Government of **Western Australia**
Department of **Environment Regulation**

Your ref W5790/2015/1
Our ref DER2014/003205
Enquiries Paul Anderson
Phone (08) 9964 0916
Fax (08) 9921 5713
Email paul.anderson@der.wa.gov.au

Mrs Joanna Kiddie
Environmental Manager
Silver Lake Resources Limited
PO Box 876
SOUTH PERTH WA 6951

Dear Mrs Kiddie

***ENVIRONMENTAL PROTECTION ACT 1986*: WORKS APPROVAL GRANTED**

Premises
Silver Lake Resources Murchison Goldfield Project Area
Mining Tenment: M20/108, CUE WA
Works Approval Number: W5790/2015/1

A works approval under the *Environmental Protection Act 1986* (the Act) has been granted for the above premises. The Department of Environment Regulation will advertise the issuing of this works approval in the public notices section of *The West Australian* newspaper.

The works approval includes attached conditions. Under section 55(1) of the Act, it is an offence to contravene a condition of a works approval. This offence carries a penalty of up to $125,000 and a daily penalty of up to $25,000.

In accordance with section 102(1)(c) of the Act, you have 21 days to appeal the conditions of the works approval. Under section 102(3)(a) of the Act, any other person may also appeal the conditions of the works approval. To lodge an appeal contact the Office of the Appeals Convenor on 6467 5190 or by email at admin@appealsconvenor.wa.gov.au.

Emissions from the premises that are the subject of a works approval are not authorised until or unless a licence is issued or unless the emissions are in accordance with the works approval and while that works approval is in force.

If you have any queries regarding the above information, please contact Paul Anderson on 9964 0916.

Yours sincerely

Alana Kidd
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Thursday, 19 March 2015

enc: *Environmental Protection Act 1986* Works Approval W5790/2015/1

Government of **Western Australia**
Department of **Environment Regulation**

Works Approval

Environmental Protection Act 1986, Part V

Works Approval Holder: Silver Lake Resources Limited

Works Approval Number: W5790/2015/1

Registered office:	Suite 4, Level 3 85 South Perth Esplanade SOUTH PERTH WA 6951
ACN:	108 779 782
Premises address:	Silver Lake Resources Murchison Goldfield Project Area Mining Tenement: M20/108 CUE WA 6640 As depicted in Schedule 1
Issue date:	Thursday, 19 March 2015
Commencement date:	Monday, 23 March 2015
Expiry date:	Thursday, 22 March 2018

The following category/s from the *Environmental Protection Regulations 1987* cause this Premises to be a prescribed premises for the purposes of the *Environmental Protection Act 1986*:

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: premises on which – (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	50,000 tonnes or more per year	1,400,000 tonnes per annual period

Conditions
This Works Approval is subject to the conditions set out in the attached pages.

.....
Officer delegated under section 20
of the *Environmental Protection Act 1986*

Works Approval Conditions

1 General

1.1 Interpretation

1.1.1 In the Works Approval, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 In the Works Approval, unless the contrary intention appears:

'Act' means the *Environmental Protection Act 1986;*

'annual period' means the inclusive period from 1 January until 31 December each year;

'CEO' means Chief Executive Officer of the Department of Environment Regulation;

'CEO' for the purpose of correspondence means;

Manager Licensing (Resources Sector (North))
Department of Environment Regulation
Locked Bag 33, Cloisters Square
PERTH WA 6850
Telephone: (08) 9333 7510
Facsimile: (08) 9333 7550
Email: industry.regulation@der.wa.gov.au;

'code of practice for the storage and handling of dangerous goods' means document titled "Storage and handling of dangerous goods: Code of Practice" published by the Department of Mines and Petroleum, as amended from time to time;

'dangerous goods' has the meaning defined in the *Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007*;

'environmentally hazardous material' means material (either solid or liquid raw materials, materials in the process of manufacture, manufactured products, products used in the manufacturing process, by-products and waste) which if discharged into the environment from or within the premises may cause pollution or environmental harm. Note: Environmentally hazardous materials include dangerous goods where they are stored in quantities below placard quantities. The storage of dangerous goods above placard quantities is regulated by the Department of Mines and Petroleum;

'Premises' means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Works Approval;

'Schedule 1' means Schedule 1 of this Works Approval unless otherwise stated;

'Works Approval' means this Works Approval numbered W5790/2015/1 and issued under the *Act;* and

'Works Approval Holder' means the person or organisation named as the Works Approval Holder on page 1 of the Works Approval.

1.1.3 Any reference to an Australian or other standard in the Works Approval means the relevant parts of the standard in force from time to time during the term of this Works Approval.

1.1.4 Any reference to a guideline or code of practice in the Works Approval means the current version of the guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guidelines or code of practice made during the term of this Works Approval.

1.2 General conditions

1.2.1 The Works Approval Holder shall construct the works in accordance with the documentation detailed in Table 1.2.1:

Table 1.2.1: Construction Requirements[1]

Document	Parts	Date of Document
Works Approval Application Form	All	17 December 2014
Silver Lake Resources Limited, Murchison Operation Mining Proposal, *Julies Reward In Pit Tailings Storage Facility M20/108,* 17 December 2014	All, including Drawings and Appendices	17 December 2014
Silver Lake Resources Limited, Murchison Operation Works Approval – Additional information, *Julies Reward In Pit Tailings Storage Facility M20/108,* 9 January 2015	All	17 December 2014

Note 1: Where the details and commitments of the documents listed in condition 1.2.1 are inconsistent with any other condition of this works approval, the conditions of this works approval shall prevail.

1.2.2 The Works Approval Holder, except where storage is prescribed in section 1.3, shall ensure that environmentally hazardous materials are stored in accordance with the code of practice for the storage and handling of dangerous goods.

1.3 Premises operation

There are no specified conditions relating to Premises operation in this section.

2 Emissions

There are no specified conditions relating to emissions in this section.

3 Monitoring

There are no specified conditions relating to monitoring in this section.

4 Improvements

There are no specified conditions relating to improvements in this section.

5 Information

5.1 Reporting

5.1.1 The Works Approval Holder shall submit a compliance document to the CEO, following the construction of the works and prior to operation of the same.

5.1.2 The compliance document shall:

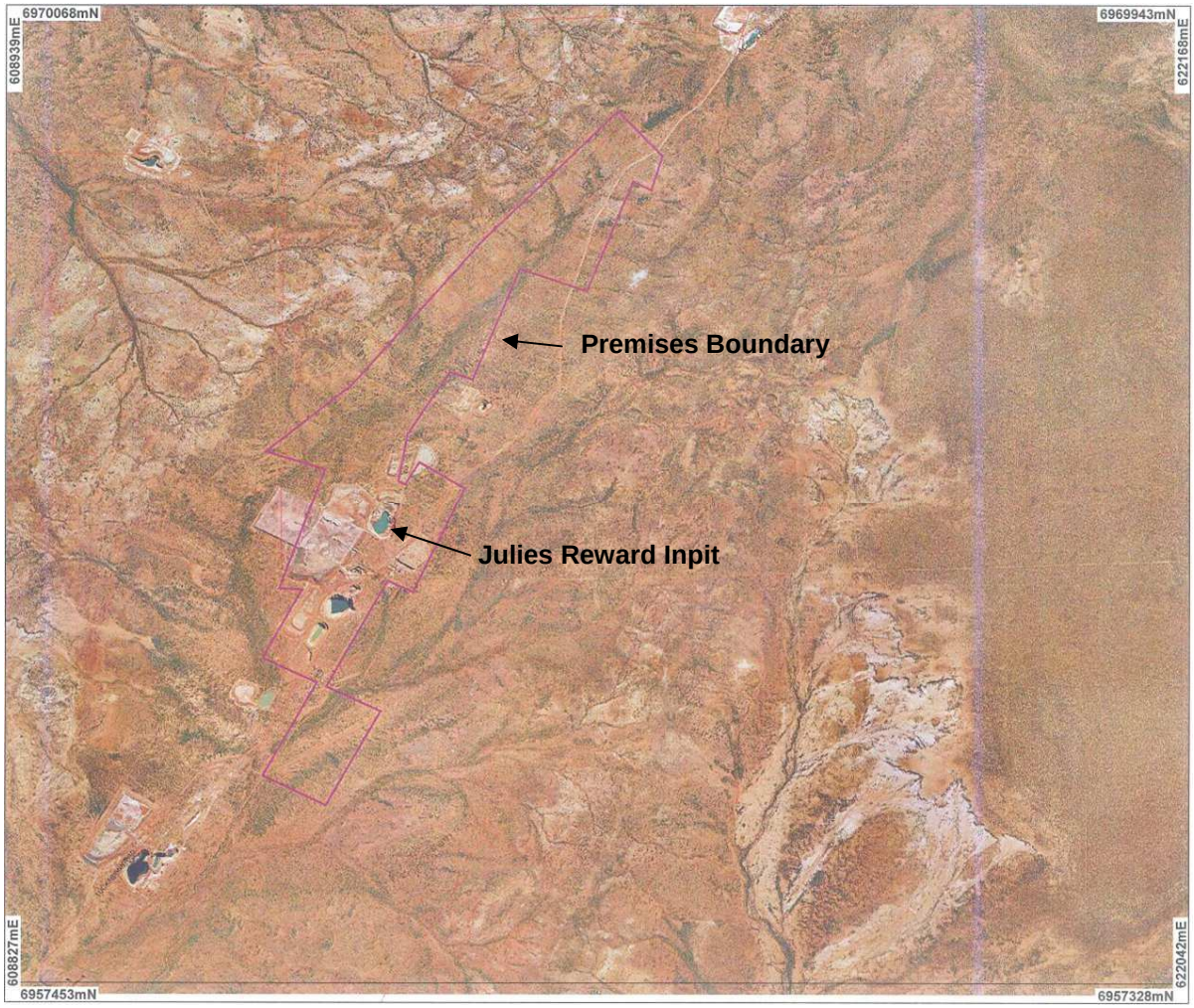
(a) certify that the works were constructed in accordance with the conditions of the Works Approval; and

(b) be signed by a person authorised to represent the Works Approval Holder and contain the printed name and position of that person within the company.

Schedule 1: Maps

Premises map

The Premises is shown in the map below. The pink line depicts the Premises boundary.



Government of Western Australia
Department of Environment Regulation

Decision Document

Environmental Protection Act 1986, Part V

Proponent: Silver Lake Resources Limited

Works Approval: W5790/2015/1

Registered office:	Suite 4, Level 3 85 South Perth Esplanade SOUTH PERTH WA 6951
ACN:	108 779 782
Premises address:	Silver Lake Resources Murchison Goldfield Project Area Mining Tenement: M20/108 CUE WA 6640
Issue date:	Thursday, 19 March 2015
Commencement date:	Monday, 23 March 2015
Expiry date:	Thursday, 22 March 2018

Decision

Based on the assessment detailed in this document the Department of Environment Regulation (DER), has decided to issue a works approval. DER considers that in reaching this decision, it has taken into account all relevant considerations and legal requirements and that the Works Approval and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by:	Paul Anderson Environmental Officer - Licensing
Decision Document authorised by:	Alana Kidd Manager Licensing

Contents

1 Purpose of this Document

This decision document explains how DER has assessed and determined the application and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

Works approval and licence conditions
DER has three types of conditions that may be imposed on works approvals and licences. They are as follows;

Standard conditions (SC)

DER has standard conditions that are imposed on all works approvals and licences regardless of the activities undertaken on the Premises and the information provided in the application. These are included as the following conditions on works approvals and licences:

Works approval conditions: 1.1.1-1.1.4, 1.2.1, 1.2.2, 5.1.1 and 5.1.2.

Licence conditions: 1.1.1-1.1.4, 1.2.1-1.2.4, 5.1.1-5.1.4 and 5.2.1.

For such conditions, justification within the Decision Document is not provided.

Optional standard conditions (OSC)

In the interests of regulatory consistency DER has a set of optional standard conditions that can be imposed on works approvals and licences. DER will include optional standard conditions as necessary, and are likely to constitute the majority of conditions in any licence. The inclusion of any optional standard conditions is justified in Section 4 of this document.

Non standard conditions (NSC)

Where the proposed activities require conditions outside the standard conditions suite DER will impose one or more non-standard conditions. These include both premises and sector specific conditions, and are likely to occur within few licences. Where used, justification for the application of these conditions will be included in Section 4.

2 Administrative summary

Administrative details		
Application type	Works Approval ☒ New Licence ☐ Licence amendment ☐ Works Approval amendment ☐	
Activities that cause the premises to become prescribed premises	**Category number(s)** 5	**Assessed design capacity** 1,400,000 tonnes per annual period
Application verified Application fee paid	Date: 9 January 2015 Date: 16 January 2015	
Works Approval has been complied with Compliance Certificate received	Yes☐ No☐ N/A☒ Yes☐ No☐ N/A☒	
Commercial-in-confidence claim	Yes☐ No☒	
Commercial-in-confidence claim outcome		
Is the proposal a Major Resource Project?	Yes☐ No☒	
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*?	Yes☐ No☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Is the proposal subject to Ministerial Conditions?	Yes☐ No☒	Ministerial statement No: EPA Report No:
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)?	Yes☐ No☒ Department of Water consulted Yes ☐ No ☐	
Is the Premises within an Environmental Protection Policy (EPP) Area Yes☐ No☒ If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes☐ No☒ If Yes, include details here, eg Site is subject to SO_2 requirements of Kwinana EPP.		

3 Executive summary of proposal and assessment

Silver Lake Resources Limited (Silver Lake) was issued *Environmental Protection Act 1986* Licence L8644/2012/1 in August 2012 for the Silver Lake Resources Murchison Goldfield Project Area (Project).

The Project was assessed as a prescribed premises under categories:

- 5 – Processing or beneficiation of metallic or non-metallic ore; and
- 6 – Mine dewatering.

The Project is located approximately 25 kilometres (km) southeast of the town of Cue in the Midwest region of Western Australia. The Project is located on mining tenements M20/55, M20/108, M20/208, M21/8, M21/72, M20/195 and L21/16. The Project is currently under care and maintenance.

Silver Lake proposes to develop the Julies Reward In-pit Tailings Storage Facility (In-pit TSF) at the Project. Tailings material generated at the Project is currently deposited into the existing above ground tailings storage facility (TSF), however, this facility has reached its capacity and an alternative storage area is required.

The In-pit TSF is located on mining tenement M20/108 and is north of the process plant and northeast of the existing TSF. As a result, only minor works will be required for the construction of the In-pit TSF. This includes relocating the tailings discharge pipeline and the decant return water pipeline from the TSF to the new In-pit TSF. The alignment of the pipelines will utilise previously disturbed land and vegetation clearing will be minimal. The pipelines will be laid above ground within a specially constructed bunded corridor, which includes a scour pit, so any spillage can be contained and controlled. The corridor is graded to allow any spilt tailings to flow back towards the In-pit TSF.

Tailings will be discharged into the In-pit TSF at a maximum rate of 1,400,000 tonnes per year for a period of four years. The proposed tailings deposition method is subaerial so as to minimise water stored on the surface of the deposited material. This will maximise, by desiccation, the in situ dry density and long-term strength of the tailings. It will also facilitate higher water returns to the process plant.

The tailings slurry will be discharged via a single spigot point over the pit rim from where the tailings will cascade over the pit walls and benches toward the pit floor. The spigot will initially be located in the southwestern section of the pit. Its alternative location will be in the northeastern section of the pit. Location of the spigot is dependent on the location of the decant pond and development of the tailings beach. The spigot location and the corresponding decant pump location will be sequenced to maximise the storage capacity of the void while increasing the potential for water recovery from the pit to the process plant.

Tailings deposition into the southwestern section of the pit will result in the decant water ponding near the northern access ramp. Decant water will be recovered from this location via a decant pump on a floating pontoon deployed from the pit ramp. Decant water will be returned to the process water pond via the existing decant water pipeline which will be moved into the same corridor as the tailings pipeline.

An earthen safety bund is already in place around the perimeter of the In-pit and will assist in preventing the ingress of stormwater. A minimum freeboard of 910 mm will be maintained at all times as part of the Silver Lakes tailings storage facility operations manual.

The main emission from the premises which is being assessed in this proposal is the discharge of the tailings material into a previously mined pit. The potential impacts on the environment include contamination of the groundwater, groundwater mounding, harm to vegetation due to pipeline failure

and overtopping. An assessment of the potential impacts from the discharge of tailings into an open mined pit, and how those potential impacts will be managed, is covered in more detail in Appendix A of this document.

An amendment to the Licence will be required following the completion of the works and the submission of a compliance document including:

- addition of the In-pit freeboard requirement;
- process monitoring of tailings deposited to, and volumes of water recovered from the In-pit;
- an update to point-source emissions to groundwater monitoring requirements; and
- addition of eight new groundwater monitoring bores (JMB01 – JMB08) and their monitoring requirements.

DER considers that Silver Lake's commitments, internal procedures and the conditions of Licence L8644/2012/1 provide sufficient protection that the risks can be appropriately managed. This works approval has not been assessed as a high risk premises requiring reduced time frames for approvals, therefore, it will be issued for the standard period of three years.

4 Decision table

All applications are assessed in line with the *Environmental Protection Act 1986*, the *Environmental Protection Regulations 1987*, and DER's Operational Procedure on Assessing Emissions and Discharges from Prescribed Premises. Where other references have been used in making the decision they are detailed in the decision document.

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
General conditions	W1.2.1 – W1.2.2 L1.2.1 – L1.2.5	OSC	**Construction** Standard general conditions have been applied to the Works Approval. **Operation** General conditions are already included in the existing Licence. No additional general conditions are required in the Licence.	Application supporting documentation
Premises operation	W1.3 L1.3.1 – L1.3.5	OSC	**Construction** There are no specified premises operation conditions in this section. **Operation** Premises operation conditions are already included in the existing Licence. An amendment to L1.3.3 and the map in Schedule 1 will be required to include the new In-pit TSF where tailings are permitted to be deposited. An assessment of the potential impacts from the discharge of tailings into an open mined pit and how those potential impacts will be managed is covered in more detail in Appendix A of this document.	*Environmental Protection Act 1986* *Environmental Protection (Unauthorised Discharges) Regulation 2004*
Emissions general	W2 L2.1.1	OSC	**Construction** There are no specified conditions relating to emissions in this section. **Operation**	*Environmental Protection Act 1986*

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			Descriptive limits have been set through condition 2.6.1 of the Licence and therefore OSC L2.1.1 regarding recording and investigation of exceedances of limits or targets is included in the Licence.	
Point source emissions to air including monitoring	W2 and W3 L 2.2	N/A	**Construction** There will be no point source emissions to air during construction of the In-pit TSF. There are no specified conditions relating to emissions to air in this section. **Operation** There are no conditions relating to emissions to air in the Licence. No new air emission conditions are required in the Licence.	*Environmental Protection Act 1986*
Point source emissions to surface water including monitoring	W2 and W3 L2.3	N/A	**Construction** There will be no point source emissions to surface water during construction of the In-pit TSF. There are no specified conditions relating to emissions to surface water in this section. **Operation** There are no conditions relating to emissions to surface water in the Licence. No new emissions to surface water conditions are required in the Licence.	*Environmental Protection Act 1986* *Environmental Protection (Unauthorised Discharges) Regulation 2004*
Point source emissions to groundwater including monitoring	W2 and W3 L2.4.1	OSC	**Construction** There will be no point source emissions to groundwater during construction of the In-pit TSF. No specified conditions relating to point source emissions to groundwater or the monitoring of such emissions are required to be added to the works approval. **Operation** Conditions for point source emissions to groundwater are already included in the	*Environmental Protection Act 1986* *Environmental Protection (Unauthorised Discharges)*

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			existing Licence. No additional conditions are required in the Licence; however Julies Reward will be removed from the dewatering discharge locations by amendment.	*Regulation 2004*
Emissions to land including monitoring	W2 and W3 L2.5	N/A	**Construction** There will be no emissions to land during construction of the In-pit TSF. There are no specified conditions relating to emissions to land in this section. **Operation** There are no conditions relating to emissions to land in the Licence. No new conditions relating to emissions to land are required in the Licence.	*Environmental Protection Act 1986* *Environmental Protection (Unauthorised Discharges) Regulation 2004*
Fugitive emissions	W2 and W3 L2.6.1	OSC	**Construction** Dust emissions are considered insignificant with only minor construction works required for the In-pit TSF infrastructure. No specified conditions relating to fugitive dust emissions are required to be added to the Works Approval. **Operation** Tailings material will remain moist during the operation of the In-pit TSF therefore no dust emissions are expected. The deposited tailings material remains wet throughout the operation of the In-pit TSF. Conditions relating to fugitive emissions are already included in the existing Licence. No additional fugitive emissions conditions are required in the Licence.	Application supporting documentation *Environmental Protection Act 1986*
Odour	W2 and W3 L2.7	N/A	**Construction & Operation** No significant odour emissions are expected during the construction and operation of the In-pit TSF. No specified conditions relating to odour emissions are required to be added to	*Environmental Protection Act 1986*

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			the Works Approval or Licence.	
Noise	W2 and W3 L2.8	N/A	**Construction & Operation** General construction type noise emissions are expected however are considered to be insignificant because the Project is isolated with the nearest sensitive premises over 25 km away. No specified conditions relating to noise emissions are required to be added to the Works Approval or Licence.	*Environmental Protection Act 1986* *Environmental Protection (Noise) Regulations 1997*
Monitoring general	W3 L3.1.1 - L3.1.4	OSC	**Construction** No monitoring is required during construction and therefore conditions are not required. **Operation** Conditions relating to general monitoring are already included in the existing Licence. No additional general monitoring conditions are required in the Licence.	Application supporting documentation *Environmental Protection Act 1986*
Monitoring of inputs and outputs	W3 L3.6	N/A	**Construction** No commissioning is proposed under the Works Approval, therefore monitoring of inputs and outputs is not required. **Operation** No specified conditions relating to the monitoring of inputs or outputs are required to be added to the Licence.	*Environmental Protection Act 1986*
Process monitoring	W3 L3.7.1	OSC	**Construction** No process monitoring is required during construction and therefore conditions are not required. **Operation**	*Environmental Protection Act 1986*

DECISION TABLE				
Works Approval / Licence section	**Condition number W = Works Approval L= Licence**	**OSC or NSC**	**Justification (including risk description & decision methodology where relevant)**	**Reference documents**
			Conditions relating to process monitoring are already included in the existing Licence. An amendment to OSC L3.7.1 will be required to include the monitoring of the volume of tailings discharged into the In-pit TSF, the volumes of water recovered from the In-pit TSF, and the map in Schedule 1.	
Ambient quality monitoring	W3 L3.8.1	OSC	**Construction** No ambient quality monitoring is required during construction and therefore conditions are not required. **Operation** Conditions relating to ambient quality monitoring are already included in the existing Licence. An amendment to OSC L3.8.1 will be required to include the monitoring and the establishment of targets for the new installed groundwater monitoring bores at the In-pit TSF, and to the map in Schedule 1.	*Environmental Protection Act 1986* Stock watering guidelines (ANZECC/ARMCANZ, 2000).
Meteorological monitoring	W3 L3.9	N/A	No meteorological monitoring required.	N/A
Improvements	W4 L4	N/A	No improvement conditions required.	N/A
Information	W5.1.1 – W5.1.2 L5.1.1 – L5.1.4, L5.2.1 – L5.2.2 and L5.3.1	OSC	**Construction** Standard information conditions have been included in the Works Approval. **Operation** Standard information conditions are already included in the existing Licence. OSC L5.3.1 has been altered to include conditions which require the Licensee to give notice to DER when the production ceases for an unspecified period of time or is recommencing.	N/A
Licence Duration	N/A	N/A	The Works Approval will be issued for the standard five year period. There are no factors that warrant the limitation of the works approval period.	N/A

5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
26/1/2015	Application advertised in West Australian (or other relevant newspaper)	No comments received	-
29/1/2015	Discussions over the phone with Dion Macale from DOW Midwest office.	Advised by Mr Macale that DoW originally had concerns with the proposal however following a meeting between the proponents and DoW, it was decided that the proposal could proceed. DoW advised that a 5C licence (extracting groundwater) has been issued to the proponent.	-
24/2/2015	Proponent sent a copy of draft instrument	No comments received	-

6 Risk Assessment

Note: This matrix is taken from the DER Corporate Policy Statement No. 07 - Operational Risk Management

Table 1: Emissions Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	Major	Severe
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High

Appendix A

Premises operation - Tailings discharge into the Julies Reward pit
The potential impacts of concern when discharging tailings into a disused mined pit void, is contamination of the local groundwater, localised groundwater mounding, pipeline failure and overtopping of the receiving pit. DER has reviewed the proponent's impact assessment for tailings discharge from the premises and is satisfied that the assessment provided by the proponent has been undertaken in an appropriate manner.

Tailings characteristics
Tailings deposited into the In-pit TSF will be generated from the processing of ore from multiple pits, underground mines and potentially external sources. The separate ore resources will be blended prior to gold recovery.

Acid-base accounting results indicate that a majority of the mined ores at the Project are considered non-acid forming (NAF). Although tailings from one of the mined pits may contain some sulfur, there is also likely to be high to very high acid neutralising capacity in this material. These geochemical properties would at least partially neutralise PAF tailings generated by processing ore that originates from those deposits.

The free cyanide concentration in tailings discharged is up to 100 parts per million (ppm) and the tailings return water 20 ppm. The salinity of the process water is approximately 700 mg/L of total dissolved solids (TDS).

The in situ tailing solids are likely to consist of sandy silt/silty sand with good consolidation characteristics.

Receiving environment
Depth to groundwater around the proposed In-pit TSF was identified as 30 metres before mining commenced. The Julies Reward pit is currently dewatered. Water levels in the pit have varied over time due to dewatering during mining and have subsequently rebounded when mining ceases. Historical groundwater sampling data around the pit reported neutral pH and a salinity range of about 450 to 600 mg/L TDS.

The closest user of the groundwater resource is a stock watering bore, Tuckabeena well, approximately 1.2 km to the south west (down aquifer).

The In-pit TSF will be dewatered prior to the commencement of tailings deposition. Under dewatered conditions, the pit will form a sink with modest inflows (approximately 6 to 7 litres per second (L/s) based on historical data) occurring from the surrounding groundwater system (predominantly from the banded iron formation (BIF)).

The conceptual model for the Julies Reward pit and surrounds recognises three hydrogeological units, shown schematically in Figure 1 (prior to deposition) and described below:

- Hydrogeological unit (HU) 1 – includes the weathered basalts forming the hanging and footwall lithological units. The deep weathering profile extends up to 100 m in depth and consists predominantly of dense clay and clayey saprock. Permeability in this unit is very low;
- HU2 – comprises the steeply dipping, north-south trending BIF units. The horizon comprises several thin laterally extensive BIF layers up to 5 metres thick. Within the oxidised zone (up to depths of 100 metres) the BIFs have developed secondary porosity through the dissolution of silica, which is further enhanced by fracturing and shearing. The HU2 provides the highest permeability unit within the pits of the Project; and
- HU3 – comprises the fresh volcano-sedimentary sequences at the base of the pit. Permeability within these units will be controlled predominantly by structural features (faulting and joint sets)

and along lithological contacts. Permeability away from structural features is expected to be low, with low storage characteristics.

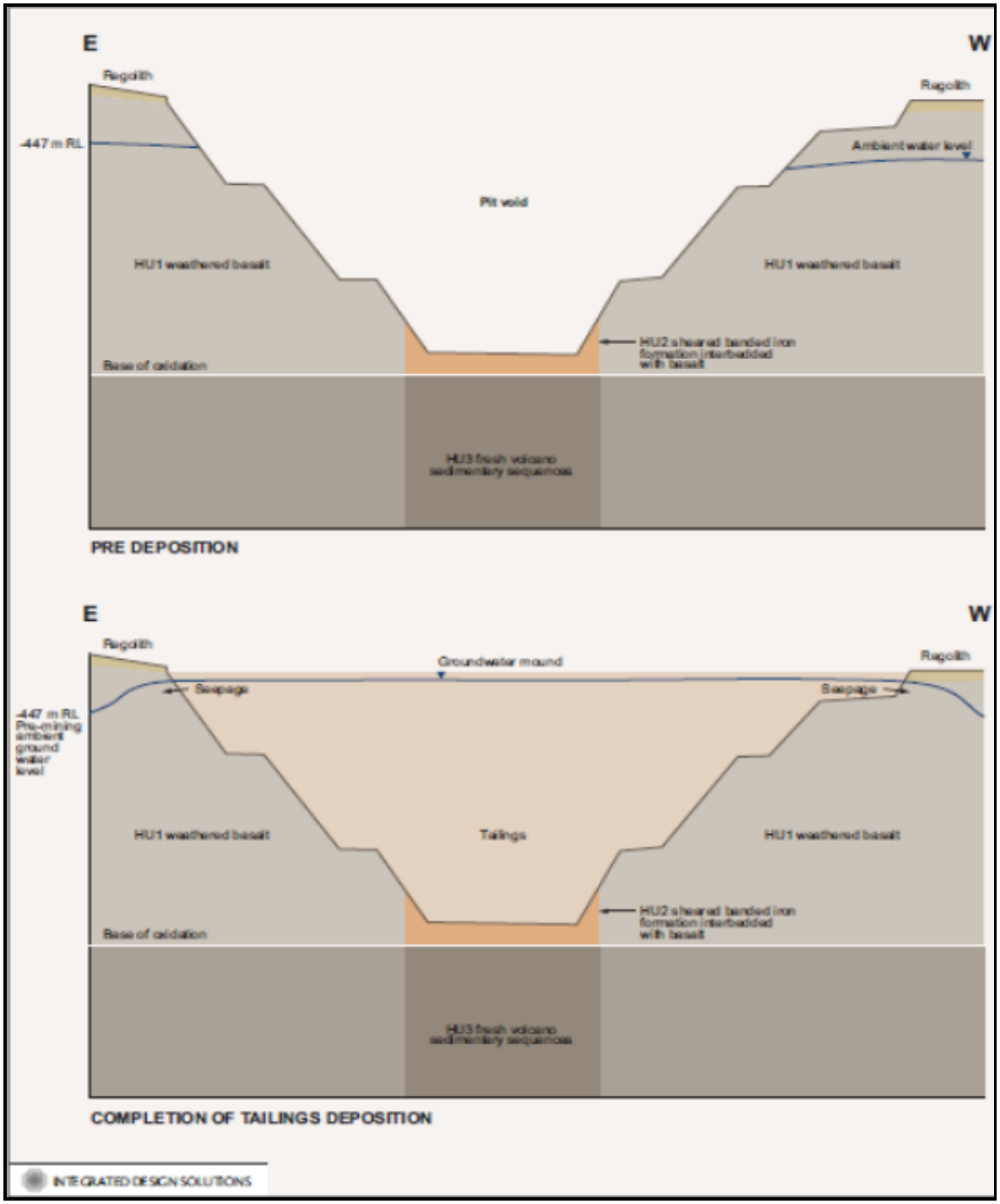


Figure 1: Julies Reward Pit Cross Section Pre and Post Tailings Deposition

Emission Risk Assessment - Operations

Emission Description
Emission: Discharge of tailings into a disused mine pit.
Impact: Potential reduction in quality of local groundwater.
Modelling using the geochemical speciation program PHREEQC (USGS 2012) was used to predict tailings pore water quality and the changes to groundwater quality that might result from seepage from the tailings after deposition in the pit. Changes in groundwater quality have been predicted assuming a conservative (in terms of environmental impacts) scenario, i.e., the seepage into surrounding groundwater originates from the oxygen-rich upper section of the deposited tailings that will promote sulfide oxidation). Accurately estimating the extent of dilution at any specific groundwater receptor, the closest being Tuckabeena Well (an inactive stock watering bore) approximately 1.2km to the southeast, is unachievable. Therefore, the geochemical modelling was performed with a sensitivity analysis component of three orders of magnitude, ranging from highly conservative (worst case scenario, 1:10 dilution) to the lowest risk scenario (1:1,000 dilution). A dilution of approximately 1:30 was required to bring the highest risk contaminant (aluminium) back to livestock drinking water standards. The modelling results indicate that most of the tailings pore water parameters meet both livestock drinking water trigger values and Silver Lake's operating licence targets prior to mixing with ambient groundwater. Of the four parameters that initially exceeded these values in the unmixed tailings pore water, all are predicted to be well below the trigger values and licence targets once mixing with groundwater is taken into account. Additionally, the lateral extent of the contamination is expected to be local, with mounding (and therefore impact) to be a maximum of within 250m of the pit at 100 years post closure.
Controls: Tailings deposited subaerial so as to minimise, as much as possible, water stored on the surface of the deposited material. This will maximise, by desiccation, the in situ dry density and long-term strength of the tailings. Also the in situ tailing solids are likely to consist of sandy silt/silty sand with good consolidation characteristics. This process will provide high water returns to the process plant and will assist in reducing seepage over time. Ambient quarterly monitoring of eight groundwater monitoring bores surrounding the In-pit TSF. Silver Lakes tailings storage facility operations manual.

Risk Assessment
Consequence: Minor.
Likelihood: Possible.
Risk Rating: Moderate

Regulatory Controls
Ambient monitoring requirements are already imposed through OSC 3.8.1 in the Licence. This condition will be amended to include the eight new groundwater monitoring bores (JMB01 – JMB08) and Targets for the measured parameters. This amendment will ensure that any impacts to groundwater quality from tailings discharged into the In-pit TSF is determined, and reported to DER, annually by submission of the AER required under condition L5.2.1 and within 72 hours as required under condition L5.3.1 if a Target has been exceeded. The methods for monitoring are consistent with those proposed by the proponent and are considered appropriate.

Residual Risk
Consequence: Minor
Likelihood: Possible
Risk Rating: Moderate

Emission Description
Emission: Discharge of tailings or tailings decant return water to land as a result of a pipeline failure.
Impact: Soil contamination and vegetation harm with tailings solids and liquors containing cyanide.
Pipeline corridors have been installed into previously disturbed areas or existing pipeline corridors

reducing disturbance to vegetation. The free cyanide concentration in tailings discharged is up to 100 parts per million (ppm) and the tailings return water 20 ppm.
Controls: All tailings and decant return water pipelines are located within bunded corridors designed to contain any spilt tailings and are inspected twice a day. Management of the tailings and decant return water pipelines in accordance with Silver Lakes tailings storage facility operations manual.

Risk Assessment
Consequence: Minor.
Likelihood: Possible.
Risk Rating: Moderate

Regulatory Controls
OSC 1.3.1 of the Licence requires all pipelines containing environmentally hazardous materials to be equipped with automatic cut-outs or provided with secondary containment.

OSC 1.3.5 of the Licence requires daily inspections of the tailings or tailings decant return water pipelines, recording of those inspections, and where those inspections identify that an appropriate level of environmental protection is not being maintained, the Licensee is to take corrective action.

Residual Risk
Consequence: Minor
Likelihood: Possible
Risk Rating: Moderate

Emission Description
Emission: Discharge of tailings to the environment as a result of overtopping.
Impact: Soil contamination and vegetation harm with tailings solids and liquors containing cyanide. The free cyanide concentration in tailings discharged is up to 100 parts per million (ppm) and the tailings return water 20 ppm. Vegetation surrounding the In-pit is heavily cleared as a result of mining activities.
Controls: Tailings deposition will be managed in accordance with the tailings storage facility operations manual. The decant water pond will be managed to minimise the pond and keep water away from the pit walls and maintaining a minimum operational freeboard of 910mm. An earthen safety bund is in place around the perimeter of the In-pit preventing the ingress of stormwater.

Risk Assessment
Consequence: Minor.
Likelihood: Rare.
Risk Rating: Low

Regulatory Controls
Operation of the In-pit TSF will occur under the Licence following an amendment to authorise tailings deposition and to specify a freeboard requirement.

OSC 1.3.5 of the Licence requires daily inspections of the embankment freeboard, recording of those inspections, and where those inspections identify that an appropriate level of environmental protection is not being maintained, the Licensee is to take corrective action.

Residual Risk
Consequence: Minor
Likelihood: Rare
Risk Rating: Low

Emission Description
Emission: Seepage of tailings from the In-pit TSF.

Impact: Vegetation harm by groundwater mounding.
When tailings deposition commences, the water level in the tailings will rise (relative to the groundwater levels achieved at the end of dewatering the pit) and localised seepage from the pit will occur. This will result in some groundwater mounding immediately adjacent to the pit walls. As tailings deposition reaches, and exceeds, the pre-mining groundwater level, seepage will extend further beyond the pit, forming a more extensive groundwater mound that will elongate along the higher permeability BIF units. Once tailings deposition into the In-pit TSF ceases, the groundwater mound will gradually dissipate, ultimately returning to pre-mining conditions. Groundwater levels are predicted to reach up to 4 to 6 m above pre-mining groundwater levels (22 to 24 m below ground level) and are therefore not expected to have any impacts on vegetation.
Controls: Tailings deposited subaerial so as to minimise, as much as possible, water stored on the surface of the deposited material. This will maximise, by desiccation, the in situ dry density and long-term strength of the tailings. Also the in situ tailing solids are likely to consist of sandy silt/silty sand with good consolidation characteristics. This process will provide high water returns to the process plant and will assist in reducing seepage over time. Silver Lake will undertake quarterly monitoring of the eight groundwater monitoring bores surrounding the In-pit TSF to determine the standing water level. Silver Lakes tailings storage facility operations manual.

Risk Assessment
Consequence: Insignificant.
Likelihood: Unlikely.
Risk Rating: Low

Regulatory Controls
Ambient monitoring requirements are already imposed through OSC 3.8.1 in the Licence. This condition will be amended to include the eight new groundwater monitoring bores (JMB01 – JMB08) which will be installed around the In-pit TSF. This amendment will ensure that standing water levels are determined quarterly, and reported to DER annually by submission of the AER required under condition L5.2.1 and within 72 hours as required under condition L5.3.1 if a Target has been exceeded. The methods for monitoring are consistent with those proposed by the proponent and are considered appropriate.

Residual Risk
Consequence: Insignificant
Likelihood: Unlikely
Risk Rating: Low