Department of Primary Industries

NSW GOVERNMENT

OUT13/12628

Mr Stephen O'Donoghue
Major projects-Mining & industry
NSW Department of Planning and Infrastructure
GPO Box 39
SYDNEY NSW 2001

23 MAY 2013

Stephen.O'Donoghue@planning.nsw.gov.au

Dear Mr O'Donoghue,

Watermark Coal Project (SSD 4975)
Response to exhibition of Environmental Impact Statement (EIS)

I refer to your email dated 20 February 2013 requesting advice from the Department of Primary Industries (DPI) in respect to the above matter.

Comment by Fisheries NSW
Fisheries NSW has reviewed the Environmental Impact Statement (EIS) in accordance with the provisions of Part 7 and Part 7A of the *Fisheries Management Act 1994* (FM Act) and relevant policies and guidelines applicable to the application of the Act.

The project involves the construction of a water pipeline from the mine site to a pump station on the Mooki River, and a proposed Biodiversity Offset Strategy. The project has the potential to have impacts on the aquatic ecology of the Mooki River.

Should the application be approved, Fisheries NSW requests the following matters be included as conditions to ensure any impacts on the aquatic ecology of the Mooki River are adequately mitigated and managed:

1. The proposed Mooki River Offset Area Management Plan as part of the Biodiversity Offset Strategy include the requirement to consult with the Department of Primary Industries (Fisheries NSW) regarding management and rehabilitation of the riparian zones within the offset area.

2. Detailed Construction Environmental Management Plans to be provided to the Department of Primary Industries (Fisheries NSW) for review and comment prior to the construction of the intake structure on the Mooki River, and are to outline:
   (i) details of the dredging footprint,
   (ii) details of the pumps, pump screens and pump intake,
   (iii) translocation protocols for fish if site dewatering is required,
   (iv) erosion and sedimentation control plans,
   (v) details of potential blockages to fish passage during construction, and
   (vi) site rehabilitation details.

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For further information please contact David Ward, Fisheries Conservation Manager (Tamworth office) on 6763 1255, or at: david.ward@dpi.nsw.gov.au.

Comment by NSW Office of Water

The NSW Office of Water advises the following key issues and the detailed comments and recommended conditions, should the application be approved, in Attachment A.

(i) According to the EIS, the proponent has secured only part of the licences required for the operations.
(ii) The proponent needs to be aware of the process of obtaining water through the trading market, what is involved, and if sufficient water for the project can be obtained.
(iii) The proponent has not committed to clearly developed mitigation strategies for possible changes in groundwater levels or quality and surface water flow or quality.
(iv) The predicted impact on the Mooki River Water Source as a result of mining is unclear in the EIS. Information on any impacts on the Mooki River Water Source should be clarified.
(v) The impact of the proposed project on the existing spatial distribution of groundwater quality and beneficial use zones within the alluvium as a consequence of laterally altered groundwater flow rates and/or directions has not been explicitly assessed.
(vi) The proponent has not demonstrated that any of the proposed potential mitigation or make-good measures are feasible and has not given commitment to any of them.
(vii) Model simulation-based scenario runs predict possible impacts of mine development to the groundwater regime. Large uncertainties may be associated with these predictions mostly due to errors in conceptualisation, uncertainty in model parameters and inadequate model calibration. It is recommended the groundwater model be updated on a 2 yearly basis to verify impact predictions and licence water take requirements.
(viii) The localised effect of flooding of Watermark Gully is a concern. Any impacts here may readily impact at the bottom section of Watermark Gully throughout all periods of the mine operation. As a result of the considerable changes to the immediate catchment, factors affecting runoff may vary substantially from year to year. The Office of Water would like to review in more detail what infrastructure may be proposed at the bottom section as this is not clearly explained in the EIS.
(ix) Monitoring bores may require licensing under Part 5 of the *Water Act 1912* unless the bores meet the criteria for exempt monitoring bores as defined in the *Water Management (General) Regulation 2011*.
(x) Floodplain works will require licensing under Part 8 of the *Water Act 1912*.

For further information please contact Hemantha Desilva, Senior Water Regulation Officer (Newcastle office) on 4904 2525, or: hemantha.desilva@water.nsw.gov.au.

Comment by Crown Lands

It is noted that:
(i) a Trig reserve is within the project area, however it is understood that this reserve will not form part of the mine site, and
(ii) there are a number of Crown roads within the mining area, however the proponent has made application to Crown Lands to close and purchase this land.

As such, no objection to the proposal is raised; however it is recommended the standard conditions detailed in Attachment B be applied to any consent.

For further information please contact Scott Stanton, Group Leader Property Services & Natural Resources (Tamworth office) on 6764 5121, or at: scott.stanton@lands.nsw.gov.au.

Comment by Office of Agricultural Sustainability and Food Security

In accordance with procedures for mining projects that affect agricultural land the Office of Agricultural Sustainability and Food Security has responded direct to your Department by letter dated 24 April 2013.

For further information please contact Liz Rogers (Orange office) on 6391 3642, or at: liz.rogers@dpi.nsw.gov.au.

Comment by Forestry Corporation NSW

As of 1st January 2013 Forests NSW became the Forestry Corporation of NSW, a separate government entity. Future referrals should be made direct to that Corporation.

In the meantime, the Corporation advises that it raises no issues with the proposal, however given the Breeza State Forest adjoins the project area the Corporation should still be advised of subsequent stages of the assessment of the application under the state significant development provisions.

For further information please contact Conan Rossler, District Manager (Baradine office) on 6843 1607, or at: conan.rossler@fcnsw.com.au.

Yours sincerely

Phil Anquetil
Executive Director Business Services

Attachment A

Watermark Coal Project (SSD 4975)
Response to exhibition of EIS

Comment by NSW Office of Water

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1. Groundwater Assessment

The open cut pits are to be constructed solely in the MDB Gunnedah-Oxley Basin (Other) Groundwater Source. The adjoining groundwater sources in close proximity to the mine site and which may be impacted include Zones 3, 7 and 8 of the Namoi Groundwater Source and the MDB Gunnedah-Oxley Basin (Spring Ridge) Groundwater Source.

1.1 Assessment against the Office of Water requirements as part of the Director General Requirements

1.1.1 *Requirement 1: Adequate and secure project water supply.*

The proponent has summarised the project's predicted water requirements and currently secured holdings for each water source (Appendix T, p. 260, summarised in Table 1, below). The proposed water management strategy, including scheduling, and infrastructure have been described (Appendix S, Chapters 4 & 7).

Groundwater seepage into the mining areas was estimated via numerical modelling. Seepage is predicted to be derived at an average rate of 0.5 ML/day (180 ML/yr; peak 756 ML/yr) and 0.03 ML/day (10 ML/yr; peak 33 ML/yr), respectively, from the *Other* and *Spring Ridge* Management Zones of the Gunnedah-Oxley Basin Groundwater Source over the 30 year life of the project. The predicted cumulative inflow of groundwater over the life of the mine is about 5,500 ML.

The project proposes to decrease the groundwater pressure of the Gunnedah-Oxley Basin (Other) Groundwater Source, which will consequently decrease that of the overlying Namoi Alluvium (Appendix T, Section 10.8) and, in turn, increase flow from the Mooki River into the alluvium (Appendix T, Section 10.9).

Model predictions suggest a project-induced decrease in groundwater flow from the underlying Gunnedah-Oxley Basin into the Namoi Alluvium, affecting Groundwater Management Zones 3, 7 and 8, respectively, by an average rate of 0.5 ML/yr (peak 1.1 ML/yr), 34 ML/yr (peak 101.8 ML/yr) and -1.2 ML/yr (peak 0.4 ML/yr).

Model predictions suggest a project-induced increase in average net flow from the Mooki River into the underlying Namoi Alluvium of about 10.8 ML/yr (total 323 ML) over the 30 year mine life, peaking at 0.13 ML/day (47.5 ML/yr) in year 24, and 5.5 ML/yr (total 166 ML) over the following 30 years after which essentially pre-mining conditions are met.

Issue: The proponent has not secured the required holdings for all but one of the relevant water sources from which take is anticipated.

Table 1. **Take of Water During and After Mining** (after Table 10.6, Appendix T, p. 260).

Water source	Predicted peak annual water take (during mining; ML)	Total share component requirement for project (units)	Share component already held by Shenhua (units)	Long-term average annual extraction limit (units)	Total share component issued (units)
Namoi Groundwater Zone 3	1.1	1.2	Nil	17,300 + suppl.	17,101
Namoi Groundwater Zone 7	101.8	112	42	3,700 + suppl.	3,697
Namoi Groundwater Zone 8	0.4	0.4	164	16,000 + suppl.	16,122
Porous Rock (Gunnedah-Oxley Basin – Other)	756	940	Nil	205,640	16,784
Porous Rock (Gunnedah-Oxley Basin – Spring Ridge)	33	42	Nil		
Mooki River	47.5	53	Nil	As calculated under clause 35 of the WSP	30,350.5
Lake Goran	0	0	1,223 (subject to issuance of certificate of title)	As calculated under clause 35 of the WSP	32,171
Zones 3, 7 or 8, or Mooki River*	600	660	Nil	NA	NA

*Required for make-up water losses, depicted temporally in Fig. 10.40, p. 262, Section 10.9, from the Mooki River into the underlying alluvium.
LTAAEL = Long term average annual extraction limit.

The proponent understands that, for a fully allocated system, the only method to obtain a water entitlement is via a dealing (Volume 1, Section 7.1.4), which cannot be guaranteed.

The proponent assumes that, for systems with unassigned water, the required water can be obtained by applying to the Minister through a controlled allocation order (Volume 1, Section 7.1.4). The proponent should be advised that the Office of Water has not made any announcements on the process for a controlled allocation order and there is currently no option for obtaining water by way of application to the Minister.

Issue: The proponent has not demonstrated that its predicted water requirements can be secured.

1.1.2 *Requirement 2: Compliance with distance restrictions for water supply works and the assessment of water source protection criteria.*

The proponent has shown that all water supply works licenced to those outside the project are >500 metres from the existing and proposed project works, as required by the relevant water sharing plans.

1.1.3 *Requirement 3: Baseline monitoring of surface and groundwater sources and dependent ecosystems for at least two years.*

Baseline groundwater monitoring, at least fortnightly for water levels and initially quarterly for quality, commenced after the first monitoring bores were installed in August 2009 (Appendix 1 of Appendix T). The proponent reportedly has a data set for the oldest bores that spans almost 3 years, whilst the majority of bores have between 1.5-3 years of data (Appendix 1 of Appendix T; monitoring sites are shown in Vol. 1, Section 2.6.1, Fig. 8). From October 2011, bores with 12-18 months of stable groundwater quality data were sampled on a six monthly or annual basis (Appendix 1 of Appendix T, Section 7.1, p. 39). The water-quality analytical suite (Appendix O of Appendix T) is fairly comprehensive, but could include iodide, which exists in coals typically at above average crustal concentration.

Flow rates for the Mooki River are obtained from the NSW Office of Water (Appendix S, p. 184).

Baseline surface water quality at 12 sites (Appendix S, Fig. 3.11, p. 25) has reportedly been undertaken, from October 2009 to the present, on a monthly basis apart from the ephemeral Watermark Gully, which is sampled during rainfall events. The monitoring analytical suite (Section 10.4.1, Table 10.6, p. 185) could be extended to include additional potential contaminants from coal, including boron, molybdenum, antimony, iodide and selenium. The number of monitoring sites will be increased after mining commences to include key storages within the mine water management system (Appendix S, Section 10.4.1).

The surface water quality baseline data summary (Appendix S, Table 3.7, pp. 30-31) should include maximum and minimum data values. The supplied data infers but does not demonstrate that at least two years of monitoring data is available.

A maximum water pH of 12.2 from the Mooki River (Appendix S, p. 28) represents a geochemically extreme environment in which some toxic elements may be highly soluble and hence prone to transport and to accumulation at environmentally sensitive sites. Such extreme values require tight quality assurance/control checks.

Comprehensive quality assurance and control considerations and analytical results are given for groundwater quality (Appendix 1 of Appendix T, Section 7.3; Appendix N of Appendix T); no such considerations are given for surface water quality.

The proponent comments (Appendix T, p. 316) that groundwater level and pressure monitoring should continue for the life of the project. It should also continue well after project completion and until equilibrium conditions are clearly met.

The proposed use of standard deviations from the mean as geochemical trigger values for further investigation (Appendix T, Section 14.3.2, p. 316) is useful to identify significant changes in some parameters from the norm, but is inappropriate for key parameters that have a non-linear scale of measurement and/or for which risk is a non-linear function; e.g. pH.

On behalf of the proponent, AGE recommends the monitoring of mine water seepage to detect any mixing of shallow alluvial groundwaters with that from the Permian strata (Appendix T, Section 14.4, p. 317). This recommendation should be extended for inclusion as part of the activities planned in the EIS. Dedicated natural environmental tracers will most likely be necessary for the early positive identification of mixing and to calculate mixing contributions.

No groundwater dependent ecosystems, vegetal (Volume 1, Section 7.1.3, p. 133) or stygofaunal (Appendix U), have been identified within the project area and thus no related monitoring has been done. Arguments given to support the likely absence of stygofauna (Appendix U, Section 7) are unsubstantiated. The assessment for the presence of stygofauna was limited to a single bore survey and included only very few bores in alluvial and colluvial geological units and none in Tertiary volcanics or within the Breeza State Forest (Appendix U, Table 1, p. 16), all of which are the most favourable host sites. The relevance of sampling sites in the dedicated stygofauna survey (Appendix U) cannot be directly evaluated because sampling depths are not given. The stygofauna sampling methods (Appendix U, Section 5) did not allow for certainty in the accurate measurement of in-situ field water-chemical parameters, which are used to indicate the suitability of conditions to host stygofauna.

Issue: The absence of stygofauna has not been demonstrated, only inferred.

AGE recommends (Executive summary, Appendix T, p. xv) the development of groundwater management plans that include appropriate backup mitigation measures. This should be included in the EIS. Sites for the additional monitoring of private bores will be determined after project approval, during development of the water management plan. This should be included within the EIS.

Issue: A proposed groundwater management plan is not presented.

1.1.4 Requirement 4: Predictive assessments of impacts on groundwater and GDEs.

(a) Groundwater

The proponent has modelled the maximum drawdown impact within the highly productive groundwater source alluvium to be <40% of the available head and <2 m in private bores (Appendix T, Sections 10.6-10.7) in accordance with the requirements of the Aquifer Interference Policy.

The proponent's numerical groundwater modelling conforms to the Australian Groundwater Modelling Guidelines (Barnett et al. 2012) according to peer review (Merrick; Appendix 9 of Appendix T). Statistics and graphs that compare modelled with observed groundwater levels (Section 9.2) demonstrate a generally good agreement.

The proponent has explicitly stated the modelling assumptions and, generally, unavoidable limitations. Whilst many of the modelling assumptions may be considered as reasonable and a common practice under the constraints of limited data and time, the impact of those, such as listed below, on predictive certainty is unknown. The current impact predictions should therefore be considered to have limited reliability. Close impact monitoring programs and early-trigger and mitigation strategies will thus need to be detailed prior to project commencement. The extent of these predictive uncertainties has operational and regulatory implications and should not be ignored. The need for model validation and, if necessary, revision or reconstruction has been recognised (Section 14.6). Some of the model uncertainties and assumptions indicated or apparent in Appendix T are:

- Uncertainties and assumptions on recharge mechanisms, locations and rates (Sections 7.3.6 & 7.4.3); recharge into many shallow units was set as a constant proportion of annual rainfall (Section 8.4.6), disregarding the preferential recharge of high-intensity, long-duration rainfall events and flood waters, and ignoring antecedent regolith moisture and climatic conditions; recharge was set for ephemeral river and creek beds by using a consistent stream bed level and uniform and constant water stage of 2 m and 1 m (Section 9.1.4, p. 142) or 3 m (Section 8.4.6, p. 117); other drainage systems were set as only gaining streams (Section 9.1.4, p. 142) without demonstration. Greatest sensitivity in the PEST calibration simulation was for recharge rate into shallow units (Section 9.2.2).
- Undisclosed data quality of aquifer parameters, recharge and evapotranspiration: no population number, spatial distribution, analytical uncertainties, or other indication of representativeness for a given geological unit; Fig's 9.15 and 9.16 (p. 157) inappropriately lump hydraulic data from a variety of lab- and field-based analyses, which have potentially very different types and degrees of analytical error, without presenting a net estimate of analytical uncertainty.
- The weathering profile simulated by applying a single, assumed multiplication factor to hydraulic parameters (Sections 8.4.3 & 9.1.4).
- Adopted parameter values from previous modelling in the region (Section 8.4.5) or other regions (e.g. mine spoil parameters; Section 10.3.8) with the assumption of adequate data quality and representativeness.
- Some relatively thick geological units lumped into a single model layer (Section 8.4.3); single hydraulic parameter values applied to represent entire model layers, apart from the Narrabri and Gunnedah Formations (e.g. Sections 9.2.3, 11.1.2 &11.3).
- Very sparse bedrock hydraulic data (Section 11.3).
- A 30-day moving average (Section 7.3.5) rather than residual mass rainfall curve used for visual and not statistical comparison to bore hydrographs.
- Evapotranspiration rate estimates scaled back by an arbitrary percentage (Section 8.4.6).
- Faults simulated (Section 8.4.7), but with very limited knowledge of their spatial distribution and types and no knowledge of their hydraulic function; fault mapping provided very localised and clearly incomplete coverage of EL7223 and generally no coverage of the broader modelled area (Fig. 8.22, p. 136); faults depicted invariably as being strictly vertical (e.g. Fig's 8.3-8.4, 10.23-10.28, etc.), which is unrealistic: an analysis of geological structures and assessment of their hydraulic properties are required.
- Subjective model input values used for unknown boundary conditions, including basement hydraulic properties and leakance to/from water bodies (Section 11.3).
- No uncertainty estimates associated with data spatial and temporal up/down scaling.
- No specified impact of tectonic strain or, potentially, mechanical loading/unloading.
- Model calibration (Section 9.1.2) and comparison (e.g. Section 9.2.11, p. 198) of model results with previous modelling studies without regard for the uncertainty in those studies.
- Numerous model layers calibrated to very few bores (Fig. 9.1, p. 139).
- Calibration done using the software PEST, within assumed parameter bounds set by the user (Section 9.1.3), via statistical simplifying techniques without defining the associated increase in uncertainty (Section 9.1.4).
- Hydraulic conductivity of the Narrabri Formation assigned as a percentage of that of the Gunnedah Formation during calibration, and varied between areas of high and low irrigation pumping; the vertical hydraulic conductivity of Quaternary aquifers was calibrated as a consistent percentage of the Gunnedah Formation's horizontal hydraulic conductivity (i.e. layer-wide vertical anisotropy ratio; Section 9.1.4) yet cannot possibly be directly related.

- An exponential decline function, determined from local and regional packer/pumping test data of undefined accuracy, was applied to reduce the target coal seams initially uniform horizontal hydraulic conductivity with depth (Section 9.1.4, p. 142).
- No uncertainty estimates given for the effect of compromises in computational efficiency (e.g. Section 8.4.3).
- The calibration performance measures (Section 9.2) do not adequately represent spatial or temporal distributions of uncertainty for a non-linear model: Fig's 9.46-9.48 (pp. 183-185) present temporally non-systematic error, which demonstrates inadequate numerical constraint for model forecasting.
- Following model calibration, the grid cell size was substantially reduced for predictive modelling (Section 10.1), yet this does not increase the quantity of measured-data sampling sites and hence the accuracy of results: results at a refined scale could thus be misleading.
- Bore pumping rates in the predictive model were based on metered average rates from June 2006 to June 2010, without discussion of this period being climatically representative over the longer term; pumping rates were unrealistically held constant (Section 10.3.6) rather than varied in response to seasonal climatic fluctuations.
- The MODFLOW model predicted an order of magnitude longer duration of groundwater recovery at the mine void than the OPSIM model due to the latter including daily rainfall and a smaller void volume (Section 10.11.2, p. 268): what error has this contributed to other parts of the MODFLOW model water budget?
- The model was tested by a single-parameter rather than global sensitivity analysis in which a single parameter value was changed per test by an arbitrary and limited, hence, biased amount (Section 11.1) that suggests an assumed high confidence in the data used; ignored non-linear parameter interactions.
- The model was tested by a Monte Carlo uncertainty analysis (Section 11.2) constrained by calibrated and not measured parameter values to generate stochastic parameters of which half furthest from the calibrated values were discarded; a biased approach.

Issue: No analytical errors or uncertainty estimates are presented, for any measured, inferred or synthetic data.

The proponent reports an inconsistent prediction for the zone of groundwater depressurization to retract by mining year 30 (Section 10.6.3, p. 230, & Fig. 10.18, p. 234) or continue to radiate outwards into the alluvium (Narrabri Formation) post mining (Appendix T, Section 10.9, p. 262).

Issue: The predicted impact on the Mooki River Water Source is unclear.

Figure 9.54 (p. 194) does not show seasonal fluctuations between stream losing and gaining conditions, contrary to that stated on p. 192.

The water budget presented in Table 9.6 (p. 194) excludes storage; and that presented in Fig. 10.34 (p. 251) excludes storage and groundwater lateral inflow and outflow.

A forecast test time of three quarters of a year (Section 9.3) is insufficient to verify the accuracy of the model for mining duration and post-mining predictions.

The proponent predicts post-mining seepage from the mounded back fill due to a higher recharge rate (Section 10.11.3).

The proponent was unable to numerically model and forecast the cumulative impact of multiple coal and coal seam gas projects due to the inaccessibility of commercially confidential industry data. The proponent instead refers to the SWS Namoi Water Study as the most current and extensive study on the area. This is considered a reasonable approach, although the Namoi Water Study has sufficient uncertainties to limit its validity for the proponent's project.

(b) Groundwater Dependent Ecosystems (GDEs)

The proponent has determined that there are no high-priority GDEs identified in the water sharing plan relevant to the zone of depressurisation (Appendix K, Section 3.2.2, pp. 3.40+; Appendix U), but noted the high potential for about 50 ha of the project area to host GDEs.

The proponent has determined that drawdown is likely in the areas of highest potential to host GDEs, but argued that inherent conditions are unfavourable for GDEs (Appendix T, Section 10.10, p. 264).

1.1.5 *Requirement 5: Definition of Upper Namoi alluvium boundary; geomorphic, hydrologic and salinity assessments of associated surface and groundwater systems.*

The proponent has re-evaluated the distribution and thickness of the Upper Namoi alluvium (Section 7.1, pp. 37+) and depicted the results in Fig's 7.3 (p. 41), 10.2 (p. 212) and 10.3 (p. 213). The project's minimum distance is 150 m from the Namoi Formation and 900 m from the Gunnedah Formation (Section 7.1.4).

The proponent argues that, over these distances, hydraulic connectivity with the shallow Permian groundwater system is restricted by the Narrabri Formation's low permeability, as inferred from slug tests and geophysical (electrical resistivity) interpretations of texture, and the absence of the more permeable Gunnedah Formation immediately adjacent to the Permian rock outcrop (Section 7.1.4). Also of relevance, though, are the hydraulic characteristics of the Permian rock, especially where weathered, between and below the proposed site of disturbance and the alluvium. According to the groundwater impact assessment (Section 7.1.4, p. 45), the hydraulic conductivity and water salinity suggest that the Narrabri Formation and weathered bedrock behave as a single interconnected groundwater system.

A bedrock structural analysis dedicated to identifying possible preferred groundwater flow paths was not done. Geophysical mapping identified potential faults beneath the alluvium (Appendix T, Section 7.1.4; Appendix V). Internal sedimentary channel and other potentially relatively permeable structures within the alluvium were not mapped.

The proponent has performed slug tests (Appendix T, Table 7.1, p. 45), but not pump testing with monitoring bores across geological boundaries to test hydrologic boundary conditions and connectivity between the Permian and alluvial aquifers. The terms *slug test* and *rising or falling head test* are used seemingly interchangeably in Appendix T, Section 7.1.4. Accordingly, the reviewer assumes that, in the strict sense, slug tests were done and rising and falling head tests are specific types of slug test. Slug tests are notoriously inaccurate.

The proponent has done water salinity testing (Appendix T, Table 7.1, p. 45) and water age dating (Table 7.4, p. 72) of the Upper Namoi alluvium. The electrical conductivity of groundwater in the alluvial aquifers is presented in Appendix T, Fig. 7.3.1 (p. 75), and the calculated total dissolved solids for Permian and alluvial aquifers is shown for the project area in Appendix T, Fig. 7.3.2 (p. 76).

As presented in Appendix T, Fig. 7.3.1 (p. 75), an increase in electrical conductivity toward Lake Goran has been contoured, but without the use of any data sampling sites actually present at the lake. Additional data, not shown in Fig. 7.3.1, has been used for data contouring and should be shown.

Numerical predictive modelling indicates that groundwater flow from Permian rock into primarily the agriculturally non-targeted Narrabri Formation of alluvial groundwater management zone 7 will be notably reduced (by an amount that is considered acceptable upon the provision that licensing requirements are met), and by a rate which peaks temporarily at 101.8 ML/year, followed by post-mining recovery; zones 3 and 8 will be affected by up to 1.1 and 0.4ML/year, respectively, during mining. About 10% of this transfer loss is predicted to impact the Gunnedah Formation (Appendix T, Section 10.8.1, p. 251-257).

The proponent has not presented the local-scale spatial distribution of alluvial aquifer groundwater quality outside of the project area (EL7223) or mapped hazardous element/salt storage, mobility, geochemical risks or the existing and likely project-induced fluxes of groundwater and solutes in the context of risks to nearby private bores.

Issue: The impact of the proposed project on the existing spatial distribution of groundwater quality and beneficial use zones within the alluvium as a consequence of laterally altered groundwater flow rates and/or directions has not been explicitly assessed.

1.1.6 *Requirement 6: Salinity budget.*

The proponent has concluded that the Mooki River salinity will likely not increase by more than 1% by the very minor seepage (Section 10.12) of relatively fresh water (Appendix W) recharged through the spoil material (Section 10.9, Appendix T).

Issue: A salinity mass balance for the Mooki River was not presented.

The adopted maximum leachate concentration used in salt export calculations was estimated incorrectly from kinetic leaching columns. A large portion of the added water had remained within the columns (Section 3 of Appendix 6 of T, pp. 12-15) and was likely more saline and of different chemistry.

An assessment of surface runoff impacts on the salt load of receiving surface waters indicates no net increase in salt export from the project area apart from a 30% increase of the Watermark Gully salt load (Appendix S, Section 7.13). However, under the assumptions and errors in the water balance and in average source contributions, this increase could be within analytical error, which is not shown.
The transience, final storage and water quality of the final void were modelled (Appendix S, Section 7.14); predictions suggest that the water level will reach equilibrium at 20-30 m below the overflow level, where it cannot contribute to external environments, at about 100 years of simulation.

Potential exists for molybdenum and selenium in seepage and runoff from overburden/interburden and coal reject material to occur at above background concentrations (Appendix W, ES4, p. ii).

An evaluation of geochemical risks to receiving environments has not been done with regard to parameters other than increased salinity, such as those associated with dilution, positive residual alkalinity, and high alkalinity, pH, sodium adsorption ratios, organic compounds and suspended solids. Results in Appendix W indicate that the leachate can be expected to have a high pH, alkalinity, and sodium adsorption ratio.

The salinity measurement of a 1:5 solid:water solution using sample pulps (Section 3 of Appendix 6 of T, p. 11) is difficult to relate to natural leaching or weathering conditions; this aspect has not been adequately addressed.

The geochemical assessment was done on drill core samples that had very likely been geochemically altered via oxidation, degassing, and potentially other processes prior to being tested, giving misleading acidity and associated pH and dissolved metal analytical results.

Authors of the geochemical assessment incorrectly claim that, for the acid-base accounting results, the main host phase of sulphur is evident from the total sulphur concentration (Appendix W, Section 4.1.1, p. 7), which therefore cannot be used to indicate the risk of acidity.

Bulk geochemistry was used for comparison to guideline values to assess trace-metal risk (Appendix W, Section 4.2, p. 21), yet has very little bearing on specific host phase stability and hence metal mobility. Soluble-metal extracts, EC and pH from 1:5 solid:water solutions were measured and, inappropriately, used for geochemical characterisation and comparison to water quality guidelines (Section 4.4, p. 25); preparation of 1:5 solid:water solutions induces numerous fundamental geochemical reactions that result in non-representative chemistry.

Kinetic leach column test result pH-time plots in Fig. KLC1 (Attachment C of Appendix W) show irregular trends which should be explained. Element concentrations should be normalised with respect to salinity so that they don't primarily present salinity trends.

A decline in salt generation and release rates post mine closure is stated as expected, but this and especially the rates of other longer-term geochemical reactions have not been demonstrated.

Issue (repeated above): Analytical errors are not presented for all data.

1.1.7 *Requirement 7: Monitoring program.*

The proponent has implemented groundwater level and quality and surface water quality monitoring programs (Section 14), as described for Point 3, above; surface water flow monitoring is done by the Office of Water.

AGE recommends, should the project receive approval:

a) that additional groundwater monitoring bores should be installed within the predicted zone of depressurisation to assess model predictions (Section 14.1);
b) the monitoring of water levels and flows from key private bores within and adjacent to the zone of depressurisation (Section 14.1);
c) the monitoring of mine water seepage rates and quality (Section 14.4).

However, these recommendations by AGE do not demonstrate that Shenhua Watermark actually intends to implement this additional monitoring.

AGE recommends that groundwater level and pressure monitoring should continue for the life of the project (Section 14.1). This monitoring should continue post mining and at least until demonstrable equilibrium is attained.

AGE recommends on-going geological and hydrogeological assessments during mining (Section 14.5), and checks after two and then every five years of operation, to test the validity of and, if necessary, revise or reconstruct the groundwater model and revise predictions (Section 14.6). The Office of Water fully supports this recommendation.

AGE recommends annual assessments and reporting of monitoring data (Section 14). Additional reporting should be provided in immediate response to a breach in any relevant parameter threshold value. All reporting should include the comprehensive description and assessment of QA/QC protocols.

As no GDEs have been identified within the predicted groundwater depressurisation zone, no monitoring of GDEs will be undertaken. A vegetation monitoring strategy is proposed (Appendix K, Section 7.3.1) which would include vegetal GDEs should their relationship with groundwater be later identified. A clear link should be defined in the strategy between the proposed vegetation monitoring and areas of greatest potential for dependent ecosystems.

Monitoring for waterway degradation should be planned.

Monitoring for subsidence of alluvium and impact on surface drainage is required.

1.1.8 *Requirement 8: Mitigation strategies.*

The groundwater assessment done by AGE (Appendix T), on behalf of Shenhua Watermark, recommends the development of groundwater management plans that include appropriate backup measures with respect to groundwater quality and volumes. Such plans should be part of this EIS.

The proponent has listed potential mitigation measures, and referred to those proposed in the Namoi Water Study, which may be considered following discussion with relevant government authorities (Appendix T, Section 14.8).

Issue: The proponent has not committed to clearly developed mitigation strategies for inappropriate changes in groundwater levels or quality and surface water flow or quality.

The proponent has listed potential make-good measures for affected land owners if mitigation measures are not feasible (Appendix T, Section 14.8).

Issue: The proponent has not demonstrated that any of these potential mitigation or make-good measures are feasible and has not expressed commitment to any of them.

1.1.9 *Requirement 9. GDE maintenance.*

As no GDEs have been identified within the predicted groundwater depressurisation zone (Appendix T, Section 10.10) no relevant mitigation strategies have been developed.

1.1.10 *Requirement 10: Remediation and rehabilitation options for disturbed areas of water courses and connected alluvium.*

A geomorphological impact assessment (Appendix X) defines proposed minor changes to catchment surface areas, the installation of vehicular crossings and a river pump station, and associated impacts and reasonable mitigation measures.

A channel diversion plan will be designed for part of Watermark Gully to mimic the natural channel function (Appendix S, Section 8.3.4). A detailed design has not been, but should be, included in the EIS.

1.2 Assessment of Minimal Impact Considerations

The potential project impacts on the aquifers listed below were assessed against the minimal impact considerations of the Aquifer Interference Policy as presented in Table 2:

(iii) Upper Namoi alluvial Groundwater Source: Zone 3 Mooki Valley Groundwater Source, Zone 7 Yarraman Creek Groundwater Source, and Zone 8 Mooki Valley Groundwater Source.

(iv) NSW MDB Porous Rock - Gunnedah-Oxley Basin Groundwater Source: Spring Ridge and Other Management Zones.

Table 2. **Assessment of proposal against Level 1 minimal impact considerations of NSW Aquifer Interference Policy.**

Aquifer	Upper Namoi alluvial Groundwater Source
Category	Highly Productive
Level 1 Minimal Impact Consideration	**Assessment**
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.	**Within Level 1 - acceptable** No high priority groundwater dependent ecosystems or culturally significant sites have been identified in the water sharing plan (Appendix K, Section 3.2.2; Appendix U) relevant to the project area (Appendix T, Section 10.10).
A maximum of a 2 m water table decline cumulatively at any water supply work.	**Within Level 1 - acceptable** The proponent has modelled the maximum drawdown impact on private bores within the alluvium to be <1.5 m (Appendix T, Section 10.7, p. 247; Table 10.2, pp. 245-247).
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.	**Within Level 1 - acceptable** Seepage from spoil in the eastern and southern mining areas is predicted to have a salinity equivalent to or less than that of groundwater in the alluvial aquifer as well as low trace metal concentrations (Appendix W). Any recharge of seepage water from the mining areas is thus expected to not lower the beneficial use category of the alluvial groundwater (Appendix 6 of Appendix T, p. 20). The proponent has not assessed potential changes in beneficial use category with respect to individual groundwater works caused by lateral changes in groundwater flow rate and/or direction. Modelling predicts a 0.4% increase in seepage rate from the Mooki River into the alluvium during mining. Post-mining recharge through spoil is predicted to increase the net flow to the Mooki River by 0.07% with respect to relatively saline baseflow from the underlying aquifers. The proponent thus predicts no increase of >1% in long term average river salinity (Appendix T, Section 10.9). A salinity mass balance has not been presented.
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	**Within Level 1 - acceptable** The project's minimum pit distance is >2 km from the Mooki River and much further from Lake Goran. Proposed pipeline options extend to Mooki River (e.g. Main Report, Fig. 9).

lesser distance) of a highly connected surface water source that is defined as a "reliable water supply".	

Aquifer	NSW MDB Porous Rock - Gunnedah-Oxley Basin Groundwater Source
Category	Less productive
Level 1 Minimal Impact Consideration	**Assessment**
Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic "post-water sharing plan" variations, 40m 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.	**Within Level 1 - acceptable** No high priority groundwater dependent ecosystems or culturally significant sites have been identified in the water sharing plan (Appendix K, Section 3.2.2; Appendix U) relevant to the project area (Appendix T, Section 10.10).
A maximum of a 2m decline cumulatively at any water supply work; or A cumulative pressure head decline of not more than a 2m decline, at any water supply work.	**Within Level 1 - acceptable** The proponent has modelled the maximum drawdown impact on all 71 licensed and metered private bores within 10 km of the project to be <1.5 m (Appendix T, Section 10.7, p. 247; Table 10.2, pp. 245-247).
Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.	**Within Level 1 - acceptable** Groundwater inflow to pits is expected during mining (Appendix 6 of Appendix T, Section 2). Post-mining (Appendix 6 of Appendix T, Section 2): Eastern mining area: backfilled; recharge of ~0.2 ML/day to porous rock aquifer at year 60. Southern mining area: backfilled; recharge of ~0.1 ML/day to porous rock aquifer at year 400. Western mining area: the final void will act as a permanent groundwater sink. The recharge derived from the eastern and southern mining areas is expected to have comparable or better water quality than the receiving porous rock aquifer: no lowering of beneficial use category is thus anticipated (Appendix T, Section 10.12.6).

1.3 The Groundwater Model

The model report is a reasonably well-structured document of 324 pages in the main body of the report plus nine appendices. To an external reader with no prior knowledge of the study area, the report is very good as a standalone document.

Locations of monitoring bores, particularly vibratory-wire- piezometers (vwps), are not clearly labelled for easy identification.

1.3.1 Comments on modelling aspects

Conceptualisation

- Based on the description of geology/hydrogeology of the project area, model conceptualisation presented in the report appears to be adequate.

Data collection

- A range of methods has been undertaken to gather data relevant for the model development which include literature review, in-situ testing and laboratory testing.

Model design

- Layering and spatial discretisation are adequate for the study.
- Quarterly stress periods are used in temporal discretisation instead of monthly stress periods. This may underestimate drawdown impacts.
- The groundwater level in some of the NOW bores in the model area is known to be influenced by river leakage. Assumption of constant river stage does not allow the model to simulate stream/aquifer interaction correctly.
- Recharge through several mechanisms has been considered. Overall, specified recharge appears to be too high.
- MODFLOW-SURFACT an enhanced version of MODFLOW software has been used to adequately simulate mining processes.
- RCH, EVT, RIV, HFB and GHB packages are active in the calibrated model. Active mining is simulated using DRN package.

Model Calibration

- Steady state and transient calibration have been attempted using manual and auto techniques.
- The transient calibration has been undertaken for the time period first quarter 1980 to second quarter 2011 (31.5 years) using 126 quarterly stress periods.
- Monitoring data from 351 NOW bores and 94 Watermark bores have been used as calibration targets.
    - A large number of extraction bores (possibly stock and domestic) with little or no water level information has been incorrectly identified as NOW monitoring bores.
    - Numbers assigned to some NOW bores are meaningless (for example GW036165-0).
    - Some of the NOW bores appear to have gone dry, or water levels fallen below screen bottom, during simulation.
    - Watermark bores have only a short record of monitoring data of bedrock water levels.
    - Effects of historical pumping are visible in model simulated hydrographs at some Watermark bore locations.
    - Almost all calibration data points have come from bores sited in the alluvium.

Calibration Assessment

- Calibration performance measures in the form of scattergrams and model statistics recommended by Groundwater Modelling Guidelines (MDBC, 2001) have been presented for both steady state and transient models. Goodness-of-fit of the scattergrams is measured by R^2 which is not included in the report.

- The total head change across the calibration points in steady state model is **111.42** m but in the transient model is **219.34** m. How?
- Table 9.3 (page 162) is incorrectly referred to as a summary of the transient model calibration statistics.
- Key statistic SRMS is 6.5% in steady state calibration and 2.7% in transient calibration less than the value (5%) recommended by MDBC (2001).
- It is difficult to achieve a uniform level of calibration across the entire domain in a model of this nature. As expected, model calibration ranges from 'poor' to 'good' across the model area. Relatively good agreement between trends in observed and model simulated heads has been achieved for NOW bores, screened in alluvial, surrounding the Project site.
- A formal sensitivity analysis has not been undertaken. However, sensitivity of calibrated parameters has been adequately discussed using sensitivities generated in auto calibration.
- Noting unusual has been detected in a short model verification run made to assess the model performance.

Water Budgets

- Global water budgets presented in the report following the transient calibration is a good indication of relative contributions from various sources. This appears to be incomplete as no storage component is included in it.

Scenarios

- Predictive scenario runs have been made using the calibrated transient model, with a refined grid, to simulate continuous mining and recovery phases. Modelling methodology adopted in making these prediction runs appears to be sound.
- A sensitivity analysis has been carried out to assess the influence of some key parameters on the model predictions.
- Uncertainty of these prediction run outputs with regard to different parameter combinations has been assessed.

1.3.2 Need for future modelling/monitoring

Model simulation based scenario runs predict possible impacts of mine development to the groundwater regime. Large uncertainties may be associated with these predictions mostly due to errors in conceptualisation, uncertainty in model parameters and inadequate model calibration.

- It is not possible to accurately quantify these uncertainties at this stage. However, it would be possible to verify the reliability/validity of predictions made by the current model if an extensive monitoring network is put in place to ascertain changes to groundwater system as mining progresses.
- This will also allow updating model calibration/model verification and, if necessary, to re-run of prediction scenarios. In fact, it is proposed in the report to undertake model verifications at regular intervals as mining progresses to assess the validity of current predictions.

2. Water Licencing and Use.

Water Sharing Plans are legally enforceable statutory plans under the *Water Management Act 2000*. The project site is located within the *Water Sharing Plan for the NSW Murray Darling Basin Porous Rock Groundwater Sources 2011*, the *Water Sharing Plan for the Upper and Lower Namoi Groundwater Sources 2003*, the *Water Sharing Plan for the Phillips Creek, Mooki River, Quirindi Creek and Warrah Creek Water Sources 2003* and the *Water Sharing Plan for the Namoi Unregulated and Alluvial Water Sources 2012.*

The EIS acknowledges appropriate water licences will be required to account for the take of water associated as part of the project. The proponent has secured some water licences for the project, however are still in the process of securing licences from all affected water sources. The proponent is yet to obtain an allocation for Zone 3 in the Upper Namoi Groundwater Source, the required allocation for Zone 7 in the Upper Namoi Groundwater Source, the required allocation for the Mooki River Water Source and the required allocation for the Murray Darling Basin Porous Rock Groundwater Source.

The proponent is required to obtain all relevant licences to account for the take of all water associated with the project, prior to mining commencing.

3. Surface Water Management.

The EIS has identified a number of potential surface water impacts associated with the project including the requirement to obtain offsite water, potential uncontrolled chemical spills, water quality impacts, loss of catchment areas, runoff and flood potential.

The proponent has simulated the potential impacts of the project on the surface catchment water balance, runoff and flood potential, and mine water balance and has presented results in the context of licensing requirements.

The proponent has used acceptable modelling tools. A visual comparison of forecast and recorded data indicates a general agreement. The modelling and forecasting approaches are compromised by limited data availability.

The proponent highlights the inherently limited quality of the water balance (OPSIM) modelling results: "Investigation outcomes are dependent on the accuracy of input assumptions. There is inherent uncertainty with respect to some key site characteristics (e.g. catchment yield/rainfall runoff, mining area groundwater inflows) which cannot be accurately determined prior to the commencement of operations" (Section 7.10, p. 84) and, accordingly, "in reality, the site water management system will implement adaptive management to minimise the environmental risks of the project" (p. 87). As for the groundwater modelling, the surface water modelling results with net modelling uncertainty should be considered at best qualitative. Modelling assumptions and uncertainties indicated from Appendix S include:

- Extrapolation of evaporation (Section 6.2.3) and extrapolation or assumption of general model parameter (Sections 7.7.2 & 9.3.9) data without demonstration of their representativeness.
- The undisclosed nature of the AWBM parameters listed in Table 6.3 (Section 6.4.1).
- A fudge factor, namely transmission loss, as a fixed proportion of surface runoff and baseflow was used to assist the matching of simulated and recorded runoff (Sections 6.3.2 & 6.3.3).
- Visual rather than statistical comparison of results was presented.
- Mine water management modelling using operational rules that were not changed for climate variability (Section 7).
- Groundwater inflow data adopted from estimates in the groundwater model (Section 7.7.1).
- The water balance (OPSIM) model is sensitive to input parameter values leading to substantial uncertainty (Section 7.11, p. 96).
- Compromised calibration of a flood discharge (RAFTS) model due to limited data for several parameters (Section 9.3.3); data was refined by joint calibration with the TUFLOW model.
- The TUFLOW hydraulic model was calibrated partly using anecdotal evidence on flood depths and extents provided by interviewed landholders (Section 9.5.1).

Surface water impacts will be mitigated via the implementation of:

a) a mine site water management system to control site water flow and storage;
b) a sediment control plan to reduce loads from disturbed area runoff; and

c) a surface water monitoring program for ongoing assessment of the site water management system and environmental impacts (Appendix S, Section 10).

These surface water management measures, as described in Section 10, appear reasonable and will be supported via adaptive management. As part of the adaptive management, a preliminary concept design for overburden emplacement drainage is shown, and mine operations for extended wet periods will be planned.

4. Floodplain Management.

The EIS outlines the mine footprint is located outside of the 1:100 flood level for both the Mooki River and most of the Native Dog Gully and Yarraman Creek areas. Most of the mine site is located on excluded areas of the designated Liverpool Plains Floodplain however there are considerable areas that are still within the 2% slope of the floodplain, such as Watermark Gully.

The flood modelling in the EIS indicates that a small section of the south-east corner of the mine may encroach upon the 1:100 flood event section of Native Dog Gully, but it is not expected to have any noticeable effect on flood behaviour.

The Office of Water questions the design of such works to ensure that there are no flows into the mine area and depending on the depth of the mine that no waters can move from the floodplain through the soil profiles at lower order events. As there are no large scale maps for the area it is unsure of what these risks may be.

The localised effect of flooding of Watermark Gully is the main concern of the Office of Water in that any impacts here may readily impact at the bottom section of Watermark Gully through all periods of the mine's operation. As a result of the considerable changes to the immediate catchment, factors affecting runoff may vary substantially from year to year. However, material in the EIS indicates there are no significant deviations from the normal especially at the bottom section which is the critical area. The Office of Water would like to review in more detail what infrastructure may be proposed at the bottom section as this is not clearly explained in the EIS.

The proponent is required to obtain a Part 8 approval under the *Water Act 1912* for floodplain works.

5. Riparian Management.

There are three main watercourses on or adjacent to the site including Watermark Gully, Native Dog Gully and the Mooki River. The watercourses are classed in the EIS as having mostly poor geomorphic condition, apart from the downstream extent of Watermark Gully which is in good geomorphic condition. The watercourses have been subjected to disturbance as a result of farming practices in the locality with earth dams and levees along the length of Watermark Gully. The other watercourses have bank erosion, headcuts, past incision and channelling and degraded riparian vegetation. Lake Goran is also located within close proximity to the project site.

A geomorphological impact assessment outlines works which may be constructed adjacent to or within riparian areas including a pump station on the banks of the Mooki River, the construction of temporary and permanent waterway vehicle crossings and minor changes to catchment surface areas.

The project also involves the relocation of the main channel of Watermark Gully further to the east, as part of the western mining area will encroach on the upper reaches of Watermark Gully. The EIS states the flow will remain similar to pre-mining conditions despite the reduced waterway area. A Channel Diversion Plan will be developed as part of the Water Management Plan for the mine, which the Office of Water would like the opportunity to review.

As part of erosion control considerations, the proponent has not attempted to quantify sediment and soil stability as functions of bed morphology and geomechanical properties and compare these to historic, current and predicted changes in flow regimes (flow frequencies, durations and intensities) through risk mapping; or considered potential soil loss and stream suspended load.

Whilst projects approved as State Significant Development are excluded from the requirement to obtain a Controlled Activity Approval under the *Water Management Act 2000*, any works within riparian areas should be consistent with the NSW Office of Water's Guidelines for Controlled Activities.

While the watercourses on site have been degraded over time, it is important appropriate rehabilitation and revegetation is implemented during the reinstatement of these drainage lines post mining.

6. Recommended conditions

Should the application be approved the Office of Water would require the following to be included as conditions.

Water supply

1. The applicant must ensure that it has sufficient water for all stages of the project, and if necessary, adjust the scale of mining operations to match its water supply.

2. The applicant must ensure it has sufficient licensed entitlement in each water source from which water is extracted or intercepted, to account for the take of water under all circumstances for the life of the project, and for any post-mining interception of water.

3. The applicant must hold a water access licence for any surface water runoff that is harvested, diverted or captured in excess of the site's Harvestable Right for each relevant surface water source.

4. The proponent must maintain records of water taken from all water sources and make these available to the Office of Water when requested. Records of water taken must be included in an annual environmental management report.

Groundwater Management

5. The applicant shall ensure that any interference between the drawdown zone to the project and access to alluvial groundwater for any water user possessing a water supply work approval and share entitlement in the water sharing plans is addressed by formal negotiated process in accordance with the water sharing plans.

6. The proponent must develop a comprehensive groundwater monitoring plan, in consultation with and to the satisfaction of the Office of Water. The groundwater monitoring plan must monitor the potential impacts of the mine on aquifers and surrounding users and implement appropriate conditions to mitigate any adverse impacts mining may create.

7. Groundwater level, pressure and quality monitoring must continue during and after the project until demonstrable equilibrium is attained.

8. Additional monitoring bores must be installed within, and additional key private bores must be monitored within and adjacent to, the predicted zone of depressurisation prior to project-related groundwater pumping.

9. The assessment and reporting of monitoring data are done annually, and in response to a breach in any risk threshold value, and reports include the comprehensive description and assessment of QA/QC protocols.

10. The proponent undertakes pump testing, with monitoring bores sufficiently distributed in each aquifer, to test hydrologic boundary conditions and connectivity between the Permian and each alluvial aquifer.

11. Mine water seepage rates and quality are monitored to detect any mixing of shallow alluvial groundwaters with that from the Permian strata.

12. The proponent shall ensure that all monitoring results are compiled into annual accounting and verification reporting to be submitted to the Office of Water when requested and included in the annual environmental management report.

13. The conceptual design for the final landform and any final void must be provided to the Office of Water for assessment in terms of long term and/or permanent depressurisation of groundwater sources.

14. The groundwater model is updated on a 2 yearly basis as mining progresses, and submitted to the Office of Water for review and comment.

15. A Water Management Plan is developed for the project in consultation with the Office of Water which includes early-trigger strategies and appropriate, well-defined, and committed to, backup mitigation measures with respect to water quality and volumes.

16. The proponent submit a Form A (construction report) to the Office of Water for all monitoring bores completed.

Surface Water Management

17. The proponent must obtain approvals for flood control works under Part 8 of the *Water Act 1912* for all works proposed on the floodplain.

18. The proponent must develop a Surface Water Monitoring Plan, to monitor at least waterway degradation, the subsidence of alluvium and any impacts on drainage, to the satisfaction of the relevant agencies.

19. The proponent must develop an Erosion and Sediment Control Plan, to the satisfaction of the relevant agencies.

20. The proponent must develop a watercourse management plan, in consultation with the Office of Water and to the satisfaction of the Director-General, which addresses the proposed relocation of Watermark Gully and includes design, construction, maintenance and rehabilitation, prior to project commencement.

21. The design of the proposed diversion must include the following:
    (i) design specifications, including hydrologic, geomorphic, water quality and ecological criteria,
    (ii) construction engineering details and sign off to construction of the diversions against approved designs,
    (iii) revegetation and any other stabilisation measures to be incorporated into the diversion designs, construction and maintenance schedules,
    (iv) monitoring and maintenance requirements for the diversions based on baseline conditions, against the hydrologic, geomorphic and water quality criteria established above, and
    (v) completion criteria and sign off for incorporation into the final landform for the project.

22. The applicant must undertake the proposed relocation of Watermark Gully in accordance with the watercourse management plan.

23. Within one month of completing the construction of the relocation of the watercourses, the applicant shall submit an as-executed report, certified by a practicing registered engineer, to the Director-General in consultation with the Office of Water.

24. Prior to relocating the original creek line, the applicant shall demonstrate that the relocation of any approved diversion is operating successfully, in consultation with the Office of Water, and to the satisfaction of the Director-General.

Final Landform

25. The applicant shall submit a final void management plan, which includes:
    (i) a justification for any final void to remain at the end of mine life,
    (ii) design criteria for any final void, which is consistent with the groundwater impact criteria to surrounding alluvial groundwater sources, and/or access limits within the MDB Gunnedah-Oxley Basin (Spring Ridge) Groundwater Source, MDB Gunnedah-Oxley Basin (Other) Groundwater Source and Zones 3, 7 and 8 of the Namoi Groundwater Source,
    (iii) long term or permanent management of any access shares in any affected groundwater source, consistent with the rules of any applicable water sharing plan, and
    (iv) consideration of the outcomes of any regional, cumulative impact assessment of mining development on the MDB Gunnedah-Oxley Basin (Spring Ridge) Groundwater Source, MDB Gunnedah-Oxley Basin (Other) Groundwater Source and Zones 3,7 and 8 of the Namoi Groundwater Source.

End Attachment A

Attachment B

Watermark Coal Project (SSD 4975)
Response to exhibition of EIS

Comment by Crown Lands

The Applicant shall ensure that all statutory requirements relating to Crown Land including but not restricted to those set down by the *Crown Lands Act 1989* are fully met.

The Applicant shall hold a Crown lands tenure, in accordance with the *Crown Lands Act 1989*, authorising occupation of Crown land reflective of the use of the land.

Irrespective of any development consent or any approval given by other public authorities, any work or occupation of Crown land cannot commence without a current tenure from Crown Lands authorising such work or occupation.

The Applicant shall conform to the following requirements under the *Crown Lands Act 1989*:

a). Where Crown roads are utilised for the purposes of the project or impacted on by the project activities, the Applicant must within 12 months of project approval, obtain a Licence or Lease over the Crown road in accordance with the *Crown Lands Act 1989*.

b). Crown roads within holdings owned by the Applicant or impacted on by projects activities as described above, may be included in a road closing application lodged by the Applicant. Where Crown roads under application cannot be closed and purchased within a 12 month period following project approval, then the Applicant must obtain Licence or Lease over the Crown road in accordance with the *Crown Lands Act 1989*.

c). Where Crown land (other than Crown roads) is utilised for the purposes of the project, the Applicant must within 12 months of project approval, obtain a Licence or Lease over the Crown land in accordance with the *Crown Lands Act 1989*. Note the Applicant has no authority to occupy or utilise Crown Land until a tenure under the *Crown Lands Act1989* is granted. Given the complexities in regard to Native Title that affect many Crown Lands it is in the Applicants best interest to inform and apply to Crown Lands for a tenure as early as possible in the development process.

d). Where the purpose of any existing Crown land Licence or Lease held or acquired by the Applicant is not compatible with the proposed project activities and land uses, the Applicant must within 12 months of project approval, obtain a new Licence or Lease over the Crown land that reflects the proposed use of the land in accordance with the *Crown Lands Act 1989*.

e). Where the Applicant fails to meet any of the above conditions, the Applicant is subsequently not in compliance with the project approval, and all necessary enforcement from NSW Planning should come into effect.

The Applicant shall consult with the Minister administering Crown lands and the Minister's delegates, on any requirement of the Applicant to restrict public access to Crown land for the reasons of public safety, in particular in relation to prevent public access to land subjected to subsidence, blasting affects, water and air quality impact, and general security around access roads haulage roads and mining infrastructure.

The Applicant shall provide the Minister administering Crown lands and the Minister's delegates, the detail of any proposed environmental offset to be located on Crown land, in particular any conditions proposed by the Applicant that seek long term security of the Offsets.

The Applicant shall consult with the Minister administering Crown lands and the Minister's delegates, on any requirement of the Applicant to seek the rezoning of Crown land. Note that the landholders consent is required prior to the lodging of any re-zoning application.

The Applicant shall consult with the Minister administering Crown lands and the Minister's delegates, throughout the life of the mine on the development and implementation of all Environmental Management Plans that affect Crown land.

The Applicant shall provide the Minister administering Crown lands and the Minister's delegates, detailed information and location diagrams of the proposed use of Crown land, including but not restricted the following land uses:

- Hazard Waste and Industrial Waste disposal sites.
- Waste Water utilisation areas.
- Point Discharge areas.
- Waste Rock and Tailing structures.
- Processing Plants and other high impact Infrastructure sites
- Gravel Borrow Pits.
- Environmental Offset areas.

The Applicant, where requested by the Minister administering Crown lands or the Minister's delegates, shall purchase Crown land considered by the Minister to be impacted on by mining operations to the extent that it is in the interests of the public of NSW that the land be sold to the Applicant. The Applicant shall pay all reasonable costs associated with the purchase. The Applicant shall pay the current market value of the land and a commercial premium as negotiated between the Applicant and the Minister administering Crown lands or the Minister's delegates.

End Attachment B