

Amendment Report

Application for Licence Amendment

Part V Division 3 of the Environmental Protection Act 1986

Licence Number	L6498/1995/11
Licence Holder	Northern Star Resources Ltd
ACN	092 832 892
File Number	2012/006868-1
Premises	Jundee Operations Mining tenements: G53/20, L53/52, L53/60, L53/68, L53/69, L53/70 - L53/73, L53/75, L53/99, L53/100, L53/102, L53/112, L53/113, L53/117, L53/136 - L53/138, L53/142, L53/143, L53/153, L53/169, L53/174, M53/155, M53/156, M53/182, M53/191, M53/192, M53/196 - M53/198, M53/199, M53/221, M53/226, M53/228 - M53/230, M53/235 - M53/237, M53/245 - M53/250, M53/326, M53/347, M53/372, M53/412 - M53/414, M53/441, M53/446, M53/451, M53/452, M53/461, M53/477 - M53/480, M53/492, M53/535 - M53/541, M53/552, M53/588, M53/589, M53/611, M53/707, M53/708, M53/711, M53/712, M53/836, M53/874, M53/895, M53/911, M53/929, M53/935, M53/940, M53/966, PL34 as depicted in Schedule 1.
Date of Report	20 December 2021
Decision	Amendment granted

Lauren Edmands MANAGER – RESOURCE INDUSTRIES an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L6498/1995/11 is held by Northern Star Resources Ltd (Licence Holder) for the Jundee Operations (the Premises), located within multiple mining tenements in the Shire of Wiluna.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L6498/1995/11 has been granted.

The Revised Licence issued as a result of this amendment consolidates and supersedes the existing Licence previously granted in relation to the Premises.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary

On 1 June 2021, the Licence Holder submitted an application to the department to amend Licence L6498/1995/11 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Category 5: increase of throughput from 3.0 million tonnes per annum (Mtpa) to 3.5Mtpa, including additional deposition into existing tailings storage facility TSF2. The proposed increase is not for deposition into TSF3, conditioned under works approval W6522/2021/1. See Appendix 1 for further detail;
- Category 54: sewage facility increase in cumulative throughput from 250m³ to 350m³ per day. The site currently has two wastewater treatment facilities, one at the accommodation village, and one at the mine site. The increase in capacity will be achieved through the use of two additional water holding tanks; one at each site. As per existing approval the surplus wastewater will be discharged on to the Tailings Storage Facility 2;
- Category 64: addition of Ramone low tonnage landfill (18 tonnes/year) to the licence and increase of throughput from 800 to 820 tonnes per annual period;
- Change references to TSF1 and TSF2 "Return Water Dam" to "Processing Water Dam" in Table 1.2.1; and
- Remove "Barton Underground Level 4 Clean Water Dam" as an ingress pond in Table 1.2.1. The Licence Holder indicates that the Barton Underground Level 4 Clean Water Dam is not a primary collection facility associated with dewatering activities at Jundee and reference to this location can therefore be removed from the licence. All dewatering discharge is likely to reach Jundee's Cook open pit facility which currently acts a final discharge location (and approved within the current licence).

This amendment is limited to changes to categories 5, 54 and 64, and administrative changes to Table 1.2.1. No changes to the aspects of the existing licence relating to Category 52 and 74 have been requested by the licence holder. Table 1 below outlines the proposed throughput changes to the existing licence. Dewatering to Jundee Cook open pit facility is already approved on the licence; consequently removal of "Barton Underground Level 4 Clean Water Dam" as a

dewatering point will not be risk assessed.

Category	Current throughput capacity	Proposed throughput capacityDescription of proposed amendment		
5	lerender lerender lerender		The licence holder seeks to increase throughput to 3.5Mtpa.	
54	250 m³/day	350 m³/day	The Licence Holder proposes to upgrade the existing wastewater treatment plant to increase throughput to 350m ³ /day	
64	800 tonnes/annual period	820 tonnes/annual period	The Licence Holder seeks to add a low tonnage landfill	

 Table 1: Proposed throughput capacity changes

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk assessments* (DWER 2020).

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.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 2 below. Table 2 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 2:	Licence	Holder	controls
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Emission	Sources	Potential pathways	Proposed controls
Category 5 am	endment: increased the	hroughput	
Tailings and contaminated water (metalloids, cyanide)	Discharge of additional tailings to TSF, associated with an increase to throughput	Seepage through base and embankments	 Existing licence conditions Condition 1.2.2 -Placement of seepage recovered near TSF1 and TSF2 into seepage processing water dams. Condition 3.2.1 – Monitoring for volume of seepage recovered Condition 3.3.1 – Monitoring of ambient groundwater quality (SWLs and groundwater quality surrounding TSF1 and TSF2) A network of fifteen seepage recovery bores surrounding TSF1 and TSF2

Emission	Sources	Potential pathways	Proposed controls
			Existing seepage recovery at site is detailed further in Appendix 1.
			Additional proposed controls
			• Use of a thickener plant (constructed in 2021) to reduce water discharge to TSF. See further detail in Appendix 1.
		Overtopping of	Existing licence controls
		TSF and direct discharge to land	• Condition 1.2.4 minimum 500mm freeboard requirement or equivalent to contain a 1 in 100 rainfall event over 72 hours
			Condition 1.2.5 embankment freeboard inspections
		Pipeline	Existing licence controls
	leak/rupture		• Condition 1.2.1 all pipelines provided with secondary containment, equipped with automatic cut-offs, equipped with telemetry systems and pressure sensors
			Condition 1.2.5 inspection of pipelines for visual integrity
Dust from tailings beaches	Discharge of additional tailings to TSF, associated with an increase to throughput	Air/windborne pathway	No controls proposed.
Category 54 a	mendment: increase o	of sewage throug	hput
Seepage	Increased sewage	Seepage	Existing licence controls:
(wastewater from sewage ponds)	throughput to wastewater treatment plant	through base and embankments to soil and groundwater	• Condition 1.2.2 WWTP sewage sludge drying beds: infrastructure requirement to build on a bunded hardstand area capable of preventing surface run-off of leachate and sludge
			• Condition 1.2.6: disposal of sludge solids and other residual solids in accordance with Western Australian guidelines for direct land application of biosolids and biosolid products
			• Excess water and water levels in the sewage ponds are managed through pumping of excess treated water into TSF2. Excess water is generated more frequently in the cooler months.
			Additional proposed controls:
			Continued discharge of surplus

Emission	Sources	Potential pathways	Proposed controls		
			wastewater to Tailings Storage Facility 2.		
			No other controls proposed.		
Overflow (wastewater from sewage ponds)	Increased sewage throughput to wastewater treatment plant	Direct discharge to soil	 Existing licence controls: Condition 1.2.3: prevention for erosion of embankments and growth of vegetation within the ponds Condition 1.2.4: minimum vertical freeboard of 300mm Excess water and water levels in the sewage ponds are managed through pumping of excess treated water into TSF2. Excess water is generated more frequently in the cooler months. Additional proposed controls: Continued discharge of surplus wastewater to Tailings Storage Facility 2. No other controls proposed. 		
Discharge of additional surplus wastewater to TSF2 (150m ³ /day)	Increased sewage throughput to wastewater treatment plant	Direct discharge to TSF2	 <u>Applicant proposed controls:</u> To ensure biological oxygen demand is lowered and therefore reduce nutrient (total nitrogen and phosphorus levels), Northern Star propose to install aeration units within the first two ponds at both the mine and accommodation village. Water monitoring is planned to be undertaken on a routine basis to verify performance of the sewage treatment plant. 		
Category 64 a	mendment: landfill co	nstruction			
Dust	Landfill construction: Excavation of ~4m deep trenches in waste rock dump surface. Place waste and cover routinely.	Air/windborne pathway	No controls proposed		
Category 64 a	mendment: operation	- disposal of clas	ss II waste into a trench		
Leachate	chate Disposal of Class II Leachate waste into a trench seepage through base and		Existing licence controls: Condition 1.2.6: construction/operation/decommissioning		

Emission	Sources	Potential pathways	Proposed controls
		embankments to soil and groundwater	can occur within the defined landfill area providing there is no waste within 100m of any surface water body; and 3m of the highest level of the water table aquifer.
			Additional proposed controls:
			 Appropriate signage detailing approved waste streams to minimise incorrect waste disposal;
			Allocation of suitable waste receptacles to manage other waste streams such as hydrocarbon contaminated soil, oil filters and recyclables (such as steel, aluminium, cardboard and paper); and
			 Induction and training of staff regarding appropriate waste management.
Windblown		Air/windborne	Existing licence controls:
waste		pathway	Condition 1.2.7: Cover requirements
			• Condition 1.2.8: licence holder to take all reasonable and practical measures to ensure that no windblown waste escapes from the landfill area and that windblown waste is collected on at least a monthly basis and returned to the active tipping area.
			Additional proposed controls:
			Cover waste on alternate days to minimise windblown rubbish;
			 Oversized waste items to be transported and disposed of at Jundee landfill;
			 Induction and training of staff regarding appropriate waste management; and
			Undertake survey of trench to estimate quantity of waste disposed into landfill on six monthly basis.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 3 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental siting* (DWER 2020)).

Table 3: Sensitive human and environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
 Threatened ecological communities: Jundee calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station: South Hill (ID 1062) Homestead (ID 1063) 	 Within premises boundary 1.5km east of mine site WWTP 1.4km east of Jundee TSF1/TSF2 (Proposed landfill locations 27km south of village WWTP)
Native vegetation	Within premises boundary and directly adjacent to tailings storage facility, wastewater treatment ponds and proposed landfill.
RIWI East Murchison Groundwater Area	2020 groundwater monitoring results for Jundee TSF1/TSF2 indicate water levels as shallow as 1.44m bgl for compliance bores and 0.84m bgl for non- compliance bores. The licence currently requires groundwater to be >1m bgl.
	Dewatering associated with mining activities has significantly modified the groundwater system in the area by creating a steepened localised hydraulic gradient eastwards towards the pits in the Jundee mining area. This has caused the local groundwater flow to be redirected towards the mining area.
	Water quality at the site ranges from fresh to hypersaline. Beneficial use of groundwater includes process water at the Jundee mining area and raw water for Jundee Village and Jundee Plant from the deeper fractured rock aquifers, which are monitored regularly to ensure ongoing viability of resources.
	Other than stock bores operated by the neighbouring Millrose Pastoral Station, no external groundwater users are within a 4 km radius of the TSF1/TSF2.
Surface water	 Perennial creek lines: Closest ~100m west from proposed landfill location Closest ~700m north-west from Jundee TSF2, 1.4km north-west from Jundee TSF1
Threatened fauna <i>Dasycercus blythi</i> (brush- tailed mulgara) Location ID's 264262 and 364746	 Location 264262: ~840m north east of the mine site WWTP ~600m south-west from Jundee TSF2 ~1km east of Jundee TSF1 Location 364746 1.3km west of proposed landfill location



Figure 1 Distance to sensitive receptors (Figure prepared by DWER environmental officer)



Figure 2 Village WWTP distance to sensitive receptors (Figure prepared by DWER environmental officer)

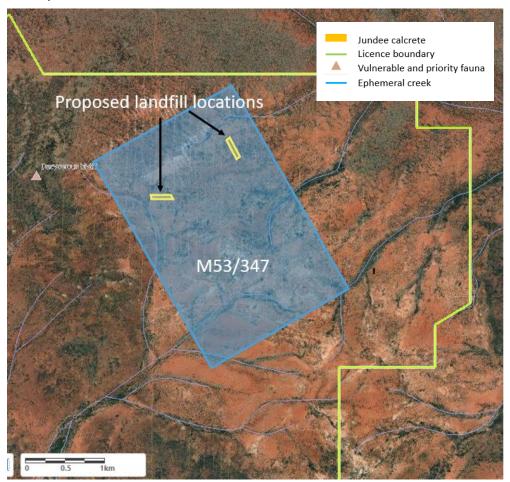


Figure 3: Distance to sensitive receptors (Figure prepared by DWER environmental officer)

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 4.

The Revised Licence L6498/1995/11 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. category 54 and 64 activities. The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Risk Event				Risk rating ¹	Licence			
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions ² of licence	Summary
Construction								
Landfill – trench excavation	Dust	Air/windborne pathway causing poor vegetation health due to dust accumulating on adjacent native vegetation. Poor vegetation health would also impact threatened fauna.	Adjacent native vegetation and threatened fauna	No controls proposed	C = Minor L = Unlikely Medium Risk	Y	Existing conditions Condition 1.2.6: management of waste	Trench excavation will be of short duration only and unlikely to result in impacts to nearby receptors.
Operation (including time-limited-operation	ions operations)							
Discharge of additional tailings to TSF, associated with an increase to throughput	Tailings and contaminated water (metalloids, cyanide)	Seepage through base and embankments causing contamination of groundwater, groundwater mounding and poor vegetation health	Shallow groundwater (<2m bgl) Jundee calcrete (TEC) Rootzones of adjacent native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Existing licence conditions Condition 1.2.2 - Placement of seepage groundwater recovered near TSF1 and TSF2 into seepage return water dams. Condition 3.2.1 – Monitoring for volume of seepage recovered Condition 3.3.1 – Monitoring of ambient groundwater quality (SWLs and groundwater quality surrounding TSF1 and TSF2) A network of fifteen	The applicant has provided a predictive water balance indicating that although throughput will increase, installation of a tailings thickener will reduce seepage rates from the existing containment infrastructure. As seepage rates are not predicted to increase with additional throughput, the associated risk remains unchanged. The delegated officer has determined to grant the increased category 5 throughput for the premises. See Appendix 1 for further detail.

Table 4. Risk assessment of potential emissions and discharges from the Premises during operation

L6498/1995/11

IR-T15 Amendment report template v3.0 (May 2021)

Risk Event	Risk Event					Licence		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions ² of licence	Summary
							seepage recovery bores surrounding TSF1 and TSF2	
		Overtopping of TSF and direct discharge to land causing poor vegetation and fauna health	Adjacent native vegetation and threatened fauna	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Existing licence controls Condition 1.2.4 minimum 500mm freeboard requirement or equivalent to contain a 1 in 100 rainfall event over 72 hours Condition 1.2.5 embankment freeboard inspections	The applicant has demonstrating existing containment infrastructure has the capacity to accommodate a throughput increase while maintaining freeboard requirements. See Appendix 1 for further detail. DMIRS has commented that currently TSF1 has been lifted to Stage 6 RL2569.0m, with TSF2 lifted to Stage 8 RL2562.0m. Both TSFs were observed to be operating with adequate freeboard, which Northern Star will be required to maintain. Existing licence controls are considered sufficient to mitigate risk associated with additional throughput.
		Pipeline leak/rupture and direct discharge to land causing poor vegetation and fauna health	Adjacent native vegetation and threatened fauna	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Existing licence controls Condition 1.2.1 all pipelines provided with secondary containment, equipped with automatic cut-offs,	Existing licence controls are considered sufficient to mitigate risk associated with additional throughput.

IR-T15 Amendment report template v3.0 (May 2021)

Risk Event	Risk Event					Licence		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's Conditions ² of controls licence sufficient?		Summary
							equipped with telemetry systems and pressure sensors Condition 1.2.5 inspection of pipelines for visual integrity	
	Dust from tailings beaches	Air/windborne pathway causing poor health of adjacent vegetation and threatened fauna.	Adjacent native vegetation and threatened fauna	No controls proposed	C =Slight L = Unlikely Low Risk	Y	N/A	Dust associated with additional throughput will not alter the risk profile of the premises significantly. The assessed risk is considered low. Additionally regulatory controls are not required.
Increase throughput category 54: Increased sewerage throughput to waste-water treatment plant	Seepage	Seepage through base and embankments to soil and groundwater. Potential contamination and mounding of groundwater leading to poor health/death of adjacent native vegetation.	Shallow groundwater (<2m bgl) Rootzones of adjacent native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Existing conditions Condition 1.2.2: WWTP built on bunded hardstand Condition 1.2.6: disposal of sludge solids and other residual solids	Existing conditions require that sludge is disposed of in accordance with the department's West Australian guidelines for biosolids management, December 2012. Surplus wastewater is pumped to TSF2. As there are few nearby sensitive receptors, and seepage associated with increased throughput likely to be minimal, existing controls are considered sufficient.
	Overflow/ overtopping	Direct discharge to soil leading to poor health or death of adjacent native vegetation. Poor vegetation health would also	Adjacent native vegetation and threatened fauna	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Existing conditions: Condition 1.2.3: prevention of embankment erosion and growth of vegetation	Existing licence controls (freeboard and prevention of embankment erosion) are considered sufficient regulatory controls.

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Risk Event	Risk Event					Licence			
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions ² of licence	Summary	
		impact threatened fauna.					Condition 1.2.4: freeboard requirement		
	Discharge of additional surplus wastewater to TSF2	Direct discharge to TSF2, causing nutrient loading of water within TSF2 and potential poor health/death of adjacent native vegetation and threatened fauna.	Adjacent native vegetation and threatened fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Existing conditions: Condition 1.2.2: allows discharge of treated sewage water into TSF1 and TSF2 <u>Modifications to existing conditions</u> Condition 1.2.2 – addition of requirement for installation of aeration units to wastewater treatment ponds Condition 3.2.1 – addition of Table 3.3.3 for monitoring of treated wastewater <u>New conditions:</u> Condition 1.2.10: reporting requirement for installation of aeration units	Applicant proposed controls including installation of aeration units in ponds and routine monitoring to verify performance of the treatment plants have been placed on the licence as regulatory controls. The licence holder will be required to apply for an amendment with an alternative method of treated wastewater discharge when TSF2 reaches capacity.	
Disposal of class II waste into a trench (low tonne landfill adjacent to Ramone underground mine)	Leachate	Leachate seepage through base and embankments to soil and groundwater. Potential poor health/death of adjacent native vegetation and contamination of nearby creek	Groundwater Adjacent native vegetation Perennial creek lines	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Existing conditions Condition 1.2.6: management of waste	As the new proposed land fill will accept low tonnage class II waste (18 tonnes of waste per year), the existing category 64 licence controls are considered sufficient regulatory controls. Existing licence controls will require construction of new landfills to be further	

IR-T15 Amendment report template v3.0 (May 2021)

Risk Event	Risk Event					Licence			
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions ² of licence	Summary	
		lines.						than 100m from surface water and shall excavate no deeper than 3m above the highest level of the water table.	
	Windblown waste	Air/windborne pathway causing poor health/death of adjacent native vegetation and threatened fauna.	Adjacent native vegetation and threatened fauna Perennial creek lines	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Existing conditions Condition 1.2.7: cover requirements Condition 1.2.8 management of windblown waste	Existing licence controls (for cover requirements and control and collection of windblown waste) are considered sufficient regulatory controls.	

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the Guideline: Risk assessments (DWER 2020).

Note 2: Proposed Licence Holder's controls are depicted by standard text. Bold and underline text depicts additional regulatory controls imposed by department.

4. Consultation

Table 5 provides a summary of the consultation undertaken by the department.

Table 5: Consultation

Consultation method	Comments received	Department response
Local Government Authority (Shire of Wiluna) advised of proposal (27/8/21 and 3/11/2021)	No comments received.	N/A
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal (27/8/21) – 1 st request for advice	 DMIRS commented with the following: Deposition of treated sewage water onto a TSF is not standard practice and the proponent should ensure the practice has been checked and approved with a qualified engineer with all relevant TSF manuals updated accordingly. TSF2 is approaching capacity, and DMIRS is currently assessing a mining proposal for TSF3, query how the applicant will handle discharge once TSF2 is no longer available. The proponent will need to seek approval under the <i>Mining Act 1978</i> for the landfill locations if not already covered under existing approvals. 	Treated sewage water deposition into the TSF represents less than 1% of the total water inflow and was approved by the department on 22 February 2008 (DEC, 2008). The licence holder will be advised to check their process with a geotechnical engineer and update their TSF manuals accordingly. The Licence Holder has advised deposition to TSF2 Stage 9 is scheduled to commence on 26 March 2022 and will provide approximately 11.6 months storage capacity. The Licence Holder has stated they will explore alternative options for disposal of treated sewage water before TSF2 is at capacity. The Licence Holder has advised that they have submitted an application for a minor change to their mining proposal (Registration ID 92565) for the landfills under the <i>Mining Act 1978</i> .
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal (3/11/21) – 2 nd request for advice, regarding an increase to category 5 throughput	 DMIRS commented that based on the most recent geotechnical review of the TSFs at Jundee, there are no concerns regarding management of these structures, or with capacity. The report detailed that under existing mining approvals, TSF1 and TSF2 combined had a remaining capacity of 12,217,020 t (report dated 12 April 2021) – note that this capacity is dependent on undertaking more lifts approved under existing mining proposals. Currently TSF1 has been lifted to Stage 6 RL2569.0m, with TSF2 lifted to Stage 8 RL2562.0m. Both 	DWER will advise the applicant that any amendments to current TSF management should be reviewed to ensure that the appropriate Mining Act 1978 approvals are also in place.

	TSFs were observed to be operating with adequate freeboard, which Northern Star will be required to maintain.	
	• Northern Star Minerals Limited are advised to ensure that any amendments to current TSF management are reviewed to ensure that the appropriate Mining Act 1978 approvals are also in place.	
Licence Holder was provided with first draft amendment on 5/10/21 and the second draft amendment on 2/12/2021.	See Appendix 2 No comments were received in response to the second draft.	See Appendix 2

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

DMIRS has raised concerns regarding discharge of treated sewage water into TSF2, being a non-standard practice and with TSF2 approaching capacity. The Licence Holder has stated that TSF2 stage 9 will be operational for another 11.6 months and will explore alternative options before TSF2 is at capacity. The Licence Holder will be required to apply for an amendment for any modifications to treated wastewater discharge at this time. For continued discharge into TSF2, the licence holder is advised to confirm the safety of on-going discharge with a geotechnical engineer and update the TSF manual accordingly.

DWER also advises the licence holder that any amendments to current TSF management should be reviewed to ensure that the appropriate Mining Act 1978 approvals are also in place. The licence holder will also require approval from DMIRS with respect to the two new landfill locations before proceeding with the proposed works.

5.1 Summary of amendments

Table 6 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Revised Licence as part of the amendment process.

Condition no.	Proposed amendments
1.2.2	 Reference to Barton Level 4 Clean Water Dam removed as per application request. Licence holder indicates all dewater is currently discharged to decommissioned pit (authorised by Table 1.2.1).
Table 1.2.1	Reference to TSF1 and 2 "return water dam" altered to "processing water dam"
	 Reference to "Effluent storage ponds" altered to "wastewater treatment ponds" as a more accurate reference to the ponds use. Infrastructure requirement for aeration units added
1.2.4	Reference to TSF1 and 2 "return water dam" altered to "processing water dam"

Table 6: Summary of licence amendments

Condition no.	Proposed amendments
Table 1.2.2	
1.2.6	 Sewage throughput updated to reflect amendment, from 150m³/day to 350m³/day
	 Waste throughput updated to reflect amendment, from 800 tonnes per year to 820 tonnes per year
1.2.10	New condition added to include reporting requirements for installation of aeration units.
3.3.1	 Modification to include reference to Table 3.3.3 Addition of Table 3.3.3 for applicant proposed monitoring of treated wastewater from the wastewater treatment ponds.
4.2.1	Addition of reporting requirements for Table 3.3.3 within the annual environmental report
Schedule 1 - Maps	Proposed landfill location map added (Ramone pit)

References

- 1. Northern Star Resources, 2021, Application Supporting Documentation and response to request for further information (DWER reference: FA258063 & DWERDT486065)
- 2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
- 3. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
- 4. DWER 2020, Guideline: Risk Assessments, Perth, Western Australia.

Appendix 1: Category 5 increased throughput

Current Infrastructure capacity

Jundee Gold Mine comprises an inactive Fisher In-Pit TSF (FPTSF), two active TSFs (TSF1 and TSF2), open pits and underground mines, waste landforms, a processing plant and associated service facilities. The existing processing plant involves the use of conventional carbon-in-leach process to recover gold. The throughput rate of the plant is currently listed as 3 Mtpa on the existing licence.

Tailings deposition is currently cycled between TSF1 and TSF2 with minor and infrequent deposition into FPTSF.

DWER has recently issued a works approval (W6522/2021/1) for construction of a third paddock style TSF3 at the site. The applicant is proposing an increase of throughput to the <u>existing</u> <u>TSF1/TSF2</u> infrastructure only and are not authorised to deposit tailings into TSF3 until conditions relating to construction and time limited operations for works approval W6522/2021/1 have been met and a separate licence amendment granted.

In a request for further information, DWER queried the capacity for current site containment infrastructure to accommodate an increase of throughput to 3.5Mtpa.

The applicant has responded that:

- Tailings deposition to TSF2 Stage 9 is scheduled to commence on 26 March 2022. TSF2 stage 9 will provide storage volume of approximately 2.252Mm³ or storage capacity of 3.377Mt based on an adopted dry density of 1.5t/m3, taking into account the full compliance with freeboard requirements, etc;
- The storage life for 3.0Mtpa throughput is about 13.5 months.
- With the throughput increased to 3.5Mtpa, the corresponding storage life will be approximately 11.6 months. The predicted time at which TSF2 Stage 9 will reach its maximum capacity is after end of February, 2023.
- Construction of TSF3 started in October 2021 and the scheduled completion date is November 2022, well before the TSF2 stage 9 capacity is reached. Therefore, the existing TSF2 stage 9 can adequately accommodate the required storage capacity based on a plan to increase throughput to 3.5Mtpa.

DMIRS has also commented that based on the most recent geotechnical review of the TSFs at Jundee, there are no concerns regarding management of these structures, or with capacity. The report detailed that under existing mining approvals, TSF1 and TSF2 combined had a remaining capacity of 12,217,020 tonnes (report dated 12 April 2021) – noting that this capacity is dependent on undertaking more lifts approved under existing mining proposals.

Existing seepage issues

Groundwater mounding associated with seepage has been observed for the Jundee TSF1/TSF2 (Figure 4). Groundwater levels as shallow as 1.44m bgl (JMB28, March 2020), were reported for compliance bores and 0.84m bgl for non-compliance bores (JMB01-D, December 2020, Figure 4) in the 2020 Annual Environmental Report (AER).

Quarterly groundwater monitoring results presented in the 2020 AER, showed all analytes of concern at low concentrations or below the laboratory limit of reporting (Table 7). The highest concentration of weak acid dissociable cyanide (WAD CN) detected was 0.009mg/L for MB12-D (September 2020), below the WAD CN limit of 0.5mg/L. All metal concentrations were below 95% Protection limit for freshwater ecosystems or below the limit of reporting.

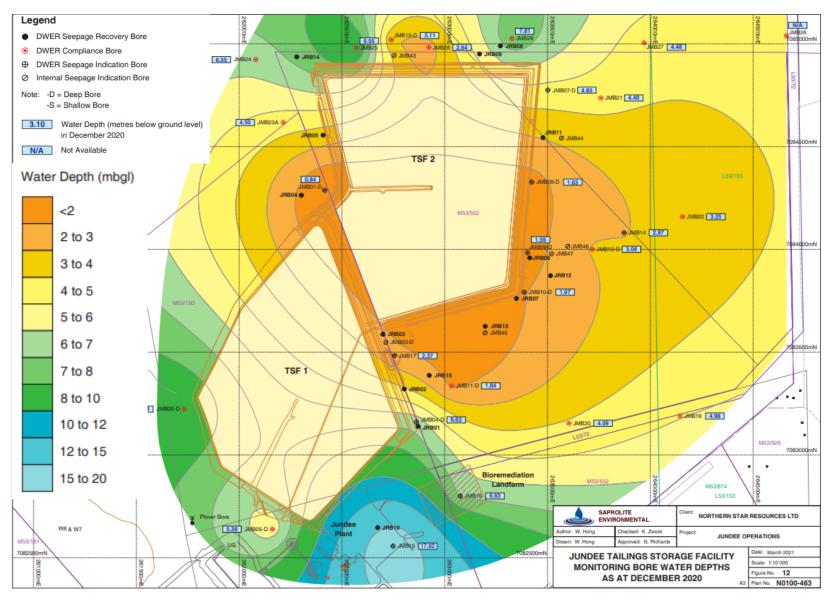


Figure 4 Jundee Tailings Storage Facility Water Depths as at December 2020

Bore ID	Date				Ana	lyte (mg/L)				
		WAD CN	As	Cd	Cu	Hg	Ni	Pb	Zn	Se
	e Limit	<0.5								
	Protection		0.024	0.0002	0.0014	0.0006	0.011	0.0034	0.008	0.011
rresnwate	r Ecosystem 14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB05-D	19-Jun-20	<0.004	< 0.05	<0.01	<0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.001
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	-01001
	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.006
JMB06-D	20-Sep-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.1
	14-Dec-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB11-D	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.002
Juibii D	19-Sep-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.1
	14-Dec-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	< 0.004	< 0.05	<0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.010
JMB12-D	19-Jun-20 19-Sep-20	<0.004 0.009	<0.05 <0.05	<0.01 <0.01	<0.01 <0.01	<0.00005 <0.00005	0.03	<0.03 <0.03	0.02	0.012 <0.1
	19-Sep-20 14-Dec-20	< 0.009	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	<0.004	< 0.05	<0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.005
JMB13-D	19-Sep-20	0.006	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	<0.1
	14-Dec-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
D (D to	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.003
JMB19	19-Sep-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.1
	14-Dec-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
						1				
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB20	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	0.12	0.003
01111120	19-Sep-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.1
	14-Dec-20	< 0.004	0.06	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	< 0.004	< 0.05	< 0.01	0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.005
JMB21	19-Jun-20	<0.004	< 0.05	< 0.01	< 0.01	<0.00005	< 0.02	< 0.03	<0.02	0.005
	19-Sep-20 14-Dec-20	<0.004 <0.004	<0.05 <0.05	<0.01 <0.01	<0.01 <0.01	<0.00005 <0.00005	<0.02 <0.02	<0.03 <0.03	<0.02 <0.02	<0.1 N/A
	14-Dec-20 14-Mar-20	<0.004	0.06	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	IN/A
	19-Jun-20	<0.004	0.00	<0.01	< 0.01	< 0.00005	< 0.02	0.03	< 0.02	0.006
JMB22	19-Sep-20	0.007	< 0.07	<0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	<0.1
	14-Dec-20	< 0.004	0.06	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB23A	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.001
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB24	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.001
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
IMD 25	19-Jun-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	0.001
JMB25	19-Sep-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	< 0.1
	14-Dec-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	N/A
	14-Mar-20	Blocked								
JMB26	19-Jun-20	Blocked								
51111120	19-Sep-20	Blocked								
	14-Dec-20	Blocked								
	14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	
JMB27	19-Jun-20	<0.004	< 0.05	< 0.01	< 0.01	<0.00005	< 0.02	< 0.03	< 0.02	< 0.001
	19-Sep-20	<0.004	< 0.05	<0.01	<0.01	<0.00005	< 0.02	<0.03	<0.02	<0.1
	14-Dec-20	<0.004	< 0.05	<0.01	< 0.01	<0.00005	< 0.02	<0.03	<0.02	N/A
	14-Mar-20	<0.004	< 0.05	<0.01	<0.01	<0.00005	<0.02	<0.03	<0.02	0.005
JMB28	19-Jun-20 19-Sep-20	<0.004 <0.004	<0.05	<0.01	<0.01	<0.00005	<0.02 <0.02	<0.03	<0.02	0.005
JMB28	17-3en-70		< 0.05	<0.01 <0.01	<0.01 <0.01	<0.00005	< 0.02	< 0.03	<0.02 <0.02	<0.1 N/A
JMB28		<0.004				AAAAAD	- 0.0Z			1N/A
JMB28	14-Dec-20	< 0.004	<0.05	1						
JMB28	14-Dec-20 14-Mar-20	< 0.004	< 0.05	< 0.01	< 0.01	< 0.00005	< 0.02	< 0.03	< 0.02	-
JMB28 JMB29	14-Dec-20	1	1	1						0.001 <0.1

Table 7 Groundwater analytical results 2020 - Jundee TSF1/TSF2 compliance bores

N/A: Not available due to omission from monitoring.
Indicates that monitoring is not required under the Licence in effect at that time.

Existing seepage management infrastructure

Water discharged to the tailings storage facilities as tailings slurry is recovered through decant of supernatant ponds and by pumping fifteen seepage recovery bores surrounding Jundee TSF1/TSF2: JRB01 to JRB15. Water recovery is also undertaken from a seepage interception trench and pond system at Jundee TSF2. Recovered water is pumped back to the Jundee Process Water Dam either directly or indirectly via the supernatant ponds or recovery dams before being returned to the Process Plant.

The 2020 Annual Environmental Report noted float sensors were installed within the TSF2 eastern seepage recovery trench in 2020 to allow for pumps to be turned on without the presence of personnel, thereby maximising seepage return to the tailings supernatant pond. The sump of the toe drain (approximately 2 to 3m outside the embankment) at Jundee TSFs was also cleaned to remove sediment in 2020 to improve seepage recovery.

The applicant estimates the sites current seepage rate for throughput of 3Mtpa (estimated using a 2D seepage model) to be 3,569m³/day. A total of 257,392m³ (~705m³/day) of seepage was recovered from the Jundee TSF1/TSF2 recovery bores during the 2020 annual review period. This represents approximately 20% recovery of total seepage by the recovery bores.

The applicant has informed DWER that a tailings thickener was constructed in 2021 and is expected to be operational in late 2021. The thickener was constructed to reduce water discharge to the TSF.

Seepage associated with additional throughput

With a throughput of 3.5Mtpa and reduction of water usage associated with the installation of tailings thickener plant, predicted seepage rates are estimated by the applicant to be reduced from 3,569m³/day to about 2,422m³/day. The applicant has provided a predictive water balance to support this.

With the revised throughput of 3.5Mtpa in combination with installation of a tailings thickener, the following change in parameters have been noted by the applicant:

- 1. Daily slurry water will be reduced from 12,329m³ to 6,393m³. This will result in the reduction of annual water consumption from 4.5Mtpa to 2.33Mtpa, despite the increase in throughput.
- 2. The decant water pond size will be reduced from about 101,800m² to 66,100m², assuming pond size equivalent to 5-day normal operating slurry water.
- 3. The significantly lower water consumption and smaller pond size will result in lower seepage rate through TSF basin, from about 3,569m³/day to 2,422m³/day. The total losses will be reduced from approximately 1.3Mm³ to 0.884Mm³.
- 4. With the increase in percentage of solids in the thickened tailings, the dry density of tailings is expected to increase accordingly. The applicant has indicated that this will increase the storage capacity but has conservatively not considered in the estimation of storage capacity for the increased throughput.

DWER outcome

The applicant has indicated that current containment infrastructure has sufficient capacity to contain a throughput increase of 3.5Mtpa until such a time that TSF3 construction and compliance has been met. This is supported by information provided during consultation with DMIRS.

The applicant has provided a predictive water balance indicating that although throughput will increase, due to the installation of a tailings thickener, seepage rates from the existing containment infrastructure will be reduced. As seepage rates are not predicted to increase with additional throughput, the associated risk remains unchanged. The delegated officer has determined to grant the increased category 5 throughput for the premises.

Appendix 2: Summary of Licence Holder's comments on risk assessment and draft conditions

Condition	Summary of Licence Holder's comment DRAFT 1	Department's response DRAFT 1		
Cover page	No reference to Increase in throughput of Processing Plant in text or tables.	The department understood that an increase of throughput would be assessed under works approval W6522/2021/1. After consulting with the applicant it was decided that an increase to throughput would be processed under this amendment and stakeholder consultation conducted a second time.		
Cover page	Updated premises description provided	Description updated		
Condition 1.2.2 Table 1.2.1	Propose to reword infrastructure requirements to: Installation of aeration units within the second and third ponds at both mine site and accommodation village. Consultant advice outlined the first ponds are to create an anaerobic environment and encourage settling of residual solids. It was recommended not to place an aeration unit that encourages aerobic conditions within these first ponds. The subsequent two ponds are suggested to have the aeration units installed.	Condition updated.		
Condition 3.3.1 Table 3.3.3	Due to safety risks associated with access of the discharge point, the applicant proposes to sample the water from the active decant pond. The monitoring frequency has been proposed for adjustment to the current monitoring frequency (for flow meter readings) and other compliance and internal monitoring frequencies (for pH and residual chlorine).	The monitoring location has been adjusted to the decant pond to eliminate safety risks. The adjustment of frequency (monthly pH and residual chlorine adjusted to quarterly and cumulative flow volume adjusted from continuous to monthly) is considered to be sufficient to characterise risks associated with wastewater treatment pond discharge. The condition has been modified.		
Condition 3.3.1 Table 3.3.3	Proposed Change: Surplus sewage wastewater is requested to be discharged into the active TSF. To maximise water recovery back into the processing circuit, Jundee proposes to discharge surplus wastewater onto the active TSF, where pumping is completed to remove water from the TSF decant pond. The Containment infrastructure table (Licence Table 1.2.1) outlines that both TSF1 and TSF2 can receive both tailings and waste sewage water.	The condition has been modified to allow for the active TSF, being either TSF1 or TSF2 to receive treated sewage treated. A note has been added to indicate that discharge of treated sewage water into an inactive TSF or to TSF3 is not permitted.		

Appendix 3: Application validation summary

SECTION 1: APPLICATION SUMM	ARY						
Application type							
Amendment to licence		Current licence number:	L6498/1995/11				
		Relevant works approval number:		N/A			
Date application received		1/6/2021					
Applicant and Premises details							
Applicant name/s (full legal name/s)		Northern Star Reso	urces Ltd				
Premises name		Jundee Operations					
Premises location	G53/20, L53/52, L53/60, L53/68, L53/69, L53/70 - L53/73, L53/75, L53/99, L53/100, L53/102, L53/112, L53/113, L53/117, L53/136 - L53/138, L53/142, L53/143, L53/153, L53/169, L53/174, M53/155, M53/156, M53/182, M53/191, M53/192, M53/196 - M53/198, M53/199, M53/221, M53/226, M53/228 - M53/230, M53/235 - M53/237, M53/245 - M53/250, M53/326, M53/347, M53/372, M53/412 - M53/414, M53/441, M53/446, M53/451, M53/452, M53/461, M53/477 - M53/480, M53/492, M53/535 - M53/541, M53/552, M53/588, M53/589, M53/611, M53/707, M53/708, M53/711, M53/712, M53/836, M53/874, M53/895, M53/911, M53/929, M53/935, M53/940, M53/966,						
Local Government Authority		Shire of Wiluna					
Application documents							
HPCM file reference number:		2012/006868-1					
Key application documents (addition application form):	al to	Application cover letter					
Scope of application/assessment		1					
		Licence amendment 1. Increase Category 5: Processing or beneficiation of					
Summary of proposed activities or changes to existing operations.		 metallic or non-metallic ore from 3,000,000 to 3,500,000. 2. Increase Category 54: Sewage facility from a 250m3 to 350m3 facility, also outlined in table 1.2.4. 					
		3. Change references to TSF1 and TSF2 Return Water Dam to Processing Water Dam, Table 1.2.1.					
		4. Remove Barton Underground Level 4 Clean Water Dam as an ingress pond, Table 1.2.1.					

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Assessed p design capa	roduction or acity	Proposed changes to the production or design capacity		
Category 5: Processing or beneficiation of metallic or non- metallic ore	3,000,000 to annual perio		3,500,000 tonnes per annual per		
Category 6: Mine dewatering	3,000,000 annual perio	tonnes per d	N/A		
Category 52: Electric power generation	42.21 MW		N/A		
Category 54: Sewage Facility	250m ³ per d	ay	350m ³ per day		
Category 64: Class II or III Putrescible Landfill	800 tonnes period	s per annual	N/A		
Category 74: Bulk storage of chemicals	10,000m ³		N/A		
egislative context and other approv	/als				
Has the applicant referred, or do they intend to refer, their proposal to the El under Part IV of the EP Act as a significant proposal?	PA Yes 🗆	No 🖂	Referral decision No: Managed under Part V □ Assessed under Part IV □		
Does the applicant hold any existing F IV Ministerial Statements relevant to the application?		No 🖂	Ministerial statement No: EPA Report No:		
Has the proposal been referred and/o assessed under the EPBC Act?	r Yes □	No 🖂	Reference No:		
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes 🛛	No 🗆	Certificate of title □ General lease □ Expiry: Mining lease / tenement ⊠ Expir Other evidence □ Expiry:		
Has the applicant obtained all relevan planning approvals?	t Yes □	No □ N/A ⊠	Approval: Expiry date: If N/A explain why? Exempt under the <i>Mining Act</i> <i>1978</i>		
Has the applicant applied for, or have existing EP Act clearing permit in relation to this proposal?		No 🖂	CPS No: N/A No clearing is proposed.		

Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes 🗆 No 🖂	Application reference No: N/A Licence/permit No: N/A No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes 🗆 No 🖂	Application reference No: Licence/permit No:.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ⊠ No □	Name: RIWI Groundwater Area Type: East Murchison Groundwater Area Has Regulatory Services (Water) been consulted? Yes I No I N/A I Regional office: Gascoyne
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes 🗆 No 🗵	Name: N/A Priority: P1 / P2 / P3 / N/A Are the proposed activities/ lancuse compatible with the PDWSA (refer to <u>WQPN 25</u>)? Yes □ No □ N/A ⊠
Is the Premises subject to any other Acts or subsidiary regulations (e.g. Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx)	Yes 🛛 No 🗆	Mining Act 1978.
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes 🗆 No 🛛	
Is the Premises subject to any EPP requirements?	Yes 🗆 No 🖂	
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes ⊠ No □	Newmont Jundee Nimary Bulk Fuel Facility 55km of Wiluna (Jundee Mine Site) CS ID: 33324 Classification: contaminated – remediation required (C–RR) / Date of classification: 26/9/2019