

Amendment Report

Application for Licence Amendment

Part V Division 3 of the Environmental Protection Act 1986

Licence Number	L8569/2011/2
Licence Holder	Northern Star Resources (Carosue Dam) Pty Ltd
ACN	116 649 122
File Number	2011/005896-1~2
Premises	Porphyry (Edjudina) Gold Project
	Legal description –
	Part of Mining Tenements M31/3, M31/4, M31/5, M31/6, M31/30, M31/76, M31/380, M31/381, L31/44, L31/59, L31/62 and L31/63.
	As defined by the Premises maps attached to the Revised Licence
Date of Report	21 October 2022
Decision	Revised licence granted

A/MANAGER, RESOURCE INDUSTRIES REGULATORY SERVICES

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

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1. Decision summary

Licence L8569/2011/2 is held by Northern Star Resources (Carosue Dam) Pty Ltd (NSR, Licence Holder) for the Porphyry (Edjudina) Gold Project (the Premises), located at Mining tenements M31/3, M31/4, M31/5, M31/6, M31/30, M31/76, M31/380, M31/381, L31/44, L31/59, L31/62 and L31/63 in the Shire of Menzies.

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 construction and operation of the Premises. As a result of this assessment, Revised Licence L8569/2011/2 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. The Revised Licence has been granted in a new format with existing conditions being transferred, but not reassessed, to the new format.

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 20 April 2022, the Licence Holder submitted an application to the department to amend Licence L8569/2011/2 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Changes to freeboard limit to a category 6 discharge location: changing freeboard limit at Margaret's Pit from 6 meters below ground level (mbgl) to 1 mbgl.
- Additional landfill location and associated bioremediation facility.

On 18 March 2022, the Licence Holder provided to the department an Environmental Compliance Report for the construction of the Turkey's nest dam 1 and the dewatering pipeline between Porphyry and Margaret's pits. The department assessed these works to be compliant with condition 1.3.14, Table 5 and therefore this infrastructure has been removed from the amended licence. The Licence Holder has confirmed that the Porphyry Project dewatering pipeline is yet to be constructed between Margaret's and Enterprise pits.

2.2.1 Category 6 discharge location

On the 12 January 2022, the department issued an amendment for the construction and operation of dewatering infrastructure to support the Porphyry underground Project. This authorised the dewatering from Porphyry Pit and underground into Margaret's and Enterprise pits. Since such time concerns were raised by pastoral landowners of the impact of these activities on nearby pastoral bores. Due to these concerns the Licence Holder has applied for this amendment to reduce the freeboard limit at Margaret's pit to allow enough capacity to accept the bulk of the dewatering volume, to prevent any discharge into Enterprise pit (however the licence holder has stated they wish to keep Enterprise pit on the licence as an authorised discharge point). The surplus volume of dewater will be diverted and used for dust suppression purposes on the premises. The possible impacts to the use of dewater discharge for dust suppression has been assessed as part of this amendment (refer to section 3.2). The change in the dewatering plan for the Porphyry Project is shown in Figure 1.

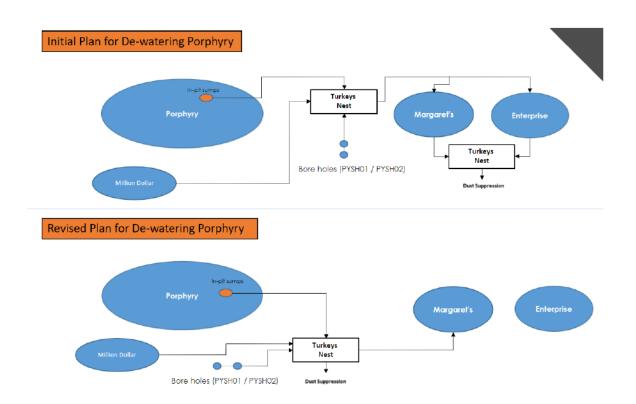


Figure 1. Changes to the dewatering plan for the Porphyry Project regarding discharge locations

2.2.2 Landfill location and bioremediation facility

The Licence Holder initially requested authorisation to include a Category 63 Class I landfill to be constructed and operated on the Porphyry / Maingays waste rock dump (WRD). After consultation regarding flexibility of waste disposal on the premises (refer to Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions, changes were made to authorise an additional Class II landfill at the new proposed location instead. This change would include an increase in maximum throughput for Category 64 outlined in Table 1.

The Licence Holder has noted that they will construct a bioremediation facility within the footprint of the WRD in order to support the new landfill. Although this activity alone is not listed under any prescribed categories under Schedule 1 *Environmental Protection Regulation Act 1987*, due to emissions related to the facility, the activity has been assessed as being related to a premises category. During consultation, the Licence Holder requested the location of this facility be extended to be include the Million Dollar WRD to allow for operational flexibility. After consideration of the risk rating of the new location, the department has accepted this change and the current licence reflects the authorisation for the bioremediation facility to be constructed on either WRD.

Category	Current production capacity	Proposed production capacity	Description of proposed amendment		
64	4, 500 tonnes per annual period	9, 500 tonnes per annual period	Licence Holder has requested to construct an additional landfill on the Porphyry / Maingays Waste		

Table 1: Proposed production changes

		Rock Dump.
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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 construction and 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

Emission	Sources	Potential pathways	Proposed controls					
Construction (category 64 and associated bioremediation facility)								
Dust	Earthworks to establish landfill facility on waste	Air/windborne pathway	No proposed controls.					
Noise	rock dump	patriway						
	Vehicle movements							
Operation (cat	egory 6)							
Mine dewater (saline to hypersaline)	e to mine dewater into mine dewater rsaline) Margaret Pit and walls of pits		 Completed Hydrological assessment modelling showing limited extent of mounding and stratification of saline water; 					
	to soil and groundwater	 Monitoring of standing water level (SWL) in 3 installed bores around Margaret's Pit; 						
			Discharge into Margaret Pit will cease if SWL reach 4 mbgl in any of the three monitoring bores; and					
			 Vegetation monitoring of environment surrounding Margaret's. 					
		Overtopping of mine dewater	 Daily inspections to ensure freeboard is being maintained; 					
		from pits	• 1m freeboard to be maintained;					
			• Crest bund around the entire pit;					
			• Directed storm recharge into Margaret's Pit from a 100 year, 72hour storm would raise the water level in the pit by no more than 0.53m, therefore as long as the freeboard is maintained, the risk of					

Emission	Sources	Potential pathways	Proposed controls
			 overtopping is minimal. Will prioritise water carts to divert dewater from Porphyry to be used for dust suppressions at Porphyry Mine and haul roads (refer to section 3.3); Water balance model shows sufficient capacity of Margaret's pit to accept volume of discharge.
	Mine dewater stored in pits	Overspray of runoff from dust suppression operations (e.g. action of spraying saline to hypersaline water)	No proposed controls.
Operation (cate	gory 64 and associated bi	oremediation facili	ity)
Dust	Unloading and storage of landfill material, waste covering activities, and vehicle movements.	Air / windborne pathway	No proposed controls.
Noise	Waste disposal, covering activities and vehicle movements.		
Leachate	Landfilling material	Direct seepage through soil	 Constructed on waste rock dump; and Separation of base of landfill and highest groundwater level must be >2m.
Windblown waste		Air / windborne pathway	 Landfill material must meet waste criteria; and Weekly maintenance schedule day after bin run. Windblown waste will be collected weekly and returned to the tipping area
Hydrocarbons seepage	Bioremediation pad	Direct seepage to soil	 All cells lined with 1mm (or greater) thickness HDPE Contaminated soils will be periodically tilled for aeration and natural UV breakdown on at least a biannual basis
Hydrocarbon contaminated stormwater		Trapped contaminated water seeping through facility	 All cells lined with 1mm (or greater) thickness HDPE Contaminated soils will be periodically tilled for aeration and natural UV breakdown on at least a biannual basis
		Run-off of contaminated	Walls of the facility will be built at least 100mm higher than the materials stored

Emission	Sources	Potential pathways	Proposed controls
		stormwater	within each cell to prevent outflow

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 e	environmental r	receptors and	distance from	prescribed activity

Human receptors	Distance from prescribed activity					
Edjudina Homestead	The Edjudina homestead is located approximately 7km to the south-east of the Prescribed Premises boundary. Human receptors are not considered to be impacted during construction or operations and therefore not further considered in the risk assessment.					
	Screened out as sensitive receptor					
Environmental receptors	Distance from prescribed activity					
Threatened Flora	• Thryptomene eremaea (P2) approximately 5.2km south-east from prescribed activity					
	Screened out as sensitive receptor					
Native vegetation	Native vegetation is located adjacent to the prescribed activities.					
Threatened/Priority Fauna	 Nearest siting of <i>Leipoa ocellata</i> (Malleefowl) (Threatened – Vulnerable) on DBCA databased is approximately 21km south from prescribed activity. 					
	Appears to be many sitings of Malleefowl throughout the area surrounding the premises with sitings stretching across the premises boundary but not the near the mining areas within the Porphyry Project (Saracen, 2008).					
	• Peregrine Falcon is likely to be present on the Northern Star tenements and have been sighted elsewhere in the general area.					
	Screened out as sensitive receptor					
Surface Water Bodies and Lines	Lake Rebecca is 15km south-west of the prescribed activity. There is a surface water drainage waterbody running just east of the Margaret Pit flowing westerly in ephemeral creeks, discharging in Lake Rebecca.					
Groundwater	Sits on the Goldfields Groundwater Proclamation Area.					
	Groundwater quality varies throughout the Porphyry project area ranging from brackish (less than 2,000mg/L total dissolved solids (TDS)) near recharge areas (elevated bedrock at drainage divides and beneath sandy drainage channels) to hypersaline (up to 300,00mg/L TDS) associated with Salt Lake systems along palaeochannel drainage lines. Depth of groundwater is approximately 344m AHD at Margaret's Pit and 365m AHD at the proposed location of the landfill. Standing groundwater levels range from 30-100 mbgl.					
Edjudina Pastoral Bores	 Ram Dam Bore – 2.3km south south-east from Margaret's Pit Sparks Well – 2.9km east of the Margaret's Pit Woolshed Bore – 5.4km west south-west of Margaret's Pit 					
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	See Figure 2 for map showing location of the bores.
Aboriginal Sites and Heritage Places	 Two current native title claims registered over the Porphyry project area Nyalpa Pirniku (WC2019/002) Maduwongga (WD2017/001) neither have been currently determined. DPLH online database revealed 2 registered Aboriginal heritage sites: RegID 19142 – Lake Rebecca (Mythological) – located 15km from Porphyry and Margaret's pit RegID 2323 [W00916] – Porphyry Gold 2 (Artefacts/Scatter) – archaeological site that would require Section 18 consent under the AHA prior to any ground disturbance – located >500m from any activities assessed amendment.

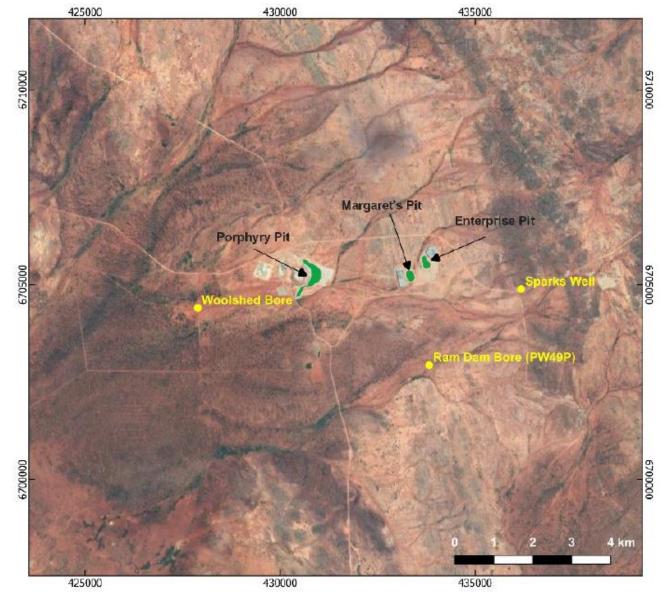


Figure 2: Location of nearby pastoral bores (in yellow)

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 L8569/2011/2 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. Category 6 activities of reducing the freeboard limit for discharge location, and Category 63 of construction and operation of a Class I inert landfill and associated bioremediation facility.

The conditions in the Revised Licence have been determined in accordance with Guidance Statement: Setting Conditions (DER 2015).

Risk Event				Hold	Licence Holder's	Holdor'o		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	controls sufficient ?	Conditions ² of licence	Justification for additional regulatory controls
Construction (Category 64)								
Source: Movement of mobile equipment (e.g. light vehicles and heavy equipment) Earthworks Activities Construction to establish facility and construct landfill trenches and bioremediation facility Operation (Category 6)	Dust	Pathway: Air / windborne pathway Impact: Smothering of vegetation	Adjacent native vegetation	Refer to Section 3.1	C = Slight L = Possible Low Risk	Y	Existing Condition 27: minimize dust emission from premises	The Licence Holder already practices dust suppression activities on site under current licence conditions. The landfill will be constructed on the WRD and for short durations only. The Delegated Officer considers the risk of the emission to be low, and that no additional regulatory controls will be necessary.
Source: Mine dewater stored in pits Activities: Disposal of additional mine dewater into Margaret's pit 	Mine dewater (hypersaline)	Pathway: overtopping of Margaret's Pit Impact: topsoil / creek line contamination and plant stress or death	Soil / sediment Adjacent native vegetation	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk C = Minor	Y	Updated Condition 26: freeboard limit Updated Condition 31: freeboard monitoring Updated Condition 31: monitoring of	Section 3.3
			Ephemeral creek lines		L = Unlikely Medium Risk		dust suppression volumes	

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

Risk Event					Risk rating ¹	Licence Holder's	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	controls sufficient ?		
	Pathway: seepage through pit walls and base to groundwaterAdjacent native vegetationImpact: mounding of GW into the root zone of the surrounding native vegetationRefer to section 3Nearby Pastoral bores or death and contaminating nearby pastoral bore qualityNearby Pastoral bores	seepage through pit walls and base to groundwater Impact:	native		C = Minor L = Unlikely Medium Risk			
		Refer to section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 34: monitoring ambient groundwater	Section 3.4		
		Pathway: overspray or runoff from dust suppression	Adjacent native vegetation		C = Slight L = Unlikely Low Risk		Existing Condition 7: dewater not be used in a manner that will impact native vegetation	The Licence Holder currently uses dust suppression activities on the premises, with existing conditions controlling the use to be limited to a manner that does not impact vegetation. After comparing the water quality of Porphyry to ANZECC (2000) short term irrigation guidelines, the pit water does not have exceeding levels of salinity (76 000 mg/L TDS), or pH (7.63) recommended for dust suppression purposes. Selenium exceeded guidelines with a reading of 0.1 mg/L (ANZECC limit of 0.05mg/L). Noting that this ANZECC value is for irrigation purposes, and this dewater will be used for dust suppression on haul roads / pre- disturbed mining land, the Delegated Officer has determined that the risk does not warrant further regulatory controls and will be adequately managed by existing licence conditions. With the low rainfall of the area, the impact of run off into ephemeral creek
Source: Mine dewater stored in pits 			Soil / sediment		C = Slight L = Possible Low Risk			
 Activities: Use of mine dewater for dust suppression 		activities Impact: topsoil contamination and plant stress or death	Ephemeral creek lines		C = Minor L = Unlikely Medium Risk	Y		

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Risk Event					Risk rating ¹	Licence Holder's		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	controls sufficient ?	Conditions ² of licence	Justification for additional regulatory controls
								lines is expected to be minor.
Operation (Category 6 <mark>4</mark>)								I
 Source: Operation of the landfill/bioremediation facility and vehicle movements Activities: Unloading landfill materials, covering waste and aerating material 	Dust	Pathway: Air / windborne pathway Impact: Smothering vegetation	Adjacent native vegetation		C = Slight L = Unlikely Low Risk		Existing Condition 27: minimize dust emission from premises	Considering that the landfill and bioremediation facility will be constructed within the footprint of the pre-disturbed WRD, the risk of dust on native vegetation is low, and the Delegated Officers considers the current licence condition to be sufficient in managing the risk.
	Windblown waste	Pathway: Air / windborne pathway Impact: disturbance to vegetation	Adjacent native vegetation	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	N/A	Updated Condition 11: waste management Existing Condition 12: waste criteria	The Licence Holder has stated that this new landfill will be managed the same as the existing landfill. Due to the distance to native vegetation and existing licence conditions requiring cover of waste, this risk event has been rated as low, and the Delegated Officer considers the risk to be adequately managed.
Source: • Landfill material	Leachate	Pathway: seepage from base of facility Impact: contamination of soil and groundwater	Groundwater		C = Slight L = Unlikely Low Risk		Existing Condition 15: pest control Existing condition 16: windblown waste Existing Condition 18: containment infrastructure	The Licence Holder has stated that this new landfill will be managed the same as the existing landfill. Due to the construction on the waste rock dump, high evaporation rates in the area, and the large distance to groundwater (>30m), the Delegated Officer considers this to be low risk, and to be sufficiently managed by existing licence conditions and Licence Holder controls.

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Risk Event					Risk rating ¹	Licence Holder's		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	controls sufficient	Conditions ² of licence	Justification for additional regulatory controls
Source:	Hydrocarbons	Pathway: Seepage from base of facility directly into soil Impact: contamination of soil and GW	Groundwater		C = Minor L = Unlikely Medium Risk	Y	Updated Condition 11: Waste management	The landfill and bioremediation facility will be constructed on the WRD and the distance to groundwater in the area is over 30m in depth. Due to high evaporation and proposed Licence Holder controls for containment of material within these sites, the Delegated Officer has determined that the risks associated with seepage from the
 Operation of landfill / bioremediation facility Activities: Disposal of waste and contaminated soil 	Operation of landfill / bioremediation facility Pathway: contaminated stormwater C = Minor Update Contaminated Contaminated Activities: Impact: leaching into groundwater Impact: leaching into groundwater Medium Risk Update Contaminated	Updated Condition 18: containment infrastructure Updated Condition 19:	contaminated soil to groundwater will be adequately managed by these controls and existing licence conditions.					
	contaminated stormwater	Pathway: overtopping of cells and runoff from misplaced contaminant Impact: contaminated stormwater	Ephemeral creek lines Adjacent native vegetation		C = Minor L = Rare Low Risk	Y	construction requirements	The Delegated Officer has taken into consideration the low rainfall and high evaporation rates in the area to determine the likelihood of this risk event occurring to be rare. The proposed location of the facilities and Licence Holder controls are sufficient in managing the risk. No additional regulatory controls are required.

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.

3.3 Detailed risk assessment for Margaret's Pit over topping

3.3.1 Overtopping risk of Margaret's pit discharging hypersaline mine dewater

The Licence Holder is authorised under their current licence to dewater into Margaret's pit to support the dewatering demand for the new proposed underground Porphyry Project. The Premises lies on top of the Edjudina Station pastoral land. Consultation carried out by the Licence Holder identified that there were concerns over dewatering into Enterprise due to follow through effects on nearby pastoral bores. To mitigate this concern, the Licence Holder has requested to amend the licence to decrease the freeboard limit at Margaret's pit from the current authorised limit of 6m to 1m. This is to allow sufficient capacity for the pit to accept the entire volume required from the Porphyry pit and old flooded underground channels to allow for future new underground development.

Due to this decrease in freeboard, the likelihood of overtopping is much greater due to the smaller distance between the highest authorised water level and the pit crest. Overtopping may lead to discharge of pit water into the surrounding environment which can damage vegetation and downstream ecosystems by surface ephemeral creek lines.

The estimated volumes and rates for the discharge and water balance at Margaret's pit are shown in Table 5. Although evaporation is generally quite high in the area, the model follows a conservative approach to not include evaporation from the pit's surface when predicting the water level in Margaret's pit. The initial estimated seepage rates are approximately 12 L/s during active dewatering but will decrease to 0.5L/s after the cessation of dewatering. Including the estimated seepage inflow into Porphyry pit during dewatering, the approximate dewater volume is 1,450ML to dewater the pit and flooded old underground (Penningtonscott, 2022a). The Licence Holder has advised that approximately 0.4ML/day of discharge will be diverted for dust suppression purposes to use across the premises.

Table 5: Water balance volumes for Margaret's Pit during active dewatering(approximately 262 days) (Penningtonscott, 2022a)

Current volume	Discharge	Seepage loss	Expected volume	Maximum volume at 1m
(ML)	rates (L/s)	rates (L/s)	after dewatering (ML)	freeboard limit (ML)
1,435	70.4	12.25	1,307	1,392

3.3.2 Licence Holder's controls to manage the risk of overtopping

Due to the high rate of seepage, and slow filling rate of the dewatering, the Licence Holder does not expect the freeboard of the pit to be reached. Although the volumes of inputs and outputs indicated in Table 5 demonstrates that Margaret's pit (with a freeboard of 1m) has sufficient capacity to support the bulk of the initial dewatering to occur, the Licence Holder has committed to prioritising the use of water carts to divert large portions of the dewatering from the project. It is expected that due the high demand and expected volumes required for dust suppression throughout the duration of the life of the mine (LOM), this will lessen the likelihood of the decreased freeboard to come under threat, and result in overtopping and discharge of mine dewater into the surrounding environment.

The Turkey's nest dam 1 (conceptualized in

Figure 1), will act as an intermediate discharge location between the two pits, where water will be temporarily stored and removed for water carts. In the application the Licence Holder proposed to dewater into Enterprise as a last resort to redirect any excess discharge from Margaret's should the freeboard come under risk, however during assessment of the dewatering infrastructure, it was confirmed that the necessary pipeline to support dewatering between Margaret's and Enterprise is yet to be constructed, and therefore the department will

not consider this measure as a suitable control to influence the risk assessment.

The Licence Holder has proposed to monitor the freeboard monthly during active dewatering and for 24 months after dewatering and have committed to recording volumes of water removed from Porphyry, discharged into Margaret's and used for dust suppression to be provided in the Annual Environmental Report.

3.3.3 The department's risk assessment

The department has assessed that due to the short timeframe of proposed discharge into Margaret's pit, the risk is decreased. Once dewatering has ceased, the pit water level is expected to decrease due to natural seepage into the surrounding groundwater. The capacity of Margaret's pit has been reviewed and considering the commitment to divert large amounts of expected discharge for dust suppression purposes, the Delegated Officer has determined that the likelihood of an overtopping event to as **unlikely**. A model of the pit water quality at Margaret's prior to discharge shows a significant stratification of saline water overlying denser hypersaline water. A survey of the area has shown there is little to no vegetation within approximately 500m of the pit crest. The consequence of overtopping to adjacent native vegetation is **moderate** due to potential for vegetation stress and death due from exposure to mine dewater. Therefore, the final risk rating for this even has been assessed as **medium**. The Delegated Officer has concluded that the Licence Holder controls, and existing licence conditions will mostly manage the impacts and mitigating the risks of overtopping. The Licence Holder controls to record and report volume of dewatering effluent used for dust suppression has been conditioned in the licence as a monitoring requirement.

3.4 Detailed Risk assessment for seepage from Margaret's Pit

3.4.1 Risk and receptors of seepage from Margaret's Pit

Data from water quality parameters of Porphyry and Margaret's Pit were provided by the Licence Holder. There was only a slight variation in recorded salinity (TDS) and pH values, indicating that the water quality of the pits is relatively similar. The water quality of the two pits is shown in Table 6.

Pit	рН	TDS (mg/L)
Porphyry	7.42	75,000
Margaret's	7.46	82,000

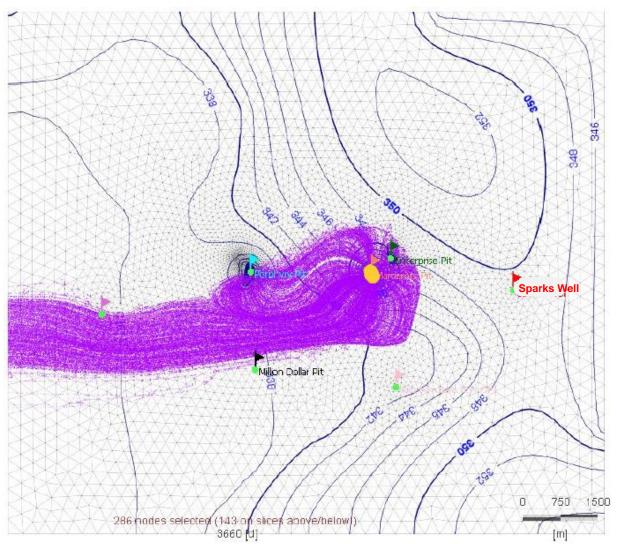
Table 6. Pit water quality parameters

It was shown that there is significant stratification of water in Margaret's pit with the salinity ranging from 23,500mg/L recorded in the top 40m and increasing significantly to levels of 82,000mg/L and 87,900mg/L towards the bottom of the pit. This represents the denser hypersaline water underlying the less dense saline water towards the top of the pit.

Modelling of the area has shown that groundwater migration from Margaret's pit occurs in a westerly direction, moving past the southern edge of Porphyry pit and towards Lake Rebecca located 15km west of the Margaret's Pit. Due to the low permeability of the fresh rock aquifer, the worst-case scenario model indicated that solute would travel no more than 200m from the edge of the pit by the end of the LOM (approximately 4 years) and no more than 900m from the edge of the pit within 10 years after commencing the project (Penningtonscott, 2022b).

As was shown in

Figure 1, there are three pastoral bores owned by Edjudina Station which are located near Margaret's Pit. The Woolshed bore is the only of those 3 bores located within the groundwater migration path (shown in Figure 3), but due to the low permeability, it has been modelled to take several decades for the solute particle to travel the 5.4km WSW from the pit to that bore. This bore has been recorded to have a salinity of 4,000 to 10,000mg/L. The Sparks Well and Ram Dam bores, although located 2.9km and 2.3km respectively from the pit, lie outside the modelled worst-case scenario for groundwater migration from Margaret's pit. Both these bores have recorded salinity levels of 500 to 1,000mg/L TDS which is considered suitable for



livestock use.

Figure 3: Groundwater flow path from Margaret's Pit simulated over infinite time dispersity against the location of the 3 pastoral bores (in red) (Penningtonscott, 2022b).

Another potential receptor associated with seepage from a pit, are the impacts of groundwater mounding that occur during and after the deposition of water into a pit past the natural groundwater elevation. Mounding around a pit increases the water table, exposing the root zone of vegetation to saline and hypersaline water.

The vegetation in the area has been surveyed to consist of non-groundwater dependent, shallow rooted shrubland. The modelled discernible mounding (defined as draw up of 0.5m) associated with the seepage from Margaret's pit by the end of the approximately 8-month dewatering period would not extend more than 150m from the edge of the pit and would

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Woolshed Bore

extend no more than 800m after 10 years (Penningtonscott, 2022b).

3.4.2 Licence Holder's controls to manage the risk

Although numerical modelling shows that it is unlikely for groundwater to mound to a level of 4 mbgl, which is considered to be the limit before shallow rooted vegetation may become impacted, the Licence Holder will implement a monitoring program for groundwater mounding around the pit. The licence holder has installed 3 monitoring bores located 50,100 and 200m from the Margaret's pit crest to monitor the hydraulic movement of groundwater seepage from the pit to the surrounding environment. These will be monitored monthly during operation. The licence holder has stated that the pumping into Margaret's will cease if the standing water levels reach 4 mbgl in either of the 3 installed bores. Existing licence conditions including flow meters to measure volumes of water discharged at Margaret's and measure of pit water quality will monitor the level and quality of water entering the pit and can be used to determine the risk levels associated with any seepage from the pit.

3.4.3 Department's risk assessment for native vegetation

Mounding of saline/hypersaline groundwater can impact the root zones of native vegetation which in turn can lead the death or serious health effects to impacted vegetation. Modelling completed by Penningtonscott (2022b) has shown the extent of the discernible mounding surrounding the pit over 10 years, and the Delegated Officer has considered the likelihood of any mounding caused by seepage to impact native vegetation is **unlikely**. The consequence of the mounding on vegetation health is **minor** considering the modelled extent and distance to vegetation from the pit crest. Therefore, the final risk rating for this even has been assessed as **medium**. The Licence Holder controls to measure SWL around the pit (and a limit for SWL of 4mbgl) will be conditioned in the licence to monitor the impacts of mounding on the groundwater levels during dewatering. The Delegated Officer has determined that monitoring should proceed at a reduced frequency following the cessation of dewatering to demonstrate the future trends of the mounding extent.

3.4.4 Department's risk assessment for impacts to nearby pastoral bores

There are three pastoral bores used for livestock located near the activity. The risk of seepage to these bores are associated with the groundwater movement of hypersaline water from the pits infiltrating the bores and impacting water quality and potable uses of these bores. Due to this, the consequence of this risk even was rated as **moderate**. After assessment of the groundwater model that detailed the direction and extent of groundwater and solute model, the likelihood of seepage to impact these bores has been considered as **unlikely**. This was determined due to the combined placement and distance of the bores in relation to the Margaret's pit based on the worst-case scenario for seepage via groundwater. Therefore, the final risk rating for this event has been assessed as **medium**. The Delegated Officer is satisfied that the model demonstrates the risk of seepage to the pastoral bores in a manner where no additional regulatory controls will be required. Current licence conditions and proposed licence holder controls have been deemed acceptable in mitigating the risk.

4. Consultation

Table 7 provides a summary of the consultation undertaken by the department.

Table 7: Consultation

Consultation method	Comments received	Department response
Edjudina Station homestead landholders advised of	No comments received.	None.

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proposal 24 August 2022.		
Licence Holder was provided with draft amendment on 28 September 2022.	Licence Holder provided comments on 30 September 2022. Refer to Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions	Refer to Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

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.

5.1 Summary of amendments

Table 8 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
-	Prescribed premises category table on front cover to include updated throughput for Category 64 activities.
-	Changes to Cover page to include bioremediation facility as an assessed activity under the licence.
-	Changes to Instrument log to include current amendment.
-	Changes to all Table numbering and captioning revised to current licence format.
Condition 8	Changes to Table 1 to add freeboard limit of turkey's nest dam and inclusion of the locations of infrastructure column.
Condition 11	 Changes to Table 2 to: update landfill information to current throughput and location; and to include hydrocarbon contaminated material with related processes and limits.
Condition 18	Changes to Table 4 to include a bioremediation cell within the containment infrastructure
Condition 19	Changes to Table 5 to remove constructed infrastructure and include new proposed landfill and bioremediation facility.
Condition 22	Changes to Condition 22 to include as constructed photographs for infrastructure required by the Environmental Compliance Report .
Condition 26	Changes to Table 8 to change the freeboard limit of Margaret's pit from >6 to >1 mbgl.
Condition 31	 Changes to Table 10 to: change the frequency of monitoring of Margaret's pit freeboard from six monthly to monthly – when in operation and for 12 months after; and to include monitoring of volume of dewatering effluent used for dust suppression.

Table 8: Summary of licence amendments

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Condition 34	Addition of Table 13 to include the monitoring of standing water levels in three bores located around Margaret's pit including a limit of 4 mbgl.
N/A	Change wording in conditions from "shall" to "must" . Changes to abbreviations for Porphyry Pit in Tables 7, 8 and 10 from PP1 to PY1/PY2.
-	Map of Porphyry / Maingays WRD for proposed location of Class I landfill and bioremediation facility Map of Porphyry project constructed dewatering pipeline Map of locations of proposed monitoring bores surrounding Margaret's pit

Table 9: Consolidation of licence conditions in this amendment

Existing condition	Condition summary	Revised licence condition	Conversion notes
N/A	Introduction	N/A	Revised to current licensing format
1.1.1 1.1.2	Interpretation and definitions	N/A Interpretation section, Definitions and Table 1	Redundant condition. Revised to current licensing format.
1.1.3	Australian or other standard	N/A Interpretation section, Definitions and Table 1	Redundant condition. Revised to current licensing format.
1.1.4	Reference to code of practice	N/A Interpretation section, Definitions and Table 1	Redundant condition. Revised to current licensing format.
N/A	All Conditions	N/A	New numbering revised to current licensing format
N/A	All Table Captions	N/A	New Table number and naming convention revised to current licensing format
4.1.1	Records	38	New numbering and update to wording format
4.1.2	Records	N/A	Redundant condition. Revised to current licensing format.
4.1.3	Records	36	New numbering and update to wording format
4.1.4	Records	35	New numbering and update to wording format
-	Records	37	Updated standard reporting conditions. Revised to current licensing format.

References

- 1. Australian and New Zealand Environment and Conservation Council (ANZECC) 2000, Australian and New Zealand Guidelines for Fresh and Marine Water Quality: The Guidelines, Australia.
- 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. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
- 5. Penningtonscott 2022a, Addendum water balance information to the H3 Hydrogeological investigation of the Porphyry Project. Prepared for Northern Star Resources Limited.
- 6. Penningtonscott 2022b, Porphyry Project Margaret's Pit wastewater disposal impacts assessment 1m freeboard. Prepared for Northern Star Resources Limited.

Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Item	Condition	Summary of Licence Holder's comment	Department's response
1.	Condition 11, Table 2	Change the permissible location of both Class I and II landfill to either location in Figure 6 (both Porphyry / Maingays and Million Dollar WRD). The Licence Holder would like the freedom to dispose of these materials at both locations.	The department has noted this request and after clarification about waste disposal intentions from the Licence Holder, changes were made to the licence to allow for more operational freedom. Instead of approving a Category 63 Class I landfill, the new landfill will be classified as a Category 64 Class II that allows a larger range of materials to be disposed at the new proposed location (Porphyry / Maingays WRD). The department has reassessed the change of landfill type and has concluded that the risks will be adequately managed.
2.		The Licence Holder has confirmed that the maximum throughput for the proposed Class I landfill will be 5,000 tonnes per annual period.	Inline with the changes to landfill Categories (refer to Item 1) the department will increase the assessed throughput of Category 64 from 4,500 to 9,500 tonnes per annual period.
3.	Condition 18, Table 4	The Licence Holder has requested to slightly change the infrastructure requirements for the <i>Bulk fuel yard</i> containment cells.	This requested change regards conditions outside the scope of this amendment. The risk assessment did not consider any changes to conditions for existing approvals for Category 73 activities. The department has advised the Licence Holder to seek this change through a separate amendment.
4.	Condition 19, Table 5	The Licence Holder has requested to remove the landfill construction condition regarding the dimensions of the trenches to allow for operational flexibility. The Licence Holder has since advised that the maximum trench size for the landfill will be 25 x 5 x 4m (LxWxD).	The department has noted the request for operational flexibility for the size of the landfill trenches and has agreed to include maximum sizes for the dimensions to allow flexibility for the Licence Holder to comply with this condition.
5.		The Licence Holder has requested to change the permissible location of the Class II landfill to both Porphyry / Maingays and Million Dollar WRD.	Request not changed as landfill on Million Dollar WRD is already constructed.
6.		The Licence Holder has requested to remove the bioremediation facility construction condition regarding the dimensions of the cells to allow for operational	Refer to Item 4.

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Item	Condition	Summary of Licence Holder's comment	Department's response
		flexibility. The Licence Holder has since advised that the maximum cell size for the bioremediation facility will be 10 x 10 x 1m (LxWxD).	
7.		The Licence Holder has requested to remove the condition regarding "Secondary containment bunding will be constructed around the bioremediation facility to capture incidental spillage".	Although the department considers all applicant's proposed controls during the risk assessment, the risks associated with the bioremediation facility have been assessed to be sufficiently managed by other conditions in place and therefore this requirement will be removed from the licence.
8.		The Licence Holder has requested to have the flexibility to construct the bioremediation facility on either the Porphyry / Maingays and Million Dollar WRD.	This additional authorised location was not included in the original proposal, however the department has determined that due to adequate containment conditions and no change to the risk rating, this requested change can be incorporated in this amendment and the infrastructure location for the facility to be updated to allow construction on Porphyry / Maingays and Million Dollar WRD.
9.	Condition 25, Table 7	The Licence Holder has requested to include Pioneer Paddock and Million Dollar Pit as additional emission	The department has rejected this change to include these two new emission points. This was not included in the original proposal and will require an
10.	Condition 26, Table 8	points to land for the purpose of dewatering.	additional risk assessment prior to inclusion on the licence. The Licence Holder will need to request these changes under another licence amendment
11.	Condition 31, Table 10		application.
12.	Old Condition 34	The Licence Holder has requested to remove the 'evaporation' and 'estimated seepage losses' parameters from the Margaret's Pit water table condition.	The department has noted the applicants request and has determined that the risk will be adequately managed through other conditions on the licence. In removing this condition, the requirement to record and report the volume of dewatering effluent used for dust suppression will be conditioned into Table 10.

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMM	ARY					
Application type						
Amendment to licence	\boxtimes	Current licence number:	L8569/2011/2			
		Relevant works approval number:		N/A		
Date application received		20 th April 2022				
Applicant and Premises details						
Applicant name/s (full legal name/s)		Northern Star (Caro	sue Dam) Pty Ltd			
Premises name		Porphyry (Edjudina) Gold Project				
Premises location		430880E 6705240N Activities relation to Category 6 (Dewatering) are located in leases: M31/3, M31/4, M31/30 and L31/59 Activities relating to Category 63 (Class I inert landfill) are located within mining tenement M31/5				
Local Government Authority		Shire of Menzies				
Application documents						
HPCM file reference number:		2011/005896-1~2				
Key application documents (addition application form):	al to	 Supporting documents in 2011/005896-1~2: Cover letter regarding Margaret's Freeboard Change L8569-2011-2 Current licence Porphyry Gold Project Supporting Documents Technical Memorandum for 1m freeboard – (pennington scott, 2022) Fee Calculator 			-	
Scope of application/assessment						

 into Margaret's Pit In order to do so, the applicant is requesting to increase the allowable freeboard limit from 6mbgl to 1mbgl at 				
 In last amendment, licence was updated to include dewatering from Porphyry Pit to Margaret's Pit and Enterprise Pit. After stakeholder concerns over dewatering into Enterprise Pit, the applicant has decided to dewater on into Margaret's Pit In order to do so, the applicant is requesting to increase the allowable freeboard limit from 6mbgl to 1mbgl at 	Licence amendment			
 dewatering from Porphyry Pit to Margaret's Pit and Enterprise Pit. After stakeholder concerns over dewatering into Enterprise Pit, the applicant has decided to dewater on into Margaret's Pit In order to do so, the applicant is requesting to increase the allowable freeboard limit from 6mbgl to 1mbgl at 	Operation of Category 6:			
 Applicant is requesting to amend licence conditions which restricts the freeboard limit of Margaret's Pit – freeboard will be marked at the lowest point No new infrastructure, discharge point or changes to production throughput Construction and operation of Category 63: Applicant requests to include a Category 63 to their current licence Through put of 5000 tonnes per year Same management plan as other approved landfill on t licence Will be located on top of approved footprint of Maingays/Porphyry Waste Rock Dump (WRD) Area will support Bioremediation facility, using HDPE liner and be aerated quarterly. 	 In last amendment, licence was updated to include dewatering from Porphyry Pit to Margaret's Pit and Enterprise Pit. After stakeholder concerns over dewatering into Enterprise Pit, the applicant has decided to dewater only into Margaret's Pit In order to do so, the applicant is requesting to increase the allowable freeboard limit from 6mbgl to 1mbgl at Margaret's Pit to improve storage availability Applicant is requesting to amend licence conditions which restricts the freeboard limit of Margaret's Pit – freeboard will be marked at the lowest point No new infrastructure, discharge point or changes to production throughput Construction and operation of Category 63: Applicant requests to include a Category 63 to their current licence Through put of 5000 tonnes per year Same management plan as other approved landfill on the licence Will be located on top of approved footprint of Maingays/Porphyry Waste Rock Dump (WRD) Area will support Bioremediation facility, using HDPE liner and be aerated quarterly. Landfill trenches will be around 8x2x2 and bio pads will 			

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

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed / assessed production or design capacity		Proposed / assessed changes to the production or design capacity		
Category 6: Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore	3 000 000 tonnes per year		No change in production capacity		
Category 63: Class 1 inert landfill site: premises (other than clean fill premises)	5000 tonnes per year		5000 tonnes per year		
N/A- Bioremediation pad					
Legislative context and other approvals					
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?		Yes 🗆 No 🖂		Referral decision No: Managed under Part V □ Assessed under Part IV □	

Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes 🗆 No 🖂	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes 🗆 No 🖂	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ⊠ No □	Certificate of title □ General lease ⊠ Expiry: L31/44 (02/07/2029) L31/59 (02/11/2030) L31/62 (27/06/2031) L31/63 (22/12/2031) Mining lease / tenement ⊠ Expiry: M31/3, M31/4, M31/5 & M31/30 (07/10/2028) M31/76 (11/08/2030) M31/380 & M31/381 (14/02/2028) Other evidence □ Expiry:
Has the applicant obtained all relevant planning approvals?	Yes □ No □ N/A ⊠	Approval: Expiry date: Not required as within mining tenements
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes 🗆 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: GWL 169295(5)

Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ⊠ No □	Name: Goldfields Groundwater Area Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes No N/A □ Regional office: Goldfields Goldfields
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes □ No ⊠	Name: N/A Priority: N/A Are the proposed activities/ landuse 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 RIWI Act 1914
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 ⊠	Classification: N/A Date of classification: N/A