



Department of Primary Industries

OUT15/23020

Ms Phillipa Duncan
Mining Projects
NSW Department of Planning and Environment
GPO Box 39
SYDNEY NSW 2001

2 SEP 2015

Phillipa.Duncan@planning.nsw.gov.au

Dear Ms Duncan,

**Dargues Reef Gold Project Modification 3 (MP 10_0054 Mod 3)
Response to exhibition of Environmental Assessment**

I refer to your email dated 10 July 2015 requesting advice from the Department of Primary Industries (DPI) in respect to the above matter.

Comment by DPI Fisheries

DPI Fisheries advise that the Spring Creek crossing design has now taken account of the Fish Passage Guidelines. The EA indicates that a 3m diameter steel pipe or equivalent box culvert or arch structure will be utilised.

Recommended Condition of Approval

Detailed design of the fish passage should be undertaken in consultation with DPI Fisheries and the crossing not be constructed until the finalised design has been endorsed by the Department.

For further information please contact Allan Lugg, Senior Fisheries Conservation Manager, (Huskisson Office) on 4428 3401, or at allan.lugg@dpi.nsw.gov.au.

Comment by Marine Parks

Marine Parks reiterates comments made in the Department's response of March 2015 and in particular the concerns over the use of cyanide as a leachate to extract the gold from the ore. It is noted that the tailings facility has been greatly expanded under the new proposal to accommodate the proposed processing changes. Due to the highly sensitive environments of the receiving waters both within the immediate area of the mine and downstream within the Deua and Moruya River catchments the determining authority must ensure there is no risk of any pollution event resulting from the use of cyanide (in any of its forms) within those waterways. If there is a risk, we strongly recommend not approving the use of cyanide at the mine.

For further information please contact Justin Gilligan, A/Manager, Batemans Bay Marine Park (Narooma Office) on 4476 0801, or at justin.gilligan@dpi.nsw.gov.au.

Comment by DPI Water

DPI Water has reviewed the Environmental Assessment (EA) for the proposed modification to the Dargues Reef Gold Mine. Initially reference is made to DPI's response to the original Mod 3 EA for this project. The following key comments, information requests and recommended conditions of approval are provided to assist in finalising the assessment of the project. Further comments are provided in Attachment A.

Key Comments

- The proposal for increased groundwater take will require an increase in the licensed entitlement held at the site. Currently this would require licensing under the *Water Act 1912* which the proponent can apply for. The draft Water Sharing Plan for the South Coast Groundwater Source has been prepared which covers this project site, and upon commencement of this plan the proponent would be required to obtain entitlement from existing licence holders or via a Controlled Allocation Order under the *Water Management Act 2000*.
- The revised groundwater model predicts depressurisation to be less than previously predicted with no impact on private bores.
- The sensitivity analysis on the groundwater model indicated significant uncertainty in the fault hydraulic parameters used in the model. This results in the potential for significantly higher groundwater inflows than predicted and a resultant increased impact on baseflows to creeks. Additional data collection is recommended in the groundwater assessment (Appendix 10) to reduce this uncertainty.
- The uncertainty of mine inflows from faults highlights the need to periodically review the groundwater model and validate predictions against impacts, in addition to considering the adequacy of mitigating measures and licensed entitlement. It is recommended a review of the groundwater model be completed prior to commencement of mining operations with the additional data collected since preparation of AGE (2013). This would be with the aim of reducing the uncertainty of mine inflows and associated impacts, and adequately informing preparation of the Water Management Plan and potential licensing requirements.
- Section 4.4.3.1 of the EA indicates groundwater levels would be fully recovered within 10 years of mining which was consistent with the previous EA, however Appendix 10 states post-mining groundwater levels will recover within 10 to 20 years.
- It is recommended specific triggers be developed for potential seepage from the TSF and incorporated into a contingency response plan.
- Additional groundwater monitoring and sampling is recommended for potential cyanide and acidic seepage.
- Clarification is requested of the proposed TSF liner construction and the permeability to be achieved.

- Construction of the proposed Spring Creek crossing is recommended to be carried out in accordance with DPI Water's Guidelines for Controlled Activities on Waterfront Land.

Recommended Conditions of Approval

The proponent shall review the Water Management Plan for the project. This plan must be developed in consultation with DPI Water.

The proponent shall update the Groundwater Model with all available measured groundwater and surface water data prior to commencement of operations. This plan must be developed in consultation with DPI Water.

For further information please contact Tim Baker, Senior Water Regulation Officer (Dubbo Office) on 6841 7403 or at tim.baker@water.nsw.gov.au.

Comment by Office of Agricultural Sustainability & Food Security

In accordance with procedures for mining projects that affect agricultural lands the Office of Agricultural Sustainability & Food Security has responded direct to your Department.

For further information please contact Rob Williamson, Leader Land Use Planning (Orange office) on 6391 3166, or at: rob.williamson@dpi.nsw.gov.au.

Yours sincerely



Kristian Holz
Policy, Legislation and Innovation

Attachment A

Dargues Reef Gold Project Modification 3 (MP 10_0054 Mod 3) Response to exhibition of EA Detailed comments – DPI Water

General Comments – Main Environmental Assessment

- Table 11 indicates the TSF embankment volume to be increased from 588 000m³ in the previous Mod3 EA to 670000m³. This has resulted in an increased capacity for managing rainfall events by no discharge for a 1 in 1000yr 72 hr event (compared to a 1 in 100yr event for the original Mod3 EA) and for events with discharge now it is designed for a 1 in 100 000 yr 72hr event (compared to a 1 in 10 000yr event previously).
- Section 2.1.3.1 indicates the basin of the TSF is to achieve a permeability of 1×10^{-9} m/s over 900mm which compares to the 1×10^{-8} m/s in the previous Mod3 EA. Clarification however is requested on the statement in Section 2.6.5.3 which proposes the basin of the TSF to be lined by an insitu clay liner to a permeability of 3×10^{-8} m/s and which is then to be overlain by a 1.5mm HDPE liner.
- Section 2.6.5.3 and Section 5.4 of Appendix 7 indicates additional measures such as a seepage interception trench located downslope of the TSF embankment and/or seepage recovery bores would only be installed if monitoring identifies unacceptable levels of seepage. It is recommended specific triggers be developed for this and incorporated into a contingency response plan.
- Section 2.7 indicates harvestable rights dams HRD-E and HRD-F are not to be constructed and that the total volume of harvestable rights dams is 37ML. This is equivalent to the Maximum Harvestable Rights Dam Capacity for the proponent's total landholdings.
- The proponent currently holds water licence (10BL605106) with an annual entitlement of 320ML for water take at the Dargues Reef underground mine. Other licences include 10BL605107, 10BL605108 and 10BL605109 for groundwater take from the Snobs (39ML), United Miners (16ML) and Stewart and Mertons (24ML) historic workings. Any proposed water take that exceeds these volumes will require additional entitlement.
- Construction of the proposed Spring Creek crossing is recommended to be carried out in accordance with DPI Water's Guidelines for Controlled Activities on Waterfront Land.
- The water balance modelling indicates an increase in the maximum compensatory flow required from 2.1L/s in the approved EA to 2.5L/s. This is predicted to be met from harvestable rights dams for 93% of the period modelled which is a change from 97% for the approved project. Consequently there is an increased demand from the historic workings to a maximum of 32.4ML/yr in a worst year on record.

Groundwater Monitoring

- Section 4.4.4 of the Main EA and Appendix 7 proposes 6 additional shallow ("TSFWB01 to TSFWB06", 5-20 m deep) groundwater monitoring bores down-gradient of the modified Tailings Storage Facility (TSF). Sites are still to be selected but have been generally illustrated in drawing number 801-139-A201-090 by Knight Piésold Consulting. The general detail of these bores is set out in accompanying drawing number 801-139-A201-091. It is noted that only 5 new bores are identifiable on the drawing hence clarification is requested.

- Existing bore DRWB05, a matter of concern previously because it may have been lost by construction and operation of the TSF, will now be specifically maintained and considered in the monitoring of leachate from the TSF.
- The proposed approach of using specific monitoring locations for cyanide leachate is considered mostly satisfactory and places additional monitoring to that originally recommended closer to the stored waste containing cyanide. This approach however, does not necessarily present itself as able to monitor for unexpected seepage into deeper aquifers or especially for an 'early warning' of contamination in the Spring Creek alluvium.
- DPI's previous response considered that: "Additional monitoring in relation to potential acidic seepage during mining and then during recovery and post closure should also be implemented to ensure detection of adverse impacts into the mine in the first instance, then any impacts on Spring Creek." This matter is not considered to have been adequately addressed in the revised EA. The risk is a compounding risk to potential cyanide contamination but has a higher likelihood of occurrence because of the large amount of material with a recognised propensity to degrade. There is also an operational in-mine risk posed by unexpected or excessive degradation of this waste source. A specifically engineered, monitoring bore located in the maximum groundwater drawdown envelope, and to be sampled with falling and rising groundwater pressures, was proposed for this purpose. This monitoring bore should be constructed and sampled as part of the regular groundwater monitoring regime.
- It is recommended the proponent further amend the monitoring plan and install a nested piezometer cluster further along Spring Creek as previously recommended by DPI. Specifically the newly proposed bore TSW06 and the non-indicated 'missing' bore - TSW05, should be placed as previously recommended:
 - "Prior to the commencement of mining; the Proponent should install one [amended] new shallow bore nest down-gradient of the project site to assist in early detection of any adverse cyanide leachate. The screened intervals of these bores will intersect:
 - (i) the existing watertable and the likely watertable immediately post closure; and
 - (ii) the regolith/saprolite interval 5 to 10 m below the associated shallower bore.
 This bore nest/cluster should be on the eastern side of Spring Creek [amended] at a location about half-way between the mining area and Majors Creek."
- Some rationalisation of the groundwater monitoring bores e.g. DGWB11 to DGWB13 if not yet built, may be possible and it is recommended this be addressed by the proponent in a revised WMP.
- The proponent has not sufficiently taken into account comments about the need to address hydrochemical sampling, especially for cyanide in its various forms, and on a broader scale for related chemical indicators. A brief mention of a general undertaking to monitor is made in Sections 4.4.4 and 4.5.4.5 of the amended EA.
- As previously discussed; the groundwater sampling program needs to specifically include an increased range of analytes related to the cyanide usage train, and the potential effects of cyanide products once in the groundwater system. This is more than just sampling for WAD cyanide. It is recommended the major cation – sodium, and anion radical – sulfate, are related to ensure that they are always tested (in the absence of a total cation/anion sample) because sodium salts are used to deliver cyanide to the ore leaching process and sulfate can be present in the cyanide treatment train or can be related and/or derive from acidic leachate.

Groundwater Modelling

DPI Water has reviewed the additional groundwater modelling included in Appendix 10 (AGE 2013) as part of this revised EA. This report was not provided in support of the previous EA for Mod 3. Key points from this additional report include the following:

- The groundwater model was recalibrated based on measured groundwater levels, however there was insufficient data to determine baseflow for use in the model recalibration.
- The model predicts groundwater inflows to the mine to reach a maximum of 11L/sec for a short period in the second year of mining and to reduce to about 8L/s at the end of mining in Year 5.
- Depressurisation of the groundwater levels is predicted in the model to be slightly less than previously predicted and will not impact on any private bores. This is due to changes in the aquifer parameters and representation of mining in the revised model.
- Post mining groundwater levels are predicted to recover within 10 to 20 years and flow of groundwater through the paste fill will be minimal.
- Baseflow is predicted to be impacted in lower Spring Creek by a maximum of 55% or 2L/s at the end of mining and in Majors Creek by a maximum of 40% or 2.5L/s at the end of mining. Baseflow is predicted to recover back to pre-mining levels approximately 50 years post mining. This prediction is however subject to significant uncertainty as discussed in Section 6.6 of the report.
- Uncertainty was recognised in the fault hydraulic parameters applied in the model and the report recommends that further data collection be used to reduce this uncertainty. This is critical as the report indicates that changing the faults hydraulic conductivity has the most impact on the baseflow to the lower section of Spring Creek and Majors Creek. This is illustrated in Figure 27 which shows the output from a sensitivity analysis where increases in the hydraulic conductivity of the faults generally doubles the predicted mine inflow. This therefore has implications to accurate baseflow impact predictions and compensatory flow volumes, and the potential water entitlement that will need to be held.
- The model predicts post mining that <0.1% of the groundwater that enters the creek systems as baseflow will have interacted with the paste fill and the abandoned workings. This was considered to not have a significant impact on water quality in the creeks due to the effects of dilution and that the paste fill is likely to cause an alkaline effect which would not enable solubilisation of metals.
- Recommendations are provided to improve the data collection and future modelling efforts. These are supported by DPI Water.

Hydrogeological Assessment Recommendations

1. The proponent present predictive groundwater modelling results for 5, 10, 15, 20 and 50 years post closure, and that:
 - (i) these results be periodically updated whenever groundwater modelling is updated, and
 - (ii) should any variations from predictions be noted when annual field monitoring results are compared to the modelling predictions, then these differences are to be addressed in a Revised Water Management Plan in consultation with DPI Water.
2. Prior to the commencement of mining an additional shallow groundwater monitoring bore (screened length of approximately 30m) is recommended to intercept:
 - (i) the current watertable,
 - (ii) most of future potentiometric surfaces during mining, and
 - (iii) the rising watertable post closure.

It is to be positioned adjacent to, and down slope of, the proposed spillway to the Eastern Waste Rock Emplacement facility at about surface RL of 695 m AHD.

3. Drawing number 801-139-A201-090 by Knight Piésold Consulting (Appendix 7) indicates 5 new bores in contrast to 6 bores referred to in Section 4.4.4 of the Main EA. It is

recommended the 'missing' bore (TSFWB05) and the new bore TSFWB06 be relocated downstream on Spring Creek.

4. Prior to the commencement of mining it is recommended the installation of groundwater monitoring bores DGWB11 to DGWB13 is completed, and sampling from these is included in the routine groundwater monitoring schedule.
5. Prior to the commencement of mining; the Proponent should install one new shallow bore nest down-gradient of the project site to assist in early detection of any adverse cyanide leachate; equivalent of proposed bores TSFWB05 and TSFWB06. The screened intervals of these bores will intersect:
 - (i) the existing watertable and the likely watertable immediately post closure; and
 - (ii) the regolith/saprolite interval 5 to 10 m below the associated shallower bore.

This bore nest/cluster should be on the eastern side of Spring Creek at a location about half-way between the mining area and Majors Creek.

6. The following analytes are added to the existing water quality sample testing for all groundwater samples from the site: field redox (Eh), laboratory pH, total cyanide, free cyanide, cyanide WAD, thiocyanate, ammonium, sodium and sulfate.

End Attachment A