



Application for Works Approval Amendment

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

Works Approval Number	W6205/2018/1
Works Approval Holder	Abra Mining Pty Limited
ACN	110 233 577
File Number	DER2018/001572
Premises	Abra Base Metals Project MEEKATHARRA WA 6642 Legal description – Part of mining tenements L52/194, M52/776, G52/292 and L52/210 As defined by the Premises maps attached to the revised works approval
Date of Report	30 October 2024 (FINAL)
Decision	Revised works approval granted

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1. Decision summary

Works approval W6205/2018/1 is held by Abra Mining Pty Limited (works approval holder) for the Abra Base Metals Project (the Premises), located at mining tenements L52/194, M52/776, G52/292 and L52/210.

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 W6205/2018/1 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 27 June 2024, the works approval holder submitted an application to the department to amend works approval W6205/2018/1 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- removal of the requirement for a liner from the Tailings Storage Facility (TSF) Cell B basin; and
- alter the footprint of the initial TSF Cell B design.

2.2.1 Overview of Premises

The original works approval was issued on 28 June 2019 for the construction and commissioning of category 5 (processing of metallic or non-metallic ore) activities.

Infrastructure at the Premises comprises of crushing and ore storage bin, grinding circuit, lead / silver flotation and concentrate, concentrate dewatering utilising a thickener and filter, tailings thickener, and TSF.

The original TSF design included a two cell, paddock type facility, located to the north of the plant site, between two intermittent creek lines. The TSF was to be constructed in six stages and incorporate a rock-ring decant with submersible decant pumps in each cell to recover water from the TSF. The decant pond was to be raised in conjunction with the raising of the perimeter embankments. Surface water diversion channels and bunds were to be constructed to divert catchment runoff from the ridge areas to the south of the TSF behind the plant site towards the north, away from the TSF.

The original design included starter embankments and TSF cell basins that were to be lined with geosynthetic clay liner (GCL) to produce a low permeability liner with hydraulic conductivity of 1×10^{-12} metres per second (m/s) at the base of the TSF to reduce seepage. This was based on initial metallurgical test work.

The original works approval had a condition that required the works approval holder to undertake a geochemical analysis from 10 individual tails samples once tailings were produced. Specifically, to undertake leaching tests of the material using the US EPA Method 1313 procedure (LEAF Test).

As part of a previous works approval amendment application (amendment issued on 27 October

2023), the results from the LEAF Test analysis, updated TSF seepage modelling report, updated TSF Cell A Design report and hydrogeological report were provided for reasoning to alter the design of the TSF Cell A.

Previous technical advice (DWER)

At the time of the works approval amendment assessment, the department sought technical advice from the department's Principal Hydrogeologist for the removal of the GCL from the TSF Cell A basin and alter the liner type to a high-density polyethylene (HDPE) liner for the starter embankments. The technical advice provided for the previous amendment is summarised below as well as recommendations:

- The works approval holder should undertake suitable subgrade preparation of the substrate beneath the TSF footprint to reduce permeability of the soils within the area.
- The works approval holder should install and construct at least one monitoring bore located hydraulically downgradient of the proposed interception drain to assess its effectiveness in recovering seepage.
- The works approval holder should undertake monitoring of the monitoring bores near the TSF and should be sampled on a quarterly basis to monitor for groundwater contamination from leached metals.

Thus, the department amended condition 1 of the works approval W6205/2018/1 to include that the TSF basin is constructed as a compacted foundation and the construction of an interception drain north of the TSF. Condition 4 and 5 were added to allow for the construction and reporting of monitoring bores. Condition 15, Table 5 was amended to ensure ambient groundwater monitoring was undertaken on a quarterly basis.

Previous advice from Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)

The department also referred the amendment application to DEMIRS to be advised on the geotechnical aspects and potential environmental issues on the removal of the GCL from the base of the TSF Cell A.

DEMIRS advised that no geotechnical or environmental issues were identified in the assessment after reviewing the revised Mining Proposal related to the removal of the liner for TSF Cell A.

2.2.2 Proposed amendments

Removal of the liner from TSF Cell B basin

The works approval holder engaged Rockwater (2024) to undertake a hydrogeological assessment and modelling of potential seepage from the TSF Cells A and B as supporting information for the removal of the liner from the TSF Cell B basin.

Rockwater (2024) concluded the following from the results of the numerical seepage modelling from the planned TSF Cells A and B:

- TSF site is underlain with sediments and saprolite typical of low hydraulic conductivity, with about 5 to 10 m of silt, gravel, and sand.
- Estimated seepage rates were 200 cubic metres per day (m^3/d) and 366 m^3/d for TSF Cells A and B, respectively. This is higher than the previous seepage modelling of rates 7 to 12 m^3/d calculated by CMW Geosciences (CMW) (2022) as a different type of seepage model was used, which underestimated seepage rates. Groundwater mounding will be generated through seepage about 12 m below the TSF Cells during the first 12-month discharge.
- With dewatering activities, leachates from tailings will be transported toward the

underground mine in the southwest of the site. Modelling indicates that groundwater will be impacted by tailings seepage at the production bore, about five years, and six years for the Abra Mine box cut.

- Boron levels from the initial supernatant composition in the tailings exceeded the ANZG (2018) irrigation and general use guidelines. However, these levels are expected to reduce via transport and dilution in groundwater when seepage reaches the underground mine.
- Estimate seepage rates and travelled distance are potentially overestimated as a result of assuming a constant thickness of tailings material for the first 12 months of deposition. In addition, numerical simulations do not consider diversion drains (CMW 2022) constructed downstream of the TSF embankments and potential pumping of the decant water to mitigate the seepage to the water table.
- Groundwater mounding below the tailings will decrease leakage rates, especially to the water table, however, results show that in the absence of an interception drain, seepage beneath the TSF wall would likely raise groundwater levels down gradient of the wall or near the ground surface.
- The gravelly and shallow sandy layer could form a zone of preferred flow, channelling seepage under the TSF walls and may result in water daylighting near the wall. Installation of an interception drain or drains, and pumping sumps could control this, especially north of the TSF. With TSF Cell B planned north of TSF Cell A, this may require the construction of either a temporary drain until TSF Cell B is constructed, or a covered drain in the area of that cell.

The department notes that Rockwater (2024a) stated that *“three monitoring bores were added in 2024, including two bores further east of Cell A (WMB002A, WMB002) and one bore on the west side of the processing plant (WMB001). These will form the basis of the monitoring network to enable early detection of any seepage from Cell A and Cell B.”* It should be noted that Rockwater (2024b) has indicated that monitoring bore WMB002A was decommissioned due to faulty casing and that WMB002 was the replacement bore. The department requested further information on the installation of the three monitoring bores on 9 July 2024, of which information was provided to the department on 9 October 2024.

The department has assessed the bore construction and design specifications as part of this amendment and have confirmed that they are deemed suitable for monitoring as part of the existing monitoring bore network on the premises. These monitoring bores will be included in the time-limited operations phase and the current monitoring requirements under condition 15, Table 5 of the amended works approval.

CMW (2024) have indicated that as the TSF Cell B is constructed, the monitoring bore will be decommissioned as it is located within the TSF Cell B footprint. A replacement bore had been proposed, TSFMB009 with the location indicated on Site Plan 7 under the works approval W6205/2018/1. However, during the consultation period of reviewing the draft works approval and draft amendment report, the works holder provided reasoning to not install the replacement monitoring bore. The works approval stated that *“the existing monitoring bore MB003 is situated in very close proximity to the proposed location of MB09 to monitor seepage from the TSF. As such, the engineers confirmed that MB09 could be decommissioned and a replacement bore was not required, as MB003 could be utilised to monitor the TSF Cell B.”*

The department has reviewed the location of monitoring bores on Site Plan 7 and has no objection of not constructing a replacement monitoring bore for MB09, as the location of monitoring MB003 can be used to monitor TSF Cell B.

Changes to the footprint of the initial TSF Cell B design

The works approval holder engaged with CMW (2024) to prepare an updated TSF Cell B design report that excluded the liner on the base of the cell and to reduce the footprint size. With exception to the TSF Cell B basin liner being removed and a reduced TSF Cell B footprint area, the original TSF design requirements reviewed and assessed in the original works approval remain unchanged.

The proposed seepage management controls have been proposed in the updated TSF Cell B design:

- Cut-off trench installed under the upstream toe of the perimeter embankment that will be excavated to 'refusal' on the cemented layer (Wiluna Hardpan).
- HDPE liner installed on the upstream slope of the embankment and part of the TSF basin directly under the decant.
- Installation of seepage recovery trenches with sumps at low points and provision for seepage recovery bores, if required.

The department advises that the works approval holder ensure all other regulatory approvals are revised, where required on the proposed changes of this amendment application.

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 which have been considered in this amendment report are detailed in Table 1 below.

Table 1 also details the proposed control measures the works approval holder has proposed to assist in controlling these emissions, where necessary.

Table 1: Works approval holder controls

Source / Activities	Emission	Potential pathways	Proposed controls
Construction			
Additional construction activities for TSF Cell B: <ul style="list-style-type: none"> • cut-off trench; • compaction of base; and • installation of piezometer in base and underneath the 	Dust	Air / wind dispersion	Existing condition 1 of W6205/2018/1 relates to the design and construction requirements for this infrastructure.
	Stormwater	Overland runoff from dust contaminated	Existing condition 1 of W6205/2018/1 relates to the design and construction requirements for this infrastructure.

Source / Activities	Emission	Potential pathways	Proposed controls
embankment.		areas	
Operation			
Storage of tailings material at TSF Cell B that no longer includes an impervious liner at the base as originally approved and reduced footprint size.	Increased tailings seepage	Seepage through the soils to the underlying groundwater and nearby creek lines	<ul style="list-style-type: none"> maintain and operate cut-off trench; maintain and operate interception drain to the north of the TSF; undertake ambient groundwater monitoring from the TSF monitoring bores on a quarterly basis; daily visual inspections to confirm general integrity of the TSF embankments and HDPE liner are maintained; and visual inspections for any downstream seepage.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020a), the Delegated Officer has excluded employees, visitors and contractors of the works approval 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 2 below provides a summary of potential 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)). It should be noted that any potential sensitive human receptors have been screened out from the risk assessment due to the distance of at being more than 40 km of the Premises.

Table 2: Sensitive environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
Surface water including nearby drainage lines / creeks	<p>TSF infrastructure intersects or lies close to two minor drainage lines. There is also a larger drainage line (5 Mile Creek) which is located about 1.2 km east of the project. These drainage lines remain dry for long periods of time and only flow during heavy rainfall events (ephemeral).</p> <p>Applicant states “<i>seepage will be localised to immediate vicinity of TSF Cell B and will flow back towards the mining operations.</i>”</p>
Groundwater	<p>Groundwater levels range from 16 – 54 mBGL at the Premises. Groundwater under the TSF is approximately 10.64 to 25.7 mBGL, based on the standing water levels measure in four of the surrounding TSF monitoring bores.</p> <p>Salinity measured from these bores range from 320 mg/L to 710 mg/L Total Dissolved Solids, with a pH between 7.2 to 8.3.</p> <p>Groundwater within this area is good quality and suitable for livestock drinking, potable or industrial use.</p>

Environmental receptors	Distance from prescribed activity
Nichol Springs aboriginal heritage site	<p>Approximately 15 km north from the premises.</p> <p>Applicant states “<i>seepage will be localised to immediate vicinity of TSF Cell B and will flow back towards the mining operations.</i>”</p>

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 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 works approval 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 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 in Table 3.

The revised works approval W6205/2018/1 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 has been included in this amendment report, however licence conditions will not be finalised until the department assesses the licence application.

Table 3. Risk assessment of potential emissions and discharges from the Premises during construction, commissioning and operation

Risk Event					Risk rating ¹ C = consequence L = likelihood	Works approval holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works approval holder's controls				
Construction								
Additional construction activities at the TSF Cell B: <ul style="list-style-type: none"> • cut-off trench; • compaction of base; and • installation of piezometer in base and underneath the embankment. 	Dust	Air / wind dispersion directly impacting nearby creek lines.	Nearby creek lines	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Yes	Condition 1 , 2, and 3.	Condition 1 inclusion of additional design and construction requirements related to TSF Cell B to reduce impacts from seepage to the environment. These include compaction foundation of the TSF Cell B basin, starter embankments lined with HDPE liner, cut-off trench with a nominal depth of 0.5 m and width of 4 m, and HDPE liner installed upstream slope of the embankment and part of the TSF Cell B basin directly under the decant system infrastructure. As noted under section 2.2.1 technical advice was previously sought from the department's Principal Hydrogeologist and DEMIRS on the removal of the liner for TSF Cell A basin. This advice is applicable for the removal of the liner for TSF Cell B basin.
	Stormwater	Overland runoff from dust contaminated areas causing contamination of nearby creek lines.			C = Slight L = Unlikely Low Risk	Yes		Condition 1, 2 and 3.

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Risk Event					Risk rating ¹ C = consequence L = likelihood	Works approval holder's controls sufficient?	Conditions ² of works approval	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Works approval holder's controls				
Time-limited operations								
Storage of tailings material at the TSF Cell B that no longer includes an impervious liner at the base as originally approved and reduced footprint size.	Increased tailings seepage	Seepage through the soils to the underlying groundwater and nearby creek lines. Contamination of underlying potable groundwater source. Contamination of nearby creek lines causing ecosystem disturbance.	Groundwater Nearby minor creek lines and large creek (5 Mile Creek) approximately 1.2 km east from the Premises	Refer to section 3.1	C = Moderate L = Possible Medium Risk	Yes	Conditions 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17.	Not applicable.

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

Note 2: Proposed works approval holder's controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

4. Consultation

Table 4 provides a summary of the consultation undertaken by the department.

Table 4: Consultation

Consultation method	Comments received	Department response
Works approval holder was provided with draft amendment on 17 October 2024	<p>Received on 23 and 25 October 2024.</p> <p>Works approval holder provided requested figures for site plan 1 and 7, and updated Table 7 of premises boundary coordinates.</p> <p>Works approval holder also provided reasons for not replacing monitoring bore MB09.</p>	<p>The department updated the relevant figures and premises boundary coordinates' table in the works approval.</p> <p>Refer to section 2.2.2 for the response to the monitoring bore issue.</p>

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 5 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 5: Summary of works approval amendments

Condition no.	Proposed amendments
3, Table 1	Inclusion of additional design and construction requirements for TSF Cell B. Amendment to vibrating wire piezometers where installation is within the TSF embankment.
4 & 5	Removal of infrastructure and reporting requirements for groundwater monitoring bores as no further bores are proposed to be constructed.
4 to 20	Condition number change (previously conditions 5 to 22) as conditions 4 and 5 related to bore requirements has been removed.
13, Table 4	Inclusion of the additional monitoring bores, TSFMB009, WMB001, and WMB002. Table number change as Table 3 was removed, related to bore requirements.
17	Removed reference to 'related to mine dewatering only' from condition 19(d).
Site plan 2	Updated figure to amend footprint size of TSF Cell B.
Site plan 7	Updated figure of all the groundwater monitoring bore locations.
Site plan 8	New figure of the TSF Cell B site plan.
Site plan 9	New figure of the TSF Cell B seepage recovery plan.

Condition no.	Proposed amendments
Site plan 10	New figure of the TSF Cell B section details.
Site plan 11	New figure of the TSF Cell B typical sections.
Premises boundary coordinates	Inclusion of 'Schedule 2' to the existing heading. Amendment to premises boundary coordinates.

References

1. CMW Geosciences (CMW) 2022, *Tailings Storage Facility (TSF) Cell A – Abra Base Metals Project, WA – Design Report*, Perth, Western Australia. Unpublished report prepared by CMW for Abra Mining Pty Ltd.
2. CMW 2024, *Tailings Storage Facility (TSF) Cell B – Abra Base Metals Project, WA – Design Report, 6 May 2024*, Perth, Western Australia. Unpublished report prepared by CMW for Abra Mining Pty Ltd. Unpublished report prepared by CMW for Abra Mining Pty Ltd.
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020a, *Guideline: Risk Assessments*, Perth, Western Australia.
5. DWER 2020b, *Guideline: Environmental Siting*, Perth, Western Australia.
6. Rockwater 2024a, *Hydrogeological Assessment of TSF Cell B Tailings Seepage*, Jolimont, Western Australia. Unpublished report prepared by Rockwater for Abra Mining Pty Ltd.
7. Rockwater 2024a, *Production and Monitoring Bore Completion Report*, Jolimont, Western Australia. Unpublished report prepared by Rockwater for Abra Mining Pty Ltd.