Trust is the cornerstone to all of our projects

Groundwater and surface water baseline and impact assessment
<table>
<thead>
<tr>
<th>Contents</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key aspects related to water</td>
<td>3</td>
</tr>
<tr>
<td>Purpose of the studies</td>
<td>7</td>
</tr>
<tr>
<td>Methodology</td>
<td>6</td>
</tr>
<tr>
<td>Key findings</td>
<td>14</td>
</tr>
<tr>
<td>Mitigation and management measures</td>
<td>20</td>
</tr>
<tr>
<td>Potential impacts</td>
<td>22</td>
</tr>
<tr>
<td>Next steps</td>
<td>25</td>
</tr>
</tbody>
</table>
Key Aspects
How much water will the project require?

Total make-up water requirement per year is approximately 3 GL (3,000 ML).

This water will be used for:

- Processing ~ 2.5 GL (water entrained with tailings disposal)
- Dust suppression ~ 370 ML includes rehab areas
- Business operational purposes (laboratory, ablutions, etc.) ~ 15 ML
- Water used by contractors, wash down bays, and other incidental uses ~ 55 ML
Key Water Aspects

Where will the water come from?

It is expected that the water will be primarily sourced from the Mitchell River as winter-fill allocation.

*Kalbar recognises that this is dependent on winter-fill allocation being made available by SRW and for Kalbar to purchase this allocation in a competitive process.*

Water requirements will be supplemented with groundwater from the Latrobe aquifer.

*Kalbar recognises that groundwater from this aquifer is fully allocated and that Kalbar will need to purchase groundwater from existing licence holders.*

Rain water falling on site water dams, tailing areas and the mining void will also be utilised in processing.
Key Water Aspects

How will water be managed by Kalbar?

Kalbar’s water management plan aims to achieve the following:

• Minimise the amount of new water used by:
  – Maximising water recovered from tailings
  – Capturing and using rain water falling in mine dams and mine void
  – Use “mine contact” rain water as process water
  – Treat and quality control excess mine contact water for possible managed discharge

• Minimise the impact on environmental flows to the Mitchell and Perry Rivers
  – Controlled release of rain water falling on non-mining areas within project area
  – Prevent uncontrolled release of water from site by using water capture dams

• Have a positive impact on Mitchell River flow during summer months
  – Release stored water from site in a controlled manner during summer months
03

Purpose of the studies
Purpose of the studies

EES Scoping Requirement:

_Catchment values - To minimise effects on water resources and on beneficial and licensed uses of surface water, groundwater and related catchment values (including the Gippsland Lakes Ramsar site) over the short and long-term._

Purposes of the water studies were to:

- Characterise the existing environment
- Identify and evaluate design and mitigation measures
- Assess likely effects of the project on environmental values of water
- Develop the approach to monitoring, auditing and reporting on performance
Groundwater and surface water technical studies

Groundwater and surface water impact assessment report (Coffey)

Surface water
- Conceptual surface water management strategy and water balance
- Landscape stability and sediment transport regime assessment
- Surface water assessment – site study

Groundwater
- Groundwater modelling
- GDE assessment
- Tailings seepage and mine contact water quality assessment

EMM Water Technology Water Technology Water Technology EMM EHP EGi
Method
Method

• Desktop review of information
• Field investigation
  – Drilling and installing new groundwater observation wells
  – Aquifer hydraulic testing
  – Monitoring groundwater levels and quality
• Identification of environmental values
• Investigation, analysis and modelling
  – Site water balance (EMM)
  – Sediment transport, site and regional surface water assessments (Water Technology)
  – Groundwater model (EMM)
  – Groundwater dependent ecosystem assessment (EHP)
  – Tailings seepage and mine contact water quality assessment (EGi)
• Impact and risk assessment
• Develop mitigation measures and monitoring plans

Regulatory consultation

• Department of Environment, Land, Water and Planning (DELWP)
• Earth Resources Regulation (ERR)
• Environment Protection Authority (EPA)
• West Gippsland Catchment Management Authority (WGCMA)
• East Gippsland Catchment Management Authority (EGCMA)
• Southern Rural Water (SRW)
• East Gippsland Water (EGW)
Surface water sampling locations
Groundwater monitoring locations
Key findings
Key findings - tailings water

Tailings water quality assessment (EGi)
- Geochemical analysis of potential seepage water through tailings, overburden and ore

- All extract waters were close to pH neutral (not acidic, nor alkaline).
- Overall, leachable element concentrations were low.
- No exceedance of Australian Drinking Water Guideline criteria (ADWG, 2018).
- Aluminium and copper exceed freshwater aquatic ecosystem criteria (ANZECC, 2000).
- Low sulfur content means low acid sulfate soil risk.

# - AEP - Annual exceedance probability
Key findings - surface water 1

Conceptual surface water management strategy and water balance (EMM)
Assessment of performance of the site water management system.

- Spillway release from water management dams to Mitchell River - 2.6 % AEP# (occurs in 3 years over 117 year historical record).

- Spillway release from water management dams to Perry River catchment 0.9% AEP# (occurs in 1 year over 117 year historical record).

- Top-up groundwater supply to meet exceedance of 3 GL consumption during dry years (more than 80 ML is needed in 10% of years).

- Climate change scenarios demonstrate lower spillway release volumes and additional requirement of top-up groundwater.

# - AEP - Annual exceedance probability
Key findings - surface water 2

Surface water assessment – site study (Water Technology)

- Assessment of flood risk and site water quality effects
  - Water strategy reduces downstream flood risk reduced during operations.
  - Post rehabilitation flows to Simpson Gully, Lucas Creek, and Honeysuckle Creek will increase, but potential erosion can be mitigated by recommended controls.
  - Undisturbed water (existing conditions) – aluminium and phosphorus concentrations above ecosystem criteria (ANZECC, 2000).
  - Mine contact water - aluminium, total suspended solids and phosphorus concentrations are elevated and above ecosystem criteria but below trigger values for agricultural irrigation and livestock (ANZECC, 2000).
  - Surface water has over 97% probability of being fully retained.

Surface water assessment – regional study (Water Technology)

- Assessment of quality and quantity impact on Mitchell and Perry rivers and Gippsland Lakes
  - Quality:
    - Mitchell River: no measurable affect on water quality.
    - Perry River: most qualities are (at worst) unaffected by mining excepting an increase in aluminium.
    - Site runoff will have additional dilution with passage downstream, reducing modelled impacts further at the Gippsland Lakes.
  - Quantity
    - Perry River: annual flow increase of 1%.
    - Mitchell River: 0.01% reduction in annual flow volumes before consideration of potential winter-fill water extracted under license.
Key findings – groundwater

**Groundwater modelling (EMM)**
- Regional groundwater model developed to assess effects of groundwater extraction and mounding
  - 0.5 m groundwater mounding contour extends 4 km from the project area.
  - Localised higher mounding could develop directly below the tailing cells.
  - No areas of inundation are expected outside the mining boundary.
  - Maximum drawdown of 5 m in Latrobe Group aquifer at Year 3.
  - 1 m drawdown persists 10 years post mining around borefield.
  - Insignificant water balance effects to Gippsland Lakes, Providence Ponds, Perry River, Woodglen aquifer storage and recovery site and Boisdale Formation aquifer.

**Groundwater dependent ecosystem (GDE) assessment (EHP)**
GDE survey and assessment based on groundwater modelling results
  - Mounding presents Low to Negligible risk to GDEs.
  - Highest risk of GDE impact is in Moilun Creek where watertable lifts 0.2 m to within 1 m below surface.

**Tailings seepage water quality (EGi)**
- Geochemical assessment of tailings leachate samples to characterise potential tailings seepage water quality
  - Aluminium and copper exceed freshwater aquatic ecosystem criteria (ANZECC, 2000).
  - Compliant with Australian drinking water guideline criteria (ADWG, 2018).
  - Tailings seepage quality comparable with background groundwater quality.
Conceptual hydrogeological model
Conceptual hydrogeological model

![Conceptual model - Site based Northeast to southwest cross section](image-url)
Mitigation and management measures
Mitigation and management measures

Key mitigation and management measures:

- Catchment water onsite will be retained. The probability of discharge in any year is less than 3% to the Mitchell River and less than 1% to the tributary of Perry River.

- Water that has only been in contact with disturbed areas from outside of the mine void or tailings dam that is retained in water management dams will be offset by water from the fresh water storage dam.

- Clean water to be diverted around the mine where possible (offset where not).

- A groundwater monitoring network will be installed to assess the effect of extracting groundwater on Latrobe Group aquifer and overlying aquifers.

- Stream bed instability to be identified and monitored prior to and during construction, operations, closure and post-closure.
  - If required, erosion potential to be addressed through grade control
  - To inspect annually during construction and operation
07
Potential impacts
Potential impacts

Groundwater:

All residual risks **very low** to **low**.

Attributable to:

- Hydraulic isolation of Latrobe Group aquifer (where project extraction is occurring)
- No adverse effects on groundwater dependent ecosystems from groundwater mounding due to the disconnected nature of the systems
- Tailings seepage water is predicted to be of higher quality than the natural groundwater within project area

Surface water:

**Very low** to **low** residual risk to the Mitchell River and Gippsland Lakes.

Potential impacts with **low** residual risk to the Perry River and tributaries:

- Spillway discharge from water management or sediment dams following extreme rainfall events impacting on the beneficial uses of Perry River
Potential impacts

Perry River:

<table>
<thead>
<tr>
<th>Potential impact (surface water)</th>
<th>Likelihood</th>
<th>Consequence</th>
<th>Residual Impact Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Uncontrolled release of water from sediment ponds increasing sediment transport to Perry River, negatively impacting on beneficial uses of Perry River.</td>
<td>Unlikely</td>
<td>Moderate</td>
<td>Low</td>
</tr>
<tr>
<td>Uncontrolled release of mine contact water with concentrations of some metals and nutrients to the Perry River impacting on beneficial uses.</td>
<td>Unlikely</td>
<td>Moderate</td>
<td>Low</td>
</tr>
</tbody>
</table>

- Event based analysis of site discharges show that TSS increases would be small and that aluminium and phosphorus concentrations are below ANZECC short-term trigger values for agricultural irrigation and livestock
  - Phosphorus concentration 0.086 mg/L
  - Aluminium 1.38 mg/L
- Comments on likelihood of spillway discharge:
  - Perry Catchment mine contact dam is given highest priority to pump to process water system
  - Surface Water Modelling identifies the AEP at less than 1%
  - Discharge could only occur to the Perry Catchment when mining is occurring within this catchment
  - Climate change further reduces the likelihood of spillway discharge
08
Next steps
Next steps

Groundwater:

• Review baseline monitoring plan and continue monitoring.
• Review groundwater sampling method for low permeability aquifers.

Surface water:

• Quantify baseline flow and quality conditions in the Perry River catchment.
• Collect ephemeral stream flow samples to confirm baseline water quality (no flows were recorded during baseline monitoring period).