

PROPOSED BICKHAM COAL MINE

PROPOSED SCOPE OF WATER RESOURCE ASSESSMENT AND DRAFT WATER MANAGEMENT PLAN

1) General Scope of Work

The proposed scope of work for studies leading to preparation of a Water Resource Assessment and Draft Water Management Plan for the proposed Bickham Coal Mine project includes sufficient work to meet the requirements for assessment under Part 3A of the *Environmental Planning & Assessment Act 1979*, including requirements arising as a result of the recommendations of the draft Strategic Assessment of Coal Mining Potential in the Upper Hunter Valley.

It is proposed to confine the groundwater resource assessment studies to areas within 3 km of the proposed open cut mine outline, as any direct hydrogeological impacts of the proposed mining operation are expected to be contained well within this distance. The studies would also consider any potential indirect hydrogeological impacts downstream or downgradient from this study area. Surface water studies would include both the Pages River and Kingdon Ponds catchments.

It is proposed that the water resource assessment would make use of up to 3.5 years of baseline surface water and groundwater monitoring data, which has been collected from the project area since the commencement of monitoring in June 2002. This includes monitoring through a range of climatic conditions, as well as a period of intense monitoring of both surface water and groundwater during the extraction of a bulk coal sample from the project site during 2004, and the subsequent recovery of groundwater levels in 2005.

The scope of work outlined below addresses principally the requirements arising as a result of the recommendations of the draft *Strategic Assessment of Coal Mining Potential in the Upper Hunter Valley*. It is proposed that the Water Resource Assessment and draft Water Management Plan would also address the typical matters relating to groundwater, surface water and related values, that are likely to be applied by the Director-General for the overall impact assessment for this project. These requirements are not detailed here. Further, the WRA and draft WMP would also address the requirements as they relate to water resources of all other relevant legislation and policy guidelines.

2) Proposed Project Management Team and Reporting Structure

The Proponent for the project is Bickham Coal Company Pty Ltd. The Water Resource Assessment and Water Management Plan will be completed under the overall direction of Peter Dundon of Peter Dundon and Associates Pty Ltd, with contributions from a number of specialist individuals and organisations. Key individuals are also nominated to provide internal Peer Review. The study team will also consult extensively with relevant government departments during the preparation of the Water Resource Assessment and Water Management Plan.

Key individuals in the Project Management Team are as follows:

Bickham Coal Management –

Executive Director	David Foster
Project Manager	John Richards

Water Study Team –

Peter Dundon	Peter Dundon and Associates	Overall study leader and hydrogeology studies
Hugh Middlemis	Aquaterra	Groundwater modelling
Ilka Wallis	Aquaterra	Groundwater modelling
Peter Cook	CSIRO	Isotope / tracer studies
Steve Perrens	Evans and Peck	Surface water studies
Alison Tourle	Evans and Peck	Flood modelling
Rod Davis	Mining & Exploration Geology	Geology
Paul Lambert	Parsons Brinckerhoff	Geotechnical studies
Graham Holt	G Holt and Associates	Geotechnical studies
Martin Predavec	Parsons Brinckerhoff	Terrestrial ecology
Paul Anick	Marine Pollution Research	Aquatic ecology
Noel Merrick	UTS (Centre Groundwater Studies)	Groundwater peer review
Andrew Bewsher	Bewsher Consulting	Surface water peer review

Key Consultations with Government Departments –

Fergus Hancock Department of Natural Resources, Hunter Region

Howard Reed Department of Planning

Department of Environment and Conservation

Department of Primary Industries – Minerals

Department of Primary Industries – Agriculture

3) General requirements arising as a result of the recommendations of the draft Strategic Assessment of Coal Mining Potential in the Upper Hunter Valley

- a) The proponent will prepare a full groundwater and surface Water Resource Assessment and a draft life-of-mine Water Management Plan (including water management relating to mine closure and post-mining).
- b) The Water Resource Assessment and draft life-of-mine Water Management Plan will:
 - i) examine contained and surrounding groundwater resources within 3 km of the proposed mine, to assess the distribution of groundwater and groundwater continuity, and to confirm the groundwater salinity within the region of potential impact of the proposed mine, identify all mapped high priority groundwater resources, along with embargoed aquifers, Water Sharing Plan areas (if applicable) and outline protective mechanisms in place for these aquifers;
 - ii) model and assess groundwater responses to ongoing open cut de-watering and associated aquifer de-pressurisation;
 - iii) examine connectivity between the Pages River and alluvial and hard rock aquifers in the vicinity of the proposed mine;
 - iv) examine appropriate means of avoiding any significant inflow to the mine from either the alluvium of the Pages River or any protected alluvial aquifer, if

- required, and identify potential risks to protected aquifers (defined as “high priority embargoed aquifers”) and present a mechanism to monitor impacts, detect levels of impacts against accepted trigger levels, and options for remediation of impacts which exceed nominated trigger levels;
- v) examine means of minimising generation of mine wastewater, maximising use or re-use of mine wastewater, and options for the mine to achieve a “nil discharge” status;
 - vi) demonstrate that mitigation measures and contingency plans are capable of adequately addressing any risks to flow or water quality in Pages River as a result of mining;
 - vii) discuss potential final void configurations, modelled groundwater inflow for up to 100 years post mining, and post-mining management options and outcomes for any residual water resources impacts; and
 - viii) Report and discuss water resource concerns identified by the local community
- c) The Water Resource Assessment and draft Water Management Plan will demonstrate that the proposed coal mine can be managed so as to maintain the long-term integrity of the streams, alluvial aquifers and ecosystem values of the Pages River Catchment and the Kingdon Ponds Catchment. To this end, the Assessment and draft Management Plan will demonstrate that:
- i) opportunities for alternative use of excess mine wastewater, either on-site or off-site, have been fully investigated prior to any mine wastewater discharge being proposed;
 - ii) mine wastewater discharges (if any) will have no significant impact on the water quality of the receiving waters, and that all major water quality parameters (eg salinity, acidity, turbidity, etc) in any discharge will be consistent with maintaining the water quality of the Catchments and their associated values;
 - iii) any discharge will not significantly alter natural flow regimes in Pages River or the Kingdon Ponds Catchment;
 - iv) buffer zones have been applied between the proposed coal mine and the Pages River (and any other streams) consistent with the DNR’s ‘Guidelines for Management of Stream/Aquifer Systems in Coal Mining Developments – Hunter Region, April 2005’;
 - v) areas of riparian vegetation within land owned or controlled by the proponent are protected and/or rehabilitated, so as to provide improved riverine health and improved bank stability, and to assist maintenance of healthy aquatic ecosystems; and
 - vi) runoff of silt or sediment will be controlled using appropriate techniques set out in “Managing Urban Stormwater: Soils and Construction” (2004).
- d) The local and regional community will be consulted during the preparation of the draft Assessment and Management Plan.

4) Other specific information requirements

The following information requirements relating to surface water, groundwater and related values are likely to be applied by the Director-General for the environmental assessment for the Bickham Coal Mine.

a) Land Status/Ownership

- i) Land title description and if proposal includes Crown land (eg bed of waterway) or Crown roads
- ii) Land tenure (eg freehold/lease/license)

iii) Details of the registered owner/s of the property and applicant/s

b) Site Information/Survey

- i) Site location with north point and scale, presented at no less than 1:10000 scale for the mining project, the length of streams to be affected and the zone between the pit(s) and the Pages River.
- ii) Layout plan, set out at a scale of not less than 1:10000
- iii) Survey plan of the existing site, at a scale of not less than 1:10000 for native vegetation blocks and mine pit(s) for the project
- iv) Survey plan to provide cross sectional details along the mine pit(s), at sections along the Pages River and for the barrier interval between the mine pit(s) and the bed of the Pages River
- v) Topographic contours at not less than 5 metre intervals
- vi) Site features - watercourses, lakes, wetlands, vegetation, buildings, tracks, infrastructure etc.
- vii) Details on direction of flow of surface and groundwater, water levels, high bank, low bank, major aggradation / erosion for any watercourses, flood runners, terraces and other geomorphological features
- viii) Plan to identify 1: 100 year flood level
- ix) Plans showing surface, watercourse bed/bank long profile and piezometric gradients, with particular emphasis on the barrier between the pit(s) and the Pages River
- x) Photographs (multiple frames) across the development site, with particular emphasis on any area for which a licence, permit or approval will apply. Note: If watercourses are impacted upon in the vicinity of the development, include photographs also looking upstream and downstream at points of geomorphic change or at distances of no greater than 500 metres
- xi) Layout plan to indicate the location of photographic reference points
- xii) Exploration borehole survey plan, geological structure interpretation, nomination and sampling of representative core sections, geochemical sampling testing and prediction
- xiii) Land capability map, soil profiling and assessment.

c) Project Description and Operational Information

- i) Description of the proposed development, including all ancillary works (stormwater drainage, access crossings, roads or railway access, pipelines or other infrastructure)
- ii) Operational plan detailing the ongoing operation including staging/ sequencing of the mine extraction plan, including cross sectional plans for each mine pit
- iii) Geotechnical engineers report on the stability of the proposal and its influence on geological or soil terrain stability and geochemistry
- iv) Erosion and Sediment Control Plan prepared in accordance the guideline manual 'Managing Urban Stormwater Soils and Construction'
- v) Assessment of salinity hazards
- vi) Rehabilitation plan that details the progressive and final restoration/ rehabilitation of landform, revegetation, surface water, groundwater and maintenance
- vii) Monitoring program for assessment on fluvial geomorphology – with particular emphasis on the current status of the Pages River and any other affected watercourse
- viii) Monitoring program for assessment of surface water
- ix) Monitoring program for assessment of groundwater, with particular emphasis on volume/salinity relationships pre-mining, through mine life and to the

establishment of stable trends across the site post-mine development – with verification of any groundwater modelling conducted on the site

- x) Contingency plans, in the event that surface and/or ground water behaviour leads to adverse impacts not in accord with modelling predictions for the site
- xi) Contingency plans linked to the monitoring program, with trigger levels nominated for assessment against current water availability and usage in the Pages River Catchment

d) *Geomorphology/ Watercourses*

- i) Assessment of the impact of the proposal on the existing flow regime (ie flow quantity, velocity, frequency and duration) for all rainfall events up to a 100 year Average Recurrence Interval
- ii) Assessment of impact on the fluvial geomorphology of the watercourse including any erosion and sedimentation likely to be caused by the development
- iii) Measures to be implemented to guard against actual and potential environmental disturbances during the construction and operation of the proposal
- iv) Draft water management plan, which is based on and includes appropriate engineering, geomorphic and ecosystem identification and protection principles
- v) Rehabilitation principles and measures, landform reconstruction and revegetation strategies to minimise salinity recharge/discharge

e) *Groundwater*

- i) Explain and justify the choice of groundwater model developed for the groundwater assessment including inputs, choices and ranges of parameters and strata, and sensitivity analyses of the model.
- ii) Details of any proposed groundwater extraction, including purpose, location and construction details of all proposed bores and expected annual extraction volumes
- iii) Details of any proposed works likely to intercept groundwater
- iv) Description of different aquifer systems including their extent and inter-relationships (including inter-relationships with surface water bodies and dependent ecosystems)
- v) Description of the flow directions and rates and the physical and chemical characteristics of the aquifers, including differentiation of different aquifers and aquifer characteristics (ionic speciation, hydraulic conductivities, migration rates, linkages between aquifers)
- vi) Description of the potential interaction of hard rock aquifer systems on the site and alluvial groundwater connected to the Pages River, and the presence of any geological structures potentially acting as preferential pathways for groundwater transmission
- vii) Details of the predicted impacts of any final landform on the groundwater regime
- viii) Details of the existing groundwater users within the area of the proposal and any potential impacts on these users, including water/salt balance assessment to determine if interception of groundwater by the project will have environmental, economic and/or social benefits/disbenefits to water users, the community and the local environment
- ix) Details of the predicted highest groundwater table at the development site, and the level of natural variability across the site, and anticipated changes in groundwater conditions across the project site to the limit of depressurisation as the project proceeds
- x) An assessment of the quality of the groundwater for the development site

- xi) Identify water application areas and method of application, and measures to address unacceptable salt accumulations across the site
- xii) Details of proposed method of disposal of tailings or waste water
- xiii) Details of the results of any models or predictive tools used, including inputs, sensitivity analyses, justification for any assumptions used in the development of the model(s), and general conformance with the MDBC groundwater flow modelling guidelines¹
- xiv) Specification for groundwater model performance measures
- xv) Assessment of alternative configurations and engineering of final void based on 100 year model impact predictions

f) *Surface Water*

- i) Details of any proposed surface water extraction, including purpose, location of any existing pumps, dams, diversions, cuttings and levees on the site, and expected annual extraction volumes, from both on-site interception and external sources
- ii) Identify sources of surface water, proportions of flow resulting from groundwater accessions, and measures to protect and enhance ecosystem integrity, and the geomorphic integrity of affected streams above, within and below the project site
- iii) Location and design specifications for all clean water diversions including channels, detention basins and outlet fixtures
- iv) Location and design specifications for dirty water or contaminated water circuit including channels, detention basins and outlet fixtures
- v) Provide details regarding any dirty water or contaminated discharge resulting from the proposed development
- vi) Provide information on detailed water balance including inflows and imports and/or exports to and from the proposed development
- vii) Details of the integrated water management system, including an assessment of changes to the water balance under a range of conditions (including 10%, 50% and 90% wet years and severe storm events)
- viii) Specification for hydrological model performance measures

g) *Water Storage Structures*

- i) Details of proposed water storage structures, including purpose, location, design specifications (crest, bywash, discharge, low flow bypass provisions)
- ii) Calculation of the catchment area, water storage structure capacity (ML) and water storage surface area.
- iii) Calculation of the Maximum Harvestable Right Dam Capacity (MHRDC)
- iv) Estimate the MHRDC as it changes over the life of the operations
- v) Details of stream order (using the Strahler System)
- vi) Estimate of evaporation rates and annual evaporation losses
- vii) Details of pumps and intended extraction volumes from the water storage structure/s
- viii) Details of any other persons/party to be supplied (eg. volume, rate, purpose)
- ix) Identify impacts on other licence users or 'basic rights' as defined in *Water Management Act 2000*
- x) Identification of potential construction / surveillance requirements of the Dam Safety Act

¹ "Murray-Darling Basin Commission Groundwater Flow Modelling Guide", by H Middlemis, N Merrick and J Ross, October 2000.

h) Monitoring and Management Programs

- i) Details of monitoring programs, including:
 - distribution of monitoring network
 - frequency of monitoring
 - parameters to be monitored
- ii) Details of mitigation and contingency plans with respect to groundwater contamination and identification of triggers for implementation of these plans.
- iii) Detail the presence of groundwater dependent ecosystems in the surrounding areas, including the identification of flora and fauna and their likely dependence on groundwater.
- iv) Identification of required buffer zones for any likely groundwater dependent ecosystems.
- v) Identification of auditing and reporting schedule.

5) General legislative and policy framework

The Water Resource Assessment and draft Water Management Plan will aim to demonstrate that (in respect of water resources) the proposed mine will operate in accordance with applicable legislation and natural resource management policies. It is expected that the Bickham Coal Mine proposal will be subject to environmental assessment under Part 3A of the *Environmental Planning & Assessment Act 1979*.

A list of the principal legislation administered by the Department of Planning (DoP) and the Department of Natural Resources (DNR), together with relevant Government natural resource management policies and gazetted Hunter Valley Water Sharing Plans appears below. The natural resource legislation listed below will be applied within the context of Part 3A of the *Environmental Planning & Assessment Act 1979*.

a) Statutory Framework

The following legislation is administered by the Department of Planning (DoP):

- *Environmental Planning & Assessment Act 1979*
- *Environmental Planning & Assessment Regulation 2000*

The following legislation is administered by the Department of Natural Resources (DNR):

- *Rivers and Foreshores Improvement Act 1948*
- *Water Act 1912*
- *Water Management Act 2000*
- *Native Vegetation Conservation Act 1997*
- *Native Vegetation Act 2003*
- *Native Vegetation (Savings and Transitional) Amendment (Minimal Clearing Exemption) Regulation 2004*
- *Plantations and Reafforestation Act 1999*
- *Coastal Protection Act 1979*
- *Hunter Water (Special Areas) Regulation 2003*
- *Dam Safety Act 1978*

Where relevant, new roles and responsibilities of the Catchment Management Authority will be considered under vegetation management legislation.

b) Water Sharing Plans

There are no Water Sharing Plans gazetted or in published draft which are directly relevant to development within the Pages River Catchment. However, if any Water Sharing Plans relevant to the Project area are drafted or gazetted prior to completion of the Water Resources Assessment and Water Management Plan, they will be considered.

c) Policy Guidelines

- NSW State Rivers and Estuaries Policy
- NSW Sand and Gravel Extraction Policy for Non-Tidal Rivers
- NSW Coastal Policy
- NSW Wetlands Management Policy
- NSW Groundwater Policy Framework Document - General
- NSW Groundwater Quantity Management Policy
- NSW Groundwater Quality Protection Policy
- NSW Groundwater Dependent Ecosystem Policy
- NSW Weirs Policy
- Farm Dams Policy