

## Surface Water – Mining Area and Surrounds

Metropolitan Coal's Longwalls 20-22 and Longwalls 23-27 underground mining areas include the Waratah Rivulet and its tributaries (such as Tributaries A and B) and the Eastern Tributary and its tributaries (Figure 1). These streams flow directly to the Woronora Reservoir (Figure 1).

Metropolitan Coal's surface water monitoring program includes monitoring of:

- stream features;
- surface water flow;
- pool water levels;
- stream water quality; and
- reservoir water quality.

The monitoring results are described below.

### **Stream Features**

Visual and photographic surveys of streams are conducted to monitor changes to stream features (such as surface cracking and iron staining) as mining progresses.

Stream bed cracking was noted at Pools ETK, ETO, ETP and ETAA on the Eastern Tributary and at Pool N on the Waratah Rivulet during the reporting period. Iron staining and water discolouration were recorded at a number of rock bars and/or pools.

During the reporting period, gas releases in the Waratah Rivulet were observed in Pools K, L, O and P (Figure 2). Gas releases were identified for the first time in Pool P in February 2014 and continued to the end of the reporting period.

In accordance with the Metropolitan Coal Longwalls 20-22 and Longwalls 23-27 Water Management Plans, the following actions were undertaken following identification of the gas release:

- monitoring conducted weekly to determine the extent of the gas releases;
- gas concentration monitoring; and
- identification of any observable environmental effects (e.g. impacts to riparian vegetation or fish).

No environmental effects resulting from the gas releases have been observed.

### **Surface Water Flow**

Surface water flow monitoring has included continuous flow monitoring at the Sydney Catchment Authority (SCA) owned gauging stations on the Waratah Rivulet (GS2132102) and Woronora River (GS2132101) (Figure 3) and at the New South Wales Office of Environment and Heritage (OEH) gauging station on O'Hares Creek at Wedderburn (GS213200). Gauging stations have also been installed by Metropolitan Coal on the Eastern Tributary and Honeysuckle Creek.

Numerical catchment models for the Waratah Rivulet, Woronora River and O'Hares Creek control catchments have been developed using the nationally recognised Australian Water Balance Model (AWBM). The AWBM is a catchment-scale water balance model that estimates streamflow from rainfall and evaporation.

Metropolitan Coal is regenerating the current flow records from the Waratah Rivulet, Woronora River and O'Hares Creek gauging stations using amended rating relationships. Re-calibrated catchment models will be developed for the Waratah Rivulet, Woronora River and O'Hares Creek gauging stations in the next reporting period.

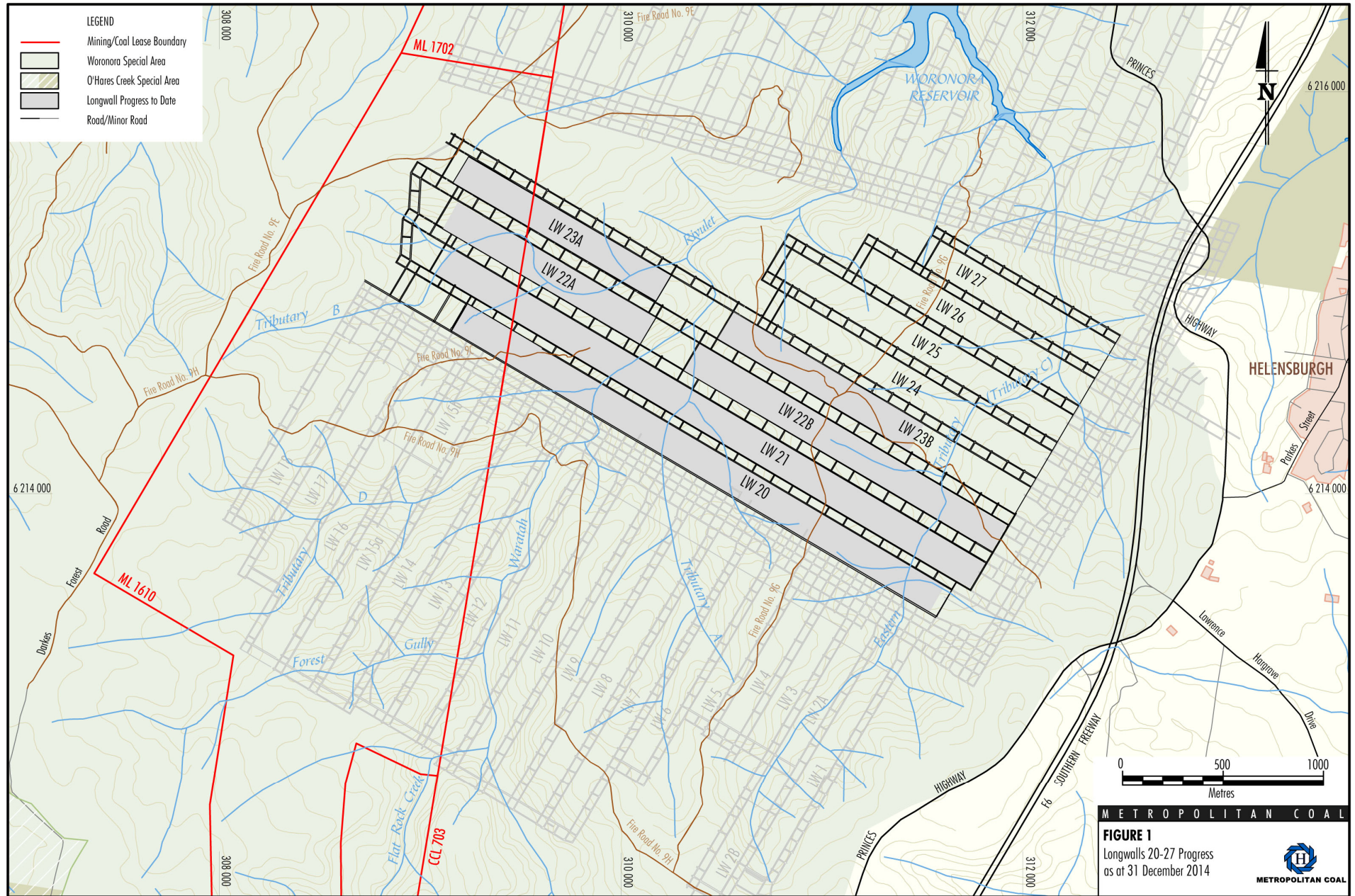
### **Pool Water Levels**

Water levels in a number of pools on the Waratah Rivulet, Eastern Tributary, Tributary B and Woronora River are manually monitored on a daily basis or monitored using a continuous water level sensor and logger.

Pools A, B, C, E, F, G, G1, H and I on the Waratah Rivulet are situated in the completed mining area (i.e. overlying Longwalls 1 to 13) between Flat Rock Swamp and the tailgate of Longwall 20 (Figure 2). As a result of previous mining, the water levels in pools upstream of Flat Rock Crossing (i.e. Pools A to F) and immediately downstream of Flat Rock Crossing (Pools G and G1) have previously been impacted by mine subsidence.

The water levels in Pools A, B, C, E, F, G1, H, I, J, K, L, M, P, Q, R, S and V have remained above their cease to flow levels throughout the reporting period. Water levels in Pools G and N regularly fell below their cease to flow level during the reporting period (Figure 2).

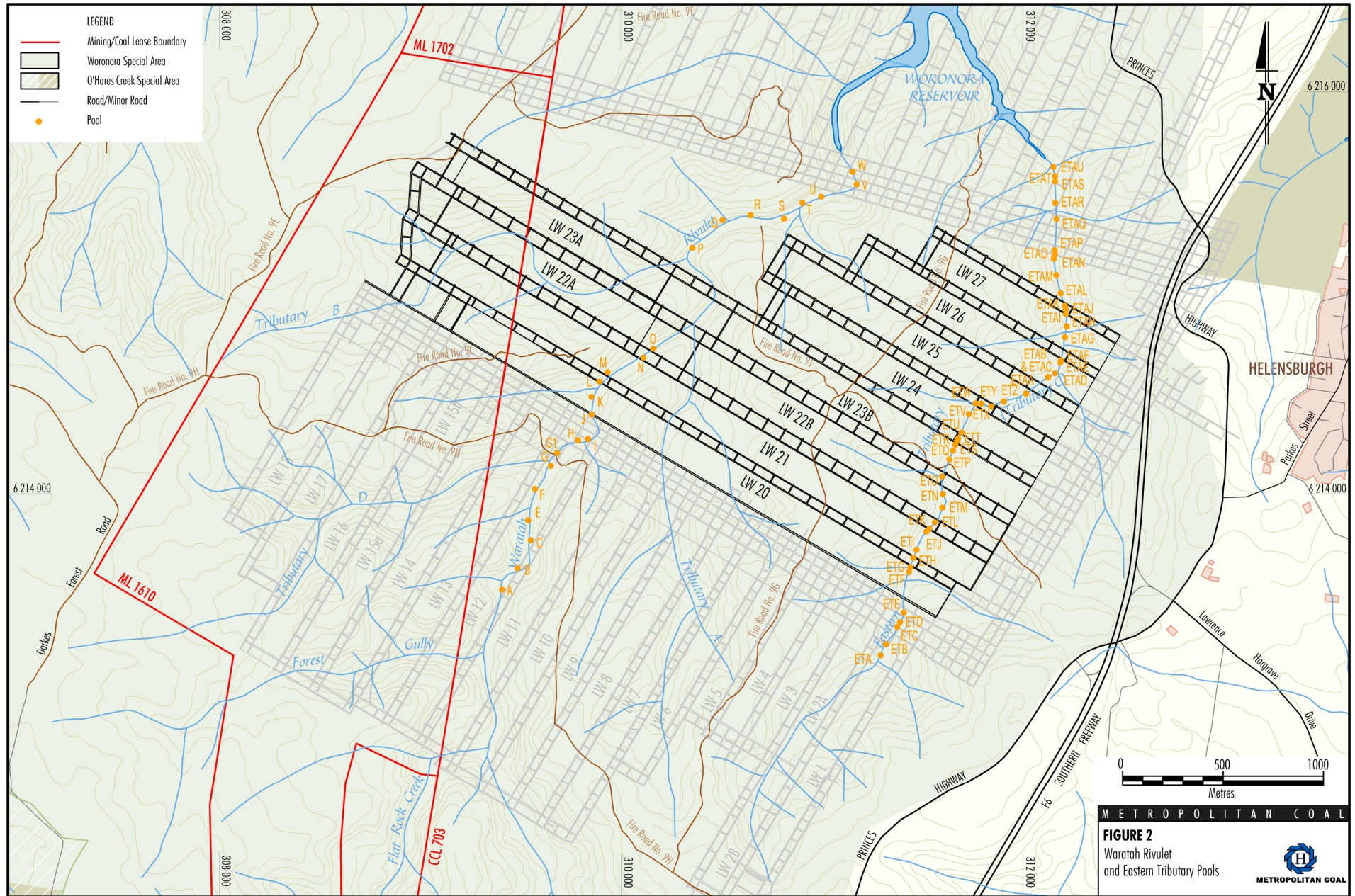
# METROPOLITAN COAL - ENVIRONMENTAL MONITORING SUMMARY



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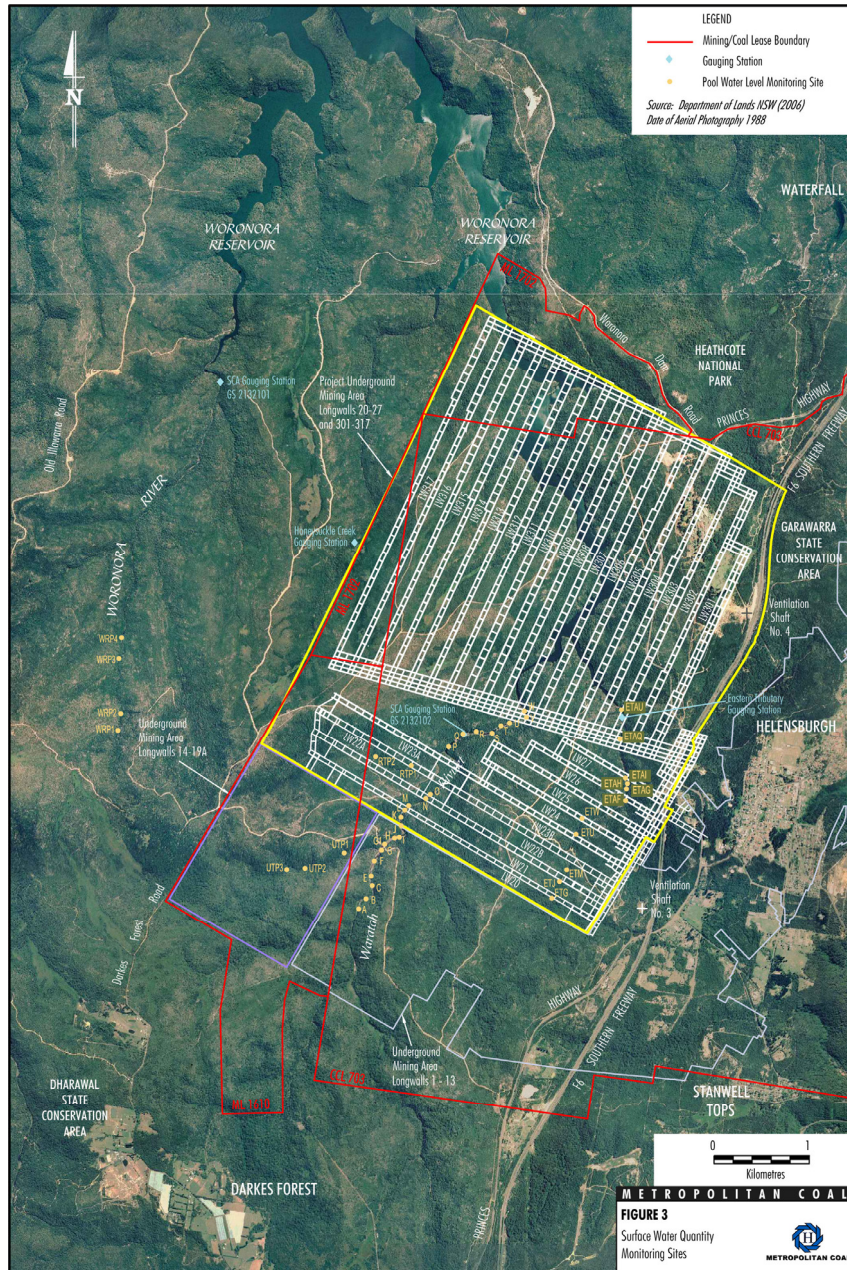


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Pools O, T, U and W do not have established surveyed cease to flow levels because these pools do not have 'solid' rock bar controls, however the shape of the recorded pool water level hydrographs in all pools suggest that these pools exhibited natural behaviour during the reporting period.

Stream remediation activities on the Waratah Rivulet are described in the Rehabilitation section of this Environmental Monitoring Summary.

## Stream Water Quality

Surface water quality sampling has been conducted monthly at a number of sites on the Waratah Rivulet, Tributary B, Tributary D, Eastern Tributary, Far Eastern Tributary, Honeysuckle Creek, Bee Creek and the Woronora River (Figure 4).

Water quality parameters sampled include electrical conductivity, pH, redox potential, dissolved oxygen, turbidity, calcium, magnesium, sodium, potassium, chloride, sulphate, bicarbonate, total nitrogen, total phosphorus, nitrate, barium, strontium, manganese, iron, zinc, cobalt and aluminium.

The key water parameters, namely pH, electrical conductivity, dissolved aluminium, dissolved iron and dissolved manganese are graphically presented for all of the water quality monitoring sites in the 2014 Annual Review and AEMR/Rehabilitation Report.

With the following three exceptions water quality data over the reporting period has generally been within the typical ranges seen in the historic recorded water quality data:

- Fluctuation in pH values at the Woronora River sampling sites between pH 8.5 at WOWQ1 in June 2014 and pH 3.7 at WOWQ1 in August 2014. The recorded high and low pH values were relatively consistent between sampling sites.
- Three relatively elevated dissolved iron concentrations were recorded at site ETWQ N on the Eastern Tributary in April, May and October 2014.
- The trend of increasing pH and EC at the downstream sampling sites on Tributary B prior to start of the reporting period appear to have plateaued. Dissolved manganese at these sites appears to be trending upward relative to the historical concentrations but still remains relatively low. Dissolved manganese at sampling site RTWQ2 trended down during the latter part of the reporting period while it continues to generally trend up at sampling site RTWQ1 downstream.



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### ***Woronora, Nepean and Cataract Reservoir Water Quality***

Metropolitan Coal sources surface water quality data for the Woronora Reservoir, Nepean Reservoir and Cataract Reservoir from the SCA in accordance with a data exchange agreement. The monitoring data is used to assess potential mining impacts on the water quality of the Woronora Reservoir.

### ***Assessment of Environmental Performance***

The monitoring results were used to assess the Project against the water resource and watercourse performance indicators relevant to surface water, including those related to:

- Surface water flow.
- Water quality reaching the Woronora Reservoir.
- Water quality of Woronora Reservoir.
- Waratah Rivulet environmental consequences.
- Eastern Tributary environmental consequences.

The performance indicator for *water quality reaching the Woronora Reservoir* was exceeded during the reporting period:

*Changes in the quality of water entering Woronora Reservoir are not significantly different post-mining compared to pre-mining concentrations that are not also occurring at control site WOWQ2.*

The results indicated that the 12 month sliding mean for dissolved iron at site WRWQ9 exceeded the baseline mean plus one standard deviation. The 12 month sliding mean for dissolved manganese at site WRWQ9 and site ETWQ2 also exceeded the baseline mean plus one standard deviation.

In accordance with the Metropolitan Coal Longwalls 20-22 and Longwalls 23-27 Water Management Plans, an assessment was made against the watercourse subsidence impact performance measure:

*Negligible reduction to the quality of water resources reaching the Woronora Reservoir.*

The assessment concluded that the performance measure had not been exceeded.

The performance indicators for *Waratah Rivulet environmental consequences* relating to gas releases in Pool P were also exceeded during the reporting period.

The gas release performance indicators, *No gas releases observed at Pool P on the Waratah Rivulet* (Longwalls 20-22 performance indicator) and *No gas releases observed at Pools P to W on the Waratah Rivulet* (Longwalls 23-27 performance indicator), were exceeded in February 2014 when gas releases were first identified at Pool P. Following assessment, the performance indicators were revised to *Visual observations of gas releases in Pool P on the Waratah Rivulet indicate the gas releases have increased beyond those observed up to 17 April 2014* (Longwalls 20-22 and Longwalls 23-27 performance indicator). The revised performance indicator was exceeded in September 2014.

In accordance with the Metropolitan Coal Longwalls 20-22 and Longwalls 23-27 Water Management Plans, assessments were made against the watercourse subsidence impact performance measure:

*Negligible environmental consequences (that is, no diversion of flows, no change in the natural drainage behaviour of pools, minimal iron staining, and minimal gas releases) on the Waratah Rivulet between the full supply level of the Woronora Reservoir and the maingate of Longwall 23 (upstream of Pool P).*

Assessments of the Pool P gas releases concluded that the performance measure had not been exceeded.