INDEPENDENT EXPERT ADVISORY PANEL FOR MINING

ADVICE RE:

METROPOLITAN COAL MINE

Stage 2: LONGWALLS 312-316

Date: 31 March 2025

Report No: IEAPM 202503-02

EXECUTIVE SUMMARY

On 4 July 2024, the Director Resource Assessments, NSW Department of Planning, Housing and Infrastructure (DPHI) requested the Independent Expert Advisory Panel for Mining (IEAPM – 'the Panel') to provide advice in relation to the proposed Extraction Plan (EP) for secondary coal extraction from Longwalls (LWs) 311-316 at the Metropolitan Coal Mine. Metropolitan Mine (MM) is operated by Metropolitan Collieries Pty Ltd (MC), a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). The EP is for longwalls in the mining area approved in 2009 for the Metropolitan Coal Project (MCP).

The scope of the Advice sought from the Panel was as follows:

- *Whether the Panel's previous recommendations in the documents above have been adequately addressed, in particular in relation to large swamps and water quality modelling and monitoring;*
- *The adequacy of large swamp impact predictions presented in the Large Swamp Assessment (Appendix H of the EP) and associated appendices;*
- *The adequacy of the proposed performance measures and indicators for large swamps required by condition 4(b) Schedule 3 of the consent and included in the Large Swamp Assessment (Section 7.2), and the need or otherwise to set more defined performance measures for large swamps beyond those related to threatened species, populations, or ecological communities;*
- *The need or otherwise to modify the mine plan to minimise/avoid impacts, particularly on large swamps, and ensure compliance with existing and proposed performance measures;*
- *The adequacy of the water and swamp monitoring programs;*
- *The water and swamp TARPs and whether they;*
    - *Enable measurement of compliance with existing and proposed performance measures established under the consent and proposed in the EP for large swamps; and*
    - *Have triggers (and associated performance indictors) that adequately reflect the existing and proposed performance measures.*

The Panel should feel free to provide any other advice it considers would assist the Department in reviewing the EP.

After the initial briefing by DPHI Assessments, preliminary review of information and Panel meetings; the IEAPM determined that due to a range of complexities, some unresolved at the time, a two-stage approach was the most suitable for this project. It was envisaged that Stage 1 would conclude advice on LWs 311 and 312 and Stage 2 would deal with LWs 313-316.

Stage 1

Two IEAPM advice reports were submitted to DPHI in Stage 1, being:

05/09/2024

This advice drew a range of conclusions and recommendations relevant to progressing the Panel's consideration of its scope of advice before the Panel could conclude its advice on LW 311 and LW 312.

16/10/2024

This advice was in the form of a letter report which documented some of the complexities associated with distilling the performance measures (PMs) that apply to Swamps 76, 77 and 92, portions of which overlay the proposed LWs 312-316. Consequently, the Panel's advice was limited to supporting the extraction of LW 311 subject to a range of matters that it recommended should be

considered when drafting approval conditions for this longwall panel. Further, consideration of LW 312 was transferred to Stage 2.

A particularly noteworthy complexity associated with providing advice on the EP for LWs 312 – 316 is the standalone and, apparently, uniquely constructed consent condition that constitutes Schedule 3 Condition 4 and that is specific to the undermining of Swamps 76, 77 and 92.

The complexities associated with providing advice on Stage 2 are, to a large degree, a legacy of the fact that the MCP was:

- the first coal project to be assessed after amendments to Part 3A of the *Environmental Protection Act 1979* in 2008 which, at the time, were considered to extinguish the opportunity to retrospectively apply PMs embedded in consent conditions to features not identified at the time of environmental assessment and project determination or to changes in the gazetted status of features from that at the time of environmental assessment and project determination.
- the first coal project to be assessed by the Planning Assessment Commission (PAC) established in 2008; and
- the first coal project assessment that was required to have regard to the 2008 findings and recommendations of the inquiry into the *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield - Strategic Review,* usually referred to today as *The Southern Coalfield Inquiry* (SCI).

These three aspects resulted in a step change in the rigour of environmental assessment of coal projects, driven by the findings of the SCI and by the PAC Assessment Panel including subject experts. However, in the case of the MCP:

1. the bulk of the Environmental Assessment (EA) for the project had been completed prior to the findings of the SCI, and
2. there was a learning curve associated with framing consent conditions to reflect the objectives of the new assessment regime.

These two factors impacted on the way some consent conditions were framed for the MCP, in particular Schedule 3 Condition 4 which pertains specifically to Swamps 76, 77 and 92. The Panel concludes that this condition does not reflect the core aspects of the PAC's relevant recommendations that it was intended to address and is effectively unworkable. Further, additional complexities have been introduced by a lack of appreciation by some as to what gave rise to the consent condition, compounded by Coastal Upland Swamps subsequently being gazetted by both the State and Federal Governments as an *Endangered Ecological Community.* These and other factors have had implications for the varied interpretations and expectations of a range of stakeholders, including some aspects of advice previously provided by the Panel. These are addressed in this seminal advice for LWs 312-316.

The Panel researched the background to this situation and sought a range of input, concluding that it was not possible to satisfy the literal wording of Schedule 3 Condition 4. Notwithstanding this, subject to some refinements, the PMs for Swamps 76, 77 and 92 proposed by MC could largely satisfy the intent of the PAC's foundation recommendations.

Based on the material presented to the Panel, the supplementary information supplied by MC and the Panel's approach to resolving complexities, the Panel has made the following conclusions and recommendations in relation to the EP for LWs 312-316 (version R01-C).

CONCLUSIONS

Complexities and their resolution

1. Schedule 3 Condition 4 specific to Swamps 76, 77 and 92 aims to reflect the PAC recommendations that prompted the formulation of this approval condition, but it has been drafted in a manner that appears unique as a project approval condition and, taken literally, presents difficulties in practice to the point of being illogical and unworkable.
2. These difficulties appear to arise out of the step change in the rigor of project assessment introduced at the time of assessment of the MCP and the associated learning curve in how environmental consent conditions were to be framed going forward.
3. The concept of swamps of 'special significance' was advanced by the PAC and raised in some submissions is academic going forward. The PAC reported that it found no convincing evidence to classify any swamps as such, the Panel does not consider that any of Swamps 76, 77 or 92 to be of 'special significance', there is no basis for applying the concept retrospectively, and the concept has been superseded by the subsequent gazetting of Coastal Upland Swamps as an EEC.
4. Swamp 92 is a significant example of a Coastal Upland Swamp that is large, complex and in pristine condition and, given that the majority of this swamp overlies only first workings, the Panel concludes that MC's revision to the mine plan to now stop LW 312 and LW 313 short so as to both avoid undermining this swamp and restrict subsidence effects to very low values, complemented with MC's designation of a Performance Measure (PM) for this swamp of negligible environmental consequences, are responsible and welcomed actions.
5. Based on its own review of the PAC report that informed the framing of environment-related consent conditions, the Panel does not consider that the EP comprehensively addresses the PAC's concerns regarding managing impacts on the valley infill sections of Swamps 76 and 77 and the environmental consequences of any impacts for the headwater sections of these swamps. Since the PAC's concerns were not clearly captured in Schedule 3 Condition 4, this may have to stand. However, the outcomes of subsidence assessment and environmental assessment for the valley in-fill sections of Swamps 76 and 77 suggest that the incomplete capture of the PAC's recommendations may not have serious implications for achieving the PMs that are relevant for these swamps.
6. In the given circumstances, and in light of the PAC's assessment report and the MCP consent conditions, the Panel concludes that both the intent of the PAC in regard to Swamps 76, 77 and 92 and the intent of Schedule 3 Condition 4 could be achieved if:
    a. MC's proposed PM for Swamp 92 of *"negligible environmental consequences"* was endorsed by the Planning Secretary ('Director General').
    b. MC's proposed PM for Swamps 76 and 77 of "negligible environmental consequences for threatened species" was to be expanded to "negligible environmental consequences for threatened species, ecological communities and populations" in order to also be consistent with Schedule 3 Condition 1, and endorsed by the Planning Secretary (noting that this is confined to species, ecological communities and populations gazetted as threatened at the time of the Project Approval).
    c. Any approval of the EP for LWs 312-316 included a requirement that all valley closure impacts which present a risk to not achieving the approved PMs relevant to Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.

7. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

Groundwater

8. The groundwater recommendations from the Panel's advice on LWs 311-312, all of which are relevant to LWs 312-316, have been addressed satisfactorily in the proposed TARP or otherwise in the MC responses to the recommendations, with exceptions:
    a. The shallow Hawkesbury Sandstone (HBSS) groundwater should be included in the triggers in the relevant Trigger Action Response Plan (TARPs) (Table 14A and Table 14 B of the Biodiversity Management Plan (BMP)).
    b. Soil moisture measurements should explicitly be considered in the analysis of impacts and consequences following a level 2 or 3 swamp groundwater trigger in both Table 14A and Table 14 B of the BMP.
    c. Further refinements to the description of the semi-quantitative analysis of groundwater recession are advisable.
9. The proposed piezometer in the lower end of Swamp 77 will be a useful source of information, but due to the nature of the lower end of the swamp this piezometer will not be a suitable basis for a TARP or groundwater performance indicator. The Panel concludes that the practical options for assessing the hydrological impacts at the downstream end of Swamp 77 are: monitoring of hydrology at the installed sites further upstream in the swamp since these will influence the baseflow supply to the lower end of Swamp 77; and monitoring of physical impacts to the rockbars at the downstream end of Swamp 77.

Surface water

10. The surface water recommendations in the Panel's advice on LWs 311-312, all of which are relevant to LWs 312-316, have been addressed satisfactorily in the MC responses, with the exception of aspects raised in the Biodiversity section of this advice.

Biodiversity

11. If valley closures along lengths of tributaries R and S are as high as predicted, this is likely to result in environmental consequences for threatened species if and where they are present, particularly the Littlejohn's Tree Frog and Giant Burrowing Frog which both rely on pools for breeding. If these impacts do occur, and result in loss of breeding habitat, the environmental consequences for these species are unlikely to be considered negligible. In the case of tributary P, the additional/incremental valley closure due to the extraction of LWs 311-316 is not high and less likely to result in environmental consequences for threatened species, if they are present.
12. The TARPs for amphibians, presented in the Revised BMP (November 2024) are generally supported. However, a number of amendments to these TARPs are recommended.
13. Baseline surveys for the Giant Dragonfly and Ground Parrot are incomplete and no TARP or monitoring program is provided for either threatened species. If the baseline surveys for the Giant Dragonfly or Ground Parrot identify these species, then amendments to the BMP will be required including additional monitoring and a new TARP(s).

14. The Panel's previous (Stage 1) recommendation that the assessment of the biodiversity PM for Swamps 76, 77 and 92 should be based directly on the groundwater performance indicator was premised on these swamps being regarded as EECs for the purpose of assessing the EP for LW 312-316. Given this this premise is no longer considered appropriate, the Panel concludes that PM is now interpreted as relating only to threatened species and that previous recommendation is superseded by those below.
15. Notwithstanding the above, the Panel is of the view that should the Giant Dragonfly be recorded in the upland swamps, exceedance of a swamp groundwater performance indicator is highly likely to lead to exceedance of the threatened species PM given the obligate dependence of this species on groundwater. A robust TARP, performance indicator and monitoring program will be required if biodiversity monitoring is relied upon to demonstrate that the PM has not been exceeded.

RECOMMENDATIONS

Complexities and their resolution

The Panel recommends that:

1. The intent of Schedule 3 Condition 4 be given effect by approval conditions that:
    a. Endorse the refined mine layout that now results in LW312 stopping 120 m short and LW313 stopping 80 m short of their originally planned finishing points.

    b. Endorse MC's proposed PM for Swamp 92 of *"negligible environmental consequences".*

    c. Are based on MC expanding its proposed PM for Swamps 76 and 77 to "*negligible environmental consequences for threatened species, ecological communities and populations*" before endorsement by the Planning Secretary.

2. Any approval of the EP for LWs312-316 should include a requirement that all valley closure impacts which present a risk to not achieving the approved PMs for Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.

3. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

Groundwater

4. The level 2 TARP in Tables 14A and 14B of the BMP should include a trigger for potential impacts on HBSS shallow (~10m) groundwater levels where suitable baseline data exist, whereby an accelerated reduction in shallow HBSS groundwater levels would trigger an action. One piezometer per swamp with the longest period of baseline data would suffice.
5. The level 3 TARP in Tables 14A and 14B of the BMP should be robust enough to ensure that low baseline substrate groundwater levels do not preclude a trigger.
6. The technical document on implementing the semi-quantitative groundwater trigger should be incorporated as an appendix in the Water Management Plan or the MC Annual Report, and that

the time-series of groundwater levels from which the cumulative frequency distributions are derived is added to the document for the readers' reference.

7. The incorporation of soil moisture in Table 14A (footnote 6) of the BMP should be replicated in Table 14B of that document.

Surface Water

8. MC's progress with implementing previous Panel recommendations related to water quality (Panel Report No: IEAPM 202310-1 R1) should be reviewed by DPHI following publication of MC's 2024 Annual Review.

Biodiversity

9. The threatened species survey program report should be provided as soon as possible by MC and reviewed by DPHI.
10. If the Giant Dragonfly is recorded during baseline surveys, it is recommended that the results of the baseline monitoring and the proposed amendments to the BMP, including a suitable TARP and monitoring program, are provided to DPHI for review and comment. This should occur prior to commencement of secondary extraction of LW312.
11. The Panel considers that there is a strong requirement for pool water level monitoring in suitable breeding pools of tributaries R and S if threatened species are found to be present. The Large Swamp Amphibian Monitoring TARP does not include any triggers related to pool water level. Given the above, the triggers should be amended.
12. The Panel recommends that iron flocculent deposition in suitable breeding pools is monitored and incorporated into the triggers for the Large Swamp Amphibian Monitoring TARP.
13. The Action/Response in the Level 3 trigger in Table 18 of the Revised BMP (November 2024) should be amended to insert the underlined words: "Where appropriate contingency measures or remediation cannot be implemented to address an impact, or remediation measures are unsuccessful in addressing the impact, Metropolitan Coal would provide a suitable offset to compensate for the impact to the satisfactory of the Planning Secretary".
14. The TARP for Large Swamp Amphibian Monitoring should be amended to indicate that if a subsidence impact results in an exceedance of a performance indicator for threatened species, as assessed against control sites, then the PM for threatened species has been exceeded and further assessment against the PM is not required.
15. The proposed TARP for amphibians (Table 18 of the Revised BMP, November 2024) should be applied to Swamps 76, 77 and 92 as well as the downstream extent of tributaries P, R and S.
16. The TARPs for threatened amphibians should focus on changes in abundance for each individual species, i.e. not overall abundance or relative abundance. Table 18 of the BMP should be amended to ensure this occurs. There may be benefit in looking at relative abundance between life cycle stages (e.g. adult males and females to tadpoles) for individual species.
17. A Level 2a trigger should be reported to the Technical Committee as a Level 2a trigger even if detected differences cannot be attributed to mining. Amend the Action/Response to "Any significant differences detected that are not attributable to mining impacts (e.g. are a result of environmental conditions or stochastic events) are to be considered normal conditions and will be reported as Level 1 to the Technical Committee."

18. The performance indicator in Table 18 of the BMP (November 2024) be modified to read 'The abundance of Littlejohn's Tree Frog, Red Crowned Toadlet or Giant Burrowing Frog is not expected to experience a decline compared to previous years that is significantly different to the trend for that species at control sites'. The determination of an impact should be based on a change in abundance of any threatened species and not on the assemblage of all threatened species.

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Glossary

BMP	Biodiversity Management Plan
DCCEEW	NSW Department of Climate Change, Energy, the Environment, and Water
DCCEEW-CPHR	NSW Department of Climate Change, Energy, the Environment and Water - Conservation, Heritage and Regulation Group
DCCEEW-Water	NSW Department of Climate Change, Energy, the Environment and Water – Water Division
DPHI	Department of Planning, Housing and Infrastructure
EEC	Endangered Ecological Community
EP	Extraction Plan
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
HBSS	Hawkesbury Sandstone
IEAPM	Independent Expert Advisory Panel for Mining
IAPUM	Independent Advisory Panel for Underground Mining
LW	Longwall
MM	Metropolitan Mine
PM	Performance measure
TARP	Trigger Action Response Plan
TSC	NSW *Threatened Species Conservation Act 1995*
VWP	Vibrating Wire Piezometer

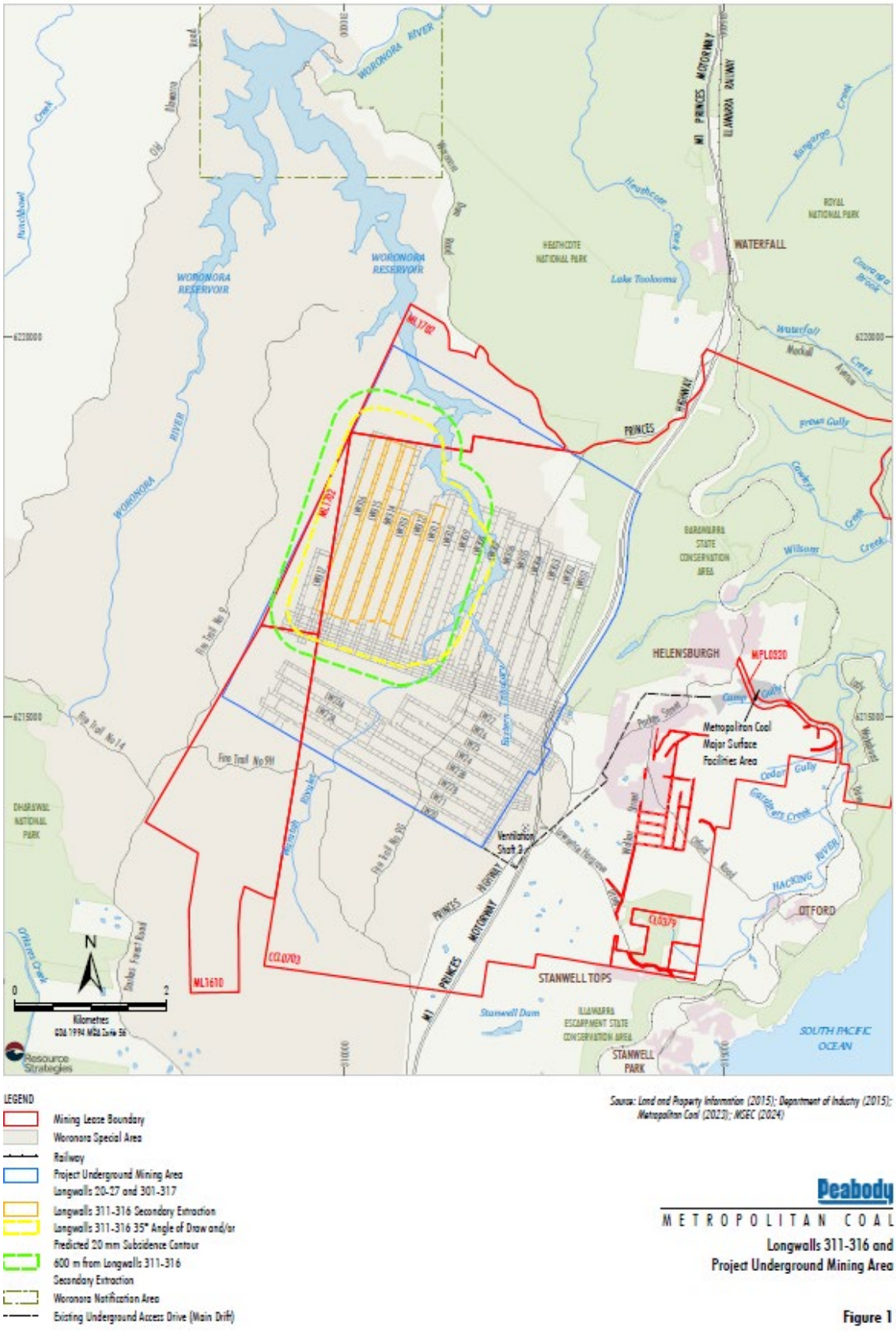
1.0 INTRODUCTION

Metropolitan Mine (MM) is an operating underground coal mine located approximately 30 kilometres (km) north of Wollongong. The mine is operated by Metropolitan Collieries Pty Ltd (Metropolitan Coal - MC), a wholly owned subsidiary of Peabody Energy Australia Pty Ltd (Peabody). Development consent was granted in June 2009 and has been subsequently modified several times. The subsidence impact performance measures (PMs) stated in the Consolidated Consent are described in Schedule 3 Condition 1, reproduced in the following Table 1.

Table 1: Subsidence impact performance measures (Table 6 of the Extraction Plan).

Water Resources	
Catchment yield to the Woronora Reservoir	*Negligible reduction to the quality or quantity of water resources reaching the Woronora Reservoir* *No connective cracking between the surface and the mine*
Woronora Reservoir	*Negligible leakage from the Woronora Reservoir* *Negligible reduction in the water quality of Woronora Reservoir*
Watercourses	
Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P)	*Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases)*
Eastern Tributary between the full supply level of the Woronora Reservoir and the maingate of Longwall 26	*Negligible environmental consequences over at least 70% of the stream length (that is no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining and minimal gas releases)*
Biodiversity	
Threatened species, populations, or ecological communities	*Negligible impact*
Swamps 76, 77 and 92	*Set through condition 4 below*
Land	
Cliffs	*Less than 3% of the total length of cliffs (and associated overhangs) within the mining area experience mining-induced rock fall*
Heritage	
Aboriginal heritage sites	*Less than 10% of Aboriginal heritage sites within the mining area are affected by subsidence impacts*
Items of historical or heritage significance at the Garrawarra Centre	*Negligible damage (that is fine or hairline cracks that do not require repair), unless the owner of the item and the appropriate heritage authority agree otherwise in writing*
Built Features	
Built features	*Safe, serviceable and repairable, unless the owner agrees otherwise in writing*

Under the conditions of the Consolidated Consent, MC is seeking approval for an Extraction Plan (EP) for longwall panels 311 to 316 (LWs 311–316). Figure 1 shows the location of the Project Area and the layout of LW 311 to 316 as proposed in the EP dated 15 November 2024. Figure 2 shows the modified mine plan that is the subject of this advice.



LEGEND

- Mining Lease Boundary
- Woronora Special Area
- Railway
- Project Underground Mining Area Longwalls 20-27 and 301-317
- Longwalls 311-316 Secondary Extraction
- Longwalls 311-316 35° Angle of Draw and/or Predicted 20 mm Subsidence Contour
- 600 m from Longwalls 311-316 Secondary Extraction
- Woronora Notification Area
- Existing Underground Access Drive (Main Drift)

Source: Land and Property Information (2015); Department of Industry (2015); Metropolitan Coal (2023); MSEC (2024)

Peabody
METROPOLITAN COAL
Longwalls 311-316 and Project Underground Mining Area

Figure 1

Figure 1: Plan of existing and proposed longwall workings in the current Project Approval area at Metropolitan Mine based on Revision EP-R01-C of the EP for LW311-316 dated November 2024.

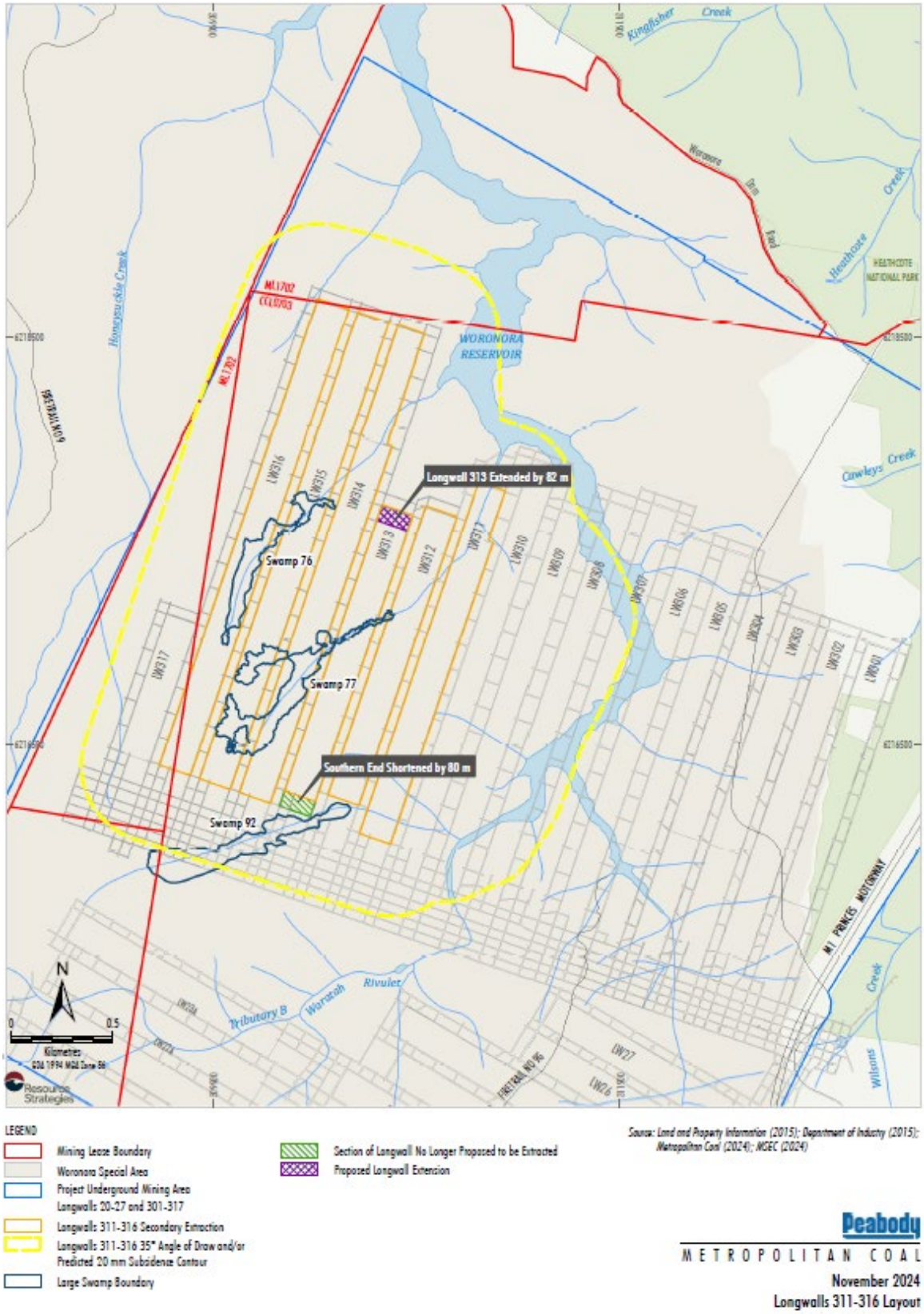


Figure 2: Plan of existing and proposed longwall workings in the current Project Approval area at Metropolitan Mine based on Revision EP-R01-C of the EP for LW311-316 dated November 2024 and revisions to the starting and finishing points of LW313.

LW 311 was approved by the Department of Planning, Housing and Infrastructure (DPHI) in October 2024. This Panel advice relates to the extraction plan for LWs 312 to 316.

As shown in Table 1, the subsidence impact PMs identify a separate condition (Condition 4) for Swamps 76, 77 and 92, the areas of which overlap with the proposed LWs 312-316 (Figure 2). Schedule 3 Condition 4 sets the following requirements:

> *The Proponent shall not undermine Swamps 76, 77 and 92 without the written approval of the Director-General. In seeking this approval, the Proponent shall submit the following information with the relevant Extraction Plan (see condition 6 below):*
>
> *(a) a comprehensive environmental assessment of the:*
>
> - *potential subsidence impacts and environmental consequences of the proposed Extraction Plan;*
> - *potential risks of adverse environmental consequences; and*
> - *options for managing these risks;*
>
> *(b) a description of the proposed performance measures and indicators for these swamps; and*
>
> *(c) a description of the measures that would be implemented to manage the potential environmental consequences of the Extraction Plan on these swamps (to be included in the Biodiversity Management Plan – see condition 6(f) below), and comply with the proposed performance measures and indicators.*

As part of addressing Schedule 3 Condition 4, MC undertook an assessment (referred to as the *Large Swamp* Assessment) of Swamps 76, 77 and 92 and consulted with a range of government agencies.

The primary catalysts for requesting the Panel's advice are concerns raised by WaterNSW and DCCEEW-CPHR regarding potential impacts to swamps and water quality and the associated impacts to threatened species, watercourses and the Woronora Reservoir.

2.0 SCOPE OF WORKS

In 2021, DPHI established the Independent Advisory Panel for Underground Mining (IAPUM) for the purpose of giving it and the Independent Planning Commission (IPC) access to expert advice when assessing mining proposals under the *Environmental Planning and Assessment Act 1979*. The IAPUM's remit was expanded to all mining in 2023 when it was renamed the Independent Expert Advisory Panel for Mining (IEAPM – 'the Panel').

On 4 July 2024, the Director Resource Assessments, DPHI requested the Panel to provide advice in relation to the proposed EP for secondary coal extraction from LWs 311-316 at MM (refer Appendix A). This follows four relevant previous sets of advice provided on MM by the Panel and its predecessor, the IAPUM, these advices being:

1. Advice Re: Water Quality Performance Measures for Metropolitan Coal Mine (IEAPM, 2023a)
2. Advice Re: Large Swamp Environmental Assessment Requirements for the Extraction Plan for Longwalls 311 to 316 (IEAPM, 2023b)
3. Advice Re: Metropolitan Coal Mine: Independent Review of Environmental Performance to 2022 (IEAPM 2023c and IEAPM 2023d)
4. Advice Re: Metropolitan Mine Longwalls 308 – 310 Extraction Plan (IAPUM, 2022).

The scope of DPHI's request for advice pertaining to the EP for LWs 311-316 is as follows:

- *Whether the Panel's previous recommendations in the documents above have been adequately addressed, in particular in relation to large swamps and water quality modelling and monitoring;*
- *The adequacy of large swamp impact predictions presented in the Large Swamp Assessment (Appendix H of the EP) and associated appendices;*
- *The adequacy of the proposed performance measures and indicators for large swamps required by condition 4(b) Schedule 3 of the consent and included in the Large Swamp Assessment (Section 7.2), and the need or otherwise to set more defined performance measures for large swamps beyond those related to threatened species, populations, or ecological communities;*
- *The need or otherwise to modify the mine plan to minimise/avoid impacts, particularly on large swamps, and ensure compliance with existing and proposed performance measures;*
- *The adequacy of the water and swamp monitoring programs;*
- *The water and swamp TARPs and whether they;*
    - *Enable measurement of compliance with existing and proposed performance measures established under the consent and proposed in the EP for large swamps; and*
    - *Have triggers (and associated performance indictors) that adequately reflect the existing and proposed performance measures.*

The Panel should feel free to provide any other advice it considers would assist the Department in reviewing the EP.

The Chair of the Panel (Em. Professor Jim Galvin) convened a Project Panel comprised of the following members[1]. Professor Neil McIntyre co-chaired this Project Panel and coordinated this Advice Report:

- Em. Professor Jim Galvin – Subsidence and Mining
- Mr John Ross – Groundwater
- Professor Neil McIntyre – Surface Water
- Dr Ann Young – Swamps
- Mr Nathan Garvey – Biodiversity and Ecology
- Professor David Waite – Water Quality.

3.0 METHOD OF OPERATION

3.1. ACTIVITIES AND TIMELINE

After the initial briefing by DPHI Assessments, preliminary review of information and Panel meetings; the Panel determined that due to a range of complexities and some unresolved matters at the time, a two-stage approach was the most suitable for this project. It was envisaged that Stage 1 would conclude advice on LW 311 and LW 312, and Stage 2 would deal with LWs 313 – 316.

Stage 1

Two IEAPM advice reports were submitted to DPHI in Stage 1, being:

[1] A summary background on Panel members is presented in Appendix B.

05/09/2024

This advice drew a range of conclusions and recommendations relevant to progressing the Panel's consideration of its scope of advice before the Panel could conclude its advice on LW 311 and LW 312.

16/10/2024

This advice was in the form of a letter report which documented some of the complexities associated with distilling the performance measures (PMs) that apply to Swamps 76, 77 and 92, portions of which overlay the proposed LWs 312-316. Consequently, the Panel's advice was limited to supporting the extraction of LW 311 subject to a range of matters that it recommended should be considered when drafting approval conditions for this longwall panel. Further, consideration of LW 312 was transferred to Stage 2.

Stage 2

This current advice addresses all of the longwalls in Stage 2 (being LWs 312-316) and is presented in the following chapters:

- Chapter 2 – Scope of works
- Chapter 3 – Method of Operation
- Chapter 4 – Complexities and their resolution
- Chapter 5 – Groundwater
- Chapter 6 – Surface Water
- Chapter 7 – Biodiversity
- Chapter 8 – Other Matters
- Chapter 9 – Conclusions
- Chapter 10 – Recommendations.

The Panel convened by videoconference during the preparation of its advice and was administratively supported by the Panel Secretariat staff provided by DPHI – Major Projects Advisory.

The timeline relating to the Panel's assessment of the EP for LWs 311-316 is summarised in Table 2. These activities were supported significantly by a range of knowledge gained by Panel members from previous site visits and documentation reviews relating to MM.

Table 2: Timeline relating to the Panel's assessment of the Extraction Plan for LWs 311-316 at Metropolitan Mine

Date	Milestone
04/07/2024	DPHI request for advice from IEAPM and supply of initial documentation
23/07/2024	Briefing from DPHI staff
23/07/2024	Panel teleconference to discuss issues and to resolve any advice queries
08/08/2024	IEAPM Request for Information (various detail)
14/08/2024	Metropolitan Coal response to IEAPM questions and queries
16/08/2024	Panel teleconference to discuss issues and report structure

Date	Milestone
19/08/2024	Supply of additional information relating to response to agency advice
23/08/2024	BCS briefing
27/08/2024	Panel videoconference to progress report
05/09/2024	IEAPM Advice Report relating to Longwalls 311-312 issued to DPHI-Assessments
04/10/2024	IEAPM Request for Information relevant to Large Swamp assessment, subsidence, field measurements
08/10/2024	IEAPM Request information relevant to Swamp 77
16/10/2024	IEAPM Advice Report relating to Longwall 311 only issued to DPHI-Assessments
05/11/2024	IEAPM Site Visit
11/11/2024	IEAPM request for information relating to borehole logs, imagery, hydrological modelling
14/11/2024	Supply of additional information by Metropolitan Coal
3/12/2024	Supply of additional information by Metropolitan Coal
3/12/2024	IEAPM request for additional information relating to subsidence predictions
07/02/2025	Meeting between Panel Chair and DPHI Assessments
18/02/2025	Supply of additional information by Metropolitan Coal
25/02/2025	Panel videoconference to discuss report progress
17/03/2025	Videoconference with Panel Secretariat

3.2. REFERENCE DOCUMENTATION

Numerous key documents were provided through DPHI to support the Panel in preparing this advice. These documents are listed in Table 3. A range of documents that the Panel has had regard to in compiling this advice are also recorded under References.

Table 3: Reference Documentation

Stage	Document Reference	Document Name
Initial documentation	Provided by DPHI	**Extraction Plan LW 311-316 November 2024 including:** • Appendix 1 – Subsidence Report i. Appendix A Water Management Plan ii. Appendix B Land Management Plan iii. Appendix C Biodiversity Management Plan iv. Appendix D Heritage Management Plan v. Appendix E Public Safety Management Plan vi. Appendix F Subsidence Management Plan vii. Appendix G Coal Resource Recovery Plan viii. Appendix H Large Swamp Assessment • Appendix 2 – Subsidence Addendum Letter **Peabody Six Monthly Report - 1 January to 30 June 2023** • Report and 10 attachments **Pre-submission Agency Advice** • DPI Fisheries • DCCEEW-Water • DCCEEW-CPHR • DCCEEW-CPHR follow up • Heritage NSW • MEG • Subsidence Advisory • WaterNSW • Wollongong City Council **IEAPM High Level Review Report LW 311-316 November 2023 (IEAPM202311-1)** **Metropolitan Coal Response to IEAPM Advice Report 2023** **LW 309 Waratah Rivulet TARP Results** **Metropolitan Coal Response to Submissions Letter**
Supplementary Documentation	Provided by DPHI	**Post Submission Agency Advice** • DCCEEW-CPHR • DCCEEW-Heritage NSW • DPIRD Fisheries • DPIRD NSW Resources • WaterNSW • Wollongong City Council

Stage	Document Reference	Document Name
	Provided by Metropolitan Coal	**Response to Independent Expert Advisory Panel for Mining Request for Information 14 August 2024** • Attachment 1 – Predicted Profiles of Subsidence, Upsidence and Closure along Tributaries • Attachment 2 - Eastern Tributary Water Levels Pre and Post Stream Remediation • Attachment 3 - Eastern Tributary Photography March 2024 • Attachment 4 – Fault Photos • Attachment 5 – Large Swamps Drone Survey **Response to Agency Advice Submissions 19 August 2024** • Appendix 1 Registered Aboriginal Parties Correspondence • Appendix 2 Subsidence Predictions based on Revised Layout, 30m and 60m Width Reductions • Appendix 3 Eastern Tributary Water Levels Pre and Post Stream Remediation • Attachment 4 Metropolitan Coal Mine Eastern Tributary Stream Photos **Large Swamps and Adaptive Management** (issued 26 August 2024)
	Provided by Metropolitan Coal	**Response to Independent Expert Advisory Panel for Mining Request for Information** **Supplied 14 November 2024** • Cross Sections of Honeysuckle Valley S106 • Ariel imagery • Swamp GW Borehole Logs **Supplied 29 November 2024** • Letter Metropolitan Coal Longwalls 311-316 Extraction Plan – IEAPM Site visit **Supplied 18 February 2025** • Metropolitan Coal Longwalls 311-316 Extraction Plan November 2024 R01-C • Biodiversity Management Plan November 2024 R01-C • Subsidence Monitoring Program November 2024 R01-C • Water Management Plan November 2024 R01-C • Appendix H Subsidence Report 16 October 2024 • Longwalls 311-316 Layout November 2024 • MSEC Longwall 313 modified finishing end and commencing end Mine Subsidence Overview 10 December 2024 **Supplied 11 March 2025** • Swamp 77 Contingency Plan

4.0 COMPLEXITIES AND THEIR RESOLUTION

4.1. BACKGROUND TO COMPLEXITIES

The Metropolitan Coal Project (MCP) was assessed in 2009 and is unique in three aspects, being that it was:

- the first coal project to be assessed after amendments to Part 3A of the *Environmental Planning Assessment Act 1979* in 2008 which, at the time, were considered to extinguish the opportunity to retrospectively apply PMs embedded in consent conditions to features not identified at the time of environmental assessment and project determination or to changes in the gazetted status of features from that at the time of environmental assessment and project determination.
- the first coal project to be assessed by the Planning Assessment Commission (PAC) established in 2008 and which, at the time, provided for inclusion of subject experts on PAC Assessment Panels; and
- the first coal project assessment that was required to have regard to the findings and recommendations of the inquiry into the *Impacts of Underground Coal Mining on Natural Features in the Southern Coalfield - Strategic Review* usually referred to today as *The Southern Coalfield Inquiry* (SCI).

The combination of these aspects resulted in a step change in the rigour of assessment of the environmental consequences of underground coal mining proposals. Three particularly important developments were:

- Assessment was no longer to be determined primarily on predicted mining-induced subsidence effects (ground movements), as had generally been the case, but rather on using these predictions to inform associated mining-induced subsidence impacts and environmental consequences as recommended by the SCI and defined in the footnote[2] below.
- A focus was brought to the phenomenon of non-conventional surface subsidence (far-field horizontal movements, valley closure, upsidence and other topographical effects), its significant contributions to mining-induced subsidence effects and environmental consequences in the Southern Coalfield of NSW, and to the limitations of prediction methodologies for non-conventional subsidence.
- A shift to framing consent conditions in terms of PMs that defined maximum permissible subsidence impacts and environmental consequences, rather than in terms of maximum permissible subsidence effects.

This process identified a number of matters during the PAC's assessment of the MCP assessment for which the knowledge base to inform the project assessment was inadequate. Three of these matters that impact on the EP for LWs 311-316 relate to valley closure prediction and impacts, mining-induced environmental consequences for valley-infill swamps, and determining the significance of specific swamps and clusters of swamps (noting that at the time Coastal Upland Swamps had not been gazetted

[2] **Subsidence effects**: the deformation of the ground mass surrounding a coal mine due to the mining activity. The term is a broad one, and includes all mining-induced ground movements, including both vertical and horizontal displacement, tilt, strain and curvature.
Subsidence impacts: the physical changes to the ground and its surface caused by subsidence effects. These impacts are principally tensile and shear cracking of the rock mass and localised buckling of strata caused by valley closure and upsidence but also include subsidence depressions or troughs.
Environmental consequences: the environmental consequences of subsidence impacts, including loss of surface flows to the subsurface, loss of standing pools, adverse water quality impacts, development of iron bacterial mats, cliff falls, rock falls, damage to aboriginal heritage sites, impacts on aquatic ecology, ponding, etc.

as an Endangered Ecological Community). The PAC proposed an approach for determining if some swamps in the Southern Coalfield warranted being classified as of 'special significance'.

The PAC made recommendations to the Department as to PMs for natural and man-made features but, unlike later PAC determinations, the Department had latitude in how these were reflected in the consent conditions.

The mine layout for LWs 311 – 316 has been revised three times since first being assessed by Mine Subsidence Engineering Consultants (MSEC) for the purpose of informing the EP for LWs 311-316. The first revision involved a substantial reduction in the original lengths of all six longwall panels for operational reasons. The second revision shortened the length of LW 312 by stopping mining 120 m short of its originally planned finishing position. The third revision reduced the length of LW 313 by 80 m at the finishing end and increased the length of the panel by 82 m at its commencing end. The second and third revisions are related to the EP review process and implemented for the purpose of providing an added level of environmental protection to Swamp 92 by standing off all longwall panels from it.

Figure 3 shows two mining layouts referred to in EP documentation as the 'Previous Layout' and as the 'Revised Layout'. It does not capture the latest revisions to LW 312 and LW 313 shown in Figure 2. The figure shows Swamps 76, 77 and 92 and their associated tributaries S, R and P, respectively, which are focal points in this chapter.

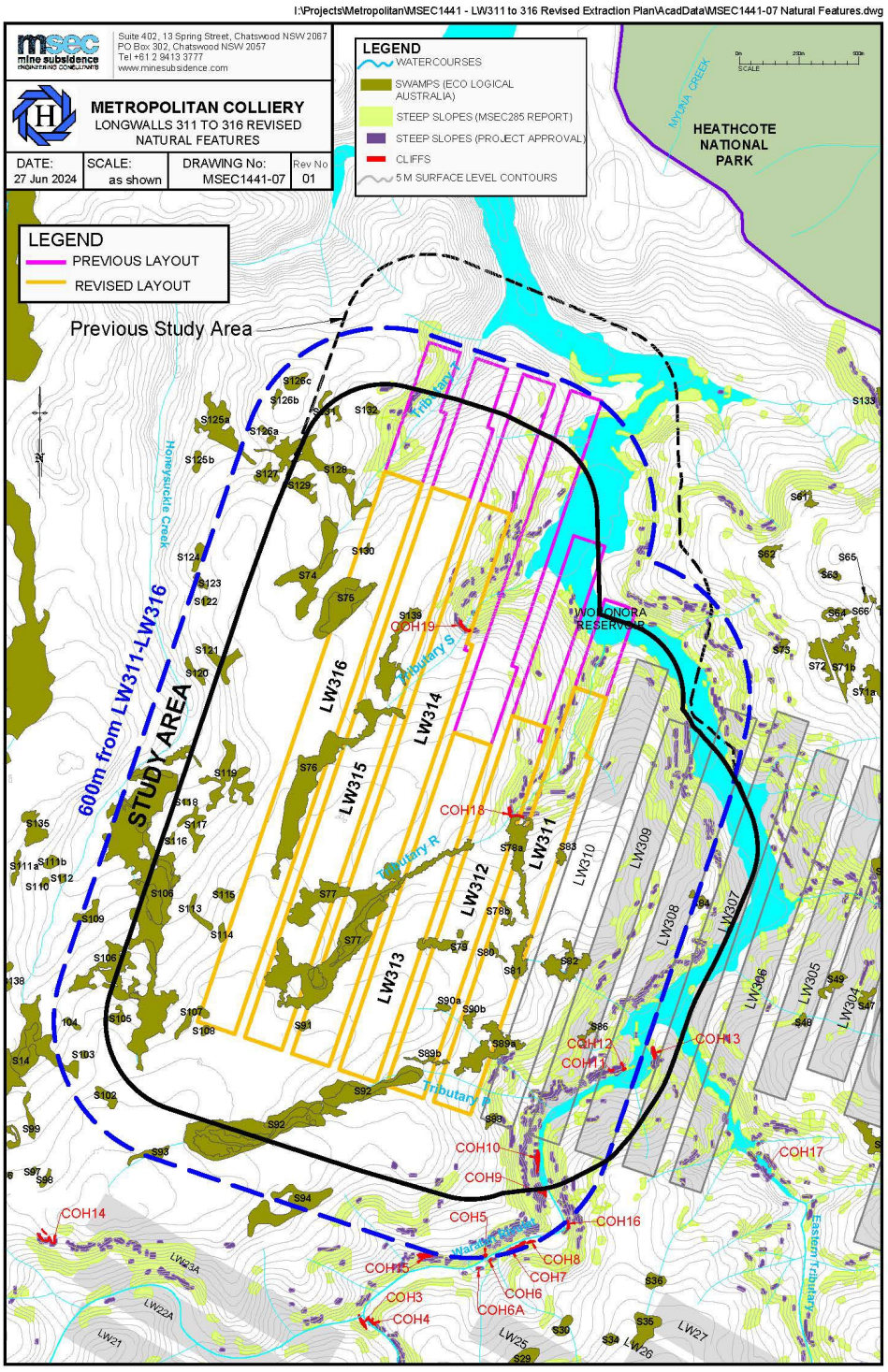


Figure 3: The mine layout for LWs 311 to 316 (MSEC, 2024b), noting that it does not capture changes made to the finish points of LW 312 and LW 313 and the starting point of LW 313.

4.2. COMPLEXITIES

A number of environment-related complexities are associated with assessing the proposed mine layout and management plans for LWs 312-316. These principally relate to:

Swamps of Special Significance

A number of stakeholders contend that one or more of Swamps 76, 77 and 92 are swamps of 'special significance', a concept introduced in the PAC's 2009 *Review Report for the Metropolitan Coal Project*. MC considers that none of the three swamps qualify as swamps of special significance (Peabody, 2024).

Schedule 3 Condition 4

Schedule 3 Condition 4 (repeated here because of its particular relevance to this advice and bolded for later comparison purposes) states:

> ***The Proponent shall not undermine Swamps 76, 77 and 92 without the written approval of the Director-General. In seeking this approval, the Proponent shall submit the following information with the relevant Extraction Plan (see condition 6 below):***
>
> ***(a) a comprehensive environmental assessment of the:***
>
> - ***potential subsidence impacts and environmental consequences of the proposed Extraction Plan;***
> - ***potential risks of adverse environmental consequences; and***
> - ***options for managing these risks;***
>
> ***(b) a description of the proposed performance measures and indicators for these swamps; and***
>
> ***(c) a description of the measures that would be implemented to manage the potential environmental consequences of the Extraction Plan on these swamps (to be included in the Biodiversity Management Plan - see condition 6(f) below), and comply with the proposed performance measures and indicators.***

This form of consent condition appears to be unique in two critical respects, namely:

a) It provides for the Proponent, rather than the project assessment process, to determine a PM; and
b) It provides for the determination of a PM to be delayed until many years after project approval and the commencement of mining, being some 15 years in this case.

Due to the advanced and locked-in state of the overall mine layout that formed the basis of the project assessment and approval conditions, the introduction of any new PM at such a late stage in the life of an underground mining operation has an elevated possibility of not being able to be satisfied either at all, or without impacting adversely on the continuity of production and the ongoing viability of the mine plan.

Consideration of Schedule 3 Condition 4 is complicated further by the fact that Swamps 76, 77 and 92 now meet the definition of Coastal Upland Swamps in the Sydney Basin Bioregion as listed under both the NSW *Biodiversity Conservation Act 2016* (BC Act) and Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). At the time of Project Approval in 2009, Coastal Upland Swamps in the Sydney Basin Bioregion had not been gazetted as an Endangered Ecological

Community (EEC)[3]. They were only gazetted as such on 9 March 2012 under Part 3 of Schedule 1 of the NSW *Threatened Species Conservation Act 1995* (now the BC Act) and on 17 July 2014 under the EPBC Act.

The Panel has been presented with a view from some stakeholders that as the PMs for Swamps 76, 77 and 92 required under Schedule 3 Condition 4 have yet to be approved by the Director-General (now Planning Secretary), these three swamps should now be treated as EECs when determining those PMs. Opinions on this view are divided, with MC firmly opposing the proposition.

The Status of the Mine Layout

Longwall panel development has already advanced to a stage where the only mine design control now available for further reducing environmental consequences of extracting LWs 312-316 is to stand off from features. There is a view that if this control is applied to Swamps 76 and 77 it could result in an unviable mining operation. The control is feasible to implement in the case of Swamp 92, because only small portions of this swamp overly longwall panels and these portions are confined to the flanks of the longwall footprints (see Figure 3).

4.3. RESOLUTION OF COMPLEXITIES

The resolution of the complexities noted in Section 4.2 has involved considerable historical research, discussion, third-party advice and time expenditure on the part of the Panel. The Panel has had particular regard to the assessment report of the PAC (DoP, 2009) as it considers that to be the most accurate and verifiable reflection of what the consent conditions were intended to capture.

In that regard, it is noted for the record that the Chair of the IEAPM Panel and a contributor to this current advice, Em. Prof. Jim Galvin, was a member of the PAC Assessment Panel for the MCP and had input into the framing of the PAC's advice on swamps by its Chair, Dr Neil Shepherd. Further, at the time of assessment, the PAC sought and had regard to the advice of Dr Ann Young[4], who is also a member of the IEAPM Panel for this current advice.

This advice on the resolution of complexities is preceded by a summary of several underpinning surface subsidence principles and subsidence predictions for MM in order to facilitate understanding the Panel's advice on these matters.

4.3.1 Underpinning Subsidence Basics

One outcome of the SCI has been the consistent application of the terms 'conventional' subsidence and 'non-conventional subsidence' to describe the two primary sources of subsidence effects. For present purposes, conventional subsidence can be conceptualized as trough-like subsidence of the surface as the overburden sags into mining excavations. The magnitude and areal extent of associated subsidence effects and subsidence impacts are determined primarily by the depth, width and height of the mining excavations (panels) and the widths of the pillars that separate panels (interpanel pillars). Conventional subsidence primarily accounts for subsidence effects and impacts in terrain that is not incised by valleys.

[3] "Endangered" is the status of Coastal Upland Swamps in the Sydney Basin Bioregion under the NSW *Threatened Species Conservation (TSC) Act 1995*. "Threatened" is an umbrella term for Vulnerable, Endangered, Critically Endangered that is used in the MCP Performance Measures. For the purpose of this advice the two words are inter-changeable; however, for consistency with the TSC Act, EEC is used is where referring specifically to the status of the Coastal Upland Swamps under the TSC Act, and "Threatened" is used otherwise.

[4] p.74 of PAC Assessment Report

Non-conventional subsidence, in particular valley closure, is associated with terrain that contains incised valleys, such as that which characterises the Southern Coalfield and the Western Coalfield of NSW and that is reflected in Figure 3. Mining can cause an increase in pre-existing horizontal stress concentrations across valley floors that slowly and naturally drive valley formation. The elevated stress concentrations can cause accelerated cracking, shearing, buckling and uplift (upsidence) of the valley floor strata. The compressive stresses and strains associated with this behaviour can be an order of magnitude, or more, greater than those associated with conventional subsidence and can give rise to significant environmental consequences, especially for continuity of surface flow in valley floors and natural features that depend on surface and near-surface water, and for water quality. While the magnitude of valley closure is also influenced by mining dimensions, it is less sensitive to changes in these dimensions than conventional subsidence and is governed more by the valley depth and width and the proximity of mining.

At the time of determination of the MCP, the concepts of conventional subsidence engineering were well established, and it was accepted that the proposed mine design was conservative for a longwall operation and should result in small levels of conventional subsidence. The EA classified all swamps as 'headwater' swamps, the implication being that they were located away from incised valleys. The combination of these two factors led to the Proponent's proposition that these swamps would not experience more than negligible environmental consequences, which has been the case up to now with respect to demonstrable mining-induced vegetation change.

However, the PAC questioned the proposition that all swamps were headwater swamps and expressed a view that at the least the downstream ends of Swamps 76, 77 and 92 constituted valley infill swamps. This was an important issue because:

1. Severe environmental consequences due to valley closure had already resulted from longwall mining under and in the vicinity of Waratah Rivulet at MM (Mills & Huuskes, 2004),(Galvin, 2005).
2. An understanding of non-conventional subsidence was still evolving.
3. The methodology for predicting non-conventional subsidence effects, impacts and environmental consequences was still under development, with predicted valley closure not correlating well to measured valley closure.

It remains the case that, as shown in Figure 4 (below), predicted valley closure does not correlate well with measured valley closure. This continues to be addressed by designing to an upper bound of predicted valley closure, meaning that measured valley closure is generally less than predicted. However, this poor correlation has implications for predicting impacts due to valley closure, since a range of outcomes can be associated with a given predicted valley closure. This has resulted in the illogical procedure of predicting valley closure impacts based on predicted valley closure rather than on a database of measured valley closure, because predicted valley closure values correlate better with resultant impacts than do measured values. The approach, illustrated in Figure 5, is based on the frequency of cracking of rock bars sufficient to result in a reduction in water being held back by the rock bar. It does not extend to considering other impacts of valley closure. The approach finds application across a number of mining operations in NSW, notwithstanding that it has been the subject of a number of reviews critical of the approach.

Against this background, Figure 6 provides an important basis for resolving some of the complexities associated with the EP for LWs 312-316 and the Panel's advice. It shows the profiles of predicted valley closure for each of Swamps 76, 77 and 92 and their associated tributaries (S, R and P, respectively) for each of the following mine layouts:

- Previous layout (being a layout that was modified just prior to submission of the EP).
- Revised layout (which is now the basis for the EP for LWs 311-316).

- Revised layout but based on a 60 m reduction in panel width, prepared at the request of the Panel.

The most recent revisions to the starting and/or finishing ends of LW 312 and LW 313 are not shown but these result in nil to negligible change in the valley closure predictions shown for the revised layout.

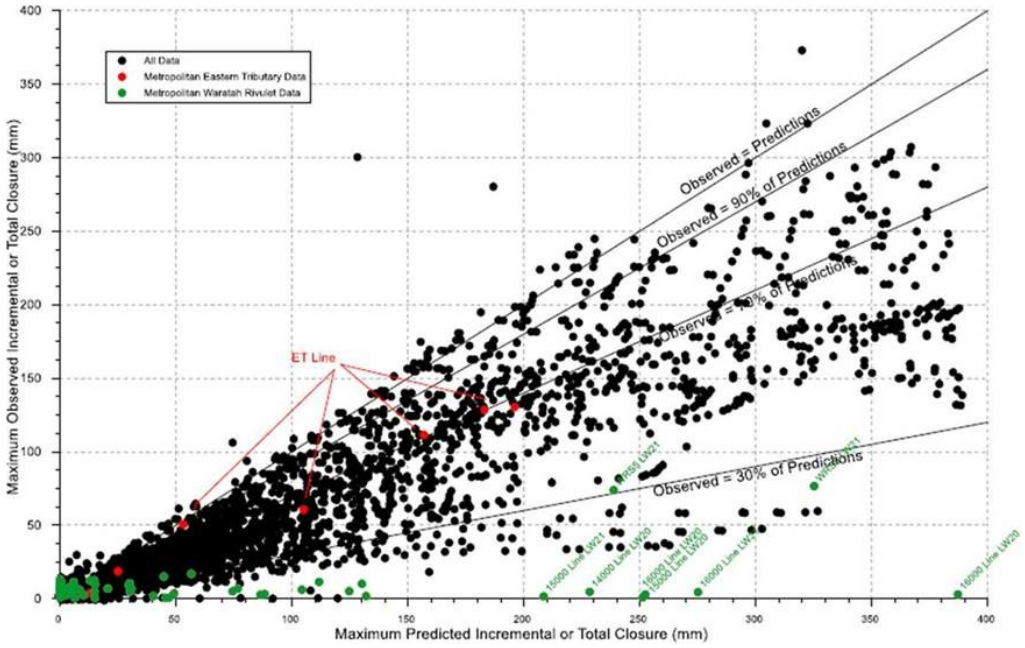


Figure 4: Predicted Versus Observed Valley Closure at Metropolitan Mine and other Southern Coalfield Mines (copied from supplementary information provided by Peabody to DPE 17/08/22).(IEAPM, 2022).

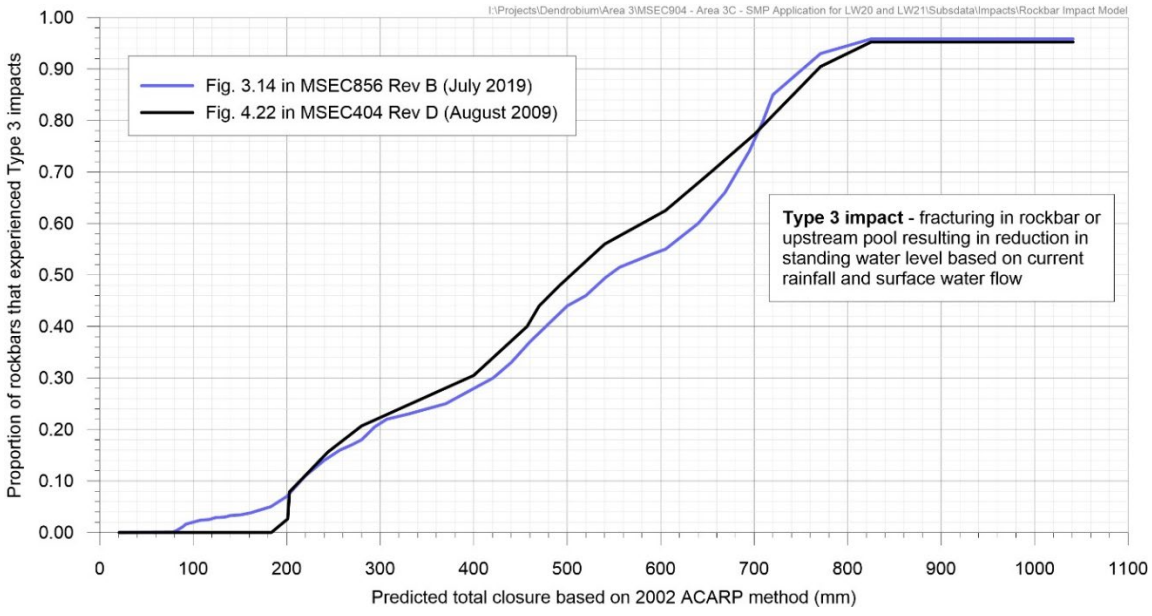


Figure 5: Relationship between predicted total valley closure and proportion of rockbar controlled pools that have experienced Type 3 impacts (Source: (MSEC, 2009, 2019)).

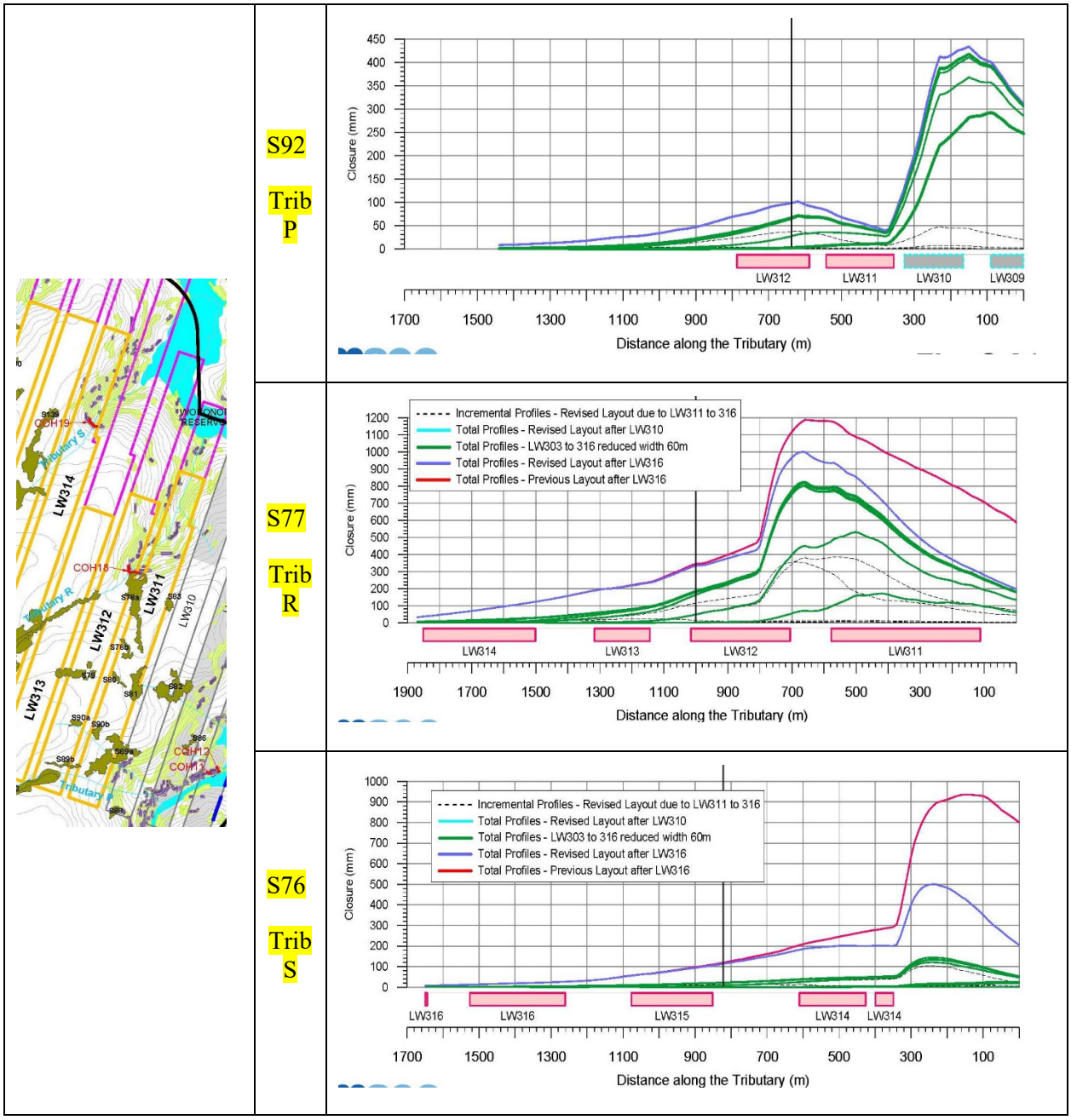


Figure 6: Profiles of cumulative valley closure for 3 different mine layouts evaluated for LWs313 – 316 (Note: LW303 should read LW313). Source: (Peabody, 2024).

4.3.2 Proposed Resolutions

Swamps of Special Significance

The PAC assessment for the MCP introduced the concept of identifying if an individual swamp or group of swamps possessed attributes that resulted in them being of 'special significance' and consequently requiring special consideration in a risk assessment framework. The PAC report stated that:

> *'Special Significance Status' is based on an assessment of a natural feature that determines the feature to be so special that it warrants a level of consideration (and possibly protection) well beyond that accorded to others of its kind. It may be based on a rigorous assessment of scientific*

importance, archaeological and cultural importance, uniqueness, meeting a statutory threshold or some other identifiable value or combination of values.

The PAC then went on to conclude that:

> *There is no convincing evidence before the Panel that identifies any individual swamp or groups of swamps in the project area as being sufficiently unique or different so as to require identification as being of special significance and thus requiring special consideration in a risk assessment framework. This would be the appropriate course if, by some rigorous methodology, a swamp or group of swamps had been identified as being of special significance beyond that accorded to upland swamps generally. The Panel is not convinced that the cluster analysis by DECC provides this level of significance.*[5]

It seems reasonable to the Panel to assume that if Coastal Upland Swamps had already been gazetted as an EEC at the time of determination of the MCP, the PAC would not have had a basis or need to include Swamps 76, 77 and 92 in its consideration of features of 'special significance'. Although this was not the case, the issue of 'special significance' is still considered by some to have currency. This is notwithstanding that, at the time of its assessment, the PAC reported that there was no convincing evidence of any individual swamp or group of swamps that required being identified as being of special significance. In some cases, there appears to be a view that such evidence now exists.

In 2012 the (former) Office of Environment and Heritage (now DCCEEW-CPHR) drafted guidance for proponents when undertaking environmental impact assessment for upland swamps, including recommendations on interpretation of the criteria defined by the PAC. These Upland Swamp Environmental Assessment Guidelines (OEH 2012) were released in draft form. To the Panel's knowledge, they were never finalised or formally endorsed. In its advice of 5 September 2024, the Panel expressed a view that because of their size, vegetation complexity and status as an EEC, Swamps 77 and 92 meet the criteria proposed by OEH (2016) for swamps of special significance on the Woronora Plateau.

Subsequently, there have been a number of developments which have resulted in the Panel revisiting the question of whether Swamps 77 and 92 are of special significance. These include:

- A second site visit by the Panel that provided the opportunity for a more detailed and focussed field inspection and assessment of Swamp 77.
- A recognition, following review of the PAC documents as summarised above, that the conclusions of the PAC assessment should prevail as the PAC had the best understanding at the time of the thresholds that it was advocating for swamps to be classified as of special significance.

Notwithstanding that MC does not consider any of Swamps 76, 77 and 92 to be of special significance, MC concurs with the Panel and other stakeholders that Swamp 92 is a significant example of a large Coastal Upland Swamp that is in pristine condition. Consequently, MC has modified its mine plan to provide this swamp with a high level of protection from mining-induced environmental impacts. The modifications are based on not exposing this swamp to conventional tensile strains greater than 0.4 mm/m (being the generally accepted lower threshold for causing cracking of rock) and to valley closure greater than 100 mm. These criteria have translated to the mine layout being modified so that LW312 and LW 313 now stop 120 m and 80 m, respectively, short of their original planned position.

The Panel considers that any further discussion on whether any of Swamps 76, 77 or 92 are or are not classified as being of special significance is academic.

[5] p.78 of PAC Assessment Report

Schedule 3 Condition 4

In assessing conformance of the EP with Schedule 3 Condition 4, the Panel has assigned particular significance to the following extracts from the PAC Assessment Report. These are presented in page number order to arrive at the PAC's recommendation specific to Swamps 76, 77 and 92.

- *The Panel was directed specifically to take account of the SCI recommendations in reviewing the Project. As a result, significant deficiencies in the information provided in the EA[6] and PPR[7] have been identified and are commented on throughout this report. However, it is important that the context be noted: the Proponent had commenced many of the studies for the EA prior to the SCI Report becoming available and therefore it is unreasonable to expect that this particular EA could take full account of the SCI findings.[8]*
- *The Panel noted that there were significant deficiencies in the EA and the PPR in relation to prediction of non-conventional subsidence impacts at swamps. This led to concerns that a small number of swamps might be at risk from this source and it was considered desirable that further work be undertaken to establish the nature and extent of any such risk before undermining of these swamps could proceed.[9]*
- *The Panel raised with the Proponent on several occasions the issue of the accuracy of the claim that all swamps were headwater swamps. On each occasion, the Panel received strong assurances that the swamps are headwater swamps, e.g. 'there is no evidence to suggest that upland swamps within the Project Area are composite or transitional in nature'.*
- *It is the view of the Panel that the assessment of potential impacts on upland swamps in the Project Area leaves much to be desired. There is insufficient information in the EA to identify areas within swamps that may have predominantly valley infill characteristics with any level of confidence and there is no attempt to provide valley closure and upsidence predictions for individual swamps despite the high levels of strain recorded at some (unspecified) swamps.[10]*
- *The Proponent has also supplied information on the characteristics of the lower ends of swamps S76, S77 and S92 that suggests that the negative environmental consequences of any subsidence impact involving the terminating features of these swamps would have a limited effect on the swamp because the gradient profile of the swamp shows that the pooling effect behind these features only extends for a short distance. The proposition is that a loss of water from this section of the swamp would have little impact on the overall hydrology of the swamp. This is important because it supports the Panel's view that, even though the predicted closure strains using the current methodology are high, the risks associated with pursuing the Panel's recommended strategy for these three swamps are relatively low (See Section 9.4.2).[11]*
- ***After careful consideration of all the material now available to it the Panel considers that, for those swamps unlikely to be exposed to non-conventional subsidence impacts, the risks of significant negative environmental consequences for an individual swamp are low. However…….. The Panel is also of the view that at least three of the swamps identified as being exposed to non-conventional subsidence impacts should be the focus of further attention before undermining is allowed to proceed. These are swamps S76, S77 and S92.***

  Application of the principles in Section 9.4.1 would require consideration of at least the following approval conditions for swamps S76, S77 and S92:

[6] EA – Environmental Assessment

[7] PPR – Preferred Project Report – a report based on a revised mine plan produced by the Proponent in response to some matters arising during the assessment process and which informed the compilation of the consent conditions.

[8] p.i, Executive Summary, PAC Assessment Report

[9] p.iv, Executive Summary, PAC Assessment Report

[10] p.86 of PAC Assessment Report

[11] p.129 of PAC Assessment Report

i) To the satisfaction of the Director-General provide a comprehensive assessment of subsidence impacts and possible negative environmental consequences for each swamp arising from the proposed mining activities including impacts from both conventional and nonconventional subsidence.

ii) If risks of negative environmental consequences are present, conduct an assessment to the satisfaction of the Director-General of the options for managing these risks including possible strategies for avoidance, mitigation and/or remediation. This assessment is to include information on the approach, likelihood of success, costs and any other relevant matter.

iii) Implement the approved strategy to the satisfaction of the Director-General.

iv) If the strategy approved under (iii) includes both undermining the swamp and protection from significant environmental consequences, design and implement an approved monitoring program for the area/s of risk that, where relevant, will:

- ***detect any subsidence-related impact(s) from an approaching longwall or undermining;***
- ***allow those impact(s) to be compared with predicted impact(s);***
- ***identify and measure any hydrologic consequences for the swamp;***
- ***identify and measure any environmental consequences for the swamp; measure the success of any mitigation or remediation strategies employed.***

v) Where the impacts exceed those predicted and the approved strategies under iii) are unsuccessful in preventing environmental consequences, carry out such additional works as may be required to restore the swamp hydrology and/or provide agreed offsets to compensate for the consequences.

This approach is not designed to provide a higher level of protection to Swamps S76, S77 and S92 than that being afforded to other swamps in the Project Area. Depending on the assessed level of risk, the extent of any likely consequences and the options for managing these, it may well be possible to proceed with any planned undermining without reaching the point where a decision must be made to either damage the swamp or alter the mining parameters to reduce the impact.

The Panel considers that the risks to those parts of the three identified headwater swamps in the Project Area that are exposed to potential impacts from valley closure and upsidence can be managed successfully under the suggested approval conditions. However, the Department may wish to consider whether it is satisfied that there are swamps in the Project Area that may be exposed to risk from non-conventional subsidence have been identified.[12]

The Panel's interpretation of the PAC's commentary and overarching PAC recommendation in the final bolded quote is that the PAC was recommending more detailed studies into valley closure and its consequences for the downstream ends of Swamps 76, 77 and 92, with the objective of successfully managing potential impacts from valley closure in order to afford the same level of protection to the valley-infilled sections of these swamps as afforded to their headwater sections. However, the PAC did not preclude damaging a swamp. It provided for conducting an assessment, to the satisfaction of the Director-General, of the options for managing these risks including possible strategies for avoidance,

[12] p.87-88 of PAC Assessment Report

mitigation and/or remediation and for offsets should remediation not be successful, with any approved strategy to be implemented to the satisfaction of the Director-General.

Critically, the PAC did not make any recommendation for new PMs and performance indicators to be developed after Project Approval. The intent and enactment of the PACs recommendations regarding Swamps 76, 77 and 92 appears to have been misinterpreted when formulating Schedule 3 Condition 4.

Given that the criteria for assessing and setting PMs for the MCP represented a step change in how coal projects were to be assessed going forward, the Panel considers it reasonable for a learning curve to be associated with framing consent conditions under these changed circumstances. The need for this learning curve is evidenced, for example, by:

- the Project Approval requiring that a description of the proposed PM and indicators for Swamps 76, 77 and 92 be included (addressed) in the EP upon its submission. This effectively means that the design and approval process is circular, in that the EP is to be submitted prior to the approval of the PMs for Swamps 76, 77 and 92 yet this, in turn, should inform the development of the mine layout on which the EP is to be based. This circular process is also illogical and contributes to the mine layout being defined by longwall roadway development (for which an EP is not required) taking place well ahead of the assessment of the EP for the longwall panels delineated by these roadways. Once the longwall development roadways have been driven, the only principal control still available for restricting the development of environmental consequences for features is stand-off distance from them.
- the other component of the PMs specified for Biodiversity in Schedule 3 Condition 1 (Table 1), which stipulates "negligible impact" for threatened species, populations, or ecological communities. This PM should rather have been expressed in terms of "negligible consequence", consistent with the recommendations of the SCI. The MCP PAC stressed the difference between subsidence impacts and environmental consequences, as evidenced in the following extract:

  > *Subsidence impacts and environmental consequences are not the same thing. In many (possibly most) cases there may be subsidence impacts but, unless they are of sufficient magnitude to affect the hydrologic balance of the swamp, there will be no detectable environmental consequences.*[13]

Notably, the corresponding PM in the Consent Conditions for the subsequent coal project assessed by the PAC and conditioned by the Department (being the Bulli Seam Operations Project) was conditioned as *negligible consequence*.

In endeavouring to comply with Schedule 3 Condition 4, the Biodiversity Management Plan (also dated November 2024) proposes a PM for Swamp 92 of *"negligible environmental consequences"* and, for Swamps 76 and 77, a PM of *"negligible environmental consequences for threatened species"*.[14] The Panel acknowledges and supports the transition away from a PM based on "impacts" to one based on "environmental consequences".

Nevertheless, the Panel does not consider that the EP comprehensively addresses the PAC's concerns regarding managing impacts on the valley infill sections of Swamps 76 and 77 and the environmental consequences of any impacts for the headwater sections of these swamps. Since the PAC's concerns were not clearly captured in Schedule 3 Condition 4, this may have to stand. On this occasion, this may not have serious implications since, as reference to Figure 6 shows:

- Valley closure along tributary P within and immediately downstream of Swamp 92 is predicted to be less than 100 mm which, by reference to Figure 5, implies a very low likelihood of any

[13] P.81 of the PAC Assessment Report
[14] Tables 14B, 15 and 18 of the BMP.

significant valley closure impacts on Swamp 92 (notwithstanding as previously noted the limitations of that predictive approach).

- Similarly, predicted valley closure along tributary S within and immediately downstream of Swamp 76 is predicted to be less than 120 mm which, by reference to Figure 5, again implies a very low likelihood of any significant valley closure impacts on Swamp 76.
- Predicted valley closure along tributary R within and immediately downstream of Swamp 77 is up to about 330 mm and, therefore there is a realistic likelihood of cracking and uplift of this tributary. Subsequent to its advice of 5/9/24, MC was able to provide an access route for the Panel to inspect the downstream end of Swamp 77. This inspection has not changed the Panel's views on the likelihood of valley closure induced impacts at this location. However, the inspection satisfied the Panel that it should be technically feasible to remediate impacts to the degree required to protect the integrity of this area of Swamp 77.

To aid in considering submissions and to provide a valuable point of reference, the Panel requested MC to undertake a sensitivity study of the effect on valley closure of decreasing longwall panel widths by 30 m and by 60 m, notwithstanding that this control is both very unlikely to be economically feasible and comes at too late a stage in the mining program to implement. The outcomes of the study are based on reducing the widths of all four longwalls from LW 313 to LW 316 and are also captured in Figure 6. These actions result in a reduction in predicted valley closure of only 130 to 150 mm.

The Panel notes that the proposed PM for Swamp 92 of *"negligible environmental consequences"* sets an across-the-board absolute and unqualified standard. However, the PM of *"negligible environmental consequences for threatened species"* for Swamps 76 and 77 does not fully encapsulate the elements of the PM for biodiversity set by Schedule 3 Condition 1 (being *"threatened species, populations, or ecological communities"*). The Panel is of the view that this proposed PM should be strengthened to *"negligible environmental consequences for threatened species, ecological communities and populations"*.

The Panel is of the understanding that MC's proposed PMs for Swamps 76, 77 and 92 are not intended to apply to threatened species, ecological communities and populations that were not gazetted as such at the time of Project Approval. The Panel's advice is based on accepting that position as:

1. It aligns with that which has been adopted consistently since 2009 in a range of forums and advices, including environmental audits, the Inquiry of the Independent Expert Panel into Mining in the Catchment (IEPMC), and past advices of the IAPUM and the IEAPM.
2. It is consistent with the objectives of project assessment to lock in the overall mine layout and associated conditions of approval at the time of project assessment in order to provide security of tenure and investment, control over mining going forward and continuity of production.

<u>The Status of the Mine Layout</u>

The term 'first workings' refers to bord and pillar workings that are designed to result in minimal subsidence of the surface. For this reason, they are exempt in NSW from requiring an EP prior to their formation. This includes longwall development roadways, with the result that longwall panels can be formed up well in advance of the assessment and approval of subsidence effects, subsidence impacts and environmental consequences associated with the extraction of the longwall panels that the first workings have already delineated.

In many longwall mining operations, this can have adverse implications for restricting environmental consequences since at least three of the four primary mine design controls for limiting mining-induced subsidence effects and impacts are no longer available, these being:

- Longwall panel width.
- Interpanel pillar width (width of roadway development pillars).
- Longwall panel direction.

In thicker coal seams, mining height may also constitute a primary control.

In the case of LWs 312 – 316, longwall development is already well ahead of longwall extraction and there is no option to reduce mining height. This means that the only option still available for controlling subsidence impacts and associated environmental consequences on features is for longwall panels to stand off from them. This is both pertinent and suboptimal because the EP for these longwall panels has yet to be approved. It takes on added significance given that the PM for biodiversity required by Schedule 3 Condition 4 for Swamps 76, 77 and 92 above these longwall panels has yet to be approved by the Planning Secretary. Given the extensive and irregular surface footprint of Swamps 76 and 77 over LWs 313 to 316, any future need for longwall extraction to stand off from these swamps could have serious implications for continuity of mining.

A number of concerns have been expressed about this situation, not only in regard to MC but also at other longwall mining operations. However, in the case of MC, it needs to be put into perspective since the mine design is already very conservative for a longwall operation. The longwall panel width is narrow (138-163 m), the interpanel pillar width to height ratios are high (~12 to 15) and the mining height is low by industry standards (2.8 m). One implication of these dimensions is that the ratio of longwall development driveage to longwall extraction is very high by industry standards and contributes to longwall development having to maintained well in advance of longwall extraction.

The conservativeness of the mine design for managing conventional surface subsidence was acknowledged by the PAC and by the Independent Expert Panel for Mining in the Catchment (IEPMC, 2019a, 2019b) and is reflected in no reported non-compliances with biodiversity PMs over the last 15 years. The primary issue going forward is the likely effectiveness of the predeveloped longwall layout for managing unconventional surface subsidence associated with valley closure and the potential environmental consequences this could have for threatened species and populations.

4.4. CONCLUSIONS AND RECOMMENDATIONS RE COMPLEXITIES

Conclusions

1. Schedule 3 Condition 4 specific to Swamps 76, 77 and 92 aims to reflect the PAC recommendations that prompted the formulation of this approval condition, but it has been drafted in a manner that appears unique as a project approval condition and, taken literally, presents difficulties in practice to the point of being illogical and unworkable.
2. These difficulties appear to arise out of the step change in the rigor of project assessment introduced at the time of assessment of the MCP and the associated learning curve in how environmental consent conditions were to be framed going forward.
3. The concept of swamps of 'special significance', advanced by the PAC and raised in some submissions, is academic going forward. The PAC reported that it found no convincing evidence to classify any swamps as such, the Panel does not consider that any of Swamps 76, 77 or 92 to be of 'special significance', there is no basis for applying the concept retrospectively, and the concept has been superseded by the subsequent gazetting of Coastal Upland Swamps as an EEC.
4. Swamp 92 is a significant example of a Coastal Upland Swamp that is large, complex and in pristine condition and, given that the majority of this swamp overlies only first workings, the Panel concludes that MC's revision to the mine plan to now stop LW 312 and LW 313 short so as to both avoid undermining this swamp and restrict subsidence effects to very low values,

complemented with MC's designation of a PM for this swamp of negligible environmental consequences, are responsible and welcomed actions.

5. Based on its own review of the PAC report that informed the framing of environment-related consent conditions, the Panel does not consider that the EP comprehensively addresses the PAC's concerns regarding managing impacts on the valley infill sections of Swamps 76 and 77 and the environmental consequences of any impacts for the headwater sections of these swamps. Since the PAC's concerns were not clearly captured in Schedule 3 Condition 4, this may have to stand. However, the outcomes of subsidence assessment and environmental assessment for the valley in-fill sections of Swamps 76 and 77 suggest that the incomplete capture of the PAC's recommendations may not have serious implications for achieving the PMs that are relevant for these swamps.
6. In the given circumstances, and in light of the PAC's assessment report and the MCP consent conditions, the Panel concludes that both the intent of the PAC in regard to Swamps 76, 77 and 92 and the intent of Schedule 3 Condition 4 could be achieved if:
    a. MC's proposed PM for Swamp 92 of *"negligible environmental consequences"* was endorsed by the Planning Secretary ('Director General').
    b. MC's proposed PM for Swamps 76 and 77 of "negligible environmental consequences for threatened species" was to be expanded to "negligible environmental consequences for threatened species, ecological communities and populations" in order to also be consistent with Schedule 3 Condition 1, and endorsed by the Planning Secretary (noting that this is confined to species, ecological communities and populations gazetted as threatened at the time of the Project Approval).
    c. Any approval of the EP for LWs 312-316 included a requirement that all valley closure impacts which present a risk to not achieving the approved PMs relevant to Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.
7. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

<u>Recommendations</u>

The Panel recommends that:

1. The intent of Schedule 3 Condition 4 be given effect by approval conditions that:
    a. Endorse the refined mine layout that now results in LW312 stopping 120 m short and LW313 stopping 80 m short of their originally planned finishing points.
    b. Endorse MC's proposed PM for Swamp 92 of *"negligible environmental consequences"*.
    c. Are based on MC expanding its proposed PM for Swamps 76 and 77 to "*negligible environmental consequences for threatened species, ecological communities and populations*" before endorsement by the Planning Secretary.
2. Any approval of the EP for LWs312-316 should include a requirement that all valley closure impacts which present a risk to not achieving the approved PMs for Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.

3. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

5.0 GROUNDWATER

Shallow groundwater systems located above LWs 311 to 316 comprise:

- Localised perched groundwater in the shallow colluvial substrate in each of the upland swamps (more so in the valley fill swamps rather than the headwater swamps)
- Localised perched groundwater in the weathered HBSS located near surface beneath the upland swamps
- Regional groundwater located at depth in the HBSS. The regional water table beneath the ridgelines occurs within this formation.

Perched groundwater is ephemeral and is recharged by rainfall. Moisture conditions in the swamp substrate are known to vary between fully saturated and dry.

Regional groundwater discharges sustain baseflows to permanent pools and creeks located low in the catchment towards Woronora Reservoir. Declines in this water table due to increased rock fracturing and lateral shears are known to accelerate groundwater drainage and impact water quality and quantity in rock pools, springs and stream baseflows.

Mining can also have impacts on perched groundwater. An acceleration of perched groundwater drainage in both the swamp substrate and the weathered sandstone, resulting in drier conditions for longer periods, can result from surface cracking of the sandstone immediately below a swamp. The Panel recognises that an accelerated decline in perched HBSS groundwater levels does not necessarily mean that there will be a corresponding accelerated decline in substrate water levels, however it is a useful performance indicator to trigger appropriate action.

5.1. RELEVANT RECOMMENDATIONS FROM STAGE 1 ADVICE

Recommendations in the Stage 1 advice relevant to LWs 312-316 are listed below followed by comments on MC's response:

- *The T6 standpipes and the multi-level VWPs for Swamps 92 and 77 and standpipes at two sites in Swamp 76 should be installed as soon as practicable*. The Panel is satisfied that MC is making efforts to install the recommended groundwater monitoring as soon as practicable.
- *It is recommended that updates to the 1-dimensional and 2-dimensional models and their predictions should be undertaken in annual reviews to refine understanding of reasons for any observed subsidence consequences and to refine predictions for subsequent longwalls*. The Panel is satisfied that MC intends to update the swamp hydrology models in consideration of relevant new monitoring data and report updates in annual reviews.
- *The large swamp groundwater level 2 TARP should include a trigger for potential impacts on HBSS shallow (~10m) groundwater levels, at which frequency of analysis of swamp groundwater levels should increase*. The Panel is not satisfied with the proposal for considering the HBSS shallow groundwater in the TARPs. This is addressed in Section 5.2 below.
- *The large swamp groundwater triggers should allow for the possibility that the baseline period levels have been below the logger level*. This has been addressed in the revised TARP although further modification is recommended. This is addressed in Section 5.2 below.

- *The highest-level large swamp groundwater trigger action should include reviewing the mine plan for longwalls yet to be mined; The large swamp groundwater TARP should explicitly state that a trigger at any one site constitutes a trigger for that swamp; The large swamp groundwater TARP should include quarterly reporting of level 2 triggers and associated analysis*. The Panel is satisfied with how these recommendations have been addressed in the revised TARP.
- *The upland swamp groundwater levels 2 and 3 TARP includes a trigger for potential impacts on soil moisture, at which analysis of soil moisture changes in relation to recession rates and groundwater levels should be undertaken*. The Panel is satisfied with how soil moisture has been treated in the revised upland swamp groundwater monitoring TARP (Table 14A of the BMP), and recommends it is similarly included in Table 14B of that document.
- *A technical document, which clearly defines how the large swamp groundwater TARP triggers are assessed, including examples, should be appended to the management plan*. A technical document was provided to the Panel. The Panel considers the method to be reasonable. It is recommended that the technical document is incorporated as an appendix in the Water Management Plan or the Annual Report and that the time-series of groundwater levels from which the cumulative frequency distributions are derived is added to the document for the readers' reference.
- *It is recommended that a shallow swamp groundwater monitoring piezometer is installed near to the end of Swamp 77 at its downstream extent and, if safely accessible, rockbars and pools within the lower end of Swamp 77 should also be monitored for loss of water and visual impacts (fracturing and iron staining)*. MC has committed to installing a piezometer in the lower end of Swamp 77 although the Panel now believes (after the November site inspection) that this site is of limited value. This is reviewed further under Section 5.3 below.
- *It is recommended that the action "Initiate assessment against the performance measure for threatened species" is removed from the highest-level Upland Swamp Groundwater TARP so that the trigger of this [groundwater] TARP defines an exceedance of both the Performance Indicator and the Performance Measure for the large swamps*. The topic of suitable TARPs and performance indicators for the threatened species PM is covered in Section 7.0 of this advice.

5.2. LARGE SWAMP GROUNDWATER MONITORING TARP

In its Stage 1 advice the Panel recommended:

> *The large swamp groundwater level 2 TARP should include a trigger for potential impacts on HBSS shallow (~10m) groundwater levels, at which frequency of analysis of swamp groundwater levels should increase.*

The rationale for this recommendation was given as:

> *The TARP omits the HBSS shallow groundwater level, which if impacted could provide an early warning of groundwater impacts to the swamps.*

The revised proposed large swamp groundwater monitoring TARPs (Table 14B of the Biodiversity Management Plan, November 2024) does not address the recommendation, rather the triggers still rely on measurements of the swamp substrate groundwater levels.

The MC response to the Panel recommendation was:

> *The revised Extraction Plan will include a monthly analysis of the HBSS groundwater levels once valley closure at a Large Swamp GNSS pair is above 50 millimetres (mm). Relevant*

hydrographs and a brief analysis will be provided to the Technical Committee on a monthly basis when the Large Swamp Valley Closure TARP is at Level 1 or Level 2. If the Valley Closure TARP reaches Level 3, the analysis would be increased to a fortnightly frequency.

Associated with that response, MC has proposed a Large Swamps Valley Closure Monitoring TARP, in which the level 2 trigger actions include consideration of swamp groundwater and deeper monitoring data. The Panel considers this to be an insufficient response to its recommendation because:

- The triggers employed in the Large Swamps Valley Closure Monitoring TARP are not a logical or sufficient indicator of potential subsidence impacts and impacts to the shallow HBSS sandstone groundwater may occur prior to the valley closure triggers.
- As previously advised, the shallow HBSS groundwater levels can provide an early warning of impacts to the swamp substrate groundwater levels. At monitoring locations 76-2, 77-2 and 92-2 there is hydraulic connectivity between the shallow HBSS groundwater and the swamp substrate groundwater for much of the time, hence it is likely that drainage of shallow groundwater in the weathered HBSS could lead to impacts on the swamp substrate groundwater during periods of low rainfall.
- The proposed level 2 trigger is not robust since the baseline minimum 7-day substrate water level for some piezometers is at or below the logger level, so it would be impossible for a level 2 trigger to be activated at these locations. One way of addressing this is incorporating the shallow HBSS groundwater levels.
- The Panel's previous recommendation is straightforward to apply where reasonable baseline data exist.

For LWs 312-316, the Panel recommends that the level 2 TARP should include a trigger for potential impacts on HBSS shallow (~10m) groundwater levels where suitable baseline data exist, whereby an accelerated reduction in shallow HBSS groundwater levels would trigger an action. One piezometer per swamp with the longest period of baseline data would suffice. The level 3 TARP should also be robust enough to ensure that low baseline substrate groundwater levels do not preclude a trigger.

5.3. MONITORING AT THE DOWNSTREAM END OF SWAMP 77

In its Stage 1 advice, the Panel recommended:

> *It is recommended that a shallow swamp groundwater monitoring piezometer is installed near to the end of Swamp 77 at its downstream extent and, if safely accessible, rockbars and pools within the lower end of Swamp 77 should also be monitored for loss of water and visual impacts (fracturing and iron staining).*

MC responded (table of responses received by Panel on 2nd October 2024):

> *Piezometer Installation: A proposed location has been identified for a substrate monitoring piezometer in the downstream end of Swamp 77, as discussed in the response to Recommendation 6.*
>
> *Rockbar and Pool Monitoring: While rock platforms have been observed at the downstream end of Swamp 77, there is no evidence that these are 'controlling rock bars'. Based on visual observations and a review of LiDAR data, there is no obvious controlled rock bar feature, which would hold-back water/sediment, that has been identified within or at the downstream end of Swamp 77.*

There are no observable pools in the lower end of Swamp 77, although moisture is evident at some locations in the substrate after rainfall. There are a handful of minor pools below Swamp 77 prior to the stream dropping over the edge of cliff/overhang COH18. Metropolitan Coal is investigating the installation of a fixed camera to be mounted at the discharge point of Swamp 77 to record once daily still images of any changes to water colour and detect the presence of iron staining. A walking access track to the lower end of Swamp 77 for visual monitoring is being applied for under the SWAF for works described in Recommendation 31 and Metropolitan will add the installation of a substrate piezometer to the SWAF currently being prepared. While this inclusion will delay the SWAF and subsequent approval, installation may be possible in December 2024 or January 2026.

The installation as planned would meet the recommendation for monitoring at the downstream end of Swamp 77.

The Panel's recommendation was based on the high subsidence impacts predicted to occur at the downstream end of Swamp 77 and therefore the high risk of hydrological impacts. During the site visit on 4th November 2024, the Panel visited the area near the downstream end of Swamp 77 where the piezometer is planned to be installed. Following this inspection, the Panel considers that a piezometer in the lower end of Swamp 77 is not a sufficient basis for a groundwater performance indicator as the groundwater level is likely to be shallow and have large seasonal variations. Given the piezometer is also likely to destroyed by debris and flood flows, this monitoring site is now considered to be of limited value. The Panel considers that the practical options for assessing the hydrological impacts at the downstream end of Swamp 77 are:

1. Monitoring of hydrology at the installed sites further upstream in the swamp (i.e. as already included in the proposed TARPs subject to the advice in Section 5.2), since these will influence the baseflow supply to the lower end of Swamp 77;
2. Monitoring of physical impacts to the rockbars at the downstream end of Swamp 77.

It is recommended that approval conditions for LWs 312-316 include a requirement that the physical condition of the rockbars at the downstream end of Swamp 77 is monitored; any visible fracturing is reported and assessed by MC's technical committee, and; if the fracturing is considered to be a risk to the environmental consequences for threatened species, then contingency measures are proposed.

6.0 SURFACE WATER

6.1. RELEVANT RECOMMENDATIONS FROM STAGE 1 ADVICE

Recommendations in the Stage 1 advice relevant to LWs 312-316 were:

- *The site S92-GS water quality monitoring should include measurement of total metals concentrations.*
- *Peabody should commit, subject to access permission, to monitoring the depth profiles of water quality of the Woronora Reservoir at WDFS1 or other suitable site including regular (at least bi-annual) sampling throughout the remaining mining period, plus sampling following level 3 triggers for water quality reaching the reservoir.*
- *An analysis of historical water quality trends in Woronora Reservoir and their relation to mining development should be included in the Metropolitan Coal 2024 Annual Review, and this should not be provisional on further suitable data becoming available.*

The Panel is satisfied with MC's response to these recommendations. Progress with implementing the Woronora Reservoir recommendations should be reviewed by DPHI after publication of MC's 2024 annual review report.

During the Panel's visit to the swamps on 4th November 2024, clear evidence of iron staining, presumably as a result of natural processes, was observed. This highlights the sensitivity of this region to potential enhanced iron mobilisation as a result of increased cracking. While the impact of increased iron mobilisation and subsequent transport of iron on Woronora Reservoir water quality is uncertain but likely to be small (see Panel Report No: IEAPM 202310-1(R1)), the visual impact within the catchment is likely to be significant. Ecological impacts of increased iron mobilisation and surface deposition of iron oxides are uncertain though, based on results provided by Klop-Toker et al. (2021), negative impacts on the breeding and subsequent viability of threatened species such as Littlejohn's Tree Frog (*Litoria littlejohni*), if present, are likely to be substantial. An associated recommendation is included in Section 7.4 of this advice.

All aspects of surface water management for LWs 312-316, including the proposed Performance Indicators, TARPs and monitoring plans are considered by the Panel to be satisfactory for this EP, except as advised in Section 7 of this advice.

7.0 BIODIVERSITY

7.1. RELEVANT RECOMMENDATIONS FROM STAGE 1 ADVICE

Recommendations in the Stage 1 advice relevant to LWs 312-316 are listed below followed by comments on the MC response:

- Recommendation 8. *Further baseline surveys are required for threatened frog species, using appropriate survey methods and effort, conducted at a suitable time of year with survey locations targeting breeding habitat through the upland swamps (where present) and along suitable reaches of Tributaries P, R and S*. MC has engaged an ecologist to undertake further amphibian surveys with surveys anticipated to be completed in late 2024 to early 2025. However, the Panel is yet to see the methods proposed for these baseline surveys or the results. This is discussed further in Section 7.2.
- Recommendation 9. *Additional surveys are required for Swamps 92, 77 and 76 using best practice methods. The Panel recommends the company engage with BCS* (now DCCEEW-CPHR) *in developing a suitable survey method.* The Revised BMP (November 2024) commits to undertaking additional targeted surveys for the Giant Dragonfly in Swamps 76, 77 and 92 and the Ground Parrot in Swamp 92. The Revised BMP (November 2024) states that Giant Dragonfly surveys will target exuviae but no survey method is provided for the Ground Parrot. The Panel is yet to see the methods proposed for these baseline surveys or the results. This is discussed further in Section 7.2.
- Recommendation 11. *It is recommended that the action "Initiate assessment against the performance measure for threatened species" is removed from the highest-level Upland Swamp Groundwater TARP so that the trigger of this TARP defines an exceedance of both the Performance Indicator and the Performance Measure for the large swamps*. In Table 14B of the Revised BMP (November 2024) this has been amended to "Complete assessment against the performance measure for threatened species". PMs and performance indicators are discussed further in Section 7.3.

- Recommendation 12. *It is recommended that the Performance Indicator under Upland Swamp Vegetation Monitoring is removed (while maintaining the monitoring, annual reporting and TARP) and instead the groundwater Performance Indicator is relied upon to assess the Performance Measure for the large swamps*. This recommendation has been revised as it was not based on the classification of Swamps 76, 77 and 92 as at the time of Project Approval but rather than on their subsequent gazetting as EECs. The TARP table has been removed from the Revised BMP (November 2024), while vegetation monitoring will be conducted in Swamps 76 and 77. Given the very low likelihood of impacts to Swamp 92 following revisions to the longwall layout, this is considered suitable. The Panel supports the inclusion of Swamp 92 (along with Swamps 76 and 77) in drone surveys.
- Recommendation 21. *The Biodiversity Management Plan should present a set of TARPs for the large swamps separately from the TARPs for other swamps*. The Revised BMP (November 2024) includes TARPS specific to the Large Swamps for groundwater and amphibian monitoring. No Large Swamp specific TARP is provided for other threatened species. If the baseline surveys for the Giant Dragonfly or Ground Parrot identify these species, then amendments to the BMP will be required including additional monitoring and a new TARP(s).
- Recommendation 22. *The Amphibian Performance Indicator and TARP should focus on abundance of individual species and availability of habitat (particularly breeding pools) along individual waterways*.
- Recommendation 23. *The Amphibian TARP Level 2 trigger should assess if there has been a reduction in abundance of a threatened species (Red-crowned Toadlet, Littlejohn's Tree Frog or Giant Burrowing Frog) along an impacted waterway which has not been observed at control sites for one year. The Level 3 trigger should assess if there has been a reduction in abundance of a threatened species (Red-crowned Toadlet, Littlejohn's Tree Frog or Giant Burrowing Frog) along an impacted waterway which has not been observed at control sites for greater than one year*. The Revised BMP (November 2024) provides a new TARP for Large Swamp Amphibian Monitoring at Table 18. The Panel is generally supportive of the amendments to the TARP for threatened amphibians and recognises that substantive changes have been made in response to previous recommendations from the Panel. Further comments on threatened amphibian TARPs are in Section 7.4.
- Recommendation 24. *Both Level 2 and 3 triggers should also include a trigger for drying of pools resulting in loss of habitat. It is recommended that periods align with the trigger levels above (i.e. loss of habitat for one year (Level 2) and greater than one year (Level 3))*. The Revised BMP (November 2024) commits to installing pool water level monitoring equipment in pools if breeding pools are identified during baseline surveys. Numerous pools were identified by DCCEEW-CPHR during surveys conducted in 2023 and declines in water availability following mining have been tied to declines in abundance of Littlejohn's Tree Frog (Klop-Toker et al. 2021). The Panel considers that there is a strong requirement for pool water level monitoring at any breeding pool sites identified. The Large Swamp Amphibian Monitoring TARP does not include any triggers related to pool water level. Given the above, the triggers should be amended.
- Recommendation 25. *Further detail should be provided on the analysis to be conducted in relation to threatened species. The wording of the final action/response should make reference to implementation of appropriate mitigation/remediation or provisions of offsets, as per Sections 9 and 10. Remove the word "consider"*. The Revised BMP (November 2024) provides updates on the proposed analysis of threatened amphibian monitoring data. The Panel is of the view that this is satisfactory. The Large Swamp Amphibian Monitoring TARP includes an Action/Response *"Where appropriate contingency measures or remediation cannot be implemented to address an impact, Metropolitan Coal would provide a suitable offset to*

compensate for the impact to the satisfactory of the Secretary of Planning". The Panel views this as satisfactory subject to the insertion of the words "or remediation measures are unsuccessful in addressing the impact".

- Recommendation 26. *A reduction in a frog abundance at an impact site should translate directly to exceedance of the Performance Measure, hence the action "Initiate assessment against the performance measure for threatened species" should be deleted from the action/response. Table 19 of the Biodiversity Management Plan should be reviewed to determine if this is required*. In their response to the Panel recommendations in September 2024, MC contend that this is inconsistent with Recommendation 23 and that assessment of a PM must consider changes relative to control sites in accordance with a Before-After Control-Impact (BACI design). The Panel supports this position. For clarity, the Panel's concern was, and remains, that if a performance indicator determines exceedance of the PM there need not be any further assessment of whether the PM has been exceeded. In this case, the Panel accepts that assessment against a control site is appropriate. If that indicates there has been a mining consequence on threatened species then no further assessment is required.

Recommendations 34-41 have largely been addressed and/or considered in sections above.

7.2. POTENTIAL PRESENCE OF THREATENED SPECIES AND IMPLICATIONS IF PRESENT

At the time of submitting this advice, MC has not provided any baseline survey results in the mining area of LWs 312-316 that address the Stage 1 recommendations, except summaries of results in the Honeysuckle Creek catchment. Therefore, the Panel is unable to advise further on the likelihood that the threatened species PMs (the PMs in Table 13 of the EP dated November 2024) will be exceeded if the proposed mine plan proceeds or on the need for additional PMs and performance indicators for other threatened species (Giant Dragonfly and Ground Parrot). The Panel repeats its Stage 1 advice that:

"*The key impact to terrestrial biodiversity, particularly amphibians, will arise from reduced streamflow and/or reduction in pool water levels which provide habitat for breeding frogs. Subsidence impacts, including cracking of bedrock, leakage from pools and diversion of surface water flow, is predicted to occur along the lower lengths of Tributaries P, R and S given predicted valley closure levels (Appendix I of Peabody 2024a and MSEC 2024). If subsidence impacts do occur along these tributaries, this is highly likely to result in impacts to threatened species where they are present (presence is indicated in the BCS* (now DCCEEW-CPHR) *survey results presented to the Panel on 23 August 2024), particularly the Littlejohn's Tree Frog and Giant Burrowing Frog who both rely on pools for breeding. If these impacts do occur, and result in loss of breeding habitat, they are unlikely to be considered negligible*."

This is documented for upland swamps and streams above Dendrobium Mine where a number of impact monitoring sites have shown reduced habitat conditions and reduced frog detection (Klop-Toker et al. 2021, Niche 2024). On that basis, if surveys show that threatened species that are dependent on pool levels exist in lengths of tributaries R or S where pool levels are predicted to be impacted, then it is highly likely that under the proposed mine layout, contingency measures will ultimately be required[15].

The Panel also notes the conclusion of Niche (2024) that "*mining effects have likely resulted in the loss or reduction of the population"* of Giant Dragonfly in swamps above Dendrobium Mine and that further survey "*would assist in assessing whether undermined swamps may still present suitable foraging habitat"*. Loss of sustained high moisture levels in the swamp sediments is known to be a loss of breeding habitat with South32 (2023) noting that once groundwater levels decline below the depth of larval burrows (>70 cm) *"and the peat dries the habitat and potentially population in a specific swamp*

[15] In the case of tributary P, the additional/incremental valley closure due to the extraction of LWs 311-316 is not high and less likely to result in environmental consequences for threatened species, if they are present.

is lost" (p.36). This conclusion supports the view that where Giant Dragonfly are present, exceedance of a swamp groundwater performance indicator is highly likely to lead to exceedance of the threatened species PM, and emphasises the Panel's concern for robust baseline surveys to confirm the presence or absence any populations of Giant Dragonfly above LWs 311-316.

7.3. PERFORMANCE INDICATORS FOR DETERMINING THREATENED SPECIES PERFORMANCE MEASURE EXCEEDANCE

In its Stage 1 advice, the Panel advised that the (then) proposed PM *Negligible Impact on Threatened species, Populations and Ecological Communities* should be tightly linked to the proposed groundwater performance indicator, so that an exceedance of the latter would unambiguously define an exceedance of the former. This advice was based on the following:

- The long (potentially decades) lag between mining and consequences to threatened species, and ecological communities in the swamps, hence groundwater being a more timely indicator.
- The Panel's opinion, recent research (Mason et al. 2021, Cairns et al. 2024) and NSW government advice[16] that coastal upland swamp ecosystems are adapted to the swamp hydrology including intermittent water-logging. Hence impacts to swamp groundwater are regarded by the Panel as inevitably leading to environmental consequences for the swamp ecosystem including any threatened species that is part of that ecosystem.

In its response to the recommendations, MC stated:

> *Metropolitan Coal does not agree that an impact to the groundwater level in the swamp substrate means that there would be an exceedance of the Performance Measure Negligible impact on Threatened Species, Populations, or Ecological Communities. This is evidenced by the lack of Performance Measures exceedance for Swamps 20 and 28 despite an exceedance of the groundwater level performance indicator.*
>
> *If data analysis indicates a biodiversity Performance Indicator has been exceeded, Metropolitan Coal will complete an assessment against the Performance Measure and consider the need for management measures.*

The premise of the Panel's Stage 1 advice was that, in the context of Schedule 3 Condition 4, the swamps would be treated as a threatened ecological community. Under that premise, the Panel had no doubt that enhanced drainage of a swamp would equate to exceedance of the PM. That premise is no longer considered appropriate for the reasons given in Section 4.1 of this advice and the PM is now interpreted as relating only to threatened species.

Nevertheless, the Panel considers that the swamps provide habitat for groundwater-dependent relevant threatened species, namely the Giant Dragonfly. If this species is present (currently unknown and pending baseline survey results), the Panel considers that greater than negligible consequence to the population is highly likely if greater than negligible drainage of the swamp groundwater occurs. In lieu of a robust monitoring program capable of reliably determining whether greater than negligible environmental consequences have occurred for this threatened species, this is the Panel's position. This places the emphasis on MC to complete robust and reliable baseline surveys and, if recorded, define a robust monitoring program and suitable performance indicators to address the PM in a timely manner.

The Panel recommends:

[16] https://threatenedspecies.bionet.nsw.gov.au/profile?id=20261

- If the Giant Dragonfly or Ground Parrot are identified during baseline surveys, amendments to the BMP are required, including a TARP, suitable performance indicators and robust monitoring program capable of determining in a timely manner whether greater than negligible environmental consequences have occurred. If this is not achieved, in lieu of this, the exceedance of the groundwater performance indicators should be viewed as resulting in an exceedance of the threatened species PM.
- That the results of the baseline surveys and any resulting amendments to the BMP are provided to the Panel for review and comment prior to being endorsed by the Department. Endorsement should occur prior to commencement of secondary extraction of LW 312.

7.4. THREATENED AMPHIBIAN TARP

As noted above, the Panel is generally supportive of the amendments to the TARP for threatened amphibians included in the November 2024 version of the BMP. The Panel makes the following comments on that TARP:

- The proposed TARP (BMP November 2024, Table 18) related to amphibians is titled "Large Swamp Amphibian Monitoring". The Panel has concerns over potential impacts to threatened species in the downstream sections of tributaries R and S and considers that the TARP for LWs 311-316 should apply to these streams also.
- The location and length of monitoring transects must be informed by baseline surveys. Monitoring transects should be located in areas with known populations of threatened amphibians.
- The TARP now considers changes in relative abundance. The Panel is of the view that analysis of relative abundance is not suitable for measuring changes in amphibian populations. For example, if baseline monitoring detects two species with 90 individuals of Species 1 and 10 individuals of Species 2 the relative abundance of Species 1 is 9:1 or 90%. If in subsequent years, monitoring detects 9 individuals of Species 1 and 1 individual of Species 2 the relative abundance of Species 1 remains 90% despite a large drop in the abundance of Species 1.
- The measurement of abundance should focus on changes in abundance for each individual species, i.e. not overall abundance or relative abundance. Table 18 of the BMP should be amended to ensure this occurs. The performance indicator in Table 18 should be modified to read 'The abundance of Littlejohn's Tree Frog, Red Crowned Toadlet or Giant Burrowing Frog is not expected to experience a decline compared to previous years that is significantly different to the trend for that species at control sites'.
- An additional approach is to measure the relative abundance of adults (males and females), juveniles and tadpoles to detect changes in different life stages. This approach is similar to the approach taken by Klop-Toker et al. (2021) and would allow the measure of relative abundance of different life cycle stages in relation to subsidence impacts to determine whether this results in environmental consequences for threatened amphibians, given a greater likelihood of impacts to early lifecycle stages where the species is reliant on pools.
- It is not clear how the two parameters of non-threatened amphibians and species richness are used in the TARP analysis. This should be clarified or these elements removed.
- It is not clear how acoustic recorders are used in the assessment. Acoustic recorders can determine how frequently adult males are calling within a localised area. However, this may mask any environmental consequences which occur. For example, Klop-Toker et al. (2021) found that adult frogs can still occupy the landscape, and adult males may continue calling, even though tadpole numbers may decline significantly.
- The TARPs must include pool level monitoring and triggers related to pool level monitoring.

- A Level 2a trigger should be reported to the Technical Committee as a Level 2a trigger even if detected differences cannot be attributed to mining. Causation may not be able to be determined and may be uncertain. Amend the Action/Response as below:
    - *"Any significant differences detected that are not attributable to mining impacts (e.g. are a result of environmental conditions or stochastic events) are to be considered normal conditions and will be reported as Level 1 to the Technical Committee."*
- Based on results provided by Klop-Toker et al. (2021), negative impacts on the breeding and subsequent viability of threatened species such as Littlejohn's Tree Frog from increased iron mobilisation and surface deposition of iron oxides are likely to be substantial. The Panel recommends that iron flocculent deposition in suitable breeding pools is monitored and incorporated into the triggers for the Large Swamp Amphibian Monitoring TARP.

8.0 OTHER MATTERS

The Panel emphasises the importance of appropriate surface water, groundwater and biodiversity monitoring being planned far enough in advance to provide a sufficient understanding of the groundwater, surface water and ecological systems and sufficient baseline data for assessing potential impacts and consequences. The Panel acknowledges the efforts made by MC in addressing much of the Panel's advice on monitoring and emphasises that continued focus on this issue is critical.

In previous advice, the Panel has recommended MC develop a replicable and reliable technique for mapping the extent of, and sub-communities within, the upland swamps. The revised BMP (November 2024) makes a commitment to undertaking drone surveys. Remote sensing techniques provide a robust and reliable method for undertaking impact assessments and monitoring changes due to subsidence. The Panel strongly recommends MC develop these methods for their current application for LWs 317 and 318 and for future monitoring.

9.0 CONCLUSIONS

<u>Complexities and their resolution</u>

1. Schedule 3 Condition 4 specific to Swamps 76, 77 and 92 aims to reflect the PAC recommendations that prompted the formulation of this approval condition, but it has been drafted in a manner that appears unique as a project approval condition and, taken literally, presents difficulties in practice to the point of being illogical and unworkable.
2. These difficulties appear to arise out of the step change in the rigor of project assessment introduced at the time of assessment of the MCP and the associated learning curve in how environmental consent conditions were to be framed going forward.
3. The concept of swamps of 'special significance' was advanced by the PAC and raised in some submissions is academic going forward. The PAC reported that it found no convincing evidence to classify any swamps as such, the Panel does not consider that any of Swamps 76, 77 or 92 to be of 'special significance', there is no basis for applying the concept retrospectively, and the concept has been superseded by the subsequent gazetting of Coastal Upland Swamps as an EEC.
4. Swamp 92 is a significant example of a Coastal Upland Swamp that is large, complex and in pristine condition and, given that the majority of this swamp overlies only first workings, the Panel concludes that MC's revision to the mine plan to now stop LW 312 and LW 313 short so

as to both avoid undermining this swamp and restrict subsidence effects to very low values, complemented with MC's designation of a Performance Measure (PM) for this swamp of negligible environmental consequences, are responsible and welcomed actions.

5. Based on its own review of the PAC report that informed the framing of environment-related consent conditions, the Panel does not consider that the EP comprehensively addresses the PAC's concerns regarding managing impacts on the valley infill sections of Swamps 76 and 77 and the environmental consequences of any impacts for the headwater sections of these swamps. Since the PAC's concerns were not clearly captured in Schedule 3 Condition 4, this may have to stand. However, the outcomes of subsidence assessment and environmental assessment for the valley in-fill sections of Swamps 76 and 77 suggest that the incomplete capture of the PAC's recommendations may not have serious implications for achieving the PMs that are relevant for these swamps.
6. In the given circumstances, and in light of the PAC's assessment report and the MCP consent conditions, the Panel concludes that both the intent of the PAC in regard to Swamps 76, 77 and 92 and the intent of Schedule 3 Condition 4 could be achieved if:
    a. MC's proposed PM for Swamp 92 of *"negligible environmental consequences"* was endorsed by the Planning Secretary ('Director General').
    b. MC's proposed PM for Swamps 76 and 77 of "negligible environmental consequences for threatened species" was to be expanded to "negligible environmental consequences for threatened species, ecological communities and populations" in order to also be consistent with Schedule 3 Condition 1, and endorsed by the Planning Secretary (noting that this is confined to species, ecological communities and populations gazetted as threatened at the time of the Project Approval).
    c. Any approval of the EP for LWs 312-316 included a requirement that all valley closure impacts which present a risk to not achieving the approved PMs relevant to Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.
7. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

<u>Groundwater</u>

8. The groundwater recommendations from the Panel's advice on LWs 311-312, all of which are relevant to LWs 312-316, have been addressed satisfactorily in the proposed TARP or otherwise in the MC responses to the recommendations, with exceptions:
    a. The shallow Hawkesbury Sandstone (HBSS) groundwater should be included in the triggers in the relevant Trigger Action Response Plan (TARPs) (Table 14A and Table 14 B of the Biodiversity Management Plan (BMP)).
    b. Soil moisture measurements should explicitly be considered in the analysis of impacts and consequences following a level 2 or 3 swamp groundwater trigger in both Table 14A and Table 14 B of the BMP.
    c. Further refinements to the description of the semi-quantitative analysis of groundwater recession are advisable.
9. The proposed piezometer in the lower end of Swamp 77 will be a useful source of information, but due to the nature of the lower end of the swamp this piezometer will not be a suitable basis for a TARP or groundwater performance indicator. The Panel concludes that the practical options for assessing the hydrological impacts at the downstream end of Swamp 77 are:

monitoring of hydrology at the installed sites further upstream in the swamp since these will influence the baseflow supply to the lower end of Swamp 77; and monitoring of physical impacts to the rockbars at the downstream end of Swamp 77.

Surface water

10. The surface water recommendations in the Panel's advice on LWs 311-312, all of which are relevant to LWs 312-316, have been addressed satisfactorily in the MC responses, with the exception of aspects raised in the Biodiversity section of this advice.

Biodiversity

11. If valley closures along lengths of tributaries R and S are as high as predicted, this is likely to result in environmental consequences for threatened species if and where they are present, particularly the Littlejohn's Tree Frog and Giant Burrowing Frog which both rely on pools for breeding. If these impacts do occur, and result in loss of breeding habitat, the environmental consequences for these species are unlikely to be considered negligible. In the case of tributary P, the additional/incremental valley closure due to the extraction of LWs 311-316 is not high and less likely to result in environmental consequences for threatened species, if they are present.
12. The TARPs for amphibians, presented in the Revised BMP (November 2024) are generally supported. However, a number of amendments to these TARPs are recommended (see Section 10).
13. Baseline surveys for the Giant Dragonfly and Ground Parrot are incomplete and no TARP or monitoring program is provided for either threatened species. If the baseline surveys for the Giant Dragonfly or Ground Parrot identify these species, then amendments to the BMP will be required including additional monitoring and a new TARP(s).
14. The Panel's previous (Stage 1) recommendation that the assessment of the biodiversity PM for Swamps 76, 77 and 92 should be based directly on the groundwater performance indicator was premised on these swamps being regarded as EECs for the purpose of assessing the EP for LW 312-316. Given this this premise is no longer considered appropriate, the Panel concludes that PM is now interpreted as relating only to threatened species and that previous recommendation is superseded by those below.
15. Notwithstanding the above, the Panel is of the view that should the Giant Dragonfly be recorded in the upland swamps, exceedance of a swamp groundwater performance indicator is highly likely to lead to exceedance of the threatened species PM given the obligate dependence of this species on groundwater. A robust TARP, performance indicator and monitoring program will be required if biodiversity monitoring is relied upon to demonstrate that the PM has not been exceeded.

10.0 RECOMMENDATIONS

Complexities and their resolution

The Panel recommends that:

1. The intent of Schedule 3 Condition 4 be given effect by approval conditions that:
    a. Endorse the refined mine layout that now results in LW312 stopping 120 m short and LW313 stopping 80 m short of their originally planned finishing points.
    b. Endorse MC's proposed PM for Swamp 92 of *"negligible environmental consequences"*.
    c. Are based on MC expanding its proposed PM for Swamps 76 and 77 to "*negligible environmental consequences for threatened species, ecological communities and populations*" before endorsement by the Planning Secretary.
2. Any approval of the EP for LWs312-316 should include a requirement that all valley closure impacts which present a risk to not achieving the approved PMs for Swamps 76, 77 and/or 92 are to be remediated to the satisfaction of the Planning Secretary within 12 months of the abatement of the valley closure impacts.
3. Any approval for the EP for LWs312-316 should include a requirement for an End-of-Panel review report to be produced within 3 months of the completion of each longwall panel and to include coverage of cumulative impacts and environmental consequences for the preceding three longwall panels.

Groundwater

4. The level 2 TARP in Tables 14A and 14B of the BMP should include a trigger for potential impacts on HBSS shallow (~10m) groundwater levels where suitable baseline data exist, whereby an accelerated reduction in shallow HBSS groundwater levels would trigger an action. One piezometer per swamp with the longest period of baseline data would suffice.
5. The level 3 TARP in Tables 14A and 14B of the BMP should be robust enough to ensure that low baseline substrate groundwater levels do not preclude a trigger.
6. The technical document on implementing the semi-quantitative groundwater trigger should be incorporated as an appendix in the Water Management Plan or the MC Annual Report, and that the time-series of groundwater levels from which the cumulative frequency distributions are derived is added to the document for the readers' reference.
7. The incorporation of soil moisture in Table 14A (footnote 6) of the BMP should be replicated in Table 14B of that document.

Surface Water

8. MC's progress with implementing previous Panel recommendations related to water quality (Panel Report No: IEAPM 202310-1 R1) should be reviewed by DPHI following publication of MC's 2024 Annual Review.

Biodiversity

9. The threatened species survey program report should be provided as soon as possible by MC and reviewed by DPHI.
10. If the Giant Dragonfly is recorded during baseline surveys, it is recommended that the results of the baseline monitoring and the proposed amendments to the BMP, including a suitable

TARP and monitoring program, are provided to DPHI for review and comment. This should occur prior to commencement of secondary extraction of LW312.

11. The Panel considers that there is a strong requirement for pool water level monitoring in suitable breeding pools of tributaries R and S if threatened species are found to be present. The Large Swamp Amphibian Monitoring TARP does not include any triggers related to pool water level. Given the above, the triggers should be amended.
12. The Panel recommends that iron flocculent deposition in suitable breeding pools is monitored and incorporated into the triggers for the Large Swamp Amphibian Monitoring TARP.
13. The Action/Response in the Level 3 trigger in Table 18 of the Revised BMP (November 2024) should be amended to insert the underlined words: "Where appropriate contingency measures or remediation cannot be implemented to address an impact, or remediation measures are unsuccessful in addressing the impact, Metropolitan Coal would provide a suitable offset to compensate for the impact to the satisfactory of the Secretary of Planning".
14. The TARP for Large Swamp Amphibian Monitoring should be amended to indicate that if a subsidence impact results in an exceedance of a performance indicator for threatened species, as assessed against control sites, then the PM for threatened species has been exceeded and further assessment against the PM is not required.
15. The proposed TARP for amphibians (Table 18 of the Revised BMP, November 2024) should be applied to Swamps 76, 77 and 92 as well as the downstream extent of tributaries P, R and S.
16. The TARPs for threatened amphibians should focus on changes in abundance for each individual species, i.e. not overall abundance or relative abundance. Table 18 of the BMP should be amended to ensure this occurs. There may be benefit in looking at relative abundance between life cycle stages (e.g. adult males and females to tadpoles) for individual species.
17. A Level 2a trigger should be reported to the Technical Committee as a Level 2a trigger even if detected differences cannot be attributed to mining. Amend the Action/Response to "Any significant differences detected that are not attributable to mining impacts (e.g. are a result of environmental conditions or stochastic events) are to be considered normal conditions and will be reported as Level 1 to the Technical Committee."
18. The performance indicator in Table 18 of the BMP (November 2024) be modified to read 'The abundance of Littlejohn's Tree Frog, Red Crowned Toadlet or Giant Burrowing Frog is not expected to experience a decline compared to previous years that is significantly different to the trend for that species at control sites'. The determination of an impact should be based on a change in abundance of any threatened species and not on the assemblage of all threatened species.

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APPENDIX A – DPHI REQUEST FOR ADVICE AND REVISED REQUEST FOR ADVICE

Department of Planning, Housing and Infrastructure

Our ref: MP 08_0149

Emeritus Professor Jim Galvin
Chair - Independent Expert Advisory Panel for Mining

By email: j.galvin@bigpond.net.au

4 July 2024

Subject: Request for Advice – Metropolitan Coal Mine – Longwalls 311 to 316 Extraction Plan

Dear Prof Galvin

I am writing to you to request advice from the *Independent Expert Advisory Panel for Mining* (the Panel) in relation to the Metropolitan Coal Mine (MP 08_0149).

Metropolitan Coal is seeking approval for an Extraction Plan (EP) for secondary coal extraction from Longwalls (LW) 311 to 316 which are a continuation of the longwall series undermining the Woronora Reservoir. A copy of the EP application is provided as **Attachment 1**.

Metropolitan Coal has consulted with several agencies in the preparation of this EP. A copy of agency advice and Metropolitan Coal's response to this advice is attached for your consideration (see **Attachment 2**).

Further feedback is being sought from these agencies by the Department and will be provided to the Panel when received (to be provided as **Attachment 3**).

The Department considers the key technical issues for LWs 311 to 316 are the potential impacts to swamps and water quality, as raised in the advice from the Department of Climate Change, Energy, the Environment and Water (DCCEEW), Biodiversity, Conservation and Science (BCS) and WaterNSW. In particular, the impacts of mining on three large swamps (i.e. S76, S77 and S92) and their associated threatened species, and water quality of watercourses and the Woronora Reservoir, have been raised as specific concerns.

The Panel has previously provided advice on the Metropolitan Mine which included recommendations relevant to the LW 311 to 316 EP. This advice included:

- *Advice re: Metropolitan Mine Longwalls 308 – 310 Extraction Plan* (September 2022);

- *Independent review of environmental performance to 2022* (September 2023);
- *Water Quality Performance Measures for Metropolitan Coal Mine* (October 2023);
- *High Level Review – Large swamp environmental assessment requirements for the Extraction Plan for Longwalls 311 to 316* (November 2023).

Metropolitan Coal provided responses to recommendations made in these documents (see Attachments 4 and 5).

The Department is seeking advice from the Panel on the LW 311 to 316 EP, including:

- whether the Panel's previous recommendations in the documents above have been adequately addressed, particularly in relation to large swamps and water quality modelling and monitoring;
- the adequacy of the large swamp impact predictions presented in the *Large Swamp Assessment* (Appendix H of the EP) and associated appendices;
- the adequacy of the proposed performance measures and indicators for large swamps required by condition 4(b) Schedule 3 of the consent and included in the *Large Swamp Assessment* (Section 7.2), and the need or otherwise to set more defined performance measures for large swamps beyond those related to threatened species, populations, or ecological communities;
- the need or otherwise to modify the mine plan to minimise/avoid impacts, particularly on large swamps, and ensure compliance with existing and proposed performance measures;
- the adequacy of the water and swamp monitoring programs;
- the water and swamp TARPs and whether they:
  - enable measurement of compliance with existing and proposed performance measures established under the consent and proposed in the EP for large swamps; and
  - have triggers (and associated performance indicators) that adequately reflect the existing and proposed performance measures.

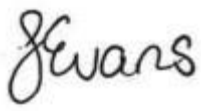
The Panel should feel free to provide any other advice it considers would assist the Department in reviewing the EP.

To assist the Panel, I have attached a copy of Metropolitan Coal's six-monthly report January to June 2023, and the most recent Waratah Rivulet Technical Committee Valley Closure Meeting for LW 309 (see **Attachment 6** and 7).

It would be appreciated if the Panel can provide advice on the EP by **16 August 2024.**

Please contact me on 8274 1274 or jessie.evans@dpie.nsw.gov.au if you have any questions or require additional information for your review.

Yours sincerely,



Jessie Evans

Director
Energy and Resource Assessments

Attachments:

1. LW 311 to 316 EP
2. Agency Advice to Metropolitan Coal
3. Agency Advice to the Department
4. Metropolitan Coal's response to agency comments
5. Metropolitan Coal's responses to Panel recommendations on the EPs for LW 308-310 and LW 31-316
6. Metropolitan Coal Six Monthly Report January to June 2023
7. Waratah Rivulet Technical Committee Valley Closure Meeting for LW 309 – 1 March 2024

Department of Planning, Housing and Infrastructure

Our ref: MP 08_0149

Emeritus Professor Jim Galvin
Chair - Independent Expert Advisory Panel for Mining

By email: j.galvin@bigpond.net.au

2 August 2024

Subject: Request for Advice – Metropolitan Coal Mine – Longwalls 311 to 316 Extraction Plan

Dear Prof Galvin

Thank you for your letter dated 26 July 2024, outlining the Panel's staged approach for providing advice on the Metropolitan Coal Mine Extraction Plan for Longwalls 311 to 316 (Extraction Plan). I note the staged approach will comprise:

1. Reviewing whether the Panels' previous recommendations have been adequately addressed in relation to large swamps and water quality modelling and monitoring;
2. Restricting the Stage 1 advice to LW311 and 312; and
3. Recommending clear and timely performance indicators that unambiguously define when impacts on biodiversity are greater than negligible.

The Department accepts this staged approach.

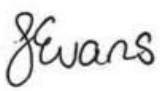
As the Panel is aware, the Department has requested that government agencies provide advice on the Revised Extraction Plan. WaterNSW and BCS have requested additional information on performance measures and indicators and adequacy of monitoring programs.

The Department will request that Metropolitan Coal provides a response to agency comments for Stage 1. To aid in providing a timely response to the Panel, the Department will request that Metropolitan Coal's response is focused on proposed performance measures and indicators, and monitoring programs, for LWs 311 and 312.

It would be appreciated if the Panel can provide advice on the EP by **23 August 2024.**

Please contact me on 8274 1274 or jessie.evans@dpie.nsw.gov.au if you have any questions or require additional information for your review.

Yours sincerely,



Jessie Evans

Director
Energy and Resource Assessments

APPENDIX B – PANEL BIOGRAPHY

Jim Galvin (Chair)

Professor Galvin is an Emeritus Professor (University of New South Wales) in Mining Engineering and former member of the NSW Planning Assessment Commission. Professor Galvin is one of the world's foremost experts on underground coal mining and subsidence and has extensive experience in geomechanics, mine management and risk management. He was a member of the Independent Panel for the Southern Coalfield Inquiry (2008), several subsequent reviews of mining projects in the Southern Coalfield and most recently, Chair of the Independent Expert Panel on Mining in the Catchment.

John Ross

John Ross is a Senior Principal Hydrogeologist with over 40 years' experience specialising in water resource, site contamination, infrastructure, mining and natural resource impact assessment and management. His specialty is sedimentary basin hydrogeology, particularly the Great Artesian Basin, Sydney-Gunnedah and Gloucester basins here in NSW. John has held specialist management roles in public and private corporations and environmental consultancies. He has a Bachelor of Science (Geology) and a Certificate in Engineering Hydrology and Groundwater Hydrology.

John provides technical hydrogeological expertise and advice across the spectrum of water resource development, environmental/water planning, assessment and management projects, including environmental impact assessments, environmental audits and technical peer reviews, monitoring programs, remedial action plans, modelling and groundwater licensing matters. John also has extensive experience in community and regulatory consultation across the eastern seaboard.

Neil McIntyre (co-Chair for this Advice)

Neil McIntyre is Professor of Hydrology and Water Resources at The University of Queensland. He holds a BEng in Civil Engineering from Edinburgh University, and an MSc in Environmental Engineering and PhD in water quality modelling from Imperial College London. He is a Chartered Civil Engineer (UK Engineering Council), with expertise including surface water hydrology, water security assessments, and impacts of land use changes and mining on hydrology and water quality. His advisory roles have included serving on the Institution of Civil Engineer's Water Expert Panel (UK), the Steering Committee of the Commonwealth Leading Practice Sustainable Development Program, and the NSW Independent Expert Panel for Mining in the Catchments.

Ann Young

Dr Young is a retired academic who worked at the University of Wollongong's School of Earth and Environmental Sciences. Her PhD was a seminal study into the upland swamps on the Woronora Plateau. Between 2006 and 2017, she was a member of community consultative committees at two mines in the Southern Coalfield. She was involved with the Commonwealth Government's review of Temperate Highland Peat Swamps on Sandstone EEC and a member of the NSW Government's Independent Expert Panel for Mining in the Catchment.

Nathan Garvey

Nathan is an experienced ecologist with over 20 years' practice in biodiversity assessment and approvals across eastern Australia. Nathan holds a Bachelor of Science and Graduate Diploma in Biological Science from the University of NSW and is a Certified Environmental Practitioner and a Biodiversity Assessment Method (BAM) accredited assessor under the Biodiversity Conservation Act.

Nathan has experience across a diverse range of sectors including mining, oil and gas, linear infrastructure, renewable energy and residential development, including biodiversity assessment for major projects, offsetting and EPBC Act referrals. He has strong expertise and experience in the assessment of impacts to biodiversity arising from subsidence, as well as impacts to groundwater dependent ecosystems arising from groundwater drawdown. He is one of NSW's leading experts in biodiversity approvals and offsetting.

David Waite

David Waite is a Scientia Professor in the School of Civil and Environmental Engineering at the University of New South Wales. Professor Waite obtained his PhD from the Massachusetts Institute of Technology and has served as the Head of the Department of Water Engineering (1993-1999), Director of the Centre for Water and Waste Technology (1993-2006), Head of the School of Civil and Environmental Engineering (2007-2013) and Deputy Dean of the Faculty of Engineering (2013-2018) at UNSW. His principal research areas are that of investigation of physico-chemical processes in natural and engineered systems and biogeochemical transformation and fate of contaminants. Professor Waite is the CEO of the UNSW Centre for Transformational Environmental Technologies (CTET) and is an Associate Editor of the journal Environmental Science & Technology. He was honoured with international membership of the US National Academy of Engineering in 2018 for his distinguished service to engineering.