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Operationalising a declared mine rehabilitation plan in Victoria: insights from the Hazelwood case study

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Abstract

Victoria's Mineral Resources (Sustainable Development) Act 1990 and associated declared mine regulations establish the Declared Mine Rehabilitation Plan (DMRP) as a statutory instrument for rehabilitation and closure planning at declared mines. The DMRP links rehabilitation objectives, measurable criteria, monitoring, verification and licence relinquishment within a structured regulatory process.

Hazelwood mine, located in the Latrobe Valley, Victoria, provides an important case study in the practical implementation of this new regulatory instrument. As the first of Victoria's declared mines to progress a DMRP through public exhibition, Hazelwood illustrates both the opportunities and challenges associated with translating regulatory requirements into a practical, evidence-based rehabilitation plan.

This paper examines how the Hazelwood DMRP has been structured and operationalised through rehabilitation domains, closure objectives, measurable criteria, monitoring and verification processes. It also considers how risk is reflected through the identification of hazards, risk pathways and domain-specific performance measures across active rehabilitation, passive rehabilitation and post-relinquishment phases.

The paper further examines the interface between the DMRP and the environmental effects statement (EES) process, particularly where parallel statutory processes create sequencing, communication and stakeholder engagement challenges. These issues are relevant to Hazelwood because the DMRP must identify a preferred rehabilitation concept while the EES assessment of that concept and alternatives remained under way.

Drawing on the Hazelwood experience, the paper identifies practical insights for future declared mine rehabilitation planning, including the need for clear scope definition, early guidance, transparent treatment of residual risk, and closure criteria that can be reviewed and refined as monitoring data and technical understanding improve. The Hazelwood case study demonstrates that the DMRP can operate as an adaptive planning instrument, provided its objectives, criteria, monitoring commitments and review mechanisms are clearly linked and communicated.

Keywords: *declared mines, DMRP, mine closure, risk-based regulation, Hazelwood*

1 Introduction

Mine closure regulation in Victoria has evolved considerably over the past 2 decades in response to increasing recognition of the long-term environmental, social and financial risks associated with large and complex mining operations. Historically, closure planning was largely addressed through static documents prepared to satisfy licence conditions, often focused on near-term compliance rather than the demonstration of durable, long-term closure outcomes. While these plans provided an important regulatory baseline, they were limited in their capacity to respond to uncertainty, changing risk profiles and emerging community expectations over the multi-decadal timeframes associated with mine closure.

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In recent years, this regulatory approach has shifted toward a more explicit risk-based framework that emphasises accountability, transparency and verifiable performance. This shift recognises that mine closure is not a discrete end of life activity, but a progressive and adaptive process that must respond to evolving knowledge, legacy conditions and societal values. Central to this transition is the movement away from static rehabilitation plans toward enforceable statutory instruments that are intended to be reviewed and refined as rehabilitation progresses, capable of revision as risks, evidence and closure strategies develop over time.

The introduction of the Declared Mine Rehabilitation Plan (DMRP) represents a significant step in this evolution. The DMRP establishes a statutory mechanism that links closure planning, financial assurance and licence relinquishment within a single regulatory framework. By requiring clearly defined closure objectives, measurable criteria, monitoring and verification; the DMRP seeks to ensure that rehabilitation commitments are both proportionate to risk and demonstrably achieved. Importantly, it is designed to accommodate long-term uncertainty while maintaining clear regulatory expectations, thereby enabling adaptive management rather than prescriptive end point definition.

The Hazelwood mine, owned and formerly operated by ENGIE, presents a critical case study through which to examine the practical application of this regulatory reform. As one of Australia's largest legacy coal mining sites, Hazelwood is characterised by its scale, complexity and heightened public visibility, as well as strong community expectations regarding safety, environmental protection and future land use. Hazelwood will be the first of the declared mines to implement a DMRP in parallel with the preparation of an environmental effects statement (ESS) which is publicly exhibited. This provides a unique opportunity to assess how the DMRP operates in practice when applied to a site with significant legacy risks and intergenerational closure obligations.

This paper does not seek to present the DMRP as a finalised or fully tested closure framework. Rather, it examines how the DMRP has been applied in practice at Hazelwood and identifies implementation insights arising from that experience. The focus is therefore on the practical structuring of the plan, the treatment of risk and uncertainty, the development of closure objectives and criteria, and the interaction between the DMRP and parallel statutory processes.

2 Regulatory and policy context

The DMRP responds to longstanding challenges in mine closure governance, including premature relinquishment, insufficient financial assurance, and the limited capacity of traditional rehabilitation plans to remain fit for purpose over extended closure horizons. By formalising rehabilitation planning as a living instrument linked to verification, financial mechanisms and licence relinquishment, the Victorian regulatory regime seeks to align closure practice more closely with risk profile, community expectations and public interest outcomes.

The introduction of new regulations after cessation of mining has imposed considerable unforeseen time and cost demands on ENGIE, requiring the closure concept to be fully revisited and assessment of impacts and alternatives prosecuted publicly. This unplanned process has resulted in ENGIE bearing significant commercial and regulatory obligations throughout an extended care and maintenance period. Given the scale and complexity of the project, the regulator may not have fully anticipated the resources, preparation and implementation effort required under the new regulations, contributing to understandable but challenging delays. While public empathy for a multinational entity may be limited, it is important to recognise that the mine was originally established by the State in the 1940s to serve the Victorian community and was subsequently acquired during the period of privatisation. Ultimately, the regulatory burden at the point of closure falls primarily on the licence holder, despite the fact that insufficient planning during the mine's operational phase was a collective responsibility.

2.1 Declared mine rehabilitation plans under the *Mineral Resources (Sustainable Development) Act 1990*

For the purposes of this paper, the DMRP is described as a statutory rehabilitation planning instrument rather than a stand-alone framework.

Its practical structure comprises:

1. definition of post-mining land use and landform
2. identification of rehabilitation domains and subdomains
3. identification of closure objectives and measurable closure criteria
4. monitoring and verification processes to demonstrate performance
5. identification and management of residual risks to people, property, land, environment and infrastructure
6. post-relinquishment monitoring and management plans.

In Victoria, DMPRs are governed by the *Mineral Resources (Sustainable Development) Act 1990* and the Mineral Industries Amendment Regulations 2022. These regulations apply to mines declared by the Minister that present heightened closure risk due to factors such as scale, complexity, legacy conditions or duration of post-closure management.

Ministerial Guidelines for preparation of a DMRP released by the Victorian Government in October 2025 prescribe the required structure and content of a DMRP, including the identification of rehabilitation domains, closure objectives, measurable criteria and associated monitoring and verification mechanisms. The Ministerial Guidelines emphasises clear linkages between identified hazards, risk pathways and defined outcomes, thereby embedding risk-based thinking into closure planning. Importantly, DMRPs are subject to regulatory review and public exhibition, reinforcing transparency and enabling greater scrutiny of proposed closure strategies.

A critical feature of the DMRP regulatory framework is its explicit connection to licence relinquishment and inclusion of a risk-based post-closure monitoring and maintenance plan that defined contribution to the post-closure fund for management of legacy impacts into perpetuity. Demonstrable achievement of closure objectives and criteria, supported by verifiable evidence over defined timeframes, forms the regulatory basis for determining whether relinquishment may be considered. This approach seeks to avoid the transfer of unresolved closure risk to the State while providing proponents with greater certainty regarding the evidentiary expectations associated with long-term closure performance.

2.2 Declared Mine Fund and financial assurance mechanisms

The Declared Mine Fund (the Fund) operates as a complementary financial mechanism intended to ensure adequate resources are available to address residual closure risk. Contributions to the Declared Mine Fund are calibrated to the rehabilitation and closure risks identified within the DMRP, reinforcing the principle that financial assurance should be proportionate to risk and responsive to changes over time.

This represents a departure from traditional financial assurance models that rely heavily on upfront bonds or bank guarantees, which may not reflect evolving risk profiles or the extended durations over which closure outcomes must be demonstrated. By linking financial contributions to a risk-based rehabilitation plan, the Declared Mine Fund seeks to improve alignment between regulatory assurance and actual closure performance.

The integration of financial mechanisms with adaptive rehabilitation planning reflects a broader policy intent to strengthen accountability for intergenerational risks while maintaining flexibility to accommodate innovation and site-specific solutions. However, this approach also introduces new challenges, including the need for robust assessment of risk and impacts, specific, measurable, achievable, relevant, timely (SMART)

performance criteria, and post-closure governance arrangements capable of managing long-term uncertainty, land management functions and financial assets.

3 Site context: Hazelwood mine

3.1 Site history and legacy conditions

The Hazelwood mine is a large open cut brown coal mine located in the Latrobe Valley, Victoria, operated for several decades to supply coal to the adjacent Hazelwood power station (Figure1). Since the 1980s, rehabilitation planning for the site has been centred on the concept of forming a pit lake. Following privatisation in 1996, the pit lake concept was formalised in the approved mine work plan, which contemplated a full lake to approximately the Morwell River level reference level (RL) +45 m Australian height datum (AHD). However, closure planning subsequently evolved in response to operational priorities, water availability considerations, and regulatory approvals pursued to enable continued mining. In particular, the 2004–2006 EES for the mine expansion introduced alternative closure concepts that differed markedly from the established full lake approach. While these alternatives sought to address groundwater and stability considerations, they were not fully assessed against long-term passive safety or sustainability objectives.

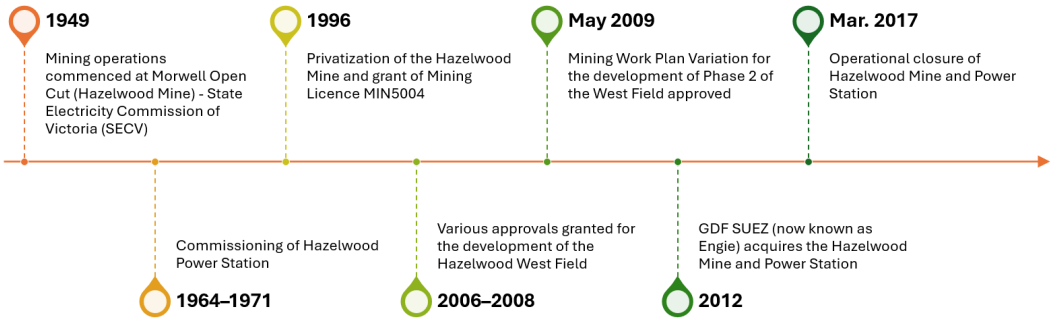

Figure 1 Key operational milestones, Hazelwood mine

ENGIE Hazelwood is the current mine licence holder and is responsible for preparing and implementing the Hazelwood DMRP in accordance with Victorian statutory requirements. This responsibility includes demonstrating how the proposed rehabilitation concept, closure objectives, measurable criteria and monitoring programs will support achievement of a safe, stable and sustainable post-mining landform.

In the wake of the millennial drought, one of the most severe droughts in Australian history impacting Victoria between 1997 and 2009, the 2009 variation to the mine work plan further revised the closure concept, proposing a partial pit lake with a substantially lower final water level to minimise water demand. This concept was informed by preliminary hydrogeological modelling aimed at counterbalancing aquifer pressures, but it placed greater emphasis on short-term water efficiency than on long-term closure performance. The reliance on ongoing intervention and the absence of a robust evidence base meant that key uncertainties regarding stability and future liability remained unresolved.

The complexity of Hazelwood's legacy conditions became more pronounced following the 2014 mine fire and the subsequent Hazelwood Mine Fire Inquiry (the Inquiry), commissioned by the Victorian Government. The mine fire began in February 2014, during a period of severe fire weather and continued burning for 4 weeks. It was particularly difficult to control due to the burning coal seam. The Inquiry highlighted the elevated risks associated with exposed coal batters, long-term void management, and fire susceptibility, and concluded that pit lake rehabilitation options represented the most viable pathway for long-term risk reduction across the Latrobe Valley mines. Importantly, the Inquiry also emphasised the need for a mine-specific, detailed closure assessment rather than the application of generic solutions as areas were at different stages of rehabilitation and risk was unevenly distributed across the mine site, meaning generic

closure frameworks were inadequate as they assumed uniform conditions and did not prioritise high-risk zones during these stages of rehabilitation.

ENGIE Hazelwood has not been permitted to progress final rehabilitation of the mine since coal production ceased in 2017. While progressing assessment of the of the rehabilitation concept, ENGIE Hazelwood continues to undertake 'no regrets' rehabilitation (being works that will be required to be undertaken regardless of final landform approval), including batter stabilisation, overburden placement and decommissioning of redundant infrastructure. Concurrently, extensive technical investigations have been completed to improve understanding of geotechnical stability, groundwater behaviour, hydrological connectivity and environmental risk.

3.2 Closure vision and post-mining transition

Against this backdrop, the long-term vision for Hazelwood has progressively shifted from closure as a purely technical rehabilitation exercise towards a broader post-mining transition that seeks to return the site to a beneficial use consistent with community expectations and regional development objectives. While this approval pathway, illustrated in Figure 2, reflects best practice by providing for stakeholder participation in decision-making, it has also significantly delayed rehabilitation implementation and exposed the company to complex financial and operational risks.

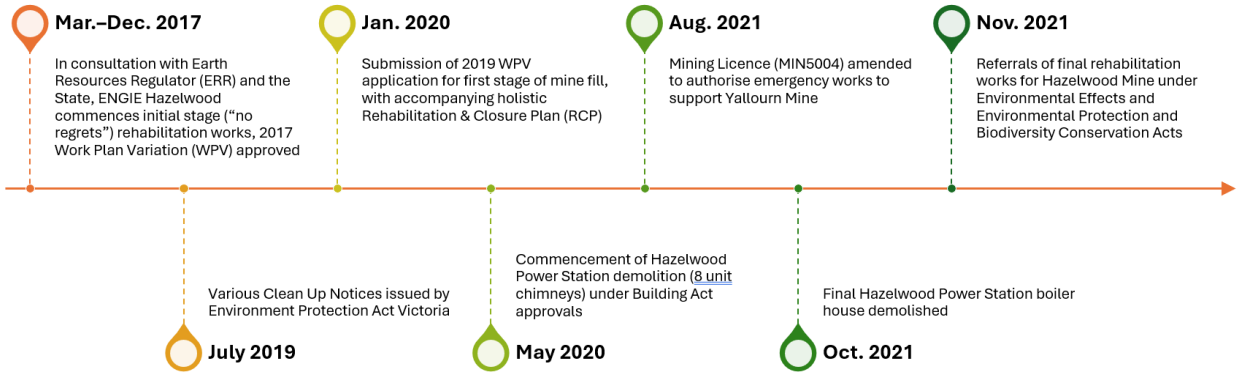

Figure 2 Hazelwood closure timeline

The preferred closure concept underpinning the Hazelwood DMRP of a high-level pit lake is informed by a growing body of site-specific technical studies as well as international experience with rehabilitated lignite mines, particularly in Germany. This concept has been reinforced through successive assessments, including investigations undertaken for the Inquiry and subsequent detailed geotechnical, hydrological and hydrogeological studies. These assessments indicate that a full lake provides the most viable option for managing key long-term risks without compromising water availability for environmental values and community use.

Notwithstanding this overarching vision, post-mining land use at Hazelwood is subject to a range of constraints arising from stability, safety and environmental thresholds. These constraints limit the feasibility of certain land uses and necessitate careful consideration of intergenerational risks, particularly where reliance on active management or engineered controls would compromise long-term sustainability. The DMRP framework provides a mechanism to define closure objectives and measurable criteria that reflect these considerations, while allowing for adaptive management as knowledge improves. In this context, Hazelwood's transition from an operational mine to a post-mining landscape is framed not as a single end point decision, but as a staged, evidence-based process that must demonstrate enduring performance within a range of permissible uses before relinquishment and broader opportunities can be realised.

These legacy conditions make Hazelwood a useful case study for examining the practical application of the DMRP. The site requires a rehabilitation planning approach capable of addressing long-term geotechnical, groundwater, fire, water management and land use risks, while also providing sufficient transparency for regulators, communities and future land managers.

4 Closure concept development and risk basis

4.1 Rationale for the preferred closure concept

The Hazelwood Concept Master Plan (CMP) prepared in 2019 was informed by strategic background studies and technical investigations, supported by an analysis of key site elements, the surrounding context, and the challenges and opportunities these present for the Hazelwood site. This work culminated in a consolidated assessment of site constraints and opportunities that were considered with identifying suitable end land uses and final landform options for the Hazelwood site as represented in Figure 3.

The preferred closure concept for Hazelwood was not selected solely on the basis of land use aspiration. It was informed by the need to reduce material long-term risks associated with the mine void, including geotechnical stability, groundwater interaction, exposed coal and fire risk, water management and future land capability. In this sense, the closure concept provides the foundation for the risk-informed structure of the DMRP.

In determining end land uses, it was essential to consider the site's expansive nature and diverse landforms, which could support a range of post-mining uses. Rather than prescribing fixed land uses, ENGIE Hazelwood seeks to support informed decision-making by transparently identifying residual risks and constraints, and by incorporating input from stakeholders and adjacent landowners. This approach enables responsible, sustainable development that can respond to current and future needs.

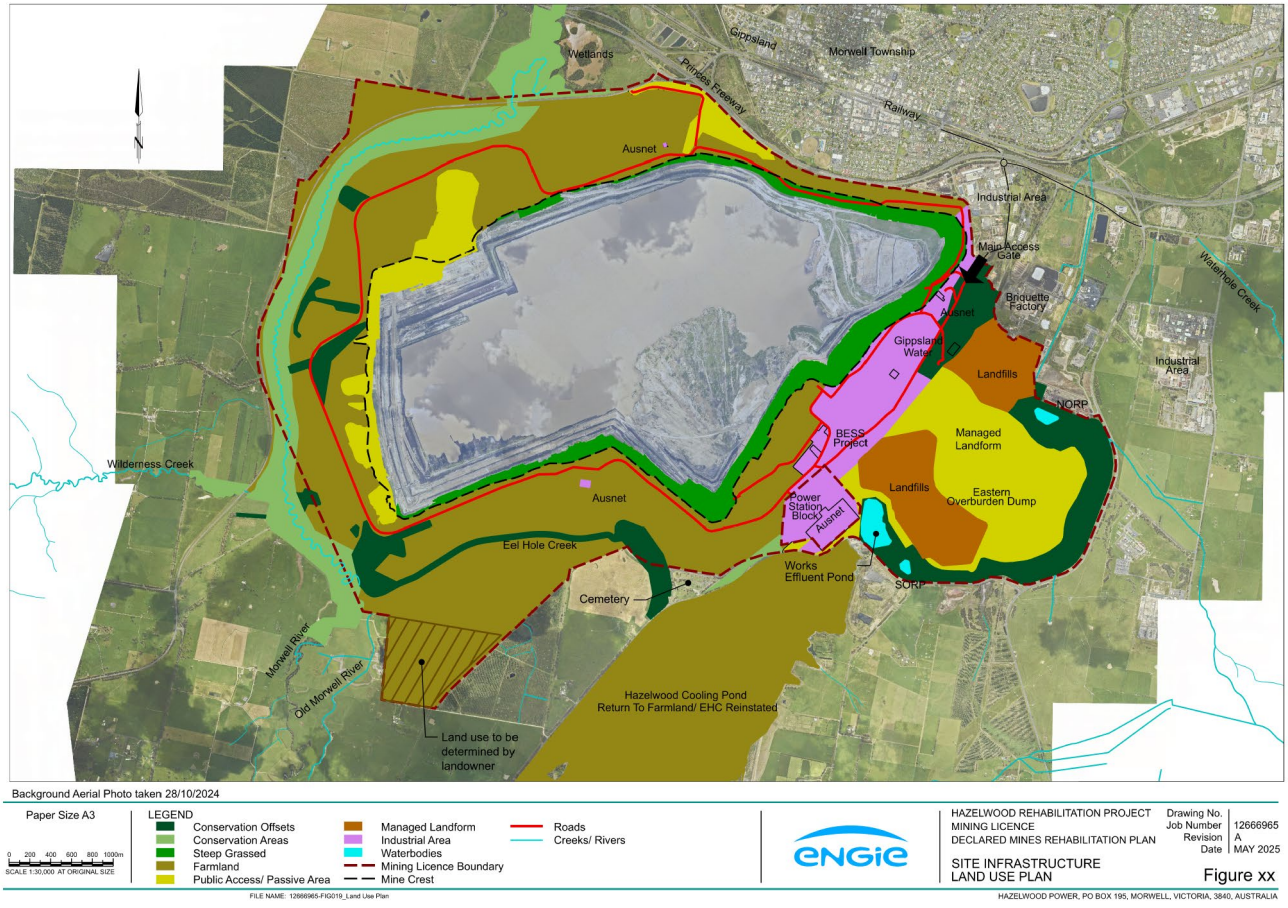

Figure 3 Site infrastructure land use plan

The following factors were considered when determining the preferred end land uses:

1. Stability assessment – robust geotechnical and hydrogeological assessments that define land characteristics that are critical to ensuring each closure domain is safe, stable and sustainable.
2. Planning /zoning controls – current and future planning provisions and zoning controls that may stipulate specific controls for end land use, particularly in the context of mitigating the risk of fire.
3. Tenure of land – internal and external to mine lease, current and future.
4. Land Use – agricultural, cultural, industrial, transport, recreation, future utilities and service infrastructure that align with risk mitigations for fire.
5. Sensitive receptors – ensuring people, property, land, environment and infrastructure are considered in the context of current and future impacts.
6. Natural features – open space, waterways, floodplains, wetlands and riparian zones.
7. Heritage areas – (cultural and historical) adjacent to the project and within waterways and remnant vegetation.

Central to the preferred landform is the proposed high-level pit lake to RL +45 m AHD. The pit lake landform provides a solution to the key technical risks associated with the mine, including floor heave, slope failure, ground movement and coal fire. Within this RL +45 m AHD filled pit lake option, there are 2 scenarios that are being considered, across a range of criteria, in the landform and water supply options assessment undertaken for the EES. These scenarios are an 'unconnected lake' scenario, which does not interact with any other waterways, and a 'connected and controlled lake' scenario, which could take a limited portion of peak flows from the Morwell River during flood events and controlled discharge back into the Morwell River downstream.

4.2 Project phases

There are 3 key phases of rehabilitation considered in the DMRP, each of which have a unique risk profile. Figure 4 provides an overview of the 3 phases and key activities which occur in each phase.

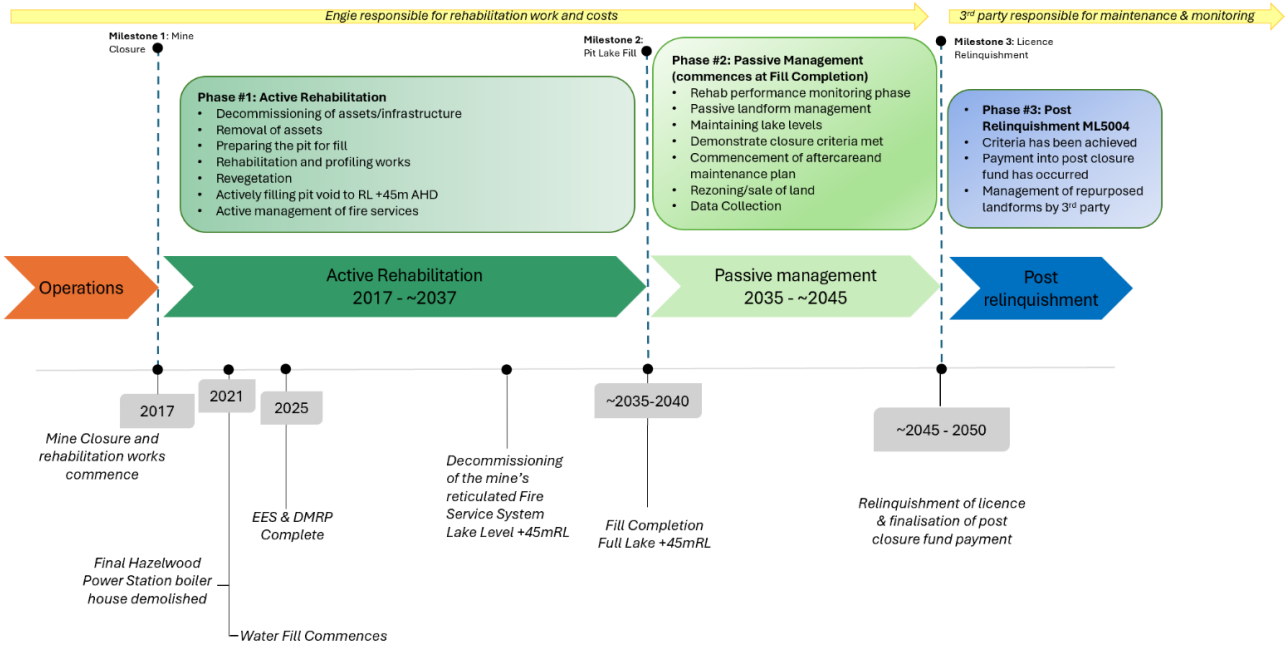

Figure 4 Overview of the rehabilitation phases and key activities

The 3 phases are outlines as follows:

- Active rehabilitation – time in which active works are occurring on site, including demolition and disposal of assets, landform earthworks, active management of fire services system, filling of the lake and revegetation.
- Passive management – filling the lake, active management of fire services system, monitoring and maintenance of rehabilitated landforms.
- Post relinquishment – following attainment of completion criteria and relinquishment of the mining licence, land is transferred to post-mine land manager.

4.3 Risk assessment and hazard pathways

The process undertaken to identify risk events, hazards and their associated impacts during the rehabilitation of the Hazelwood site has been a continual evolution of a risk management process employed by ENGIE since 2015. The consequence of impact on community health and wellbeing is considered within each risk category. For the purposes of the DMRP, risk is considered through the relationship between identified hazards, potential impact pathways, affected domains, closure objectives and measurable criteria. This approach allows the risk profile to be considered across different rehabilitation phases, recognising that some risks reduce as active rehabilitation works are completed, while others require longer-term monitoring and verification.

A total of 46 risks were identified in the DMRP risk register, with the risk profile changing over time, as presented in Table 1. The purpose of identifying these risks was not only to record potential events, but to ensure that material risks were reflected in the closure objectives, criteria and monitoring requirements assigned to each relevant domain. This provides the connection between the DMRP risk register and the practical requirements against which rehabilitation performance will be assessed.

Table 1 Risks identified

Category	Total	Number of risks at each phase		
		Active rehabilitation	Passive rehabilitation	Post closure
Fire	5	5	5	5
Security	3	3	3	3
Geotechnical	10	10	10	10
Environmental	28	26	25	21
Total	**46**	**44**	**43**	**39**

4.4 Closure objectives and measurable criteria

Closure objectives define the overarching outcomes required for licence relinquishment: a safe, stable, sustainable and non-polluting landform. Closure criteria translate these objectives into measurable requirements for assessment and verification. Criteria are developed at the domain level and reflect each area's risk profile, physical characteristics and proposed post-closure land use. They must identify the performance outcome, supporting evidence and timeframe for verification.

Examples include criteria for geotechnical stability, water quality, erosion, vegetation establishment and absence of unacceptable risks to people or the environment. Criteria may be short, medium or long term, depending on the time required to demonstrate performance. Monitoring and maintenance programs support verification and enable corrective action where required. The DMRP also manages uncertainty through conservative assumptions, model validation, trigger action response plans and periodic review.

Importantly, closure criteria are not static. The DMRP is intended to operate as an adaptive statutory instrument that can be reviewed and refined as rehabilitation progresses, monitoring data become available, technical predictions are validated or revised, and residual risks are better understood. For Hazelwood, this adaptive function is particularly important because some closure outcomes, including landform stability, groundwater response, water quality and ecosystem development, can only be confirmed over medium- to long-term timeframes. The 'living' nature of the DMRP is therefore expressed through its monitoring, verification and review mechanisms, rather than through continual change for its own sake.

5 Interface with the environmental effects statement

The DMRP and the EES are complementary but distinctly separate statutory instruments that collectively inform decision-making for the long-term closure and rehabilitation of the Hazelwood site. Each process operates under a different legislative framework and with different approval pathways.

The DMRP defines the adopted rehabilitation concept, closure objectives and closure criteria required to achieve licence relinquishment and deliver a safe, stable, sustainable and non-polluting landform. The EES, by contrast, assesses the potential environmental, social and economic impacts associated with the proposed rehabilitation concept and rehabilitation alternatives, including cumulative and long-term effects.

By virtue of statutory timeframes under the new regulations, the DMRP has been developed while the project is the subject of an EES process which is incomplete; therefore, assumptions regarding the preferred closure concept, landforms, land uses and post-closure management have been adopted in the DMRP. It is anticipated that the EES will result in recommendations, conditions or refinements that will directly influence future refinements of the DMRP, and the DMRP will therefore need to be revised at the conclusion of the EES to incorporate the EES findings. While this iterative interaction ensures consistency between closure planning and environmental impact assessment outcomes, it creates a challenge for regulators and communities reviewing and endorsing the DMRP in advance of EES completion.

5.1 Environmental impacts associated with long-term and intergenerational land use change

In the Hazelwood context, the EES is relevant to the DMRP because it assesses the broader environmental, social and economic implications of the rehabilitation concept and associated alternatives over long timeframes. The EES complements this framework by assessing the significance, likelihood and consequences of potential adverse outcomes under plausible future scenarios, including climate variability, land use change pressures and altered hydrological regimes. Together, the DMRP and EES should ensure that rehabilitation outcomes are assessed not only for technical compliance at the point of relinquishment, but also for their capacity to support acceptable environmental and social outcomes for future generations. This integrated approach supports informed decisions about the acceptability of residual risks and the long-term suitability of proposed post-mining land uses.

5.2 Constrained post-mining land use options driven by safety and stability thresholds

Post-mining land use options that are presented in the DMRP are fundamentally constrained by the requirement to achieve and maintain safety and stability thresholds over the long term. The EES acknowledges and assesses these constraints by examining whether proposed land uses are compatible with the inherent characteristics of the rehabilitated landforms and the level of residual risk that remains after closure. This approach ensures that post-mining land use planning is grounded in realistic and defensible assumptions about land capability, rather than aspirational outcomes that may be incompatible with long-term risk management. The EES therefore reinforces the DMRP's risk-based framework by testing the environmental acceptability of land uses that are technically achievable within defined safety and stability limits.

5.3 Complementary and overlapping regulatory considerations

The interface between the DMRP and the EES reflects a broader regulatory environment in which multiple statutory regimes apply to mine closure and rehabilitation at Hazelwood including, mining, environmental protection, planning, water, and land management legislation. While the DMRP is the primary instrument governing rehabilitation obligations and licence relinquishment, the EES provides a mechanism for coordinating requirements across these regulatory domains. Areas of overlap such as water supply and quality protection, biodiversity outcomes, land stability and long-term risk management are addressed through consistent assumptions, aligned performance measures and clearly defined responsibilities.

Importantly, neither process operates in isolation. Conditions or commitments arising from the EES may be reflected in the DMRP as updated closure criteria, monitoring programs or mitigation measures. Conversely, the DMRP provides assurance that rehabilitation commitments assessed through the EES can be implemented, monitored and verified over time.

Although it is recognised that these 2 regulatory instruments complement each other, issues have arisen with their simultaneous approval. Delivering a coherent and integrated framework for managing closure risks and supporting effective regulatory and community decisions depends on interdepartmental collaboration and consistent government approaches. However, in Hazelwood's instance and given the site is the first to tread this path, shortcomings in the planning and execution of overlap in statutory instruments have been noted. This has inevitably led to duplication, delays and confusion in project execution, negatively affecting ENGIE's ability to progress the project, straining resources and exhausting communities as a result of new statutory obligations on the back of extensive engagement over recent decades.

6 Implementation insights from the Hazelwood Declared Mine Rehabilitation Plan

The preparation of the ENGIE Hazelwood DMRP highlighted practical insights and several important lessons for future declared mine rehabilitation projects. Key challenges arose from the interaction between the DMRP and the EES, particularly where rehabilitation planning milestones preceded EES assessment outcomes leading to some stakeholder confusion regarding the status of preferred closure concepts. Additional complexities resulted from the absence of government guidance for the newly introduced DMRP framework, differing spatial boundaries between the DMRP and EES, and the need to clearly communicate responsibilities and post-closure outcomes across multiple regulatory jurisdictions. The project also reinforced the importance of developing clear, measurable and verifiable closure criteria to build confidence among future land managers and support successful land transfer and relinquishment outcomes. These observations are relevant to future declared mine projects because they show where guidance, sequencing, scope definition and stakeholder communication are critical to effective implementation.

6.1 Interface and timing between the Declared Mine Rehabilitation Plan and the environmental effects statement

One of the most significant challenges encountered during the development of the DMRP was its interface with the EES, particularly with respect to sequencing and timing. Public exhibition of the DMRP was a statutory requirement prior to the finalisation of the EES process. This created tension and confusion for some stakeholders, who questioned why the DMRP identified a preferred closure concept when that concept had not yet been fully assessed through the EES.

The DMRP is intended to describe the final post-closure landform and land use for the mine licence area with sufficient certainty to support the development of closure criteria. By contrast, the EES assesses the level of impact from a proposed outcome, alongside a range of alternatives, at a particular point in time. The different timing of these processes made it difficult to communicate clearly that the DMRP closure concept was provisional and would be refined in response to EES findings, even though this is implicit in the regulatory framework. This experience highlights the need for clearer guidance on how preferred options in a DMRP should be presented and understood when EES approvals remain outstanding.

Implementation insight: future declared mine projects would benefit from more explicit regulatory guidance on managing and communicating 'preferred but assessable' closure concepts, particularly where EES processes are running in parallel or lagging key DMRP milestones. This should also cover identifying and prioritising issues that are material to a specific EES decision at a given point in time, recognising that ongoing site management responsibilities will continue to naturally evolve.

6.2 Timely government guidance to support new regulatory instruments

At the time of the Hazelwood DMRP preparation and exhibition, Government guidance on this new regulatory instrument was yet to be released. This resulted in significant interpretation of evolving regulatory expectations and in the absence of a reference framework the application of best practice principles was challenging. While a lack of guidance did encourage a degree of innovation and flexibility, it also introduced uncertainty regarding the level of detail, formality and evidentiary burden expected by regulators and stakeholders. In some instances, matters such as closure criteria structure, treatment of uncertainty, and the relationship between objectives and performance measures had to be developed iteratively through engagement rather than guided by established protocols.

Implementation insight: early establishment of guidance to accompany release of new statutory instruments would materially improve consistency, reduce rework, and support greater parity between rehabilitation plans across different declared mine sites.

6.3 Scope variability between Declared Mine Rehabilitation Plan and the environmental effects statement

The difference in spatial scope between the DMRP and the EES presented a further complexity. The DMRP applies strictly to the mining licence area, whereas the EES encompasses a broader project footprint, including assets and landforms such as the Hazelwood cooling pond that fall outside the mining licence boundary.

This mismatch required careful explanation to stakeholders, many of whom reasonably expected a single, integrated description of all post-closure outcomes. The separation of responsibilities and regulatory instruments – while logical from a statutory perspective – was not always intuitive, and at times contributed to confusion regarding accountability, ongoing management responsibilities and long-term land use outcomes.

Implementation insight: where DMRP and EES boundaries do not align, early and repeated clarification of roles, scope, and jurisdiction is critical. Clear mapping and narrative explanation should be a foundational component of stakeholder communication strategies.

6.4 Securing buy-in from future land managers

The Hazelwood experience reinforced the importance of closure criteria as a trust-building mechanism. Clearly defined, measurable, and verifiable closure criteria provide future land managers with assurance about what conditions they will inherit, what risks have been avoided or mitigated, and what responsibilities remain after relinquishment. Where such criteria are perceived as too vague or overly reliant on future management, confidence in land transfer and re-use may be undermined.

Implementation insight: early engagement with prospective land managers, coupled with transparent closure criteria that clearly delineate residual risks and responsibilities, is critical to enabling successful post-mining land transitions.

6.5 Transferability to future declared mine projects

The Hazelwood DMRP experience demonstrates that declared mine rehabilitation planning is as much a governance and engagement challenge as it is a technical one. Key lessons with respect to regulatory sequencing, scope definition, guidance availability and future land stewardship are likely to be common across other large complex mining projects.

Implementation insight: embedding these lessons into future guidance, approval sequencing and stakeholder communication will improve the effectiveness, credibility, and social acceptance of mine rehabilitation planning across Victoria. Most importantly, clearer alignment between strategic impact assessment (EES) and closure delivery frameworks (DMRP) will support more confident decision-making and more durable post-mining outcomes.

7 Implications for adaptive Declared Mine Rehabilitation Plan implementation

The Hazelwood case study highlights broad implementation implications for adaptive mine rehabilitation planning. These implications are relevant to the DMRP because the ability to update criteria, incorporate new evidence and respond to changing expectations depends on a regulatory environment that supports timely decision-making and proportionate management of risk. Where approval pathways are delayed or expectations remain uncertain, the adaptive function of the DMRP may be constrained in practice.

Innovation in mine closure is increasingly recognised as essential to achieving sustainable, cost-effective and socially acceptable outcomes. Innovative approaches to complex projects with long execution timeframes are required to ensure they respond to technical advancements and evolving stakeholder expectations. However, we must ensure that the current regulatory and approval environment does not allow innovation to be constrained by systemic risk aversion rather than a lack of technical solutions. Regulatory frameworks are designed to minimise long-term liability and public risk, but in doing so can unintentionally favour conservative, precedent-based approaches that defer innovation until late in the mine life when flexibility has largely been lost. Worse still where it implements regulatory burden that is so timely and resource intensive that opportunities are lost, which could otherwise be funnelled into innovative closure outcomes. This dynamic reinforces legacy constraints, increases closure costs, does not meet community expectations and transfers unresolved risk to governments and communities.

When end-state objectives, performance standards and post-closure responsibilities remain ambiguous for much of a mine's operating life, regulators and operators both default to risk-averse decision-making. Late-stage negotiations then occur under heightened financial and political pressure, limiting the scope for alternative land uses, innovative landform designs or adaptive closure pathways. While Victoria has introduced coordination mechanisms such as the Latrobe Valley Regional Rehabilitation Strategy to improve alignment, the gap between operator planning and community and government expectations remains evident, largely because closure decisions are still left too late in the project life cycle.

International experience, particularly observed during a recent European study tour by ENGIE, highlights a contrasting approach at some European sites. In jurisdictions such as Germany, early and binding commitments between the State and mine operators establish long-term closure objectives alongside operational approvals. Closure is treated as a shared planning challenge rather than a residual compliance task. With clearer expectations set earlier, operational mandates are more certain, community expectations can be better managed, and opportunities for governments to participate in achieving parallel objectives such as regional development, water management or biodiversity outcomes become more apparent. Importantly, financial risks are identified and managed earlier, reducing the likelihood of costly surprises at the end of mine life.

International examples considered by ENGIE indicate that closure outcomes may be more effectively supported where long-term expectations are established earlier and where regulators, operators and governments have a shared understanding of closure objectives. For Hazelwood, this reinforces the importance of using the DMRP not only as a compliance document, but as an adaptive instrument that records current assumptions, identifies residual uncertainty and provides a pathway for criteria and management measures to be refined over time.

8 Conclusions

The Hazelwood DMRP provides an important case study in the practical implementation of Victoria's declared mine rehabilitation planning requirements. As the first of Victoria's declared mines to progress a DMRP through public exhibition, Hazelwood demonstrates the value of a structured statutory instrument that links rehabilitation domains, closure objectives, measurable criteria, monitoring, verification and licence relinquishment.

The case study also shows that the effectiveness of the DMRP depends on how clearly these elements are connected. A risk-informed approach requires more than the identification of hazards in a risk register; it requires material risks to be reflected in domain-specific closure objectives, measurable criteria and monitoring commitments. Similarly, the adaptive or 'living' nature of the DMRP depends on clear review mechanisms that allow criteria and management measures to be refined as monitoring data, impact assessment outcomes and technical understanding evolve.

The Hazelwood experience highlights several practical implementation challenges, including the sequencing of the DMRP and EES processes, the need for clearer guidance for new regulatory instruments, the importance of scope definition, and the need to communicate residual risks and land use constraints to stakeholders and future land managers. These insights are relevant to future declared mine projects and other complex closure settings where long-term rehabilitation outcomes must be demonstrated under conditions of uncertainty.

Overall, the Hazelwood case study indicates that the DMRP has the potential to support more transparent and adaptive rehabilitation planning where its objectives, criteria, monitoring and review mechanisms are clearly defined and consistently communicated. Continued refinement of guidance, engagement and regulatory coordination will be important to ensuring that future DMRPs operate effectively as practical tools for long-term mine rehabilitation and closure planning.

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Use of artificial intelligence disclosure statement

In the preparation of this work, the author used Microsoft Copilot to enhance readability, correct grammatical errors and refine phrasing. The authors have reviewed the content and edited it where required and take full responsibility for said content.