APPENDIX K2

WATER BALANCE PEER REVIEW

BIRD IN HAND GOLD PROJECT

MINING LEASE PROPOSAL MC 4473

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TECHNICAL MEMORANDUM

DATE 11 July 2017 **PROJECT No.** _____-001-M-Rev0

TO Katherine Laughton
Terramin Australia Ltd.

CC

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REVIEW OF MINE WATER BALANCE MODEL FOR BIH PROJECT

Overview of Model

Golder Associates Pty Ltd (Golder) was requested by Terramin to undertake a review of the mine water balance for the BIH project, located in the Adelaide Hills in South Australia. The water balance model, referred to as BIH Water Balance _v1-.xlsx, is Excel-based and simulates both the surface water and groundwater components associated with the operational phase of the mine. The model comprises a number of worksheets broadly defining:

i) Model assumptions

ii) Model input data

iii) Calculation worksheets associated with the various components comprising the mine water balance

iv) An overall summary sheet outlining model results associated with the surface and groundwater components for the month of simulation

v) Estimates of storage capacities to retain mine-impacted runoff for a range of storm durations and annual exceedance probabilities (AEP), noting that these results do not appear to be considered in the mine water balance itself.

The model is not continuous and therefore the water balance assessment is instead undertaken for an individual month within the year. All model inputs and variables, however, remain constant throughout the year apart from rainfall and evaporation. For these two parameters the following approaches are incorporated:

- Rainfall: The model utilises a relatively short monthly rainfall record obtained from the Bureau of Meteorology (BoM) website for the nearby Woodside rainfall station (BoM no. 24583) for the period 2007 to date. Summary statistics for each month were also obtained from the BoM defining rainfalls associated with:
  - Mean
  - Lowest
  - 5^{th}, 10^{th}, 50^{th}, 90^{th}, 95^{th} percentiles
  - Highest
- Evaporation: Monthly average evapotranspiration for the site from the BoM.

Within the model the user can then select the month to be evaluated along with the nominated summary statistic, that is, mean, 50% percentile, etc. on which the rainfall is based.

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Comments on Model Review and Adequacy

The following comments are made relating to the water balance model:

1) The model includes a check balance indicating it correctly accounts for model inflows and outflows, i.e. the model balances. A review of the results indicated this is correct.

2) The climatic inputs to the model provide a reasonable approximation of the local climatic conditions, although applying evapotranspiration estimates may provide a lower estimate of actual open water evaporative losses than is the case. A more acceptable approach would have been to apply the evaporation based on Class A Pan estimates (also available from the BoM) factored by a lake:pan coefficient.

3) The natural seepage is too large. In the model this is calculated simply as the difference between the rainfall and runoff (which is assumed to be 0.23 times the rainfall). The majority of the water that does not run off would actually be lost through evapotranspiration. Reducing the seepage value (which actually represents recharge to the groundwater system) and introducing an evapotranspiration loss will not, however, have any impact on the modelling results.

4) Within the 'Summary' worksheet the model can result in negative flow values for the contribution from the SA Water/Rainwater to the managed aquifer recharge (MAR) during high rainfall months. This is not valid and indicates the logic should be corrected. I am not sure why the MAR is set to the mine groundwater inflow. I would have thought it should be equal to the 'Water Available' (cell AR47). Making this change marginally reduces the overall flow associated with the SA Water/Rainwater component during months of high rainfall. However, overall the 'error' in the model this does not affect the results to any extent.

5) Flows associated with the surface water component within the model are far smaller (around two orders of magnitude) than those associated with the groundwater inflows and MAR.

6) The model does not provide a continuous simulation of the water retained in surface storages. This is not an issue if water is either continuously treated (as in the surface storage dam) or is continuously released to a wetland/swales/WSUD (as in the stormwater runoff).

7) Water is released from the stormwater dam to wetlands/swales. A suggested option may be to assess if it may instead be feasible to use this water for dust suppression and backfill, thereby potentially reducing the estimates of required water from SA Water.

Overall, however, the model is considered to provide a reliable and appropriate measure of the mine water balance provided there is no need to account for month to month accumulation of water within the ponds.

Should you require any further information please do not hesitate to contact us.

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