Independent expert review
Water resources

Presentation to the Independent Planning Commission

Public Hearing · 17 July 2026 · Branxton Community Hall

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Documents reviewed

EIS (Dec 2022)	Water Assessment and Groundwater Impact Assessment (AGE 2022)
Amendment Report (Jul 2025)	Water Assessment (EMM 2025), Groundwater Modelling Report and Surface Water Impact Assessment - basis of the Department's Assessment Report
Public Environment Report (Apr 2026)	Updated Groundwater Modelling Report (EMM 2026), Surface Water Impact Assessment (Engeny 2026)
Assessment Report (Jun 2026)	Department of Planning, Housing and Infrastructure - recommended conditions of consent

Review focused on: groundwater modelling, surface water balance, water resource impacts on the Hunter River and Wollombi Brook alluvium, and permanent void hydrology.

Matters addressed in my report

- Water balance modelling and reliance on Hunter River extractions
- Multi-year drought performance and supply reliability
- Water balance mass balance and closure
- Cumulative and incremental impacts on the Hunter River
- **Alluvial aquifer drawdown**
- Successive modelling generations and their reconciliation
- **The Carrington West Wing low permeability barrier wall**
- Groundwater–surface water connectivity and baseflow
- Permanent final void hydrology and long-term water quality
- **Application of relative versus absolute assessment standards**
- The Department's Assessment Report and its conclusions

I present three of these today (as marked in bold). The remaining matters are addressed in my written report.

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Three matters for the Commission

1 Modelling of alluvial drawdown

Concept of alluvium – Permian ‘disconnection’ is relied upon in presentation and in modelling, but is questioned here. Successive generations of modelling produced substantially different predictions without explanation.

2 The Carrington West Wing barrier wall

The Project's impact predictions for the Hunter River alluvium assume a performance standard is reached. The wall's engineering detail, verification arrangements, and monitoring plan a specifications don’t assure of this standard.

3 Relative rather than absolute assessment standards

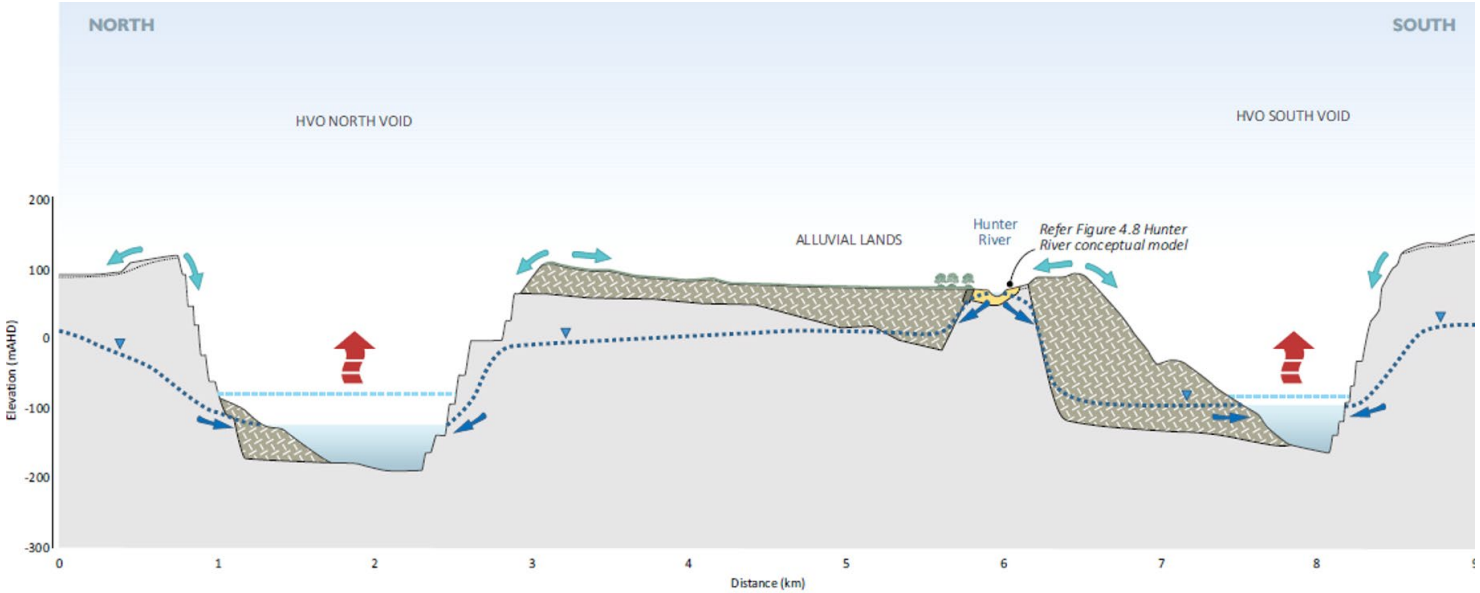
Impacts are consistently assessed by comparison to previously approved outcomes, not against absolute environmental standards, ultimately not providing any absolute standard of protection.

POINT 1

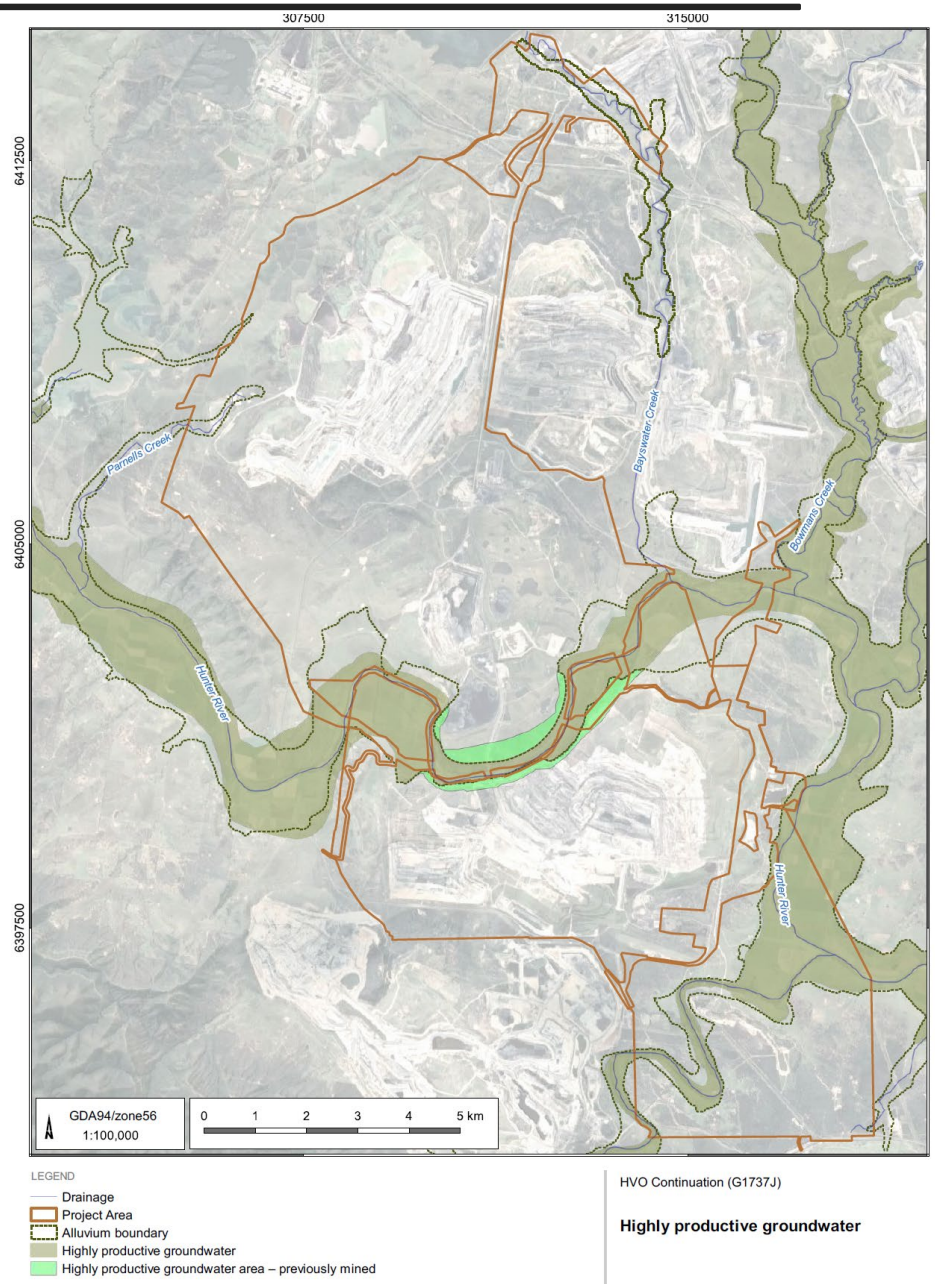
Modelling of alluvial drawdown

The alluvium–Permian disconnection is treated as binary and universal throughout, and unclear how it is actually represented. The Wollombi Brook alluvium prediction has moved from "up to 5 m" (EIS 2022) to "up to 2 m" (Amendment 2025) to "no stated magnitude" (PER 2026). Same model.

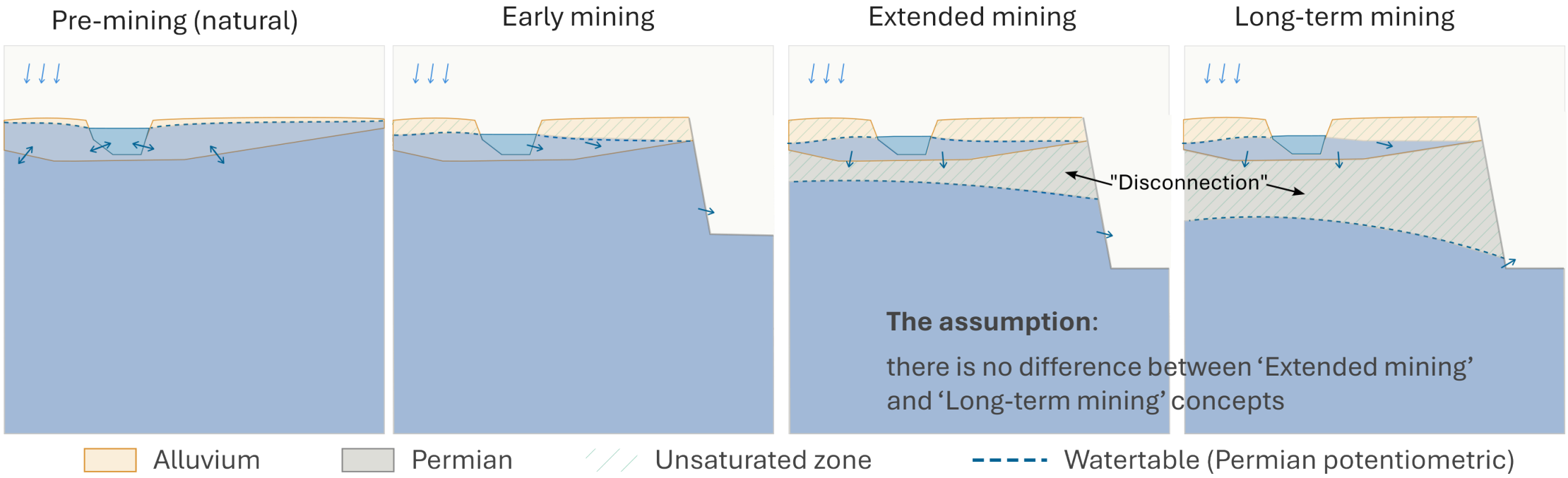
The regional groundwater context



- Alluvial formations near the surface are associated with the Hunter River and Wollombi Brook floodplains and are highly permeable with relatively high-yielding and better-quality groundwater that is a regional water-supply aquifer and supports the water-dependent ecosystems
- Excavation of mine pits is accompanied by ongoing removal of groundwater that is encountered. This results in substantial reduction in the groundwater resource and means that adjacent river systems will see reduction in baseflow and increased losses during periods of flow



Concepts of groundwater interaction with alluvium



The assessments leans heavily on a conceptual model of alluvium that is largely "disconnected" from depressurised Permian.

- Is drawdown in alluvium properly modelled?
  - A saturated-only groundwater model poorly represents (assumes flow cessation?) through unsaturated zone,
  - and details on how base of river or of alluvium represented is key
- Is there really no difference between these 'Extended mining' and 'Long-term mining' concepts?
- As an impact of mining, how is 'disconnection' considered a baseline condition?

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Wollombi Brook alluvium - competing predictions of impacts

EIS (AGE 2022)

up to 5 m

Cumulative drawdown in the Wollombi Brook alluvium above the Lemington Underground mine

Amendment (EMM 2025)

up to 2 m

Same model, same mechanism. No technical explanation offered for the reduction.

PER (EMM 2026)

no magnitude

Reported only as "minority of parameter realisations." Peak value no longer stated.

Same MODFLOW-USG model. Same domain. Same conceptual representation of Lemington Underground. Different numbers.

No numbers

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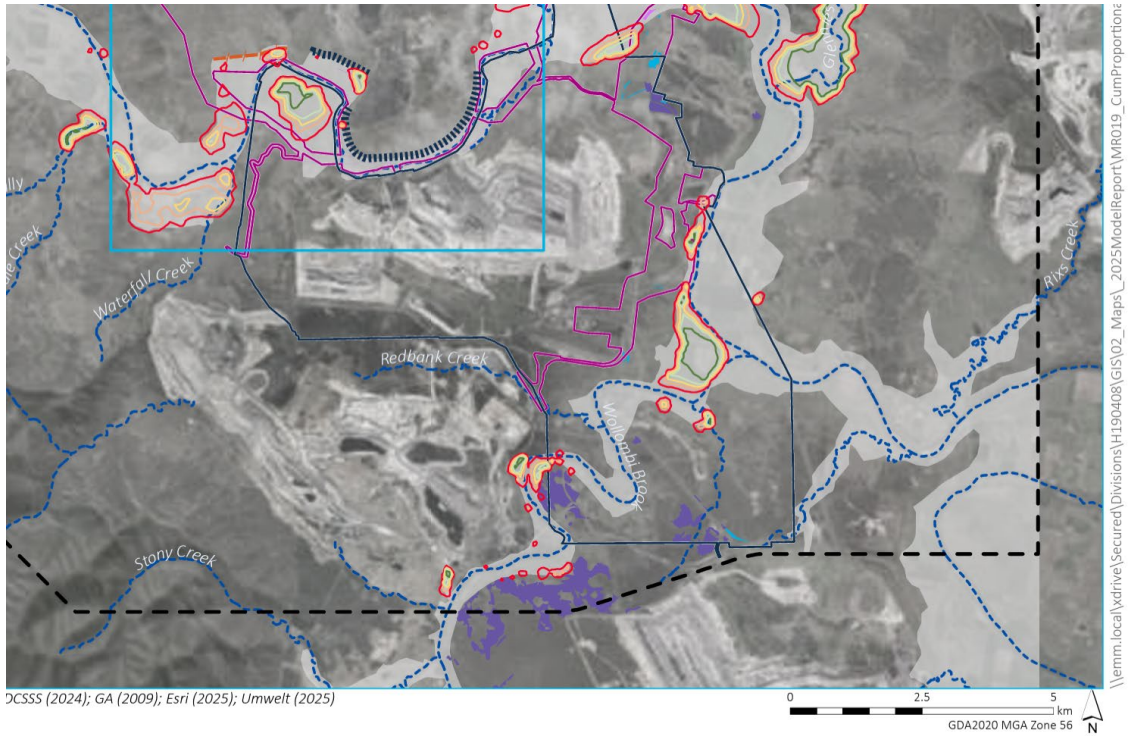
Interpreting results from ensemble simulations

Drawdown:
maps showing a "*proportional likelihood*" based on the proportion of “realisations” that exceed a criteria”

- For alluvium, maps showing likelihood of drawdown over 0.2m is presented
- The underlying Permian strata, over 2m

“very likely” that drawdown in the Permian Strata underneath the Wollombi Brook alluvium will be >2m, but very unlikely that drawdown in the Wollombi Brook alluvium to be over 0.2m.



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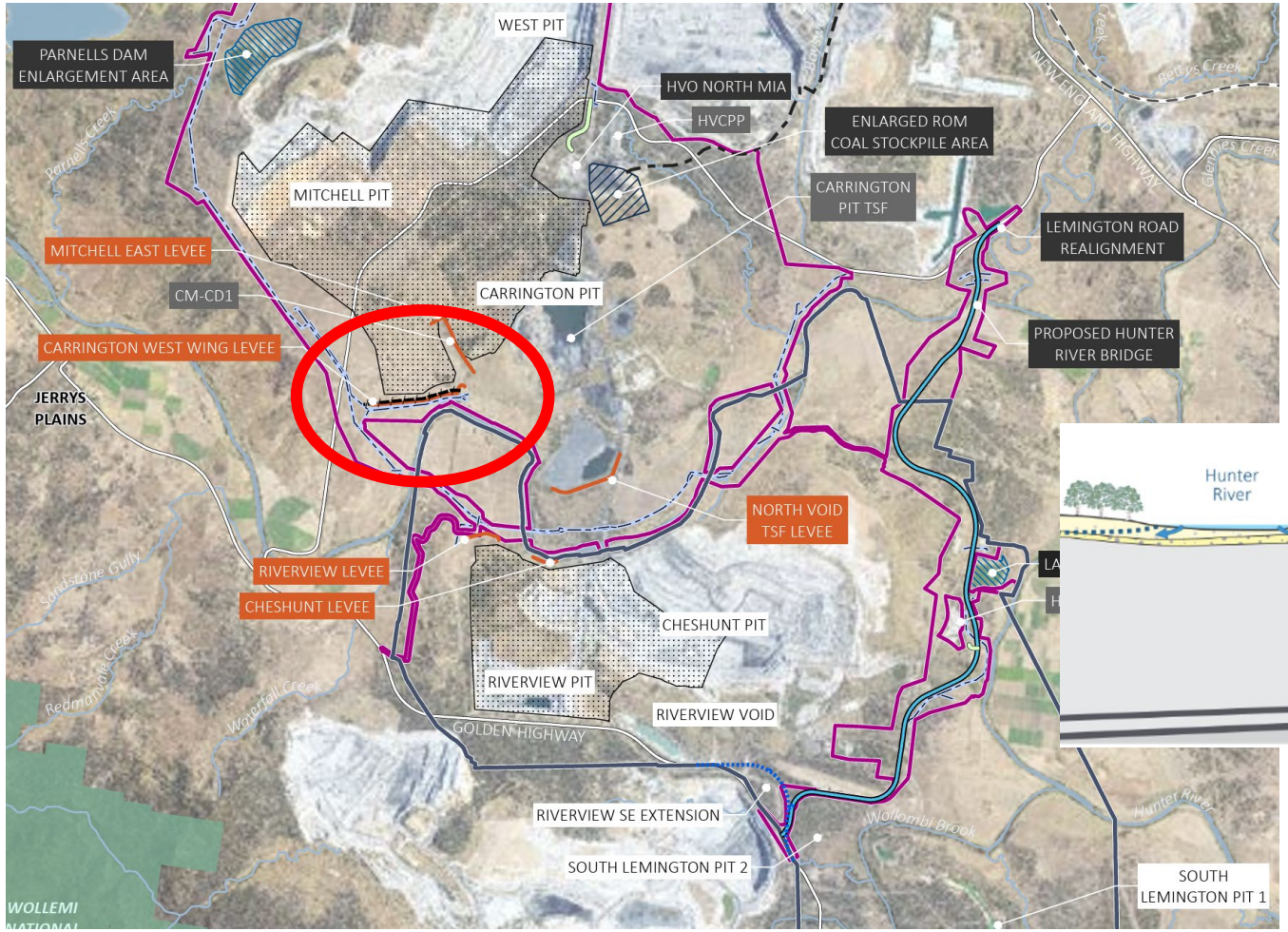
POINT 2

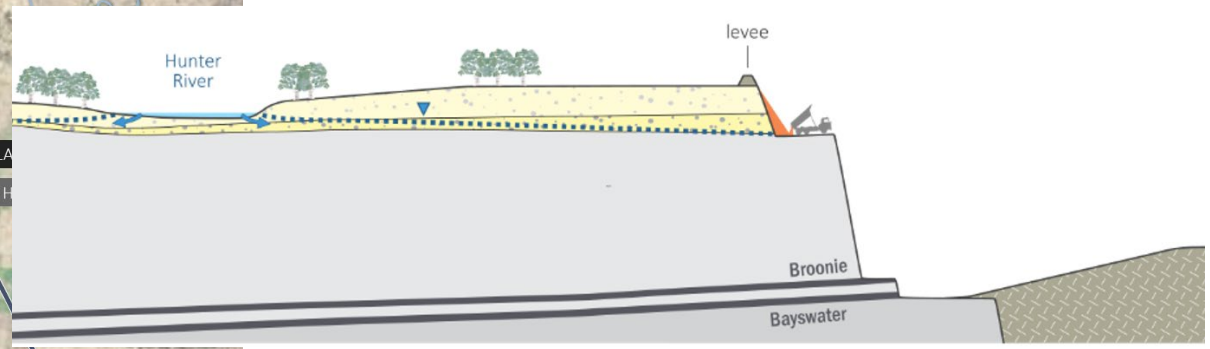
The Carrington West Wing low permeability barrier wall

The Project's impact predictions for the Hunter River alluvium depend materially on the wall performing to a permeability of 10 $^{-8}$ m/s for centuries. The current documents specify no wall thickness, no depth, no keying detail, no verification arrangements, and no long-term monitoring plan.

Why is a barrier wall proposed?



Because mine plan encroaches on river



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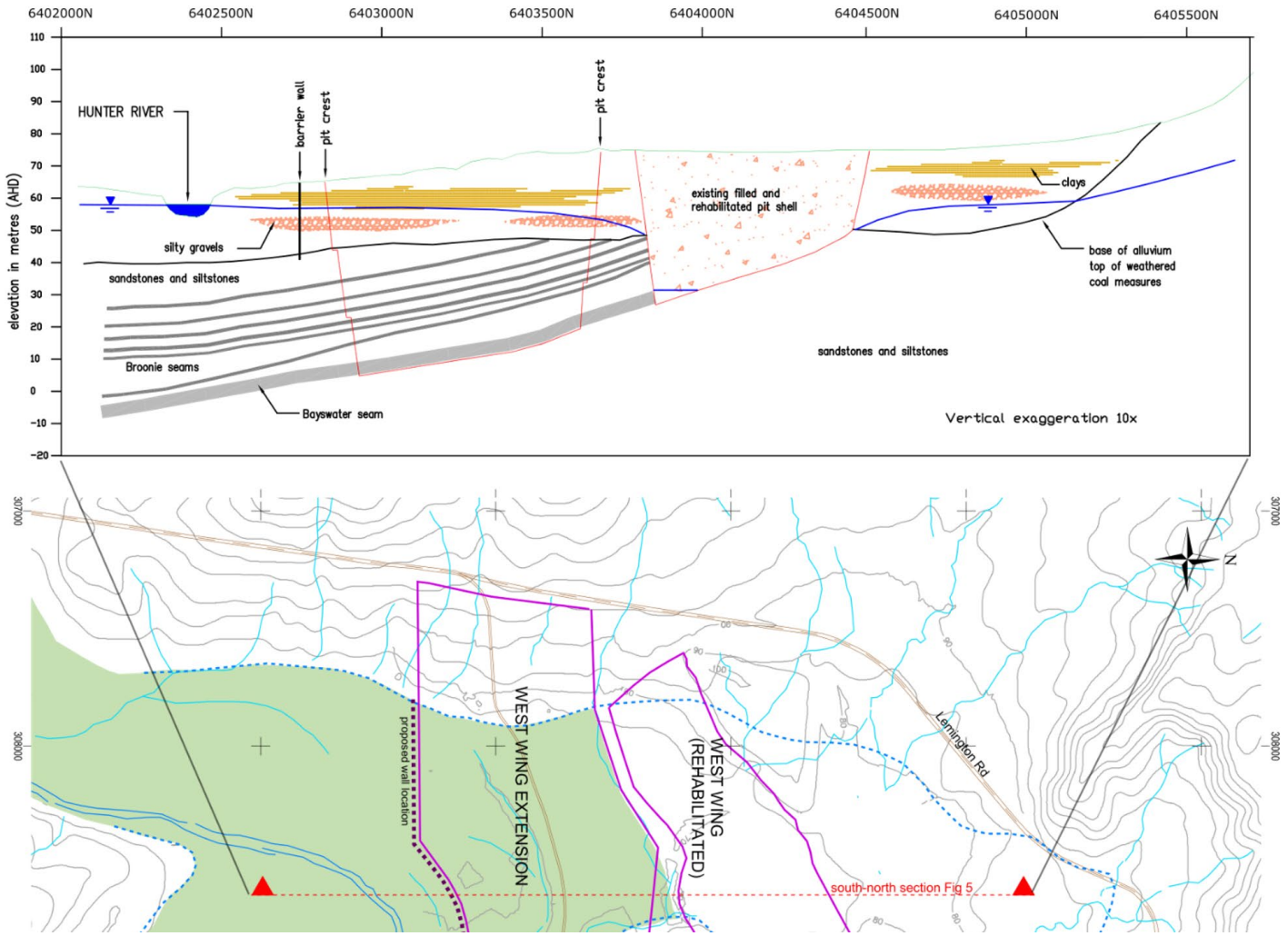
What we know about the wall

What the consent requires

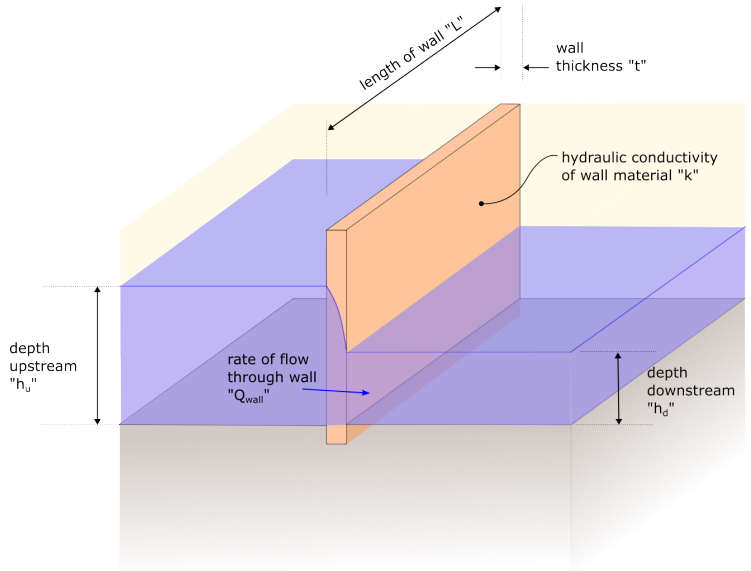
- Location in plan view
- Design permeability of 10^{-8} m/s
- “Keyed into unweathered rock”
- Constructed before mining within 100 m of the paleochannel
- As-built report and endorsement by DPI Water

Predictions depend on the wall performing to design specification.

What we must assume



- 25m depth?
- Head differential?



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What we must assume

The current documents do not specify:

- Wall thickness*
- Depth below the alluvium base
- Keying into unweathered rock - method and verification
- Construction materials
- Construction methodology
- Quality assurance and verification of as-built permeability
- Long-term performance monitoring program
- Trigger levels and contingency response if underperforming
- Long-term integrity and degradation to year 3000
- Sensitivity of predicted impacts to wall underperformance

* Specification of hydraulic conductivity without wall thickness is incomplete

With same hydraulic conductivity, a wall 2m thick is 10 times more effective than one 0.2m thick, and less prone to failure
(its like specifying design of a mattress by saying the material to be used, but not saying how thick it should be)

What the modelling assumes

What is represented in the model

- Design permeability of 10^{-8} m/s -applied uniformly
- Activated at model time-step of construction
- Persists at design permeability to year 3000
- Fixed hydraulic conductivity of 10^{-8} m/s Deterministic across all 500 probabilistic realisations

What is not represented

- Uncertainty in wall performance - fixed across all 500 realisations
- Any degradation of permeability over time
- Localised defects, gaps, or imperfect keying

What is not stated

- Wall thickness - physical dimensions not stated in the report
- depth or keying detail in current documents

The groundwater model assumes the wall performs to specification - built to design, installed on time, and maintained at design permeability for the multi-century post-closure recovery period.

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POINT 3

Relative rather than absolute assessment standards

Three permanent saline pit lakes with median long-term TDS of 7,100 to 21,550 mg/L will remain in perpetuity. The assessment describes them as "consistent with existing approved outcome." No absolute environmental standard has been applied to determine whether this outcome is acceptable.

Baseline creep

- Extensive and long history of mining operations at the location of the Project.
- Difficult to discern incremental effects from this Project, and
- Quantify the net effect of mining on the environment.

“baseline creep” - Where the impacts of the Project are measured in relative terms to other projects and / or impacts already occurred

It becomes difficult to offer any absolute standard of reference to measure acceptable impacts to the environment or society - i.e. each project in a chain of approvals can pass a test that measures it against its predecessors, while collectively the cumulative outcome fails any absolute test.

The documentation by the proponent argues for the suitability of the Project in terms relative to other mines with such frequency that it becomes a structural feature of the assessment framework.

"The documentation by the proponent argues for the suitability of the Project in terms relative to other mines with such frequency that it becomes a structural feature of the assessment framework"

Examples

1 Reference to previously approved outcomes

- Mine plan modifications "consistent with current approval"
- Reduction from three to two permanent pits framed as a benefit of the Project
- Water management strategy "consistent with existing HVO Complex strategies"

2 Accepting a degraded baseline as the reference

- Prior mining and "approved future mining" as reasons impacts are not significant
- Alluvium–Permian disconnection accepted as the baseline
- Re-disturbance treated as a different category from new disturbance
- Water quality tested "within the existing range" rather than against absolute criteria

3 Deflecting to other actors or natural sources

- Wollombi drawdown attributed to Lemington Underground legacy
- Industry salinity contribution small by referencing natural dryland sources

Three matters for raised in this presentation

1 How exactly is ‘disconnection’ in Alluvium-Permian interactions simulated in modelling, with specific regard to desaturation and representation of any ‘conductance’ layer under the river?

What are the specific modelling changes between the three generations of assessment that produced the shifting predictions for alluvial drawdown?

2 What design detail, verification arrangements, monitoring plan, and contingency response applies to the Carrington West Wing barrier wall, given the impact predictions depend on it performing to specification ?

3 What absolute environmental standards have been applied in reaching a “no-significant-impact” conclusion ?