



Appendix B	Groundwater Sampling and Analysis Plan	1
B.1	Introduction	3
B.2	Groundwater Monitoring Bore Network	3
B.3	Groundwater Monitoring Program	6

B.1 Introduction

This Groundwater Sampling and Analysis Plan is based upon the recommendations made in the groundwater chapter of the Environmental Impact Statement (EIS) for the Daunia Project, which was prepared by SKM in October 2008. The recommendations for groundwater monitoring made in the EIS were as follows:

- A monitoring network should be established prior to the commencement of mining to ensure there is sufficient baseline information on groundwater levels and quality;
- Two of the bores that were installed for the Poitrel Mine in April 2008 are on the Red Mountain Mining Lease and will form part of this network;
- The monitoring network should aim at monitoring on-site and regional groundwater quality monitoring of the coal seam aquifer and alluvium aquifer (where present). The groundwater samples will undergo laboratory analysis for pH, electrical conductivity, total dissolved solids, cations, anions, nutrients (Total Nitrogen, Ammonia, Total Phosphorous and Reactive Phosphorous) and selected metals (Arsenic, Cadmium, Copper, Lead, Mercury, Selenium and Zinc);
- Groundwater level and quality monitoring will initially be undertaken on a regular basis to enable the detection of seasonal fluctuations and any groundwater level or quality impacts; and
- Post mining groundwater monitoring will be undertaken within monitoring bores that were installed during the operational phase of the project.

It is anticipated that a six month groundwater monitoring program will commence in March 2009 and will be completed by the end of August 2009.

B.2 Groundwater Monitoring Bore Network

The groundwater monitoring network will be used to provide a snapshot of the baseline hydrogeological conditions and temporal changes in groundwater conditions prior to mine development. The network will also be monitored in the long term (i.e. during and post mining) to provide ongoing measurement of quality and quantity, including temporal and seasonal changes. In addition to providing baseline information, the results from the groundwater monitoring undertaken will provide a measurement of any impacts that are occurring.

The groundwater monitoring network will comprise ten groundwater bores, including eight new bores and two existing bores.

The eight new bores will be located at four sites, each site featuring two side by side groundwater bores: one targeting the alluvial aquifer and the other targeting the coal seam aquifer (i.e. a total of eight piezometers). The locations of the new monitoring bores will be strategically placed (outside of the proposed mining area and plant footprint) to ensure that groundwater monitoring can continue post mine development. The locations of the new bore sites are shown in **Figure B-1**.

In addition to the new groundwater monitoring bores, the groundwater monitoring network will include two existing bores (Obs 2 and Bore 5), which were installed on the Red Mountain Mining Lease for the Poitrel Mine in April 2008. A summary of the two existing bores is shown in the Table B-1 below.



Table B-1 Summary of bores installed on Red Mountain Mining Lease for the Poitrel Mine in April 2008

Bore ID	Location	Target Strata	Approximate Depth	Current Purpose
Obs 2	631405, 7557531	Leichhardt and Vermont Seams – Rangal Coal Measures	45 m	Monitor groundwater level response along eastern margin of inferred seam occurrence (potential boundary condition and extent of direct hydraulic connectivity with pit). Maximum model predicted drawdown influence area.
Bore 5	631341, 7560011	Leichhardt and Vermont Seams – Rangal Coal Measures	50 m	Monitor potential impacts to potential nearby users currently extracting from the Rangal Coal Measures aquifer (existing location).

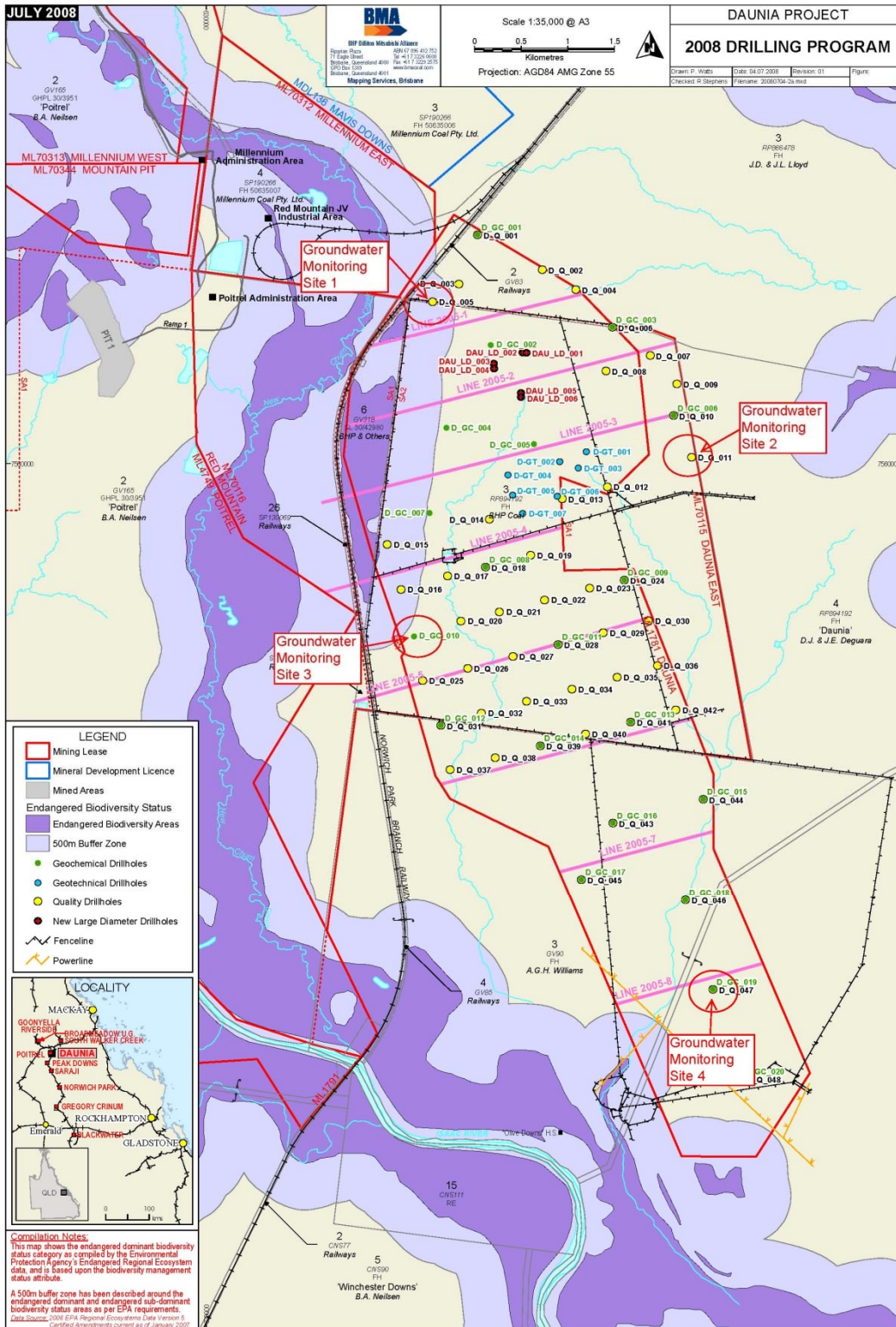


Figure B-1 Approximate Locations of Groundwater Monitoring Network Piezometers

B.3 Groundwater Monitoring Program

The primary aim of undertaking groundwater monitoring on-site is to ensure sufficient baseline data is gathered for consideration of the following hydrogeological aspects:

- Temporal and spatial variations in groundwater levels;
- Temporal and spatial variation in groundwater quality; and
- Groundwater level or quality impacts (e.g. early detection of drawdown or groundwater quality caused by pit dewatering).

The monitoring program will be used to identify impacts prior to them being experienced by neighbouring landholders. In addition to this, data collected for the alluvial aquifer will be used in the future to update the existing groundwater model to better identify the level of impact on neighbouring groundwater users and the nearby riparian vegetation. Results from the monitoring program can also be assessed in the future to better define the interaction between surface water and groundwater (in particular the Isaac River alluvium) at the Project Site.

Groundwater monitoring will be undertaken for an initial period of six months. Subsequent to this BMA will generate quarterly reports on the results of the monitoring program and a yearly report which includes an assessment of the impacts of mining and the need to review the predicted future impacts. Groundwater monitoring will be undertaken based on the requirements in the Queensland EPA's Water Quality Sampling Manual (3rd Edition, EPA 1999), the National Environmental Protection Council's National Environmental Protection (Assessment of Site Contamination) Measure (NEPC Service Corporation, December 1999), and the Australian and New Zealand Standard AS/NZS5667.1:1998: Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples (Standards Australia, 1998).

Groundwater monitoring will involve:

- groundwater quality sampling - samples will be collected and sent to a laboratory for chemical analysis. Sampling will be undertaken in the 1st, 3rd and 6th month of the monitoring program (i.e. a total of three groundwater quality sampling events); and
- groundwater level monitoring and collection of physico-chemical data (i.e. salinity, pH) will be undertaken on a fortnightly basis for the first three months and on a monthly basis for the remaining three months.

The method of groundwater monitoring will be undertaken following the procedure outlined below:

- 1) Depth to water table will be measured using a Solinst interface meter;
- 2) Bores will be purged of at least three well-volumes of groundwater using a submersible pump or bailer. Purged water will be disposed of to nearby drains or adjacent land. The method of purging will be tailored for each site, dependent on the parameters being analysed to ensure the accuracy of results;
- 3) Analysis of physico-chemical parameters will be undertaken during the purging of each bore using a water quality (multi-parameter) meter. Recording of the required parameters will be taken once the results have stabilised (i.e. are representative of the aquifer); and
- 4) Collection of groundwater samples will be undertaken following the purging of each bore. A clean disposable bailer will be used to collect the sample to limit the potential for cross-contamination between samples. Groundwater samples will be collected in a laboratory supplied sampling container that will be appropriately dosed with preservative for the analysis required.



All field equipment will be decontaminated between bores to prevent cross-contamination. During each monitoring event Quality Assurance samples will be collected to assess the consistency of laboratory analyses. This will comprise one duplicate and one triplicate sample (two per monitoring event), as well as a rinse blank from all non-disposable equipment (one per monitoring event).

The required physico-chemical parameters and the analytical schedule for groundwater sampled are listed in Table B-2 below.

Table B-2 Physico-chemical and Laboratory Analysis

Physico-chemical Parameters	Laboratory Parameters
pH, temperature, Electrical Conductivity and Total Dissolved Solids.	Ammonia as N, Nitrite, Nitrate, Total Nitrogen as N, Total Phosphorous as P, Arsenic, Cadmium, Chromium, Copper, Nickel, Lead, Zinc, Mercury, Major Cations, and Major Anions.

It is anticipated that the six month groundwater monitoring program will commence in March 2009 and will be completed by the end of August 2009. Subsequent to this BMA will generate quarterly reports on the results of the monitoring program and a yearly report which include an assessment of the impacts of mining and the need to review the predicted future impacts.