



SANDFIRE RESOURCES NL

**Mine (Exploration Operations) Management
Plan Amendment September 2016
Authorisation 0234-04 Version 4
Sandfire Resources NL
Borrooloola Project NT**

Date: 7 September 2016

Distribution:

Department of Mines and Energy	
Mining Environmental Compliance	1
Sandfire Resources NL	1
AMETS	1
DME File:	M2010/0218
DME Doc Ref:	MDOC2016/03980
RDM Document:	SAN00254448

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Section	Amendment
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2.0 Project Details	2.0 Project Name and Location 2.1 Tenements –advise JV Pacifico and MMG Authorisations; advise titles changes in Authorisation 0234-04V4 Amendment 2.2 History of Exploration - Activities and Current Status updated 2.3 Proposed Activities – updated for 2016-17
3.0 Project Site Conditions	3.0 Project Site 3.1 Land Area Type 3.2 Hydrology 3.3 Flora and Fauna 3.4 Current Land Use 3.5 Identified Stakeholders – see Section 4.4 – updated for 2016-17 3.5 Historical Aboriginal Heritage Sites – updated for 2016-17
4.0 Environment Management	4.0 Environmental Management Plan – updated for 2016-17 4.1 Environmental Policy And Responsibilities – updated for 2016-17 4.2 Statutory Requirements – updated for 2016-17 4.3 Non-Statutory Requirements – updated for 2016-17 4.4 Identified Stakeholders And Consultation – updated for 2016-17 4.5 Induction And Training – updated for 2016-17 4.6 Identification Of Environmental Aspects And Impacts – updated for 2016-17 4.7 Emergency Procedures And Incident Reporting – updated for 2016-17 4.8 Environmental Audits And Inspections – updated for 2016-17 4.9 Environmental Performance Reporting – updated for 2016-17
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1.0 OPERATOR DETAILS

1.0 Operator

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1.1 Organisational Structure Chart

Details of the Company Board Governance are included on the Sandfire website:

www.sandfire.com.au.

The Borroloola Project operations fall within the Exploration and Business Development Group, as shown on the Organisational Chart in Appendix 1 (1.1 SFR Exploration & Business Development Organisational Chart September 2016 (SAN00274772).pdf.

1.2 Workforce

There were no exploration field operations for the Borroloola Project during either 2015 or 2016. Field operations during the northern dry field season were based at the Eloise Mine, south-east of Cloncurry, Queensland. For these operations, the Sandfire personnel on site, and contractors, operate on a Fly In – Fly Out roster.

For exploration drilling between 2004 and 2013 the diamond core has been stored in metal and plastic trays on 110 pallets in the Howard Springs yard. During 2015, this was sorted to offer to the DME Darwin Core Facility. This work was carried out by the workforce indicated in Table 3.

Table 2: Exploration Workforce

Workforce	Employee or Contractor	No	Base
One Geologist	Employee	1	West Perth
One Field Supervisor & One Assistant	Employees	2	Howard Springs, NT
Two Administration Officers	Employee	2	West Perth

2.0 PROJECT DETAILS

2.0 Project Name and Location

The Borroloola Project is centred about 660 km southeast of Darwin in the “Gulf Country” of the Northern Territory, Australia. On the eastern boundary are the township of Borroloola, the McArthur River (HYC) Mine and its loading facility at Bing Bong on the Gulf of Carpentaria. To the south is Cape Crawford and to the north are Nathan River and Lorella Springs Stations (Figure 1).

Access to the Project area is good with sealed roads from Darwin, by travelling about 590 km southwards along the Stuart Highway to Hi-Way Inn and then 270km eastwards along Carpentaria Highway to Cape Crawford. The unsealed Cape Crawford - Nathan River – Roper Bar Road runs south-north across the project area, and then continues west along the Roper Highway to meet the Stuart Highway near Mataranka, providing an alternate access route during the dry season. The unsealed Ryan’s Bend Road crosses the southern part of the Project from west to east.

The Cape Crawford - Nathan River – Roper Bar Road also provides access to Lorella Springs. During 2010, the road into Lorella Springs was substantially upgraded resulting in improved access to the central parts of the Project area. However access deteriorates significantly in the central and northern parts of the Project area where multiple creek crossings need to be navigated. Each wet season results in substantial damage to most creek crossings which need to be re-established.



Figure 1: Borrooloola Project Location



2.1 Tenements (Mining Interests – Titles)

The Borroloola Project comprises a total area of approximately 9,659 square kilometres of twenty-eight granted Exploration Licences, one Mining Lease and three Exploration Licence under application in the Northern Territory. The Limmen National Park, which was declared a National Park on 17 July 2012; overlays approximately 50% of the area of the Borroloola Project and impacts on twenty of the tenements, as shown on Figure 2.

The Borroloola Project, with the exception of EL26555, was farmed-out with two Joint Venture (JV) partners during 2013. The agreements were executed with these companies:

- MMG Ltd North Batten Option & Joint Venture Agreement (MMG) – Executed 29 May 2013, and
- West Rock Resources Ltd Borroloola West Farm-in Agreement (WRR) – Executed 1 July 2013. Pacifico Minerals Ltd (Pacifico), a public company listed on the Australian Stock Exchange (ASX: PMY), acquired 100% of West Rock Resources Ltd on 19 August 2013. During July 2016 EL24401, EL26837 and EL26857 were withdrawn from the JV.

The tenements of interest to MMG, Pacifico and Sandfire are indicated in Table 4 as shown on Figure 2. For exploration operations by Pacifico and MMG, the tenements of interest to each party are covered by separate Mine (Exploration Operations) Management Plan Authorisations:

- MMG North Batten Project MMP Authorisation 0814-01: – accepted 21 July 2016, and
- Pacifico Borroloola West MMP Authorisation 0758-01 – accepted 29 August 2016.

Sandfire Mine (Exploration Operations) Management Plan (MMP) for Borroloola Project Authorisation 0234-04 Variation 3 was submitted on 7 September 2015..

Sandfire MMP Authorisation 0234-04 'AF7-007 Application for an Authorisation Form' Amendment, and the corresponding 'AF7-008 Nomination of an Operator Form' were submitted by hand to the DME as executed original documents on two occasions: on 6 November 2015 for 27 granted Exploration Licences and one Mining Lease titles, and, following the approval of EL30098 on 12 November 2015, on 22 January 2016 over 29 granted titles. After a further request from the DME Mining Compliance Branch on 27 May 2016 for clarification of the rehabilitation status for surrendered titles EL25591, EL26909, EL26953, Sandfire confirmed on 15 June 2016 that there had been no field exploration activities undertaken, and hence no outstanding rehabilitation works remaining on the titles.

Sandfire Mine (Exploration Operations) Management Plan (MMP) for the Borroloola Project was accepted as Authorisation 0234-04 Variation 4 on 22 June 2016.



Table 3: Borroloola Project MMP Authorisations and Tenements Schedule 2015

Tenement	Area ha Blocks	Granted	Yr	NT Status	JV Status	MMP JV Authorisation	Status as at 7 September 2016
Borroloola							
MLN624	16.18ha	24/10/1971	45	NTDA	PMY	0758-01	Subject to LNP
EL24401	87	3/06/2005	12	NTDA	NIA		
EL25501	37	Application		NT Freehold	MMG		NT Freehold
EL26299	52	Application		NT Freehold	MMG		NT Freehold
EL26555	103	11/09/2008	8	NTDA	N/A		Subject to LNP
EL26587	20	11/09/2008	8	NTDA	N/A		Subject to LNP
EL26599	326	Application		NT Freehold	PMY		NT Freehold
EL26831	212	9/06/2009	8	NTDA	MMG	0814-01	Subject to LNP
EL26833	183	9/06/2009	8	NTDA	MMG	0814-01	Subject to LNP
EL26835	208	9/06/2009	8	NTDA	MMG	0814-01	
EL26836	178	9/06/2009	8	NTDA	MMG	0814-01	
EL26837	107	9/06/2009	8	NTDA	N/A		Subject to LNP
EL26938	140	9/06/2009	8	NTDA	PMY	0758-01	Subject to LNP
EL26939	70	9/06/2009	8	NTDA	PMY	0758-01	Subject to LNP
EL28508	12	20/07/2011	6	NTDA	PMY	0758-01	
EL28534	4	7/09/2011	6	NTDA	PMY	0758-01	Subject to LNP
EL28540	4	7/09/2011	6	NTDA	PMY	0758-01	Subject to LNP
EL28541	3	7/09/2011	6	NTDA	PMY	0758-01	Subject to LNP
EL28656	39	27/10/2011	5	NTDA	MMG	0814-01	Subject to LNP
EL28657	45	27/10/2011	5	NTDA	PMY	0758-01	Subject to LNP
EL28658	117	27/10/2011	5	NTDA	PMY	0758-01	Subject to LNP
EL28659	20	27/10/2011	5	NTDA	PMY	0758-01	Subject to LNP
EL29022	53	25/07/2012	6	NTDA	MMG	0814-01	
EL30048	90	03/06/2005	12	NTDA	MMG	0814-01	Split of EL24401
EL30098	69	Application		NTDA	N/A		
EL30137	99	09/06/2009	7	NTDA	MMG	0814-01	Split of EL26833 Subject to LNP
EL30152	159	09/06/2009	7	NTDA	MMG	0814-01	Split of EL26835 Subject to LNP
EL30156	169	09/06/2009	7	NTDA	MMG	0814-01	Split of EL26831 Subject to LNP
EL30157	26	09/06/2009	7	NTDA	PMY	0758-01	Split of EL26837 Subject to LNP
EL30158	161	09/06/2009	7	NTDA	MMG	0814-01	Split of EL26836 Subject to LNP
EL30302	113	09/06/2009	7	NTDA	PMY	0758-01	Split of EL26938 Subject to LNP
EL30305	23	09/06/2009	7	NTDA	PMY	0758-01	Split of EL26939 Subject to LNP



Figure 2: Borroloola Project - Sandfire MMG & Pacifico MMP Authorisations and Tenements Location 2016

2.2 History of Exploration Activities and Current Status

Sandfire has been active in the Borroloola Project area since 2004. Figure 3 of this 2016 MMP Amendment is the Rehabilitation Index Plan status for 2016.

Sandfire Field Supervisor carried out an inspection of Prospects drilled between 2004 and 2012 in August 2013 and January 2014. The January 2014 inspection was compiled as a rehabilitation status report, included as 5A Memo M Gibbs Rehab Status NT Borroloola Project as at 13 Jan 2014 (SAN00207353-002).pdf in Appendix 5A REHABILITATION of the October 2014 MMP Amendment.

The DME Mining Environment Compliance Group completed a field audit of exploration operations by Sandfire on its Borroloola Project from 2004 to 2012 between 16 and 20 September 2013, accompanied by Sandfire Field Supervisor and Senior Geologist Andy Hansen, included in Appendix 5A of the October 2014 MMP Amendment.

The area of the disturbed footprint at the Lorella Campsite that required final outstanding rehabilitation is indicated in Table 5 Current Status Rehabilitation and in the security calculation spreadsheet (5.1 MMP 0234-04V3 Amend Exploration Security Calculation 2015 (SAN00261254-001)), included in Appendix 5B of the September 2015 MMP Amendment.

Table 4: Borroloola Project Previous Status Rehabilitation

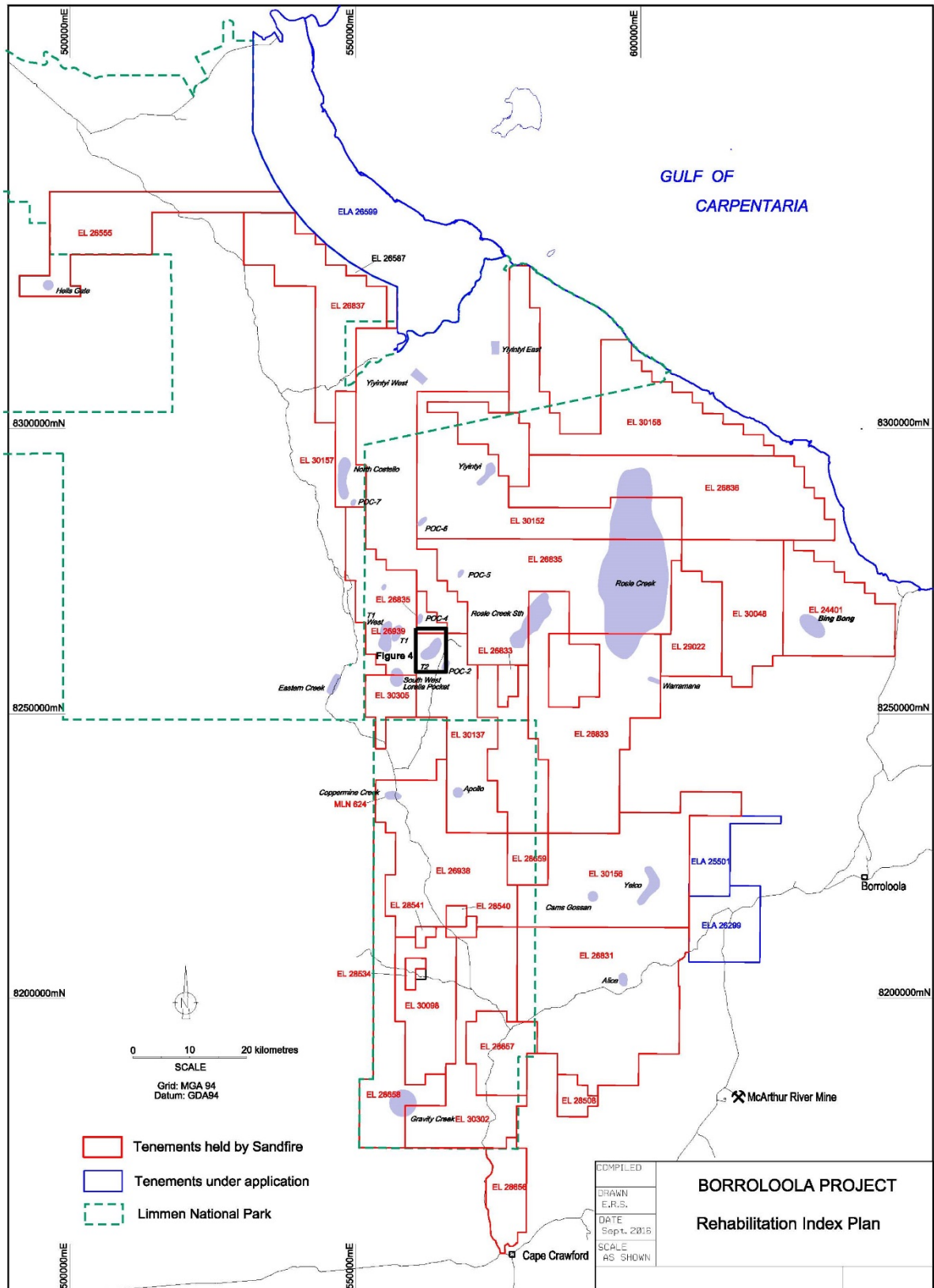
Mining Interests (i.e. titles)	EL30137
Camp area cleared (Exploration Base Campsite on Lorella Springs Pastoral Lease)	2.00
Total area disturbed (hectares)	2.00
Total area rehabilitated (hectares)	0

There were no exploration field operations for the Borroloola Project during 2016. For exploration drilling between 2004 and 2013 the diamond core was stored in metal and plastic trays on 110 pallets in the Howard Springs yard. During 2015, this was sorted and tabulated then offered to the DME Darwin Core Facility.

After the Lorella campsite demobilisation in July 2014, it was agreed with and Rhett Walker, Manager of the Lorella Springs Wilderness Park on the Lorella Pastoral Lease, that surplus drilling and exploration items left over at the campsite were available for his collection and use. Rhett has advised verbally that all of the items have been collected.

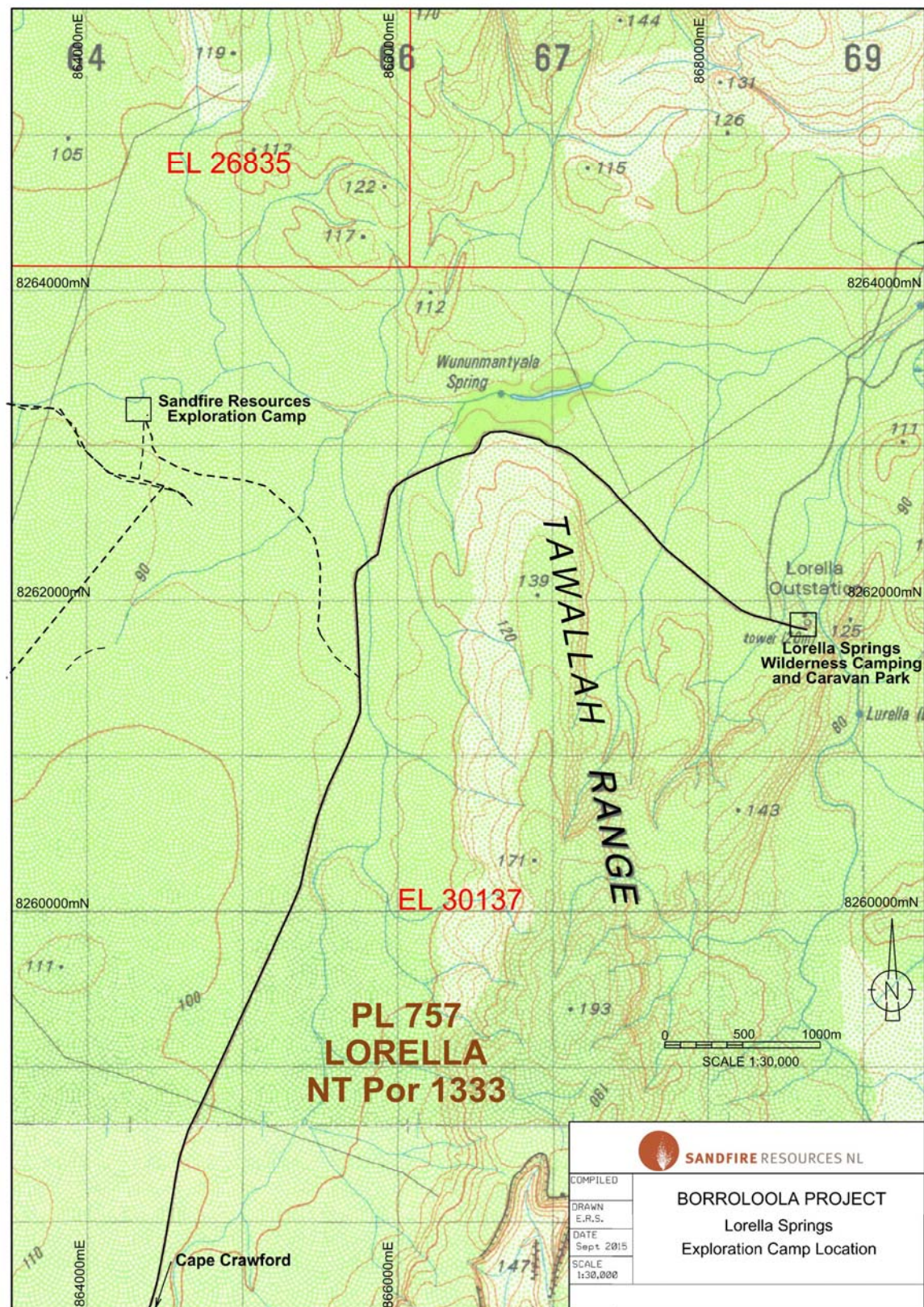
2.3 Proposed Activities

No further exploration is proposed on EL26555 at Hells Gate Prospect. All other Sandfire tenements under Authorisation 0234-04 are subject to farm-in joint ventures whose operations are covered by separate authorisations, as indicated in Section 2-1.



Ten Rehab Index (Sept16).dgn Default 6/09/2016 3:45:30 PM

Figure 3: Borrooloola Project 2004 – 2016: Rehabilitation Index Plan



Lorella Camp Loc.dgn Default 7/09/2015 1:05:41 PM

Figure 4: Lorella Springs Exploration Base Camp Rehabilitation Status Plan



3.0 PROJECT SITE CONDITIONS

3.0 Project Site

3.1 Land Area Type

Geomorphology and geology are described in the 1:250 000 Geological Map Series Explanatory Notes for Bauhinia Downs SE53-03 and Mt Young SE53-04.

The geomorphology of the project area has regions characterised by a series of linear sandstone ridges which cross the direction of drainage causing the accumulation of sediment and the formation of broad shallow valleys such as the Lorella Pocket, with gentle erosion slopes off the coastward side of the ridges. Erosion is in most areas slow to moderate.

The McArthur Basin is a large sedimentary basin with an exposed area of about 180,000 km². Most of it lies within the north-eastern Northern Territory, and it extends over the border into the state of Queensland. Thick marine and non-marine sedimentary rocks were deposited from the late Palaeoproterozoic to the early Mesoproterozoic (1800-1430 Ma).

The Borroloola Project area lies within the Batten Fault Zone where sediments of the Tawallah, McArthur and Roper Groups rest unconformably on the Scrutton Volcanics, and are partially concealed by Cretaceous and Tertiary sediments.

Commodities sought during the period between 2004 and 2013, have been copper, lead, zinc, silver, uranium, diamonds, manganese, and iron ore.

As a base metals target, the McArthur Basin contains volcanic rocks and related intrusive igneous rocks and sediments of the Batten Trough which is a prime target area for SEDEX type economic sulphide deposits. This type of deposit holds 50% of the world's zinc and lead reserves, and make up around 25% of world zinc and lead production. In particular the McArthur Basin hosts the world-class McArthur River (HYC) zinc-lead-silver deposits.

In the north of the Borroloola Project tenements, a target exists for uranium where the McArthur Basin basal sediments overlie, in part, coeval sequences of acid volcanics and granites, elsewhere host settings for major unconformity-related uranium deposits.

Diamonds have been the target of previous exploration over the area covered by the southern part of the Borroloola Project; here there has been recovery of multiple macrodiamonds, as well as microdiamonds and kimberlitic indicator minerals from alluvial samples. The diamonds and indicators were recovered from creeks surrounding a remnant Cretaceous plateau within surrounding McArthur Group sediments. This situation is analogous to the Merlin Kimberlite cluster where Devonian-aged kimberlite pipes may occur beneath Cretaceous cover rocks.

During the Cretaceous Period, around 90 to 100 million years ago, the coastal areas along the Gulf of Carpentaria were inundated by a shallow sea. Manganese accumulations were formed in embayments close to the shoreline of this sea in a series of depositional episodes. The largest of these is on Groote Eylandt, a large island located within the Gulf of Carpentaria,



130kms northeast of Sandfire Resources' tenements. This style of manganese occurrence is the target of exploration in the northern part of the Borroloola Project.

In the northwest part of the Borroloola Project a sedimentary iron formation called the Sherwin Ironstone Member occurs within the Sherwin Formation of the Mesoproterozoic Roper Group. The Sherwin Formation contains massive oolitic to pisolitic ironstone within interbedded medium to very coarse ferruginous sandstone, mudstone and shale. A resource has been identified along strike at the Roper Bar Iron Ore Project managed by Western Deserts Resources Limited where the haematitic sandstone ironstones have been locally enriched by the addition of microcrystalline specular hematite.

3.2 Hydrology

Several significant rivers flow in a north-easterly direction across the project tenements into the Gulf of Carpentaria: the Roper, Towns, Little Towns and Limmen Rivers, Rosie and Batten Creeks and the MacArthur River. These are discussed in the following section. Numerous large permanent water holes also exist within the Borroloola Project area. The drainage associated with many of these has been observed to be flowing above ground as late in the dry season as July. No water is drawn from surface water for domestic purposes.

3.3 Flora and Fauna

Vegetation is typical of eucalyptus and acacia woodlands, sparse shrublands and tussock or hummock grasslands on sandstone plains and plateaux and lateritic plains. Sandstone ridges which dissect the topography throughout the region are sparsely vegetated.

A desktop review of Fauna and Flora including weeds of the Borroloola Project region was undertaken during 2012 by EcOz Environmental Surveys (EcOz Sandfire - Flora and Fauna Desktop Review 2012 (SAN00121613). The pictorial significant Flora and Fauna ID guide prepared in handbook form to include with induction of field staff has been updated with an addendum. The combined ID Booklet (EcOz Sandfire - Significant Species ID Booklet 2012 & Addendum 2014 88p (SAN00227124)) is also included in Appendix 3A of the MMP Amendment October 2014.

The Flora and Fauna Assessment, as summarised below, aimed to:

- Describe the general environment of the project region using existing climate records, land systems and vegetation mapping,
- Determine threatened fauna and flora species likely to be present over the Borroloola Project region and specifically within the Alice, Bing Bong, Rosie and Hells Gate Prospect exploration prospect areas using existing datasets of distributions and habitats,



- Determine what weeds were known or be likely to occur in the project region, and
- Determine any sites of conservation significance within the project region.

Reference sources used were the Biogeographic Regionalisation of Australia, the NT Flora and Fauna Atlas, Atlas of Living Australia, and Fish Atlas of Australia, and an on-line predictive modelling enquiry tool which interrogates a range of existing flora and fauna data to predict the presence of species within a search area.

Climate experienced over the region is a tropical northern Australia wet and dry season regime which influences rainfall and river flows, movement of native and introduced fauna, and vegetation growth patterns. Average rainfall is between 600 to 800 mm per year.

Land systems and vegetation distributions were mapped over the four prospects on which exploration was proposed for the 2012 and 2013 field seasons:

- Alice sandstone ridges and plains – hosting eucalyptus woodlands, sparse scrubland and hummock grassland
- Bing Bong lateritic plains – host eucalyptus woodlands, sparse scrubland and tussock grassland
- Rosie sandstone plains, alluvial floodplains and coastal dunes - host eucalyptus woodlands, sparse scrubland and tussock grassland
- Hells Gate sandstone hills and plateaux and lateritic plains – host acacia woodlands and tussock grasslands

The project covers two bioregions – the Gulf Coastal and the Gulf Falls and Upland:

- The Gulf Coastal Bioregion includes gently undulating coastal plains with scattered rugged sandstone outcrops and offshore islands north and east of a south-easterly trending line between Nathan River and Borroloola. The lower reaches of the Roper, Towns and McArthur Rivers and Rosie and Batten Creeks cross this bioregion which includes 16 species listed as threatened at national or state level, the most significant being two mammals: the Canefield Rat (*Rattus sordidus*) - a typical moderately large rodent, and Carpentarian antechinus (*Pseudantechinus mimulus*) - a mouse-sized dasyuid marsupial.
- The Gulf Falls and Upland Bioregion of undulating terrain and scattered low, steep rocky hills lies in the region south and west of the line between Nathan River and Borroloola. The upper reaches of the Roper and McArthur Rivers host ten (10) floral or faunal species which are listed as threatened, the most significant being the Carpentarian Grasswren (*Amytornis dorothea*) and two endemic reptiles: the Snake-eyed skink (*Cryptoblepharus zoticus*), and a gecko, Borroloola dtella (*Gehyra Borroloola*), in the rocky sandstone ranges of Nathan River Station.



A number of threatened birds, mammals, reptiles, fish and rays are included in the EcOz Significant Flora and Fauna ID Guide. Further information for each of the significant species above is included as summary information pamphlets in Appendix 3A.

Introduced fauna, viz., swamp buffalo, dogs, donkey, raised cattle, cane toads and feral cats and pigs have varying impacts within the project region.

From the desktop study, 58 introduced plants are recorded within the Project area, of which ten are listed as either Classes A (to be eradicated) and B (growth and spread to be controlled) or Classes A and C (not to be introduced into the NT) weeds. EcOz indicated that another five weed species were known to occur in the region. Nine of these 15 weed species are described and pictured in the EcOz Significant Flora and Fauna ID Guide.

Two weed species were highlighted as being a fairly significant problem in similar environments in Queensland: Prickly acacia (*Acacia nilotica*), and Mesquite (*Prosopis* species), for which summary information pamphlets are included in Appendix 3A.

Of four Sites of Conservation Significance (SOCS) in this part of the Gulf of Carpentaria two impact only the margins of the project tenements. Both are Wetlands of National Significance:

- coastal mudflats of the Limmen Bight – eight threatened fauna species, ten flora species endemic to the NT, breeding colonies for four marine turtles and Roseate Terns, and significant numbers of itinerant shorebirds
- the McArthur River floodplain – six threatened fauna species, eight endemic flora species, breeding colonies of marine turtles and terns and itinerant shorebirds

Fires are a regular occurrence throughout the region, so much so that between 1997 and 2010 a majority of the landscape had been burnt at least once, with impacts on native fauna.

The EcOz Sandfire - Significant Species ID Booklet 2012 & Addendum 2014 88p (SAN00227124) indicates the likelihood of occurrence of threatened fauna and flora, and of weeds, at four Prospects: Alice, Bing Bong, Rosie and Hells Gate, and provide a Field Data Collection checklist and a complimentary follow-up Actions Checklist. From this booklet the threatened fauna, flora and weeds more specific to Hells Gate Prospect are also pictured in the updated EXP-EXP-ER-004f Site Induction Hells Gate NT [SAN00189382-004], included in Appendix 4B of the MMP Amendment October 2014.

The impact for the Borroloola Project area from the updated list of threatened species in the Northern Territory at nt.gov.au/environment/animals/threatened-animals and nt.gov.au/environment/native-plants/threatened-plants is to be assessed.

3.4 Current Land Use

Land occupancy and use in the Borroloola Project region includes Aboriginal communities on freehold and lease properties, pastoralists also on leased properties and mining exploration companies on lease tenements. Details of each land holding are included in Appendices



3B_LAND_TITLE_SEARCHES and 3C_ NATIVE_TITLE_SEARCHES of the MMP Amendment October 2014.

The NT Land Corporation manages former pastoral leases Billengarah and Nathan River, and the Bing Bong and St Vidgeon Crown Leases in Perpetuity, on behalf of Native Title Claimant Groups. Exploration activities on Aboriginal leased properties are subject to Native Title. Land use by local aboriginal people includes accessing sites for cultural activities, fishing, camping, hunting and travel across the land.

Lorella Springs Pastoral Lease and McArthur River Perpetual Pastoral Lease are operating pastoral stations. In the case of Lorella Springs, the Manager, Mr Rhett Walker, also runs the Lorella Springs Wilderness Park located along the headwaters of Rosie Creek which passes through the Tawallah Range extend to the Gulf of Carpentaria.

Sandfire Resources Exploration camp has been located on Lorella Springs during the 2008, and 2010 to 2014 field seasons (Figure 2). There have been consultations with the manager regarding the use of existing tracks, retention of exploration tracks, and disposal of waste on the station.

The Western Desert Resources (WDR) haul road has been constructed to transport iron ore from the Roper Bar Mine site adjacent to Hells Gate Prospect to loading facilities at Bing Bong. A quarry approximately in the middle of the route, EPM29817, was used for road base material. The footprint transects the northern part of the Project area.

3.5 Aboriginal Heritage and Cultural Sites

An inspection of the register for sites of cultural significance on EL26555 was undertaken through the Aboriginal Areas Protection Authority (AAPA). The search of 1 September 2014 identified numerous recorded sacred sites and restricted work areas along the Towns River, for which details and location figure are included in Appendix 3D of the MMP Amendment October 2014.

A search of all Sandfire tenements as at 29 August 2016 is included in Appendix 3 of this 2016 MMP Amendment (3.1 AAPA Heritage Abstracts 29 August 2016 R1.pdf).

Sandfire will comply with any of the constraints imposed by traditional owners and the AAPA with regard to working in the vicinity of these cultural sites. Sandfire has also consulted with local aboriginal groups resulting in ground inspections prior to drilling.

Features of cultural and environmental significance within the Limmen National Park and Limmen Bight Marine Park are protected by regulations and monitored by rangers (Figure 2). Information documents and plans are included in Appendix 3D of the MMP Amendment October 2014. No work has been carried out or is proposed at or near park facilities.

4 ENVIRONMENT MANAGEMENT

4.0 Environmental Management Plan

Sandfire follows the EXP-EXP-GENM-003e Environmental Management System Environmental Performance Standards V2 Draft (SAN00116596) from its Digirock OHS&E Field Manual included in Appendix 4A of the 2015 MMP Amendment. This includes the protection and minimizing of impacts on these resources through the development of sufficient knowledge of the resources, the inter-relationships in the natural environment and the related interaction with stakeholders.

The Sandfire Exploration General Safety, Building & Infrastructure, Environment and Cultural Heritage 2015 document details links on Sandfire's Intranet to documents that form part of the Exploration General Field Manual (GENM) – Control Document Number 150514, included in Appendix 4 of this MMP Amendment (4.0 Sandfire Exploration General Safety, Building & Infrastructure, Environment and Cultural Heritage 2015.pdf)

4.1 Environment Policy and Responsibilities

Sandfire has an EXP-EXP-OHSM-001c Policy - Environmental - June (SAN00039941) also included in Appendix 4A of the 2015 MMP Amendment. The purpose of this policy is to set requirements for the sustainable, safe and efficient use of ground water resources and related ecosystems in Borroloola Project MMP areas of activity.

Sandfire commits to ensuring responsible environmental management through a series of sensible precautions and procedures in which unnecessary damage to the environment is minimised, and where possible, early rehabilitation takes place to allow the short growing season of the region to have optimum benefit.

Sandfire has environmental management procedures based on four approaches:

- Awareness – Personnel are made aware of potential impacts and expected to use this awareness to avoid impact.
- Impact reduction – Notwithstanding the practical and financial constraints under which the Company operates, work must always be conducted in a manner that causes the least environmental impact.
- Rehabilitation – All ground disturbances is to be rehabilitated to the standards set by the DME guidelines.
- Review/audit – Rehabilitation progress is internally monitored and reviewed. Information gathered should be used to inform future work and rehabilitation program planning.

Sandfire Environmental Responsibilities apply to all staff as indicated in Table 6.

**Table 5: Sandfire Environmental Responsibilities**

Level within organisation	Responsibilities
Responsible Officer	Ensures that the organisation meets the environmental commitments set out in the MMP including training requirements.
Managers	Managers plan, schedule and control all work and must ensure that the environmental commitments set out in the MMP are met.
Supervisors – Senior Geologists	Supervisors control of the day to day work in the field under the guidance of the manager.
Employees	Employees are required to complete their work in a manner that does not put themselves, others or the environment at risk.

The Responsible Officer as the person responsible for the conduct of environmental activities in the organisation (in the context of this MMP Amendment) will:

- prepare a schedule for environmental monitoring of disturbances, the performance of rehabilitation activities and the monitoring of rehabilitated areas to assess the regrowth of vegetation on the areas.
- undertake a review of the Environmental systems operating within Sandfire in conjunction with the appropriate consultative group/person every 12 months. These procedures are reviewed by management every year as part of their sign off of the procedures within the Digirock OHS&E manual.

Managers may be delegated the responsibilities for training employees, for establishing schedules to perform rehabilitation activities and to conduct monitoring activities of rehabilitated areas. Managers have responsibility in their areas of control to:

- be responsible for the oversight of delegated responsibilities to the supervisor.
- Ensure all risks to the environment are identified, assessed and effectively controlled by regular monitoring of activities on the site and scheduling regular site meetings.
- Equip employees with the necessary skills, training and equipment to safely undertake their work.

Supervisors may be delegated the responsibilities for training employees to ensure that employees have the necessary skills and knowledge to conduct activities in accordance with Sandfire's environmental policy and the environmental commitments in the MMP. Supervisors-Senior Geologists have a responsibility to:

- Implement relevant environmental policies and procedures in their areas of control.
- Provide the necessary information, instruction and training to workers under their control.
- Ensure workers carry out their jobs effectively and safely.

Employees have a responsibility to:

- Follow reasonable instructions in the performance of Sandfire's activities on site and carry out rehabilitation activities as directed by the Supervisor or Manager.



- Protect their own health and safety and to avoid adversely affecting the health and safety of other persons in the workplace.
- Report any environmental incident or accident to the supervisor as soon as possible after the event.
- Ensure that all equipment is used correctly.
- Report or make recommendations to management to avoid, eliminate or minimize any hazards of which they are aware regarding working conditions or methods.
- Keep their work area tidy.

4.2 Statutory Requirements

- Aboriginal Land Rights (NT) Act (1976)
- Bushfires Act (2004) and Regulations
- Crown Land Act (1992) and Regulations
- Environment Protection and Biodiversity Conservation Act (1999)
- Environmental Assessment Act (1994)
- Environmental Offences and Penalties Act (1996)
- Heritage Act (1991) and Regulations
- Mining Management Act (2011) and Regulations (Conditions of Authorisation)
- Mineral Titles Act (2010) and Regulations (Conditions of Exploration Licence)
- Northern Territory Aboriginal Sacred Sites Act (1989) and Regulations
- Native Title Act (1993) and Native Title Amendment Act (1998)
- Parks and Wildlife Commission Act (1980)
- Pastoral Lands Act (1992)
- Plant Health Act ()
- Plant Health Regulations (2011)
- Territory Parks and Wildlife Conservation Act (2006), Bye-Laws and Regulations
- Water Act (1992) and Regulations
- Work Health and Safety (National Uniform Legislation) Act (2011) and Regulations
- Weeds Management Act (2001)

4.3 Non-Statutory Requirements

Liaison with all Stakeholders is outlined in Section 4.4



4.4 Identified Stakeholders and Consultation

- Australian Mining and Exploration Title Services (AMETS)
- Aboriginal Areas Protection Authority (Authority certificate and register inspections)
- Billengarra National Native Title Tribunal Claim FC#: NTD6030/00 DC00/29 Northern Land Council Contact: Rhonda Trandy
- Bone Lagoon Outstation – access to Bing Bong on EL24401 and Warramana on EL26833 (Contact: Patrick Mullholland).
- Borrooloola Community
- Cow Lagoon Settlement Gurdanji Aboriginal Corporation (Laiskey 000 04630) National Native Title Tribunal Claim FC#: NTD6015/02 DC02/14 is traversed by an access track on EL26831 (Contacts: Bruce Joy, Michael Barclay).
- Department of Land Resource Management (DLRM) formerly Natural Resources Environment The Arts and Sport (NRETAS) (Contacts: Eddie Webber, Stuart)
- Department of Mines and Energy (DME) Mining Environmental Compliance Division Contact: Frances Perrett Senior Mining Officer
- Leila Creek Station (Contact: Chris Schilling)
- Limmen Bight Fishing Camp owner and operator - Stephen Barrett
- Lorella Downs National Native Title Tribunal Claim FC#: NTD6016/00. Northern Land Council Contact: Rhonda Trandy
- Lorella - Nathan River National Native Title Tribunal Claim FC#: NTD6031/02 Northern Land Council Contact: Rhonda Trandy
- Lorella Springs Station Maximus No. 82 Pty. Ltd and Landmark Developments Pty Ltd (Manager: Rhett Walker 08 8983 3728)
- McArthur River Station Mt Isa Mines Ltd (Contact: Dave Daniell)
- McArthur River National Native Title Tribunal Claim FC#: NTD6031/00 DC00/27
- Nathan River Ranger Station (08 8975 994)
- Sandfire Resources is a publicly listed company and consideration of all shareholders will be taken into account during operations.
- St Vidgeon Crown Lease in Perpetuity 346 N.T. Portion 00819 (Northern Land Council Contacts: Anthony Chong, Jackie Green, Howard Smith)
- Worksafe (Tim Gosling or Mark Crossin)
- Wurrunburru Association Incorporated Crown Lease in Perpetuity #429 N.T. Portion 02432

Consultation with Landholders

Regular communications will be undertaken with the Pastoral Lessees and other authorised users of the site, e.g., Limmen National Park Rangers, updating them on activities as they occur. Details of mobilisation and demobilisation of each phase of drilling activities be notified to these users in advance.

During 2012, Sandfire Resources NL (Sandfire) advised the Pastoral Lease Landholders of its proposed exploration activities in accordance with regulation No. 71 for section 32(1) or 49 of the Mineral Titles Act.

Mining Environmental Compliance Division of the DME will be notified annually of previous exploration work, and rehabilitation carried out, and proposed activities over the project area.

Bushfires NT has been contacted with regards to procedures in case of a bush fire. Regular communications will be made to monitor fire risk within the area.

Culture and Heritage Management

Sandfire has developed a Community Relations Policy Statement for relations with Australian Aboriginal Native Title Groups whose country falls within the Borroloola Project sites and tenements, 'SFR Community Relations Policy Statement' included with Appendix 4A of the 2013 Mine Management Plan Amendment for Exploration Operations Authorisation 0234-04 V2.

Sandfire conducted "On Country" meetings in Borroloola with community representatives and Aboriginal Elders outlining exploration activities proposed in MMPs for 2006, 2007 and 2008. In March 2010 Sandfire staff participated in consultative meetings with the Narwinbi Native Title Group and the NLC representative body in Borroloola regarding prospective exploration on applications EL25501 and EL26299. A meeting with Elders representing the Marra Aboriginal Land Trust with Freehold over application EL26599 was held in Ngukurr in 2011.

During 2012 and 2013, Sandfire's Community Relations and Tenements Officers carried out numerous Heritage Surveys with representatives of the underlying Native Title Claims at the Hell's Gate, Rosie Creek and Alice Prospects. Sandfire staff also participated in initial consultation meetings with the Wurrunburru Aboriginal Corporation and the NLC in relation to access into the wholly held Crown Lease in Perpetuity. These meetings were being held in order to form an agreement with Wurrunburru and gain access to the property in order for drilling to be carried out at the Bing Bong prospect, now managed by Pacifico under its farm-in JV agreement with Sandfire.



4.5 Induction and Training

The Sandfire Induction for the Borroloola Project is included as EXP-EXP-ER-004a Site Induction Borroloola (SAN00137377) in Appendix 4B of the MMP Amendment September 2015. The EcOz Sandfire - Significant Species ID Booklet 2012 (SAN00121612) and Addendum 2014 88p (SAN00227124) are provided to Sandfire staff on induction to help identify significant fauna and flora, including weeds, likely to be encountered at Hells Gate during the field season.

A revised Borroloola Induction to include update to threatened species and awareness of quarantine risk from movement of machinery and equipment will be prepared prior to further exploration operations for tenements EL26555, EL26587, EL26837 and EL30098 for which Sandfire has responsibility. For the 2016 field season, no operations are proposed.

The Digirock Exploration field Manual available in hardcopy at each exploration site includes procedures which address drill site rehabilitation and collar plugging (Digirock Drilling and Clearing Rehabilitation (SAN00113457), included in Appendix 3B of the 2012 Mine Management Plan Amendment for Exploration Operations Authorisation 0234-04, which in turn follows DME AA7-029_Construction_and_Rehabilitation_of_Exploration_Drill_Sites.

Emergency procedures including response to Natural or Environmental Emergencies, e.g. fire, bushfire or flood, and environmental incident such as fuel or oil spills, are also included in Appendix 4A of the MMP Amendment 2015 as EXP-EXP-OHSM-002 Regional Exploration Sandfire Hazard Notification Form (113436-002).

4.6 Identification of Environmental Aspects and Impacts

Identified environmental aspects and impacts, respective risk ratings, and prevention and remediation management measures have been outlined in Table 7.

The Exploration Campsite is located near Lorella Springs (Figure 3). The Lorella Springs pastoral lease manager has agreed regarding waste disposal that Sandfire and its contractors dig their own tip and dispose of their own general waste as detailed in the signed letter provided to the Mining Environment Group August 2012 (2012 MMP 0234-03 Amend Rhett Walker re rubbish disposal Lorella Springs auth (SAN00098203-002), submitted as part of the 2012 Mine Management Plan Amendment for Exploration Operations Authorisation 0234-04.

Waste streams are of a domestic nature, e.g., kitchen waste and cardboard packing boxes. Tip contents are burnt regularly (twice weekly) to control windblown rubbish and deter scavengers, and covered over at the end of the field season. Tip dimensions are 10m (length) x 4m (width) x 1.5m (depth) = 0.04ha. Field staff are aware of fire ban days through Bushfires NT and rubbish burns will not take place on these days. To clarify disposal of rubbish at Exploration base camp, and drillers' camps, the letter from Rhett Walker is included in Appendix 4 of this MMP Amendment (4.3 2012 MMP 0234-03 Amend Rhett Walker re rubbish disposal Lorella Springs auth (SAN00098203-002).pdf).



For the Lorella Springs Exploration Camp, water is drawn from a previous drill hole BLWB005. Total domestic water use is estimated to be less than 1000 l/ field day. Water for drilling purposes has been drawn at each prospect from exploration RC drill holes established by the drilling contractors at the beginning of each field season.

Management of weeds by inspection and wash down of vehicles prior to entry and exit from project area is detailed in Table 7 and is included in the Hells Gate Site Induction. The wash down area at Lorella camp is on compacted gravel that is sprayed with glyphosphate at the start and end of the field season.

All Environment Incidents prior to October 2011 were recorded on a register; all environmental incidents after this date are recorded in an in-house Reporting Database (InControl) via an Incident Report (4.6 EXP-EXP-OHSM-032a Incident Investigation Form A4 Regional Exploration 2013 (SAN00167511-002), provided in Appendix 4A of the October 2014 MMP Amendment.

Sandfire Regional Exploration has monthly General and Occupational Health, Safety and Environment (OHSE) meetings facilitated by telephone conference calls. Prior to each OHSE meeting the InControl Events Listing for each month is circulated to all staff. This lists health, safety and environment incidents, near misses, and hazards for the previous month, and is tabled for discussion. A recent Meeting Agenda and Events Listing are included in Appendix 4 of this MMP Amendment (4.1 (SAN00205516-032) EXP-EXP-Exploration Meeting Agenda 16 August 2016.pdf and 4.2 Events Listing July for OHSE Meeting 16 August 2016.pdf).

In the absence of field operations on its Borroloola Project tenements during 2015 and 2016, this provides an indication of Sandfire's commitment to record keeping of health, safety and environment incidents, near misses, and hazards.

Table 6: Identification of Environmental Aspects and Impacts

Aspect	Impact	Risk Rating	Management measures (prevention)	Management measures (remediation)
Clearing for drill pads/ tracks/ camps	Possible loss of native flora and habitat for fauna	Medium	Leave the area of the drip line of a tree's canopy untouched to protect the tree's root ball. If drill pads are required, clear the smallest possible area using blade –up technique. Re-establish / clear tracks using blade–up technique. Establish camps in cleared areas.	Close/ cap drill holes as soon as possible after exploration activities have ceased. Re-spread topsoil over pads; monitoring will determine if re-seeding is required. Remove all rubbish from camp areas for disposal at approved facility.
Weed management	Spread of weeds	Medium	Inspect and wash down vehicles prior to entry and exit from project area. Wash down area at Lorella camp is on compacted gravel that is sprayed with glyphosphate at the start and end of the field season. Record keeping for vehicle wash downs is	Establish monitoring and control procedures to ensure that measures are in place that are effective in weed management. Incidences of new weed species on site will be reported to DLRM and DME.
Drilling	Hydrocarbon spills – risk of contamination of soil, surface and ground water Dust and noise emission – disturbance to flora and fauna	Medium	Sumps to be lined with a heavy polyurethane membrane where appropriate. All drilling fluids used in sumps are to be biodegradable. Diesel fuel will be brought on site in bulk tankers and stored in self-bunded 12,000 litre fuel containers. Fuel is delivered to the drill rigs via a 2200 litre fuel tank loaded aboard a light truck and transferred via electric pump. Spill kit will be on hand at transfer point. Disturbance to flora and fauna will be minimal due to sensitive clearing of drill pads. Noise and dust emissions will be managed with mandatory noise and dust reduction equipment on plant and machinery. PPE will be issued to personnel to minimize exposure to dust and noise.	Contaminated soils will be either removed to a facility in Katherine NT approved for disposal of hydrocarbon wastes, or remediated on site for minor spills. Any spills are recorded as an InControl Incident Report. Topsoil will be re-spread as soon as possible after cessation of drilling.
Fuel Storage	Hydrocarbon leak / spill	Medium	Diesel fuel will be brought on site in bulk tankers and stored in self-bunded 12,000 litre fuel containers. Fuel is delivered to the drill rigs via a 2200 litre fuel tank loaded aboard a light truck and transferred via electric pump. Spill trays are not provided; however Spill Kits are on hand at transfer / refueling points.	Contaminated soils will be either removed to a facility in Katherine NT approved for disposal of hydrocarbon wastes, or remediated on site for minor spills. Any spills are recorded as an InControl Incident Report.
Hydrology	Water encountered during drilling/ surface water	Medium	If water is encountered, it will be diverted into drill sumps or settlement ponds.	If water to be diverted onto surrounding land will first be diverted into a silt trap. The water that may leave the trap will have deposited its silt load into the trap before leaving.
Sacred Site Intrusion	Destruction of sacred site	High	The operator has received abstracts and plans from the AAPA Register of Sacred Sites confirming that there are recorded and registered sacred sites within the project area. The sites have been recorded on field maps to ensure that the areas remain undisturbed.	Knowledge of the precise location of sacred sites on the project area will enable the operator to remove any risk of intruding on recorded and registered sacred sites.

Aspect	Impact	Risk Rating	Management measures (prevention)	Management measures (remediation)
Flora and Fauna Management	Intrusion/ removal of threatened species habitat	High	The EcOz Significant Flora and Fauna ID Guide outlines the likelihood of occurrence of the threatened fauna and flora, and of weeds, and provides a Field Data Collection checklist and a complimentary follow-up Actions Checklist. This guide is included with staff orientation. Prior to work being undertaken a visual inspection will be conducted to determine the presence of any threatened flora and fauna at each prospect.	Upon completion of rehabilitation a visual inspection will be conducted. Any threatened species of either fauna or flora will be recorded in the format required by the Field Data Collection checklist.
Waste Management	Human waste, kitchen waste and food scraps can attract animal pest species	Medium	Covered bins will be used for the collection and storage of wastes. All rubbish is buried in dedicated rubbish tips away from surface water. Rubbish bins or pits will be established in locations which minimise the threat to stock or wildlife. Waste waters from kitchens and showering facilities are directed to earth drains designed to prevent discharge unless septic tanks have been installed in which case all waste water is contained with them. Toilet facilities may consist of drill holes (long drops) or chemical systems. Any necessary pits are covered with a minimum of one meter of fill. All personnel will be instructed in correct waste management during their site induction.	The Lorella Springs station owner/manager, Rhett Walker, has agreed that for waste disposal; Sandfire and its contractors dig their own tips, dispose of own general waste, burn twice weekly, and bury
Erosion Management	Un-rehabilitated drill pads and drill holes can become eroded. Risk of impact on flora and fauna.	High	Rehabilitate drill pads and cap drill holes to DME specifications as soon as possible if no further downhole activity is planned. Maintain uniform surface contouring on area.	Establish a monitoring regime to ensure that rehabilitated areas are not subject to erosion.



4.7 Emergency Procedures and Incident Reporting

As outlined in Section 4.5 Induction and Training, on induction, all Employees are briefed on the procedures and notification documentation required in case of OHS&E and environmental emergencies. These procedures are reviewed by management every year as part of their sign off of the procedures within the Digirock OHS&E manual.

Field managers and field supervisor are aware of their responsibilities to report immediately all emergency incidents, and to identify if the incidents include OHS & E and / or environmental components. Sandfire staff record all OHSE and environmental incidents within the InControl database. Notifications take the form of:

- Incident Report EXP-EXP-OHSM-003 Incident Investigation Form A4 Regional Exploration 2013 (SAN00167511-001).pdf;
- Hazard Notification Form EXP-EXP-OHSM-002 Regional Exploration Sandfire Hazard Notification Form (SAN00113436-002).pdf,
- Borroloola Emergency Response Procedure EXP-EXP-ER-005 Borroloola Emergency Response Management Plan - Part 2 (SAN00136500-002).pdf
- Risk Assessment Standard-SFR-OHS-ST-007 Risk Management Standard (SAN00166650-006), Risk Management Procedure SFR-OHS-Risk Management Procedure (SAN00166644-003) and Risk register assessment record form EXP-CTD Regional Exploration Principle Hazard Register (SAN00131014-010).pdf.

OHS&E incidents and emergencies are assessed using the matrix as detailed in Table 8.

Table 7: Matrix from Sandfire Incident Report Form (SAN00167511-001)

Injury	Consequence (What Could/Did Happen?)			Rate it
	Damage	Environmental	Process Loss	
Fatal injuries Permanent disability	More than \$1million	Widespread major damage	More than \$10million	Catastrophic
Lost Time (7days or longer) or Long Term Illness	\$500k-\$1million	Serious damage	\$5million-\$10million	Major
Restricted duties or Lost Time (less than 7 days)	\$250K-\$500k	Reversible damage	\$1million-5million	Moderate
Medical treatment Injury	\$50k-\$250k	Minor damage	\$50k-\$1million	Minor
First Aid Injury	Less than \$50k	Immediately reversible damage	Less than \$50k	Negligible

This matrix has been reviewed against the DME Advisory #AT8-006 Environmental Incident Reporting Guideline January 2014 (SAN00211397-001) in which the Table, Guide to Severity Classification, identifies the criteria to be used to assess the severity of an environmental incident, rated 1 to 4. Reports must be made for incidents classified as Severity Class 2, 3 and 4 of this Table on the required form CF7-001_Notification_of_an_Environmental_Incident May 2013 (SAN00211398-002), in accordance with Section29 of the Mining Management Act. Both the guideline and form were included in Appendix 4A of the MMP Amendment October 2014.

No environmental incidents have been reported in the period since the Environmental Incident Register was submitted in September 2013. No other internal environmental audits and inspections have been carried out at Sandfire's Borroloola Project.

4.8 Environmental Audits and Inspections

Sandfire's Field Staff carry out inspection of drillhole sites which have been rehabilitated. Drill Site rehabilitation is recorded on the template form for each site and entered into the database table in Appendix 5A of the MMP Amendment October 2014 updated as RehabStatusTemplate_NT_Jan2014_Amended_16032014 (SAN00211165-003).

Monitoring of activities on the site will be, in the first instance, by the Field Supervisor as indicated in Table 6 – Sandfire Environmental Responsibilities. During rehabilitation in October 2013 assessment and comments were made of recovery after rehabilitation at Prospects drilled in prior years (Memo M Gibbs Rehab Status NT Borroloola Project as at 13 Jan 2014 (SAN00207353-002).

The DME Mining Environment Compliance Group of the Senior Mining Officer, Mining Compliance Division and two Environmental Officers completed a field audit of exploration operations by Sandfire on its Borroloola Project from 2004 to 2012 between 16 and 20 September 2013, accompanied by the Sandfire Field Supervisor and Senior Geologist.

Rehabilitation of Sandfire's exploration activities during the period 2004 to 2012 have been completed during October 2013, leaving only 2013 activities outstanding. Photos taken during October 2013, including outstanding drilling disturbance at Hells Gate Prospect were submitted to the DME Mining Environment Compliance on 10 February 2014. The final Rehabilitation Status Memo compiled in January 2014 was also submitted.

Monitoring of the Health and Safety Management Plan

The Health and Safety Management Plan (HSMP) will be monitored to ensure its ongoing effectiveness and suitability to manage the health and safety risks arising from exploration activities. The Exploration and Business Development Manager is responsible for the overall program of monitoring of the HSMP.

Exploration is required to provide quarterly assurance statements to the Sandfire Health and Safety Committee, which includes assurance that the critical risks in exploration are being controlled. Those assurance statements require the Exploration and Business Development Manager to be satisfied that the HSMP is effective to control the risks.

The effectiveness of the HSMP will be monitored through:

- Management site visits.
- Audits.
- Hazard and incident reporting.

- Incident investigations.
- Site Inspection
- Pre-start and tool box meetings (daily when on site)

Exploration will conduct one internal audit of an exploration site and one external audit of an exploration site in 2014. The Exploration and Business Development Manager may require further audits at any time, and must consider whether to authorise a further audit(s) in the following circumstances:

- After a fatality.
- After a serious incident.
- If he is not able to provide a monthly assurance statement.
- Improvement or prohibition notice issued by the Statutory authority

Non-conformance and corrective actions

Non-conformance with the HSMP will be identified through:

- Management site visits.
- Audits.
- Hazard and incident reporting.
- Incident investigations.

Corrective actions required to address identified non-conformance will be recorded in the non-conformance register. Outstanding corrective actions will be reported to the Sandfire Health and Safety Committee as part of exploration's monthly reporting obligations.

4.9 Environmental Performance Reporting

Water Management

No water is drawn from surface water for domestic purposes. Water for drilling purposes has been drawn from exploration RC drill holes established at the beginning of each field season. All drilling fluids are initially contained in plastic-lined sumps.

For the Lorella Springs Exploration Camp water is drawn from a previous drill hole BLWB005. Written confirmation regarding the use of water bores on Lorella Springs has been provided by the Manager. Biodegradable water (food scraps) are buried as camp waste. Excess drill cuttings are buried in a purpose-dug pit. A drop toilet is located at a minimum of 100m from any surface water.

Hydrocarbon storage is in bunded tanks. Waste from servicing of drill rigs, loaders, equipment including generators, waste oil, rags, grease and cartridges has been collected and disposed of off-site to Katherine, in accordance with statutory regulations.

**Invasive Species Management**

Environmental training for Invasive Species Management is provided to employees at induction with 3A EcOz Sandfire - Significant Species ID Booklet 2012 & Addendum 2014 88p (SAN00227124).

All personnel will be advised during their induction that equipment is inspected on entering the site and is washed down prior to leaving site to avoid weed infestation. The wash down area was a designated area close to the camp with a gravel type surface and used a motorised high pressure cleaner. The area was sprayed with glyosphate weed killer at the beginning and end of each season to minimise grass growth, and there was no noticeable weed growth.

Flora and Fauna Management

Wherever possible, care will be taken not to disturb the natural habitat. Clearings for drill pads will be kept to the absolute minimum consistent with operator and equipment safety. Vehicles will be thoroughly cleaned before entering and leaving the region to prevent the transport of weeds. Sandfire commissioned a Flora and Fauna desktop study of the Borroloola Project in 2012 which is summarised in Section 3.3 above.

The 3A EcOz Sandfire - Significant Species ID Booklet 2012 & Addendum 2014 88p (SAN00227124) outlines the likelihood of occurrence of the threatened fauna and flora, and of weeds, and provides a Field Data Collection checklist and a complimentary follow-up Actions Checklist. This guide is included with staff induction.

Noise and Air Quality Management

The exploration activities will be conducted in remote areas where noise and dust would have minimal impact on the environment and accordingly monitoring was not warranted. All machines used on site are fitted with adequate commercial noise suppression systems to meet normal residential /industrial use standards. Earplugs are available for staff and authorised visitors to use.

All machines are fuelled with diesel which burns to produce water, carbon dioxide, carbon and in most cases, some sulphur based emissions. These are not likely to cause significant problems in the remote open air environment of the Authorisation.

Operators of machinery will minimise risks associated with dust emissions and noise by wearing PPE and ensuring that the work area is located up wind during activities. Dust masks are provided for operators as a matter of standard equipment. Dust suppression of tracks is carried out either by spreading water with loaders or water carts where necessary.

As much of the dust generated by the drilling operation as possible will be collected via cyclone(s) into plastic bags for geological and geochemical sampling. Dust ensuing from the collar or the cyclone chimney will be directed well away from, and downwind of, personnel working in the vicinity of the drill.

Hazardous Materials and Hydrocarbon Management

Hazardous substances likely to be utilised during the drilling program are diesel fuel, engine oil, hydraulic oil, two-part drilling foam and water-soluble detergent-based lubricants for core bit.

Only experienced drilling personnel will be permitted to mix and apply the two-part drilling foam. Diesel will be stored in trailer/truck mounted tanks. Care will be taken to prevent spillage to ground during refuelling operations. All waste oils will be captured in approved receptacles and disposed of off-site in accordance with statutory regulations.

Material Safety Data Sheets which set out properties of the substance, precautions for use, hazard information, first aid requirements, storage and emergency response, so as the substance may be safely handled, stored and used in the workplace, will be held on the drill rig by the drilling contractor for each hazardous substance likely to be utilised during the drilling operations. All hazardous substances are to be stored in original containers and be clearly labelled.

An emergency response plan is provided by the drilling contractor where there is the likelihood of any spills whilst using a hazardous substance on the site.

Bunded pallets are a storage device that Sandfire use to store drums of hydrocarbons so that if a leak should occur it is contained in the catchment area underneath the drums and doesn't spill onto the ground. The volume stored is limited to the rating of the bund to ensure all spillage will be contained. (Figure 19):



Figure 5: Hydrocarbon Management - Bunded Pallets

Spillage from truck mounted tanks will be recorded on an InControl Incident Report. Contaminated soils will be either removed to an approved facility in Katherine, NT for disposal

of hydrocarbon wastes or remediated on site for minor spills. Topsoil will be re-spread as soon as possible after cessation of drilling.

Radiation Management Plan

A radiation management plan, 2013 Sandfire Resources Radiation Management Plan (EXP-EXP-GENM-018 Sandfire Resources NL Radiation Management Plan Exploration Australia - 15 January 2013 (SAN00142035-002)), has been developed and is included in Appendix 4A of the October 2014 MMP Amendment.

5. Environment Rehabilitation

5.0 Exploration Rehabilitation

Status of Current Rehabilitation

Further to the MMP Amendment submitted to the DME in October 2014 and subsequently accepted by the Department, no further field activities have taken place.

Access tracks rehabilitation is not as easily quantified, as tracks are also used by pastoralists and other stakeholders and the general public for tourism. There was agreement reached with the Manager Lorella Springs Pastoral Lease that access tracks upgraded or cleared during 2010 for exploration be left open. The letter of acceptance for liability of access tracks upgraded or cleared during 2010 to Rhett Walker is included in Appendix 5 of this MMP Amendment (5.1 2010 MMP Letter Rhett Walker Lorella Sp Station auth access tracks (SAN00020518).pdf).

Otherwise, after rehabilitation of the drill sites is completed the tracks are allowed to grow over with table drains and whoa-boys put in by contractors where necessary to prevent erosion; this relies on regrowth after each wet season.

Fly exploration camps were the norm during 2004 and 2006 for diamond drilling at Coppermine Creek Prospect, and at Lorella Springs for the 2008 Manganese exploration. More substantial messing and office caravans were utilised at the larger Yalco campsite in 2007 and 2008 for diamond drilling programs, and at the Lorella Springs campsite used for all exploration since 2010. Exploration campsites were left clear at the end of each field season.

Rehabilitation has been carried out following guidelines set out in DME AA7-029_Construction_and_Rehabilitation_of_Exploration_Drill_Sites. Drillholes are initially identified with Hole_ID on a stake at the collar pipe and are capped at hole completion. When rehabilitated, all collar pipes have been cut below ground level and buried. As part of the rehabilitation of all drill sites, drill cuttings and sample bags have been removed.

Rehabilitation of previous disturbance between 2004 and 2013, both for access tracks and drilling, is indicated on photographs provided to the DME. Photographs are labelled with drillhole collar ID, during and after. Photos identified as 'during' show completion of the drill



hole when capped. Those photos labelled 'after' indicate that collars have been cut below surface and pads and sites have been fully rehabilitated.

Natural revegetation is anticipated to occur through the germination of local provenance seed. The Sandfire Field Supervisor carries out inspection of drillhole sites which have been rehabilitated. Drill Site rehabilitation is recorded on the template form for each site and entered into the database. After rehabilitation of the drill sites is completed the tracks are allowed to grow over and table drains and whoa boys put in by contractors where necessary to prevent erosion.

Rehabilitation Activities Conducted

The rehabilitation index plan Figure 3 indicates prospect areas for which the rehabilitation status of drill holes completed in the 2004-2013 period have been rehabilitated.

At the Lorella Exploration Base campsite on EL30137 all above-ground infrastructure, including Sea Containers and equipment, was de-mobilisation over a two week period during July 2014. Photos of the status of the campsite are included in Appendix 5A of the October 2014 MMP Amendment.

Surplus exploration and drilling items not required by Sandfire have been made available to Mr Rhett Walker, Manager of the Lorella Creek Pastoral Lease 757, as indicated in the letters of 31 July 2014, also included in Appendix 5A of the October 2014 MMP Amendment (Sandfire ltr auth to Rhett Walker retain Lorella campsite surplus items July 2014 (SAN00221482-003) and 5A Rhett Walker ltr & fig accept surplus items Lorella campsite July 2014 (SAN00221481-002)).

The letter was resent to Rhett Walker in August 2015, included in Appendix 5A of the 2015 MMP Amendment (5.0 Rhett Walker ltr re surplus items Lorella camp TBA August 2015 (SAN00221481-003).pdf).

No further drilling has been carried out on EL26555 at Hells Gate Prospect during either 2014 or 2015. All prepared sites, completed drill holes (13HGRC001-012) and access tracks were rehabilitated during the first week of September, 2014. After- photographs taken to verify rehabilitation at each hole site were included as 5A RehabStatusTemplate_NT HellsGate Rehab September 2014).xlsx in Appendix 5A of the October 2014 MMP Amendment.

The After- photos have been labelled and included with photos showing access track rehabilitation as a document in Appendix 5A of the 2015 MMP Amendment as 5.0 Hells Gate 2013 RC Rehab Photos 2014 (SAN00261252-002).pdf.

During and after drilling programs, Sandfire commits to the following practices as detailed in Table 9:

- RC percussion chips will be sub-sampled on site by automatic sampling equipment on the drill rig and by manual riffle sampling. RC assay samples will be removed from site and analysed at commercial laboratories in Katherine or Perth.



- Bulk sample residues in plastic bags will be stored systematically either on each drill pad or in a designated sample storage 'dump' until they are of no further use. Excess bulk residues will be buried after they are considered of no further use.
- All drill collars will be cased and capped/sealed near ground level with PVC hole plugs shortly after each hole is completed. This is to allow later access for surveying and possible down-hole geophysical surveying or subsequent drilling. Collars will be plugged and buried in the approved manner when they are no longer required.
- Prior to final exiting of the tenement, all remaining hole collars will be buried in accordance with DME guidelines.
- Drill sumps will be back-filled as soon as practicable after the completion of all drilling operations. If possible sufficient time will be allowed for the pits to largely dry up to prevent overflow of drilling waste products at the time of rehabilitation.
- Drill pads will be restored as near as possible to original land form shape after they are of no further practical use. Access tracks will be protected against erosion by construction of appropriate whoa boys (subject to landowner not requesting they be left in usable condition). In conjunction with input for the pastoral lessee, appropriate channels and bunds will be constructed on pads and access tracks not rehabilitated before the next wet season to prevent erosion.
- The end use of the site is assumed to be a self-sustaining vegetative regime. It is also assumed that fauna will recolonise the land once vegetation is restored. Some tracks in the area were already in existence. Discussions with the landowner will be done prior to closure to determine the end land use.

Topsoil Management

Topsoil disturbance will be minimised. Original profiles will be maintained where possible. Clearing will mainly be limited to the restoration of existing tracks and blade removal of vegetation only. Topsoil from sumps will be stockpiled for correct replacement on completion of activities.

Revegetation Methods

Disturbance involved in AirCore and RAB drilling programs is minimal as existing vegetation is avoided. RC and Diamond drilling requires clearance for access and pads; however it has been observed over a number of field seasons that natural re-colonisation of plants occurs over time particularly if the topsoil is replaced.

Fire Management

Field staff monitors and are aware of fire ban days through Bushfires NT thus ensuring all fire pre-cautions are met. All vehicles and earthmoving equipment are fitted with fire extinguishers. No intentional burning off on the permit has been conducted or is envisaged.

Table 8: Exploration Rehabilitation Table

Disturbance	Rehabilitation Activities	Schedule (Timing)	Closure Objectives / Targets	Monitoring Techniques
Drill holes	When samples have been analysed and there is no requirement to go back down-hole, the holes will be permanently plugged with plastic cones below ground level, backfilled and mounded as per DME Advisory Note AA7-029. If more down-hole activity is proposed temporary caps will be installed.	Holes will be permanently or temporarily capped following cessation of the drilling program.	All holes will be permanently plugged/ capped as per DME Advisory Note AA7-029.	Rehabilitated drill sites will be inspected after 12 months to ensure that the site is safe and stable and that there have not been any hole failures. Remediation of any failures will be undertaken immediately.
Drill pads	Any topsoil that was removed will be re-spread over the pad. Any shrubs or trees that were removed will be placed over the area to provide habitat for small fauna.	The pad may not be rehabilitated immediately after drilling ceases if more down-hole is scheduled. If no further work is proposed the pad will be rehabilitated after drilling ceases as per DME Advisory Note AA7-029.	The drill pad will be rehabilitated after drilling ceases as per DME Advisory Note AA7-029. Drill pads will be left in a safe and stable condition as soon as possible after the end of drilling program.	Rehabilitated drill pads will be inspected after 12 months to ensure that the site is safe and stable and that regrowth on the area is satisfactory.
Sumps	Sumps will not be filled until all water has been pumped out or evaporated.	If no further work is proposed the sump will be rehabilitated after drilling ceases as per DME Advisory Note AA7-029.	The sump will be rehabilitated after drilling ceases as per DME Advisory Note AA7-029. Sumps will be left in a safe stable condition as soon as possible after the end of drilling program.	Rehabilitated sumps will be inspected after 12 months to ensure that the site is safe and stable and that regrowth on the area is satisfactory.
Costeans	None proposed.			
Bulk sample pits	None proposed.			
Tracks / Gridlines	Some new tracks/ gridlines required. Existing tracks to be cleaned up if required using blade-up technique. If compaction occurs they will be ripped prior to closure of the site as per DME Advisory Note AA7-005, unless required to remain in place by the pastoralist.	Tracks/ Gridlines will be rehabilitated as per DME Advisory Note AA7-005 upon closure of the Authorisation unless required to remain in place by the pastoralist.	Tracks will be rehabilitated as per DME Advisory Note AA7-005 unless required to remain in place by the pastoralist.	Rehabilitated tracks will be inspected at after 12 months to ensure that they remain safe and stable and that regrowth on the area is satisfactory.

Disturbance	Rehabilitation Activities	Schedule (Timing)	Closure Objectives / Targets	Monitoring Techniques
Sample bags	Drill cuttings stored in sample bags are stored either on drill pad or at sample farm while drill cuttings are being analysed. Upon completion of this process drill cuttings will be either be removed from sample bag and returned down-hole or buried separately from sample bag at farm pit	Sample bags rehabilitation will be completed within 6 months or at completion of assessment process, whichever occurs sooner.	Empty sample bags down-hole or and remove all bags from site for disposal at approved facility.	Rehabilitated drill pads will be inspected after 12 months to ensure that the site is safe and stable, free from sample bags and that regrowth on the area is satisfactory.
Semi-permanent Camp	Semi-permanent camps would be established with dimensions 100m x 200m for exploration base, and 50m x 50m for contractors, using existing cleared areas and trees for shade and located away from surface water.	Camp site being vacated either at completion of contractor program or at end of the exploration field season will be cleaned up prior to leaving the site.	The camp will be located on previously cleared area. The site will be left clean in readiness for subsequent field seasons.	When contractor program or exploration field season finished site will be inspected after 12 months to ensure that it remained stable and that regrowth on the area is satisfactory.
Camp	Other than base camp small campsites 30m x 30m only are proposed; tents to be established on open areas, no clearing proposed. Domestic rubbish will be removed and disposed of at an approved facility.	Camp site being vacated will be cleaned up prior to leaving the site.	The camp will be located on previously cleared area. The site will be left in "as found" condition.	Camp site will be inspected after 12 months to ensure that they remain safe and stable and that regrowth on the area is satisfactory.

5.1 Costing of Closure Activities

The 2014 MMP Amendment Exploration Security Calculation included in Appendix 5B of the 2015 MMP Amendment (5.1 MMP 0234-04V3 Amend AF7-014 Exploration Security Calculation Tool 2015 (SAN00261254-001).xlsx). This calculation takes into account the demobilisation of above ground infrastructure at the Lorella Exploration Base campsite, and the closure activities required, and the completed rehabilitation at the Hells Gate Prospect of proposed and completed drill hole sites and access.

Previously, the 'Assumptions and Considerations' worksheet indicates that RC drill pads assume average 10mx10m, and DDH pads 10mx20m. These figures were applied to the security calculations of disturbance for 2004 -08 and 2010-2011 exploration operations, but were modified for the 2012 operations to reflect actual pad dimensions of 18m x 15m for RC and 35m x 18m for diamond drilling. Disturbance for sumps was based on actual dimensions of 6m x 3m x 1m depth. RAB / AirCore drill pads were estimated as 8m x 5m. The 2013 RC drilling at Hell's Gate used an estimated 15m x 15m pad dimension.

The 2015 'Assumptions and Considerations' worksheet indicates upgrades to established roads assumed 5m width. Establishment of new RC / DD drillhole access tracks by Sandfire used an estimated 4 metres width track. Camp dimensions were indicated as 100m x 200m for established base camps, such as at Lorella Springs.

The 2016 Security Calculation Estimate is included in Appendix 5 of this MMP Amendment (MMP 0234-04V3 Amend AF7-014 Exploration Security Calculation Estimate 2016 (SAN00261254-004).pdf).

6. PERFORMANCE OBJECTIVES

The Senior Project Geologist, as the Responsible Person, will ensure all Performance Objectives are achieved:

- A formalised written emergency procedures manual prepared and kept in vehicles and in the site office.
- Ensure all employees continue to be fully aware and trained on environmental issues, incidents and procedures.
- Continued monitoring of erosion and weed infestation and ensure prompt action is taken to ratify the situation if any occurs.
- Maintain regular contact with the landowner and Bushfires NT.
- Ensure that once activities have completed on the work area, that these areas are rehabilitated according what has been stated in this MMP.
- Employment and Training: committed to employing and training more indigenous personnel.

Sandfire further commits to provide environmental improvement targets, e.g., reduce dust creation on access tracks by XX% by YYYY, prior to further exploration operations for tenements EL24401, EL26555, EL26587, EL26837 and EL30098 for which Sandfire has responsibility.

