Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Licence

Division 3, Part V *Environmental Protection Act 1986*

Licence Number	L9099/2017/1
Applicant	Kundana Gold Pty Limited
ACN	009 643 252
File Number	DER2017/001616
Premises	Carbine/Paradigm Project Area M 16/548 Mount Burges Shire of Coolgardie
Date of Report	20 December 2017
Status of Report	Final

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1. Definitions of terms and acronyms

In this Decision Report, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Applicant	Kundana Gold Pty Ltd
Category/ Categories/ Cat.	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
CS Act	*Contaminated Sites Act 2003* (WA)
Compliance Report	means a report in a format approved by the CEO as presented by the Licence Holder or as specified by the CEO (guidelines and templates may be available on the Department's website)
DBCA	Department of Biodiversity Conservation and Attraction
Decision Report	refers to this document.
Delegated Officer	an officer under section 20 of the EP Act.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V, Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation As of 1 July 2017, the Department of Environment Regulation (DER), the Office of the Environmental Protection Authority (OEPA) and the Department of Water (DoW) amalgamated to form the Department of Water and Environmental Regulation (DWER). DWER was established under section 35 of the *Public Sector Management Act 1994* and is responsible for the administration of the *Environmental Protection Act 1986* along with other legislation.
EP Act	*Environmental Protection Act 1986* (WA)
kL	kilolitre
Gold Extractions Exemption Order	Environmental Protection (Gold Extraction Operations Exemption) Order 1993
HDPE	High Density Polyethylene
Licence Holder	Kundana Gold Pty Limited
mbgl	metres below ground level

mg/L	milligram per litre
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 *Guidance Statement: Risk Assessment*
RIWI Act	*Rights in Water and Irrigation Act 1914*
RL	Reduced Level
SWL	standing water level
TDS	Total Dissolved Solids

2. Purpose and scope of assessment

Kundana Gold Pty Ltd (Kundana Gold) (Applicant) submitted an application for a works approval and licence on 8 September 2017 under Division 3, Part V of the *Environmental Protection Act 1986* (EP Act). The application was to permit dewatering from Paradigm pit with discharge into Carbine pit, located approximately 20 km to the west.

Discharging mine dewater causes the Premises to become Prescribed under category 6 of Schedule 1 of the *Environmental Protection Regulations 1987.* The Applicant has requested a production capacity of 1,500,000 tonnes per annual period. The infrastructure required for the dewatering had been installed previously for mining operating under an Environmental Protection (Gold Extraction Operations Exemption) Order 1993, and the Applicant requested to withdraw the application for a works approval on 9 October 2017.

The Decision Report sets out the assessment of risks arising from emissions and discharges only, from the operation of Category 6 dewatering.

Table 2 lists the documents submitted during the assessment process.

Table 2: Documents and information submitted during the assessment process

Document/information description	Author	Date/version
Application form and supporting document - *Works Approval/Licence Application Supporting Document – Paradigm Dewatering*	Northern Star Resources Limited	September 2017
Background information provided on the Environmental Protection (Gold Extraction Operations Exemption) Order	Northern Star Resources Limited	19 September 2017
Email - withdrawal of Works Approval application	Northern Star Resources Limited	9 October 2017
Email: Subject: *RE: L9099 Paradigm Pit Dewatering queries and progress update*.	Northern Star Resources Limited	22 November 2017

3. Background

Mining operations at Paradigm were commenced by Paddington Gold Pty Ltd in 2002 under an Environmental Protection (Gold Extraction Operations Exemption) Order 1993 (Gold Extractions Exemption Order). The Paradigm pit and underground operations were dewatered via a bunded pipeline to Carbine pit, 2 km to the west. Operations ceased in the middle of 2007.

Northern Star Resources Limited (Northern Star), the parent company wholly owning Kundana Gold Pty Ltd, has conducted exploration drilling programs in the area. In order to allow exploration activities to advance, dewatering of the Paradigm pit to Carbine pit commenced in April 2017 and the bulk of the Paradigm pit lake has been dewatered. Further dewatering will be required to lower the water level in the underground working. Once mining commences, ongoing dewatering will be required.

The dewatering pipeline and pumping system is now expected to become permanent infrastructure and used to allow the mining of ore.

The dewatering operations will be wholly located within M16/548. Kundana Gold Pty Ltd is the tenement holder of M16/548 and will be the Licence Holder.

Table 3 lists the prescribed premises categories that have been applied for.

Table 3: Prescribed Premises Categories applied for

Classification of Premises	Description	*Premises production or design capacity or throughput applied for*
Category 6	Mine dewatering: Premises on which water is extracted and discharged into the environment to allow mining of ore.	1,500,000 tonnes per year

4. Overview of Premises

4.1 Location

The premises is located approximately 17 km southeast of Ora Banda as shown in Figure 1 below. The premises boundary is the whole of M16/548.

4.2 Operational aspects

Pipelines and pumping infrastructure are already in place from previous mining activities operating under Gold Extractions Exemption Order.

Historical pump testing and current estimates for Paradigm pit groundwater inflow indicate the pumping rate to be around 20 - 50 L/second. The estimated throughput applied for is based on the higher water yield of 45 - 50 L/second as a contingency, and is also aligned with the Groundwater Licence (GWL) abstraction allocation. Actual inflows will be tested again once surplus water in Paradigm pit is pumped out.

Sampling of Paradigm pit water during 2017 provided the water quality results listed in Table 4 below.

The current water level at Carbine pit is 398 m RL to the crest of the pit. Carbine pit has a remaining capacity of approximately 3,340,000 kL allowing for a freeboard of 6 m (at 424 m RL) (from the Application).

Table 4: Paradigm pit water quality

Paradigm Pit water		
Parameter (mg/L)	**24/05/2017**	**12/09/2017**
Al	<0.20	<0.10
Bicarbonate	132	165
Carbonate	<1	<1
Hydroxide	<1	<1
As	<0.020	<0.010
Ca	1320	1180
Cd	0.005	0.0016
Cl	52300	46700
Cn - WAD	<0.040	<0.040
Co	<0.020	0.056
Cr	<0.020	<0.010
Cu	<0.020	<0.010
Fe	<1.00	<0.50
Hg	<0.0001	<0.0001
Ionic Balance (%)	7.58	6.42
K	165	87
Mg	3060	3140
Mn	0.399	1.88
Na	24800	21800
Ni	0.108	0.118
NO2	<0.01	<0.01
NO3- (mg/L)	0.02	0.04
NOx	0.02	0.04
Pb	<0.020	<0.010
Se	<0.20	<0.10
SO2-4	6800	5810
TDS	87800	76300
TSS	20	
Zn	0.107	0.311
ph - Lab result (pH Unit)	7.57	7.17
Ionic Balance (%)	7.58	6.42

4.3 Infrastructure

The infrastructure, as it relates to Category 6 (dewatering) activities, is detailed in Table 5 and with reference to the Site Plan as shown below as Figure 2.

Table 5: Category 6 infrastructure

	Infrastructure
	Prescribed Activity Category 6
Dewatering will be carried out via a 2.1 km High Density Polyethylene (HDPE) pipeline which runs from the central section of Paradigm pit to the eastern end of Carbine pit. The pipeline is laid within an earthen bunded v drain corridor along the toe of the Paradigm waste rock dump. The pipeline has been buried under a road in four places along to pipeline corridor. Three scour pits are located at low points along the pipeline corridor. A flow meter and leak detection system is also installed.	
1	HDPE pipeline
2	Flow meter and leak detection system
3	Earthen v-drain bund and three scour pits

Figure 1: Siting and Location Map

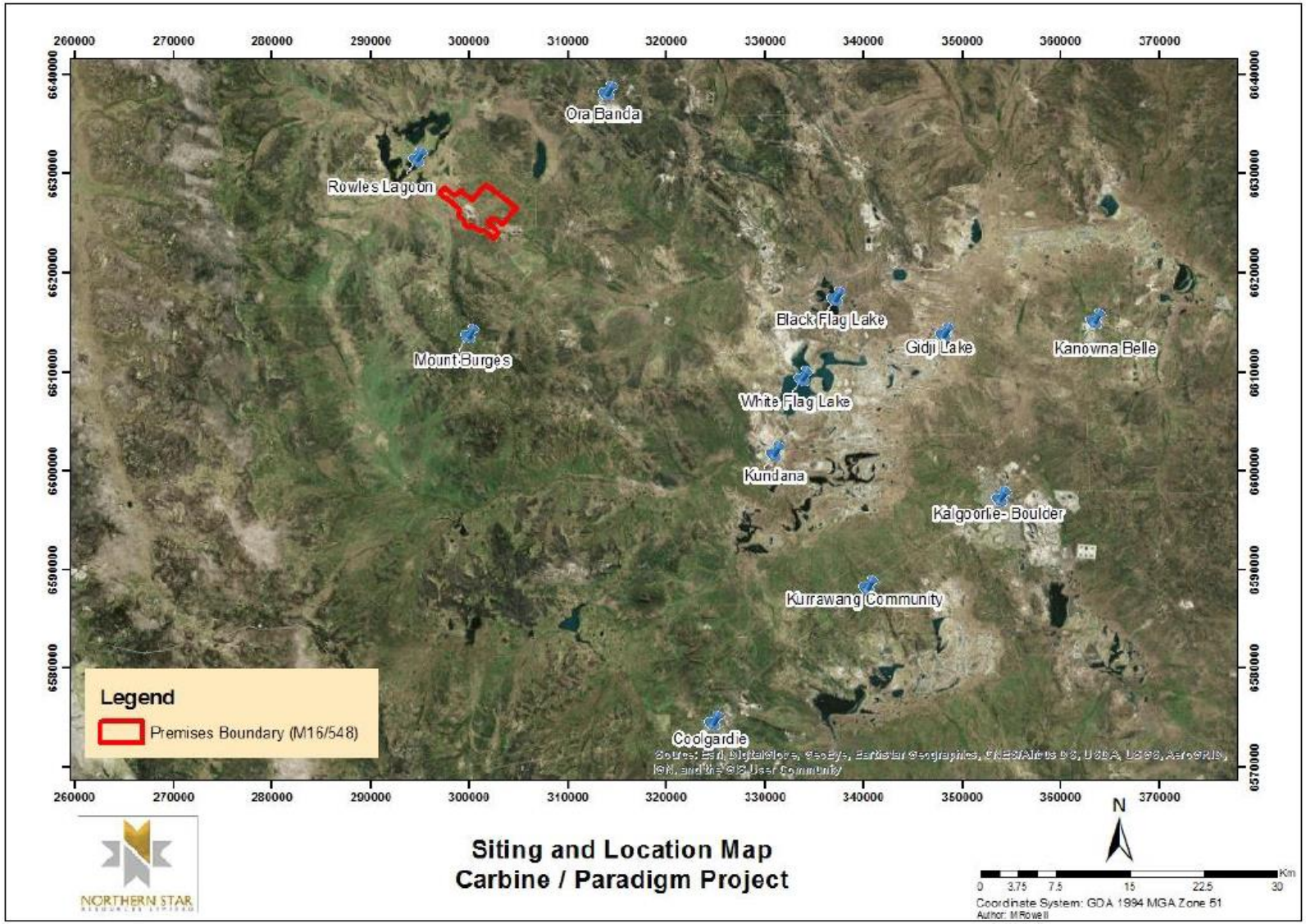
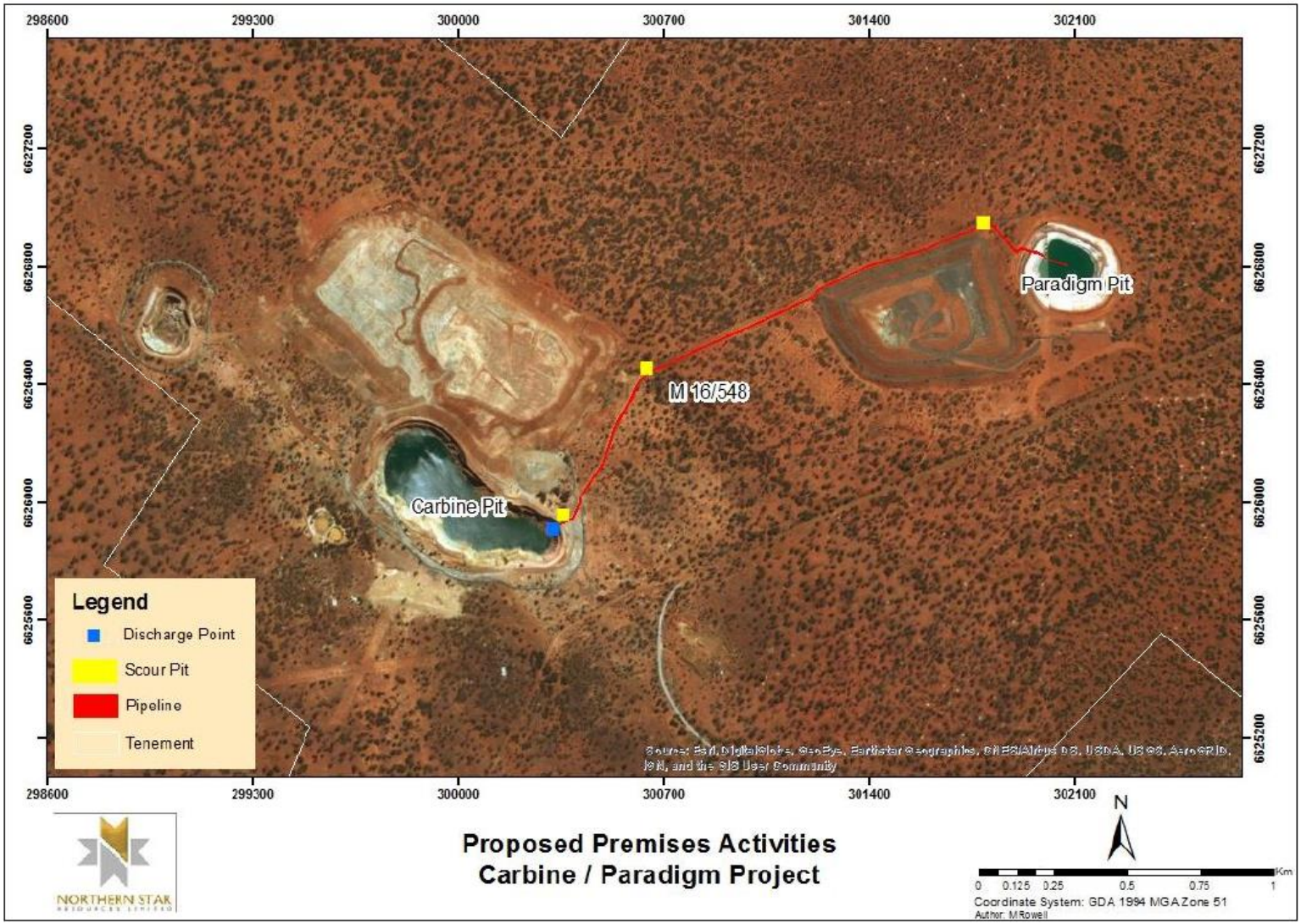


Figure 2: Site plan



5. Legislative context

The Applicant has advised that the following approvals are relevant to the assessment.

Table 6: Relevant approvals and tenure

Legislation	Number	Approval
Rights in Water and Irrigation Act 1914	GWL104053	Abstraction of up to 1,500,000 kL of groundwater.
Mining Act 1978	NOI 1658, Reg ID 15060. NOI 3777, Reg ID 17164 NOI 4354, Reg ID 17741	Carbine Project (1994) Paradigm Open Cut Project (2001) Paradigm Underground Project (2003) A Mining Proposal will be submitted to DMIRS for the proposed new development prior to the Project commencing.

5.1 Contaminated sites

The Premises is not classified under the *Contaminated Sites Act 2003* and has not been reported as a known or suspected contaminated site.

5.2 Part V of the EP Act

5.2.1 Applicable regulations, standards and guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations.

The guidance statements which inform this assessment are:

- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Publication of Annual Audit Compliance Reports (May 2016)*
- *Guidance Statement: Licence Duration (August 2016)*
- *Guidance Statement: Environmental Siting (November 2016)*
- *Guidance Statement: Decision Making (February 2017)*
- *Guidance Statement: Risk Assessments (February 2017)*

5.2.2 Works approval and licence history

Mining operations at Paradigm were commenced by Paddington Gold Pty Ltd in 2002 under an Environmental Protection (Gold Extraction Operations Exemption) Order 1993 (Gold Extractions Exemption Order). The premises was not constructed under a works approval or operated under a licence.

Table 7 summarises the works approval and licence history for the premises.

Table 7: Works approval and licence history

Instrument	Issued	Nature and extent of works approval, licence or amendment
L9909/2017/1	This licence	For dewatering paradigm pit discharging in Carbine pit

5.2.3 Clearing

The applicant does not anticipate that additional land disturbance will be required.

6. Consultation

The Application was advertised in the *West Australian* newspaper on 6 November 2017 and the DWER website from 3 November 2017 for a 21 day submission period. No submissions were received.

Letters inviting comment were sent to the Department of Mining, Industry Regulation and Safety (DMIRS) and the Shire of Coolgardie on 6 November 2017.

DMIRS responded that they had no concerns or comments for the licence application, providing the dewatering activities were conducted in accordance with a Notice of Intent (NOI) for the Paradigm pit approved in September 2001. The NOI included approval for the installation of a dewatering pipeline between Paradigm and Carbine pits.

No comments were received from the Shire of Coolgardie.

7. Location and siting

7.1 Siting context

The premises is located within the Shire of Coolgardie, and is 60 km northwest of the City of Kalgoorlie-Boulder and 17 km southeast of Ora Banda.

7.2 Residential and sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 8 and shown in Figure 2 below.

Table 8: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Ora Banda	17 km northeast of the premises
Kurrawang Community	55 km southeast of the premises
City of Kalgoorlie-Boulder.	60km southeast of the premises

7.3 Specified ecosystems

Specified ecosystems are areas of high conservation value and special significance that may be impacted as a result of activities at or Emissions and Discharges from the Premises. The distances to specified ecosystems are shown in Table 9 and Figure 1 above. Table 9 also identifies the distances to other relevant ecosystem values which do not fit the definition of a specified ecosystem.

The table has been modified to align with the *Guidance Statement: Environmental Siting.*

Table 9: Environmental values

Specified ecosystems	Environmental value and distance from the Prescribed Activity
Important wetlands – Western Australia	Rowles Lagoon is the nearest wetland listed in the Australian Directory of Important Wetlands, located within the same Interim Biogeographical Regionalisation for Australia (IBRA) bioregion, which is the Coolgardie bioregion. Rowles Lagoon is the only freshwater wetland within the Goldfields Region reserved for nature conservation. Rowles Lagoon is 6.5 km northwest of the pits and dewatering pipelines
Department of Biodiversity Conservation and Attraction (DBCA) Lands and Waters	Rowles Lagoon Conservation Park and Clear and Muddy Waters Nature Reserve (conservation of Flora and Fauna) are 6.5 km northwest of the pits/dewatering pipes.
Ramsar wetlands	No listed Ramsar Wetlands are within a 15 km radius.
Threatened Ecological Communities and Priority Ecological Communities	None within a 15 km radius.
Biological component	**Distance from the Prescribed Activity**
No declared rare flora or fauna or priority flora species recorded on the premises or within a 15 km radius. The Carbine/Paradigm Project area lies within the South-West interzone or the Coolgardie Botanical District. The vegetation is described as Goldfields Eucalypt woodland with acacia understory. Vegetation remains in the close vicinity of the project pits and the dewater pipeline.	

7.4 Groundwater and water sources

The distances to groundwater and water sources are shown in Table 10.

Table 10: Groundwater and water sources

Groundwater and water sources	Environmental value and distance from the Prescribed Activity
Public Drinking Water Source Areas	None within at least 15 km.
Major watercourses	Rowles Lagoon System is the closest water body to the premises and has conservation value. No significant drainage system within the or near the premises. The area consists of gently undulating valley plains, shedding low velocity sheet water to the south east.
Groundwater	Based on drilling assessments and previous studies, groundwater is approximately 40 – 47 mbgl at both pits (from the Application). The aquifer is Palaeochannel – Fractured rock. Groundwater in the area is hyper saline with Total Dissolved Solids (TDS) up to 90,000 mg/L (from the Application). No beneficial uses in the area other than for mining purposes
RIWI Act Groundwater Area	Premises located on the Goldfields Groundwater Area

7.5 Soil type

Chief soils are alkaline red earths with limestone or limestone nodules at shallow depth (< 24 in.) on gently sloping slightly concave plains with low gentle rises (DWER GIS – *Soils, Statewide*).

7.6 Meteorology

7.6.1 Rainfall and temperature

The closest Bureau of Meteorology (BOM) weather station is located at the Kalgoorlie-Boulder airport. The average annual rainfall in the Kalgoorlie- Boulder areas is 268 mm. Most of the rainfall occurs during the months of February (summer) and July (winter).

8. Risk assessment

8.1 Determination of emission, pathway and receptor

In undertaking its risk assessment, DWER will identify all potential emissions pathways and potential receptors to establish whether there is a Risk Event which requires detailed risk assessment.

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission. Where there is no actual or likely pathway and/or no receptor, the emission will be screened out and will not be considered as a Risk Event. In addition, where an emission has an actual or likely pathway and a receptor which may be adversely impacted, but that emission is regulated through other mechanisms such as Part IV of the EP Act, that emission will not be risk assessed further and will be screened out through Table 11.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Tables 11 below.

Table 11: Identification of emissions, pathway and receptors during operation

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
Dewatering	Abstraction resulting in drawdown of groundwater levels.	None	Groundwater dependent ecosystems	Abstraction of groundwater.	Reduction in groundwater availability for dependent vegetation.	No	Not within scope of Part V of the EP Act. Regulated under the RIWI Act and Part IV of the EP Act.
	Discharge to Carbine pit.	Dewater from Paradigm pit	Saline to hypersaline groundwater	Movement of pit lake water through pit walls and base to groundwater	Contamination of groundwater with dewater from Paradigm pit.	No	Groundwater is hypersaline and of no beneficial use (apart from dust suppression purposes).

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
		Mounding of hypersaline groundwater table in the vicinity of the receiving pit.	Surrounding native vegetation	Lateral movement of pit lake water through pit walls	Decline/ death of vegetation via hypersaline water uptake from roots.	Yes	See Section 8.4
		Overtopping of the pit with hypersaline water.	Native vegetation adjacent to the pit.	Direct discharge	Decline/ death of vegetation due to inundation.	Yes	See Section 8.5
	Dewatering pipeline	Rupture of pipeline causing hypersaline discharge to land.	Native vegetation adjacent to the pipeline.	Direct discharge	Decline/death of vegetation due to inundation.	Yes	See Section 8.6

8.2 Consequence and likelihood of risk events

A risk rating will be determined for risk events in accordance with the risk rating matrix set out in Table 12 below.

Table 12: Risk rating matrix

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

DWER will undertake an assessment of the consequence and likelihood of the Risk Event in accordance with Table 13 below.

Table 13: Risk criteria table

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the Risk Event occurring.		The following criteria has been used to determine the consequences of a Risk Event occurring:		
			Environment	Public health* and amenity (such as air and water quality, noise, and odour)
Almost Certain	The risk event is expected to occur in most circumstances	Severe	• **onsite impacts**: catastrophic • **offsite impacts local scale**: high level or above • **offsite impacts wider scale:** mid-level or above • Mid to long-term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded	• Loss of life • **Adverse health effects:** high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • **Local scale impacts:** permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	• **onsite impacts**: high level • **offsite impacts local scale**: mid-level • **offsite impacts wider scale**: low level • Short-term impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are exceeded	• **Adverse health effects:** mid-level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • **Local scale impacts**: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	• **onsite impacts**: mid-level • **offsite impacts local scale**: low level • **offsite impacts wider scale**: minimal • Specific Consequence Criteria (for environment) are at risk of not being met	• **Adverse health effects:** low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • **Local scale impacts:** mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	• **onsite impacts**: low level • **offsite impacts local scale**: minimal • **offsite impacts wider scale**: not detectable • Specific Consequence Criteria (for environment) likely to be met	• Specific Consequence Criteria (for public health) are likely to be met • **Local scale impacts:** low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	• **onsite impact**: minimal • Specific Consequence Criteria (for environment) met	• **Local scale**: minimal to amenity • Specific Consequence Criteria (for public health) met

^ Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting.*

* In applying public health criteria, DWER may have regard to the Department of Health's *Health Risk Assessment (Scoping) Guidelines.*

"onsite**"** means within the Prescribed Premises boundary.

8.3 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment table 14 below:

Table 14: Risk treatment table

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk Event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk Event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk Event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk Event is acceptable and will generally not be subject to regulatory controls.

8.4 Risk Assessment – Discharge to Carbine pit - mounding

8.4.1 Description of risk event

Normal Operation

Mounding of the groundwater in the vicinity of Carbine pit may occur from discharging dewater into the pit. Mounding can increase groundwater levels from lateral seepage through pit walls.

8.4.2 Identification and general characterisation of emission

The quality of the groundwater in the vicinity of the project is considered hypersaline with TDS up to 90,000mg/L. Samples in May and September 2017 from the Paradigm pit lake recorded average TDS of 82,050 mg/L and average pH of 7.37. There is currently no safe access to sample Carbine pit. It is expected that water quality of Carbine Pit is similar to Paradigm pit (hypersaline).

8.4.3 Description of potential adverse impact from the emission

Mounding can impact on any surrounding vegetation if it reaches depth of roots. Saline water can contaminate surrounding soils with dissolved solids (salts) and cause vegetation stress or death.

The most recent flora and vegetation surveys of the Carbine/Paradigm Project area were conducted in 2015. The vegetation unit of the area is broadly described as Goldfields Eucalypt woodland with chenopod and acacia understory. Eucalypts are generally known to be shallow rooted. The project area includes remaining native vegetation.

No Threatened or Priority Ecological Communities, Declared Rare Flora or Priority Flora species have been recorded within the project area. There are no known groundwater dependent ecosystems in the area.

8.4.4 Applicant controls

Carbine pit water levels will be kept at a minimum 6 m below ground level, to protect surrounding vegetation as a result of mounding. Surveyors will measure the water levels at least monthly. Dewatering volumes from Paradigm pit will be monitored weekly.

8.4.5 Key findings

The Delegated Officer has reviewed the information regarding the impact of mounding and has found:

1. There is potential for vegetation to be damaged due to uptake of hypersaline water if mounding were to occur.
2. No threatened or priority ecological communities or flora has been identified within the premises.
3. The Applicant has committed to maintain water levels to at least 6m below pit crest level to protect surrounding vegetation from mounding.

8.4.6 Consequence

If mounding of the groundwater occurs to the point where it reaches the depth of the root zone, the impact of hypersaline water on vegetation will cause mid-level on site impacts. Therefore, the consequence from mounding is considered to be **moderate**.

8.4.7 Likelihood of Risk Event

The impact to vegetation due to lateral movement of water through pit walls is more likely as water levels rise. The Applicant's controls include maintaining water levels to at least 6 m below pit crest level. The likelihood of impact to vegetation due to mounding will probably not occur, and is therefore **unlikely**.

8.4.8 Overall rating of mounding

Comparing the consequence and likelihood ratings described above with the risk rating matrix (Table 12) it can be determined that the overall rating for the risk of impact to vegetation from mounding is **medium.**

8.5 Risk Assessment – Discharge to Carbine pit - overtopping

8.5.1 Description of Risk Event

Abnormal operation

Overtopping of Carbine pit may occur in abnormal events if dewatering is not managed in conjunction with major rainfall events.

8.5.2 Identification and general characterisation of emission

The quality of the water in the vicinity of the project is considered saline to hypersaline with TDS levels up to 90,000 mg/L. Samples in May and September 2017 from the Paradigm pit lake recorded average TDS of 82,050 mg/L and average pH of 7.37.

8.5.3 Description of potential adverse impact from the emission

Hypersaline water can contaminate surrounding soils with dissolved solids (salts) and can cause vegetation stress or death.

The most recent flora and vegetation surveys of the Carbine/Paradigm Project area were conducted in 2015 by Botanica Consulting. The vegetation unit of the area is broadly described as Goldfields Eucalypt woodland with chenopod and acacia understory. Eucalypts are generally known to be shallow rooted. The project area includes remaining native vegetation.

The survey did not identify any threatened or priority ecological communities, priority species or environmentally sensitive area at the premises. Rowles Lagoon (the only freshwater wetland within the Goldfields Region reserved for nature conservation) is approximately 6.5 km northwest of Carbine pit.

8.5.4 Applicant controls

The Applicant has surveyed Carbine pit and stated that the current water level is 398 m RL to the crest of the pit and determined that the remaining capacity is approximately 3,340,000 kL, allowing for a 6 m freeboard. The Applicant has determined there is adequate space to receive dewater from Paradigm pit.

To ensure the water holding capacity in Carbine pit is not exceeded, the applicant proposes to monitor dewatering volumes on a weekly basis and surveyors will measure the water levels at least monthly.

8.5.5 Key findings

The Delegated Officer has reviewed the information regarding the impact of overtopping of carbine pit and has found:

1. There is potential for vegetation to be damaged due to release of dewater if the pit were to overtop.
2. No threatened or priority ecological communities or flora were found within the premises. The closest sensitive environmental receptor is Rowles Lagoon which is 6.5 km away.
3. The Applicant has surveyed the pit with the results showing there is adequate volume for the proposed amount of dewater to be discharged.
4. The Applicant has committed to maintain water levels to at least 6m below pit crest level.

8.5.6 Consequence

If overtopping of Carbine pit occurs, the impact of hypersaline water on native vegetation will cause low-level on-site impacts. Therefore, the consequence of overtopping of Carbine pit is considered **minor**.

8.5.7 Likelihood of Risk Event

Due to the available capacity within the pit and regular visual monitoring to maintain a 6 m freeboard, the likelihood of Carbine pit overtopping will probably not occur in most circumstances. The likelihood of impact to native vegetation from overtopping of the pit is therefore **unlikely**.

8.5.8 Overall rating of overtopping of Carbine pit

Comparing the consequence and likelihood ratings described above with the risk rating matrix (Table 12) it can be determined that the overall rating for the risk of overtopping of Carbine pit is **medium.**

8.6 Risk Assessment – Dewater pipeline rupture

8.6.1 Description of Risk Event

Abnormal operation

Rupture or failure of the pipeline may occur during abnormal operating events causing discharge of hypersaline mine dewater to native vegetation and fauna.

8.6.2 Identification and general characterisation of emission

Water samples in May and September 2017 from the Paradigm pit lake recorded average TDS of 82,050 mg/L and average pH of 7.37.

8.6.3 Description of potential adverse impact from the emission

Saline water can contaminate surrounding soils with dissolved solids (salts) and can cause vegetation stress or death. The project area includes remaining native vegetation. Eucalypts are generally known to be shallow rooted.

The most recent flora and vegetation survey was conducted in 2015 by Botanica Consulting. The survey did not identify any threatened or priority ecological communities, priority species or environmentally sensitive area at the premises.

Rowles Lagoon (the only freshwater wetland within the Goldfields Region reserved for nature conservation) is approximately 6.5 km northwest of Carbine pit.

8.6.4 Applicant controls

This assessment has reviewed the controls set out in Table 15 below.

Table 15: Applicant's proposed controls for dewater pipeline rupture

Dewater pipelines	Infrastructure controls	Location reference
Dewater pipeline	DN225 class PN25 HDPE pipe is used up the Paradigm pit wall DN250 class PN6.3 HDPE pipe from the top of Paradigm pit to Carbine pit and is contained within an earthen bunded v-drain to ensure spills are contained. Three scour pits located at low points to act as a collection sump for spills. EM digital flow meter installed at the discharge point. Equipped with leak detection between two flow metres located at each end of the pipeline. Leak detection with auto shutdown.	Figure 2
	Operation controls	**Location reference**
	Weekly visual inspection of pipeline and pumping infrastructure.	NA

8.6.5 Key findings

The Delegated Officer has reviewed the information regarding Dewater pipeline rupture and has found:

1. There is potential for vegetation to be damaged due to release of dewater if the pipeline were to rupture.
2. No threatened or priority ecological communities or flora were found within the premises or 15km radius. The closest sensitive environmental receptor is Rowles Lagoon which is 6.5 km away.
3. Water from a pipeline spill would be directed by v-drain to scour pits and be contained.
4. The pipeline is equipped with a leak detection system with automatic cut-off.
5. The Applicant proposes weekly inspections of the pipelines.

8.6.6 Consequence

If a pipeline rupture occurs, the impact of saline water will likely cause low level on-site impacts. Therefore, the consequence of a pipeline rupture is **minor**.

8.6.7 Likelihood of Risk Event

Given the controls proposed by the Applicant, the likelihood of impacts to vegetation from a pipeline rupture, will probably not occur in most circumstances. Therefore, the likelihood of the risk event is considered to be **unlikely**.

Comparing the consequence and likelihood ratings described above with the risk rating matrix (Table 12) it is determined that the overall rating for the risk of a pipeline rupture is **medium.**

8.7 Summary of acceptability and treatment of Risk Events

A summary of the risk assessment and the acceptability or unacceptability of the risk events set out above, with the appropriate treatment and control, are set out in Table 16 below. Controls are described further in section 9.

Table 16: Risk assessment summary

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
1.	Hypersaline mine dewater – mounding	Mine dewater from Paradigm pit	Lateral movement of water through pit walls	Water level maintained at least 6 m below crest level	Moderate consequence Possible **Medium risk**	Acceptable subject to regulatory controls
2.	Hypersaline mine dewater – overtopping	Mine dewater from Paradigm pit	Direct discharge to Carbine pit. Overtopping may occur	Water level maintained at least 6 m below crest level	Moderate consequence Unlikely **Medium risk**	Acceptable subject regulatory controls
3.	Hypersaline mine	Mine dewater	Direct discharge from pipeline	Pipeline lies within earthen v-bund with	Moderate consequence	Acceptable subject regulatory

	Description of Risk Event			Applicant controls	Risk rating	Acceptability with controls (conditions on instrument)
	Emission	**Source**	**Pathway/ Receptor (Impact)**			
	dewater – pipeline rupture	from Paradigm pit	rupture	three scour pits constructed to collect any spills. Pipeline equipped with leak detection and auto cut-outs. Weekly inspections of the pipeline.	Unlikely **Medium risk**	controls

9. Regulatory controls

A summary of regulatory controls determined to be appropriate for the Risk Event is set out in Table 17. The risks are set out in the assessment in section 8 and the controls are detailed in this section. The conditions of the Licence will be set to give effect to the determined regulatory controls.

In accordance with *Guidance Statement: Risk Assessments* (February 2017), where the Applicant's proposed controls lowered or determined the consequence or likelihood of a risk event, these controls will be conditioned in the instrument.

Table 17: Summary of regulatory controls to be applied

		Controls (references are to sections below, setting out details of controls)		
		9.1 Infrastructure and equipment maintenance and operation	**9.2 Monitoring**	**9.3 Reports**
Risk Items (see risk analysis in section 8)	Hypersaline mine dewater – mounding	•	•	•
	Hypersaline mine dewater – overtopping	•	•	•
	Hypersaline mine dewater – pipeline rupture	•		

9.1 Specified infrastructure and equipment controls

9.1.1 Carbine pit

The Delegated Officer has determined that water level should be maintained at least 6 m below the receiving pit crest level.

Grounds: The Applicant's control was considered by the Delegated Officer in determining risk of mounding and overtopping of Carbine pit.

9.1.2 Dewatering pipelines and pumps

The Delegated Officer has determined the following infrastructure and equipment should be maintained and operated for pipeline spill management.

Infrastructure controls and operation	
Dewater pipeline	DN250 PN6.3 HDPE contained within an earthen bunded v-drain. Three scour pits located at low points to act as a collection sump for spills. Flow meter installed at the discharge point. Equipped with leak detection between two flow metres located at each end of the pipeline. Leak detection with auto shutdown. Weekly visual inspection of pipeline and pumping infrastructure.

Grounds: These controls generally replicate the Applicant's controls and were considered by the Delegated Officer in determining risk of pipeline rupture and spill.

9.2 Monitoring requirements

The Licensee shall record the total volume of water discharged on a monthly basis.

The receiving pit (Carbine pit) will require monitoring of freeboard on a monthly basis and sampling of water quality for TDS and pH on a quarterly basis.

Grounds: The Delegated Officer considers this reporting is appropriate to monitor any water quality impacts at the Premises. Monitoring volumetric flow will ensure an accurate annual discharge amount is accounted for. Monitoring of freeboard is to identify the level of the pit lake in comparison to the 6 m below crest level freeboard limit. TDS and pH levels will provide basic water quality data to ensure any changes which may impact on the receiving pit are identified.

9.3 Record keeping

Record-keeping conditions will be included in the Licence to ensure the Licensee maintains all relevant records, logs all complaints and outlines the requirements for a Compliance Report and a Monitoring Report.

9.4 Information

A compliance report is required to be submitted annually indicating the extent to which the licence holder has complied with the conditions of the licence for the preceding year, and for documenting actual throughput for the prescribed category.

The Licensee shall also submit an annual report comprising discharged water volumes and water quality data including a comparison against previous reports for trends or changes to be identified.

10. Determination of Licence conditions

The conditions in the Licence in Attachment 1 have been determined in accordance with the *Guidance Statement: Setting Conditions*.

The *Guidance Statement: Licence Duration* has been applied and the licence expires in 20

years from date of issue.

Table 18 provides a summary of the conditions to be applied to this Licence.

Table 18: Summary of conditions to be applied

Condition Ref	Grounds
Environmental Compliance Condition 1	Environmental compliance is a valid, risk-based condition to ensure appropriate linkage between the licence and the EP Act.
Infrastructure and Equipment Condition 2	These conditions are valid, risk-based and contain appropriate controls.
Monitoring Condition 3	This condition is valid, risk-based and consistent with the EP Act.
Record keeping Information Conditions 4, 5, 6, 7 and 8	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

DWER notes that it may review the appropriateness and adequacy of controls at any time and that, following a review, DWER may initiate amendments to the Licence under the EP Act.

11. Applicant's comments

The Applicant was provided with the draft Decision Report and draft Licence on 15 December 2017. The Applicant had no comments on the draft documents.

12. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1).

Based on this assessment, it has been determined that the Issued Licence will be granted subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Alana Kidd
Manager Licensing
Industry Regulation (Resource Industries)

Delegated Officer under section 20
of the *Environmental Protection Act 1986*

Appendix 1: Key documents

	Document title	In text ref	Availability
1.	Environmental Protection (Gold Extraction Operations Exemption) Order	Gold Extractions Exemption Order	Western Australian Government Gazette, WA, 29 January 1993 No. 20.
2.	Application form and supporting document - *Works Approval/Licence Application Supporting Document – Paradigm Dewatering*, Northern Star Resources Limited, September 2017	the Application	DWER records (A1519060
3.	Email: Subject: *RE: L9099 Paradigm Pit Dewatering queries and progress update*. Sent by Northern Star Resources Limited, 22/11/2017 3:48 PM	the Application	DWER records (A1567211)
4.	Environmental Protection (Gold Extraction Operations Exemption) Order	Gold Extractions Exemption Order	Western Australian Government Gazette, WA, 29 January 1993 No. 20.
5.	*Guidance Statement: Decision Making*. Department of Environment Regulation, February 2017	-	Accessed at www.dwer.wa.gov.au
6.	*Guidance Statement: Environmental Siting.* Department of Environment Regulation, November 2016	-	
7.	*Guidance Statement: Licence duration.* Department of Environment Regulation, August 2016	-	
8.	*Guidance Statement: Risk Assessments,* Department of Environment Regulation, February 2017	-	
9.	*Guidance Statement: Setting conditions.* Department of Environment Regulation, October 2015	-	
10.	*Level 1 Flora & Vegetation Survey of the Carbine and Paradigm area*, Botanica Consulting, October 2015 Draft 1	Flora survey	DWER records (A1567211)
11.	*Publication of Annual Audit Compliance Reports,* Department of Environment Regulation, May 2016	-	

Attachment 1: Licence L9909/2017/1