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Contact: *Girja Sharma*
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Our ref: *D2018/90698*

Dear Mr Freeman

Response to Submissions: Hume Coal Project (SSD 15_7172) and Berrima Rail Project (SSD 15_7171)

Thank you for your email received 23 July 2018 seeking comments on the Response to Submissions (RTS) for the Hume Coal and Berrima Rail Projects (SSD 7172 & SSD 7171).

The proposed Hume Coal Project and associated Berrima Rail Project are located within the declared Sydney catchment area. Pursuant to the *Water NSW Act 2014*, WaterNSW has objectives and functions within declared catchment areas. A key function is to protect and enhance the quality of water.

WaterNSW has adopted a set of principles that establish outcomes it considers as essential to protect the drinking water supplies of the Greater Sydney region from mining impacts – see https://www.waternsw.com.au/data/assets/pdf_file/0010/119890/Mining-principles.pdf

The principles relevant to the Hume Coal Project are:

- Protection of water quality – WaterNSW considers that mining activities must not result in a reduction in the quality of surface and ground water inflows to Lake Burragarang,
- Protection of water quantity – WaterNSW considers that mining activities must not result in a reduction in the quantity of surface and groundwater inflows to Lake Burragarang or loss of water from the Lake's catchment, and
- Sound and robust evidence regarding environmental impacts – Water NSW considers that information provided by the proponent must be detailed, thorough, scientifically robust and holistic. The potential cumulative impacts must be comprehensively addressed.

WaterNSW has considered its mining principles in the review of the RTS and notes that the concerns raised in our submission on the EISs dated 30 June 2017 have been acknowledged and largely addressed for the Hume Coal and Berrima Rail Projects.

WaterNSW's remaining concerns in relation to the Projects are provided in the attachment. Our main concerns regarding the Hume Coal Project are summarised below:

1. WaterNSW requests that the Department seek advice and have regard for that advice in the preparation of the environmental assessment report, specifically in relation to:
 - the mine plan and associated factor of safety, and implications to increased risk in subsidence and in turn impacts on ground and surface waters
 - the potential for assumed relaxation zone of 2 m used in the groundwater modelling to be greater than 2 m in the vicinity of faults, dykes and diatremes

and if so, the potential implications on mine inflow and baseflow reduction predictions, and

- details about acceptable water quality for releases from sediment dams and how this will be achieved.
2. The RTS states compensatory flows are not considered necessary, given the low flow yield impacts predicted. The RTS further states that the predicted impacts on potential groundwater dependent ecosystems as a result of baseflow reduction is insignificant and the rate of reduction of the total baseflow is expected to be minor and the impact on surface water users to be minimal. Therefore, Hume Coal considers, no make good provisions apply according to the NSW Aquifer Interference Policy. WaterNSW considers that the data on yield impact for the Medway Rivulet is confusing and makes it difficult to assess the impact on yield. WaterNSW requests that yield and baseflows for pre-mining (existing case) for comparison for impacted sub-catchments be updated from that provided in Tables 4.2 and 4.3 (WSP, 2018).
 3. The additional mass balance analysis, to assess the potential water quality impacts associated with the reduced dilution from mine induced baseflow reduction, were undertaken for average baseflow and surface flow for the Wingecarribee River. However, analysis has not been undertaken for the low flows during dry climatic conditions. No mass balance analysis has been undertaken for the Medway Rivulet which has much smaller flows therefore water quality impacts are likely to be higher. WaterNSW considers that the potential water quality impacts associated with the reduced dilution from mine induced baseflow reduction should also be assessed for the Medway Rivulet and Medway dam including during low flow conditions because these are affected waterway and water storage dam in terms of annual yield loss and baseflow reductions.

WaterNSW considers the Berrima Rail Project and Hume Coal (Access Roads and the Mine Infrastructure Site) have the potential to have a neutral or beneficial effect (NorBE) on water quality. WaterNSW is unable to advise the Department at this stage whether the Hume Coal Project (Mining component) would have a neutral or beneficial effect on water quality.

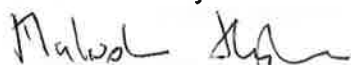
Water NSW requests that if the Hume Coal Project is recommended for approval the consent should include performance measures with respect to water management as follow:

- negligible reduction in the surface water flow in Medway Rivulet, Oldbury Creek, Belanglo Creek, Black Bobs Creek, Wells Creek and Wingecarribee River, and
- negligible reduction in water quality in Medway Rivulet, Oldbury Creek, Belanglo Creek, Black Bobs Creek, Wells Creek and Wingecarribee River.

WaterNSW considers considerable care in designing, implementing and maintaining water quality control measures would be required for both the Hume Coal Project and the Berrima Rail Project. Robust monitoring, reporting, auditing and compliance programs would also be required. This would include programs managed by agencies in particular the key regulators – the Department of Planning and Environment and the Environment Protection Authority.

WaterNSW would appreciate continued involvement in the assessment of the Projects. If you wish to discuss these comments, please contact Girja Sharma on 9865 2501.

Yours sincerely



MALCOLM HUGHES
Manager Catchment Protection

Attachment - WaterNSW Comments on the Response to Submissions Report for the Hume Coal and Berrima Rail Projects

Subsidence Assessment

The reviews of the subsidence assessment undertaken by Dr Ismet Canbulat (22 December 2017) and Galvin & Associates (December 2017) for the Hume Coal Project (Mining component¹) raise concerns regarding the stability of narrow width to height web pillars, particularly their factor of safety and load distributions. The reviewers requested detailed numerical modelling to predict pillar loads and load redistributions in case the web pillars fail.

Detailed supplementary analysis has been undertaken using a series of 2-D and 3-D numerical models to investigate the pillar system stability, load distribution and associated subsidence as a function of geometry and overburden conditions (Heasley, 2018). The numerical modelling results indicate that the overburden weight from web pillars is carried by the intra-panel and inter-panel barriers and that the amount of load transferred to the adjacent barrier pillars is directly related to the stiffness of the overburden. The modelling results estimate that with one single web pillar failure, subsidence increases only by 1 mm and with entire section of web pillars failed, only localized increases in surface subsidence by 16 to 24 mm.

Galvin & Associates (December 2017) raised concern regarding the factor of safety for pillar stability predicted in the EIS were inconsistent with NSW legislation (Table 2) and minimum safety factor adopted in the UNSW Pillar Design Methodology for use in Australia. Despite improvement in modelled certainty, the factor of safety predicted in Tables 3 and 4 (Heasley, 2018) appears still lower than the minimum safety factor adopted in the UNSW Pillar Design Methodology.

WaterNSW requests DPE seek advice with regards to this matter and implications to increased risk in subsidence and in turn impacts on ground and surface waters; and have regard for that advice in the preparation of the environmental assessment report for the Hume Coal Project.

Geological Structures

Faults, dykes and diatremes over the Hume Coal mining area shown in Drawings 9 and 10 of the Subsidence Assessment Report (Mine Advice Pty Ltd, December 2017) and Figure 6.5 of the Revised Water Assessment (EMM, 2018) appear to be inconsistent. Notwithstanding, there is no detailed information provided about these geological structures, including the nature and type of faults and movement of faults or the classification of dykes and diatremes. This concern has been raised in reviews undertaken by Dr Ismet Canbulat (22 December 2017) and Galvin & Associates (December 2017). As noted by the reviewers, Hume Coal has acknowledged that there remains the potential for unmapped structures to be present in the area, and some geological features will only be detected at the time of mining. Hume Coal claims that the proposed mining method has the flexibility to deal with such features including by shortening the mined panels if necessary.

WaterNSW questions how a remotely controlled miner can identify mapped and unmapped geological structures. Considering these structures have the potential to increase subsidence risk; may act as groundwater conduits; and consequently increase mine inflows and cause baseflow reductions in surface watercourses, Water NSW is specifically concerned regarding the potential impacts of faults and dykes:

¹ Proposed underground mining area excluding above ground mine infrastructure site and access roads

- in the north-eastern part of mine plan, east of main gate road overlain by Wells Creek where depth of cover is 120 m, and
- in the western part of the mine plan overlain by Belanglo Creek and area to the east where depth of cover is 80 m and Hawkesbury sandstone is subject to significant weathering and is reported that the sandstone is exposed to surface (Figure 2.5, Mine Advice, December 2016).

WaterNSW notes that the updated groundwater model for the Hume Coal Project assumes a 2 m relaxation zone, i.e. zone of enhanced hydraulic conductivity connecting mine workings to the overlying lower Hawkesbury Sandstone, due to the Hume Coal Project. WaterNSW is concerned that this assumed relaxation zone could be greater than 2 m in the vicinity of faults, dykes and diatremes and if so, the potential implications on mine inflow and baseflow reduction.

WaterNSW requests that DPE seek advice with regards to this matter and the potential implications on mine inflow and baseflow reduction predictions; and have regard for that advice during the assessment of the Hume Coal Project.

Groundwater Assessment

WaterNSW notes that the revised groundwater modelling for the Hume Coal Project (Mining component) has addressed the primary issues raised in the groundwater modelling critiques related to uncertainty analysis, including sensitivity testing with a substantial historical climate range and key hydrogeological parameters. WaterNSW also notes that the mass balance error of the modified groundwater flow model is now reported to be low. However, the model's Scaled Root Mean Square (SRMS) metric remains above 10%, which imply that significant uncertainty remains about the hydrogeological response to the proposed mining. This level of uncertainty is a concern to WaterNSW.

WaterNSW seeks clarification regarding a number of the modelling results:

- What are the implications of the significantly increased average aquifer storage "loss" (Discharge minus Recharge) between Table 7 EIS-model predictions of 6.4 ML/day to that shown in Table 14 for the Modified EIS model of 13.7 ML/day? Does this imply that there will be a long-term deficit in water over the life of the mine?. WaterNSW note that the water balance for the Mean K Baseline Model predicts the "Loss" value reduces to 0.7 ML/year in any case, and
- WaterNSW notes that the value of Drain discharges for the Mean K Baseline Model is lower than that for the Modified EIS model (23.9 vs 30.3 ML/day, see Tables 14 and 19). Although vertical permeability (K_v) values are not provided in the Revised Groundwater Modelling (HydroSimulations, June 2018), it is expected that the result of reducing horizontal permeability (K_h or K_x) in the Mean K Baseline Model in accordance with the values shown in Table 18 would have increased K_v and therefore increased the Drain discharge volumes.

Surface Water Assessment

Site water balance and releases (Revised Surface Water Assessment, WSP June 2018)

Minor discrepancies in the site water balance for the Hume Coal Project are as follows:

- The total net water demand for mine operations is reported 12,837 ML in Table 3.2 (column 4) and 12,698 ML in Table 3.7, a difference of 139 ML over 19 years of mining. This inconsistency needs to be corrected.

- The total water volume supplied from storage/s in Table 3.4 and 3.7 is reported 23,688 ML. Table 3.4 implies that all storages supply this water whilst Table 3.7 implies that only the Primary Water Dam (PWD) supplies the water, which leads to confusion. This confusion becomes clear in Table 3.8.

Table 3.10 specifies water releases from sediment basins SB03 and SB04 to Oldbury Creek subject to meeting first flush criteria and Section 3.2.2.6 states that water from these dams will be subject to water quality being acceptable. Details about acceptable water quality for releases from sediment dams and how this will be achieved are not provided. WaterNSW considers that the Department should seek further advice on this matter and have regard for that advice in the preparation of the environmental assessment.

Annual Volumetric Loss and Baseflow Reductions

Annual volumetric loss and baseflow reductions presented in Tables 4.2 and 4.3 (WSP, 2018) and (Table 24, HydroSimulations, June 2018) suggest that the Medway Rivulet and Medway dam are the most affected waterway and water storage dam from the Hume Coal Project (Mining component) in terms of annual yield loss (particularly Oldbury Creek) and baseflow reductions.

The RTS states that the Medway dam (total storage capacity 1350 ML) will transition from a gaining to a losing system during mining, likely due to the artificial elevation of the water table which appears contradictory. Induced leakage from Medway dam of 19ML/yr has been accounted and this transition from gaining to losing is predicted to be temporary and to revert to gaining 25 years after cessation of mining. This is a concern to WaterNSW.

The changes in flow regime in the most affected Medway Rivulet sub-catchment appears mainly due to baseflow reduction due to the lowering of groundwater resulting from mining. This is a concern to WaterNSW. The RTS states, however, due to constant flows from Moss Vale STP of 2.3 ML/day and Berrima STP of 0.2 ML/day, Medway Rivulet and its tributaries are predicted to experience:

- no zero flows for existing and operational case for the Medway Rivulet. If the constant discharges from Medway Rivulet are excluded, the changes in predicted low flow regime below 5.0 ML/day may occur and number of no flow days increase by 25% for wet and 35% under dry climatic scenario, and
- baseflow reduction in Medway Rivulet catchment to decrease to less than 0.1 ML/day 66 years after the commencement of mining, and
- flow in the Oldbury Creek with or without constant low flow discharges from Berrima STP are approximately the same. The changes to Oldbury Creek flow regime during mining operations are minor compare to pre-mining due to releases from the sediment basins SB03 and SB04 to some extent offsetting impacts to flow.

The RTS states given the low flow yield impacts predicted, compensatory flows are not considered necessary. Further the RTS states that the predicted impacts on potential groundwater dependent ecosystems as a result of baseflow reduction is insignificant and the rate of reduction is expected minor of the total baseflow and impact on surface water users would be minimal. Therefore, Hume Coal considers no make good provisions apply according to NSW Aquifer Interference Policy. WaterNSW considers that the data on yield impact for the Medway Rivulet in Table 4.2 (WSP, 2018) is confusing and difficult to analyze impact on yield. WaterNSW requests that yield and baseflows for pre-mining (existing case) for comparison for impacted sub-catchments should be updated from that provided in Tables 4.2 and 4.3 (WSP, 2018).

Baseflow reductions and impacts on water quality of waterways

The additional mass balance analysis undertaken (Section 5.5, WSP, 2018) to assess the potential water quality impacts associated with the reduced dilution from mine induced baseflow reduction indicate that the concentrations of identified contaminants (see Table 5.12) in stream flow is similar for the existing and operational scenarios and any minor differences are undetectable (Section 5.5.3).

WaterNSW notes that the mass balance calculations were undertaken:

- for 67%-ile baseflow reduction of 0.982 ML/day only, and analysis did not include 90%-ile baseflow reduction of 1.207 ML/day (see Table 24, HydroSimulations, June 2018)
- for Medway Rivulet Management Zone for average baseflow and surface flow for the Wingecarribee River at Greenstead (No 212009) where average baseflow and surface flows were 25.2 ML/day and 114 ML/yr (average stream flow was 139.2ML/day) {Note there may be some discrepancy in reporting the units of these flows}. However, analysis has not been undertaken for the low flows during dry climatic conditions for the Wingecarribee River
- no mass balance analysis has been undertaken for the Medway Rivulet which has much smaller flows (5 ML/day) therefore water quality impacts are likely to be higher, and
- contaminants such as conductivity and Phosphorus (see Table 5.12) were not included in the mass balance analysis, which could have greater water quality impacts.

In light of above deficiencies in the mass balance analysis, it is difficult to assess whether the Hume Coal Project (Mining component) would have a neutral or beneficial effect on water quality. WaterNSW considers that the potential water quality impacts associated with the reduced dilution from mine induced baseflow reduction should also be assessed for:

- the Medway Rivulet and Medway dam for both average and dry weather flows because these are most affected waterway and water storage dam in terms of annual yield loss and baseflow reductions, and
- 90%-ile peak baseflow reductions, and
- the low flows for the Wingecarribee River.

Surface Infrastructure

It is noted that mine water dam 06 (MWD06) is proposed within the 1 in 100 year Annual Recurrence Interval Flood Level of Medway Rivulet. To prevent potential failure of MWD06 it is considered that this dam be relocated to above the 1 in 100-year flood level or consideration be given to armouring the exterior walls up to the 1 in 100 year ARI level plus freeboard to prevent scour during a flood event.

WaterNSW previously raised concerns as to the lining of the PWD and other mine water dams on site in order to prevent contaminated water leaching from the dams. The RTS states that the PWD and other dams, which will come in contact with coal, would be lined up to 'normal' storage levels. It is unclear what is normal storage level. Is it 124 ML for PWD, based on the 83 to 124 ML normal operating range of the dam? WaterNSW considers that the PWD is also a contingency storage for the storage of all mine and surface water on site, therefore justification should be provided as to why the PWD is not proposed to be lined to the full storage capacity of the dam.

It was noted that the internal mine access road crosses Medway Rivulet at approximately the 1 in 5 ARI flood level and that the RTS does not provide specific details of a waterway crossing design. Similarly, the design of the floodplain and waterway crossings of the Berrima

Rail line are not covered in the RTS. WaterNSW would appreciate being consulted on the waterway and floodway crossings associated with mine access roads and the rail line at the detailed design of the project, if the project is recommended for approval.

Groundwater quality assessment

Hydrogeochemical modelling has been undertaken for Hume Coal Project to assess the impacts of emplacement of lime amended reject slurry into mined-out voids; and subsequent groundwater interaction on groundwater quality (RGS Environmental Pty Ltd 2018). The modelling results indicate that the modelled concentrations of some of the metalloids in groundwater, although exceed ADWG and/or ANZECC guideline criteria for copper, nickel, selenium and zinc, but generally lower or equal to the baseline groundwater conditions for the Wongawilli seam, except nickel. Nickel is reported within the range of baseline concentrations for the Wongawilli seam.

WaterNSW notes that the groundwater water quality in Wongawilli seam has been monitored in 15 bores, however, the hydrogeochemical assessment is based on the groundwater quality of only one bore (HU0018PZA/B). Clarification is required in this regard.

It is noted that streams gaining from the regional groundwater systems overlie the western part of the mining project area and the mining is proposed to start in the western mining area. WaterNSW requests that if the project is recommended for approval the consent should include a detailed and robust monitoring program and contingency plans, to be developed in consultation with WaterNSW, to ensure the water quality of streams gaining from the regional groundwater systems are not impacted.

Water Licensing

Licences required for the Hume Coal Project include:

- Aquifer category – for the groundwater from aquifers
- Unregulated river category – surface water taken over 10% of the overland flow
- Water collected on non-excluded works (dams) or not covered by harvestable rights

The following approvals are required from WaterNSW:

- *Water Management Act* Section - 60D - Taking water otherwise than by or from water supply work or extraction point nominated in access licence.
- *Water Management Act* Section – 71W - To nominate water supply works

Water NSW cannot grant an approval under section 71W to nominate water supply works unless the proponent can demonstrate that the mitigation measures for the loss of water to the drinking water catchment and the base flows proposed are counted from the same water source.

Harvestable rights and licensing requirements

Information provided in relation to harvestable rights (HR) is inaccurate and inadequate including Hume Coal claims for 111 ML/year for HR. Hume Coal claims that the Dam on the Oldbury Creek is part of their harvestable rights. Oldbury Creek is a fourth order stream and therefore harvestable rights do not apply to this dam.

The PWD is designed to receive water from many other dams including MWD 5 and MWD 6. The PWD will also work as a flood management structure and capture flood flows during extreme weather events. Unaccounted water captured by the PWD may need to be accounted for by holding unregulated category licences.

NSW approach to licensing of intercepted baseflow

The yield impact assessment for the Medway Rivulet Management Zone (Volume 2B, Appendix 2 Part 1, Tables 4.2 and 4.3) states a maximum volumetric loss of 0.9% (Max 763 and Mean 434 ML/yr) during wet climate and 1.6% (Max 495 and Mean 239 ML/yr) during dry climate. The Oldbury sub-catchment is predicted to have 4.3% (Max 424 and Mean 159 ML/yr) reduction in yield under wet conditions and 4.5% (Max 208 and Mean 72 ML/yr) reduction in yield under dry conditions. Maximum rate of baseflow reduction due to stream baseflow reductions induced by dewatering in and around the mine during its operational period is estimated to be 359 ML/year (0.982 ML/day) {Table 24, HydroSimulations, June 2018}.

The RTS states given the low flow yield impacts predicted, compensatory flows are not considered necessary. Further the RTS states that the predicted impacts on potential groundwater dependent ecosystems as a result of baseflow reduction is insignificant and the rate of reduction is expected minor of the total baseflow and impact on surface water users is going to be minimal. Therefore, Hume Coal considers no make good provisions apply according to NSW Aquifer Interference Policy. WaterNSW considers that the data on yield impact for the Medway Rivulet in Table 4.2 (WSP, 2018) is confusing and difficult to analyze impact on yield. WaterNSW requests that yield and baseflows for pre-mining (existing case) for comparison for impacted sub-catchments be updated from that provided in Tables 4.2 and 4.3 (WSP, 2018).

NorBE Assessment for Hume Coal (Mine Infrastructure Site and Access Roads) and Berrima Rail Projects

The stormwater quality modelling using MUSIC software for Hume Coal (Access Roads) and Berrima Rail Projects are not consistent with the "Using MUSIC in Sydney's Drinking Water Catchment. MUSIC models have altered background concentrations for TP and TN (C* and C** values) in swales to give beneficial outcome to the models. The proposed constructed wetlands for the treatment of stormwater for the rail project and access roads appear to be hydraulically undersized. When WaterNSW corrected the models, NorBE was not achieved for both models. The rail project proposes 7 hectares of revegetation to achieve NorBE but the area for revegetation is not indicated on the plans. Notwithstanding, WaterNSW considers if MUSIC modelling is correctly undertaken and with slightly larger capacity of the ponds for water quality treatment for Hume Coal (Access Roads) and Berrima Rail Projects, NorBE is likely to be achieved.

WaterNSW could not audit the MUSIC model for the Hume Coal Project (Mine Infrastructure Site) as it is not clear what is happening in the model. Notwithstanding this, WaterNSW considers if MUSIC modelling is correctly undertaken the infrastructure site with proposed various sediment basins, if used to collect and treat stormwater runoff from the site and hydraulically sized, could achieve NorBE.

WaterNSW requests that MUSIC stormwater quality modelling be undertaken, in consultation with WaterNSW, at the detailed design for the Berrima Rail and Hume Coal (Access Roads and Mine Infrastructure Site) Projects to ensure the stormwater management measures are hydraulically designed and appropriately located to achieve NorBE on water quality.

Proposed offsets for water quality impacts

WaterNSW notes that

- the Hume Coal Project proposes 42.5 hectare of riparian protection zones (i.e. restricting, clearing, farming and industrial activities) on Evandale (19.6 hectares) and

Mereworth (22.9 hectares) properties to offset the water quality impacts associated with mined induced baseflow reductions in creeks, and

- the Berrima Rail Project proposes 7 hectares of revegetation to achieve NorBE.

WaterNSW requests that if the Hume Coal and Berrima Rail Projects are recommended for approval the consent should include a requirement for these commitments to be incorporated into a Catchment Improvement and Land Management Plan and that the plan be developed in consultation with WaterNSW.

Performance Measures

Water NSW requests that if the Hume Coal Project is recommended for approval the consent should include performance measures with respect to water management as follows:

- negligible reduction in the surface water flow in Medway Rivulet, Oldbury Creek, Belanglo Creek, Black Bobs Creek, Wells Creek and Wingecarribee River, and
- negligible reduction in the water quality in Medway Rivulet, Oldbury Creek, Belanglo Creek, Black Bobs Creek, Wells Creek and Wingecarribee River.

Implementation of monitoring, auditing and compliance programs

WaterNSW considers that the Hume Coal and Berrima Rail Projects would require considerable care in designing, implementing and maintaining water quality control measures. Robust monitoring, reporting, auditing and compliance programs would also be required. This would include programs managed by agencies in particular the key regulators – the Department of Planning and Environment and the Environment Protection Authority.

