

METROPOLITAN COAL - ENVIRONMENTAL MONITORING SUMMARY

Longer-term groundwater level data for upland swamps has also been acquired with single swamp substrate piezometers at sites SWAMP1, SWAMP2 and SWAMP3, and paired piezometers at sites SWAMP4 and SWGW1 (Figure 1).

The swamp groundwater monitoring results are described in the Biodiversity Environmental Monitoring Summary.

Shallow Groundwater Levels

Continuous water level monitoring of shallow groundwater levels has been conducted at sites WRGW1, WRGW2 and WRGW7 along Waratah Rivulet, site RTGW1A on Tributary B (to May 2014) and sites ETGW1 and ETGW2 on the Eastern Tributary (Figure 1).

Sites WRGW1 and WRGW2 are located on opposite banks of the Waratah Rivulet, to the immediate south of Longwall 20 (Figure 1) and show comparable information over the reporting period with rapid response to rainfall events. At the time of passage of the Longwall 21 mining face past the piezometer sites (March 2012), the measured groundwater levels dropped by about 1 m. As wet conditions prevailed at the time, this was not a climatic effect. Water levels recovered by about 0.5 m at the end of 2012 but fell again slightly (by about 0.3 m) when the Longwall 22A face was closest to the monitoring sites (at a distance of approximately 500 m). The water levels at sites WRGW1 and WRGW2 started to drop shortly before the start of Longwall 23A due to a dry period from May to July 2014. They continued to fall (by about 0.6 m) until heavy rainfall occurred from 18 to 20 August 2014. Throughout the reporting period, the water levels at sites WRGW1 and WRGW2 have correlated closely with rainfall trends (as indicated by the residual mass curve on Chart 1) and have not shown any response to mining (Chart 1).

Site WRGW7 is located approximately 400 m downstream of Longwall 23 (Figure 1). The shallow groundwater level data that is available for Site WRGW7 on the Waratah Rivulet (Chart 2) indicates there is good correlation between the response at WRGW7 and rainfall trend, and good evidence of stream-aquifer interaction for Waratah Rivulet flow events.

Site RTGW1A is located over Longwall 22A. Longwall 22A passed site RTGW1A in May 2013. Around this time the groundwater levels dropped approximately 4 m lower than experienced in the preceding dry period throughout 2012 (Chart 3) as a result of mining. Up until May 2014 the base level remained low but rapid rises in water level (of about 8 m) occurred in response to heavy rainfall events. Due to bore failure, data is only available up until May 2014.

At sites ETGW1 and ETGW2, located downstream of Longwall 23, shallow groundwater levels have previously followed the rainfall trends closely, and have continued to do so during the reporting period (Chart 4). The variations at these sites are unrelated to mining.

Deep Groundwater Levels/Pressures

Continuous groundwater level/pressure monitoring has been conducted in accordance with the Longwalls 20-22 and Longwalls 23-27 Water Management Plans at bores 9HGW0 (Longwall 10 Goaf Hole), 9EGW1B, 9FGW1A, 9GGW1-80, 9GGW2B, 9HGW1B, 9EGW2A, PHGW1B, PHGW2A, F6GW3, F6GW4, PM01, PM02 and PM03 (Figure 1).

The time-series head variations and vertical head differences for these bores have been examined with the following outcomes:

- very few installations are providing unreliable data;
- the vibrating wire piezometers that had been slow to stabilise since installation, particularly those installed in claystones, are now generally stable;
- sites close to current mining show significant depressurisation with depth, consistent with the Project Environmental Assessment (EA); and
- sites close to old workings at Helensburgh show substantial depressurisation with depth, consistent with the Project EA.

Groundwater Quality

Shallow groundwater quality has been sampled monthly at sites WRGW1, WRGW2 and WRGW7 along the Waratah Rivulet and sites ETGW1 and ETGW2 on the Eastern Tributary.

Water quality parameters sampled include electrical conductivity, pH, redox potential, calcium, magnesium, sodium, potassium, chloride, sulphate, bicarbonate, barium, strontium, manganese, iron, zinc, cobalt and aluminium. The samples collected for the analysis of metals have been field filtered.

The key observations at the Waratah Rivulet groundwater quality monitoring sites are:

- Iron concentrations are usually in the 1 - 10 milligrams/litre (mg/L) range with the exception of sites WRGW1 and WRGW2 on the Waratah Rivulet.
- Peak value iron concentrations of 12 mg/L and 10 mg/L occurred at sites WRGW1 and WRGW2, respectively, during the reporting period.

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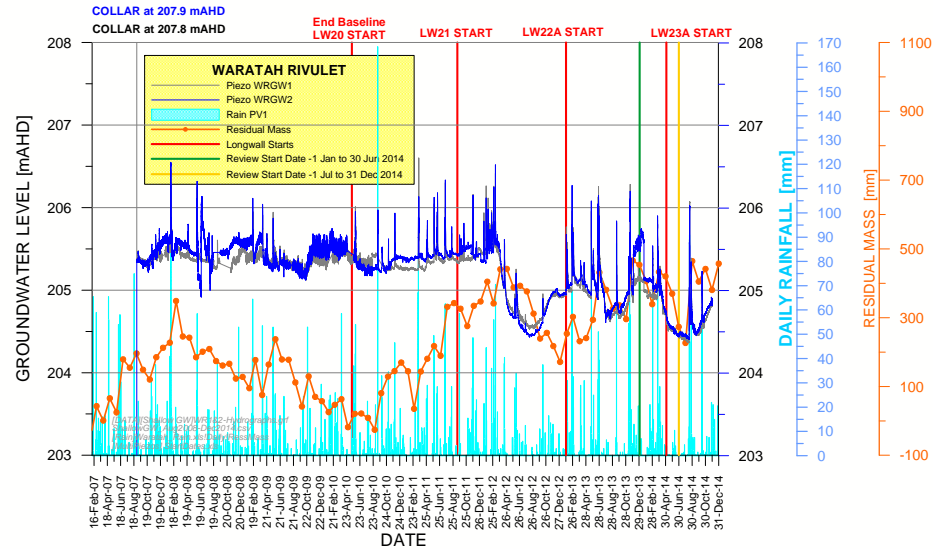


Chart 1 Shallow Groundwater Hydrographs on Waratah Rivulet at WRGW1 and WRGW2

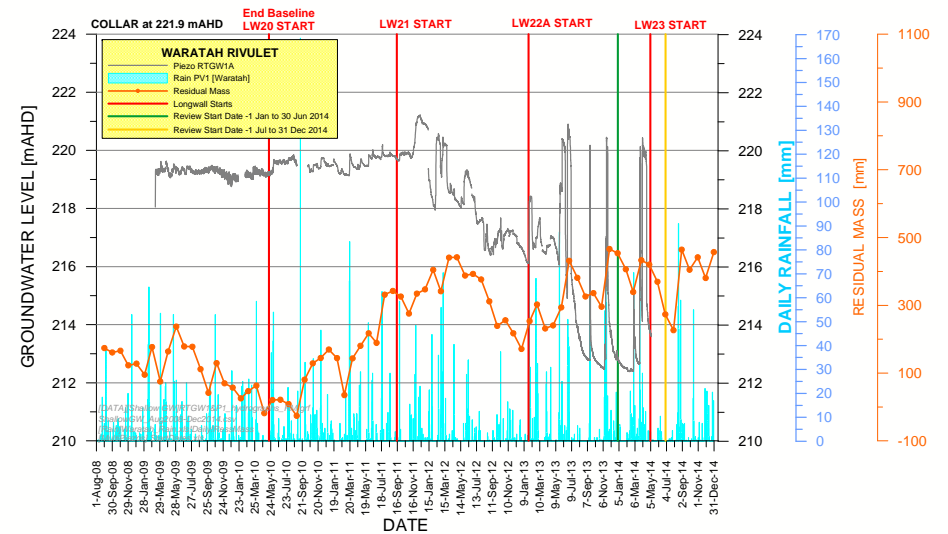


Chart 3 Shallow Groundwater Hydrograph on Tributary B at RTGW1A

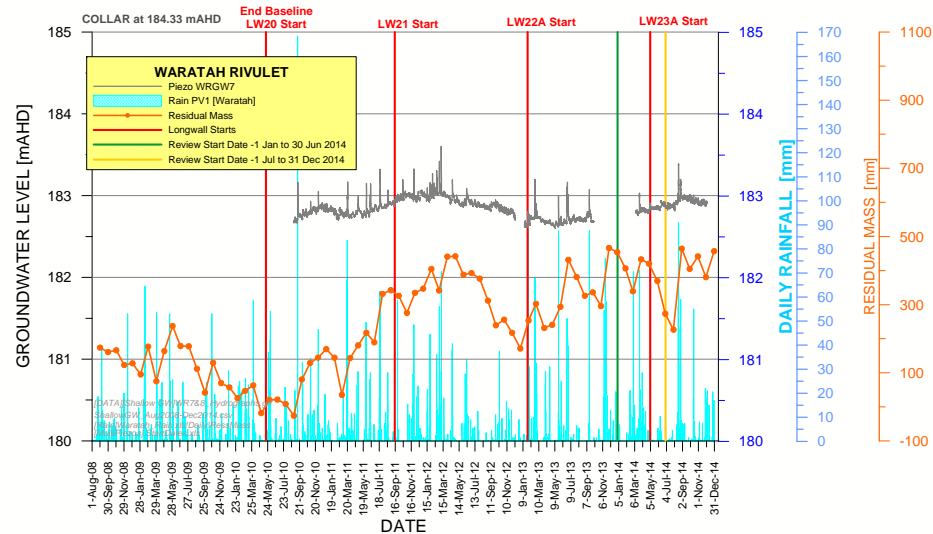


Chart 2 Shallow Groundwater Hydrograph on Waratah Rivulet at WRGW7

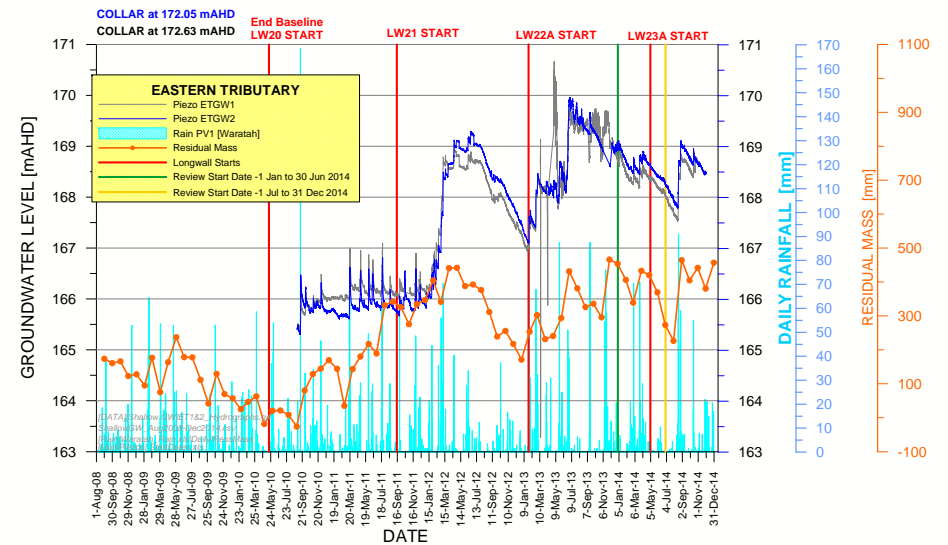


Chart 4 Shallow Groundwater Hydrograph on Eastern Tributary at ETGW1 and ETGW2

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- Manganese concentrations are always less than 1 mg/L.
- Iron and manganese concentrations increase with distance downstream to WRGW1 and WRGW2 and then decrease (relative to sites WRGW1 and WRGW2) with distance downstream to WRGW7.
- Groundwater is generally acidic with pH usually between pH 5.5 and 7.
- Aluminium was below the detection limit in all samples.

Inspections of Mine Workings and Mine Water Make

Metropolitan Coal conducts inspections of mine workings and monitors mine water make as indicators of potential connective cracking from the surface to the mine.

The inspections of mine workings have not identified any abnormal water flows from the goaf, geological structure, or strata generally.

Monitoring of the mine water balance includes calculation of the inferred water make. The inferred water make (i.e. groundwater that has seeped into the mine through the strata) is calculated from the difference between total mine inflows (reticulated water into the mine, moisture in the downcast ventilation, and the *in-situ* coal moisture content) and total mine outflows (reticulated water out of the mine, moisture in the exhaust ventilation, and moisture in the run-of-mine coal). The 20 day average daily mine water make was less than 2 megalitres per day (ML/day) during the reporting period (Chart 5).

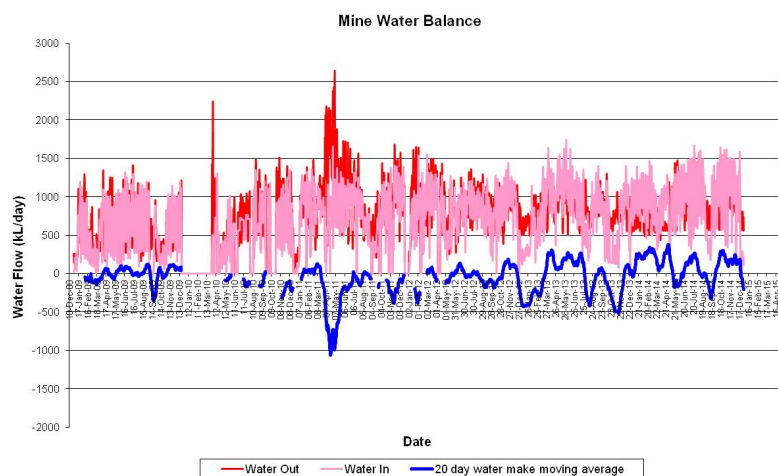


Chart 5 Estimated Daily Mine Water Make

Assessment of Environmental Performance

The monitoring results were used to assess the Project against the water resource and watercourse performance indicators relevant to groundwater. The assessments indicated that none of the performance indicators were exceeded:

- *Visual inspection does not identify abnormal water flow from the goaf, geological structure, or the strata generally.*
- *The 20-day average mine water make does not exceed 2 ML/day.*
- *Significant departures from the predicted envelope of vertical potentiometric head profiles at Bores 9GGW2B and 9FGW1A do not occur (Longwalls 20-22 Water Management Plan).*
- *Significant departure from the predicted envelope of the vertical potentiometric head profile at Bore 9GGW2B does not occur (Longwalls 23-27 Water Management Plan).*
- *The water tables measured at Bores 9FGW1A and 9GGW1-80 are higher than the water levels of streams crossed by a transect along Longwall 22 (i.e. a hydraulic gradient exists from each bore to the nearest watercourse).*
- *The groundwater head of Bores 9GGW2B and PM02 is higher than the water level of Woronora Reservoir (i.e. a hydraulic gradient exists from the bores to the Woronora Reservoir).*

None of the water resources performance measures relevant to groundwater were exceeded during the reporting period:

- *No connective cracking between the surface and the mine.*
- *Negligible leakage from the Woronora Reservoir.*