Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L8666/2012/2
Licence Holder	Northern Star (Carosue Dam) Pty Ltd
ACN	116 649 122
Application Number	APP-0028046
Premises	Mt Celia Legal description – Mining tenements M39/307, M39/740, L39/128, L39/130 and L39/134 MENZIES WA 6436 As defined by the Premises maps attached to the Revised Licence
Date of Report	31 July 2025
Decision	Revised licence granted

Christine Pustkuchen

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MANAGER, RESOURCE INDUSTRIES
ENVIRONMENTAL REGULATION (STATEWIDE DELIVERY)

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

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1. Decision summary

Licence L8666/2012/2 is held by Northern Star (Carosue Dam) Pty Ltd (Licence Holder) for the Mt Celia Mine (the Premises), located within mining tenements M39/307, M39/740, L39/128, L39/130 and L39/134.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during operation of the Premises. As a result of this assessment, Revised Licence L8666/2012/2 has been granted.

The Revised Licence issued as a result of this amendment 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 19 March 2025, the Licence Holder submitted an application to the department to amend Licence L8666/2012/2 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Increase the assessed production capacity for discharge of mine dewater from 500,000 tonnes to 3,000,000 tonnes per annual period; and
- Authorise Deep South Pit for the discharge of mine dewater, up to 3,000,000 tonnes per annual period.

This amendment is limited only to changes to Category 6 activities from the Licence. No changes to the aspects of the existing Licence relating to Category 89 have been requested by the Licence Holder.

Table 1 below outlines the proposed changes to the existing Licence

Table 1: Proposed design or throughput capacity changes

Category	Current throughput capacity	Proposed throughput capacity	Description of proposed amendment
6	500,000 tonnes per annual period	6,300,000 tonnes per annual period	Installation of new dewatering pipeline and associated infrastructure; and Dewatering of the Safari Bore Pit into the Deep South Pit.
89	4,500 tonnes per year	No change	N/A

The Safari Bore Pit was initially mined between 2003 and 2005 (Figure 1). Following cessation of mining and active dewatering in 2005, a pit lake formed within the Safari Bore Pit void. As the Licence Holder dewatered and mined at the Deep South Pit and underground mine, licence L8666/2012/1 was granted in 2012 to authorise the discharge of mine dewater to the Safari

Bore Pit, at a rate of 500,000 tonnes per annual period[1].

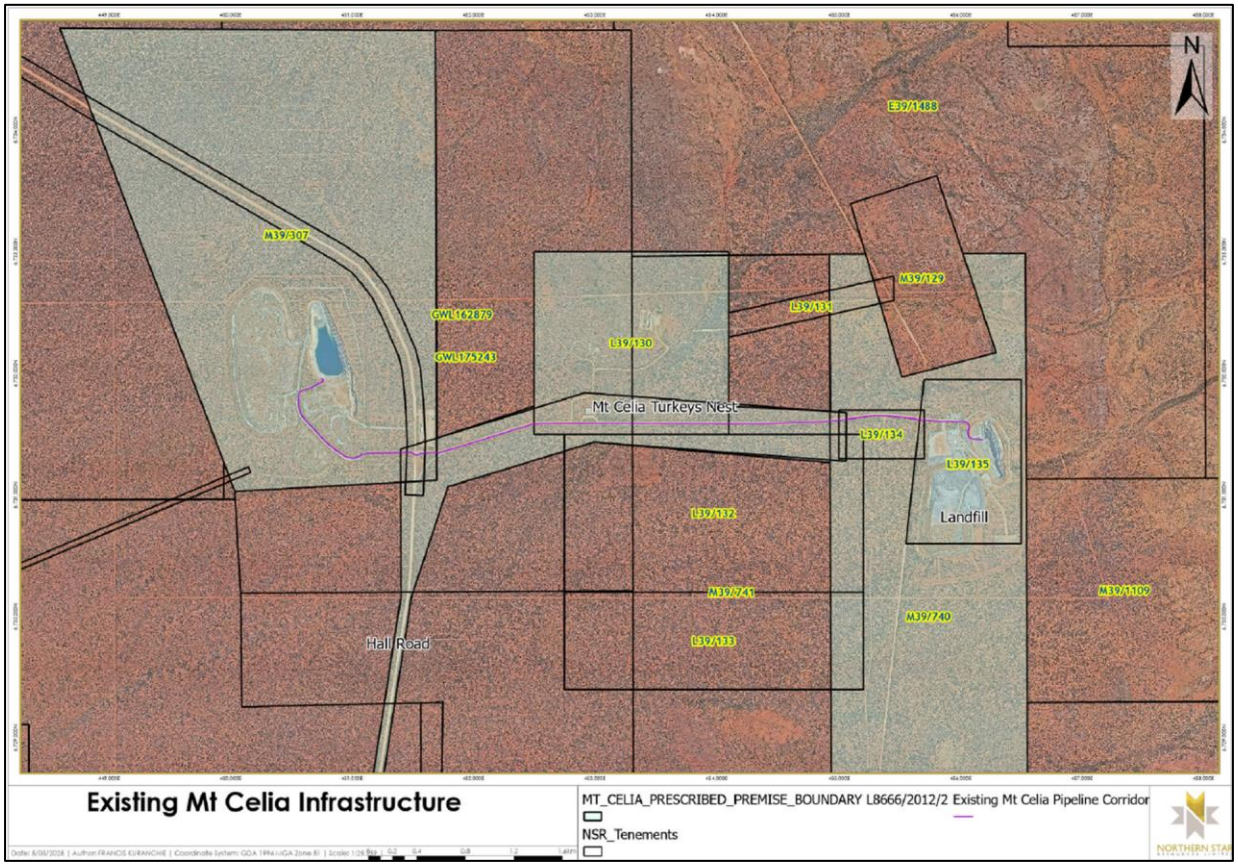

Figure 1: Site layout, including Safari Bore Pit, Deep South Pit, and dewatering pipeline corridor

Dewatering of the Deep South Pit ceased in mid-2023, following completion of active mining. The Licence Holder is proposing to recommence mining operations at the Safari Bore Pit. To undertake this, the Safari Bore Pit will need to be dewatered due to the pit lake that has formed. Currently, the pit lake is estimated to be 86 m deep, with pit water level at around 323 mRL. It is estimated that the pit lake volume is approximately 2,100,000 kL.

The Licence Holder is proposing to undertake the dewatering activities in two phases: (i) the initial dewatering of the pit lake of approximately 2,100,000 kL within a period of six months (assuming dewatering rates between 160 L/s and 200 L/s), (ii) followed by operational dewatering of approximately 189,216 kL to maintain safe, dry working conditions within the pit (assuming groundwater inflow of 6 L/s). Due to the initial dewatering of the pit lake, dewatering throughput for the first year of operations will be significantly higher than the subsequent years. To account for groundwater inflows that are higher than anticipated, the Licence Holder has requested an assessed production capacity of 3,000,000 tonnes per annual period, providing 700,000 tonnes of additional throughput as contingency (i.e., >6 L/s)[2].

Mine dewater from the Safari Bore Pit will be discharged at the now-inactive Deep South Pit. The storage capacity of the Deep South Pit consists of 900,000 kL within its underground

[1] The Licence Holder has requested that Safari Bore Pit be retained in the amended licence as an authorised discharge location for mine dewater from Deep South Pit, as mining operations (and the need for mine dewatering) at Deep South Pit may recommence in the future, subject to commodity prices and resource estimates.

[2] Assuming density of mine dewater is 1 kg/kL.

workings[3] and 2,630,000 kL within the 81 m-deep pit void[4], resulting in a total storage capacity of approximately 3,500,000 kL (Pennington Scott 2025b). The current capacity of Deep South Pit is sufficient to contain mine dewater from the entire Safari Bore Pit lake, which would completely fill up the underground workings and partially fill up the open pit, bringing pit lake level to approximately 25.4 m below crest level, and approximately 14 m above estimated pre-mining water table (Pennington Scott 2025b). At this elevation, the hydraulic gradient would likely reverse, causing the pit to become a source of seepage migrating outwardly. Total seepage losses are expected to be approximately 140,000 kL annually (Pennington Scott 2025b).

To enable mine dewatering at the required rates to drawdown the Safari Bore Pit lake, the Licence Holder has proposed the following upgrades to the dewatering infrastructure:

- Install a new DN355 pipeline within the existing 6.5 km pipeline corridor between Safari Bore and Deep South Pits (Figure 1), including pumping equipment, telemetry, flow meters (at both dewatering and discharge points), leak detection and cut-off devices;
- Construct a booster pump station comprising of a diesel generator (0.5 MW) and a 20 kL self-bunded fuel storage at the Safari Bore Pit; and
- Minor earthworks to the existing v-drain to accommodate the new pipeline.

The existing DN200 dewatering pipelines were determined to be unsuitable for the line pressure required. The existing Deep South turkeys nest will also be utilised to store mine dewater for dust suppression (Figure 1).

2.2.1 Consolidation of Licence

As part of this amendment package the department has consolidated the licence by incorporating changes made under the *Notice of Amendment to licence reporting requirements* granted on 16 May 2022

The obligations of the Licence Holder have not changed in consolidating the licence. The department has not undertaken any additional risk assessment of the Premises related to previous Notice of Amendment.

In consolidating the licence, the CEO has also:

- updated the format and appearance of the Licence; and
- revised licence condition's numbers, and removed any redundant conditions and realigned condition numbers for numerical consistency

The full consolidation of licence conditions as they relate to this Revised Licence are detailed in Section 5.1. Previously issued Amendment Notices will remain on the department's website for future reference and will act as a record of the department's decision making.

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 2020b).

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

[3] After accounting for an estimated 400,000 kL lost due to groundwater inflow following cessation of active mine dewatering.

[4] With a minimum freeboard of 6 m below the pit crest level.

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

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of dewater pipeline and minor works on existing pipeline corridor	Air/windborne pathway	• Water trucks utilised when required to suppress dust emissions
Operation			
Saline mine dewater from Safari Bore Pit	Dewatering and transfer of mine dewater from Safari Bore Pit to Deep South Pit	Pipeline leakage or rupture	• New pipelines will be installed that are fit-for-purpose for the required dewatering rates. • Pipeline will be installed along v-drains of existing pipeline corridor. • Pipeline will be equipped with telemetry systems, leak detection and cut-off devices, as well as flowmeters. • Pipelines will be inspected daily. Existing licence L8666/2012/2 requires pipelines containing saline water to either be equipped with telemetry systems and pressure sensors, or automatic cut-offs, or be installed within secondary containment.
	Discharge of mine dewater to Deep South Pit	Overtopping of Deep South Pit	• A minimum freeboard of six metres below pit crest level will be maintained. • Flowmeters will be installed at the dewatering and discharge end of the pipeline to determine volumes dewatered and discharged. • Standing water level of Deep South Pit will be monitored monthly. • Excess mine dewater will be redirected to the Deep South turkey's nest for reuse in dust suppression.
		Seepage through pit	• The pH and TDS of the Deep South Pit

Emission	Sources	Potential pathways	Proposed controls
Construction			
		walls and pit base, resulting in groundwater mounding	water will be monitored quarterly.
	Storage of mine dewater in Deep South turkey's nest	Overtopping of Deep South Pit	None. Existing licence L8666/2012/2 requires the turkey's nest: • To be lined with HDPE. • To maintain a freeboard of at least 300 mm or sufficient to withstand a 1-in-100 year storm event for 72 hours (whichever results in the larger freeboard). • To be inspected every 12 hours when in operation.
	Dust suppression using mine dewater from Safari Bore Pit	Direct discharge to land	None. Existing licence L8666/2012/2 requires saline mine dewater to be used for dust suppression in a way that minimises harm to surrounding vegetation.
Hydrocarbon	Storage and use of fuel storage at the Safari Pit booster station	Loss of containment, resulting in discharge to land	• Fuel storage will be located adjacent to power generator and be self-bunded.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020b), 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 2020a)).

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

Human receptors	Distance from prescribed activity
None.	N/A
Environmental receptors	**Distance from prescribed activity**
Native vegetation	Native vegetation at the premises is dominated by low, open or sparse woodland of mulga (*Acacia aneura* sp.), eucalypts,

	Eremophila and associated species. Pennington Scott (2025a) stated that deep-rooted groundwater-dependent native vegetation is unlikely to be present in the area, due to naturally deep groundwater levels.
Surface water bodies	Ephemeral drainage lines are present nearby and intersect with the premises, bringing flow towards Lake Raeside, a major salt lake. Drainage line flow direction reflects regional surface topography, sloping from the north-east to the south-west.
Groundwater aquifer	Hydrogeology of the premises is characterised by deep weathering profile over surface materials that has developed through much of the Cenozoic era. The weathered profile can be divided into several zones, with saprock and lower saprolite zones being the most important aquifer units, as they are considered the primary groundwater transmission zone. Based on production bores installed within the saprock aquifer near the Deep South Pit, the water table depth ranged between 58 meters below ground level (mbgl) and 75 mbgl. Groundwater quality at the Deep South Pit surrounds is characterised as fresh to brackish, with salinity ranging between 750 mg/L to 5,000 mg/L. For comparison, salinity level at the Safari Bore Pit is around one order of magnitude higher than the groundwater at the Deep South Pit area. The premises is located within the Goldfields Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act 1914.* As the premises is located within the Edjudina pastoral station, a number of production bores are present to support pastoral activities, including within the premises. These include, in order of increasing distance from the relevant mine pits and dewatering pipeline, the DSPB10, Safari Bore, and Red Hill Bore. Pastoral bore DSPB10 is located approximately 500 m hydraulically upgradient, to the east of Deep South Pit.

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020b) 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 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 L8666/2012/2 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. mine dewatering activities.

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

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

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
Construction								
Installation of mine dewatering infrastructure, including pipelines; Installation of booster station, including power generator and fuel storage; Minor works on existing pipeline corridor.	Dust	***Pathway:*** Air / windborne pathway ***Impact:*** Impact to ecological health Air/windborne pathway causing impacts to health and amenity	Native vegetation	Refer to Section 3.1	C = Minor L = Rare **Low risk**	Y	Condition 21 – Infrastructure installation requirements	N/A
Operation								
Operation of mine dewatering infrastructure to dewater from Safari Bore Pit to Deep South Pit at a maximum production capacity of 3,000,000 tonnes per annual period.	Saline mine dewater	***Pathway:*** Pipeline leakage or rupture ***Impact:*** Impact to ecological health	Native vegetation; Surface water bodies.	Refer to Section 3.1	C = Minor L = Unlikely **Medium risk**	Y	Condition 1 – Saline water pipeline requirements	N/A
Discharge and storage of mine dewater at Deep South Pit at a maximum production capacity of 3,000,000 tonnes per annual period.		***Pathway:*** Overtopping of Deep South Pit ***Impact:*** Impact to ecological health	Native vegetation.	Refer to Section 3.1	C = Moderate L = Unlikely **Medium risk**	Y	Condition 4 – Freeboard requirements Condition 5 – Inspection requirements Condition 10 – Mine dewater discharge limit	N/A
		Pathway: Seepage through pit walls and pit base, resulting in groundwater mounding ***Impact:*** Impact to	Native vegetation; Surface water bodies	Refer to Section 3.1	C = Moderate L = Unlikely **Moderate risk** Refer to Section	Y	Condition 10 – Mine dewater discharge limit Condition 13 – Ambient surface water and groundwater monitoring requirements	Refer to Section 3.3

Risk Event					Risk rating[1] C = consequence L = likelihood	Licence Holder's controls sufficient?	Conditions[2] of licence	Justification for additional regulatory controls
Source/Activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Licence Holder's controls**				
		ecological health			3.3.			
		Pathway: Seepage through pit walls and pit base, resulting in groundwater mounding ***Impact:*** Deterioration of groundwater quality for beneficial use.	Groundwater aquifer Pastoral bore DSPB10 located ~ 450 m to east of Deep South Pit	Refer to Section 3.1	C = Minor L = Possible **Moderate risk** Refer to Section 3.3	N	Condition 10 – Mine dewater discharge limit **Condition 13 – Ambient surface water and groundwater monitoring requirements**	Refer to Section 3.3
Discharge and storage of mine dewater at Deep South turkey's nest for dust suppression.		***Pathway:*** Overtopping of Deep South turkey's nest ***Impact:*** Impact to ecological health	Native vegetation.	Refer to Section 3.1	C = Minor L = Rare **Low risk**	Y	Condition 3 – Containment infrastructure requirements Condition 4 – Freeboard requirements Condition 5 – Inspection requirements	N/A
		Pathway: Dust suppression using mine dewater, resulting in direct discharge to land ***Impact:*** Impact to ecological health	Native vegetation.	Refer to Section 3.1	C = Moderate L = Unlikely **Medium risk**	Y	Condition 2 – Dust suppression requirements, when using saline dewatering effluent	N/A
Storage and use of fuel storage at the Safari Pit booster station.	Hydrocarbon	***Pathway:*** Loss of containment, resulting in direct discharge to land ***Impact:*** Impact to ecological health	Native vegetation.	Refer to Section 3.1	C = Slight L = Unlikely **Low risk**	Y	Condition 21 – Infrastructure installation requirements	N/A

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

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 discharge of up to 3,000,000 tonnes of mine dewater annually to Deep South Pit

3.3.1 Background

The Licence Holder has proposed to undertake up to 3,000,000 tonnes of mine dewatering of the Safari Bore Pit annually and to discharge the mine dewater into the Deep South Pit and its underground workings. Significant discharge of mine dewater into a mine pit environment may result in significant seepage entering the environment through the pit walls, base, and underground workings. As the Deep South Pit has not been previously assessed as an authorised discharge location for mine dewatering, a detailed risk assessment has been undertaken to assess the risk of potential impacts to sensitive receptors as a result of this proposed activity.

3.3.2 Hydrogeology

Regionally, the premises is located within the Eastern Goldfields Superterrane of the Yilgarn Craton, which consists of Mesoarchean to Neoarchean igneous and sedimentary greenstone sequences interspersed with granitoids.

A deep weathering profile over surface materials developed through much of the Cenozoic era, with breakdown of rock minerals and dissolution of elements resulting in a sequence that typically progresses upwards from fresh bedrock to material increasingly altered to clay minerals (mostly kaolin) and depletion of more mobile elements. The weathered profile can be divided into several zones, including (in ascending order) saprock, saprolite, pallid zone (i.e., a clay-rich or sand-rich zone), and the mottled zone, which is typically capped with residual laterite comprising a ferruginous duricrust and pisolitic gravel.

Crystalline Archaean rocks are essentially impermeable due to a lack of primary porosity. Groundwater in these types of geology rely on secondary porosity in structural features, such as joints, faults, and shears. Secondary permeability is further enhanced by the saprolite weathering profile. The most important aquifer units at the premises are the lower saprolite and saprock layers, which are the thickest saturated unit.

In 2019, three groundwater monitoring bores were installed within the saprock aquifer around the Deep South Pit. The depth of the water table at these bores ranged between 58 meters below ground level (mbgl) and 75 (mbgl) (Pennington Scott 2025a). Hydraulic testing at these bores found that the lower saprolite to saprock zone exhibited the highest permeability, while the upper saprolite possessed permeability around one order of magnitude lower, potentially serving as an aquitard (Pennington Scott 2025a). In contrast, the unfractured bedrock possessed virtually no permeability.

Historically, discharge of mine dewater from the Deep South Pit to the Safari Bore Pit had identified a discrepancy in the mine pit water balance, where about 750,000 kL (or 60% of water discharged into the Safari Bore Pit) was unaccounted for. As such, it was thought that a significant volume of water was lost from the pit through seepage into the surrounding aquifer, in addition to water loss through evaporation. Despite the low permeability of the bedrock, it appeared that groundwater seepage had become significant when groundwater levels rose above the freshwater rock within the saprock and saprolite zones (Pennington Scott 2025a).

In terms of salinity, groundwater around the Safari Bore Pit and the Deep South Pit displayed distinct differences (Pennington Scott 2025a). Groundwater sampled from the Safari Pit contained higher levels of total dissolved solids (TDS), ranging between 20,000 mg/L and 28,000 mg/L, while groundwater at the Deep South Pit were approximately an order of magnitude lower, between 750 mg/L and 5,000 mg/L.

Historical monitoring of the Safari Bore Pit lake as well as surrounding monitoring bores and production bores around both pits has also indicated several notable distinctions (Table 5):

- Safari Bore Pit and its surrounding groundwater were significantly more saline than ambient groundwater around Deep South Pit, as indicated by electrical conductivity, total dissolved solids, and greater enrichment with major ions (e.g., calcium, magnesium, chloride, potassium, sodium, and sulfate).
- Safari Bore Pit lake water contained significantly higher concentrations of total arsenic and total nickel. Similar concentrations were not measured within surrounding monitoring and production bores.

Table 5: Historical groundwater monitoring results at Safari Bore Pit and Deep South Pit

Parameter	Unit	Mine dewater source		Receiving environment
		Safari Bore Pit lake[1]	Groundwater around Safari Bore Pit[2]	Groundwater around Deep South Pit[3]
Inorganics (field)				
pH	pH unit	7.83 to 8.04	6.79 to 8.48	7.24 to 8.55
Electrical conductivity	µS/cm	27,400 to 30,000	11,808 to 36,500	1,320 to 8,265
Total dissolved solids	mg/L	19,100 to 20,700	7,669 to 26,400	638 to 4,090
Major ions				
Calcium	mg/L	752 to 792	17 to 507	14 to 149
Magnesium	mg/L	823 to 852	515 to 1,180	21 to 158
Potassium	mg/L	188 to 235	125 to 320	14 to 54
Sodium	mg/L	5,120 to 5,990	3,920 to 6,550	197 to 892
Chloride	mg/L	9,400 to 10,500	6,320 to 12,100	358 to 1,530
Sulfate	mg/L	2,130 to 2,190	1,420 to 3,030	12 to 547
Bicarbonate alkalinity	mg/L	155 to 181	300 to 714	143 to 490
Total metals and metalloids				
Aluminium	mg/L	<0.02 to 0.03	<0.05 to 0.99	<0.01 to 0.63
Arsenic	mg/L	0.1 to 0.112	<0.002 to 0.012	0.001 to 0.006
Cadmium	mg/L	<0.0002	<0.0002 to 0.0017	<0.0001 to 0.0003
Chromium	mg/L	<0.002	<0.005 to 0.008	<0.001 to 0.009
Cobalt	mg/L	<0.002	<0.002 to 0.006	<0.001 to 0.001
Copper	mg/L	<0.002	<0.005 to 0.04	<0.001 to 0.012
Iron	mg/L	<0.1	<026 to 66.4	0.06 to 31.5
Lead	mg/L	<0.002	<0.001 to 0.005	<0.001 to 0.003
Manganese	mg/L	0.004 to 0.006	0.01 to 1.53	<0.001 to 0.003
Nickel	mg/L	0.069 to 0.082	<0.005 to 0.014	0.001 to 0.01

Parameter	Unit	Mine dewater source		Receiving environment
		Safari Bore Pit lake[1]	Groundwater around Safari Bore Pit[2]	Groundwater around Deep South Pit[3]
Selenium	mg/L	<0.02 to 0.02	<0.02 to 0.02	<0.01
Zinc	mg/L	<0.01	<0.026 to 0.365	0.012 to 0.207

Note 1: Monitoring information summarised from samples taken from Safari Bore Pit in 2023 and 20224.

Note 2: Monitoring information summarised from samples taken from groundwater monitoring bores SBMB5 and SBMB6, as well as production bores SBPB1, SBPB3, and SBPB4 in 2023 and 2024.

Note 3: Monitoring information summarised from samples taken from groundwater production bores DSPB4, DSPB5, DSPB6, DSPB7, and DSPB9 in 2023 and 2024.

3.3.3 Potential impact of mine dewater discharge

The proposed discharge of up to 3,000,000 tonnes of mine dewater to Deep South Pit is likely to result in groundwater mounding around the open pit. Elevated water table may impact surrounding native vegetation by inundating their root zones, resulting in plant stress, and in some cases, death. Exposure to saline or hypersaline water may also result in salt stress, exacerbating impacts to native vegetation.

Numerical groundwater modelling undertaken by Pennington Scott (2025a) found that (Figure 2):

- A dewatering rate of around 140 L/s to 200 L/s would likely be necessary to dewater the Safari Bore Pit within six months, assuming ongoing groundwater inflow of 6 L/s into the pit.
- At the end of the dewatering program (i.e., once discharge of mine dewater has ceased), the Deep South Pit will contain a higher hydraulic gradient, resulting in seepage of pit water into the surrounding aquifer. This process will establish equilibrium conditions and may have an impact on surrounding groundwater levels and salinity up to a certain distance from the pit.
- Deep South Pit water level will reach approximately 90% equilibrium following a few months of discharge cessation, with full equilibrium being reached after approximately six years.
- The maximum extent of the groundwater mound is projected to extend up to 1,500 m to the south-west (hydraulically downgradient) and up to 600 m to the east (hydraulically upgradient).
- Solute transport modelling was undertaken using chloride as a proxy for salinity. Assuming a maximum concentration of 10,800 mg/L at the Deep South Pit lake and a concentration of 10 mg/L in the background groundwater environment, the model predicted the maximum potential extent of salinity to be up to 600 m to the south-west (hydraulically downgradient) and up to 300 m to the east (hydraulically upgradient).[5]

Based on monitoring information from 2023 and 2024, it is evident that pit lake water at the Safari Bore Pit and the surrounding groundwater contained significantly higher TDS, major ions, as well as some metals and metalloids (Table 5). As a result of the proposed discharge, the Deep South Pit lake will become more enriched with these parameters and is likely to migrate

[5] Based on report figure, it seems the range for 'impact' is from 250 mg/L onwards. Solute transport modelling relied solely on groundwater velocity, without accounting for other critical solute transport processes, such as hydrodynamics dispersion, diffusion, and potential chemical reactions.

outwards with the predicted groundwater mound. Impacted groundwater may express itself in nearby ephemeral drainage lines and continue flowing along them.

As the premises is located within the Edjudina Pastoral Station, pastoral activities are known to occur within the broader pastoral lease. A number of pastoral bores are present across the lease area to support these activities. As shown by numerical modelling, the proposed discharge of mine dewater to Deep South Pit may result in groundwater mounding and seepage in the surrounding areas, especially through the saprock and saprolite geologies.

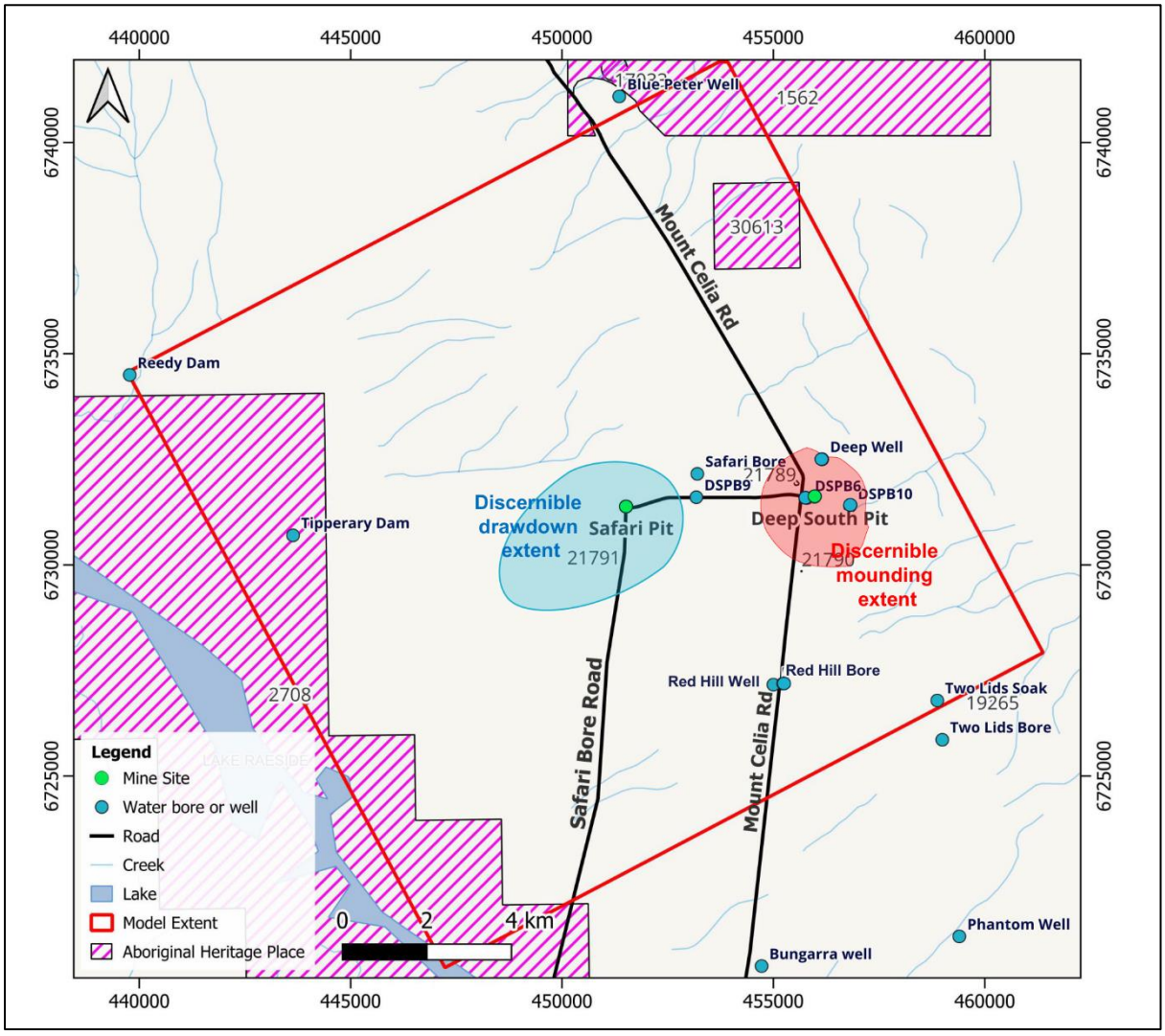

Figure 2: Predicted groundwater drawdown extent at Safari Bore Pit and groundwater mounding extent at Deep South Pit

Through a search of the department's Water Information Reporting bore database, along with field reconnaissance, Pennington Scott (2025a) has identified several third-party groundwater bores in the region (Figure 2). The nearest bores of note are, in increasing distance from the Deep South Pit:

- DSPB06[6] - approximately 250 m north-west.

[6] Production bore DSPB06 was initially constructed for the dewatering of the Deep South Pit in 2018. However, the bore was later gifted to the Edjudina Station for pastoral use. Nevertheless, use of the bore attracted cattle into the Deep South mining area, resulting in operational challenges. To mitigate this, the Licence Holder constructed

- DSPB10 – approximately 450 m east.
- Safari Bore – over 3 km west.
- Red Hill Bore – over 4 km south.

Considering the purposes and separation distances between these pastoral bores and the Deep South Pit, only pastoral bore DSPB10 was considered further in this assessment, as it is actively used to supply stock water and may be impacted by seepage from the Deep South Pit. Consistent with local groundwater salinity, groundwater from pastoral bore DSPB10 contained a TDS of approximately 950 mg/L, which is considered fresh to brackish. Potential impacts from seepage may result in a reduction in livestock drinking water quality. No further information is available at this monitoring location.

3.3.4 Risk assessment

The department has considered the hydrogeological investigations undertaken (refer to Section 3.3.3) as well as the proposed controls for managing the potential impacts of groundwater mounding and seepage from Deep South Pit (refer to Table 2).

Based on these, it is likely that groundwater mounding will develop as a result of the discharge of up to 3,000,000 tonnes of mine dewater into Deep South Pit. However, the extent of the groundwater mounding appears to be limited and is likely to reach steady state in a few years. Furthermore, the estimated throughput following dewatering of the Safari Bore Pit lake is likely to be significantly lower and become dependent on the rate of groundwater inflow into Safari Bore Pit.

The pit lake level within Deep South Pit is predicted to reach 25 m below crest level, with a minimum freeboard of 6 m specified. At these depths, the groundwater mound is unlikely to reach a level that is sufficiently shallow to interact with the root zones of surrounding native vegetation. Similarly, it is unlikely for any surface expression to occur at nearby creeks and drainage lines at the expected groundwater mound depth.

As a result, the department considers the consequence of impact associated with groundwater mounding on native vegetation to be **moderate**, with a likelihood of **unlikely**. The resultant risk rating is **medium risk**.

In considering the relatively fresher and more pristine groundwater quality at Deep South Pit, compared to the Safari Bore Pit lake and surrounding groundwater, seepage from Deep South Pit may result in salinization and degradation of groundwater quality. Currently, groundwater near Deep South Pit is considered fresh to brackish and appropriate for use as stock water. Active pastoral bore DSPB10 is located approximately 450 m to the east of Deep South Pit. While it was argued that the bore is located hydraulically upgradient of the pit and is unlikely to be impacted, the department considers there to be potential for impacts due to the consideration that the groundwater mounding from Deep South Pit is likely to flow in a radial pattern within its immediate vicinity, rather than strictly in line with regional groundwater flow direction.

As a result, the department considers the consequence of impact associated with impacted seepage on the groundwater aquifer (which is abstracted for stock water) to be **minor**, with a likelihood of **possible**. The resultant risk rating is **medium risk**.

While the Licence Holder has proposed to undertake surface water monitoring of the Deep South Pit lake for standing water levels monthly and for pH and TDS on a quarterly basis, the department has determined that the monitoring program may not be adequate for identifying

production bore DSPB10, which is further away from the Deep South Pit, in 2020 as an alternative pastoral bore, while repurposing DSPB06 as a raw water source for the reverse-osmosis water treatment plant at the Deep South Pit.

potential impacts to groundwater, which have beneficial uses nearby.

Unlike the existing discharge of mine dewater from Deep South Pit to Safari Bore Pit, the Safari Bore Pit lake and the surrounding groundwater (which will be dewatered as well once the pit lake has been drawn down) have shown elevated levels of salinity, major ions, and some metals and metalloids. Therefore, the department has determined that a more comprehensive monitoring program is required to monitor and detect impacts.

Consequently, the department has amended condition 13 to include the following specifications[7]:

- Monitoring of major ions (e.g., calcium, sodium, potassium, magnesium, chloride, sulfate, bicarbonate alkalinity) as well as total and dissolved metals and metalloids (e.g., arsenic, cadmium, chromium, copper, manganese, nickel, selenium, zinc) at the Deep South Pit lake on a quarterly basis. Monitoring of ionic composition will enable the detection of seepage influence in ambient groundwater.
- Monitoring of groundwater monitoring bore DSMB1 and production bores DSPB3, DSPB4, and DSPB10. The primary bore of concern is DSPB10, which is currently operated to support pastoral activities. The remaining bores are located at the boundary of the Deep South Pit, between the pit and DSPB10, enabling for early detection of any seepage. While DSPB3 and DSPB4 are production bores and are not fully fit for the purpose of monitoring ambient groundwater, the department considers it sufficient at this stage.

4. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Shire of Menzies advised of application on 29 May 2025.	No comments received.	N/A
Edjudina Pastoral Station advised of application on 29 May 2025.	No comments received.	N/A
Licence Holder was provided with draft amendment on 3 July 2025.	The Licence Holder provided comments on 25 July 2025. Refer to Appendix 1.	Refer to Appendix 1.

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

[7] The department notes that the additional regulatory requirements specified are meant for monitoring impacts associated with a mine dewater discharge of up to 3,000,000 tonnes per annual period. Monitoring requirements may be reassessed in the future through a licence amendment should such a high assessed production capacity be no longer required. However, the Licence Holder may need to demonstrate, using adequate monitoring data, that the drawdown and discharge of Safari Bore Pit lake has not impacted local groundwater aquifer around the Deep South Pit.

controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table 7 and 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.

Table 7: Formatting updates to licence conditions in this amendment

Existing condition	Condition summary	Revised licence condition	Conversion notes
All	Condition text, condition text headers, and references to figures	N/A	Revised to current licensing format.
N/A	Introduction text	N/A	Removed from amended licence. Information is available in guidance documents as well as the decision documents.
1.1.1 1.1.2	Interpretation and definitions	N/A	Updated Interpretation text and revised to current licensing format. Moved Definitions to Table 14 in amended licence.
1.1.3	Australian or other standard	N/A	Redundant condition. Revised to current licensing format. Information is available in the Interpretation text.
1.1.4	Reference to Code of Practice	N/A	Redundant condition. Revised to current licensing format. Information is available in the Interpretation text.
1.1.5	Authorised emissions	N/A	Redundant condition.
1.1.6	Saline water pipeline management	1	No change.
1.1.7	Use of saline water for dust suppression	2	Revised naming convention to current licensing format.
1.1.8	Containment dam requirements	3	Revised naming convention to current licensing format.
1.1.9	Freeboard for containment dam	4	No change (refer to Table 8 for changes made under this amendment).
1.1.10	Inspection	5	No change (refer to Table 8 for changes made under this amendment).
1.1.11	Waste management	6	No change.
1.1.12	Waste cover management	7	No change.
1.1.13	Windblown waste management	8	No change.

Existing condition	Condition summary	Revised licence condition	Conversion notes
2.1.1	Investigation of limit exceedance	9	Revised to current licensing format.
2.2.1	Point source emission to groundwater	10	Revised naming convention (refer to Table 8 for changes made under this amendment).
2.2.2	Point source emission limit to groundwater	N/A	Removed condition, amalgamated requirement into condition 10.
3.1.1	Australian Standards for monitoring	11	No change (refer to Table 8 for changes made under this amendment).
3.1.2	Monitoring frequency	12	No change (refer to Table 8 for changes made under this amendment).
3.2.1	Monitoring of point source emission to groundwater	13	Revised naming convention (refer to Table 8 for changes made under this amendment).
4.1.1	Records	15, 16	Revised to current licensing format.
4.1.2	Annual Audit Compliance Report	17	Revised to current licensing format. Updated in accordance with the Notice of Amendment of Licence Reporting Requirements (16 May 2022).
4.1.3	Complaints	14	Revised to current licensing format.
4.2.1	Annual Environmental Report	18	Revised to current licensing format. Updated in accordance with the Notice of Amendment of Licence Reporting Requirements (16 May 2022).
4.2.2	Other requirements for Annual Environmental Report	N/A	Removed condition, amalgamated requirement into condition 18.
4.2.3	Non-annual reporting	19	No change.
4.3.1	Notification	20	No change.
N/A	Schedule 1: Maps	N/A	Revised to current licensing format. Updated figure format.

Table 8: Summary of licence amendments

Condition no.	Proposed amendments
N/A	Updated assessed production / design capacity from 500,000 tonnes per annual period to 3,000,000 tonnes per annual period. Updated registered business address from Level 1, 388 Hay Street, SUBIACO WA 6008 to Level 4, 500 Hay Street, SUBIACO WA 6008.

Condition no.	Proposed amendments
	Updated Licence History log.
Condition 4	Updated condition to refer to Table 3. Added Table 3 to specify freeboard requirement for Deep South Pit.
Condition 5	Updated Table 3 to include inspection requirements for Deep South Pit, when mine dewater is being discharged.
Condition 10	Updated Table 6 to include Deep South Pit, including a limit of 3,000,000 tonnes per annual period.
Condition 11	Updated condition to refer to AS/NZS 5667.4 for sampling from lakes.
Condition 13	Updated Table 7 to: • Include monitoring of surface water at Deep South for mine dewater discharge volume, standing water level, pH, total dissolved solids, as well as total and dissolved metals and metalloids, during discharge of mine dewater to the Deep South Pit. • Specify averaging period for surface water monitoring. • Update footnote 1 to clarify the frequency of monitoring. • Remove footnote 2 as sequence of water level measurement and sample collection is less crucial in surface water monitoring. Added Table 8 to: • Specify monitoring of groundwater at production bores DSPB3, DSPB4, and DSPB10, as well as monitoring bore DSMB1 for standing water level, pH, total dissolved solids, as well as dissolved metals and metalloids, during discharge of mine dewater to the Deep South Pit.
Condition 18	Updated Table 9 to: • Specify reporting requirements and format for ambient surface water and groundwater monitoring related to condition 13.
Condition 21	New condition to specify installation requirements for upgraded dewatering pipeline and booster pump station.
Condition 22	New condition for environmental compliance reporting requirements.
Condition 23	New condition for environmental compliance reporting requirements.
N/A	Updated Definitions in Table 13 by: • Including definitions for *AS/NZS 5667.4*, *biennially*, *books*, *department*, *DWER*, *discharge*, *emission*, *EP Act*, *EP Regulations*, and *waste*. • Remove definitions of *quarterly*, *Schedule 1*, and *Schedule 2*.
N/A	Updated Schedule 1: Maps by: • Updating Figure 1 and Figure 2, and ensuring they are referenced appropriately in condition text. • Adding Figure 3 to show locations of ambient groundwater monitoring locations.

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020a, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020b, *Guideline: Risk Assessments*, Perth, Western Australia.
4. Pennington Scott 2025a, *Carosue Dam Operations – Safari to Deep South Dewatering Study* (Rev 1), Osborne Park, Western Australia
5. Pennington Scott 2025b, *Technical Memorandum: Safari dewatering into Deep South – DWER request for further information*, Osborne Park, Western Australia.

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

Condition	Summary of Licence Holder's comment	Department's response
----	On the cover page, the Licence Holder requested that the registered business address for Northern Star (Carosue Dam) Pty Ltd be updated from Level 1, 388 Hay Street, SUBIACO WA 6008 to Level 4, 500 Hay Street, SUBIACO WA 6008. The Licence Holder has confirmed that the updated address is consistent with the registered business address detailed in their ASIC company extract.	The department has updated the registered business address on the cover page of the amended licence.
Condition 21 – Design and installation requirements	In Table 12, the Licence Holder requested that the requirement for the dewatering pipeline from Safari Bore Pit to Deep South Pit be revised to remove requirement for the pipeline to have a minimum pumping capacity of 6 L/s. The Licence Holder argues that setting a requirement for minimum pumping rate is not practical or feasible and would not provide any benefit for environmental management and protection. The Licence Holder had no issues with the requirement for the pumping capacity to not exceed 250 L/s.	The department has no issues with the proposed amendment and has modified the requirement in Table 12 accordingly.
	In Table 12, the Licence Holder requested that the requirement for spill management infrastructure and equipment for the dewatering pipeline from Safari Bore Pit to Deep South Pit be revised to be consistent with existing licence conditions (e.g., condition 1).	The department has no issues with the proposed amendment and has modified the requirement in Table 12 accordingly.
----	In Schedule 1: Maps, the Licence Holder provided updated Figure 1, Figure 2, and Figure 3, as requested by the department.	The department has updated the relevant figures in Schedule 1: Maps.