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Dear Chris

### **Comments from peer review – Solomon Life of Mine**

HydroConcept has completed a peer review of the FMG (Fortescue Metals Group) hydrogeological assessment relating to the Solomon Life of Mine. The review was undertaken by Mr Seth Johnson (Principal Hydrogeologist) with a focus on ensuring the conceptualisation is a realistic representation of the water regime; the numerical modelling provides reliable predictive outputs; and the water resource management strategy integrates and considers the findings.

The document and associated appendices present a detailed technical discussion on the groundwater resource assessments, including comparisons with predictive analysis provided in previous submissions, relating to the Solomon Life of Mine. It has been completed to a high standard and is acceptable for submission to the different Government agencies for their review and consideration.

The progressive improvement in understanding of the water resources at and surrounding Solomon provides a useful technical basis and robust appreciation of the groundwater system. The methodologies employed in the field activities, and subsequent groundwater assessments, are appropriate and align with industry standards.

The expansion of Solomon requires the development of additional water supplies to meet future water requirements with considerable ongoing investigation and assessment of groundwater resources in the Southern and Lower Fortescue Rivers. As such, the peer reviewer provides the following comments and observations that are of importance and significance for life of mine water management at Solomon, and associated Southern and Lower Fortescue Borefields.

#### *Solomon Mining Area*

- There has been ongoing development in the conceptual hydrogeology, which has addressed previous knowledge gaps and has been fully integrated into the numerical flow modelling. The hydrostratigraphy is well resolved with a robust appreciation of hydraulic variability within the CID (channel-iron deposit) aquifer. The groundwater flow dynamics along flow, at flow divides, as well as vertical processes are well understood.
- The key mechanisms of groundwater recharge associated with large rainfall events have been established; however, it is important that future groundwater models attempt to better integrate this conceptualisation. This will provide improved confidence and accuracy in water balance estimations.

- The comparison between previous and current modelling predictions suggests there is reasonable correlation, with only slight differences in drawdown extents and abstraction volumes. In a similar way, the comparison between modelled predictions and actual measurements are considered relatively minor.
- The predictive modelling provides a reliable assessment tool in understanding groundwater drawdown impacts and evaluating the likely mitigation success for the three riverine pool systems at Kangeernarina, Weelumurra and Zalamea.
- The hydraulic integrity of the subsurface groundwater barriers at the western and southwestern ends of Queens are critically important for the protection of the pools in Weelumurra Creek, and preventing additional groundwater inflows from the west. The predictive modelling suggests that the barrier (modelled as largely impermeable and non-leaking) and associated supplementation has potential to meet these objectives.
- The placement of the hydraulic barrier and associated supplementation of up to 68 L/sec is a major commitment and key component in the successful development of the Solomon Life of Mine. There is no discussion on the design and nature of the hydraulic barrier; as such, the peer reviewer is unable to comment on its potential efficacy over the long term.
- The water balance suggests that decant water recovery will be less than 10% of the overall water consumption. All opportunities for improved recovery of decant water should be explored to reduce the need for additional water from external borefields.
- Supplementation of Kangeernarina Pool has been implemented with no breaches in trigger levels and impact on vegetation health. Ongoing maintenance and review will be critical, as groundwater drawdown has not reached the pools, suggesting that the supplementation system is yet to be fully tested.
- The placement of tailings as a backfill option may provide opportunities to integrate / combine with the hydraulic barrier to further reduce / restrict groundwater throughflow.
- There is no mention of mine closure relating to Solomon. The recovery of the groundwater regime, development of pit lakes and long-term maintenance of pools are all important groundwater resource considerations that will require attention.

#### *Southern Fortescue Borefield*

- The conceptual hydrogeology has been progressively improved through the development of the two borefield phases. The hydrostratigraphy seems logical with the derived aquifer parameters and model development being conservative in nature.
- The numerical model appears to be appropriate, representative and provides meaningful predictions of likely impacts associated with groundwater abstraction. There has been an attempt to include event-based recharge into the model, which has been replicated in the modelled groundwater responses.
- Owing to the deep watertable (more than 15 m bgl) and limited hydraulic connectivity, it has been assumed that the impact of groundwater dependent ecosystems within the borefield area is minimal – this seems a fair assumption.
- The predictive modelling suggests that groundwater abstraction has potential to impact on the water regime at Hamersley Gorge. Despite some uncertainty in the amount of change, it has been recognised that there is a change potential that will require some form of

management commitment. This will be most critical during borefield operation requiring the development of trigger levels, and possibly supplementation / remedial actions.

- Based on the predictive modelling, there will be increasing storage depletion of groundwater resource over the life of the borefield. By Year 30, it is predicted that more than 65% of all groundwater abstracted will be from groundwater storage. Discussions with the Department of Water will be required to ensure that storage depletion is acceptable.

#### *Lower Fortescue Borefield*

- The conceptual hydrogeology seems to be robust, appropriate and aligns with current understanding of the regional hydrogeology. The hydrostratigraphy seems logical with the aquifer parameters and model development being conservative in nature. The undertaking of longer aquifer tests, up to 10 days, is an important technical development as it provides a more confident appreciation of aquifer response.
- The numerical model has been developed based on first-principles, with conservative hydraulic parameters and rainfall-percentage recharge estimation. There is some recognition of the likely recharge processes, in terms of valley rainfall and river recharge, but there will be need for an improved recharge approach in future model development. Discharge has been adequately considered, in terms of groundwater throughflow and evapotranspiration loss; there is however need for further model refinement to avoid the use of the constant head boundaries.
- The numerical model appears to be representative and provides a meaningful appreciation / depiction of the likely impacts associated with groundwater abstraction for two different scenarios (7 GL/yr and 14 GL/yr over 25 years). The model is conservative in nature and potentially over-estimates drawdown impacts and changes in groundwater storage.
- For both abstraction scenarios, the predictive modelling suggests that water levels in pastoral bores will be influenced, there is potential for drawdown beneath groundwater-dependent vegetation along the Fortescue River, and the possibility of hydrological change at Powellina Pool. This will require management commitment, in terms of trigger level setting, monitoring, and possibly supplementation / remedial actions.
- There are unlikely to be abstraction impacts on groundwater resources at Millstream. As the borefield becomes operational, there is some potential for river recharge to be intercepted by the Lower Fortescue Borefield – this is unlikely to influence Millstream.
- As with the Southern Fortescue Borefield, there is potential for storage depletion of groundwater resources. Future model refinement and development is required, in terms of recharge and throughflow, to fully evaluate and assess the extent of storage depletion.

#### Conclusion

The Solomon Life of Mine builds on operational experiences, including ongoing investigations and data collection. It shows a commitment by FMG to continually improve its understanding of the water resources and progressively integrate any new knowledge into its predictive modelling. This approach has been demonstrated through the integration of modelling predictions at Solomon, as well as its other operations in the Chichester Range.

There are a number of significant water challenges associated with the Solomon Life of Mine. The design and nature of the subsurface hydraulic barriers in the west and southwest of Queens are critical components to the successful implementation and operation of Solomon. In addition, the substantial volumes of groundwater abstraction will also require ongoing monitoring, management and commitment for project success.

The peer reviewer is satisfied that the 'Hydrogeological assessment of the Solomon Life of Mine' report provides an accurate and representative appreciation of the water resources, and potential impacts associated with the future mining operations.

Yours sincerely



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The peer review has been completed by Mr Seth Johnson, a Registered Practising Geoscientist (Number 10106), who is bound by the Australian Institute of Geoscientists' Code of Ethics. It has been produced independently being based on information provided by Fortescue Metals Group Ltd. All comments are considered accurate and provided in good faith.