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**DPE4541**

Dear Paul

**AIRLY MINE EXTRACTION PLAN CONSULTATION DRAFT: COMMENT ON THE ADEQUACY OF THE PROPOSED MECHANISMS AND CONTINGENCY ACTIONS TO MANAGE SURFACE IMPACTS**

As requested in your email of 1 September 2017, please find herein comments of the Independent Expert Panel (IEP) on the Airly Mine Extraction Plan, Draft for Consultation.

The IEP considers that the various management plans reviewed are generally suitable to manage the unlikely event of surface impacts to cliffs, pagodas, steep slopes and other surface features from the proposed mining in the CLZ. The management approach adopted relies on the expectation of long term stability of the pillars as the primary control and with pillars of width to height ratios of 1:1 directly below the cliff lines this expectation is reasonable. The related Trigger Action Response Plan (TARP) is based around ensuring that the mining geometry is developed as planned. This TARP is expected to be effective.

As a general comment on the management approach proposed, the IEP would encourage Centennial Coal Company Limited (CCCL) to develop systems to closely monitor the cliff formations; even those that are not expected to move significantly. The IEP considers that such monitoring would be consistent with the Objectives of Subsidence Monitoring (s2.9.1.1) in the NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 i.e. "ensuring that the mine operator has a current and correct understanding of the hazards of subsidence".

The monitoring would ideally be aimed to better understand the nature and magnitude of any natural changes, the nature and magnitude of any mining induced changes and the suitability of and accuracy/resolution of surface monitoring systems. These systems are proposed for compliance monitoring of the same features once extractive mining commences. Confidence in the base line experience is considered likely to be of significant benefit at this later, more critical stage.

Various monitoring systems are currently referred to in the EP, but the IEP was not able to determine the accuracy/resolution of any of these systems and therefore their likely effectiveness as potential controls.

## **1. INTRODUCTION**

Airly Mine is an underground coal mine located 5km northeast of the village of Capertee and approximately 171km northwest of Sydney on the northern fringe of the Western Coalfields. CCCL, the owner of the mine, is required under Condition 7 in Schedule 3 of SSD\_5581 to prepare an Extraction Plan (EP) for the proposed first workings within an area known as the Cliff Line Zone (CLZ). CCCL has lodged consultation drafts for a Subsidence Monitoring Program (SMP), a Land Management Plan (LMP) and a Public Safety Management Plan (PSMP) with the NSW Department of Planning and Environment (DPE). The DPE commissioned the IEP to comment on the adequacy of the proposed mechanisms and contingency actions to manage any impacts. This report presents the IEP's comments on the proposed plans in accordance with the conditions of consent for the Airly Mine requiring these documents to be prepared in consultation with the IEP.

The IEP was provided on 1 September 2017 by DPE with access to the following documents to review:

1. Airly Mine Cliff Line Zone of First Workings Extraction Plan
  - Common Appendix 1: Master Trigger Action Response Plan
  - Appendix 2: Other Relevant Regulatory Requirements
  - Appendix 4: Stakeholder Consultation – (EP and supporting SMP, PSMP and LMP)
2. Subsidence Monitoring Program: Cliff Line Zone of First Workings Extraction Plan (ML1331): Draft for Consultation, Rev No EP-SMP\_Rev0
  - Appendix 3: Figures
3. Land Management Plan: Cliff Line Zone Extraction Plan (ML1331) Draft for Consultation, Rev No EP-LMP\_Rev0
4. Public Safety Management Plan: Cliff Line Zone of First Workings Extraction Plan (ML1331) Draft for Consultation, Rev No EP-PSMP\_Rev0
5. Updated Subsidence Risk Assessment (in App3 to LMP & PSMP\_Subsidence RA extracts\_Land & Public Safety\_CLZ EP (ML1331)\_Rev0.pdf)

The IEP has reviewed these documents as requested. Much of the detail is repeated in the various documents but the essential elements are the same in each. For the purposes of this review, the plans are considered as one. Specific reference is made to individual plans where necessary.

## **2. Review of Approach**

The approach presented to managing the subsidence impacts is based on the expectation that the pillar systems are long term stable. The pillar geometries for the CLZ were reviewed by the IEP (2016). That review confirmed the expectation of long term stability as reasonable given the width to height ratio of pillars in the CLZ of greater than 10. The IEP is nevertheless mindful of the value of confirming that the subsidence outcomes are as expected through appropriate monitoring.

The TARP that describes the primary management response for the cliffs pagoda and steep slopes focuses on ensuring the pillars are mined consistent with the design geometry. This approach is expected to be an appropriate strategy to manage the mining of these pillars.

The pillar geometries within the CLZ are expected to lead to some low level ground movements based on experience elsewhere in the Western Coalfield, possibly up to a few tens of millimetres. A subsidence monitoring system that has the accuracy/resolution to detect these low level movements would give confidence that the ground movements are being successfully monitored with sufficient accuracy to be useful from protecting significant cliff formations both during this mining and subsequently once extractive mining commences nearby.

There is some allowance within the development consent conditions for SSD\_5581 for some rock falls to occur.

*Occasional rock falls, displacement or dislodgment of boulders or slabs of less than 30m<sup>3</sup>, or fracturing occurs, that do not impact Aboriginal heritage, EECs or public safety, that in total, do not impact more than 2% of the total area of cliffs (excluding minor cliffs) or pagodas within 26.5° of any Airly mine workings in the EP Area, other than pagodas affected by the New Hartley Shale Mine Potential Interaction Zone.*

This allowance is expected to be sufficient to accommodate any rock falls that may be of predominantly natural origin as well as any mining induced rock falls that could conceivably be associated with the proposed first workings.

## **3. Discussion**

The IEP considers there are a number of challenges for CCCL in managing surface impacts and their consequences, particularly the consequences of rock falls from cliffs and pagodas. These include:

- differentiating impacts that might occur from substantially natural causes from those that are mining induced, both during the period of active mining and afterwards

- the accuracy and timeliness with which subsidence effects can practically be measured and mining plans modified relative to the timeframe in which subsidence impacts might be observed
- the nature of the surface terrain at the site complicating the accurate measurement of subsidence effects, particularly the low magnitude effects expected above the CLZ
- the suddenness with which pillar instability might occur in the unlikely event it were to occur and therefore the inability to effectively respond.

The approach outlined in the EP to meet these challenges is based primarily on the design of the coal pillars and the expectation that these will only lead to low level subsidence at the surface. This approach is considered reasonable and appropriate but the IEP encourages CCCL to develop a demonstrably effective way to monitor ground movements in the cliff line environment above Airly Mine when the ground movements are expected to be of low level.

On Page 39 of the Airly Mine Subsidence Monitoring Program - Cliff Line Zone of First Workings Extraction Plan, there is the following note.

*Note: Surface Subsidence Effects Monitoring (Ground Movements) - Due to the permanent long term stable and non-subsiding pillars with negligible pillar settlement (which will be difficult to detect compared to natural movements as concurred by IEP (refer Section 1)), compliance monitoring of ground movements is not appropriate or required for the current EP Area.*

The IEP considers that the expected long term stability of the pillars and low level subsidence does not justify abandoning monitoring of ground movements in the cliff line environment at Airly Mine. Long term stability of pillars and low levels of subsidence are expected but monitoring suitable to confirm the expected outcomes and to inform future mine planning decisions is nevertheless recommended, particularly around cliff line features that are likely to be sensitive to ground movements because of their size or previous mining impacts.

Should there be any perceptible surface impacts, the challenge for CCCL will be to confirm the magnitude and mechanics of the ground movements that caused the impacts and to determine whether these impacts are mining related or not. Multiple systems, including high accuracy/resolution three-dimensional subsidence monitoring systems and the understanding that they yield are considered likely to provide the strongest basis to differentiate impacts caused by natural processes from those caused by mining.

The management plans as outlined describe several systems for monitoring ground movements. The IEP had difficulty determining whether any of these systems would be practical for the purposes of monitoring subsidence

movements of the low magnitude expected. Although not necessarily critical for first workings within the CLZ, high confidence monitoring systems will be required when adjacent extractive mining is undertaken. It would be of benefit to CCCL to have demonstrated confidence in the use of ground movement monitoring systems prior to their use for critical management decisions.

#### **4. Conclusions**

The IEP considers the various management plans that were reviewed are reasonable and appropriate to manage the unlikely event of surface impacts to cliffs, pagodas, steep slopes and other surface features from proposed first workings in the CLZ.

The IEP encourages CCCL to develop and demonstrate methods suitable to closely monitor sensitive cliff formations, even cliffs that are not expected to move significantly, so as to build confidence in the understanding of how they respond not only to mining but also to natural processes such as seasonal and diurnal temperature changes and rainfall events.

If you have any queries or require further clarification of any of the issues raised please don't hesitate to contact either Professor Ismet Canbulat or the undersigned.

Yours sincerely



Ken Mills  
Principal Geotechnical Engineer (for and on behalf of the IEP)