Decision Report

Application for Licence

Division 3, Part V *Environmental Protection Act 1986*

Works Approval Number	L9193/2019/1
Applicant	Orminex Limited
ACN	008 740 672
File Number	DER2018/001330
Premises	Penny's Find Project Legal description - M27/156 and L27/90 KALGOORLIE BOULDER WA
Date of Report	13 November 2019

1. Definitions

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

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
Applicant	Orminex Limited
ANZECC (2000)	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand, 2000. *Australian New Zealand Guidelines for Fresh and Marine Water Quality*. Volume 1 Chapters 1 - 7 2000.
Category/ Categories	Categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations
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
Emission	has the same meaning given to that term under the EP Act.
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Licence Holder	Orminex Limited
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 Penny's Find Gold Mine 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*
TDS	Total Dissolved Salts
TSS	Total Suspended Solids

2. Purpose and scope of the assessment

2.1 Occupier Details

An application was received by the Department of Water and Environmental Regulation (DWER) on 15 August 2018 for a Licence from Empire Resources Limited. The application was under Prescribed Premises Category 6 (Table 2), to authorise dewatering and discharge of dewatering effluent from the existing open pit mine void at Penny's Find Project (the Premises) on Mining Lease M27/156 and M27/90. At the time the legal occupier of the

Premises was held as a joint venture between Empire Resources Limited (60%) and Brimstone Resources Limited (40%).

On 2 May 2019 during the assessment of this application the Premises mining tenures were sold to Orminex Limited. The transfer of title documentation is being undertaken and has not been provided at the time of this assessment. On 24 May 2019 DWER was provided with evidence of legal authority to the land by Orminex Limited (the Occupier). DWER determines Orminex Limited as the legal occupier of the Premises and is the Occupier of the land to which the Issued Licence is required under the *Environmental Protection Act 1986* (EP Act).

2.2 Description of proposed activity

Open pit mining operations commenced at the Premises in May 2017 and were completed in April 2018. Since then the Premises has been in care and maintenance. The Occupier is proposing to further develop the site into an underground mine to explore mineral deposits to a depth of, approximately, 195m below the base of the existing open pit mine. The infrastructure to dewater the pit is already in place and will be utilised to remove the water in the open pit allowing access to the proposed portal level. Dewatering of the underground will be into the base of the pit and from the base of the pit to Lake Penny approximately 1km to the south west of the open pit.

The existing open pit mine void has filled with water to the height of 290mRL (approximately 35m below ground level) during the time the Premises has been in care and maintenance. In the initial application the dewatering rate was estimated to be 18 L/s over an 11 hour period for two years (1489 m^3 per day, 543,485 kL per annum) to be discharged directly to Lake Penny. The Occupier submitted an addendum (24 May 2019) to the original licence application to increase the mine dewatering rate to 40 L/s (3456 m^3/day) over a 24 hour period for a total of two years. This will increase the discharge capacity to Lake Penny to 1,261 440 k/L per annum. The increased pumping allows for the removal of the approximately 233,000kL of excess water in the pit, the ongoing inflow of the current open pit flows plus the future underground mine dewater. (Orminex, 2019a)

The portal is to be located at 270mRL, the level of the pit lake will then be maintained at 255 mRL. The base of the pit being 245mRL the pit lake surface will be approximately 15m below the portal level and 10m above the base of the pit. (Orminex, 2019a and b) The flow rate is expected to reduce between 20 to 30 L/s during the operation of the mine and the Occupier will pump groundwater directly from the underground mine into the open pit mine void allowing the water sufficient time to settle prior to being discharged to Lake Penny.

The dewatering will be transferred from the open pit mine void by above ground pipework. The pipework is in existence but will be replaced prior to pumping to reduce the current right angle bends where possible along the existing alignment and install a leak detection system with auto shutoff. There is currently two pipes that both come from the pit (110 mm and 160mm diameter) however Orminex propose to replace these two pipes with a single pipe of 250 mm diameter that extends from the open mine pit to Lake Penny. An additional pipe will extend off this pipeline to direct a small volume of water to the storage dam for use in dust suppression. The pipework is proposed to be anchored at regular intervals to restrict movement and installed telemetric equipment will manage potential variations in flow rates. Existing V-drains with bunding are constructed along the pipework to capture any potential loss of dewater effluent. Catch pits will be installed for joins at high stress points (right angle bends).

The existing discharge outlet at Lake Penny is raised and fixed on a rock bunded wall and extends approximately 20 m from the shoreline. The water exits the pipe onto this structure with the rocks dispersing the water to reduce erosion. This rock wall is to be enlarged so that an energy diffusion device fitted to the end of the discharge pipe can be anchored to the top of the wall. The effluent discharge plume expected to be received at Lake Penny was modelled over the duration of the dewatering period proposed and included local topographic data and observed evaporation rates. The surface area/volume of Lake Penny to be inundated from dewatering discharge was 13.2 percent in summer impacted by high evaporation rates and 27.3 percent in winter higher due to decreased evaporation rates. Lake Penny has an area of

516.9 hectares and the lake bed is greater than required to dispose of the dewater effluent (Hydrologia 2019).

The existing clay lined storage dam has been proposed to temporarily store up to 1000 kL of dewater for the use of dust suppression only. No dewater effluent from the existing storage dam will be discharged to Lake Penny.

The documents submitted during the assessment process are detailed in Table 3.The infrastructure as it relates to Category 6 activities, is detailed in Table 4 and the Premises boundary and dewatering map is shown in Figure 1.

This Decision Report only assesses the potential environmental and public health risks associated with emissions and discharges related to Category 6 activities. The assessment of risk is assessed at the maximum design capacity proposed (40 L/s). This assessment does not assess the risks associated with the proposed underground mining operations and does not authorise the applicant to abstract water. The abstraction of groundwater is regulated under the *Rights in Water and Irrigation Act 1914* and a separate application for a groundwater licence is currently being assessed.

Table 2: Prescribed Premises Category

Classification of Premises	Description	Proposed Premises production or design capacity or throughput
Category 6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore	1,261 440 tonnes per annum

Table 3 below lists the documents submitted during the assessment process.

Table 3: Documents and information submitted during the assessment process

Document/information description	Date received
New Licence Application, Empire Resources Limited, Penny's Find Project – DWER Document reference A1712014	15 August 2018
Memorandum Dewatering Discharge from the Penny Find Project to Lake Penny - DWER Document reference DWERDT112283	21 November 2018
Penny's Find Project Revised Mining Proposal Reg ID 58607 Amendment – Underground Mining M27/156, G27/01, L27/90 12 November 2018 Document reference A1750973	13 December 2018
Penny's Find Licence Application – Additional Information on Groundwater Abstraction Licence 27 March 2019 Document reference A1776656	28 March 2019
Applicant Response to Request for Further Information Document reference A1791640	18 April 2019
Memorandum Prescribed Premise Licence Application amendments Document reference A1791633 (New Occupier, Increase Dewater Capacity)	24 May 2019
J0100071 Penny's Find Memo Final – Modelling Methodology Document reference A1792654	29 May 2019
Acquisition Completed Penny's Find Gold Mine Document reference A1787036	08 May 2019

Applicant Response to Request for Further Information Document Reference DWERTD188313	12 August 2019
Applicant Response to Request for Further Information Document Reference A1820235 – Water quality results of mine void at Penny's Find.	03 September 2019

Table 4: Penny's Find Gold Mine Category 6 infrastructure

Infrastructure Prescribed Activity (Category 6)
Transfer groundwater to Lake Penny from Premises open pit mine via pipeline to Lake Penny
HDPE pipeline (250 mm in diameter) a total length of 1.5 km constructed from the open mine pit to the to Lake Penny. An additional HDPE pipeline (250 mm diameter, 27 m length) will extend off this pipeline to direct a small volume of water (~1000m3) to the storage dam for use in dust suppression. Pipework is anchored at regular intervals and extends 20 m from the shoreline into Lake Penny. Catch pits will be installed for joins at high stress points (right angle bends).
A 1 m wide V- Drain is 0.5 m deep with a minimum 0.5 m high earthen bunding and capacity to contain 593 m^3 of water for approximately four hours.
Pipeline telemetry with pressure sensors installed for leak protection and to identify changes in flow rates. Automatic shut off and alert system is triggered when the variance in flow rate is by more than 5% for ten minutes and 10% for two minutes.
2 x Flow meters, one on discharge point to storage dam and at the discharge point at Lake Penny
1 x Fixed rock bunding wall at the discharge point at Lake Penny with energy dissipation device anchored in place.
1 x Storage Dam 2.2 m in depth and clay lined with a total capacity of 3542m^3, and freeboard capacity of 2538m^3 when 0.5 m freeboard maintained.
Other activities
Management of stormwater and overflow of the storage dam
Directly related activities
Pending authorisation (at the time of this assessment) of abstraction of groundwater for mining under the *Rights in Water and Irrigation Act 1914*

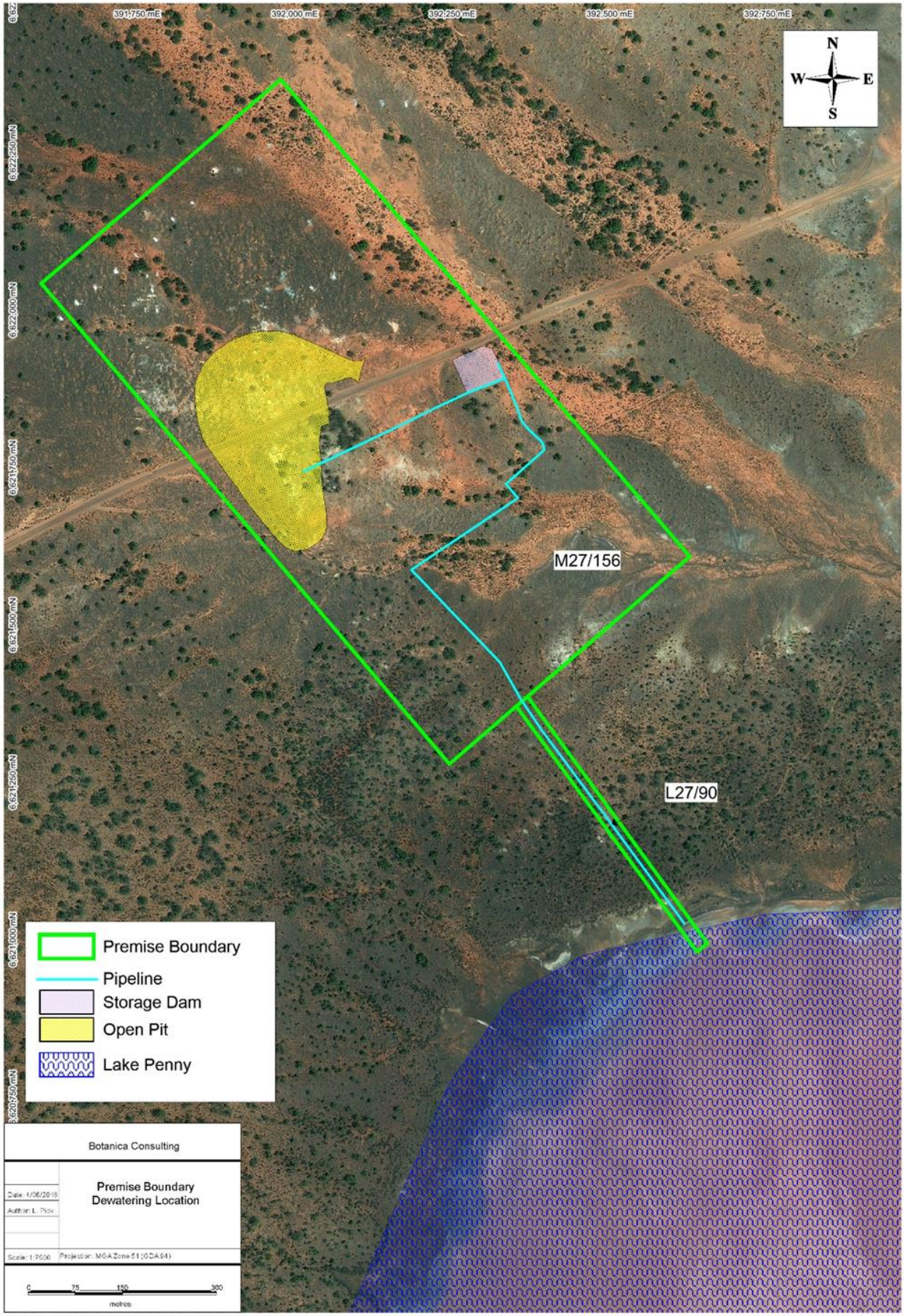

Figure 1: Proposed Premises boundary depicted by green outline and dewatering process depicted by blue line.

3. Legislative context

Table 5: Relevant approvals and tenure to the assessment

Legislation	Number / Agency	Subsidiary	Approval
Environmental Protection Act 1986 *(Division 2, Part V) - Clearing of Native Vegetation*	CPS 6819/7 (DMIRS)	Empire Resources Limited (transfer of title is currently being undertaken to transfer mining tenements to Orminex Ltd.)	Purpose Permit approval to clear 50 ha of native vegetation for mining and dewatering activities (expires 1 January 2021)
Mining Act 1978	Tenement numbers: M27/156, L27/90 Mining Proposal Reg ID 58607and 75697 (DMIRS)		Mining Act tenure permits mining activities. Mining Proposal approved for open pit mining. Amendment to the Mining Proposal for underground mining also approved.
Rights in Water and Irrigation Act 1914	GWL 181513(1) (DWER)		Licence to take water for mining purposes and dust suppression. 5C Groundwater Licence (GWL) for greater amount of discharge is pending approval. Once approved it will be merged into GWL181513.

3.1 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: Regulatory Principles (July 2015)*
- *Guidance Statement: Decision Making (June 2019)*
- *Guidance Statement: Environmental Siting (November 2016)*
- *Guidance Statement: Risk Assessments (February 2017)*
- *Guidance Statement: Setting Conditions (October 2015)*
- *Guidance Statement: Licence Duration (August 2016)*

4. Location and siting

The Premises is located approximately 45km north-east of Kalgoorlie-Boulder within the Hampton Hill Pastoral Lease. (Figure 2) The regional climate is arid to semi-arid with an annual mean rainfall (1975-2003) of 270mm and an annual mean areal potential evapotranspiration of 1200mm.

Figure 2: Location of Penny's Find Project

The topography of the area around Penny's Find is characterized by undulating plains on greenstone and granitic rocks of the Yilgarn Craton. The soil landscape system covering the tenement M27/156 is 'Low breakaways with saline gravelly lower plains supporting predominately halophytic low shrublands'. The soil landscape system covering the tenement L27/90 and the discharge point on Lake Penny is 'Salt lakes with fringing saline alluvial plains, kopi dunes and sandy banks, supporting halophytic shrublands and acacia tall shrublands'. Vegetation is predominately red mallee blackbutt- salmon gum-gimlet woodlands with mulga and halophytic shrublands (and some spinifex grasslands). (Botanica 2018)

4.1 Lake Penny

Lake Penny, which is to receive the mine dewatering is approximately 1km south east of the Penny's Find Pit which is within the central catchment area for the lake. It has an area of approximately 516.9 hectares and is situated within a salt lake basin within the Raeside-ponton catchment of the Western Plateau and is considered a *slightly to moderately disturbed* ecosystem due to historical mining and pastoral activities. It is a natural non-perennial waterbody, receiving regional water drainage from surrounding non-perennial tributaries from the north west that flow for short durations only after rainfall events in an easterly direction to Lake Penny. The lake is surrounded by smaller localised areas of land that become inundated with water after rainfall events to the south east (Figure 3). The surface sediment of Lake Penny was described as clay with a halite crust. It is proposed that the salt crust reaches a maximum of 2 cm towards the center of the Lake. A salt crust up to 10 cm thick may dissipate during heavy rainfall events (DOW 2009).

4.2 Groundwater

The project area lies within the catchment, and immediately north of, the Yindarlgooda North branch of the extensive Roe Palaeodrainage system. The aquifer that the mine intersects is a fractured rock aquifer and as such is unlikely to be uniformly permeable. Higher permeability is likely to be associated with the base of the weathered zone and zones of fracturing within the fresh bedrock. Investigations prior to the commencement of mining the pit gave an estimated

flowrate of 6L/s but during operations this was found to between 8.5 – 23.2 L/s with an average dewatering rate of 18.5L/s. (Orminex Limited 2019b)

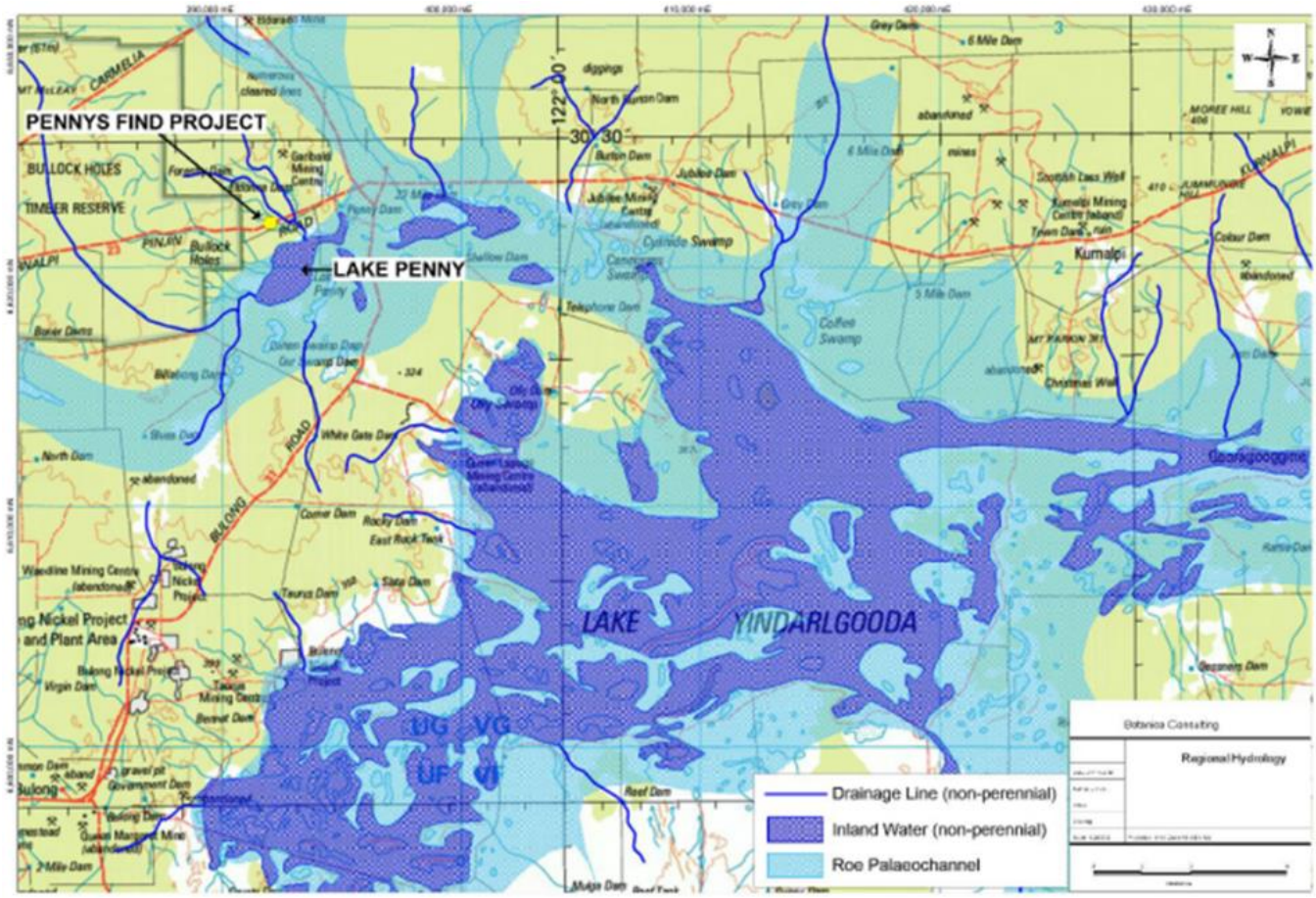

Figure 3: Regional hydrography for Lake Penny

4.3 Vegetation at Lake Penny

A flora assessment conducted by Botanica Consulting in 2015 pre mining identified the vegetation surrounding Lake Penny as Heath of *Melaleuca lateriflora* and low heath of *Tecticornia indica* subspecies *bidens* on the salt lake edge. No threatened or priority flora taxa were identified within the vegetation community at Lake Penny. Post mining assessment has not been provided.

Figure 4: Heath of *Melaleuca lateriflora* and low heath of *Tecticornia indica* subsp.*bidens* on salt lake edge, September 2015

4.4 Fauna assessment

There is limited information on the fauna present in the Lake Penny and the Prescribed Premises area. There is a single malleefowl sighting recorded on the NatureMap database that was sighted near the storage dam area of the mining operations (DBCA).

4.5 Aquatic biota assessment

An assessment of aquatic biota at Lake Penny in 2001 prior to mine dewatering indicated low biodiversity yielding only large numbers of alga *Lamprothamnium* sp. (Campagna 2007). An assessment of aquatic biota post open pit mining has not been conducted.

5. Dewatering discharge

5.1 Water quality results

Lake Penny compared to other salt lakes within the Goldfields region showed similar physical and chemical characteristics (hypersaline and highly mineralised) (DOW 2009 and SIGMC 2018).

Water quality results and parameters tested have been provided for groundwater, water contained within the mine void, water contained within the storage dam and discharge water at Lake Penny and are shown in Table 6 below. Water quality results were compared by have been compared against the ANZECC (2000) guidelines trigger values for protection of 80% of species in marine environments. The following points are noted:

- Water is hypersaline across all sampling sites.
- Total Suspended Solids (TSS) contained in the groundwater sampling from 2015 is elevated compared to the 2019 sampling of the water from the mine void and the 2018 sampling of water at the Lake Penny discharge point.
- Copper concentrations exceeds the trigger value 0.008 mg/L across all sampling sites.
- Zinc concentrations exceeded the trigger value 0.043 mg/L in groundwater and the water contained in the mine void. The discharge point at Lake Penny and the storage dam was not sampled and tested for Zinc concentrations.
- An assessment on Selenium concentrations in dewater effluent is limited as no sampling was conducted for the water contained in the mine void and groundwater. It is unclear if the level of reporting at the storage dam and at Lake Penny discharge point is below detection levels so that the results can be compared to the ANZECC default guideline value. 0.003mg/L is suggested as a low reliability trigger value marine guideline in the ANZECC default guideline values for protecting aquatic ecosystems.
- The limit of reporting for Mercury in water contained in the storage dam exceeds the relevant water criterion and it is unclear if the concentration of Mercury is of environmental concern.
- The limit of reporting for lead in water samples for the mine void and groundwater also exceeded the relevant water criterion and it is unclear if lead is of potential environmental concern.
- The pH across all sampling sites was neutral, ranging between 6.7 and 7.21.

Table 6: Water quality results

Parameter	Unit	Mine void (2019)	Mine void (2019)	Groundwater bore sample (2015)	Storage dam (2018)	Lake Penny discharge point (2018)	ANZECC (2000) Protection of 80% Marine species
pH	-	7.14	7.21	6.7	6.9	6.9	No trigger value specified
Electrical Conductivity (EC)	mS/m	184000	183000	150000	17700	17600	
TDS	mg/L	182000	195000	130000	180000	180000	
TSS	mg/L	25	21	5700	150	73	
Chloride	mg/L	93500	96900	69 000	Not sampled		
Sulphate	mg/L	11200	11000	9 400			
Calcium (Ca)	mg/L	1180	1140	980			
Potassium (K)	mg/L	194	189	130			
Magnesium (Mg)	mg/L	7540	7250	4 800			
Sodium (Na)	mg/L	63700	60300	38 000			
Alkalinity	mg/L	85	81	13			
Arsenic (As)	mg/L	<0.020	<0.020	< 0.05	< 0.05	< 0.05	
Boron (B)	mg/L	Not Sampled			4.9	5.1	
Beryllium (Be)	mg/L				< 0.005	< 0.005	
Cadmium (Cd)	mg/L	0.0361	0.0351	< 0.005	0.006	0.0066	0.036
Chromium (Cr-VI)	mg/L	<0.020	<0.020	< 0.05	< 0.005	< 0.005	0.085
Copper (Cu)	mg/L	0.15	0.16	< 0.05	0.019	0.023	0.008
Iron (Fe)	mg/L	Not Sampled			< 0.05	< 0.05	No trigger value specified
Mercury (Hg)	mg/L	<0.0001	<0.0001	< 0.00005	< 0.005	< 0.005	0.0014
Molybdenum (Mo)	mg/L	Not Sampled			< 0.05	< 0.05	No trigger value specified
Nickel (Ni)	mg/L	0.328	0.302	< 0.05	< 0.05	< 0.05	0.56
Lead (Pb)	mg/L	<0.020	<0.020	< 0.05	< 0.005	< 0.005	0.012
Selenium (Se)	mg/L	Not Sampled			< 0.05	< 0.05	0.003 is suggested as a low reliability trigger value as marine guideline in the ANZECC default guideline values for protecting aquatic ecosystems.
Zinc (Zn)	mg/L	1.43	1.4	0.25	Not Sampled		0.043

5.2 Modelling of discharge plume

The modelled discharge plume shows the maximum extent of inundation (27.3 %) on the surface of Lake Penny during the winter period where maximum inundation is expected due to rainfall events and decreased evaporation rates (Figure 5). The lake bed is proposed to be greater than required to dispose of the dewater effluent (Hydrologia 2019).

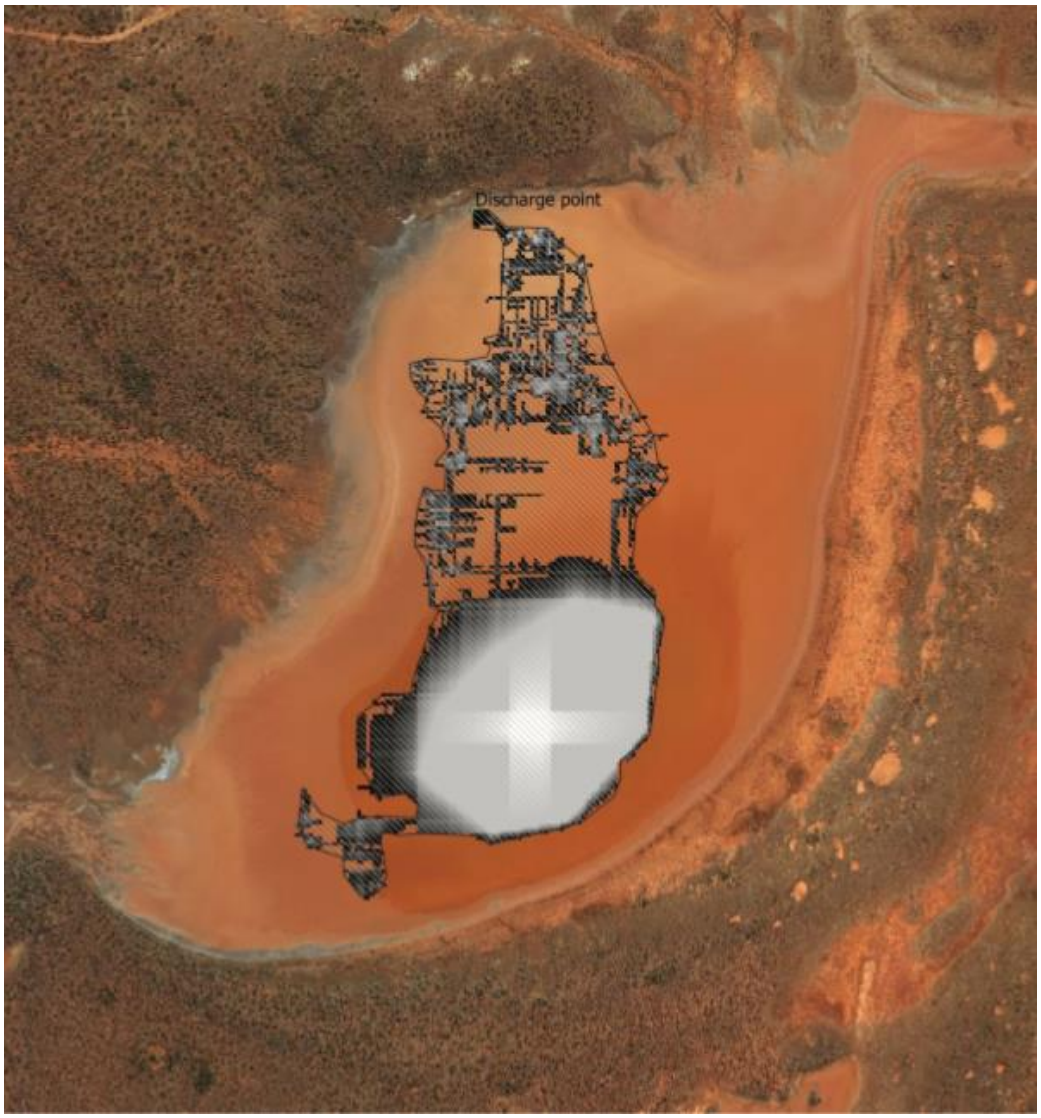

Figure 5: Modelled discharge plume expected during winter at Lake Penny.

6. Emission sources, pathways and receptors

6.1 Emissions

The potential for emissions to impact on sensitive receptors has been assessed in accordance with the Department's Risk Framework. The key emissions considered in this report are increased salt loading and potential elevated concentrations of metals/metalloids from hypersaline water that is discharged to Lake Penny from dewatering activities.

The Occupier has proposed measures to assist in controlling these emissions, where necessary. The control measures have been considered when undertaking the risk assessment detailed in Table 8.

6.2 Receptors

Risk is assessed as a combination of emission sources, the proximity and sensitivity of receptors to those emission sources and any pathways that can allow the emission to reach and potentially harm the receptor. Human receptors associated with Hampton Hill Station (27 km) and residents within the City of Kalgoorlie-Boulder (45km) are more than 25 km southwest of the discharge point at Lake Penny. The distant to residential receptors from the discharge point at Lake Penny is too far for any potential adverse impacts, therefore, have been excluded from the risk assessment.

Table 7 below provides a summary of environmental receptors in proximity to the premises and the risk assessment in Table 8 considers these receptors in the context of emissions and potential pathways.

Table 7: Identification of sensitive receptors from activity boundary

Environmental Receptors	Distance from Prescribed Premises
Lake Penny – salt lake (Ephemeral) covers an area of 517 ha with riparian vegetation fringes and water dependent biota	Direct discharge of hypersaline groundwater from open pit mine void on to Lake Penny.
Lake Yindarlgooda	8 km south east from the discharge point from Lake Penny
Managed Lands and Waters (DBCA)	The Bullock Holes Timber Reserve is located approximately 2 km west of the discharge point at Lake Penny. Water flow from Lake Penny drains south and away from the Timber Reserve.
Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)	No TECs or PECs are located within the Premises boundary or near the discharge point at Lake Penny.
Threatened/Priority Flora	No threatened flora is located within the Premises boundary.
Threatened/Priority Fauna	The vulnerable fauna species, *Leipoa ocellata* (malleefowl) has been recorded within the Premises area. Potential for nesting in area unknown.
Groundwater (Hypersaline TDS 130 000 mg/L)	The groundwater is not considered a sensitive receptor as it is hypersaline.
Public drinking water source areas	Not present within or adjacent to the Premises boundary

6.3 Pathways

The main pathway for the dewater emission to enter the environment is the direct flow of the discharge onto the surface of Lake Penny. This will increase the salt loading in the lake sediment and the freshwater inflowing from rainfall events. It alters the hydrological cycle of the lake as it remains wet continuously rather than going through a dry/wet cycle. The constant inundation can impact on riparian vegetation as the water either comes into direct contact with the vegetation or the air dispersal of salts from the lake surface covers the vegetation and soils.

Another form of pathway is trophic transfer of metals/metalloids through bioaccumulation in individual organisms associated with salt lake systems that are a food source to many bird species, potential for secondary contamination to be biomagnified in local food webs.

Pipeline breaches spilling dewatering directly onto the soil can inundate surrounding vegetation. The soil can be contaminated with increased salt and metals/metalloids.

7. Risk Assessment

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 8.

The identification of the sources, pathways and receptors to determine Risk Events are set out in Table 8 below.

Table 8: Identification of emissions, pathway and receptors of dewatering activities

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		**Potential emissions**	**Potential receptors**	**Potential pathway**	**Potential adverse impacts**		
Category 6 **Mine dewatering:** **Premises on which water is extracted and discharged into the environment to allow mining of ore**	Discharge to Lake Penny	Hypersaline dewater to surface water (lake surface)	Aquatic biota (algae and invertebrate fauna species) and birds which may feed upon them.	Direct discharge to Lake Penny from discharge outlet of effluent with elevated concentrations of metals/metalloids onto Lake Penny. Bio-accumulation and bio-magnification of metals/metalloids in aquatic organisms potentially transferring secondary toxicity effects through fauna food webs via ingestion.	Reduction in species abundance and diversity.	Yes Refer to Section 7.3	Potential impact to receptors
			Shoreline Vegetation	Air dispersal of salts from lake surface. Inundation by dewater discharged onto the lake surface.	Decline/death of vegetation from spray.	Yes Refer to Section 7.4	Potential impact to vegetation receptors

Risk Events						Continue to detailed risk assessment	Reasoning
Sources/Activities		Potential emissions	Potential receptors	Potential pathway	Potential adverse impacts		
	Pipeline failure	Saline water discharge	Native vegetation	Spill to land	Decline/death of vegetation and soil contamination	No	The pipeline is fitted with telemetry and shutoff mechanisms to minimise flow from breaches of the pipeline and it is situated within bunding to contain the spilled dewater.
	Storage Dam – the storage of dewatering effluent	Seepage of salts, metals/metalloids from effluent into soils below the storage dam	Native vegetation	Spill to land from overflow of storage dam.	Decline/death of vegetation and soil contamination	No	The storage dam will be restricted to holding 1000m^3 allowing for sufficient freeboard so that it is unlikely that the storage dam will overflow. It is unlikely that elevated concentrations of particulates will build up within the storage dam given the water is to be used for dust suppression. The use of drip bars rather than sprays reduces the likelihood of impact on vegetation or pooling of dewater on the land surface.
	Reuse of stored effluent for dust suppression activities	Direct discharge to land from overflow of effluent contaminated with elevated metals/metalloids.	Native vegetation	Direct discharge to land surface through use of water for dust suppression.	Decline/death of vegetation and soil contamination		

7.1 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 9 below.

Table 9: 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 10 below.

Table 10: 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.

7.2 Acceptability and treatment of Risk Event

DWER will determine the acceptability and treatment of Risk Events in accordance with the Risk treatment Table 11 below:

Table 11: 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.

7.3 Risk Assessment – Impact to aquatic biota from dewater discharge to Lake Penny

7.3.1 Identification and general characterisation of emission

The water to be discharged is initially from the Penny's Find pit and is groundwater that has flowed into the void from the areas the pit intersects the groundwater aquifers. Subsequently the groundwater extracted from the underground operations will be discharged into the base of the pit When groundwater is held within a mine void the water quality may be altered by contamination due to acid mine drainage and hydrocarbons from equipment used within the pit. It may also go through concentration through evaporation when it is held for long periods of time. The discharge point for the pit dewater is Lake Penny. Water quality analysis of the background groundwater pre-mining and the water accumulated in the pit showed that the water was hypersaline and levels of copper, zinc and lead exceed the ANZECC (2000) marine water criteria (80% species protection level) (Table 6).

The volume of water requiring discharge to Lake Penny currently standing in the Penny's Find pit is estimated to be 233,000kL and will likely require less than one year to discharge at 40L/s. The annual discharge volume after this is estimated to be 1,261,440kL per annum for the life of the underground mine, estimated to be 18 months with a discharge rate of 20-30L/s. The discharge to Lake Penny then is expected to continue for 2 – 3 years and be the quality described in Table 6 showing elevated levels of metals.

7.3.2 Description of potential adverse impact from the emission

Elevated suspended solids metals/metalloids and salts may have adverse impacts on salt lake ecosystem and function. The thickened salt crust may prohibit the germination or hatching of biological propagules present in the sediment and it has been found that pooled discharge waters are usually devoid of organisms. (Taukulis, 2016) There is also potential for erosion of sediments by the flow from the discharge point especially at the higher flow rate of 40L/s.

Lake Penny is a salt lake within the Raeside catchment area and Roe Palaeodrainage system. It

has an area of approximately 516.9 hectares and the dewatering plume is expected to range from 13.2% of the lake surface in summer to 27.3% in winter. There have been no comprehensive baseline studies of the sediment of Lake Penny prior the dewatering of the pit from 2017 – 2018 to assess the levels of metals/metalloids in the lake sediments. However, sediments of Lake Penny were sampled from a single point during a PHD study of Lake Yindarlgooda in which Lake Penny was assessed as a reference site with no mine dewatering occurring there at the time of the assessment. The general findings of this study reported that Lake Penny had higher salinity, total organic carbon and arsenic than the discharge sites at Lake Yindarlgooda. The study also indicated that Lake Penny had low biodiversity compared to other inland salt lakes, particularly in terms of invertebrates as none were found to hatch from the sediments sampled. The only species of alga to develop from the sediment was *Lamprothamnium* sp.

Although the biodiversity was low the productivity showed signs of being high when wet as abandoned swans nests were present on the vegetated sandbanks and a number of banded stilts were reported as present in March 2001 when the lake was full after a significant rainfall event in February 2001(Campagna, 2007). The banded stilt is an extremely nomadic, wide spread species that exploits rainfall events in normally dry inland lakes across Australia. The species feeds on the brine shrimp that typically hatch in large numbers on inland salt lakes. Given the lack of success at hatching invertebrates species from the Lake Penny sediments it cannot be assumed that the single sighting of the banded stilts at the lake after a rainfall event to be evidence of a breeding colony. The short period of time that the dewatering discharge will occur at Lake Penny means the risk to the migratory birds will be limited in terms of population and period of time.

The available information provided on the baseline state of Lake Penny indicates the lake to be lower in biodiversity than many other salt lakes in the Goldfields Region. The area directly impacted by the discharge is <30% of the lake surface and the time of impact is less than three years. Based on this the local impacts to the environment are likely to be minor and the wider environmental impact minimal – not detectable.

7.3.3 Criteria for assessment

The use of the ANZECC (2000) criteria default guideline values for marine water quality is used as a comparison for the levels of toxicants in the discharge water.

7.3.4 Consequence

The impact on the aquatic biota of direct discharge onto Lake Penny of dewater with elevated concentrations of metals/metalloids, has been determined by the Delegated Officer to be low level. Therefore, the Delegated Officer considers the consequence of direct discharge of dewater with elevated concentrations of metals/metalloids onto Lake Penny to be **Minor.**

7.3.5 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of impact on the aquatic biota of direct discharge of dewater with elevated concentrations of metals /metalloids onto Lake Penny occurring could occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Event 1 to be **Possible**.

7.3.6 Overall rating of the risk of impact to aquatic biota from dewater discharge to Lake Penny

The Delegated Officer has compared the consequence and likelihood ratings described above with the risk rating matrix (Table 9) and determined that the overall rating for the risk of direct discharge of dewater with elevated concentrations of metals /metalloids onto Lake Penny is **Medium**.

7.4 Risk Assessment – Impact to shoreline vegetation from dewater discharge to Lake Penny.

7.4.1 Identification and general characterisation of emission

The water to be discharged is initially from the Penny's Find pit and is groundwater that has flowed into the void from the areas the pit intersects the groundwater aquifers. Subsequently the groundwater extracted from the underground operations will be discharged into the base of the pit When groundwater is held within a mine void the water quality may be altered by contamination due to acid mine drainage. It may also go through concentration through evaporation when it is held for long periods of time. The discharge point for the pit dewater is Lake Penny. Water quality analysis of the background groundwater pre-mining and the water accumulated in the pit showed that the water was hypersaline and levels of copper, zinc and lead exceed the ANZECC (2000) marine water criteria (80% species protection level) (Table 6).

The volume of water requiring discharge to Lake Penny currently standing in the Penny's Find pit is estimated to be 233,000kL and will likely require less than one year to discharge at 40L/s. The annual discharge volume after this is estimated to be 1,261,440kL per annum for the life of the underground mine, estimated to be 18 months with a discharge rate of 20-30L/s. The discharge to Lake Penny then is expected to continue for 2 – 3 years and be the quality described in Table 6 showing elevated levels of metals.

7.4.2 Description of potential adverse impact from the emission

The fringing vegetation is slightly elevated from the shoreline in areas near the discharge point but this is not true for the entire shoreline and inundation of vegetation causing death is a potential impact from the discharge of the dewatering. Air dispersal of salts from the lake surface is also capable of impacting surrounding soils and vegetation.

7.4.3 Criteria for assessment

There was a vegetation survey carried out in 2015 (Botanica 2018). No threatened or Priority Flora were identified within the riparian community of heath of *Melaleuca lateriflora* and low heath of *Tecticornia indica* subsp*. bidens* on salt lake edge. Based on the Keighery vegetation health rating scale, Heath of Melaleuca lateriflora and low heath of Tecticornia indica subsp. bidens on salt lake edge was rated as 'good', which depicts that vegetation structure has been affected by multiple disturbances (grazing, pastoral land use, partial clearing); however, it still retains its basic structure and has the ability to regenerate naturally. No introduced species were identified within this vegetation type.

7.4.4 Consequence

The Delegated Officer has determined that the impact to shoreline vegetation from dewater discharge of dewater with elevated concentrations of metals/metalloids to Lake Penny will be low level. Therefore, the Delegated Officer considers the consequence of impact to shoreline vegetation from dewater discharge to Lake Penny to be **Minor.**

7.4.5 Likelihood of Risk Event

The Delegated Officer has determined that the likelihood of impact to shoreline vegetation from discharge onto Lake Penny of dewater with elevated concentrations of metals /metalloids could occur in most circumstances. Therefore, the Delegated Officer considers the likelihood of Risk Event 1 to be **Possible**.

7.4.6 Overall rating of the risk of impact to riparian vegetation from dewater discharge to Lake Penny

The Delegated Officer has compared the consequence and likelihood ratings described above

with the risk rating matrix (Table 9) and determined that the overall rating for the risk of direct discharge of dewater with elevated concentrations of metals /metalloids onto Lake Penny is **Medium**.

7.5 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 12 below. Controls are described further in section 11.

Table 12: 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	Direct discharge to the lake surface.	Direct discharge to Lake Penny from discharge outlet of effluent with elevated concentrations of metals/metalloids onto Lake Penny. Bio-accumulation of metals/metalloids in aquatic organisms potentially transferring secondary toxicity effects through fauna food webs via ingestion.	The pipeline is to be fitted with an energy dissipation device. Monitoring of the discharge to ascertain the water quality and quantity of the discharge.	Minor consequence Possible likelihood **Medium Risk**	Acceptable, generally subject to regulatory controls. Licence conditions: **2** prevents water being discharged from the storage pond. **4** requires use of an energy dissipation device at the discharge point. **6** outlines the infrastructure including the pipeline and discharge point infrastructure. **7-9** monitoring conditions to provide data on water quality.
2	Hypersaline mine dewater	Direct discharge to the lake surface.	Air dispersal of salts from lake surface.	The discharge point is 20m from the shoreline and fitted with an energy dissipation device to reduce potential for pooling due to erosion of the lake surface close to shore.	Minor consequence Possible likelihood **Medium Risk**	Acceptable, generally subject to regulatory controls. Licence conditions: **2** prevents water being discharged from the storage pond. **4** requires use of an energy dissipation device at the discharge point. **6** outlines the infrastructure including the pipeline and discharge point infrastructure. **7-9** monitoring conditions to provide data on riparian vegetation condition.

8. Consultation

The Occupier was provided with the draft Decision Report and draft Licence on 18 October 2019. The Occupier provided comments on the draft documents summarised in Table 13.

Table 13: Summary of occupier comments on risk assessment and draft conditions

Method	Comments received	DWER response
Application advertised on DWER website (29/05/2019)	No Comments received	Not required
Direct interest stakeholders notified 28/05/2019	Comments received 20/06/2019. Shire of Kalgoorlie- Boulder had no objections to the application	Not required
Technical Advice Requested by DWER to Principal Hydrogeologist (8/01/2019)	Response received 22/01/2019	Not required
Applicant notified of draft 18/10/2019	Comments received 31/10/2019 and 13/11/2019. Pipeline details confirmed and corrected pipeline route provided.	Not required

9. 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).

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 approval under the EP Act.

Tim Gentle

Digitally signed by Tim Gentle
Date: 2019.11.13 15:19:49 +08'00'

Timothy Gentle
MANAGER RESOURCES INDUSTRIES
REGULATORY SERVICES

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

Appendix 1: Key documents

Document title	In text reference	Availability
Works Approval (W6183/2018/1) application form and supporting documentation (October 2018)	N/A	DWER records (A1732966; A1732975)
Department of Water.2009. Development of Framework for assessing the cumulative impacts of dewatering discharge to salt lakes in the goldfields of Western Australia. Outback Ecology Services.	DOW 2009	Accessed at https://www.water.wa.gov.au/
SIGMC 2018. Final Report B2018 Project: Appendix O: Ecological Assessment of Lake Lefroy's peripheral wetlands. Stantec Australia.	SIGMC 2018	Accessed at http://www.epa.wa.gov.au
Orminex Limited, Groundwater licence operating strategy: Orminex Limited: Penny's Find, Groundwater Resource Management.	Orminex Limited 2019a	DWER records (DWERDT202200)
Orminex Limited, Hydrogeological assessment: Orminex Limited: Penny's Find, Groundwater Resource Management.	Orminex Limited 2019b	DWER records (DWERDT202198)
Taukulis, F. E. (2016). Dewatering discharge in the Goldfields: ecology, monitoring, management and mitigation. Goldfields Environmental Management Group, Kalgoorlie.	Taukulis, 2016	Accessed at http://www.gemg.org.au/GEMG/workshop
Botanica Consulting: Memorandum: Dewatering dishcarge from the Penny Find Project to Lake Penny.	Botanica 2018	DWER Document reference DWERDT112283
Campagna, V.S. 2007, Limnology and biota of Lake Yindarlgooda – an inland salt lake in Western Australia under stress	Campagna 2007	Accessed at: https://espace.curtin.edu.au/handle/20.500.11937/1883
Department of Biodiversity, Conservation and Attractions. NatureMap database	DBCA	Accessed at: https://naturemap.dbca.wa.gov.au/
DER, July 2015. *Guidance Statement: Regulatory principles.* Department of Environment Regulation, Perth.	N/A	Accessed at www.dwer.wa.gov.au
DER, October 2015. *Guidance Statement: Setting conditions.* Department of Environment Regulation, Perth.		
DER, August 2016. *Guidance Statement: Licence duration.* Department of Environment Regulation, Perth.		
DER, February 2017 *Guidance Statement: Risk Assessments*. Department of Environment Regulation, Perth.		
DER, February 2017. *Guidance Statement: Decision Making*. Department of Environment Regulation, Perth.		