FINAL VOID WATER BALANCE ASSESSMENT

On completion of mining, the Wallaby Pit would be abandoned and progressively become inundated with water. The abandoned pit would form a discrete catchment that would intercept rainfall and runoff, and groundwater throughflow within the superficial formations, Carey Palaeodrainage and fractured bedrock aquifer systems.

The rate at which the pit is inundated would be dependent on water balance factors together with incremental volume and surface area characteristics of the final void (shown on Figures 1 and 2).

A broad assessment of the period for inundation of the pit to steady-state conditions has been completed. Water balance parameters have been approximated for this assessment and include:

- rainfall 0.22 m/annum;
- evaporation from the in-pit lake 1.2 m/annum (Laverton Epan x 0.4);
- total pit-area catchment (including waste dumps and perimeter areas of the pit) 4,900,000 m^2;
- runoff coefficient 0.5;
- groundwater recharge/throughflow of:
  - 5,361,120 m^3/annum (170 L/s) for inflow into the pit below an elevation of 315 m AHD;
  - 4,257,360 m^3/annum (135 L/s) for inflow at 320 m AHD;
  - 2,680,560 m^3/annum (85 L/s) for inflow at 350 m AHD;
  - 2,144,448 m^3/annum (68 L/s) for inflow at 360 m AHD;
  - 1,072,224 m^3/annum (34 L/s) for inflow at 380 m AHD; and
  - 536,112 m^3/annum (17 L/s) for inflow at 390 m AHD.

The estimated groundwater recharge/throughflow rates reflect the yields by the dewatering system at the completion of mining (170 L/s) and the projected decline of these rates as water levels in the lake immerse the palaeochannel sand intervals in the pit walls and approach steady-state conditions at elevations marginally below the natural water table.

The results of the final void water balance are summarised in Table 1.

Table 1

Wallaby Pit Final Void Water Balances

Year	Lake Area (m^2)	Runoff Area (m^2)	Annual Water Balances (m^2)					Lake Water Level (m AHD)
			Lake Rainfall	Lake Evaporation	Runoff	Groundwater Recharge	Balance	
1	210,000	4,663,000	46,200	(252,000)	513,000	5,361,120	5,668,320	105.3
2	240,000	4,633,000	52,800	(288,000)	509,700	5,361,120	5,635,620	131.2
3	270,000	4,603,000	59,400	(324,000)	506,400	5,361,120	5,602,920	153.3
4	305,000	4,568,000	67,100	(366,000)	502,500	5,361,120	5,564,720	172.8
5	320,000	4,553,000	70,400	(384,000)	500,900	5,361,120	5,548,420	190.6
10	435,000	4,438,000	95,700	(522,000)	488,200	5,361,120	5,423,020	263.4
15	575,000	4,298,000	126,500	(690,000)	472,800	5,361,120	5,270,420	316.8

Year	Lake Area (m^2)	Runoff Area (m^2)	Annual Water Balances (m^2)					Lake Water Level (m AHD)
			Lake Rainfall	Lake Evaporation	Runoff	Groundwater Recharge	Balance	
20	750,000	4,123,000	165,000	(900,000)	453,600	4,020,840	3,739,440	351.4
25	820,000	4,791,000	180,400	(984,000)	527,100	2,128,680	1,852,180	369.0
30	910,000	3,963,000	200,200	(1,092,000)	436,000	1,261,440	805,640	376.5
Steady-state	1,000,000	3,873,000	220,000	(1,200,000)	426,100	536,112	(17,814)	390

The results indicate:

- The final void would take at least 40 years and probably longer to fill to near steady-state conditions with lake levels of 385 to 390 m AHD.
- The forecast maximum elevation of the lake surface is about 390 m AHD.
- Groundwater recharge/throughflow provides for the most of the inflows into the pit.
- The known groundwater quality is hypersaline (TDS about 250,000 mg/L) and consequently the standing water within the pit is expected to be of similar quality – though probably with higher salt loads due to the salinisation effects of evaporation from the surface of the lake.
- With the maximum elevation of the lake surface being below the natural water table elevation, the final void would form a groundwater sink for several decades. Over the longer-term, changes in water balance (including reductions in evaporation from the lake surface as salinity increases) may result in higher lake levels and the lake water contributing to throughflow within the local aquifer systems.