NSW GOVERNMENT | Department of Primary Industries

OUT16/19655

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Dear Jessie

DPI response to request for comment on proposed Modification 12 to Wambo Coal Mine (DA 305-7-2003)

I refer to your email dated 26 April 2016 to the Department of Primary Industries in respect to the above matter. Comment has been sought from relevant divisions of DPI. Any further referrals to DPI can be sent by email to landuse.enquiries@dpi.nsw.gov.au.

DPI has reviewed the request and provides the following recommendations with further detailed comments by DPI Water at **Attachment A**:

- The proposal should be assessed against the NSW Aquifer Interference Policy (AIP), considering the guidelines at **Attachment B**.
- Consistent with earlier DPI Water requests, the proponent should carry forward bore water level trigger values in Australian Height Datum (AHD) and not as depth.
- Consistent with previous DPI Water requests, when the proponent completes the updated Water Management Plan (WMP) augmentation, paired observation bores should be established within the interburden aquifer at sites P114 and P116.
- The proponent should advise on whether the investigation report into whether the increased electrical conductivity (EC) in shallow bore P114 is a result of a possible leakage from Wambo South Water Dam and potential remediation/mitigation measures was completed and submitted as stated in the WMP (October 2015). A copy of the report should be made available to DPI Water and the EPA.
- The proponent should provide a copy of the monitoring bore construction and lithology logs to DPI Water.
- The proponent should assess the project with respect to the AIP minimal impact consideration regarding 'No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".

- The proponent should present their strategy to account for any water taken beyond the life of the operation of the project.

- The proponent should advise how measurement and monitoring of volumetric take of water from each water source will be achieved.

- Crown land is present within the project boundary. DPI Lands & Natural Resources manage or administer the State's Crown land and Crown roads predominantly under the provisions of the Crown Lands Act 1989 and the Roads Act 1993 respectively. The proponent should note that the relevant legislation and that DPI Lands & Natural Resources is the agency responsible for administering Crown land.

- The EIS should include a description of land tenure & ownership and, where Crown land is involved, details of any lease, licence and/or reservation. DPI Lands & Natural Resources recommends that the proponent undertake a full status search with this agency to accurately determine affected Crown lands. The proponent must also identify any Crown land outside the project boundary that is subject to an activity associated with the proposal, including for example haulage roads, biodiversity offsets, buffers, water pipelines, electricity lines and drainage detention basins. For information on DPI Lands & Natural Resources status see information on website: http://www.crownland.nsw.gov.au/crown_lands/searches

- The proponent should assess the impacts of the proposal on all Crown land and clearly identify Crown land that may be significantly affected by the proposal:

    - Crown land significantly affected by the proposal should be identified and the proponent will need to obtain DPI Lands & Natural Resources' agreement to sell the affected Crown land. Where DPI Lands & Natural Resources agrees to sell the affected Crown land Transfer of Title should be completed prior to commencement of a modified consent for DA 305-7-2003 Mod 12..

    - Crown roads required as part of the development should be identified and either:
        - Closed and purchased by the Proponent; or
        - Transferred to Singleton Shire Council if the road is required to remain open as public roads.

Yours sincerely

Mitchell Isaacs
Director, Planning Policy & Assessment Advice
26/5/2016

Attachment A

Wambo Coal Mine (DA 305-7-2003 MOD 12)

Detailed comments – DPI Water

General Overview

The primary risk associated with the proposal is that a shift from mining the deeper Bowfield Seam to an intermediate depth Woodlands Seam would exacerbate the fracture interconnection up to the overlying mined Wambo Seam, which similarly has a certain degree of fracture connection up to the mined Whybrow Seam, and ultimately continues up to Wambo Creek alluvial and surface water systems historically noted to fractured to surface. Understanding the long term ramifications under this project, including the water quality aspects, is complex. Considering that as a fracture doubles in width, the potential flow volume is cubed, so the ability to transmit saline water could increase exponentially where minimal fracturing existed in the pre-mining environment.

Goaf fracturing and the resulting increased surface area contact between water and Permian rock could potentially expedite the release of additional soluble salts previously held tight within the low permeability interburden material. This is an issue for DPI Water consideration and is further complicated by the potential for subsidence and fracturing beneath and extending to the highly connected alluvial systems.

To evaluate such a complex issue DPI Water are predominantly guided by the groundwater modelling outputs which have been interpreted and presented by the proponent to indicate only minor incremental increases to that already approved under the existing development consent. This is demonstrated as part of the AIP assessment.

The groundwater model component of the Groundwater Assessment report has been independently reviewed by Dr F Kalf from Kalf and Associates Pty Ltd. Dr Kalf finds the model and report to be 'fit for purpose' with the majority of criteria for assessing a model being categorised as 'very good'. Dr Kalf identified some limitations with the model and assessment, which included the uncertainty analysis and time horizon for prediction compared with the calibration period. There are no objections to Dr Kalf's conclusion that the model having adhered with the available modelling guideline documents (NWC 2012, MDBC 2001) would be categorised as being 'fit for purpose'.

Residual Issues

A brief review of the past two Wambo Mine modifications is warranted as it influences part of this assessment.

During the proponent's previous mine modifications for the inclusion of Wambo Seam LW 10A, and the Wambo South Bates (Whybrow Seam) Underground Mine Extraction Plan Longwalls 11-13 DPI Water (formerly NOW), made a number of recommendations for inclusion in the Water Management Plan (WMP). These recommendations were for the purpose of improved monitoring and evaluation of modelled predictions.

Wambo Coal Pty Ltd (WCPL) submitted versions of the WMP to NSW Government in May and October 2015 for comment. DPI Water provided a review and response to the WMP, along with response to submissions (RtS) in May 2015, November 2015 and January 2016. Particular issues flagged by DPI Water included: (i) the need to have the groundwater triggers in AHD (to overcome the issue of subsidence); and (ii) the need for additional observation points to be nested with alluvial monitoring bores.

WCPL's response to DPI Water RtS of November 2015 advised that: (a) Table 9 has been modified to report groundwater triggers in AHD levels; and (b) additional paired observation bores would be considered as part of South Wambo Mine Mod 12, the subject of this EIS (see Table 1).

Table 1: Wambo Coal Pty Ltd Response to Submissions (6th Nov 2015)

21	DPI Water noted that groundwater trigger levels in the GWMP are not referenced in Australian Height Datum (AHD).	Table 9 of the GWMP has been amended include absolute trigger levels in m AHD.

No.	Comment	Response
22	DPI Water requested that P114 and P116 of the Wambo Creek alluvial trigger bores within the subsided area be nested or paired with deeper interburden bores to assess the direction of flow between Permian and alluvial aquifers during the post mining period.	Longwalls 11 to 13 are over 3 kilometres from Wambo Creek and therefore this particular issue is not related to the Extraction Plan. It is noted that the GWMP has been approved by the DP&E after no additional comments were received from DPI Water for over 5 months. The comprehensive approved groundwater monitoring program at the Wambo Coal Mine includes monitoring at 34 locations. As noted by DPI Water, P206 (also known as P203) and P202 are nearby interburden bores (within approximately 500 metres). It is considered that these nearby bores should be sufficient to assess the direction of flow between the Permian and alluvial aquifers. DPI Water's request will be given further consideration when reviewing the groundwater monitoring network for the upcoming South Wambo Underground Mine Modification (MOD 12 for the Wambo Coal Mine).

The Groundwater Assessment for the EIS under review states "*In the latest approved GWMP (WCPL, 2015a), 14 alluvial locations have nominated groundwater trigger levels as listed in* ***Table 6*****"**. (reproduced below as Table 2.) DPI Water notes that the water level triggers are not presented in AHD levels. These triggers should be presented as AHD levels, as previously agreed.

Table 2: Shallow Bore Water Level Trigger Values (ref Table 6 - Groundwater Assessment, March 2016)

	Depth to Groundwater (mBTOC)[1]	
Bore	Minimum (10th percentile)	Maximum (90th percentile)
P106	6.6	10.7
P109	4.6	6.7
P114	5.4	7.6
P116	4.8	7.3
P202	7.8	9.6
P203 (also known as P206)	16.1	21.6

- **It is recommended the proponent carry forward water level value triggers in AHD as previously accepted.**

With respect to the previous request for additional targeted observation points DPI Water notes that Section 6 of the Groundwater Assessment states "*It is recommended that the approved GWMP is augmented following approval to include the installation of additional groundwater monitoring sites above the southern longwall area.*" There is no clear indication of where these sites would be located. DPI Water will address this issue further when the opportunity presents to comment on the WMP augmentation.

- **It is recommended that when the WMP augmentation is developed paired observation bores into interburden be established at sites P114 and P116, consistent with previous DPI Water requests.**

In May 2015, DPI Water highlighted a concern with the water quality changes detected at observation bore P114 located on the Wambo Creek Alluvium and overlying LW10A. This bore is the closest bore to South Dam and between February 2011 and June 2014, the EC at P114 increased from below 1000 µS/cm to almost 7000 µS/cm. The average EC in the South Dam was 7350 µS/cm. No further analysis or investigation was being triggered under the proposed extraction plan. Noting that this water quality change conflicts with the Objects of the WMA (2000), DPI Water recommended trigger levels with regard to salinity be set to investigate and determine if remediation is required.

WCPL's WMP (October 2015) outlined *"An investigation into the increased EC in shallow bore P114 has been initiated to further investigate the potential for impacts on this bore as a result of possible leakage from Wambo South Water Dam and potential remediation/mitigation measures*. " It was stated that this report would be submitted by November 30th 2015. A Groundwater Assessment Review document (dated 2nd October 2015, ref H2015/36) was submitted as part of the review of the Extraction Plan for Longwalls 11 to 13. That document did not make any reference to P114 salinity or South Dam. DPI Water is not aware if the investigation report into the drivers for salinity increase at P114 was ever submitted. There is minimal detail on this issue or reference to a completed investigation in the current EIS.

- **It is recommended WCPL advise whether the investigation report into the increased EC in shallow bore P114 as a result of possible leakage from Wambo South Water Dam and potential remediation/mitigation measures was completed and submitted as stated in the WMP (October 2015). A copy of the report should be made available to DPI Water and EPA**.

The bore log construction details have not been not made available and this limits DPI Water's assessment capability.

- **It is recommended a copy of the monitoring bore construction and lithology logs be made available to DPI Water.**

Aquifer Interference Policy

A copy of the assessment against the Aquifer Interference Policy checklist is provided in Attachment B.

Points noted as part of the assessment is that minimal impact consideration level 2 criteria are triggered with 4 bores impacted beyond AIP 2m drawdown threshold, one within the alluvium and three in porous rocks . The outlined mitigation is to implement the Surface and Groundwater Response Plan (WCPL, 2015b) in the event a complaint is received in relation to loss of groundwater supply.

Assessment has not been undertaken for the longwall panels beneath Wollombi Brook against the AIP Level 1 minimal impact consideration which states *that 'No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply*" in order for the impact to be classified as Level 1.

- **WCPL should undertake an assessment against the AIP minimal impact consideration regarding *'No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply"***

Section 5.5 of the Groundwater Assessment describes the licence requirements during active mine life. A strategy to account for any water taken beyond the life of the operation of the project has not been presented.

- **It is recommended WCPL present their strategy to account for any water taken beyond the life of the operation of the project.**

Recommendations

- Consistent with earlier DPI Water requests and previously accepted by WCPL, the proponent carry forward bore water level trigger values in AHD and not as depth.
- Consistent with previous DPI Water requests, when WCPL complete the updated WMP augmentation, paired observation bores are to be established within the interburden aquifer at sites P114 and P116.

- WCPL advise on whether the investigation report into the increased EC in shallow bore P114 is result of a possible leakage from Wambo South Water Dam and potential remediation/mitigation measures was completed and submitted as stated in the WMP (October 2015). A copy of the report should be made available to DPI Water and EPA.
- It is recommended a copy of the monitoring bore construction and lithology logs be made available to DPI Water.
- WCPL should state whether or not the project adheres with the AIP minimal impact consideration regarding 'No mining activity to be below the natural ground surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".
- WCPL present their strategy to account for any water taken beyond the life of the operation of the project.
- WCPL advise how it will measure and monitor volumetric take.

For further information please contact Hemantha De Silva, Senior Water Regulation Officer, 02 4904 2525, hemantha.desilva@dpi.nsw.gov.au

End Attachment A

Attachment B

Wambo Coal Mine (DA 305-7-2003 MOD 12)

Assessing a proposal against the NSW Aquifer Interference Policy

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DISCLAIMER
This is a document produced to aid interpretation and application of the NSW Aquifer Interference Policy (2012). All information in this document is drawn from that policy, and where there is any inconsistency, the policy prevails over anything contained in this document.

Any omissions from this framework do not remove the need to meet any other requirements listed under the Policy.

Assessing a proposal against the NSW Aquifer Interference Policy

Note for proponents:
This is the basic framework against which the NSW Office of Water uses to assess project proposals against the NSW Aquifer Interference Policy (AIP).

While you are not required to use this framework, you may find it a useful tool to aid the development of a proposal or an EIS.

We suggest that you summarise your response to each AIP requirement in the table below, and provide a reference to the section of your EIS that addresses that particular requirement. Using this tool can help to ensure that all necessary factors are considered, and will help to understand what the requirements of the AIP are.

Step by step guide to assessing a proposal against the AIP:

Table 1: Does the activity require detailed assessment under the AIP?

	Consideration	Response
1	Is the activity defined as an aquifer interference activity?	If **NO,** then assessment is complete. No assessment is required under the AIP. If **YES,** continue to 2.
2	Is the activity a defined minimal impact aquifer interference activity according to section 3.3 of the AIP?	If **YES**, then no further assessment against this policy is required. Volumetric licensing still required for any water taken, unless exempt. See the implementation manual for a more detailed discussion. If **NO**, then continue on for a full assessment of the activity.

Section 3.2 of the AIP defines the framework for assessing impacts. These are addressed here under the following headings:

1. Accounting for, or preventing the take of water
2. Addressing the minimal impact considerations
3. Proposed remedial actions where impacts are greater than predicted.

1. Accounting for, or preventing the take of water

Where a proposed activity will take water, adequate arrangements must be in place to account for this water. It is the proponent's responsibility to ensure that the necessary licences are held. These requirements are detailed in Section 2 of the AIP, with the specific considerations in Section 2.1 addressed systematically below.

Where a proponent is unable to demonstrate that they will be able to meet the requirements for the licensing of the take of water, consideration should be given to modification of the proposal to prevent the take of water.

Table 2: Has the proponent:

AIP Requirement		Proponent response	DPI Water Comment
1	Described the water source (s) the activity will take water from?	Alluvial aquifers in the vicinity of Wambo are managed as the Lower Wollombi Brook Alluvial Water Source, within the *Hunter Unregulated and Alluvial Water Sources WSP 2009*. The alluvium along Wollombi Brook and a small portion of alluvium on Wambo Creek are classified as a 'Highly Productive' groundwater source by DPI Water; the remaining alluvial aquifers are classified as 'Less Productive'. The Permian and Triassic hard-rock units will be managed as the Sydney Basin - North Coast Groundwater Source within the *WSP for the North Coast Fractured and Porous Rock Groundwater Sources*. This WSP is in Draft form on exhibition from 8 February 2016 until 20 March 2016. Until then the Porous Rock groundwater source is being managed under the *Water Act 1912*. This is classified as a 'Less Productive' groundwater source by DPI Water.	Defined appropriately.
2	Predicted the total amount of water that will be taken from each connected groundwater or surface	Table 20. **Lower Wollombi Brook Water Source Max 36 ML**	Accepted

AIP Requirement		Proponent response	DPI Water Comment
	water source on an annual basis as a result of the activity?	**Porous Rock – total Max. 1,293**	
3	Predicted the total amount of water that will be taken from each connected groundwater or surface water source after the closure of the activity?	Blank	Not described.
4	Made these predictions in accordance with Section 3.2.3 of the AIP? (refer to Table 2, below)		Yes, calibrated numerical groundwater model on long term data set, calibration targets achieved well within guideline values and independently reviewed as 'fit for purpose'.
5	Described how and in what proportions this take will be assigned to the affected aquifers and connected surface water sources?	Table 20. **Lower Wollombi Brook Water Source Max 36 ML** **Porous Rock – total Max. 1,293**	Accepted
6	Described how any licence exemptions might apply?	Blank	No exemptions
7	Described the characteristics of the water requirements?	Blank	Water requirements not covered in Groundwater Assessment. Water Balance shows 4.52 ML/d mine inflow. (1650 ML/yr). Note this volume exceeds combined total shown in Table 20 but encapsulates greater model area, thus mines too. Figures 48 and 49 show UG inflow at approx. 3.5ML/d (1277 ML/yr)
8	Determined if there are sufficient water entitlements and water allocations that are able to be obtained for the activity?	Table 2 list of licences held by WCPL. This constitutes total entitlement, for all Wambo mine operations, of 70 ML/a from the Lower Wollombi Brook Water Source and 1,647 ML/a from the Porous Rock Water Source.	Licences exceed max volumes of predicted take.
9	Considered the rules of the relevant water sharing plan and if it can meet these rules?	Blank	No known additional constraints.
10	Determined how it will obtain the required water?	Not required	Accepted
11	Considered the effect that activation of existing entitlement may have on future available water determinations?	Blank	Unregulated system. Additional water would need to be purchased if AWD was less than 50% for Lower Wollombi Brook Source.
12	Considered actions required both during and post-closure	Blank	Modification relates to underground works only, not

AIP Requirement		Proponent response	DPI Water Comment
	to minimize the risk of inflows to a mine void as a result of flooding?		applicable.
13	Developed a strategy to account for any water taken beyond the life of the operation of the project?	Blank As stated in Section 1.6, WCPL currently has licensed entitlements of 70 ML/a for the Lower Wollombi Brook Water Source and 1,647 ML/a for groundwater derived from the Porous Rock source. The current groundwater licences are therefore sufficient to cover the predicted water extraction shown in **Table 20** for all approved underground mine plans and the Modification for the duration of the South Wambo Underground Mine.	**Only describes active mine. Licence surrender would be required consistent with AIP.**
	Will uncertainty in the predicted inflows have a significant impact on the environment or other authorized water users? *Items 14-16 must be addressed if so.*		Uncertainty Analysis identified by independent review as a model limitation. Fracture Zone Sensitivity Analysis looked potential changes of inflow to individual seams from the approved to modification.
14	Considered any potential for causing or enhancing hydraulic connections, and quantified the risk?	Section 3.6 Fracture Zone Implementation, Section 4.8 Fracture Zone Sensitivity Analysis. Attachment D	See comments in general overview and guided by model outputs. Adequately defined but ongoing monitoring needs to be complimentary to the risk.
15	Quantified any other uncertainties in the groundwater or surface water impact modeling conducted for the activity?		Discussion on long term salinity risks.
16	Considered strategies for monitoring actual and reassessing any predicted take of water throughout the life of the project, and how these requirements will be accounted for?		Managed as part of the Extraction Plan

Table 3: Determining water predictions in accordance with Section 3.2.3
(complete one row only – consider both during and following completion of activity)

AIP Requirement		Proponent response	DPI Water Comment
1	For the *Gateway* process: Is the	Blank	N/A

	AIP Requirement	Proponent response	DPI Water Comment
	estimate based on a simple modelling platform, using suitable baseline data, that is fit-for-purpose?		
2	For *SSD* or *mining* or *CSG production*, is the estimate based on a complex modelling platform that is: • Calibrated against suitable baseline data, and in the case of a *reliable water source*, over at least two years? • Consistent with the Australian Modelling Guidelines? • Independently reviewed, robust and reliable, and deemed fit-for-purpose?		Yes, calibrated numerical groundwater model on long term data set, calibration targets achieved well within guideline values and independently reviewed as 'fit for purpose'.
3	In all other processes, estimated based on a desk-top analysis that is: • Developed using the available baseline data that has been collected at an appropriate frequency and scale; and • Fit-for-purpose?		N/A

Other requirements to be reported on under Section 3.2.3
Table 4: Has the proponent provided details on:

	AIP Requirement	Proponent response	DPI Water Comment
1	Establishment of baseline groundwater conditions?	Section 2.5 Groundwater Monitoring	Extensive baseline data available, further sites recommended for on-going assessment. See comments in main text.
2	A strategy for complying with any water access rules?	Blank	Unregulated system. Additional water would need to be purchased if AWD was less than 50% for Lower Wollombi Brook Source.
3	Potential water level, quality or pressure drawdown impacts on nearby basic landholder rights water users?	No basic rights bores identified.	Noted.
4	Potential water level, quality or pressure drawdown impacts on nearby licensed water users in connected groundwater and surface water sources?	Table 21. Cumulative impact on 20WA208559 is 2.2m, Cumulative Impact on three private wells in hardrock of 20+ m	**Level 2 impact to 4 bores**
5	Potential water level, quality	There is a single High Priority	No section in the Groundwater

AIP Requirement		Proponent response	DPI Water Comment
	or pressure drawdown impacts on groundwater dependent ecosystems?	Groundwater Dependent Ecosystem near to Wambo. Parnell Spring, which likely flows from the Triassic-age Narrabeen Formation and feeds Milbrodale Creek, is located about 9 km south-southwest of the Modification longwall panels. This feature is therefore located outside of the active model domain. Wambo mining would result in negligible drawdown at Parnell Spring.	Assessment dedicated to GDEs, One GDE referenced in Topography and Drainage section and listed in Table 22 AIP Impact Consideration Assessment. 9km distance to an elevated GDE is likely have negligible impact as presented.
6	Potential for increased saline or contaminated water inflows to aquifers and highly connected river systems?	Section 5.2 Groundwater discharge from deeper, hard rock to alluvial flats would have been limited due to the low vertical hydraulic conductivity of the Permian strata, but it is known that over long periods of time (millennia) salinity can build up along the edges of these sediments. During and post mining these salinity accessions have been and would be arrested as a result of mine drawdown propagation. Section 5.7 This proposed Modification could not be considered to have a significant effect on the quality of groundwater or surface water around Wambo. The modelling shows no potential for increased flux of more saline water, due to the Modification, from the Permian strata to the alluvium for a period of at least 100 years, and only minor zones of enhanced upflow to alluvium after 200 years along the central part of North Wambo Creek and along Stony Creek near its confluence with Wambo Creek. The groundwater levels across the footprint of the South Wambo Underground Mine are expected to settle at about 15 m below initial conditions	Comment on this issue is provided in the main text highlighting DPI Water considerations. Previous LW10A modification resulted in further testing increases in vertical hydraulic conductivity which when modelled indicated only minor changes in impact. DPI Water accepted the model had met best practices and independently deemed 'fit for purpose' which adheres with the level considered acceptable by NSW Gov't. As the risks are increased under the subject modification, then the monitoring program needs to be commensurate to the risk: ie increased risk equals increased monitoring & management. This monitoring is addressed in the main text and recommendations.

AIP Requirement		Proponent response	DPI Water Comment
		due to permanent changes in hydraulic conductivity and storage where subsidence would occur.	
7	Potential to cause or enhance hydraulic connection between aquifers?	As above	As above
8	Potential for river bank instability, or high wall instability or failure to occur?	Blank	Underground Mine
9	Details of the method for disposing of extracted activities (for CSG activities)?	Blank	N/A

2. Addressing the minimal impact considerations

Section 3.2.1 of the AIP describes how aquifer impact assessment should be undertaken.

1. Identify all water sources that will be impacted, referring to the water sources defined in the relevant water sharing plan(s). Assessment against the minimal impact considerations of the AIP should be undertaken for each ground water source.
2. Determine if each water source is defined as “highly productive” or “less productive”. If the water source is named in the register of highly productive water sources, then it is defined as highly productive, all other water sources are defined as less productive.
3. With reference to pages 13-14 of the AIP, determine the sub-grouping of each water source (eg alluvial, porous rock, fractured rock, coastal sands).
4. Determine whether the predicted impacts fall within level 1 or level 2 of the minimal impact considerations defined in Table 1 of the AIP, for each water source, for each of water table, water pressure, and water quality attributes. The tables below may assist with the assessment. There is a separate table for each sub-grouping of water source – only use the tables that apply to the water source(s) you are assessing, and delete the others.
5. If unable to determine any of these impacts, identify what further information will be required to make this assessment.
6. Where the assessment determines that the impacts fall within the Level 1 impacts, the assessment should be “Level 1 – Acceptable”
7. Where the assessment falls outside the Level 1 impacts, the assessment should be “Level 2”. The assessment should further note the reasons the assessment is Level 2, and any additional requirements that are triggered by falling into Level 2.
8. If water table or water pressure assessment is not applicable due to the nature of the water source, the assessment should be recorded as “N/A – *reason for N/A*”.

Table 5: Minimal impact considerations – example tables

Aquifer	Alluvial aquifer

Category	Highly Productive
Level 1 Minimal Impact Consideration	**Assessment**
Water Table Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. **OR** A maximum of a 2 m water table decline cumulatively at any water supply work.	**Level 2** The only High Priority Groundwater Dependent Ecosystem near Wambo is Parnell Spring. Parnell Spring likely flows from the Triassic-age Narrabeen Formation and is located 9 km south-south-west of the Modification longwall panels (Section 2.2). Wambo mining would result in negligible drawdown at Parnell Spring. There are no High Priority Culturally Significant Sites listed in the Hunter Unregulated and Alluvial Water Sources Water Sharing Plan. A cumulative drawdown of more than 2 m is predicted at one privately owned water supply work in the mapped 'highly productive' alluvial aquifer on Wambo Creek. The Modification would result in additional drawdown at this bore of approximately 0.1 m. WCPL would continue to implement the Surface and Groundwater Response Plan (WCPL, 2015b) in the event a complaint is received in relation to loss of groundwater supply.
Water pressure A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the base of the water source to a maximum of a 2m decline, at any water supply work. **OR**, for the Lower Murrumbidgee Deep Groundwater Source: A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the top of the relevant aquifer to a maximum of a 3m decline, at any water supply work.	A cumulative drawdown of more than 2 m is predicted at one privately owned water supply work in the mapped 'highly productive' alluvial aquifer on Wambo Creek. The Modification would result in additional drawdown at this bore of approximately 0.1 m. WCPL would continue to implement the Surface and Groundwater Response Plan (WCPL, 2015b) in the event a complaint is received in relation to loss of groundwater supply.
Water quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. No mining activity to be below the natural ground	There are no simulated risks of reduced beneficial uses of the alluvium as a result of the Modification (Section 5.7). The Modification would have no discernible or negligible effect on stream baseflow or natural river leakage for Wambo Creek, North Wambo Creek, or Stony Creek stream systems, beyond the effects of approved mining. It is anticipated that the Modification would not increase the long-term salinity of North Wambo Creek, Stony Creek or Wambo Creek. The Modification would not increase the long-term

Aquifer	Alluvial aquifer
Category	Highly Productive

Level 1 Minimal Impact Consideration	**Assessment**
surface within 200m laterally from the top of high bank or 100m vertically beneath (or the three dimensional extent of the alluvial water source - whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply". Not more than 10% cumulatively of the three dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200m laterally from the top of high bank and 100m vertically beneath a highly connected surface water source that is defined as a "reliable water supply".	salinity of North Wambo Creek, Stony Creek or Wambo Creek. **Long wall panels beneath Wollombi Brook should be assessed against the distance from the highly connected surface water source.**

Aquifer	Porous rock or fractured rock
Category	Less productive

Level 1 Minimal Impact Consideration	**Assessment**
<u>Water Table</u> Less than or equal to a 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. **OR** A maximum of a 2 m water table decline cumulatively at any water supply work.	The existing project includes Level 2 impacts. There is currently no Water Sharing Plan relevant to this porous rock aquifer. Limited information is available on three privately owned bores in the vicinity of Wambo. Depending on the depth from which these bores pump, these bores may experience more than 2 m cumulative drawdown (not attributable to the Modification, but rather through cumulative impact of existing approvals). WCPL would continue to implement the Surface and Groundwater Response Plan (WCPL, 2015b) in the event a complaint is received in relation to loss of groundwater supply.
<u>Water pressure</u> A cumulative pressure head decline of not more than a 2m decline, at any water supply work.	The existing project includes Level 2 impacts. Limited information is available on three privately owned bores in the vicinity of Wambo. Depending on the extraction depth, these bores may experience more than 2 m cumulative drawdown (not attributable to the Modification, but rather through cumulative impact of existing approvals). WCPL would continue to implement the Surface

Aquifer	Porous rock or fractured rock
Category	Less productive

Level 1 Minimal Impact Consideration	**Assessment**
	and Groundwater Response Plan (WCPL, 2015b) in the event a complaint is received in relation to loss of groundwater supply.
Water quality Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.	**Level 1** There is not expected to be a migration of groundwater away from the Wambo areas in the Permian system either during mining or following completion of mining activities. On this basis, Wambo would not lower the beneficial use category of the groundwater within the Permian system.

3. Proposed remedial actions where impacts are greater than predicted

Point 3 of section 3.2 of the AIP provides a basic framework for considerations to consider when assessing a proponent's proposed remedial actions.

Table 5: Has the proponent:

	AIP Requirement	Proponent response	DPI Water Comment
1	Considered types, scale, and likelihood of unforeseen impacts *during operation*?	See points 4 and 5 below	
2	Considered types, scale, and likelihood of unforeseen impacts *post closure*?	This proposed Modification could not be considered to have a significant effect on the quality of groundwater or surface water around Wambo. The modelling shows no potential for increased flux of more saline water, due to the Modification, from the Permian strata to the alluvium for the full recovery simulation of 200 years. The groundwater levels across the footprint of the South Wambo Underground Mine are expected to settle at about 15 m below initial conditions.	Guided by the model outputs.
3	Proposed mitigation, prevention or avoidance strategies for each of these potential impacts?	See points 4 and 5 below	See points 4 and 5 below
4	Proposed remedial actions should the risk minimization strategies fail?	Consistent with the currently approved *Surface and Groundwater Response Plan* (WCPL, 2015b), in the event that a groundwater quality or level trigger level specified in the GWMP is exceeded, an investigation should be conducted in accordance with the *Surface and Groundwater Response*	Subject to Government acceptance of the Extraction Plan.

AIP Requirement		Proponent response	DPI Water Comment
		Plan. Consistent with the *Aquifer Interference Policy* (NSW Government, 2012), management measures that may be implemented as a result of the investigation described above could include relinquishment of an equivalent portion of water access licences as a direct offset for potential groundwater inflows into the underground.	
5	Considered what further mitigation, prevention, avoidance or remedial actions might be required?	No additional groundwater impact mitigation measures are proposed for the Modification. Groundwater levels and quality should continue to be monitored at Wambo in accordance with a GWMP approved under the Development Consent.	Noted.
6	Considered what conditions might be appropriate?	It is recommended that the approved GWMP is augmented following approval to include the installation of additional groundwater monitoring sites above the southern longwall area.	Additional observation points required

4. Other considerations

These considerations are not included in the assessment framework outlined within the AIP, however are discussed elsewhere in the document and are useful considerations when assessing a proposal.

Table 6: Has the proponent:

AIP Requirement		Proponent response	DPI Water Comment
1	Addressed how it will measure and monitor volumetric take? (page 4)		**Not described in Groundwater Assessment**
2	Outlined a reporting framework for volumetric take? (page 4)	Annual Report	Noted.

End Attachment B