyder in the southern part of this SOCS support a distinctive rainforest community containing a number of plant species with restricted distributions in the NT (DLRM 2015).

2.4 Land systems

Land systems in the area of the mine site are depicted in Figure 2 and described in Table 1 below. Land system mapping integrates particular geology, geomorphology, soils and native vegetation patterns across the landscape. The resultant mapping units provide ecological information relating to the particular properties and processes contained within each land system. Land system mapping is one of a number of different layers of information that may be used to characterise ecological characteristics within a site.

Table 1 Land system descriptions

Land System	Landscape Description	Landform and soils description	Soils
Baker (Bkr)	sandstone hills low hills, hills and stony plateaux on sandstone, siltstone, quartzite and conglomerate (deeply weathered in places); outcrop with shallow stony soils	Rugged hills and strike ridges with intervening narrow valleys and short lower slopes on folded Burrell Creek greywacke, sandstone and siltstone	Skeletal soils and outcrop with minor sandy red and yellow gradational soils
Bend (Bnd)	sandstone plains and rises plains, rises and plateaux mostly on sandstone, siltstone, claystone, shale and some limestone; commonly shallow soils with surface stone and rock outcrop	Undulating low strike ridges and rises on folded Burrell Creek greywacke, sandstone and siltstone	Skeletal soils and shallow gravelly loams
Flatwood (Flt)	alluvial floodplains alluvial floodplains, swamps, drainage depressions and alluvial fans; sandy, silty and clay soils on Quaternary alluvium	Alluvial floodplains, swamps, drainage depressions and alluvial fans; sandy, silty and clay soils on Quaternary alluvium	Mottled yellow earths and duplex soils
Kay	Lateritic plains and rises Plains and rises associated with deeply weathered profiles (laterite) including sand sheets and other depositional products	Level to gently undulating plains on deeply weathered rocks	Lateritic red and yellow earths



LEGEND

Mine Site Layout

Site Boundary

LANDSYSTEM

Bkr, Baker

Bnd, Bend

Flt, Flatwood

Kay, Kay

Paper Size A4

0 0.25 0.5 0.75 1

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

N

Primary Gold Limited
Toms Gully

Job Number 43-22295-00
Revision A
Date 22 Apr 2015

Figure 2: Land Systems

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Level 5 66 Smith Street Darwin NT 0800 Australia **T** 61 8 8982 0100 **F** 61 8 8981 1075 **E** drwmail@ghd.com **W** www.ghd.com

Data source: GHD, Site Boundary, 20150326; Geoscience Australia, Landsat Composite, 2004; Google Earth/CNES, Detailed Imagery, 2015. Created by:cawhitehead

2.5 Vegetation

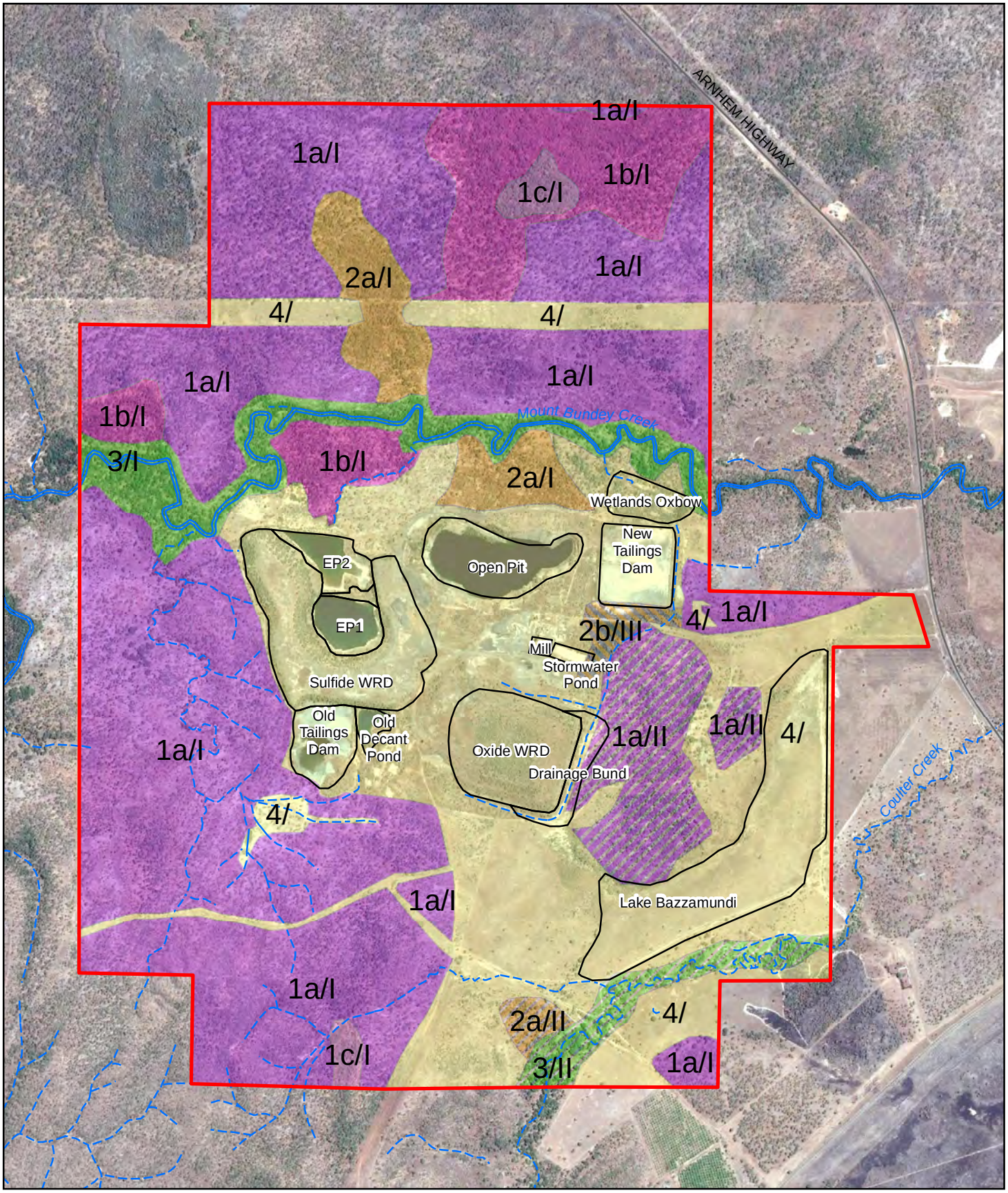
A desktop review of vegetation of the Project area included accessing flora records and distributions from DLRM and Commonwealth ecological databases. Results of the database search provided an overview of vegetation records, and an overview of flora species and communities known or predicted to occur in the Project area. The following databases and literature were reviewed:

- The NT Herbarium (Holtz) Database was used to list flora species that have been previously observed and recorded within a 10 km buffer of the Project area (DLRM 2015).
- The Commonwealth Department of the Environment Protected Matters Search Tool (PMST) was used to identify flora Matters of National Environmental Significance (MNES) listed under the EPBC Act potentially occurring in the locality within a 10 km radius (Department of the Environment 2015).
- Aerial imagery and land system mapping was used to create a preliminary vegetation map based on distinct landscape and vegetation patterns observed within the Project area.

Ground-truthing of preliminary vegetation mapping within the Mineral Lease (ML) was undertaken on 14 April 2015. Field assessment was undertaken to verify vegetation type and condition, and included the collection of the following data at 21 sites across the ML:

- Vegetation type – documentation of vegetation structure and taxonomic composition
- Vegetation extent – mapping the extent of each vegetation type
- Vegetation condition – degree of vegetation change or modification

Figure 3 depicts native vegetation mapping (type and condition) at the Toms Gully site. Information presented below describes the different vegetation types and Section 2.5.1 describes vegetation condition.



LEGEND

Mine Site Layout

Site Boundary

Vegetation type/condition

1a, I | 1b, I | 2a, I | 3, I | 4,

1a, II | 1c, I | 2a, II | 3, II

2b, III

Paper Size A4

0 0.2 0.4 0.6 0.8

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

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Primary Gold Limited
Toms Gully

Job Number 43-22295-00
Revision A
Date 22 Apr 2015

Figure 3: Vegetation

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Level 5 66 Smith Street Darwin NT 0800 Australia T 61 8 8982 0100 F 61 8 8981 1075 E drwmail@ghd.com W www.ghd.com

Data source: GHD, Site Boundary, 20150326; Geoscience Australia, Landsat Composite, 2004; Google Earth/CNES, Detailed Imagery, 2015; DLRM, NVIS 2005. Created by:cawhitehead

Vegetation map unit characterisation

The National Vegetation Information System (NVIS) (Executive Steering Committee for Australian Vegetation Information 2003) was used for the classification of typical vegetation types at Toms Gully. The NVIS provides a systematic way to describe vegetation communities at six hierarchical levels depending on the floristic and structural information available. The vegetation map units were developed at NVIS level 3.

Vegetation Type 1: Darwin Stringybark (Eucalyptus tetrodonta), Darwin Woollybutt (E. miniata) and Ironwood (Erythrophleum chlorostachys) open woodland to open forest

This map unit largely comprises the native Eucalypt woodlands occurring at Toms Gully. It can be subdivided into the following map units, according to the density of the vegetation community and species dominance:

- 1a Darwin Stringybark (*Eucalyptus tetrodonta*), Darwin Woollybutt (*E. miniata*) and Ironwood (*Erythrophleum chlorostachys*) open woodland
- 1b Darwin Stringybark (*Eucalyptus tetrodonta*), Darwin Woollybutt (*E. miniata*) and Ironwood (*Erythrophleum chlorostachys*) woodland
- 1c Ironwood (*Erythrophleum chlorostachys*) open forest

The dominant plant species are characteristically *Eucalyptus tetrodonta* (Darwin Stringybark) and *E. miniata* (Darwin Woollybutt) either singly or in co-dominant stands with *Erythrophleum chlorostachys* (Ironwood) as subdominant species. Other frequently occurring species in the upper-storey are *Terminalia ferdinandiana* (Kakadu Plum) and, on hill sides, *Corymbia dichromophloia* (Small-fruited Bloodwood).

Livistona humilis (Sand Palm), *Terminalia ferdinandiana* (Kakadu Plum)*, Gardenia megasperma* and *Acacia* species are present in the sparse mid-storey, while the under-storey is typically a grassland with *Sorghum intrans* (Annual Sorghum), *Hibiscus* species, and in some areas the declared weed *[1]*Andropogon gayanus* (Gamba Grass). An example of this map unit is shown in Figure 4.

[1] all non-native species are marked with*.

Figure 4 Example of map unit 1 - Darwin Stringybark (*Eucalyptus tetrodonta*), Darwin Woollybutt (*E. miniata*) and Ironwood (*Erythrophleum chlorostachys*) open woodland to open forest

Vegetation type 2: Paperbark (Melaleuca spp.) woodland to open forest

This map unit comprises the paperbark vegetation communities occurring at Toms Gully. Map unit 2 occurs on the floodplains of Mt Bundey Creek and Coulter Creek. It is subdivided according to the vegetation community densities into:

- 2a Paperbark (*Melaleuca* spp.) woodland
- 2b Paperbark (*Melaleuca* spp.) open forest

The upper-storey is characterised by the dominance of *Melaleuca* species, with *M. viridiflora* (Broad-leaved Paperbark) most frequently present. Other canopy species include *Acacia auriculiformis* (Black Wattle), *Lophostemon lactifluus*, *Eucalyptus australasica* (White Gum) and *Eucalyptus polycarpa* (Long-fruited Bloodwood) with *Pandanus spiralis* occurring in the mid-storey. An example of this map unit is shown in Figure 5.

Figure 5 Example of map unit 2 – Paperbark (Melaleuca spp.) woodland to open forest

Vegetation type 3: Riparian forest corridor

This map unit occurs in the immediate vicinity of Mt Bundey Creek and Coulter Creek. Plant species composition varies along the creek, but generally includes species indicative of high soil moisture levels. *Bambusa arnhemica* (Bamboo) was the most common species. Other species included *Acacia auriculiformis* (Black Wattle), *Melaleuca leucadendra* (Weeping Paperbark), *Syzygium armstrongii* and *Barringtonia acutangula* (Freshwater Mangrove). An example of this map unit is shown in Figure 6.

Figure 6 Example of map unit 3 – Riparian forest corridor

Vegetation type 4: Cleared areas

This map unit comprises previously disturbed, cleared or constructed areas for mining and mining related activities within Toms Gully. The map unit consists of bare ground or various degrees of regrowth ranging from grasslands, grasslands with isolated trees/shrubs, open to closed shrublands and open woodlands. Typical plant species encountered in this map unit are *Acacia holosericea* (Silver-leaved Wattle), *Acacia auriculiformis* (Black Wattle) and *Petalostigma pubescens* (Quinine Bush). In the understorey, colonising species include: **Andropogon gayanus* (Gamba Grass), *Sorghum intrans* (Annual Sorghum) and **Melinis repens* **(**Red Natal Grass). An example of predominantly native regrowth within this map unit is shown in Figure 7.

Figure 7 Example of map unit 4 - cleared area with native woody regrowth

2.5.1 Vegetation condition assessment

Vegetation condition assessment utilised the VAST (Vegetation Assets, States and Transitions) classification framework (Thackway & Lesslie 2005). Vegetation condition is classified into one of seven condition classes. The VAST framework (Thackway & Lesslie 2005) was applied to assess the condition of terrestrial vegetation in the survey area. The VAST classification orders vegetation by degree of modification and as a series of states from residual or baseline condition through to total removal, taking into account vegetation cover, structure, composition and regenerative capacity. Additional categories were developed to accommodate a) healthy regrowth of native grasses, shrubs and trees after disturbance; and b) the invasion of intact native woodlands by aggressive weeds (e.g. Gamba Grass).

The condition of the vegetation communities 1-3 within the Toms Gully mine site area included:

- 'I Residual', for the largely undisturbed native Eucalypt woodlands north of Mt Bundey Creek (see Figure 4)
- 'II Modified', for the native Eucalypt and Paperbark woodlands impacted by grazing in the south-east of Toms Gully (see Figure 8)
- 'IIb Modified regeneration tolerates/endures', for native Eucalypt woodlands invaded by Gamba Grass in the east of Toms Gully (Figure 9)
- 'III Transformed', for a grazed grassland with isolated trees near the entrance (Figure 10)
- 'IIIa Transformed – native woody regrowth' for cleared areas e.g. north of Mt Bundey Creek with native woody regrowth

The condition of the vegetation type 4 within the previous mining operational area varied from IIIa to VI

- 'IV Replaced – adventive' for cleared areas with Gamba Grass regrowth (Figure 11)
- 'V Replaced – managed' for the constructed wetland filter
- 'VI Removed – bare ground' such as roads and infrastructure

Native vegetation type and condition is mapped for the Toms Gully Mine site in Figure 3 above.

Figure 8 'II Modified' - native Eucalypt and Paperbark woodlands impacted by grazing

Figure 9 'IIb Modified regeneration tolerates/endures' - native Eucalypt woodlands invaded by Gamba

Figure 10 'III Transformed' - grassland with isolated trees under grazing near the entrance

Figure 11 'IV Replaced adventive' - cleared area with Gamba Grass regrowth (grazed)

2.5.2 Weeds

Weeds were sighted predominantly in areas highly disturbed by mining activities, and additionally in grazed areas adjacent to the mine site. Four weed species were recorded during the vegetation mapping survey in April 2015, and annual weed mapping by Primary Gold has documented seven weed species (Table 2 below).

One of the species recorded is listed under Schedule 2 of the Weed Management Act as Class A noxious weeds and three species are listed under Schedule 3 of the Weed Management Act as Class B noxious weeds.

Gamba grass is also listed as a Weed of National Significance (WONS).

Table 2 Weed species recorded in the Project area

Family	Scientific name	Common name	Control class
Poaceae	*Andropogon gayanus*	Gamba Grass	Class A/WONS
Poaceae	*Melinis repens*	Red Natal grass	
Passifloraceae	*Passiflora foetida*	Bush Passionfruit	
Lamiaceae	*Hyptis suaveolens*	Hyptis	Class B
Malvaceae	*Sida cordifolia*	Flannel Weed	Class B
Fabaceae	*Senna obtusifolia*	Sicklepod	Class B
Fabaceae	*Calopogonium mucunoides*	Calopo	

2.6 Desktop assessment of listed threatened or migratory species

A desktop assessment was undertaken of the surrounding environment within a ten kilometre buffer of the mine site. A desktop review of background information and data included:

- The NT flora and fauna atlas was used to list species that have been previously observed and recorded within a 10 km buffer of the Project area (DLRM 2015).
- The Commonwealth Department of the Environment Protected Matters Search Tool (PMST) was used to identify flora and fauna Matters of National Environmental Significance (MNES) listed under the EPBC Act potentially occurring in the locality within a 10 km radius (Department of the Environment 2015).

The PMST only considers flora and fauna species listed in one or more provisions of the EPBC Act, and is based on the predicted distributions of flora and fauna species and/or their habitat, rather than known records. The DLRM database contains known flora and fauna species records.

The PMST and DLRM database results, accessed in March 2015, identified 3 threatened flora species and 28 threatened or Migratory fauna species predicted or known to occur in the study area including a 10 km buffer (threatened under either or both of the EPBC and TPWC Acts). The list of fauna includes 8 mammals, 15 birds, 4 reptiles, and 1 fish. Eleven of the bird species are listed as migratory species (under the EPBC Act). No threatened ecological communities occur on or within a 10km buffer of the mine site.

The likelihood of occurrence of threatened and migratory species within a 10 kilometre buffer of the mine site was assessed based on desktop searches and literature review. Spatial data including vegetation, soils and landform data, and aerial imagery, sourced from the NT Department of Land Resource Management (DLRM) was interrogated to determine the likely presence or absence of threatened or Migratory species' habitat within or adjacent to the mine site. This information was cross referenced against literature relating to the habitat requirements of the species, and DLRM fauna species records from the study area, to determine whether the species' habitat is present or likely to be present. This information is presented in Table 3 below, and includes the following findings:

- Of the 3 threatened flora species, none is expected to occur at the mine site.
- Of the five threatened mammals determined as possibly occurring on or within the 10 km buffer of the mine site, only the Northern Quoll, Black-footed Tree Rat and Pale Field Rat have been sighted or recorded in recent times (i.e. within the last 25 years).
- Two listed threatened bird species have been determined as possibly occurring within the mine site, and both of these, the Gouldian Finch and the Partridge Pigeon, are listed as Vulnerable under EPBC and TPWC.
- Three reptile species, all listed as Vulnerable under TPWC. have been determined as possibly occurring within the mine site. Another species (Saltwater Crocodile) listed as Migratory under EPBC, is also determined as possibly occurring within the mine site.
- No threatened fish species are considered likely to occur within the mine site.

Of the 11 Migratory bird species that were predicted to occur, only the Gouldian Finch has been determined as possibly occurring within the mine site. Migratory species have a preference for wetland habitats but are likely to use multiple habitat areas.

2.6.1 Threatened species that are known to, or may, occur within the mineral lease

Key to Table 3:

EPBC	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
TPWC	*Territory Parks and Wildlife Conservation Act 2006*
DLRM	The Department of Land Resource Management (DLRM) flora and fauna records database
PMST	Information sourced from the EPBC Protected Matters Search Tool
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
NT	Near Threatened
DD	Data Deficient

Likelihood of occurrence of rare/threatened species is assessed on a 3-tier scale:

- Possible – suitable habitat occurs within the study area and species recorded historically within 10 km of the mine site
- Unlikely – suitable habitat unlikely to occur within the study area, or suitable habitat substantially modified, or suitable habitat present but species not recorded within 10 km for over 50 years
- Highly unlikely – no suitable habitat present within the study area and individuals not recorded within 10 km of the study area

Table 3 Threatened species that are known or may occur within the mine site, including a 10 km buffer

Species	Source	Conservation Status		Habitat and Resource Preference	Likelihood
		EPBC Act	TPWC Act		
Mammals					
Brush-tailed Rabbit-rat (*Conilurus penicillatus*)	PMST	VU	EN	Restricted to mixed eucalypt open forest and woodland, or on dunes with Casuarina, seeming to prefer habitats that are not burnt annually, that have an understorey of predominantly perennial grasses and a sparse-to-moderate middle storey.	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site.
Northern Quoll (*Dasyurus hallucatus*)	PMST / DLRM	EN	CR	Habitat comprises rocky areas and tall open coastal eucalypt forests. Prime habitat in these northern regions is sandstone escarpment. Habitat includes open forest and woodlands on plains dominated by *Eucalyptus tetrodonta*, *E. miniata* and *E.tectifica* open woodland on low rocky hills dominated by *E. setosa* and *E.bleeseri* and riparian areas with flowing water dominated by *Melaleuca viridiflora* and *Pandanus spiralis*. Sometimes occurs around human dwellings and campgrounds.	Possible Suitable habitat within the mine site. There are numerous records within 10 km of the mine site with the most recent record being in 2009 (DLRM 2015).
Northern Brush-tailed Phascogale (*Phascogale pirata*)	PMST	VU	EN	Most records from tall open forests dominated by *Eucalyptus miniata* (Darwin woollybutt) and *E. tetradonta* (Darwin stringybark).	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site

Bare-rumped Sheathtail Bat (*Saccolaimus saccolaimus nudicluniatus*)	PMST	CR	NT	Only anecdotal information is available based on habitat around roosts or from shot specimens. Kakadu National Park specimens collected have been from open pandanus woodland fringing the sedgelands of the South Alligator River. May forage over habitat edges such as the edge of rainforest and in forest clearings.	Possible Possible roosting and foraging habitat in Pandanus woodland present within the mine site but there are no records within 10 km of the mine site. Known only from Kakadu NP in NT
Water Mouse (*Xeromys myoides*)	PMST	VU	DD	Habitat includes mangroves and the associated saltmarsh, sedgelands, clay pans, heathlands and freshwater wetlands. Utilises both intertidal and freshwater habitats.	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site.
Black-footed Tree-rat (*Mesembriomys gouldii*)	DLRM	-	VU	Found in the Top End of the Northern Territory in tropical woodlands and open forests in coastal areas.	Possible Habitat likely to be present within the mine site and there are two records within 10 km of the mine site from 1999 (DLRM 2015).
Fawn Antechinus (*Antechinus bellus*)	DLRM	-	EN	Occurs in savannah woodland and tall open forest of the Top End of the Northern Territory.	Possible Suitable habitat within the mine site. There is one record within 5km of the mine site from 1989 (DLRM 2015).
Pale Field-rat (*Rattus tunneyi*)	DLRM	-	VU	Occurs in dense vegetation along creeks.	Possible Suitable habitat along dense vegetation along creeks may be

					present within mine site. There are numerous records within 10 km of the mine site (DLRM 2015).
Birds					
Yellow Chat (Alligator Rivers) (*Epthianura crocea tunneyi*)	PMST	EN	EN	Occurs around channels and depressions on seasonally inundated floodplains. In the dry season, it has been observed in areas of exposed mud or clay with or without a sparse (up to 50 %) cover of grasses, sedges and forbs, such as *Hymenachne acutigluma*, *Ludwigia adscendens*, *Ipomoea aquatica*, *Sesbania sesban* and species of Cyperus and Eleocharis. Habitat preferences in the wet season are less well known, but all of the few records of nesting from Kakadu National Park have been in low mangroves on the margins of tidal channels.	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site.
Red Goshawk (*Erythrotriorchis radiatus*)	PMST	VU	VU	Prefers tall open forest and woodland, or tall fringing woodlands along rivers in grasslands, shrub-lands, and low open woodlands. Also occurs in coastal and sub-coastal areas in wooded and forested lands of tropical and warm-temperate Australia or riverine forests. Nests in large trees, frequently the tallest and most massive in a tall stand, and nest trees are invariably within one kilometre of permanent water.	Unlikely Possible roosting and foraging habitat in Pandanus woodland may be present within the mine site but there are no records within 10 km of the mine site.
Gouldian Finch	PMST /	EN	VU	Inhabits open woodlands that are dominated by Eucalyptus trees and support a ground cover of Sorghum	Possible

(*Erythrura gouldiae*)	DLRM			and other grasses. Critical components of suitable core habitat appear to be the presence of favoured annual and perennial grasses (especially Sorghum), a nearby source of surface water and, in the breeding season, unburnt hollow-bearing Eucalyptus trees (especially *E. tintinnans*, *E. brevifolia* and *E. leucophloia*). Breeding habitat confined to ridges and rocky foothills.	Suitable foraging habitat present within study area. There are numerous records within 10 km study area, as recent as 2010 (DLRM 2015).
Partridge Pigeon (eastern) (*Geophaps smithii smithii*)	PMST / DLRM	VU	VU	Occurs in open forest and woodland dominated by Darwin Stringybark *Eucalyptus tetrodonta* and Darwin Woollybutt *E. miniata* that has a structurally diverse understorey. Nests on the ground, usually where there is plenty of vegetation cover. Forage where the ground layer is open, or on bare ground in recently burnt areas.	Possible Suitable habitat within the mine site. There are records within 10 km of mine site, but not since 1990 (DLRM 2015).
Australian Painted Snipe (*Rostratula australis*)	PMST	EN	VU	Inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Also use inundated or waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains.	Highly unlikely Suitable habitat not present within mine site and there are no records of the species within 10 km of the mine site.
Masked Owl (northern) (*Tyto novaehollandiae kimberli*)	PMST	VU	VU	Inhabits riparian forest, rainforest, open forest, Melaleuca swamps and the edges of mangroves.	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site.

Reptiles					
Floodplain Monitor (*Varanus panoptes*)	DLRM	-	VU	Occupies a variety of habitats, including coastal beaches, floodplains, grasslands and woodlands.	Possible Suitable habitat within the mine site. There are records within 10 km of the mine site, though not since 2002 (DLRM 2015).
Mertens' Water Monitor (*Varanus mertensi*)	DLRM	-	VU	Inhabits margins of watercourses, swamps and lagoons in Northern Australia. Has a broad geographic range, occupying coastal and inland waters across the far north of Australia.	Possible Suitable habitat within the mine site. There are records within 10 km of the mine site, as recent as 2011 (DLRM 2015).
Mitchell's Water Monitor (*Varanus mitchelli*)	DLRM	-	VU	Inhabits margins of watercourses, swamps and lagoons in Northern Australia. Has a broad geographic range, occupying coastal and inland waters across the far north of Australia.	Possible Suitable habitat within the mine site. There is one record within 10 km of the mine site, though not since 1989 (DLRM 2015).
Fish					
Freshwater Sawfish (*Pristis pristis*)	PMST	VU	VU	Occur in rivers and estuaries, while large mature animals tend to occur more often in coastal and offshore waters up to 25m depth.	Unlikely Suitable habitat within the mine site but there are no records within 10 km of the mine site.

Plants					
Goodenia quadrifida	PMST / DLRM	VU	DD	Occurs on the upper parts of estuarine floodplains, on poorly drained grey clays or silty soils. There is one record from 1967 approximately 5 km from the mine site.	Unlikely There is one record from 1967 within 10 km of the mine site (DLRM 2015).
Helicteres macrothrix	PMST / DLRM	EN	EN	Recorded from three populations: near Mt Bundey, Batchelor/Glenluckie Creek and Lake Bennett. There is a high degree of confidence that the species is restricted to its current general area. This species was recorded in 2011 south-west of the mine site, this is the Mt Bundey population. It is highly unlikely that this species occurs within the mine site.	Highly unlikely There are records within 10km of the mine site but there is a high degree of confidence that the species is restricted to its current known populations.
Schoutenia ovata	DLRM	-	EN	This species occurs in Thailand, Indochina and Java. In Australia, it is known only from the NT. In the NT, it occurs in three disjunct subpopulations, two in the Mt Bundey-Mt Goyder area and near Tipperary Station. This species has been collected from monsoon vine thicket on granite and limestone outcrops. The Mt Bundey subpopulation mostly occurs on south facing slopes.	Highly unlikely There are records within 10km of the mine site as recent as 2011 (DLRM 2015). There is a high degree of confidence that the species is restricted to its current known populations.

2.7 Impact assessment

Existing mine infrastructure comprises an open pit and underground mine, access roads, 22 kV power reticulation, processing facility, two waste-rock dumps (WRDs), two tailings storage facilities (TSFs), two evaporation dams, drains and sumps, maintenance shed and lay-down yard, stores shed and yards and administration offices.

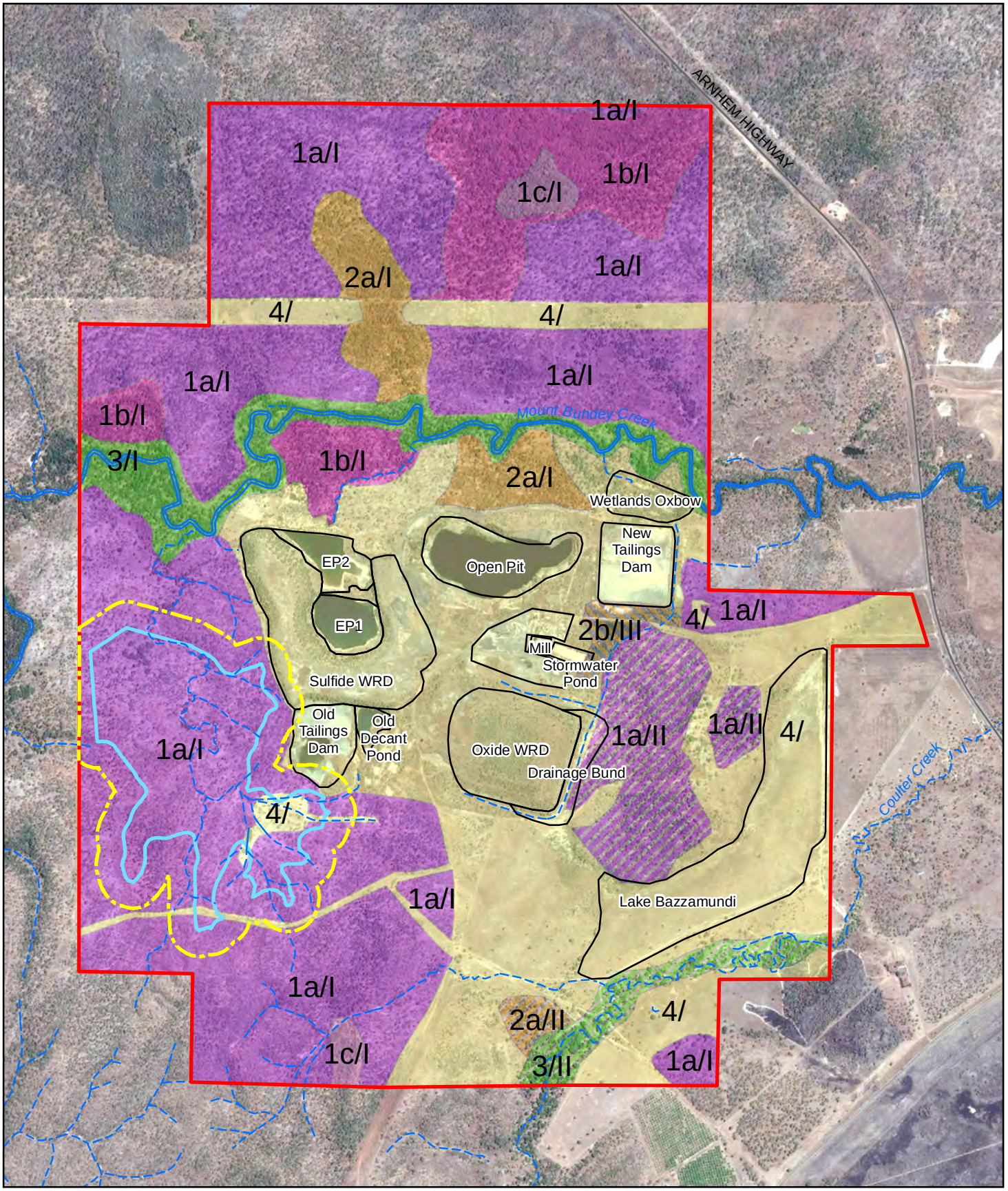
Primary Gold Ltd (PG) acquired the existing mine site in 2013 and is proposing to develop a new underground mining phase at Toms Gully (Toms Gully Underground (TGU)). The proposed Toms Gully Underground (Project) comprises the following works:

- Mining underground to the south of the existing underground workings;
- Extraction of up to 350,000 tonnes per annum (tpa) of ore over three to four years;
- Removal of approximately 720,000 tpa of waste rock, replaced underground or in the base of the existing pit (no external storage of waste rock);
- Conventional Carbon in Leach gold processing plant and ancillaries renovated and re-used;
- Storage of approximately 830,000 t of tailings in a raised TSF;
- New 2.6 GL freshwater dam;
- Treatment of pit water, then storage in new dam to facilitate mine dewatering; and
- Clearing of approximately 53.2 ha of native vegetation for the freshwater dam.

Of the clearing area for the freshwater dam, 49.7 ha is comprised of vegetation type 1 (condition I) and 3.5 ha of vegetation type 4 (Figure 12).

The freshwater dam is proposed to be constructed as part of the Project to store treated water generated from dewatering of the pit during the dry season. Water from this will be discharged to Mt Bundey Creek during the wet season when there is sufficient dilution capacity available.

A desktop risk assessment for the project was undertaken to identify potential impacts arising from construction and operation of the project on flora and fauna, including listed species. The results of that risk assessment are summarised below in Table 4.



LEGEND

- Roads
- Mine Site Layout
- Site Boundary
- Water Supply Dam
- Water Supply Dam - 100m Buffer

Vegetation type/condition

- 1a, I
- 1a, II
- 1b, I
- 1c, I
- 2a, I
- 2a, II
- 2b, III
- 3, I
- 3, II
- 4,

Paper Size A4

0 200 400 600 800

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 52

N

Primary Gold Limited
Toms Gully

Job Number 43-22295-00
Revision A
Date 04 Sep 2015

Figure 12: Vegetation

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Data source: GHD, Site Boundary, 20150326; Geoscience Australia, Landsat Composite, 2004; Google Earth/CNES, Detailed Imagery, 2015; DLRM, NVIS 2005. Created by:cmacgregor

Table 4 Potential impacts to listed threatened species and other biodiversity values

Function / Department	Hazard description	Impact description	Current Risk	Mitigation & Monitoring	Residual Risk	Comments
Weeds	construction and operational activities on the mineral lease(incl. vegetation clearing) result in Introduction of new weeds and spread of existing weeds into new areas	Decline in habitat quality in areas currently not impacted by weeds Impact on native vegetation. Increased risk of hot fire	High	Annual weed mapping (by June each year) to understand nature of the spread of weeds and plan weed control activities Conduct seasonal weed control activities in consultation with local landholder as necessary and in accordance with the site Weed Action Plan (grazing control as option)	Moderate	Existing weed issues will be exacerbated to some extent by construction and mining activities, however existing weed issues are not insignificant Weeds pose a risk to native vegetation and fauna because they alter habitat conditions and exacerbate fire impacts – fire impacts have the potential to spread localised weed impacts into off site areas
Listed threatened species	Cumulative impacts of clearing, dust, noise, artificial light associated with construction and/or operation of the mine site	disrupt lifecycle processes and or impact on the size of the population	High	dust mitigation, minimise use of artificial lights, implement noise controls	Moderate	Impacts on listed threatened species could include impacts on any of the following: Northern Quoll, Black-footed Tree Rat and Pale Field Rat, Fawn Antechinus, Sheathtail Bat Gouldian Finch, Partridge pigeon Floodplain Monitor, Mertens' &Mitchell's water monitors.

Function / Department	Hazard description	Impact description	Current Risk	Mitigation & Monitoring	Residual Risk	Comments
						Dust and noise impacts during operation have not been quantified however are likely to be localised. Dust and noise likely to be localised and short term during the clearing of vegetation for the construction of freshwater dam.
Listed threatened species	Poor water quality released from site during extreme weather (i.e. wet season)	habitat modification and/or lifecycle disruption and/or impact on the size of a population Decrease in fish populations and species richness	Extreme	Compliance with the Waste Discharge Licence Site water management plan dam design (to ANCOLD guidelines) water quality Monitoring program including annual sediment and macroinvertebrate monitoring	High	Localised Impacts on listed threatened species could include impacts on any of the following species: Floodplain Monitor, Mertens' water monitor & Mitchell's water monitors Widespread , off site impacts on aquatic fauna , including the above listed threatened species could occur Proactive management of water storages, and adequate understanding of water quality and

Function / Department	Hazard description	Impact description	Current Risk	Mitigation & Monitoring	Residual Risk	Comments
						compliance with the conditions of WDL will reduce the risk to some extent
listed threatened species	vegetation clearing for water supply dam	Fragmentation of a population and/or habitat modification and/or lifecycle disruption and/or impact on the size of a population	Moderate	Adhere to buffer widths recommended by the Northern Territory Land Clearing Guidelines with regard to riparian vegetation in drainage lines Avoid land clearing during the Wet Season (Dec-May) Clearly mark limits of clearing Have a trained fauna spotter on site during clearing operations	Moderate	Impacts on listed threatened species could include impacts on any of the following: Northern Quoll, Black-footed Tree Rat and Pale Field Rat, Fawn Antechinus, Gouldian Finch, Partridge pigeon Floodplain Monitor
Groundwater	Groundwater drawdown	Impact to any groundwater dependent ecosystems including aquatic ecosystems that are dependent on groundwater to provide dry season refugia Impact to local water users	Moderate	Hydrogeological assessment Water management planning	Moderate	The level of certainty around this potential impact is low in the absence of groundwater drawdown modelling, and in absence of dry season aquatic ecosystem characterisation

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