Government of Western Australia
Department of Water and Environmental Regulation

Amendment Report

Application for Works Approval Amendment

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

Works Approval Number	W6626/2021/1
Works Approval Holder	Northern Star (Carosue Dam) Pty Ltd
ACN	116 649 122
File Number	DER2021/000666
Premises	Carosue Dam Minesite Mining Tenements M28/269, M31/220 and M31/295 MENZIES WA 6436 As depicted by the Premises maps in Schedule 1
Date of Report	04 October 2024
Decision	Revised works approval granted

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A/MANAGER, RESOURCE INDUSTRIES

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

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1. Decision summary

Works approval W6626/2021/1 is held by Northern Star Resources (Carosue Dam) Pty Ltd (works approval holder) for the Carosue Dam Minesite (the Premises), located within mining tenements M28/269, M31/220, and M31/295.

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 works approval W6626/2021/1 has been granted.

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 13 June 2024, the works approval holder submitted an application to the department to amend works approval W6626/2021/1 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- the modification of design parameters of ancillary drains and the drainage pond associated with Tailings Storage Facility (TSF) Cell 4 that relates to line item 1 *'Stormwater management infrastructure'*, under Table 1 of condition 1; and
- change the erosion protection layer thickness from 500 mm to 300 mm due to a typographical error in the original works approval application (under Table 2, rows 1 and 3 of condition 2).

2.2.1 Proposed amendments to TSF Cell 4 construction requirements

Stormwater management infrastructure

Tetra Tech Coffey Pty Ltd (Coffey) provided the memorandum, '*Carosue Dam TSF Cell 4 Surface Water Flood Assessment'* in support of the changes to the '*Stormwater management infrastructure'* under Table 1 of condition 1 of W6626/2021/1.

Coffey (2024) undertook hydraulic modelling to confirm whether the recently constructed surface water management features for TSF4 are adequate, estimate external drain effectiveness and provide information for the amendment application.

Coffey (2024) has stated that "*the assessment builds on the 12 Nov 2021 report "Surface and Groundwater Hydrological Studies for Life of Mine TSF Expansion Project" and the 15 Nov 2021 report "Water Studies for TSF4 4 Mtpa Expansion Project" by Pennington Scott*."

Coffey (2024) noted that the works approval had incorrectly listed the 10% Annual Exceedance Probability (AEP) design flow depth as the freeboard. The corrected freeboard for the works approval would be assumed to be 0.25 m as indicated in Pennington Scott (2021) report, '*Water Studies for TSF4 4 Mtpa Expansion Project'*.

A 2D rain-on-grid model was developed for the TSF4 catchment using HEC-RAS software V6.4.1. Coffey (2024) ran preliminary models with the surveyed condition to identify overflow points. The final modelling then included the recommended upgrades to the bunding to prevent roadway overtopping in the 10% AEP event.

The modelling results indicated that the maximum velocities in the 10% AEP event were generally lower than 0.5 metres per second (m/s) across the site. The maximum velocities in both the western and south drains ranged from 1-2.5 m/s. The maximum depths for the western drain were approximately 2.2 m in the 10% AEP event, whilst for the southern drain it was approximately 0.5 m.

The following recommendations have been made:

- Western drain should be blocked at chainage 450 to isolate the low-lying area to the south.
- From chainage 0 to 450, the bund should maintain a minimum crest elevation of 376.0 metres reduced level (m RL) and have a minimum 0.25 m freeboard.
- From chainage 450 to 1300, the adjacent bund should have a minimum elevation of 377.65 m RL and a minimum 0.25 m freeboard.
- Gaps have been identified in the existing bunding that would require filling as presented in Figure 11 of W6626/2021/1. Suitable bund material must be compacted in 300 mm layers with quality control and assurance, to prevent erosion and retain water.
- From chainage 1300 to 2400, the drain may require lining with facing class rock in the steeper reaches of the alignment.
- With these recommendations, the drains should sufficiently divert the external stormwater runoff around the perimeter of the roadway up to the 10% AEP event.
- It is suggested to install a sump at the lowest part of the depression to provide dewatering as required.
- Visual inspections and maintenance should be undertaken before each wet season and following each storm event.
- Sedimentation may occur at the western drain between chainage 450 and 1300 that may require removal after a flood event.

Coffey (2024) after undertaking the hydrologic and hydraulic assessment for the works approval holder has provided proposed changes to the stormwater management infrastructure for TSF Cell 4 (Table 1). Coffey (2024) has stated that "*with the specified upgrades in place, the constructed diversion drains will route external runoff around the western and southern sides of the haul road during the modelled flows of a 10% AEP, 24-hour flood event and adequately address surface water flooding risks to TSF Cell 4.*"

Based on the above information and memorandum provided by Coffey (2024), the department has no objection to the proposed changes listed in the below table.

Table 1: Proposed changes to stormwater management infrastructure

Infrastructure	Current design construction requirements	Proposed changes
Stormwater management infrastructure	**Western drain:** • Length 2,550m • Depth 1.5m • Width 3m • Freeboard 1.25m • 382.0m RL at southern corner of the bypass haul road discharging offsite with an outlet elevation of	**Western drain and bund:** • Length 2,550m • Height from drain toe to bund crest 2.7m • Base width 1m • 380.0m RL at southern corner of the bypass haul road discharging into existing site drainage with an outlet elevation of approximately 365.5m

Infrastructure	Current design construction requirements	Proposed changes
	approximately 365.5m RL **Southern drain:** • Length 1380m • Depth 1.4m • Width 3m • Freeboard 1.15m • 382.0m RL at southern corner of the bypass haul road discharging offsite with an outlet elevation of approximately 364.5m RL **Drainage pond:** • Volume 100ML, sufficient to hold a 1 in 10year, 24-hour recurrence storm event. • Length 235m • Width 115m • Depth 4.5m • Freeboard 0.5m	RL **Southern drain:** • Length 1000m • Average depth 1m • Average width 1m • 380.0m RL at southern corner of the bypass haul road discharging into existing site drainage with an outlet elevation of approximately 366m RL **Drainage pond:** • Volume 15ML, sufficient to hold runoff from the southern drain in a 1 in 10 AEP, 24-hour recurrence storm event. • Length 235m • Width 115m • Average depth 0.75m

Erosion protection layer thickness

The works approval holder has requested to amend the erosion protection layer thickness from 500 mm to the correct 300 mm thickness. The typographical error was due to the 500 mm thickness written in the original works approval application. The works approval holder provided the document titled '*Carosue Dam Gold Mine – TSF Cell 1-3 and Cell 4 Design Report'* (Coffey, 2021) as part of the amendment application which states a 300 mm erosion protection layer thickness.

The department notes this and has verified that the document and design drawings, including some included in the works approval, states a 300 mm thickness for the erosion protection layer.

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 2020a).

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 have previously been considered in this decision report when the original works approval was issued on 15 June 2022. The proposed control measures the works approval holder proposed to assist in controlling these emissions have also remained unchanged from

the previous decision report.

3.1.2 Receptors

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

The decision report issued on 15 June 2022 provided 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 2020b)). The proposed changes to the stormwater management infrastructure likely to impact sensitive receptors remain the same as previously identified during the original works approval. For context, Table 2 provides a summary of the environmental receptors that could potential be impacted by the stormwater management infrastructure.

Table 2: Sensitive environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
Surface water and drainage lines Existing mining infrastructure has altered the flow of surface water in the area.	An ephemeral creek is approximately 1.5 km west to the TSF. There is a hydrological divide that extends from the south of the Karari open pit, dividing the Carosue Dam Project region into two different surface water domains. South of this divide, surface water flows south and east to an embayment of Lake Rebecca. North of the divide, surface water (as sheet flow) flows east from breakaways and hills of underlying bedrock to a broad drainage line which lies east of Karari, Whirling Dervish and Luvironza, then north toward Lake Rebecca.
Native vegetation	*Acacia aneura* (mulga) low woodlands associated with red loams over siliceous hard pan to the north and low woodlands of mixed mulga and *Casuarina pauper* (black oak) and *Eucalyptus* sp. on alkaline and calcareous soils to the south. Spinifex hummock grassland with eucalypt overstory on sand plain is common. Halophytic vegetation occurs throughout the region on paleo-drainage systems, breakaways and on some stony and alluvial plains. Highly saline soils support *Atriplex* (saltbush), *Maireana* (bluebush) and *Tecticornia* (samphire) shrublands, while less saline soils support mulga with saltbush or bluebush understoreys.
Threatened and / or priority fauna Malleefowl (*Leipoa ocellata*)	Approximately 1.5 km from TSF Cell 4.
Threatened and / or priority flora *Eremophila arachnoides* P3	Approximately 600 m from TSF Cell 4.

3.2 Risk ratings

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

Where the works approval holder has proposed mitigation measures/controls (as indicated in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the works approval holder'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 works approval holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified.

The revised works approval W6626/2021/1 that accompanies this amendment report authorises construction and time-limited operations. The conditions in the revised works approval 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 was included in the previous decision report, however licence conditions will not be finalised until the department assesses the licence application.

A risk assessment has not been included in this amendment report as the risk assessment undertaken in the previous decision report remains unchanged to the proposed changes in this amendment application. For construction activities to TSF Cell 4, the risk remains with a consequence of 'slight', likelihood as 'unlikely' with the risk rating at '**Low Risk'**. For operational activities for TSF Cell 4, the risk remains with consequence as 'moderate', likelihood as 'possible' or 'unlikely' with the risk rating at '**Medium Risk'**.

4. Consultation

Table 3 provides a summary of the consultation undertaken by the department.

Table 3: Consultation

Consultation method	Comments received	Department response
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) advised of the amendment application on 07 August 2024	DEMIRS replied on date 10 September 2024 stating that they have no comments to provide.	N/A
Works approval holder was provided with draft amendment on 13 September 2024	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 works approval will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table 4 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the revised works approval as part of the amendment process.

Table 4: Summary of works approval amendments

Condition no.	Proposed amendments
Cover page	Administrative changes.
Works approval history	Inclusion of the proposed changes in this amendment application.
1, Table 1	Changes to the stormwater management infrastructure for the western drain and bund, southern drain, and drainage pond.
2, Table 2	Amendment erosion protection layer thickness from 500 mm to 300 mm.
Definitions, Table 7	Amendment table number and inclusion of AEP to the table.
Figure 11	Updated figure to include proposed changes in this amendment application.

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: Risk Assessments*, Perth, Western Australia.
3. DWER 2020b, *Guideline: Environmental Siting*, Perth, Western Australia.
4. Tetra Tech Coffey Pty Ltd (Coffey) 2021, *Carosue Dam Gold Mine – TSF Cell 1-3 and Cell 4 Design Report,* unpublished report prepared by Tetra for Northern Star Resources (Carosue Dam) Pty Ltd.
5. Coffey 2024, *Memorandum – Carosue Dam TSF Cell 4 Surface Water Flood Assessment*, unpublished report prepared by Tetra for Northern Star Resources (Carosue Dam) Pty Ltd.
6. Pennington Scott 2021, *Water Studies for TSF4 4 Mtpa Expansion Project, 15 November 2021,* unpublished report prepared by Pennington Scott for Northern Star Resources (Carosue Dam) Pty Ltd.

Appendix 1: Summary of works approval holder's comments on risk assessment and draft conditions

Condition	Summary of works approval holder's comment	Department's response
Cover page	Change the registered business address to the following: *'Level 4, 500 Hay Street* *SUBIACO WA 6008'*	Amended.
1, Table 1	Proposed recommendations made for the RL lengths and other specification after checking the surveyed RL. The suggested changes around the average height/depth will take care of the fluctuations along the length of the drain dimensions. *"Western drain and bund:* • *Length 2,515m* • *Average height from drain toe to bund crest 2.7m* • *Average base width 1m…* *Southern drain:* • *Length 1,020m…* • *380.0m RL at southern corner of the bypass haul road discharging into existing site drainage with an outlet elevation of approximately 365.6m RL"*	Department notes the explanation and proposed recommendations. The department has made the requested changes.
Amendment report	The works approval holder provided an explanation for the removal of the freeboard for the western drain and southern drain: "*Concerning the freeboard information requested for the drain and the pond, we will prefer to exclude this information from the amended draft document if you approve, since the pond already includes the freeboard in the volume calculations in the Coffey document. Also, the freeboard is already factored in the listed height and depth of the drains*."	Department notes this explanation. No changes were made.