Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

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

Works Approval Number	W6883/2024/1
Applicant	Northern Star Resources Limited
File number	DER2023/000787
Premises	Crossroads Gold Mine Legal description Part of mining tenement M 24/462, M 24/640, M 27/175, M 27/191, M 27/198, M 27/202, M 27/493, M 27/494, M 27/497 and M 27/63 As defined by the coordinates in Schedule 1 of the works approval
Date of report	8/05/2024
Decision	Works approval granted

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Manager, Resource Industries
REGULATORY SERVICES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Table of Contents

1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6883/2024/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) 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 7 December 2023, Northern Star Resources Limited (the applicant) submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works (and time limited operations) relating to dewatering and landfilling activities at the Crossroads Gold Mine (the premises). The application is seeking approval to construct and operate:

- mine dewatering infrastructure which includes two saline water dams/ turkeys nests, and a 7.5 km dewatering pipeline from the Crossroads Gold Mine to Six Mile Open Pit; and
- a putrescible landfill located within the waste rock landform.

The premises relates to the categories 6 and 89 under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6883/2024/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6883/2024/1.

2.2.1 Overview of the premises

The premises is a greenfield project and is approximately 18 km north of Kalgoorlie-Boulder and is made up of the mining tenements as shown in Table 1 below.

Table 1: Tenement and Tenement Holder information

Tenement	Tenement Holder
M 24/462	Northern Star (KLV) Pty Ltd, Northern Star (Saracen Kalgoorlie) Pty Ltd
M 24/640	Northern Star (Kanowna) Pty Limited
M 27/175	Northern Star (Kanowna) Pty Limited
M 27/191	Northern Star (Kanowna) Pty Limited
M 27/198	Northern Star (Kanowna) Pty Limited
M 27/202	Northern Star (Kanowna) Pty Limited
M 27/493	Northern Star (Kanowna) Pty Limited

Tenement	Tenement Holder
M 27/494	Northern Star (Kanowna) Pty Limited
M 27/497	Northern Star (Kanowna) Pty Limited
M 27/63	Northern Star (Kanowna) Pty Limited

The Crossroads gold mine project will consist of an open pit which is expected to deliver approximately 2,700,000 tonnes of ore over a 36-month period. A waste rock landform will be constructed from the 64,800,000 tonnes of waste rock extracted through the life of the Project. Dewatering of the gold deposit will be required to access ore below the groundwater table. No processing will be undertaken at the premises. Ore will be temporarily stockpiled and transported by road trains via existing haulage routes to the nearby Kanowna Belle or Fimiston processing facilities. The premises boundary, site plan, key infrastructure and emissions points are shown in Figure 1.

2.2.2 Dewatering

Dewatering is required in order to access the ore at crossroads gold mine. Dewatering effluent will be abstracted and discharged into two HDPE lined saline water dams where the water will be used for dust suppression within the mine and unsealed haulage routes to either Kanowna Belle or KCGM processing plants.

Surplus water will be transported by pipeline to the disused Six Mile Pit located 5 km east of the Crossroads mine. Six Mile Pit is approximately 28 m deep with a pit crest elevation of about 360 mAHD. It has a capacity of approximately 600,000 kL when taking into account a proposed freeboard of 3 meters below crest level. The predicted dewatering rates of the Crossroads gold mine is higher than can be used locally for dust suppression and may exceed the storage capacity of Six Mile Pit. Water excess to the pit's capacity will be directed via pipeline to the KCGM Gidji and Fimiston Mills for processing via existing pipelines used by the KCGM Palaeovalley Borefield that run between each site.

2.2.3 Landfill

The applicant is proposing to construct a Class II putrescible landfill at the premises within the waste rock landform (WRL). It is expected that a maximum of 5,000 tonnes per year of waste will be disposed of within the landfill. The landfill will only accept inert waste type 1 and 2, putrescible waste, clean fill and special waste type 2 (tyres) (as defined within the Landfill Waste Classification and Waste Definitions (as amended 2019) (DWER, 2019).

As the waste rock landform will be new, landfill compounds with built up sides and back will be constructed. The dimensions will be an approximate depth of 2 - 5 meters with 5 - 10 meter sides and a maximum 30 meter tipping face.

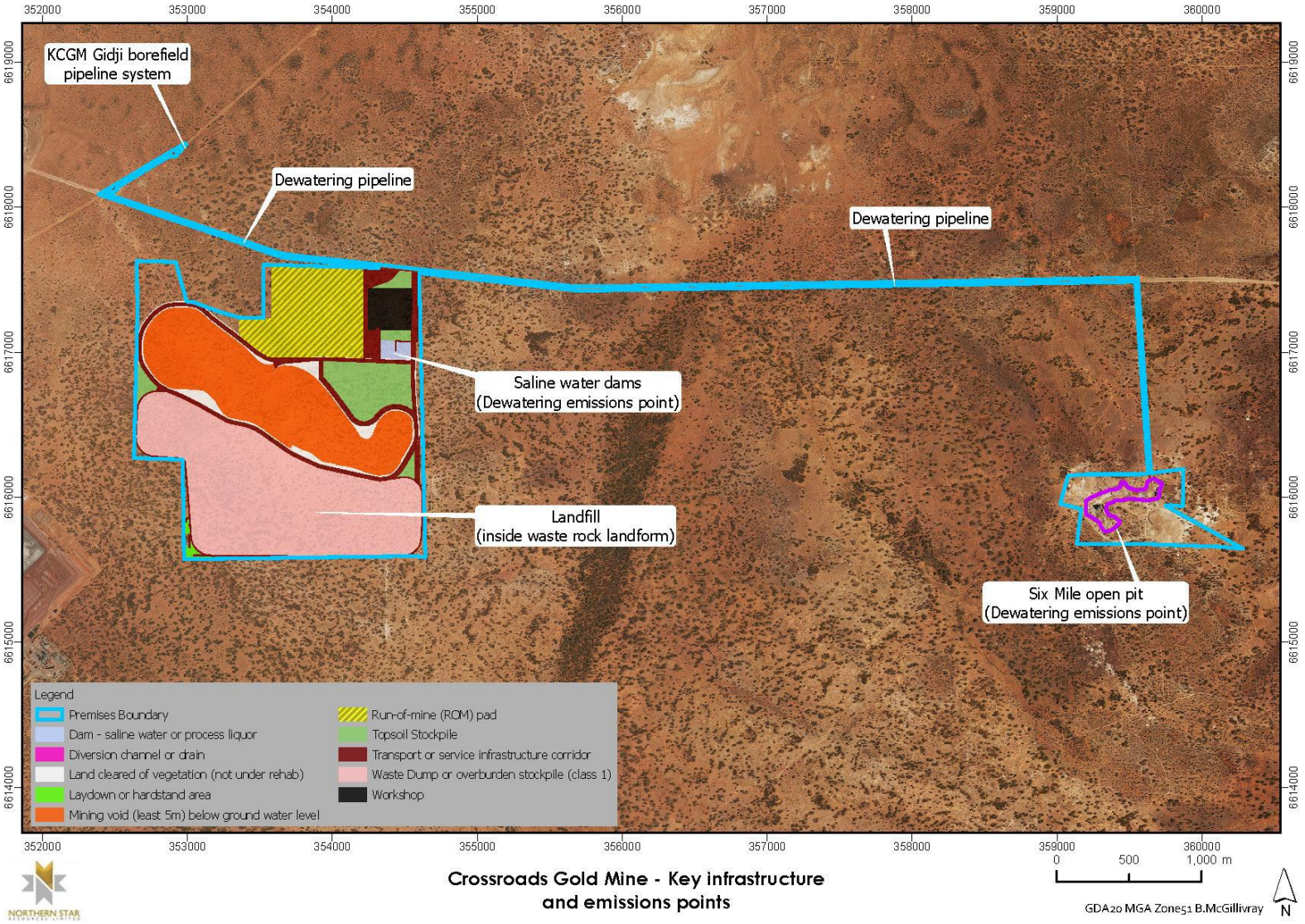

Figure 1: Premises – Site plan, key infrastructure and emissions points.

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 decision report are detailed in Table 2 below. Table 2 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 2: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction of dewatering infrastructure, pipeline and turkey's nest Vehicle movement Landfill construction	Air / windborne pathway	Utilise water carts for dust suppression during the construction activities
Operation			
Saline mine dewater	Saline water dam (turkeys nest).	Seepage	Lined with HDPE to minimise seepage.
		Overtopping	• A minimum operational freeboard of 300 mm will be maintained. • The saline water dams will feature level sensors, telemetry and process control logic to prevent over topping.
	Open pit	Seepage	• Installation of a groundwater monitoring bore (one shallow and one deep) downstream of six mile pit • Baseline and Periodic vegetation condition assessments around the pit to monitor impacts to vegetation. • Quarterly sampling and analyses of dewatering effluent and pit lake, if

Emission	Sources	Potential pathways	Proposed controls
			safely accessible.
		Overtopping	• Maintain minimum operational freeboard of 3 meters below top of pit crest. • Pit lake elevation measurements at monthly frequency.
	Dewatering pipeline	Pipeline leakage or rupture	• Bunding/secondary containment for spill containment. • Telemetry systems, flow meters, or pressure sensors for leak detection. • Automated cut-outs for pipe failure. • Buried pipeline at road floodway points. • The entire pipeline will be inspected at least once every 24 hours, this will include the buried sections of the pipeline. Also follow heavy/ prolonged rainfall events the entire pipeline and the buried sections at the floodway points will be inspected.
	Dust suppression	Direct discharge to land / overland runoff	Dribble bars and directional sprays to minimise overspray onto vegetation.
Windblown waste	Landfill	Air / windborne pathway	• Semi-enclosed compound built from mine waste. • Maximum tipping face width of 30 meters. • Waste covered with inert material at monthly frequency
Stormwater runoff		Runoff	• Windrows/bunds constructed using mine waste to divert stormwater away from the landfill compound.
Leachate		Seepage through base of landfill	• Landfill located within WRL resulting in a separation distance between base of landfill and highest groundwater level to be greater than 25 meters. • Use of clayey-oxide material from the open pit for low permeability. • Compaction of landfill base during construction and ongoing vehicle traffic. • Monthly covering of waste

3.1.2 Receptors

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

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

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

Human receptors	**Distance from prescribed activity**
None *Closest human receptor is the Mt Vetter homestead located approximately 10.5 km to the north-west of the premises.*	N/A
Environmental receptors	**Distance from prescribed activity**
Native vegetation	Native vegetation is present throughout the premises boundary, dominated by *Mulga Acacia aneura and associated species*. However, none of the vegetation communities identified were found to be of National Environmental Significance or include Threatened or Priority Ecological Communities.
Groundwater	The premises is within the Goldfields groundwater area. The application states that: - The water quality at Crossroads gold mine area is near-neutral and hypersaline, with Total Dissolved Solids (TDS) concentrations of about 165,000 mg/L. - Regional groundwater quality has TDS values ranging from 20,000 mg/L to 250,000 mg/L depending on the type of aquifer; and - Groundwater levels in the vicinity of the Six Mile Pit likely range between 21.65 meters below ground level (mbgl) and 27.69 mbgl As the groundwater in the area is hypersaline the only groundwater use is the mining industry. The regional water table is controlled by topography with an overall northwards gradient and flow direction. Locally, shallow groundwater baseflow migrates towards the salt lakes, located approximately 5 km north of the Six Mile Pit (AGE, 2023) <u>Groundwater dependent ecosystems (GDE)</u> One area has been identified as high potential terrestrial GDE via national assessments (AGE,

	2023). This potential DGE is located approximately 2.5 km north-west of the discharge pit. The GDE is described as salt lakes with extensive fringing saline plains, dunes and sandy banks, supporting low halophytic shrublands and scattered tall acacia shrublands (AGE, 2023).
Surface water bodies	Gidji lake is 5km to south-west direction of the premises boundary.
Surface water lines	Non-perennial surface water lines are located within a 5-kilometre buffer of the premises boundary. These surface water lines intersect the pipeline approximately at the midpoint. The distance to saline water dams is 1.6 kilometres, and the distance to the Six Mile Open Pit is 3.3 kilometres

3.2 Risk ratings

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

Where the applicant 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 applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

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

Works approval W6883/2024/1that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 4 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 4: Risk assessment of potential emissions and discharges from the premises during construction and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Construction of dewatering infrastructure, pipeline and turkey's nest Vehicle movement along haul roads and hardstand areas during construction	Dust	**Potential pathway:** Air / windborne pathway **Impact:** Deposition of dust on native vegetation	Native vegetation.	Refer to Section 3.1	C = Slight L = Unlikely **Low Risk**	Y	Condition 1	N/A
Operation (including time-limited-operations operations)								
Operation of mine dewatering infrastructure, including transfer, storage and disposal of dewater	Hypersaline dewatering effluent	**Potential pathway:** Seepage through six-mile pit **Impact:** Contamination of groundwater and immediate surroundings and Mounding of the groundwater table resulting in impacts to native vegetation at the surface	Groundwater users (2.5km away). Potential GDE located 2.5 km to the northwest. Native vegetation surrounding the discharge pit.	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 2 Condition 9 Condition 12 **Condition 13**	Refer to section 3.3 for detailed risk assessment. The applicant has proposed quarterly monitoring of six-mile pit lake water quality for the following parameters: TDS, pH and EC. The delegated officer has determined to include a requirement to also monitor dissolved metals, metalloids and major irons (same as what has been proposed for the discharge quality) so comparison of data can be made between the two. The monitoring data collected during time limited operation would better inform the risk assessment for the operation of this prescribed activity for the future licence amendment. Whether an expanded pit lake water

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
								quality monitoring is required on an ongoing basis will be determined during the licence application process.
		Potential pathway: Overtopping of Six Mile Pit **Impact:** Smothering of native vegetation and impacts to soil from hypersaline water.	Native vegetation Surface water	Refer to Section 3.1	C = Moderate L= Unlikely **Medium Risk**	Y	Condition 6 – Operational requirements	The discharge pit has a capacity of 600,000 m^3 and is therefore not big enough to store the expected volume of dewatering effluent. The applicant is proposing to direct excess dewater via pipeline to the KCGM Gidji and Fimiston Mills for processing via existing pipelines used by the KCGM Palaeovalley Borefield. To ensure overtopping of the pit does not occur the applicant is proposing to maintain a minimum freeboard of 3 meters below crest level. Pit lake elevation measurements will also occur at monthly frequency when discharging. These control measures have been deemed acceptable to manage this risk and therefore have been conditioned within the works approval.
		Potential pathway: Seepage through water dam (Turkey's Nest) linings Overtopping of dams **Impact:**	Surrounding soil and vegetation near the saline water dams.	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1: infrastructure requirements Condition 6: Operational requirements	The applicant has proposed to install level sensors, telemetry and process control logic features for the saline water dams to prevent overtopping. A freeboard of 300mm is also proposed to be maintained. The Delegated officer considers these controls to be sufficient to manage the risk of the dams overtopping. The applicant also proposed to install

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
		Contamination of immediate surroundings and potential impact on local ecosystems						HDPE liners within each of the two water dams to prevent seepage into groundwater. The Delegated Officer also deems this control sufficient to manage this risk. The applicant's proposed controls have been conditioned within the works approval as construction /operational requirements as per DWER's Guideline: Risk Assessments.
		Potential pathway: Leaks / spills of hypersaline water from dewatering pipeline **Impact:** Disturbance to the health of native vegetation due to high salinity resulting in vegetation stress or death	Native vegetation along pipeline route Surface water drainage lines	Refer to Section 3.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1 Condition 6 Condition 7 Condition 8	The applicant's proposed controls have been deemed to be sufficient to manage this risk event and have been conditioned within the works approval as construction / operational requirements as per DWER Guideline: Risk Assessments
		Potential pathway: Use of hypersaline dewatering effluent for dust	Native vegetation and potentially affected soil areas.	Refer to Section 3.1	C = Slight L = Unlikely **Low risk**	Y	N/A	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
		suppression causing direct discharge to ground / native vegetation **Impact:** Damage to surrounding vegetation						
Putrescible landfill within the waste rock landform	Windblown rubbish	**Potential pathway:** Wind dispersal of rubbish **Impact:** Environmental contamination and visual pollution	Surrounding environment, including local ecosystems and fauna	Refer to Section 3.1	C = Slight L = Possible **Low Risk**	Y	Condition 1 Condition 8 Condition 10 Condition 14	The applicant's proposed controls have been deemed to be sufficient to manage this risk event and have been conditioned within the works approval as construction / operational requirements as per DWER Guideline: Risk Assessments
	Contaminated stormwater	**Potential pathway:** Runoff during rainfall events **Impact:** Contamination	Surrounding soil	Refer to Section 3.1	C = Slight L = Unlikely **Low Risk**	Y	Condition 1 Condition 8 Condition 14	The Delegated Officer considers the applicant's proposed controls sufficient. Windrows/bunds construction and maintenance around the landfill minimises the risk of storm water contamination. Applicant's controls have been conditioned within the works approval in accordance with DWER Guideline: Risk Assessments
	Leachate	**Potential pathway:** Leakage of contaminated water from landfill	Groundwater systems and surrounding soil	Refer to Section 3.1	C = Slight L = Unlikely **Low Risk**	Y	Condition 1 Condition 8 Condition 14	The Delegated Officer considers the applicant's proposed controls sufficient. Noting that landfill compound will be built from mine waste which will primarily consist clayey-oxide material of naturally low permeability. A minimum of 25

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
		Impact: Potential impact on groundwater and soil quality						metres distance between the base of the landfill and the highest groundwater level acts as a sufficient physical barrier for natural attenuation of contaminants before they can reach the groundwater. Applicant's controls have been conditioned within the works approval in accordance with DWER Guideline: Risk Assessments.

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

Note 2: Proposed applicant controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

3.3 Detailed risk assessment: Seepage from Six Mile Pit

3.3.1 Overview of risk event

The discharge of dewatering effluent into Six Mile Pit may have an impact on the surrounding groundwater quality (resulting in impacts to receptors i.e. groundwater dependent ecosystems (GDE) and groundwater users) and may result in the mounding of the groundwater level to an extent where hypersaline groundwater may come into contact with the root zone of vegetation surrounding Six Mile Pit.

The applicant hired Australasian Groundwater and Environmental Consultants Pty Ltd to complete a groundwater discharge assessment for Six Mile Pit. The assessment looked at the potential impacts on the environment from the discharge of the mine dewater effluent into the pit. The assessment outlined the following:

- The Six Mile Pit has two pit lakes, of which both lakes' water levels were surveyed (and water quality sampled) on 31 August 2023. The two lakes are located towards the eastern and western end of the pit void and have water levels of 20.02 mbgl and 21.65 mbgl, respectively.
- An old bore was located near the southwestern perimeter of the Six Mile Pit had an approximate measured water level of 27.69 mbgl, which is deeper than the measured pit lakes' elevations.
- The Six Mile Pit western lake was found to have a near-neutral pH (7.98) and saline with a total dissolved solids (TDS) concentration of 39,300 mg/L.
- Groundwater samples from the Crossroads project were found to be neutral (pH of 7) and hypersaline, with TDS concentrations ranging from 180,000 mg/L to 190,000 mg/L.

The assessment concluded that there was little relative variation in water chemistry between Crossroads gold mine groundwater and Six Mile pit lake water. The assessment also concluded that water within the pit would flow out into the groundwater (pit is not a groundwater sink).

3.3.2 Receptors

Regional groundwater quality has total dissolved solids concentrations ranging from 20,000 mg/L to 250,000 mg/L depending on the type of aquifer. The regional water table is controlled by topography with an overall northward's gradient and flow direction. Locally, shallow groundwater baseflow migrates towards the salt lakes, located approximately 5 km north of the Six Mile Pit (AGE, 2023)

A potential GDE is located 2.5 km to the northwest of the Six Mile pit. The GDE is described as salt lakes with extensive fringing saline plains, dunes and sandy banks, supporting low halophytic shrublands and scattered tall acacia shrublands. This GDE has been assessed based on national assessments and therefore is unconfirmed (AGE, 2023).

There are no nearby groundwater users other than a groundwater licence (holder is a wholly owned by the applicant's subsidiary, Northern Star (Kanowna) Limited) for abstraction bores located at the Kanowna Belle Gold mine approximate 2.5 km east of the Six Mile Pit. The groundwater is being abstracted to manage seepage and is recirculated within the process plant water circuit; hence groundwater quality is not an important factor for the Kanowna Belle Gold mine water management.

There are a number of registered groundwater bores within a 5km radius of the Six Mile Pit however the bores are all within the Kanowna Belle Gold Mine tenements and have either been destroyed or are not in used.

3.3.3 Applicant's controls

The applicant is proposing the following controls:

- Maintain a minimum 3-meter freeboard within the pit. Freeboard to be inspected monthly.
- Quarterly monitoring of dewatering effluent quality and quality of the pit lake to better understand potential impacts to the receiving environment.
- Installation of a groundwater monitoring bore downstream of Six Mile Pit to allow monitoring of groundwater level and quality.

3.3.4 Risk Assessment

Groundwater quality impacts

The groundwater discharge assessment carried out by Australasian Groundwater and Environmental Consultants Pty Ltd (AGE) concluded that:

'*The quality of the groundwater planned to be discharged into the Six Mile Pit is hypersaline and neutral pH, while the water in the Six Mile Pit western lake, which is considered likely to be groundwater, has a lower salinity and slightly higher pH, but is nonetheless saline. The Six Mile Pit western lake's salinity has likely been reduced by fresher rainfall and runoff. The mixing of these waters will likely cause the surrounding groundwater to have increased salinity, but when considering that the Crossroads Project is about 8 km west of the Six Mile Pit and is located within similar geology, it is unlikely that the groundwater quality would change significantly. This suggests that the current water quality in the Six Mile Pit's western lake is likely a mixture of surface- and groundwater and that the actual groundwater quality at Six Mile Pit has higher salinity and closer to neutral pH'*

The department has reviewed AGE's assessment and agrees with the above conclusion. Minor impacts to groundwater quality are expected and therefore the likelihood of impacts to receptors (GDE and groundwater receptors) are unlikely. Distance to receptors further reduces the risk.

The applicant has proposed to undertake quarterly monitoring of discharge and pit lake water. The delegated officer supports this as limited sampling of dewatering effluent and pit lake water quality has been undertaken to date. The monitoring data collected during time limited operation would better inform the risk assessment for the operation of this prescribed activity for the future licence /licence amendment. Monitoring conditions have therefore been added to the works approval.

Groundwater mounding impacts

Groundwater mounding is expected to occur following discharge of water into Six Mile pit as water is likely to seep into the shallow weathered material. Seepage will likely be limited towards the south of the pit as lower permeability basalts are present there (AGE, 2023).

The groundwater discharge assessment carried out by AGE concluded that potential mounding is unlikely to have significant impacts on the potential terrestrial GDE which is located 2.5 km northwest of the pit due the distance between it and the pit. The potential GDE has been described as vegetation present across salt lakes which are accustomed to hypersaline conditions, further reducing the likelihood that an impact would occur if mounding was to reach this area.

The department has reviewed AGE's assessment and agrees with the above conclusion. Due to the distance to the potential GDE it is unlikely that groundwater mounding would impact this receptor and therefore no additional regulatory controls are required to manage this impact.

However, it has been identified that there is a potential risk of impact to native vegetation surrounding six-mile pit if hypersaline groundwater were to mound into the root zone. A rising

water table can harm vegetation due to the effects of the increased salt content and the reduced level of oxygen in soils that are exposed to periods of waterlogging. The groundwater depth where adverse impacts are observed on vegetation varies depending on: the vegetation type and its rooting depth; and soil texture, which effects the extent to which water will be transported vertically from the water table by capillary action (Wang et al., 2020). In arid regions, the groundwater depths where adverse impacts could take place on vegetation can vary between about one and five metres (Wang *et al*, 2020).

The applicant has proposed a minimum 3-meter freeboard within the pit which could help reduce the likelihood that groundwater levels could reach 3 mbgl. However, there is some potential for vegetation root zones to extend past 3 mbgl and reach mounded hypersaline groundwater resulting in impacts to vegetation health at the surface. The applicant is proposing to install one shallow and one deep groundwater monitoring bore downstream of Six Mile pit, the Delegated Officer supports this and has conditioned the requirement for bores to be installed with the intent to monitor groundwater level during time limited operations. A consideration for adding a limit on standing water levels within this bore should be made during the assessment for the licence.

4. Consultation

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

Table 5: Consultation

Consultation method	Comments received	Department response
The Local Government Authority was advised of the proposal on 15 February 2024	No comments received.	Not applicable
The applicant was provided with the draft documents on 11 April 2024	The applicant provided comments on 23 April 2024 - refer to Appendix 1	Refer to Appendix 1

5. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

References

1. Australasian Groundwater and Environmental Consultants Pty Ltd (AGE), 2023, *Six Mile Pit Groundwater Discharge Assessment,* Kalgoorlie, WA
2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
3. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
4. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
5. DWER 2019. *Landfill Waste Classification and Waste Definitions 1996 (as amended 2019)*, Perth, Western Australia
6. Wang, Y., Chen, M., Yan, L., Yang, G., Ma J. and Deng, W., 2020. Quantifying threshold water tables for ecological restoration in arid northwestern China. *Groundwater, 58(1), 132-142.*

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

Condition	Summary of applicant's comment	Department's response
Condition 13 Table 7	Applicant requested to add Note 3 as following: Note 3: When pit lake is able to be safely accessed.	Note 3 added.
Condition 14 Table 9	Suggested the wording be changed to c. Waste is to be disposed of in a defined area, or compound ~~trench~~ enclosed by earthen bunds; and	Wording updated.