

Appendix C4

Groundwater Assessment



Umwelt Australia Pty. Ltd.
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11 February 2010

Attention J. Gibbs

Dear Jane

Re: Long term water levels in the modified Mangoola pit shell

Further to your letter dated 16th December 2009, we have overviewed your analyses with respect to the rebounding water level within spoils emplaced in the Mangoola pit shell. In particular we have considered whether your assessments are consistent with our findings reported in 2006, noting that the multiple pit shells used in 2006 (approx. 1200ha) when consolidated into a single shell, generate an area similar to that used in your data set (1270ha). Our findings are summarised as follows:

1. The pit areas are similar but barriers (eg. between the northern and main pits) taken into account in the 2006 pit design, appear to have been removed. This means the new pit shell will act as a single rebounding sink thereby removing the potential for differential heads to develop over relatively short distances within the shell. We assume a barrier wall is still intended across Clarks Gully and Anvil Creek to inhibit leakage from Big Flat Creek back into the mine pit.
2. Since the shell areas are similar when consolidated, the groundwater recharge contributions and rainfall infiltration through the rehabilitated spoils post closure, should be similar to the 2006 estimates. Accordingly we would expect the rate of recovery of the water table with the emplaced spoils to be similar.
3. The 2006 shells incorporated two evaporative sinks which were designed to generate water losses from the contained spoils. The sinks established flow systems which acted to contain any groundwater-leachate, and inhibited over-topping. The sink areas were based on water balance calculations which assumed a rainfall infiltration rate through spoils equivalent to about 5% of the long term annual rainfall. This produced a long term void water level of 135mAHD in the Main pit and 150mAHD in the Southern pit. We note that your calculations suggest a long term level of 129mAHD in the consolidated pit. Our slightly higher elevation in Main pit is probably attributed to the soil moisture accounting algorithm we used in determining the rainfall infiltration while the much higher level in Southern pit was caused by a barrier between the two pits. Your lower level for a consolidated pit is within our range of expectation for a single pit and will not adversely effect long term outcomes.
4. Since the revised pit shell closely approximates the 2006 shell in perimeter and area, we would expect the regional groundwater impacts to be similar to the assessed impacts in 2006. In particular we would not expect any significant change to predicted strata pore pressures or groundwater levels in the shallow alluvial systems associated with Wybong Creek.

Yours sincerely

Mackie Environmental Research Pty. Ltd.

Dr. C. Mackie