Department of Primary Industries
Office of Water

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Our ref ER20556

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Dear Mr Sprott

North Wambo Underground Coal Mine MOD 14 (LW 10a) – additional information

The NSW Office of Water (Office of Water) has reviewed the additional information provided by the proponent on the 22 January regarding the North Wambo Coal Mine MOD 14 (Longwall 10A) application and provides the following comments for your consideration, with further detail at **Attachment A**:

- There remains a significant risk the proposed modification could substantially increase the impact of the project on surface and groundwater resources.
- The Office of Water does not support the outcomes of the proponents groundwater modelling.

Should you require further information regarding the Office of Water's advice, please contact me directly on (02) 8838 7529.

Yours sincerely

Mitchell Isaacs
Manager Strategic Stakeholder Liaison
11 February 2015

ATTACHMENT A

NSW Office of Water's detailed technical advice: North Wambo Coal Mine MOD 14 – additional information

Proposal

Wambo Coal Mine Pty Ltd (WCPL) is an existing open cut and underground mining operation situated approximately 15 km west of Singleton, near the village of Warkworth, New South Wales (NSW). The approved North Wambo Underground Mine Layout consists of 10 longwall panels within the Wambo Seam (Longwalls 1 to 10). The Modification would include the development of an additional longwall panel within the Wambo Seam referred to as 10A.

Background

LW 10A panel is to be 263 m wide. WCPL presents a position that the impacts of mining LW10A will have only very minor incremental impacts to that already approved. It is also argued that these impacts have been conservatively estimated due to how fracturing above mined coal seams has been incorporated within the groundwater model.

The impact assessment for the underlying Arrowfield and Bowfield Seams when approved did not consider extraction occurring in all four seams beneath Wambo Creek. Previous impacts with mining the shallowest Whybrow Seam creates elevated risks of interaction between the Permian aquifers with Wambo Creek watercourse and alluvium.

In October 2014 the groundwater advice raised concerns as part of the review of the Environmental Assessment (EA) in relation to:

i. the application of fracturing heights within a multi-seam environment; and
ii. final groundwater equilibrium heights given the land surface has subsided to a lower elevation.

Clarification and commentary to qualify the application of fracturing within the model and conclusions drawn on potential long term salinity within Wambo Creek and associated alluvium was sought. WCPL's RTS reiterated that 'fracturing represented in the model is definitely conservative' and "the Groundwater Assessment showed a net downward flux from the alluvium to the Permian rock following the recovery period". WCPL's RTS did not provide sufficient detail for the Office of Water to complete their groundwater assessment.

Consequently a meeting with WCPL was held (15 January 2015 at NSW Planning office in Sydney) to discuss technical aspects of the modelling. The Office of Water presented information taken from the EA that demonstrated the modelling outputs were not showing a downward flux from the alluvium to the Permian as described in the EA. This issue was exasperated further due to predicted land subsidence. At the meeting the Office of Water flagged concerns that the significant goaf fracturing as described within the EA was not being adequately conceptualised by the hydraulic conductivity (Kz) values applied in the model.

The meeting with the proponent clarified details with WCPL assessment and the Office of Water finalised its groundwater review of the proponent's RtS (Office of Water internal memo: Groundwater Management Branch to Major Projects, 22 Jan, 2015). However, the proponent sought at the meeting to submit further details to better qualify potential impacts. The following provides a review of this supplementary report titled 'Groundwater Assessment Response to NSW Office of Water Submissions, Report HC2015//002', dated 21 January 2015.

Proponent's Response

WCPL's supplementary report provides details on:

1. The monotonic ramp function and how the Kz maximum values were applied with justification of similar values have being applied for Southern Coalfield Mines:

2. Long term relative levels between Permian and alluvium and salinity impacts.

Office of Water Review of Supplementary Groundwater Assessment

Point 1 – Kz Values

The Kz max values applied in the model are constrained to very low values as not to be consistent with the textural description of the A fracture zone. Whilst it is acknowledged that model calibration was achieved applying such low values in this instance, other groundwater models can also achieve calibration applying log linear decay in Kz without the need to overly constrain the starting values. A recent example for Southern Coalfields is Russell Vale Colliery where similarly to WCPL they applied a Kz value of 10 for the mined out coal seam but follow a more consistent decay function for the overlying layers (see Table below). The Kz for the interburden layer immediately overlying a mined seam is 1 m/day for Russel Vale, whereas WCPL constrains this to a value some 10000 times less. The limiting Kz value applied by WCPL under this multi-coal seam proposal where significant fracturing has already been historically observed, is under estimating the vertical connectivity and consequential impacts between the alluvium and Permian groundwater systems.

NRE8 R1C GW (19 June 2014) **GeoTerra / GES**

Table 10 Calibrated Hydraulic Properties

Layer	Stratigraphic Unit	Host (kx)	Ss [1/m]	Sy	Fracture Zone (Kz)	Wonga West (Kz)	Wonga East Historic Workings Bulli Seam (Kz)	Wongawilli Longwalls (Kz)
1	Upper Hawkesbury Sandstone	3.00E-02	1.0×10^{-3}	1.0×10^{-2}	1.62E-02			
1	Layer 1 (Coastal Plain)	3.03E-01	1.0×10^{-4}	2.0×10^{-2}	9.58E-02			
2	Upper Hawkesbury Sandstone	5.00E-04	1.0×10^{-4}	1.0×10^{-2}	1.00E-05			
3	Lower Hawkesbury Sandstone	5.55E-04	1.0×10^{-4}	1.0×10^{-2}	6.86E-05			5.00E-04
4	Bald Hill Claystone	2.00E-05	1.0×10^{-7}	1.0×10^{-2}	9.88E-06			2.00E-04
5	Upper Bulgo Sandstone	6.00E-04	1.0×10^{-5}	1.0×10^{-2}	1.00E-04			2.20E-03
6	Upper Bulgo Sandstone	5.00E-04	1.0×10^{-5}	1.0×10^{-2}	2.00E-05			9.00E-04
7	Lower Bulgo Sandstone	9.00E-04	1.0×10^{-5}	1.0×10^{-2}	3.00E-05			1.00E-04
8	Lower Bulgo Sandstone	9.28E-04	1.0×10^{-5}	1.0×10^{-2}	5.00E-06			4.50E-02
9	Stanwell Park Claystone	1.47E-04	1.0×10^{-7}	1.0×10^{-2}	3.00E-06			3.82E-04
10	Scarborough Sandstone	8.00E-04	1.0×10^{-7}	1.0×10^{-2}	1.00E-05			9.72E-03
11	Wombarra Claystone	1.68E-05	1.0×10^{-5}	1.0×10^{-2}	1.50E-06	7.00E-06	4.00E-05	3.14E-03
12	Coal Cliff Sandstone	6.92E-06	1.0×10^{-5}	1.0×10^{-2}	1.00E-06	3.96E-05	3.00E-04	2.36E-03
13	Bulli Seam	3.00E-02	1.0×10^{-5}	1.0×10^{-2}	1.00E-03	0.1		0.1
14	Interburden	1.19E-05	1.0×10^{-5}	1.0×10^{-2}	1.00E-06			0.1
15	Balgownie Seam	1.00E-02	1.0×10^{-5}	1.0×10^{-2}	6.29E-03			1
16	Interburden	2.32E-05	1.0×10^{-5}	1.0×10^{-2}	5.00E-06			1
17	Wongawilli Seam	1.00E-02	1.0×10^{-5}	1.0×10^{-2}	5.00E-03			10
18	Basement	5.32E-06	1.0×10^{-5}	1.0×10^{-2}	1.09E-06			

Point 2 – Long Term Flux of Groundwater and Salinity

WCPL present in Figure 1 below the hydrograph modelling results for a synthetic bore located in the midpoint of LW10A. Figure 1 presents a 3m (upflow) head difference is generated between Permian and alluvium. Whilst the proponent does now acknowledge the upflow, it remains that the groundwater model doesn't incorporate the substantial land subsidence that will occur in this location. Observation point P114 is an actual alluvial bore located in mid-point of LW10A and had pre-mining levels around 58m AHD (Figure 2), i.e. identical to that of the synthetic bore. Previous Office of Water commentary has demonstrated the alluvium in LW10A will be subsided by as much as 9.5m in this area.

The proponent continues to side step subsidence as an issue for groundwater flux. Given the groundwater model can not assess what can logically be concluded, concerns with the long term impacts of the proposal remain. By ignoring this issue the proponent has not demonstrated with sufficient rigour the impacts of the proposal. It is clear that the upflow from the Permian to the alluvium is predicted which results in the mixing of aquifers of different water quality. Under increased Kz being generated in the Permian combined with alluvial land subsidence, these impacts will be greater than that put forward in the supplementary report. Further, this outcome contradicts that presented in the EA.

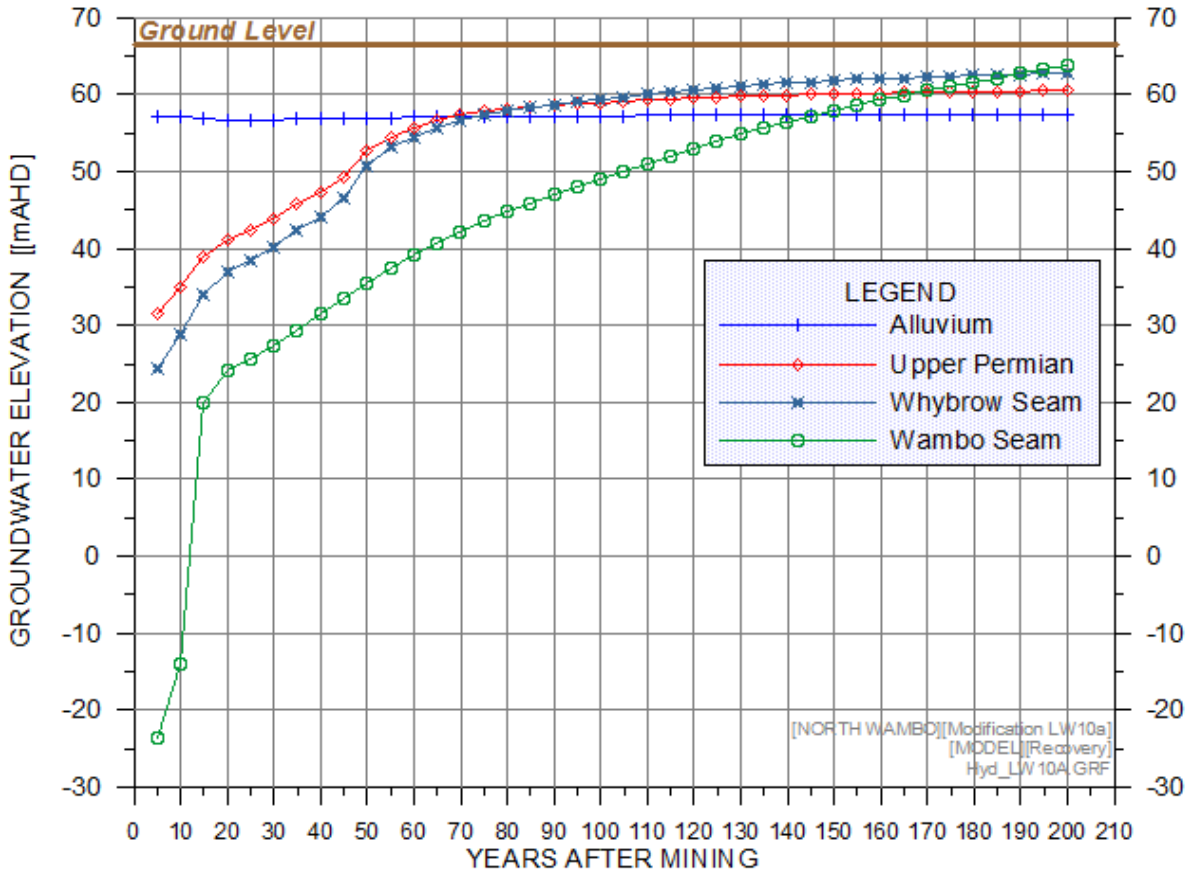
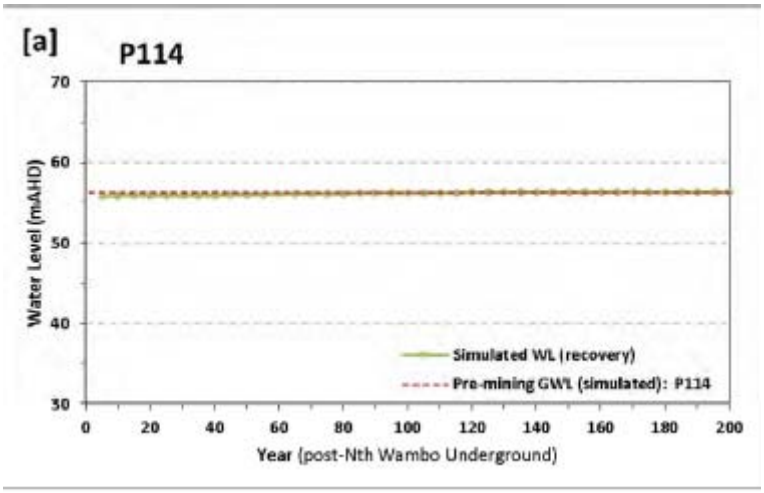


Figure 2: Alluvial observation bore in midpoint LW10A



Office of Water Recommendations

Mining of the Whybrow seam has already generated fracturing to surface beneath Wambo Creek. The proposed project (LW10A) will increase the vertical fracturing between the Wambo Seam, the Whybrow seam and the surface water / alluvial systems.

The impact assessment for the underlying Arrowfield and Bowfield Seams when approved did not consider extraction occurring in all four coal seams beneath Wambo Creek. With mining the deeper Arrowfield and Bowfield seams, increased vertical fracturing up to the Wambo Seam will occur. Mining of LW10A permits vertical fracture interconnection between all four seams and Wambo Creek and the alluvial aquifer system. Under a long term positive flux of groundwater from the Permian to the alluvium, increased discharge of saline groundwater is evident.

WCPL's conclusion as to the longer term water flux direction and predicted take of water as presented in the Environmental Assessment is not supported. The supplementary information provided has not altered this position.

End Attachment A