



# Amendment Notice 2

**Licence Number** L8558/2011/1

**Licence Holder** Sandfire Resources NL

**ACN** 105 154 185

**File Number:** 2011/004602

**Premises** DeGrussa Copper-Gold Project  
Mining Tenement 52/1046  
MEEKATHARRA WA 6642

**Date of Amendment** 9 May 2018

## Amendment

The Chief Executive Officer (CEO) of the Department of Water and Environmental Regulation (DWER) has amended the above Licence in accordance with section 59 of the *Environmental Protection Act 1986* (EP Act) as set out in this Amendment Notice. This Amendment Notice constitutes written notice of the amendment in accordance with section 59B(9) of the EP Act.

Date signed: 9 May 2018

**Alana Kidd**

**Manager, Licensing (Resource Industries)**

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

# Definitions and interpretation

## Definitions

In this Amendment Notice, the terms in Table 1 have the meanings defined.

**Table 1: Definitions**

Term	Definition
AACR	Annual Audit Compliance Report
ACN	Australian Company Number
AER	Annual Environment Report
Amendment Notice	refers to this document
Applicant	Sandfire Resources NL
Category/ Categories/ Cat.	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CEO	means Chief Executive Officer. CEO for the purposes of notification means:  Director General Department Administering the <i>Environmental Protection Act 1986</i> Locked Bag 33 Cloisters Square PERTH WA 6850 <a href="mailto:info@dwer.wa.gov.au">info@dwer.wa.gov.au</a>
Delegated Officer	an officer under section 20 of the EP Act
Department	means the department established under section 35 of the <i>Public Sector Management Act 1994</i> and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986</i> (WA)
EP Regulations	<i>Environmental Protection Regulations 1987</i> (WA)
Existing Licence	The Licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of and during this Amendment Notice.
Licensee	Sandfire Resources NL
Licence Holder	Sandfire Resources NL

L/s	litres per second
mg/L	milligram per litre
mbgl	metres below ground level
mbtoc	metres below top of collar
m/s	metres per second
Occupier	has the same meaning given to that term under the EP Act.
Prescribed Premises	has the same meaning given to that term under the EP Act.
Premises	refers to the premises to which this Decision Report applies, as specified at the front of this Decision Report.
Risk Event	as described in <i>Guidance Statement: Risk Assessment</i>
Sandfire	Sandfire Resources NL
TDS	Total Dissolved Solids
tpa	tonnes per annual period
TSF	tailings storage facility
µg/L	microgram per litre

## Amendment Notice

This amendment is made pursuant to section 59 of the *Environmental Protection Act 1986* (EP Act) to amend the Licence L8558/2011/1 issued under the EP Act for a prescribed premises as set out below. This notice of amendment is given under section 59B(9) of the EP Act.

This notice is limited only to an amendment for Categories 5, 6 and 52. No changes to the aspects of the existing Licence relating to Categories 54 or 64 have been requested by the Licence Holder.

The following guidance statements have informed the decision made on this amendment:

- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessment (February 2017)*
- *Guidance Statement: Environmental Siting (November 2016)*

## Amendment description

Sandfire Resources NL (Sandfire) (Licence Holder) (Applicant) submitted an application to amend Licence L8558/2011/1 on 25 October 2017 for the installation of a new thickener and filter at the existing Category 5 ore processing plant. The application also included a partial Compliance Report for Works Approval W5866/2015/1 for installation of the Central Discharge dewatering point and associated pipework; and a Compliance Report for Licence L8558/2011/1 for the installation of additional generators at the existing DeGrussa Power Station.

On 8 February 2018, Sandfire submitted a further application to amend the Licence for deeper TSF monitoring bores that have been installed to replace bores that have run dry due to dewatering operations.

Both applications are assessed in this Amendment Notice.

## Background

Existing facilities at DeGrussa include: open pit and underground mine, Integrated Waste Landform incorporating a Waste Rock Landform and Tailings Storage Facility (TSF), Run of Mine (ROM) pad, Processing Plant with Concentrator, processing reagents, paste plant, water storage ponds, power station, batch plant, workshops, diesel storage, washdown facilities, waste water treatment plant, reverse osmosis plant, offices, warehouses, accommodation village and an aerodrome.

## Category 5

Sandfire mines ore at the DeGrussa Project and processes ore at a crushing and screening plant, and flotation circuit to produce copper product. A small amount of ore is also sent to the nearby Plutonic Gold Mine for processing to produce gold.

Tailings are discharged to a TSF which is lined with compacted clay and synthetic liner, and has been constructed to a permeability of  $1 \times 10^{-10}$  metres per second (m/s).

Sandfire intends to process a higher grade ore sourced from the Monty deposit at the DeGrussa Processing Plant (DeGrussa) and proposes to install a larger thickener and filter to increase the grade and volume of the concentrate produced. Ore from the Monty Project will be trucked in to the DeGrussa premises and stored on the DeGrussa ROM Pad prior to processing. The mill throughput will remain the same.

There will be no change to the reagent suite currently used, but there will be a slight increase in reagent volume in the flotation process when Monty ore treatment commences.

The location of the proposed thickener and filter is shown in Figure 1 below. Figure 2 is a process flow diagram of the thickener and filtration process.

The current 14 m diameter thickener will be replaced by an 18 m diameter thickener in order to increase tonnage concentrate handling ability from 285 kilotonnes (kt) to 400 kt. The thickener is an in-process unit operation taking final concentrate from 20% solids feed to 65% solids, discharging into the existing filter feed tank. The thickener will be located within a concrete bund. Overflow water within the thickener will be returned to the process water tank for re-use in the process plant.

An additional concentrate filter (capable of 26 tonnes per hour) will be installed to complement the existing filter. It will be integrated with the northern end of the existing Concentrate Shed by approximately 18 m and will maintain the current design intent. The new filter will include a fully bunded concrete floor.

The key equipment to be installed is:

- 18 m diameter thickener;
- 2 x peristaltic hose pumps;
- 1 x 40 plate filter press; and
- 1 x 200 kW compressor.

There is no change in the TSF storage capacity or life. The current and expected tailings deposition rate into the TSF is 1.6 Mtpa at a slurry density of +60% solids by weight. Tailings deposition strategy, including freeboard, remains the same.

#### Geochemical assessment of DeGrussa and Monty tailings

An extract from Mining Proposal Reg. ID 66481 below, describes the geochemical assessment of DeGrussa and Monty tailings.

*Geochemical characterisation and assessment of two tailings samples from DeGrussa was undertaken during 2010 (MBS, 2011), while assessment of four tailings samples from the proposed Monty Project was conducted in 2016 (MBS, 2016). These samples represent tailings that will be generated by processing ores from the DeGrussa and Monty orebodies through the DeGrussa concentrator.*

*Analysis of the results (MBS, 2016) found that:*

- *The DeGrussa tailings contained much higher total sulphur concentrations (30.4% to 33.1%) than the Monty tailings (2.19% to 19.7%).*
- *Acid Neutralising Capacity (ANC) values for Monty tailings were moderate, ranging from 38-134kg H<sub>2</sub>SO<sub>4</sub>/t compared to the DeGrussa tailings. Calcite carbonate minerals were the dominant contributor to measured ANC.*
- *Concentrations of the major rock-forming elements (aluminium, calcium, iron, magnesium, potassium and sodium) indicated no significant enrichment for Monty tailings. DeGrussa tailings contained higher iron concentrations. Higher iron concentrations in the DeGrussa tailings are associated with elevated pyrite (FeS<sub>2</sub>) content (MBS, 2011) (Table 3.2).*
- *With the exception of bismuth, concentrations of the chalcophile elements in Monty tailings samples were significantly lower than concentrations present in more sulphidic DeGrussa tailings (Table 3.2).*
- *Average concentrations of barium, chromium, manganese, nickel, uranium and vanadium were higher in Monty tailings compared to DeGrussa tailings (Table 3.2).*

**Table 3.2: Geochemical Analysis of Monty and DeGrussa Tailings**

<i>Element</i>	<i>Unit</i>	<i>Monty</i>		<i>DeGrussa</i>	
		<i>Min</i>	<i>Max</i>	<i>Min</i>	<i>Max</i>
<i>Silver, Ag</i>	<i>mg/kg</i>	1.5	9.0	9.9	12.7
<i>Aluminium, Al</i>	<i>%</i>	4.1	7.8	0.48	0.67
<i>Arsenic, As</i>	<i>mg/kg</i>	73	773	1,370	1,490
<i>Barium, Ba</i>	<i>mg/kg</i>	182	296	12.3	14.6
<i>Bismuth, Bi</i>	<i>mg/kg</i>	18.6	61.1	33.2	42.4
<i>Calcium, Ca</i>	<i>%</i>	0.84	5.1	2.2	3.2
<i>Cadmium, Cd</i>	<i>mg/kg</i>	0.27	9.02	29	32
<i>Cobalt, Co</i>	<i>mg/kg</i>	66	230	251	414
<i>Chromium, Cr</i>	<i>mg/kg</i>	283	493	341	351
<i>Copper, Cu</i>	<i>mg/kg</i>	256	3,200	4,800	10,400
<i>Iron, Fe</i>	<i>%</i>	11.2	19.4	35.8	39.2
<i>Potassium, K</i>	<i>%</i>	0.89	1.58	0.066	0.073
<i>Magnesium, Mg</i>	<i>%</i>	1.6	5.4	1.4	1.5
<i>Manganese, Mn</i>	<i>mg/kg</i>	1,200	2,700	1,000	1,300
<i>Molybdenum, Mo</i>	<i>mg/kg</i>	39	67	79	83
<i>Sodium, Na</i>	<i>%</i>	0.56	1.38	0.031	0.036
<i>Nickel, Ni</i>	<i>mg/kg</i>	231	336	256	276
<i>Lead, Pb</i>	<i>mg/kg</i>	268	2,250	2,290	2,850
<i>Antimony, Sb</i>	<i>mg/kg</i>	3.1	44.6	85	100
<i>Selenium, Se</i>	<i>mg/kg</i>	18	93	75	130
<i>Tellurium, Te</i>	<i>mg/kg</i>	6.7	22.9	nm	nm
<i>Thorium, Th</i>	<i>mg/kg</i>	3.4	8.8	nm	nm
<i>Uranium, U</i>	<i>mg/kg</i>	2.1	3.4	1.4	1.7
<i>Vanadium, V</i>	<i>mg/kg</i>	95	162	19	25
<i>Zinc, Zn</i>	<i>mg/kg</i>	300	3,560	11,000	12,000

**Implications for Tailings Management**

Results from the tailings characterisation investigations indicate that Monty tailings have similar properties to the DeGrussa tailings, but are less sulphidic and generally contain lower concentrations of chalcophile metals and metalloids. Both sources of tailings are potentially acid forming (PAF). MBS (2016) concluded that Monty tailings are considered to be geochemically compatible with the DeGrussa tailings and co-disposal in the lined DeGrussa TSF is an appropriate means of controlling potential environmental risks.

The addition of tailings from Monty (21% of the total) is not expected to have any significant additional impacts on the overall geochemistry of the system

**Tailings Storage Capacity**

The 5 million tonne capacity of the TSF has been over-designed with the intent to store tailings from

*additional reserves (i.e. Monty). The storage capacity of the TSF is adequate for the additional deposition of tailings from the proposed Monty Project, as DeGrussa ore production will be gradually decreasing as the mine moves towards closure (2021).*

The risk of TSF overflow and pipeline failure essentially remains the same and has not been reassessed for this amendment.

#### Monitoring bores

TSF monitoring bores TMB01, TMB04, TMB05, TMB07, and TMB08 have run dry due to dewatering activities. New monitoring bores have been drilled at a depth of 100 metres (m) in the vicinity of the existing bores to enabling sampling and analysis of water quality. The new bores have been named TMB01B, TMB04B, TMB05B, TMB07B, and TMB08B. TMB006 remains the same.

### **Category 6**

Dewatering at the Project is by a number of sumps located in the underground mine, an open pit sump, and a dewatering bore (DWB012). Water from the underground sumps is either directed to the open pit for temporary storage to use as process water and for dust suppression, or is directed to the underground settlement ponds before being discharged to the North Creek discharge point. DWB012 intersects a dolomite fractured aquifer in the underground mine. Water from DWB012 is pumped directly via an existing pipeline to the North Creek discharge point.

Sandfire Resources is currently licensed to discharge up to 2,000,000 tonnes per annual period. Total dewater discharged to North Creek in 2015 was 377,133 tonnes, and in 2016 was 79,732 tonnes.

#### L8558/2011/1 Amendment 20 November 2014 – category 6

Inflows into the underground mine were originally anticipated to peak at 50 L/s. In late 2014 however, a fractured rock permeable dolomite unit was intersected at the footwall of the orebody in the underground mine during production drilling, with resultant in inflows of up to 160 L/s in November and December 2014.

To enable safe mining to continue, an amendment to the Licence was issued on 20 November 2014 to construct additional pipelines to enable a discharge rate of 200 L/s. The additional pipelines to North Creek have been constructed and are in operation when dewatering is required.

Dewatering returned to original levels (30 – 40 L/s) with discharge to North Creek minimised and water used preferentially in the process circuit.

#### W5866/2015/1 – category 6

The potential for intercepting another fractured dolomite unit during operations remained, and Sandfire applied for a works approval to increase the approved dewatering from 2,000,000 tonnes per annum (tpa) to 3,000,000 tpa and for additional discharge points at Central Drainage and John's Creek, in order to reduce potential impacts to North Creek.

Works Approval W5866/2015/1 was issued on 15 October 2015 for construction of the proposed pipelines and discharge points as shown in Figure 3 below. The following information is from the W5866/2015/1 Decision Document:

*“Groundwater quality at the Project is generally fresh to slightly brackish, neutral to slightly alkaline with a naturally high nitrate/nitrite concentration. Water from the open pit (up to 12 L/s) has a slightly higher salinity level due to pit wall washing and evaporation concentration. However, this is not expected to have an impact because it will be combined with the fresher groundwater at the discharge location.*

With exception of selenium, heavy metal and metalloid concentrations are well below guideline values (ANZECC 2000 for Livestock and Fresh Water) with most below detectable limits. The pit water selenium concentrations are twice as high as both guideline values. However the ferruginous soil type at the Project is expected to remove most of the selenium by surface adsorption.

Water quality parameter results for North Creek Discharge during 2014 are provided in Table 2 and 3.

**Table 2: Water Quality results for North Creek Discharge**

Analyte	Apr-14	Jun-14	Aug-14	Dec-14
TSS (mg/L)	BLD	127	BLD	17
Acidity (mg/L)	BLD	3	5	BLD
NO <sub>3</sub> (mg/L)	44	52	53	52
Sulfate (mg/L)	160	250	240	320
Arsenic (mg/L)	BLD	BLD	BLD	BLD
Cadmium (mg/L)	BLD	BLD	0.0002	BLD
Chromium (mg/L)	BLD	0.003	0.002	0.003
Copper (mg/L)	BLD	0.0025	BLD	0.061
Lead (mg/L)	BLD	BLD	BLD	BLD
Selenium (mg/L)	BLD	0.0045	0.004	0.0045
Zinc (mg/L)	BLD	-	0.01	0.07
TRHC	BLD	BLD	BLD	BLD

BLD means below level of detection

Water quality results for pH and TDS analysis for samples taken from DWB12, the underground settlement ponds (underground and pit water combined) and the discharge to North Creek is provided in Table 3. The TDS of water from the underground mine increased slightly when the fractured dolomite unit was intercepted however this has now reduced.”

**Table 3: pH and TDS results for North Creek discharge point; underground settlement ponds; and dewatering bore DWB012.**

Date	pH			TDS (mg/L)		
	Discharge Point	Settlement Ponds	DWB12	Discharge Point	Settlement Ponds	DWB12
Apr - 2014	7.99	-	7.99	970	-	970
Jun - 2014	7.95	8.1	7.9	1,420	3,400	860
Aug - 2014	7.6	8	8.3	900	2,600	820
Dec - 2014	8.4	-	7.7	1,600	1,500	770

Monitoring results for discharge to North Creek for the 2016 annual period (shown in table 2 below) indicated that dewater quality is within the ANZECC 2000 Guidelines for cattle consumption, with the exception of Selenium; and above the ANZECC 2000 Guidelines 95% metals and metalloid trigger values for slightly disturbed freshwater systems.

**Table 2: Monitoring results for dewatering discharge at North Creek**

Parameter	ANZECC 2000 95% trigger values fresh water (mg/L)	ANZECC 2000 cattle drinking water trigger values (mg/L)	Monitoring results (2016 quarterly sampling) (mg/L)
Arsenic	0.024	0.5	0.003-0.009
Cadmium	0.0002	0.01	0.0001-0.0006
Chromium	0.001	1	0.001
Copper	0.0014	1	0.008-0.015
Lead	0.0034	0.1	<0.01
Selenium	0.011	0.02	0.016-0.046
Zinc	0.008	20	0.004-0.026
TDS	-	4,000	260-2,400
Nitrate	700	400	17-21

Sandfire has submitted a partial Compliance Report for construction of the infrastructure required for dewater discharge to the Central Drainage discharge point, (location as shown in Figure 4 below). Infrastructure for discharge to John's Creek has not yet been completed (W5866/2015/1 Compliance Report, 2017).



## Category 52

The Licence was amended on 18 November 2017 to include installation, commissioning and operation of an additional two x 2 Megawatt (MW) diesel power generation units and increase the limit of the Category 52 capacity to 23 MW in aggregate.

Sandfire submitted a compliance report for construction of the two power units as part of this Application for licence amendment.

Commissioning of the new generators commenced at the end of October 2017. Condition 4.2.4 required submission of a commissioning report within three months of completion of commissioning. Sandfire notified DWER that the completion of the report had been delayed by the power station emissions monitoring program as one of the new generators suffered an electrical fault immediately prior to monitoring commencing. The monitoring was completed in late February 2018 and the Commissioning Report was submitted to DWER on 13 March 2018.

The engine manufacture has design engine performance specifications determined under ideal and controlled conditions for these units. Table 3 below outlines these specifications.

**Table 3: Power plant performance specifications**

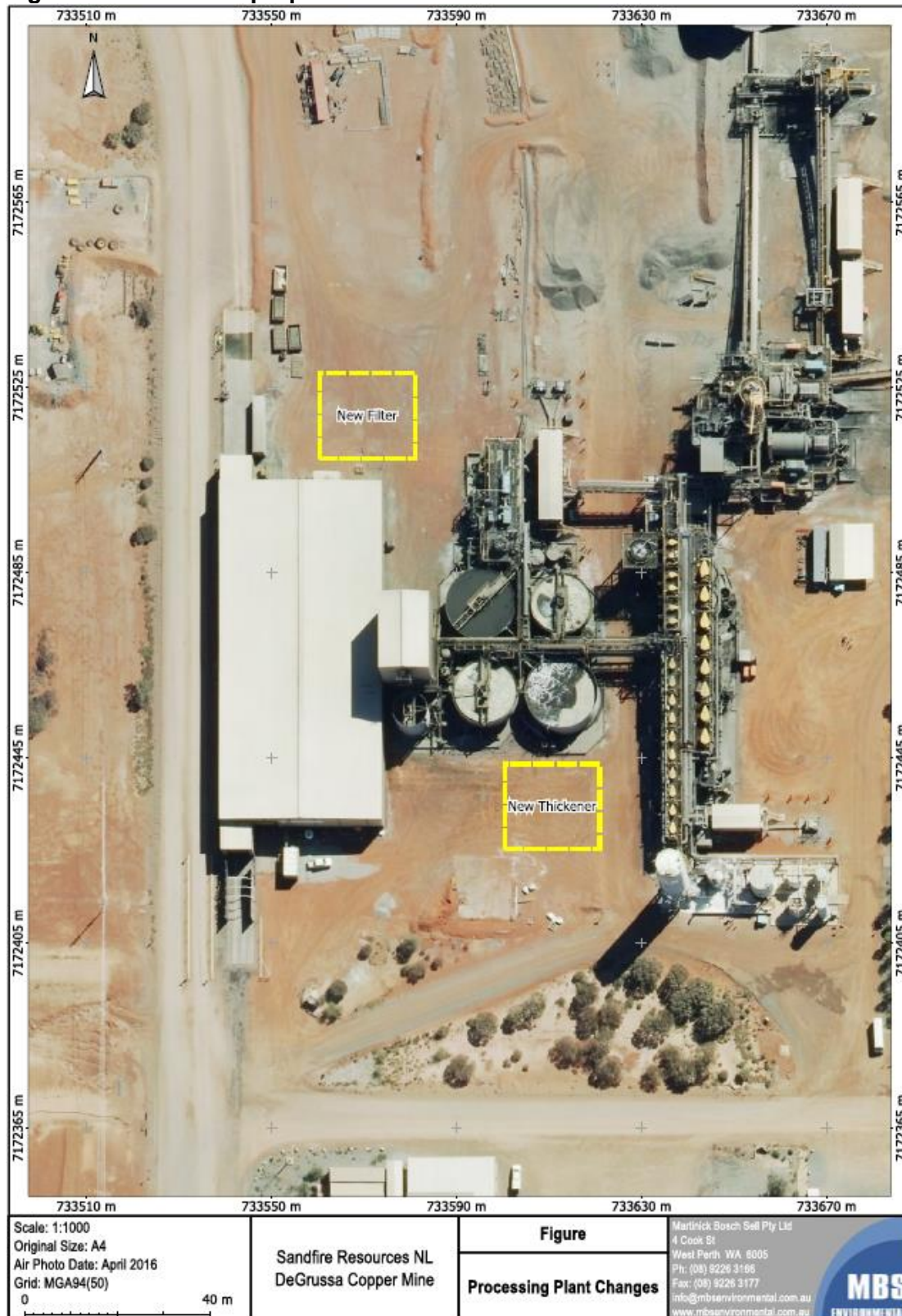
<i>Cummins Specifications @ 1500RPM</i>	<i>Unit of measure</i>	<i>Method</i>	<i>Specification (at 5 % Oxygen reference)</i>
<i>NOx (as NO<sub>2</sub>)</i>	<i>mg/m<sup>3</sup></i>	<i>ISO 8178-1</i>	<i>4500</i>
<i>CO</i>	<i>mg/m<sup>3</sup></i>	<i>ISO 8178-1</i>	<i>1300</i>
<i>SO<sub>2</sub></i>	<i>mg/m<sup>3</sup></i>	<i>ISO 8178-1</i>	<i>57</i>

Table 4 below outlines a summary of the performance measured on each unit.

**Table 4: Power Units 13 & 14 – performance results**

<i>Parameter</i>	<i>Units</i>	<i>Method</i>	<i>Generator (2000 kW)</i>	
			<i>13</i>	<i>14</i>
<i>Operating conditions during testing</i>	<i>kW</i>	<i>-</i>	<i>1850</i>	<i>1850</i>
<i>Oxides of nitrogen at 5% O<sub>2</sub></i>	<i>mg/m<sup>3</sup></i>	<i>US EPA Method 7E</i>	<i>4,674</i>	<i>5,252</i>
<i>Oxides of sulfur at 5% O<sub>2</sub></i>	<i>mg/m<sup>3</sup></i>	<i>US EPA Method 6C</i>	<i>&lt; 4.4</i>	<i>&lt; 3.9</i>
<i>Carbon monoxide at 5% O<sub>2</sub></i>	<i>mg/m<sup>3</sup></i>	<i>USEPA Method 10</i>	<i>1,569</i>	<i>1,521</i>
<i>In Stack Moisture</i>	<i>vol-%</i>	<i>USEPA Method 4</i>	<i>10.4</i>	<i>9.7</i>
<i>Total engine exhaust gas flow rate</i>	<i>Nm<sup>3</sup>/min</i>	<i>USEPA Method 2</i>	<i>118</i>	<i>138</i>
<i>In Stack temperature</i>	<i>°C</i>	<i>USEPA Method 2</i>	<i>363</i>	<i>370</i>
<i>Combustion Efficiency</i>	<i>%</i>	<i>Calculated</i>	<i>98.85</i>	<i>98.76</i>

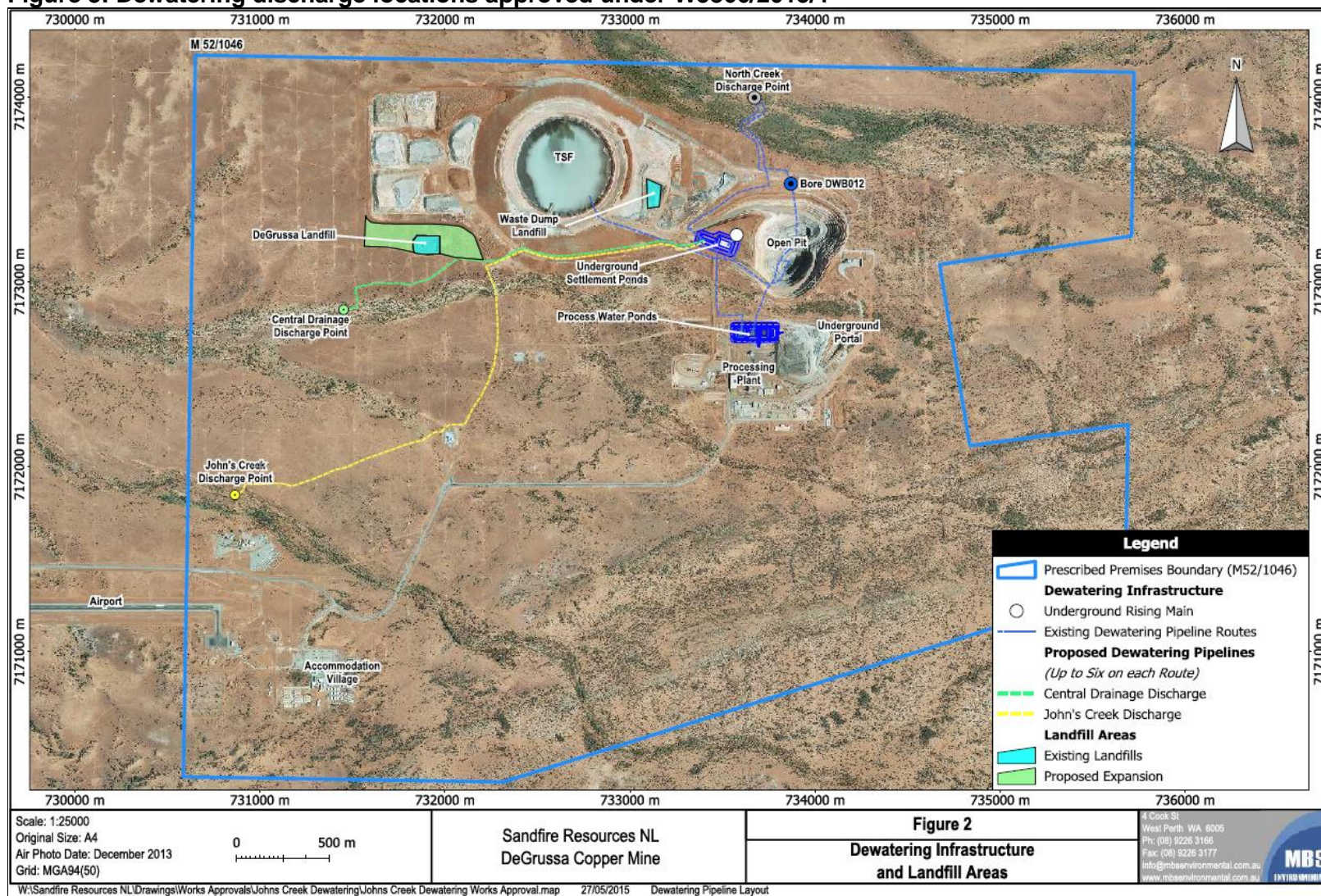
**Figure 1: Location of proposed new thickener and filter**



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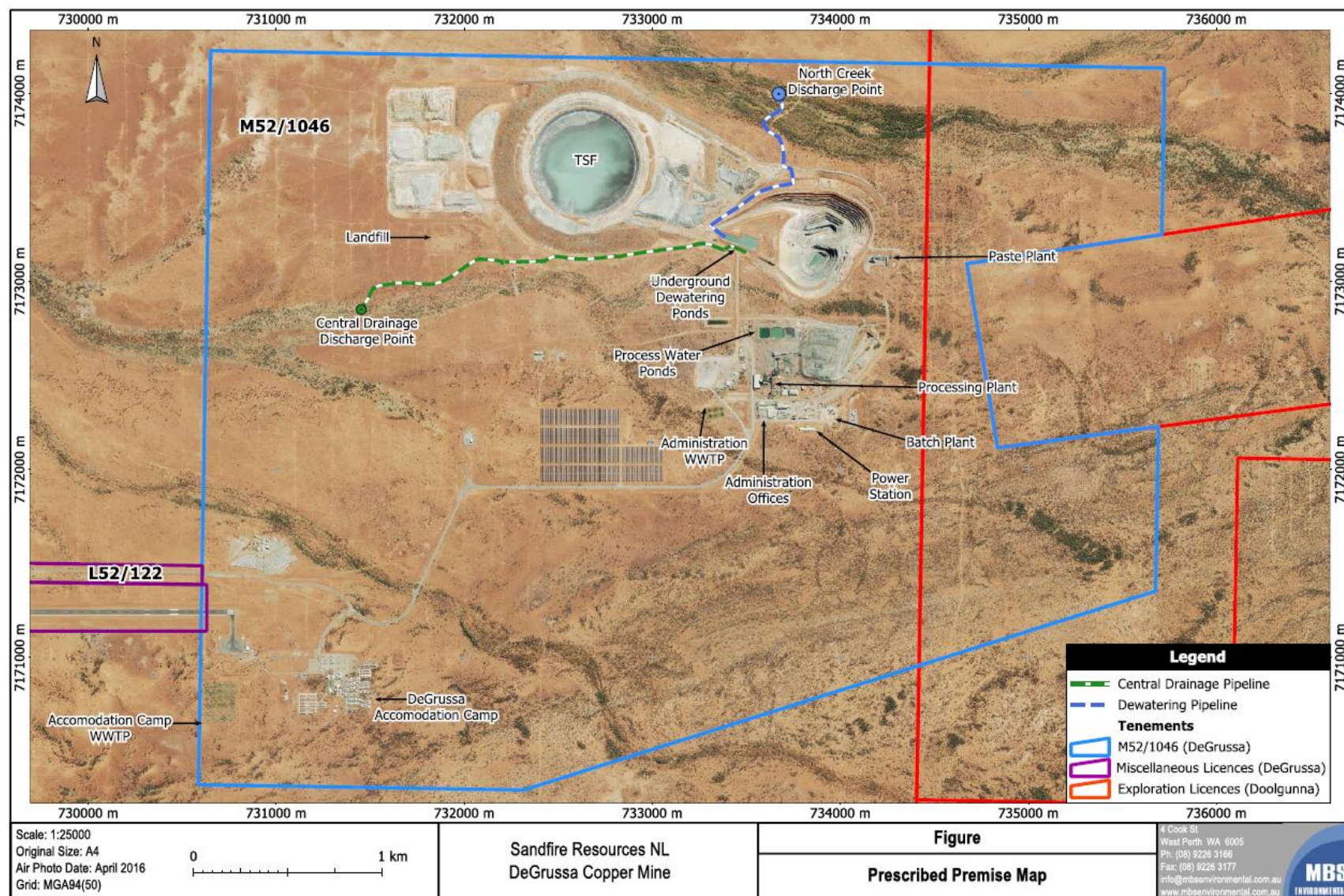


**Figure 3: Dewatering discharge locations approved under W5866/2015/1**





**Figure 4: Dewatering and discharge locations constructed, and associated ponds**



Licence: L8558/2011/1

## EP Act Part V – licences and works approvals

Table 5 provides the history of works approvals and licences for the premises.

**Table 5: History of Instruments issued**

Instrument	Commenced	Description
L8558/2011/1	23/06/2011	New Application - Category 54
W4960/2011/1	7 July 2011	New Application for Works Approval – Categories 5, 52 and 73
L8558/2011/1	9/02/2012	Amended to include category 5, 6, and 64
L8558/2011/1	22/11/2012	Licence amendment – Administration error
L8558/2011/1	9/05/2013	Licence amendment – Increase category 6 throughput
L8558/2011/1	20/06/2013	Licence amendment – Change to monitoring targets
L8558/2011/1	1/08/2013	Licence amendment – Increase category 6 throughput
W5697/2014/1	18/08/2014	New application for works approval – Category 6 and 64
L8558/2011/1	9/10/2014	Licence amendment – REFIRE format conversion and incorporate changes from completed works under W5697/2014/1.
L8558/2011/1	27/11/2014	Licence amendment – construction of additional dewater pipelines to provide for discharge up to 200 L/s.
W5866/2015/1	19/10/2015	New works approval – increase cat 6 throughput and additional dewater discharge points to Central Drainage and John's Creek, and expansion of the landfill.
L8558/2011/1	3/12/2015	Licence amendment – to increase category 5 throughput and installation of synthetic liner to the TSF
L8558/2011/1	26/04/2016	Notice of Amendment to extend licence duration to 23/12/2026
L8558/2011/1	18/09/2017	Amendment Notice to increase Category 52 design/production to 23 MW by additional of 2 x 2 MW power units.
L8558/2011/1	9/05/2018	Amendment Notice 2 to include dewatering discharge to Central Creek, installation of deeper replacement TSF monitoring bores.

## Other approvals

The Licence Holder has provided the following information relating to other approvals as outlined in Table 6.

**Table 6: Relevant approvals**

Legislation	Number	Approval
<i>Mining Act 1978</i>	Mining Proposal Reg. ID 55067 (Additional Infrastructure and Dewatering Changes)	Approved September 2015 Construction of Central Drainage and John's Creek discharge lines.
	Mining Proposal Reg. ID 64481	Approved April 2017

	(Revised ROM Pad Ramp and Minor Infrastructure)	
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## Location and receptors

Table 7 below lists the closest sensitive land uses to the Prescribed Premises.

**Table 7: Receptors and distance from activity**

Residential and sensitive premises	Distance from Prescribed Premises
Doolgunna station homestead	18 km south west of the premises
Meekatharra	150 km south of the premises

Table 8 below lists environmental receptors and distances from the Prescribed Premises.

**Table 8: Environmental receptors and distance from activity boundary**

Environmental receptors	Distance from Prescribed Premises
Parks and Wildlife Managed Lands and Waters	The Premises is on unallocated crown land (Former Doolgunna station) that is proposed for addition to the conservation estate.
Priority 1 Threatened Ecological Communities and Priority Ecological Communities	Located approximately 3.5 km west of the premises.
Threatened/Priority Flora	The nearest record of priority flora is located approximately 8 km to the south east of the premises.
Threatened/Priority Fauna	The nearest record of threatened or priority fauna is located approximately 46 km to the north east of the premises.
Surface water bodies	The nearest water body is the Gascoyne River located 40 km away.  Three weakly incised drainage systems on the Premises drain west northwest into an ephemeral tributary of the Gascoyne River.
Groundwater (suitable for stock drinking water )	10 – 17 metres below ground level (mbgl)

## Hydrogeology

The hydrogeology of the Project area is characterised by low permeability saprolite clays and bedrock with only minor fracturing. There are no clear continuous aquifers in the region, with only one highly constrained and localised higher permeability zone (referred to as the Caprock aquifer). All localised aquifers that have been identified are categorised as the fractured rock type. However, the term aquifer is probably not appropriate given the permeability and constrained nature. All units in the area are more correctly referred to as aquitards. Fractured rock aquifers at the Project occur within caprock at depths of 40 to 50 m.

Standing water levels are approximately 10 – 17 mbgl.



## Surface Water

The following information is from W5866/2015/1 and its Application documents.

*“There are no permanent water bodies, wetlands or groundwater dependent ecosystems near the Project. The nearest water body is the Gascoyne River located 40 km away. The Project’s surface water catchment consists of three weakly incised drainage systems that drain west northwest into an ephemeral tributary of the Gascoyne River (Figure 1 below). These are:*

- John’s Creek – In some parts the creek has a clearly defined channel ranging from 10-15 m wide with 1-2 m high banks. At the discharge point, the creek is quite braided and shallow and is over 100 m wide. The creek channel comprises mostly colluvium material, although runoff can accumulate in pools where rock outcrops to surface. The main channel length is 10.2 km.*
- Central Drainage – This ephemeral drainage comprises several poorly defined and relatively minor drainages that collect runoff from the central part of the Project. Central Drainage does not have a clearly defined channel within the site boundaries and is really only discernible by the presence of denser vegetation and slightly depressed ground elevation. Central Drainage has an inferred channel length of 5.8 km.*
- North Creek – This is the most significant of the ephemeral watercourses and is 200 to 300 m wide overall with numerous braided shallow channels, most of which are relatively densely vegetated. Main channel length is 16.2 km.*

*The above mentioned creeks, generally referred to as drainage channels, are dry for the majority of the time and carry runoff following significant storm events during the summer months when the potential exposure to high intensity cyclonic rainfall is greatest. On average these types of events occur only a couple of times a decade.”*

## Meteorology

The premises is located in a semi-arid environment. Average maximum temperatures vary between 19.0 and 38.3°C. High evaporation rates (3,000 mm per year) are experienced in this region.

Rainfall is low and variable and many years without significant rainfall occur. Most rain falls in episodic events from scattered thunderstorms or tropical cyclone depressions. Large volumes of rainfall are possible in short periods.



## Risk assessment

Table 9 below describes the Risk Events associated with the amendment consistent with the *Guidance Statement: Risk Assessments*. The table identifies whether the emissions present a material risk to public health or the environment, requiring regulatory controls.

**Table 9: Risk assessment for proposed amendments during operation**

Risk Event						Consequence rating	Likelihood rating	Risk	Reasoning
Source/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts				
<b>Cat 5</b> Processing or beneficiation of metallic or non-metallic ore	Overflow of new thickener bund/failure of thickener	Processing liquor containing metals and metalloids	Soils, and adjacent vegetation	Direct discharge to land along flow path	Contamination of soils with uptake of toxicants by vegetation	<b>Minor</b>  Low level on-site impacts	<b>Unlikely</b>  The risk event will probably not occur in most circumstances.	<b>Medium</b>	There are no threatened communities or species within 3.5 km.  The nearest water body is the Gascoyne River located 40 km away. Minor ephemeral creek and drainage lines run through the premises to a tributary of the Gascoyne River.  <u>Applicant controls</u> <ul style="list-style-type: none"> <li>The thickener and filter will be located within the existing process plant footprint, which comprises a bunded hardstand area with drainage reporting to sumps and a sedimentation pond.</li> <li>The thickener will be located within a concrete bund. Overflow water within the thickener will be returned to the process plant for re-use within the treatment plant.</li> <li>The filter will be integrated into the Concentrate Shed and include a fully bunded concrete floor.</li> </ul> <u>Operation - Regulatory controls</u>

									The <i>Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)</i> will apply.
	Deposition of Monty tailings mixed with DeGrussa tailings to existing TSF	Tailings leachate	Groundwater	Seepage through the base of TSF and infiltration through ground.	Contamination of water of quality suitable for stock watering.	<b>Moderate</b>  Low-level off site impacts	<b>Unlikely</b>  The risk event will probably not occur in most circumstances.	<b>Medium</b>	<p>Groundwater quality is such that it is suitable for stock watering.</p> <p>Groundwater is approximately 10 – 17 mbgl. Fractured rock aquifers at the Project occur within caprock at depths of 40 to 50 m.</p> <p>Results from the MBS (2011) and MBS (2016) tailings characterisation indicate that Monty tailings have similar geochemical properties to the DeGrussa tailings, but are less sulphidic and generally contain lower concentrations of chalcophile metals and metalloids, and higher concentrations of tellurium, thorium, uranium, and vanadium. (Mine Proposal Reg. ID 66481).</p> <p>Sandfire has installed groundwater monitoring bores drilled to 100 m at the TSF, as the existing licence bores have dried up.</p> <p><u>Applicant controls</u></p> <ul style="list-style-type: none"> <li>• The TSF is lined with compacted clay and artificial liner, and has a stated permeability of <math>1 \times 10^{-10}</math> m/s.</li> <li>• The TSF has been constructed with an underdrainage water collection system installed</li> </ul>

									<p>across the perimeter base.</p> <p><u>Existing Licence Regulatory Controls</u></p> <ul style="list-style-type: none"> <li>• Condition 1.3.4 requires the TSF to achieve a permeability of <math>1 \times 10^{-9}</math> m/s.</li> <li>• Condition 3.5.1 requires groundwater monitoring to detect seepage from the TSF.</li> </ul>
		Pipeline failure—uncontrolled discharge of tailings contaminated with metals and metalloids and salts.	Soils and vegetation	Direct discharge - flow path spill.	<p>Inundation of native vegetation.</p> <p>Contamination of soils with uptake of toxicants by vegetation</p>	<b>Minor</b> Low level on site impacts	<b>Unlikely</b> The risk event will probably not occur in most circumstances.	<b>Medium</b>	<p>There are no threatened ecological communities or species within 3.5 km.</p> <p>The nearest water body is the Gascoyne River located 40 km away. Minor ephemeral creek and drainage lines run through the premises to a tributary of the Gascoyne River.</p> <p><u>Applicant and Existing Licence Controls</u></p> <ul style="list-style-type: none"> <li>• Condition 1.3.6 requires daily inspection of tailings and return pipelines with corrective action for adverse environmental effects.</li> <li>• Condition 1.3.7 requires pipelines to be equipped with telemetry, automatic cutoffs, or secondary containment.</li> </ul>
<b>Cat 6</b> Mine dewatering	Mine dewater discharged to Central Creek	<p>Increased water in the creek system</p> <p>Alteration of surface water quality by groundwater</p>	<p>Riparian ecosystems</p> <p>Central Drainage soils and native vegetation, and fauna by food chain.</p>	Flow path along creek bed.	Pooling and/or erosion of creek bed with potential for movement of sediment, conditions for weeds, and decline and death of native	<b>Moderate</b>  Mid-level on site impacts	<b>Unlikely</b>  The risk event will probably not occur in most circumstances.	<b>Medium</b>	<p>Impacts will be localised.</p> <p>There are no threatened communities or species within 3.5 km. The majority of the vegetation surrounding the discharge point is Acacia scrubland. These species are likely to adapt to changes in water availability. An</p>

					vegetation				<p>assessment at the North Creek discharge indicates impact has been both positive and negative on the health of <i>Acacia aneura</i>, depending on the location of the site.</p> <p><u>Applicant controls</u></p> <ul style="list-style-type: none"> <li>• The discharge pipe is pierced, and rock riffle has been installed to reduce discharge water velocity.</li> <li>• Discharge points will be inspected weekly when dewatering is occurring.</li> <li>• Discharge will be alternated between North Creek and Central Drainage to better manage risk.</li> <li>• Vegetation is monitored biannually providing information for change of management controls if required.</li> </ul> <p><u>Existing Licence Regulatory Controls</u></p> <ul style="list-style-type: none"> <li>• Condition 2.3.3 requires the discharge of mine dewatering in a manner which minimises erosion and scouring impacts, and reduces the likelihood of surface ponding.</li> <li>• Condition 3.3.1 requires continuous recording of volumetric flow rate to North Creek discharge point. This condition will be amended to include the Central Drainage discharge point.</li> </ul>
		Mine dewater with elevated	Riparian ecosystems.	Flow path along the	Contamination of soils with	<b>Minor</b> Low level on	<b>Unlikely</b> The risk event	<b>Medium</b>	There are no threatened communities or species within

		metals /metalloids and salts.	Central drainage soils and native vegetation.	creek bed.	uptake of toxicants by vegetation and bioaccumulation in fauna food chain.	site impacts	will probably not occur in most circumstances	<p>3.5 km.</p> <p>The nearest water body is the Gascoyne River located 40 km away. Central Drainage drains to a tributary of the Gascoyne River.</p> <p>Monitoring results for Discharge to North Creek for 2016 indicated that dewater quality is within the ANZECC 2000 Guidelines for cattle consumption, with the exception of selenium, and above the ANZECC guidelines metals and metalloid trigger values for 95% protection freshwater slightly-disturbed systems.</p> <p><u>Applicant controls</u></p> <ul style="list-style-type: none"> <li>• Dewater passes through settling sumps and ponds prior to discharge.</li> <li>• The discharge point at Central Drainage has been constructed to enable lowering risks at North Creek by splitting the discharge.</li> </ul> <p><u>Existing Licence Regulatory Controls</u></p> <ul style="list-style-type: none"> <li>• Condition 3.3.1 requires quarterly monitoring of dewater discharge to North Creek.</li> <li>• Condition 2.3.2 provides a limit for TDS of 3,500 mg/L for mine water discharge to North Creek.</li> </ul> <p>These conditions will be amended to include Central Drainage.</p>
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		Dewater pipeline failure—uncontrolled discharge of mine dewater contaminated with metals and metalloids and salts.	Soils and vegetation and fauna by food chain	Direct discharge - flow path spill.	<p>Inundation causing declining health and death of native vegetation.</p> <p>Contamination of soils with uptake of toxicants by vegetation and bioaccumulation in fauna food chain.</p>	<b>Minor</b> Low level on site impacts	<b>Unlikely</b> The risk event will probably not occur in most circumstances	<b>Medium</b>	<p>Impacts will be limited by the area and volume of the spill.</p> <p>There are no threatened communities or species within 3.5 km. The nearest water body is the Gascoyne River located 40 km away. Central Drainage drains to a tributary of the Gascoyne River.</p> <p>Monitoring results for Discharge to North Creek for 2016 indicated that dewater quality is within the ANZECC 2000 Guidelines for cattle consumption, with the exception of Selenium and above the Guidelines 95% metals and metalloid trigger values for slightly-disturbed freshwater systems.</p> <p><u>Applicant controls</u></p> <ul style="list-style-type: none"> <li>• Dewatering pipelines are inspected weekly.</li> </ul> <p><u>Existing Licence Regulatory Controls</u></p> <ul style="list-style-type: none"> <li>• Condition 1.3.6 of the Licence requires weekly inspections of the dewatering pipeline.</li> </ul>
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## Decision

The Delegated Officer has determined that the construction of the upgraded processing plant's thickener and filter and operation of dewatering to the Central Drainage discharge point will not result in emissions which are unacceptable to public health or the environment.

Where the Applicant's controls have lowered the consequence or likelihood of a risk event, these controls are conditioned in the licence in accordance with *Guidance Statement: Risk Assessment (February 2017)*.

### Category 5

Condition 1.3.9 is amended to remove works for the power plant units and to include works for the proposed thickener and filter.

Condition 4.2.3 for submission of a construction compliance report is amended to remove reference to commissioning.

Condition 3.5.1 for monitoring of ambient ground water quality at the TSF is amended to delete the existing dry monitoring bores, and replace with the deeper bores that have been installed in the vicinity of the dry bores. The list of analytes has been amended to account for the Monty tailings, in addition to DeGrussa tailings. Molybdenum is also included due to its potential mobility in groundwater (Smith, 2007) and potential toxicity to terrestrial animals including mammals at relatively low concentrations (Mend, 2004).

### Category 6

Condition 1.3.6 requires the Licensee to undertake daily inspections of the dewatering pipeline. This condition is amended to add the Licence holder's control for weekly monitoring of the dewatering discharge points when dewater discharge is occurring.

Condition 2.3.1 is amended to include the Central Drainage discharge point.

Condition 2.3.2 is amended to include Central Drainage for TDS limit for emissions to surface water.

Condition 2.3.3 of the Licence requires the Licensee to discharge mine dewatering effluents in a manner which minimises erosion and scouring impacts, and reduces the likelihood of surface ponding. This condition will apply to the additional discharge point at Central Discharge and no change is required.

Condition 3.3.1 is amended to include the Central Drainage discharge for monitoring of point source emissions to surface water.

### Category 52

Operation of the power station with the addition of the two x 2 MW diesel power units was assessed for Amendment Notice 1 and the amendment included construction, commissioning, operation and monitoring of the power station with the additional power units. A construction report and a commissioning report were submitted to DWER. Oxides of Nitrogen and Carbon Monoxide were higher than the specifications, but deemed acceptable with consideration of risk. Licence condition 3.2.1 requires on going monitoring of the generators every two years.

Conditions 4.2.4 and 4.2.5 relating to a Commissioning Report are removed as they are now redundant. No further amendments are required to include operation of the new power units, but the front cover of the Licence is amended to include the approved category 52 design capacity of 23 MW.

## Schedule 1

Maps relevant to the amendment are updated.

## Administrative changes

Definitions have been updated.

Reporting condition 4.2.1 Table 4.2.1 Annual Environment Report is amended to remove the requirement for specific formats for monitoring reporting.

Schedule 2: Reporting and Notification forms Annual Audit Compliance Report (AACR) Proforma is removed. The AACR Proforma has been updated and is downloadable from the DWER website.

## **Licence Holder's comments**

The Licence Holder was provided with the draft Amendment Notice on 27 April 2018. Comments received from the Licence Holder have been considered by the Delegated Officer as shown in Appendix 2.

## **Amendment**

1. The Licence front cover is amended by the deletion of the text shown in strikethrough below and the insertion of the red text shown in bold underline below

Category number	Category description	Category production or design capacity	Approved Premises production or design capacity
5	Processing or beneficiation of metallic or non-metallic ore	50,000 tonnes or more per year	2,050,000 tonnes per annual period
6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore.	50,000 tonnes or more per year	2,000,000 tonnes per annual period
52	Electric power generation: premises (other than premises within category 53 or an emergency or standby power generation plant) on which electrical power is generated using a fuel.	10 megawatts or more in aggregate (using a fuel other than natural gas)	<del>49</del> <b>23</b> megawatts in aggregate
54	Sewage facility: premises on which sewage is treated (excluding septic tanks), or from which treated sewage is discharged onto land or into waters	100 cubic metres or more per day	240 cubic metres per day
64	Class II putrescible landfill	20 tonnes or more per year	1,300 tonnes per annual period

2. Definitions of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

**'CEO'** for the purpose of correspondence means;

~~Chief Executive Officer  
Department Administering the Environmental Protection Act 1986  
Locked Bag 33  
CLOISTERS SQUARE WA 6850  
Email: [info@der.wa.gov.au](mailto:info@der.wa.gov.au)~~



**Director General**  
**Department Administering the Environmental Protection Act 1986**  
**Locked Bag 33 Cloisters Square**  
**PERTH WA 6850**  
**info@dwer.wa.gov.au**

3. Condition 1.3.6 of the Licence is amended by the insertion of the bold text shown in underline below:

1.3.6 The Licensee shall:

- (a) undertake inspections as detailed in Table 1.3.4;
- (b) where any inspection identifies that an appropriate level of environmental protection is not being maintained, take corrective action to mitigate adverse environmental consequences as soon as practicable; and
- (c) maintain a record of all inspections undertaken.

**Table 1.3.4: Inspection of infrastructure**

Scope of inspection	Type of inspection	Frequency of inspection
Tailings pipelines	Visual integrity	Daily
Return water lines	Visual integrity	Daily
Embankment freeboard	Visual to confirm required freeboard capacity is available	Daily
Dewatering discharge pipelines	Visual integrity	Weekly
<b><u>Dewatering discharge points</u></b>	<b><u>Visual for signs of erosion, vegetation decline and weeds.</u></b>	<b><u>Weekly, when dewater discharge is occurring.</u></b>

4. Condition 1.3.9 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

1.3.9 The Licensee must install and undertake the Works for the infrastructure and equipment specified in Column 1 to the requirements specified in Column 2, of Table 1.3.5 below:

**Table 1.3.5: Construction Requirements**

Column 1	Column 2
Infrastructure/Equipment	Requirements (design and construction)
2 * 2 MW diesel generators	<del>Two Cummins QSK78-G9 generators to be placed within the existing building development area</del>
Hydrocarbon storage	<del>Bunding compliant to AS1940: 1993</del>
<b><u>Thickener and filter:</u></b> <ul style="list-style-type: none"> <li>• <b><u>18 m diameter thickener;</u></b></li> <li>• <b><u>2 x peristaltic hose pumps</u></b></li> <li>• <b><u>1x 40 plate filter press; and</u></b></li> <li>• <b><u>1 x 1200 kw compressor</u></b></li> </ul>	<b><u>Located within the existing Process plant footprint, which comprises a bunded hardstand area with drainage reporting to sumps and a sedimentation pond.</u></b>
<b><u>Thickener</u></b>	<b><u>Located within a concrete bund.</u></b> <b><u>Constructed so that overflow water within the thickener is returned to the process water tank for reuse within the process treatment plant.</u></b>
<b><u>Filter</u></b>	<b><u>Integrated into the concentrate shed within a fully bunded concrete floor.</u></b>

5. Condition 2.3.1 of the Licence is amended by the insertion of the bold text shown in underline below:

2.3.1 The Licensee shall ensure that where waste is emitted to surface water from the emission points in Table 2.3.1 and identified on the map of emission points in Schedule 1, it is done so in accordance with the conditions of this Licence.

Table 2.3.1: Emission point to surface water		
Emission point reference and location on Map of emission points	Description	Source including abatement
North Creek Discharge point	Dewatering discharge point to North Creek	Dewatering effluent from mining of ore
<b><u>Central Drainage Discharge point</u></b>	<b><u>Dewatering discharge point to Central Drainage</u></b>	

6. Condition 2.3.2 of the Licence is amended by the insertion of the bold text shown in underline below:

2.3.2 The Licensee shall not cause or allow point source emissions to surface water greater than the limits listed in Table 2.3.2.

Table 2.3.2: Point source emission limits to surface water			
Emission point reference	Parameter	Limit (including units)	Averaging period
North Creek Discharge point	Total dissolved solids	3,500 mg/L	Spot sample
<b><u>Central Drainage Discharge point</u></b>			

7. Condition 3.3.1 of the Licence is amended by the insertion of the bold text shown in underline below:

3.3.1 The Licensee shall undertake the monitoring in Table 3.3.1 according to the specifications in that table.

Table 3.3.1: Monitoring of point source emissions to surface water			
Emission point reference	Parameter	Units	Frequency
North Creek Discharge point  <b><u>Central Drainage Discharge point</u></b>	Volumetric flow rate	m <sup>3</sup> /day	Continuous
	Arsenic, cadmium, chromium, copper, lead, nitrate-nitrogen, selenium, sulphate, total dissolved solids, total recoverable hydrocarbons, total suspended solids, total acidity and zinc	mg/L	Quarterly
	pH <sup>1</sup>	-	Quarterly

**Note 1: In-field non-NATA accredited analysis permitted for pH measurement.**

8. Condition 3.5.1 of the Licence is amended by the deletion of the text shown in strikethrough below and the insertion of the bold text shown in underline below:

3.5.1 The Licensee shall undertake the monitoring specified in Table 3.5.1.

Table 3.5.1: Monitoring of ambient groundwater quality				
Monitoring point reference	Parameter	Units	Averaging period	Frequency
<del>TMB01</del> <b><u>TMB01B</u></b> , <del>TMB04</del> <b><u>TMB04B</u></b> , <del>TMB5</del> <b><u>TMB05B</u></b> , <del>TMB6</del> , <b><u>TMB006</u></b> , <del>TMB7</del> <b><u>TMB07B</u></b> , and- <b><u>and</u></b> <del>TMB08</del> <b><u>TMB08B</u></b>	arsenic	mg/L	Spot sample	Quarterly
	cadmium			
	chromium			
	copper			
	lead			
	<u>manganese</u>			
	<u>molybdenum</u>			
	pH <sup>1</sup>	-		
	<u>nickel</u>	mg/L		
	selenium			
	standing water level	mbgl		
	sulphate	mg/L		
	total dissolved solids			
	total acidity			
	<u>vanadium</u>			
	<u>uranium</u>			
	zinc			

Note 1: In-field non-NATA accredited analysis permitted for pH measurement.

9. Condition 4.2.1 of the Licence is amended by the deletion of the text shown in strikethrough and the insertion of bold text in underline below:

- 4.2.1 The Licensee shall submit to the CEO an Annual Environmental Report within 90 calendar days after the end of the annual period. The report shall contain the information listed in Table 4.2.1 in the format or form specified in that table.

Table 4.2.1: Annual Environmental Report		
Condition or table (if relevant)	Parameter	Format or form <sup>1</sup>
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Table 3.2.1	Specified monitoring of point source emissions to air	Tabulate
Table 3.3.1	Specified monitoring of point source emissions to surface water	<del>WR1</del> <b><u>None specified</u></b>
Table 3.4.1	Specified monitoring of point source emissions to land	<del>LR2</del> <b><u>None specified</u></b>
Table 3.5.1	Monitoring of ambient groundwater quality	<del>GR3</del> <b><u>None specified</u></b>
4.1.3	Compliance	Annual Audit Compliance Report (AACR)
4.1.4	Complaints summary	None specified

10. Commissioning conditions 4.2.3, 4.2.4 and 4.2.5 of the Licence are removed as shown in strikethrough below:

- 4.2.3 Within 60 days of the completion of the Works specified in Column 1 of Table 1.3.5 ~~and prior to commissioning~~, the Licensee shall submit to the CEO an engineering compliance document from a suitably qualified engineer, confirming that each item of infrastructure specified in Column 1 of Table 1.3.5 has been constructed to the requirements specified in Column 2.

~~4.2.4 The Licensee shall submit a commissioning report, including results of emission testing for the new diesel generators and associated infrastructure, to the CEO within 3 months of the completion of commissioning.~~

~~4.2.5 The Licensee shall ensure the report includes:~~

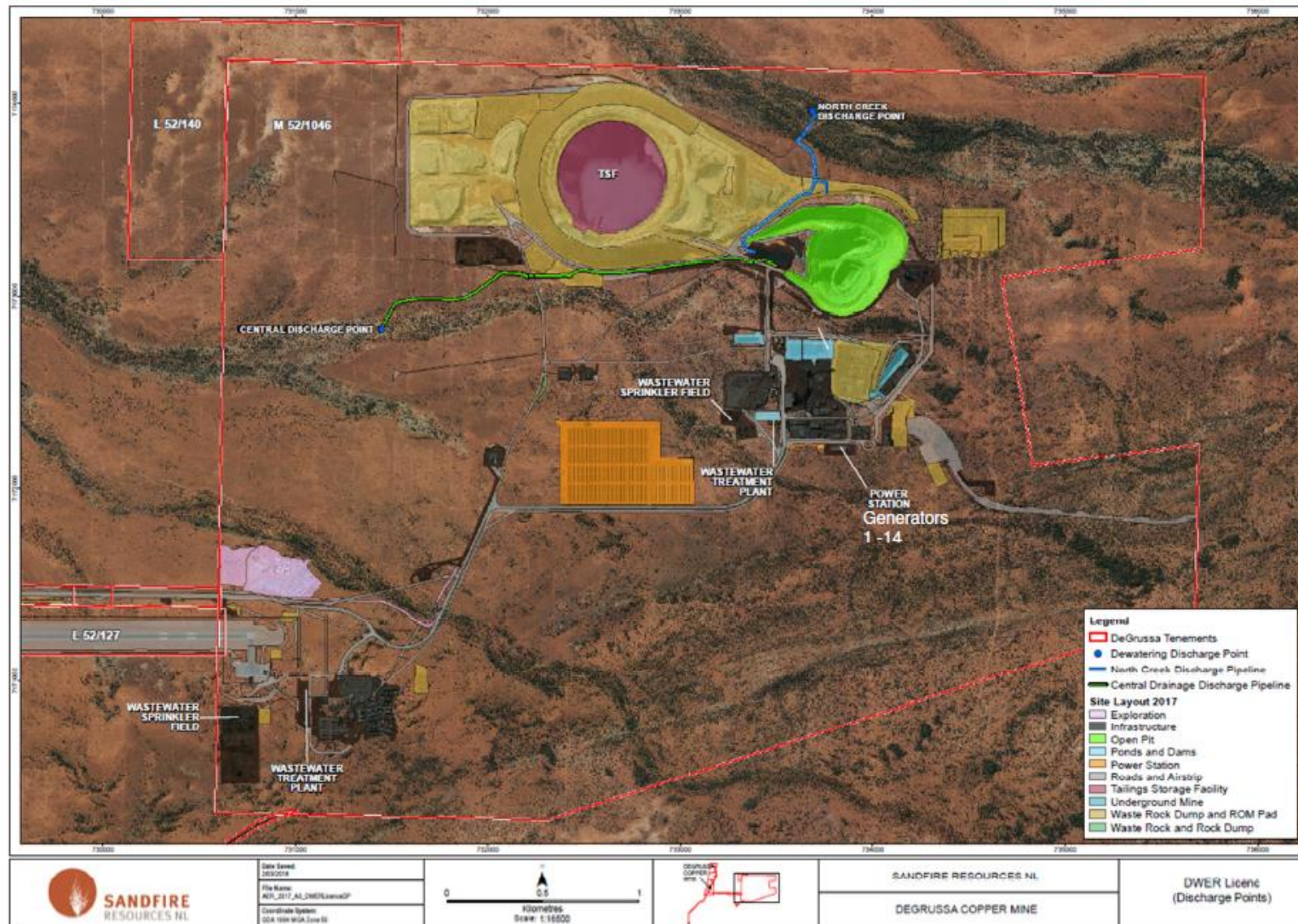
- ~~(a) a summary of the monitoring results recorded;~~
- ~~(b) a list of any original monitoring reports submitted to the Licensee from third parties for the commissioning period;~~
- ~~(c) a summary of the environmental performance of the diesel generators as installed, against the design specification set out in the amendment application;~~
- ~~(d) a review of performance against the Licence conditions; and~~
- ~~(e) where they have not been met, measures proposed to meet the design specification and/or Licence conditions, together with timescales for implementing the proposed measures.~~

11. Schedule 1: Map of emission points - the map of 'location of emission point in Table 2.3.1' and 'map of monitoring points defined in Table 3.5.1' in the existing Licence is removed and replaced by the 'Map of emission points and storage locations' below as shown by the bold underlined text below.
12. Schedule 1: Map of monitoring locations – 'locations of monitoring points defined in Table 3.5.1' in the existing licence is removed and replaced by the map below as shown in bold underlined text below.
13. Schedule 1: Map of storage locations – 'location of the storage area (TSF) defined in Table 1.3.3' in the existing licence is removed and replaced by the Map of emission points and storage locations as shown in bold underlined text below.
14. Schedule 2: Reporting and Notification forms Annual Audit Compliance Report (AACR) Proforma is removed.



Map of emission points **and storage locations**

**The locations of the emission points defined in Tables 2.2.1 and 2.3.1 and the storage area (TSF) defined in Table 1.3.3 are shown in the map below.**

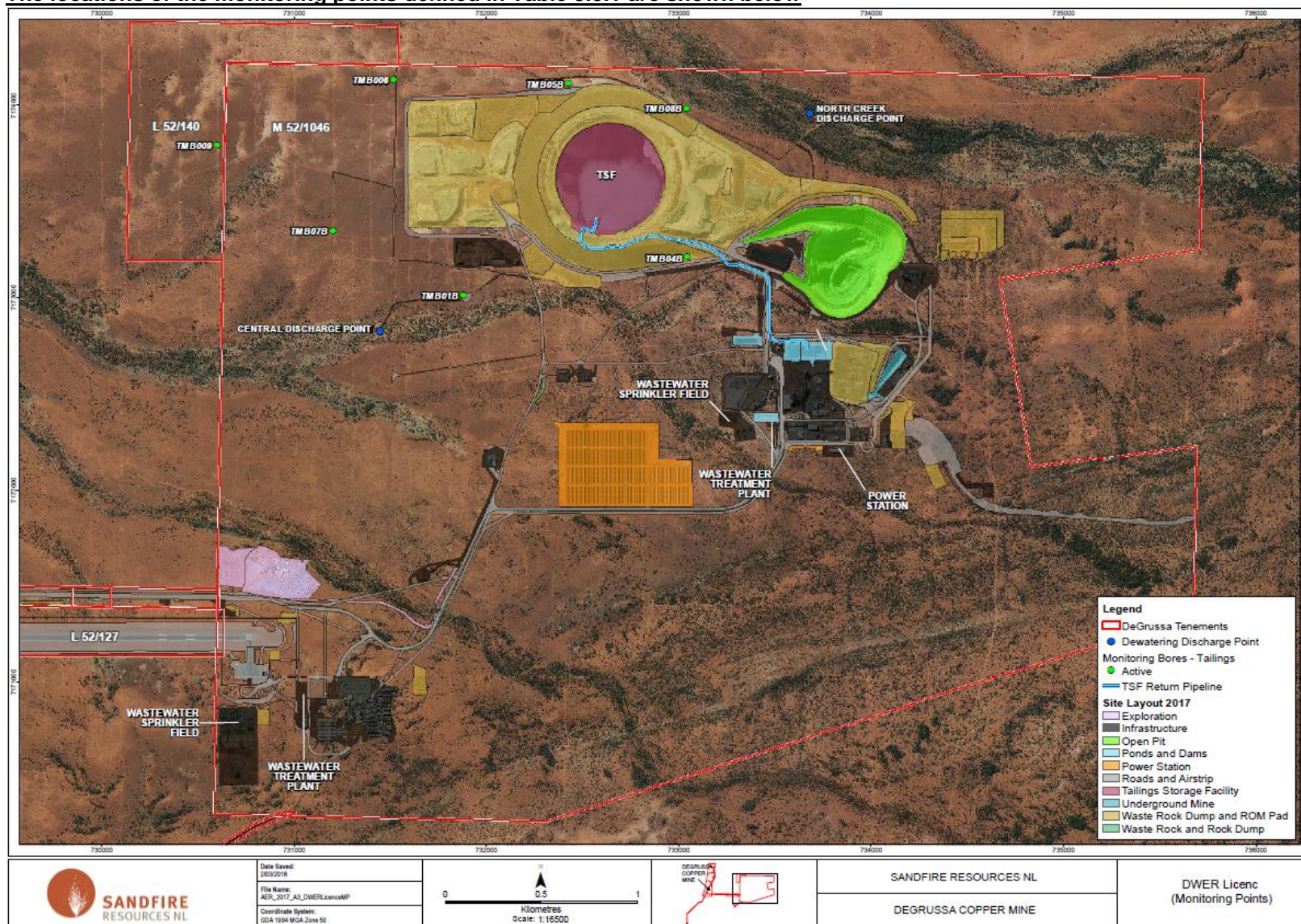


Licence: L8558/2011/1



Map of monitoring locations

The locations of the monitoring points defined in Table 3.5.1 are shown below



Licence: L8558/2011/1

IR-T08 Amendment Notice (Major) template v2.0 (July 2017)

## Appendix 1: Key documents

	Document title	In text ref	Availability
1	Application form for amendment to Licence L8558/2011/1 – DeGrussa Copper-Gold Project including attachments, received 25 October 2017	Application	DWER records (A1549660)
2	Application form for amendment to Licence L8558/2011/1 – DeGrussa Copper-Gold Project including attachments, received 8 January 2018		DWER records (A1613723)
3	Email: <i>RE: L8558 DeGrussa Licence amendments update</i> , Sandfire Resources. Sent 2/03/2018 9:07 PM		DWER records (A1626549)
4	<i>Australian and New Zealand Guidelines for Fresh and Marine Water Quality</i> , Australian and New Zealand Conservation Council, 2000	ANZEEC 2000	Accessed at <a href="http://www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1.pdf">www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1.pdf</a>
5	<i>Dewatering and Site Landfill Expansion Works Approval Application DeGrussa Copper Mine, M52/1046 Shire of Meekatharra Western Australia</i> , Martinick Bosch Sell Pty Ltd (MBS Environmental), 24 June 2015	W5866/2015/1 Application	DWER records (A933632)
6	<i>Guidance Statement: Setting conditions</i> . Department of Environment Regulation, Perth, October 2015	-	Accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
7	<i>Guidance Statement: Risk Assessments</i> . Department of Environment Regulation, Perth, February 2017	-	
8	<i>Guidance Statement: Decision Making</i> . Department of Environment Regulation, Perth, February 2017	-	
9	<i>Guidance Statement: Environmental Siting</i> . Department of Environment Regulation, Perth, November 2016	-	
10	Licence L8558/2011/1 – DeGrussa Copper-Gold Project.	L8558/2011/1	Accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
11	Mining Proposal - Revised ROM Pad Ramp and Minor Infrastructure - Degrussa Copper Mine, Sandfire Resources NL, April 2017	Mining Proposal Reg. ID 66481	Accessed at <a href="http://dmirs.wa.gov.au/">http://dmirs.wa.gov.au/</a>
12	<i>Review of Water Quality Issues in Neutral pH Drainage: Examples and Emerging Priorities for the Mining Industry in Canada</i> . MEND Report No 10.1, MEND, 2004.	Mend, 2004	The paper is available from web site <a href="https://minerals.usgs.gov/east/mea/Smith2007_508.pdf">https://minerals.usgs.gov/east/mea/Smith2007_508.pdf</a> .
13	<i>Strategies to predict metal mobility in surficial mining environments</i> , Smith, K.S., 2007. In: DeGraff, J.V. (Ed.) <i>Understanding and Responding to Hazardous Substances at Mine Sites in the Western United States</i> , Geological	Smith, 2007	The paper is available from web site <a href="https://minerals.usgs.gov/east/mea/Smith2007_508.pdf">https://minerals.usgs.gov/east/mea/Smith2007_508.pdf</a> .

	<i>Society of America Reviews in Engineering Geology, v. XVII, 25-45.</i>		
14	Works Approval W5866/2015/1 – DeGrussa Copper-Gold Project and Decision Document	W5866/2015/1	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
15	Works Approval W5866//2015/: <i>DeGrussa Copper Mine Works Approval Partial Compliance report: WA5866/2015/1 Category 6</i> , Sandfire Resources NL, 25 October 2017	W5866/2015/1 Compliance Report, 2017	DWER records (A1549660)



## Appendix 2: Summary of Licence Holder comments

The Licence Holder was provided with the draft Amendment Notice on 27 April 2018 for review and comment. The Licence Holder responded on 2 May 2018. The following comments were received on the draft Amendment Notice. The Licence Holder provided written notice to waive the 21 day comment period on 8 May 2018.

Condition	Summary of Licence Holder comment	DWER response
-	Background – Category 52. The Commissioning Report was submitted to DWER on 13/03/2018.	Background - Category 52 is edited to include submission of the commissioning report and its results. Commissioning Report conditions 4.2.4 and 4.2.5 are removed.
3.5.1	Manganese, molybdenum, nickel, vanadium and uranium have been added to the Tailings Monitoring Bore quality analysis. The average concentrations of manganese, nickel, vanadium and uranium are higher in Monty tailings compared to DeGrussa tailings and could therefore be a reason why they have been added to the analysis suite, however, why has molybdenum been included considering the geochemical analysis of the molybdenum in the Monty tailings (39-67mg/kg) was lower than molybdenum in the DeGrussa tailings (79-83mg/kg).	<p>The list of analytes has been amended to account for the Monty tailings, in addition to the existing DeGrussa tailings.</p> <p>Molybdenum is included due to its potential for mobility under circum-neutral pH conditions (Smith, 2007) and potential toxicity to terrestrial animals including mammals, at relatively low concentrations (Mend, 2004). Molybdenum was most likely not previously included in the existing licence as an oversight.</p> <p>Decision – Cat 5 section is edited accordingly.</p>