



MANNERING COLLIERY

ENVIRONMENTAL ASSESSMENT

APPENDIX H **SURFACE WATER IMPACT ASSESSMENT**

MANNERING COLLIERY

CONTINUATION OF MINING

SURFACE WATER IMPACT

ASSESSMENT

Prepared by:

HANSEN BAILEY
Level 15
215 Adelaide Street
BRISBANE QLD 4000

February 2007

For:

Centennial Coal Company Ltd
P.O Box 1000
TORONTO NSW 2283

TABLE OF CONTENTS

1.0 INTRODUCTION	1
2.0 EXISTING SURFACE WATER ENVIRONMENT	2
2.1 PROJECT SETTING.....	2
3.0 EXISTING WATER MANAGEMENT SYSTEM	3
3.1 INTRODUCTION	3
3.2 MINE WATER BALANCE	3
3.3 WATER SUPPLY	3
3.4 LICENSED DISCHARGE	3
3.5 SURFACE WATER MANAGEMENT	4
3.6 UNDERGROUND WATER MANAGEMENT.....	5
3.7 WATER QUALITY MONITORING.....	6
3.7.1 Discharge Water.....	6
3.7.2 Surface Water.....	6
4.0 PROJECT MINE WATER MANAGEMENT.....	7
4.1 INTRODUCTION	7
4.2 SURFACE WATER RUNOFF	7
4.3 GROUNDWATER INFLOW.....	8
4.4 PROJECT WATER DEMANDS.....	8
5.0 PROJECT WATER BALANCE	9
5.1 INTRODUCTION	9
5.2 METHODOLOGY	9
5.3 WATER SUPPLIES	9
5.3.1 Introduction.....	9
5.3.2 Surface Water Runoff	10
5.3.3 Groundwater Inflow	10
5.3.4 Process Waste Water.....	10
5.4 PROJECT WATER DEMANDS.....	10
5.5 WATER BALANCE	10
6.0 POST-MINING WATER MANAGEMENT.....	12
6.1 SUMMARY.....	12
7.0 SUMMARY AND MITIGATION.....	13
7.1 SUMMARY OF IMPACTS	13
7.2 MANAGEMENT AND MITIGATION	13

LIST OF TABLES

Table 1	Pollutant Monitoring Summary	6
Table 2	Predicted Project Water Generation	11

LIST OF FIGURES

Figure 1	Surface Facilities
Figure 2	Water Management System

LIST OF PLATES

Plate 1	Settlement Pond B System
Plate 2	EPL Licensed Discharge Point 1

**MANNERING COLLIERY
CONTINUATION OF MINING
SURFACE WATER IMPACT ASSESSMENT**

*for
Centennial Coal Company Ltd*

1.0 INTRODUCTION

Centennial Coal Company Limited (Centennial) undertakes mining at the Mannering Colliery (Mannering) within the Lake Macquarie and Wyong Local Government Areas of New South Wales. Mannering produced 0.327 million tonnes (Mt) of Run of Mine (ROM) coal in 2005 and 0.641 Mt of ROM coal in 2006.

Centennial is applying for a Project Approval for its existing surface facilities and for continuation of mining to extract up to 1.1 Mtpa over a ten year period (the Project) within its current mining leases. Mannering has forecast production of 0.88 Mt ROM coal in the 2006-07 financial year.

Mannering will continue to extract coal via bord and pillar mining methods. Coal extraction will be designed to ensure no noticeable surface impact.

This report presents the results of a surface water impact assessment for the continuation of mining at Mannering. Section 2.0 describes the existing surface features and surface water environment in the Project Area. Section 3.0 describes the existing Mannering water management system including the existing mine water balance, discharge licence, surface and underground water management and water quality monitoring. Section 4.0 describes the Project's water management system and Section 5.0 describes the forecast water balance for continuation of mining. Section 6.0 summarises the post-mining water management. Section 7.0 summarises the impacts and any proposed management and mitigation measures for the continuation of mining.

2.0 EXISTING SURFACE WATER ENVIRONMENT

2.1 PROJECT SETTING

Mannering is located approximately 110 kilometres (km) north of Sydney and approximately 40 km south of Newcastle, on the shores of Lake Macquarie in New South Wales.

Mannering's existing surface infrastructure is spread over an area of 51 hectares (ha) and includes the following (Figure 1):

- Administration buildings;
- Workshop;
- Material and equipment store facilities;
- Internal roads and parking facilities;
- Water management structures including storage tanks and settlement ponds;
- Access roads;
- Ventilation shafts;
- Overland conveyor systems;
- Boreholes;
- A 25,000 tonne coal stockpile; and
- Mannering Coal Crushing Facility (MCCF).

Surface features of the area above the mine include residential areas, ridges and low lying foreshore and wetland areas associated with of Lake Macquarie.

Mannering will continue to utilise existing infrastructure with no additional surface facilities proposed for construction as part of the Project.

3.0 EXISTING WATER MANAGEMENT SYSTEM

3.1 INTRODUCTION

The existing water management system for Manning is shown in schematic form in Figure 2. Sources of mine water include potable water supplied by the Wyong Shire Council (WSC), local rainfall runoff water collected from the surface facility, and groundwater inflow to the underground workings. Water demands include potable water for domestic use, sewerage, machinery wash-down and dust suppression. Excess underground mine water is pumped to the surface and passed through the on-site settlement pond system prior to discharge off-site.

No coal washing is undertaken at Manning. All ROM coal is crushed and transported via a dedicated overland conveyor to the adjacent Vales Point Power Station.

3.2 MINE WATER BALANCE

In 2005 the Manning water balance was in surplus and approximately 289 ML of excess mine water was discharged from site.

In 2005 the volume of potable water used in combined surface and underground operations was 27.2 ML (2005 Annual Environmental Management Report). The 2005 annual rainfall was 1,057 mm, recorded at the Bureau of Meteorology's (BoM's) closest rainfall recording station at the Wyee Post Office (Station No. 061082) which is approximately 6 km away. Rainfall records are complete at this station from 1899 to present and the average annual rainfall over the period of record is 1,188 mm.

3.3 WATER SUPPLY

Potable water is supplied to Manning by the WSC via a direct-metered pipeline. This water is stored on site in one of three surface storage tanks located near the entrance to the site near the south-western corner (Figure 1). The total combined storage capacity of these potable water tanks is 302 kilolitres (kL). There is no restriction on the volume of water available for supply by the WSC.

Potable water is reticulated throughout the surface and underground operations. Approximately 25% of daily consumption is used in the surface facilities for domestic use, cleaning and MCCF dust suppression. The remainder is used for dust suppression at underground operations (coal face and conveyors) and as a fire fighting water source.

3.4 LICENSED DISCHARGE

Centennial holds Environmental Protection Licence (EPL) 191 issued by the Department of Environment and Conservation (DEC) of NSW. This licence was originally granted to the previous owner of Manning and was last renewed in March 2006.

The licence provides for the discharge of water from two licensed discharge points as follows:

- EPA Licensed Discharge Point 1 (DP1) – overflow from Pond B; and
- EPA Licensed Discharge Point 2 (DP2) – overflow from Pond A.

Both DP1 and DP2 discharge into Lake Macquarie via unnamed creeks. EPL191 specifies pollution concentration limits and monitoring requirements (Section 3.7). Additionally Section L4.1 of the licence applies a discharge volume limit of 4,000 kL/day for DP1. Section L4.2 states that this “volume may be exceeded under wet weather conditions provided that all practical measures are taken to minimise additional pollution caused by the wet weather.” It also states that “dry weather conditions” mean less than 10 mm of rain falling within a 24 hour period, therefore wet weather conditions are inferred to correspond to a minimum recorded rainfall of 10 mm in a 24 hour period.

During 2005 rainfall in excess of 10 mm was recorded at the Wyee Post Office on 26 days. The EPL191 daily discharge volume limit was exceeded once in 2005 on 17 May 2005, and the corresponding BoM rainfall record for the day was 60 mm.

3.5 SURFACE WATER MANAGEMENT

Water collected at the surface of the Mannering Colliery consists of water from the following sources:

- Surface water runoff from Mannering’s 51 ha surface facility; and
- Water pumped from the underground workings.

The key features of the existing surface water system are shown on Figure 1 and consist of the following:

- Settlement Pond A;
- Settlement Pond B System which includes Settlement Ponds 1, 2, 3 and B; and
- Licensed Discharge Points DP1 and DP2;

Surface water management is based on the following key water management strategies:

- Diversion of clean surface water runoff away from areas disturbed by surface infrastructure;
- Collection of surface water runoff from areas disturbed by mining activities in catch drains and direction to sediment traps and settling dams for control of suspended sediment prior to discharge from site; and
- Collection of runoff water from industrial areas in catch drains and direction to the settlement ponds system for control of suspended sediment and pollution control prior to discharge off site.

Surface water runoff collected on site is unreliable and generally unsuitable for use in the mine water management system. Surface water runoff from the south and east of Mannering’s surface facility is directed toward the Settlement Pond B System which consists of four pollution control ponds for

sediment control. Water in this system passes successively through Pond 1, Pond 2, Pond 3 and Pond B prior to discharge off-site from DP1.

Surface water runoff from the western side of the site is directed toward Settlement Pond A. This runoff is relatively clean and this pond only receives water during rainfall events. Water undergoes sediment control and macrophytic filtration prior to discharge off site via DP2.

The combined storage volume of all existing dams is approximately 13.8 ML. The water storage capacities of the individual dams are as follows:

- Pond A – 5.4 ML;
- Pond B – 3.4 ML;
- Settlement Pond 1 - 1.8 ML;
- Settlement Pond 2 - 2.0 ML; and
- Settlement Pond 3 – 1.2 ML.

The Emergency Fire Dam has a small surface water catchment and is not part of the mine water management system. It has a capacity of 3.1 ML.

Manning does not have any dams listed as prescribed dams with the NSW Dam Safety Committee. Two other dams, the Manning Creek Ash Dam and the Vales Point Ash Dam No. 2, are located in close proximity to the EA boundary however it is not anticipated that either of these dams will be impacted by the Project.

3.6 UNDERGROUND WATER MANAGEMENT

Underground water is derived from two sources – process waste water, which is generated from underground mining operations, and groundwater, which enters the underground workings from the adjacent strata. Groundwater is saline and as such is unsuitable for reuse in the mine water management system due to its corrosive nature.

Together, water from both sources passes through an extensive goaf system that allows filtration and settlement prior to pumping, via a single pipeline, to a point on the surface adjacent to the potable water storage tanks. From here, this water is transferred to the Settlement Pond B System for sediment and pollution control prior to discharge off site at DP1.

In 2005 the volume of water pumped to the surface from the underground workings was 294 ML.

3.7 WATER QUALITY MONITORING

3.7.1 Discharge Water

Mine water discharged at both DP1 and DP2 must comply with the following pollution concentration limits as noted in EPL191:

- Oil and grease : 10 mg/L;
- pH : 6.5 – 8.5; and
- Total suspended solids (TSS) : 50 mg/L.

It is a condition of EPL191 that Centennial submits an Annual Return to DEC which comprises a Statement of Compliance and a summary of any monitoring required by EPL191. Section M2.1 of EPL191 requires the following monitoring at DP1:

- Monthly monitoring of TSS (in mg/L); and
- Monthly monitoring of pH.

The concentration monitoring summary data provided in the last two Annual Returns, based on monthly monitoring at DP1, is summarised in Table 1.

Table 1
Pollutant Monitoring Summary

Pollutant	2005	2004
pH : Lowest sample value	8.0	8.0
Mean	8.1	8.1
Highest sample value	8.3	8.5
TSS : Lowest sample value	0.0	1.0
(mg/L) Mean	7.3	3.9
Highest sample value	21.0	10.0

3.7.2 Surface Water

Random sampling of surface water quality was undertaken in November 2006 at DP1, and selected sites in Lake Macquarie downstream of DP1. Electrical conductivity (EC), a typical indicator of salinity, was recorded as part of this sampling on down stream receiving waters (ie. Lake Macquarie). The EC level in Lake Macquarie was determined to be approximately 39,000 $\mu\text{S}/\text{cm}$, indicating that it is far more saline than the mine water being discharged upstream at DP1, a sample of which had an EC level of approximately 24,900 $\mu\text{S}/\text{cm}$.

As all saline water collected at the mine site is discharged to these receiving waters there is no opportunity for the accumulation of salt within the mine's water management system.

4.0 PROJECT MINE WATER MANAGEMENT

4.1 INTRODUCTION

For continuation of mining at Manning the water management system will remain substantially unchanged. Mining will utilise the bord and pillar method so as to ensure no noticeable subsidence, as confirmed by Seedsman Geotechnical Pty Ltd in the report *Centennial Manning Subsidence Predictions for Long-Term Mine Plan (2007)*. There will be no noticeable surface impacts and consequently no impact to surface level water features which overlie the operations.

Coal production over the period of this approval application will increase from current levels to a maximum production of 1.1 Mtpa. This is far less than previous production levels. The water demand associated with the mining operation will continue to fluctuate with varying production levels, whilst remaining well below historical water demand associated with the peak mine production of 1.7 Mtpa reached in 1994-95. All mine water demands will be met using potable water supplied by the WSC.

Water collected in underground workings will continue to be pumped to the surface for transfer through the Settlement Pond B System prior to discharge off site. Surface water runoff will continue to be managed in accordance with the existing system. No new water storage ponds are proposed to be constructed for the continuation of mining.

There will be no opportunity for the accumulation of salt within the mine water management system therefore modelling of a salinity balance is not necessary for the Project. Water collected in the underground workings may have elevated salinity levels, due to the higher salinity of the groundwater inflow. However the salinity of this water will be diluted during mixing with excess fresh process water and retained surface water runoff when pumped to the existing settlement pond system. Water from this system is of a higher quality and substantially lower salinity level than the downstream receiving waters (Section 3.7.2) and will continue to be discharged off site regularly in accordance with EPL191, with no negative impact on either downstream users or the natural environment.

4.2 SURFACE WATER RUNOFF

Surface water runoff will not contribute a significant volume of water to the water management system due to the relatively small catchment area of the surface infrastructure.

As noted in Section 3.5, surface water runoff from Manning's surface facilities will be directed toward the existing settlement pond systems. The majority of the catchment will drain toward the Settlement Pond B System with the remainder draining to Settlement Pond A. The catchment areas of the Settlement Pond A and Settlement Pond B Systems have been estimated as 7 ha and 15 ha respectively.

4.3 GROUNDWATER INFLOW

In addition to the process waste water, groundwater will also enter the underground workings from the adjacent strata. Australasian Groundwater and Environmental Consultants Pty. Ltd. (AGE Consultants) has predicted the groundwater inflows for the Project in the *Mannering Mine Extension Groundwater Impact Assessment (2007)*.

The total daily groundwater inflow from both the Great Northern Seam and Fassifern Seam has been estimated as 1.41 ML /day for coal production of 1.1 Mtpa.

4.4 PROJECT WATER DEMANDS

Water will be required for the following purposes during operation of the Project:

- Domestic water and sewerage;
- Underground operations;
- Dust suppression; and
- Wash down.

All water required by mining operations will be sourced from externally supplied potable water, as the quality of the groundwater makes it unsuitable for use in mining operations. Centennial has forecast that for the maximum coal production of 1.1 Mtpa, the corresponding potable water demand may be up to 70 ML per annum. This is the absolute maximum predicted water demand based on maximum production and it is expected that, with the implementation of best practice water management strategies designed to minimise the external water demand, this estimate will most likely be less.

5.0 PROJECT WATER BALANCE

5.1 INTRODUCTION

The existing Mannering water management system is shown in schematic form in Figure 2. This system will remain substantially unchanged for the Project however the proposed increase in coal production will lead to an increase in the current external potable water demand and also an increase in predicted groundwater inflow to the underground workings. The components of the existing water management system for which supply or demand volume will change are noted in Figure 2.

5.2 METHODOLOGY

The operation of the mine water management system is dependent on factors which vary over the life of the mine including coal production volume and annual rainfall. All water required for the operation of the Project will be supplied externally by the WSC. The critical issue for the water management system is the ability to control and discharge excess water which may be generated during mining.

Therefore the water balance for the Project has been assessed for the maximum coal production volume of 1.1 Mtpa which will correspond to the maximum surplus water inflow. The corresponding annual mine water surplus has been calculated for this level of coal production for dry, average and wet annual rainfall scenarios and is summarised in Table 2.

The dry year water balance has been calculated using the 10th percentile annual rainfall and the wet year water balance has been calculated using the 90th percentile annual rainfall. Evaporative losses have not been factored into the water balance due to the relatively small surface area of the water storage ponds and because it would be less conservative to subtract this loss from the predicted water management surplus.

5.3 WATER SUPPLIES

5.3.1 Introduction

Sources of water inflow to the Mannering water management system which will be generated by the Project are as follows:

- Surface water runoff;
- Process waste water from underground operations; and
- Groundwater inflow.

5.3.2 Surface Water Runoff

The volume of surface runoff water entering the mine water management system is dependent on rainfall and the catchment areas of the settlement pond system. These pond catchments include a mixture of undisturbed, grassed, industrial and infrastructure areas for which the runoff coefficients typically range from 0.15 to 0.30. A conservative runoff coefficient of 0.3 has been applied to the whole sub-catchments of both Settlement Pond A and the Settlement Pond B System, the areas of which are noted in Section 4.2.

The corresponding rainfall runoff water volumes for dry, average and wet year scenarios are summarised in Table 2. These volumes have been estimated using the following annual rainfall data based on rainfall recorded at the Wyee Post Office from 1899 to present (Section 3.2):

- Average annual rainfall – 1,188 mm;
- 10th percentile annual rainfall – 829 mm; and
- 90th percentile annual rainfall – 1,567 mm.

5.3.3 Groundwater Inflow

As noted in Section 4.3, the groundwater inflow for the continuation of mining has been predicted by AGE Consultants as 1.41 ML/day. This corresponds to a maximum annual groundwater inflow volume of 515 ML.

5.3.4 Process Waste Water

The underground mining operations will utilise water supplied from the WSC via potable water tanks. This water will be used for dust suppression and underground processing. As this water will become mixed with groundwater it is difficult to quantify the volume of process waste water which will remain in the mine water management system. A conservative volume of 40 ML per year has been assumed for the purpose of the water balance calculation.

5.4 PROJECT WATER DEMANDS

As noted in Section 4.4, all water to be used in mining operations will be supplied from external potable water supply. Based on a maximum annual coal production of 1.1 Mtpa, the predicted annual potable water demand for the project is 70 ML.

5.5 WATER BALANCE

All project water demands must be met by external water supply as the high salinity of groundwater makes it unsuitable for use in the mine water management system. Therefore as noted in Section 5.2, the critical issue for operation of the revised Project mine water system will be the ability to control and discharge excess water generated by the Project. On this basis, a traditional water balance is not

applicable with the main concern being the predicted volume of excess water to be generated by the Project.

The predicted water surplus which will be generated in a typical year of continued mining at maximum coal production is shown in Table 2. This table lists mine water supply sources and shows the predicted mine water surplus for dry, average and wet rainfall scenarios.

Table 2
Predicted Project Water Generation

	Annual Water Volume (ML)		
	Dry Year (10 th Percentile Rainfall)	Average Year (Average Rainfall)	Wet Year (90 th Percentile Rainfall)
<u>Water Supply Sources</u>			
Surface Water Runoff	55	80	105
Process waste water	40	40	40
Groundwater inflow	<u>515</u>	<u>515</u>	<u>515</u>
Total Surplus	610	635	660

The maximum mine water surplus predicted to occur is approximately 660 ML in a year of extremely high rainfall. This surplus corresponds to an average daily discharge volume of 1.7 ML which is less than Mannering's licensed discharged limit of 4 ML/day at DP1.

In the event of an abnormally high rainfall event, which results in very high short term rainfall runoff, it is possible that Mannering may need to discharge surface water in excess of the 4 ML daily volume limit. In this event, Mannering's EPL191 permits this limit to be exceeded as long as all practical measures are taken to minimise additional pollution (Section 3.4). Therefore Mannering will be able to manage the predicted Project water surplus in accordance with its existing conditions of EPL191.

As noted in Section 3.4, BoM daily rainfall records at Wyee Post Office show that daily rainfall exceeded 10 mm on 26 occasions in 2005. Mannering's daily off-site discharge pumping records indicate that surface water discharge exceeded the 4 ML daily volume limit on one occasion in 2005 which corresponded to a period of extreme rainfall.

6.0 POST-MINING WATER MANAGEMENT

6.1 SUMMARY

Following completion of mining at Mannering surplus site infrastructure will be decommissioned and removed and the pit top facility area will be fully rehabilitated. All connections from the underground workings to the surface, including mine entries, drifts, ventilation shafts, open boreholes and other outlets will be permanently sealed. Sealing works will be completed in consultation with, and to the satisfaction of, the Department of Primary Industries (DPI) and in accordance with Section 92 of the *Coal Mine Health and Safety Act 2002*, using proven techniques such as concrete capping and backfilling. All boreholes will be sealed in accordance with the DPI (1997) *Guideline EDG01 Borehole Sealing Requirements on Land: Coal Exploration*.

7.0 SUMMARY AND MITIGATION

7.1 SUMMARY OF IMPACTS

Continuation of mining at Mannering will be undertaken so as to ensure no noticeable surface subsidence or impact and therefore no impact to surface water features which overlie the proposed underground mining operations.

The proposed maximum level of coal production of 1.1 Mtpa is substantially less than the previous maximum coal production of the operation which peaked at 1.7 Mtpa in the 1994-95 financial year. As such, although maximum production is again proposed to increase above current production levels, raw water demand for the Project will be less than previously required in the past.

The predicted Project operational water demand of up to 70 ML per annum will continue to be supplied externally as potable water from the WSC.

Mannering's EPL191 permits the discharge of up to 4 ML/day excess water from its licensed Discharge Points. In the event of a year of very high rainfall, as represented by 90th percentile rainfall records, Mannering will generate a surplus of approximately 660 ML water per annum. This corresponds to an average daily discharge volume of 1.7 ML, which is below the maximum limit specified in EPL191. Additionally EPL191 permits this daily discharge limit to be exceeded, in the event of local wet weather events in excess of 10 mm/day.

Therefore Mannering has a secure water supply to meet the water supply requirements for operation of the Project, and the existing mine water management system and discharge licence have the capacity to store and discharge the predicted excess water which will be generated by the Project.

7.2 MANAGEMENT AND MITIGATION

No changes are proposed to the Mannering water management system for the Project. The following key components of the existing site water management system will continue to be implemented:

- Best practice water management to minimize usage of raw water supplied by WSC;
- Monthly surface water quality monitoring;
- Collection of surface water runoff from surface infrastructure areas and direction to the existing sediment pond systems prior to discharge off-site; and
- Pumping of underground waste water and groundwater to the surface and transfer to the Settlement Pond B System for pollution control prior to discharge off-site in accordance with EPL191.

It is recommended that a post-mining water management plan be prepared as part of a Mine Closure Plan which should be prepared five years in advance of mine closure.

*

*

*

for
HANSEN BAILEY

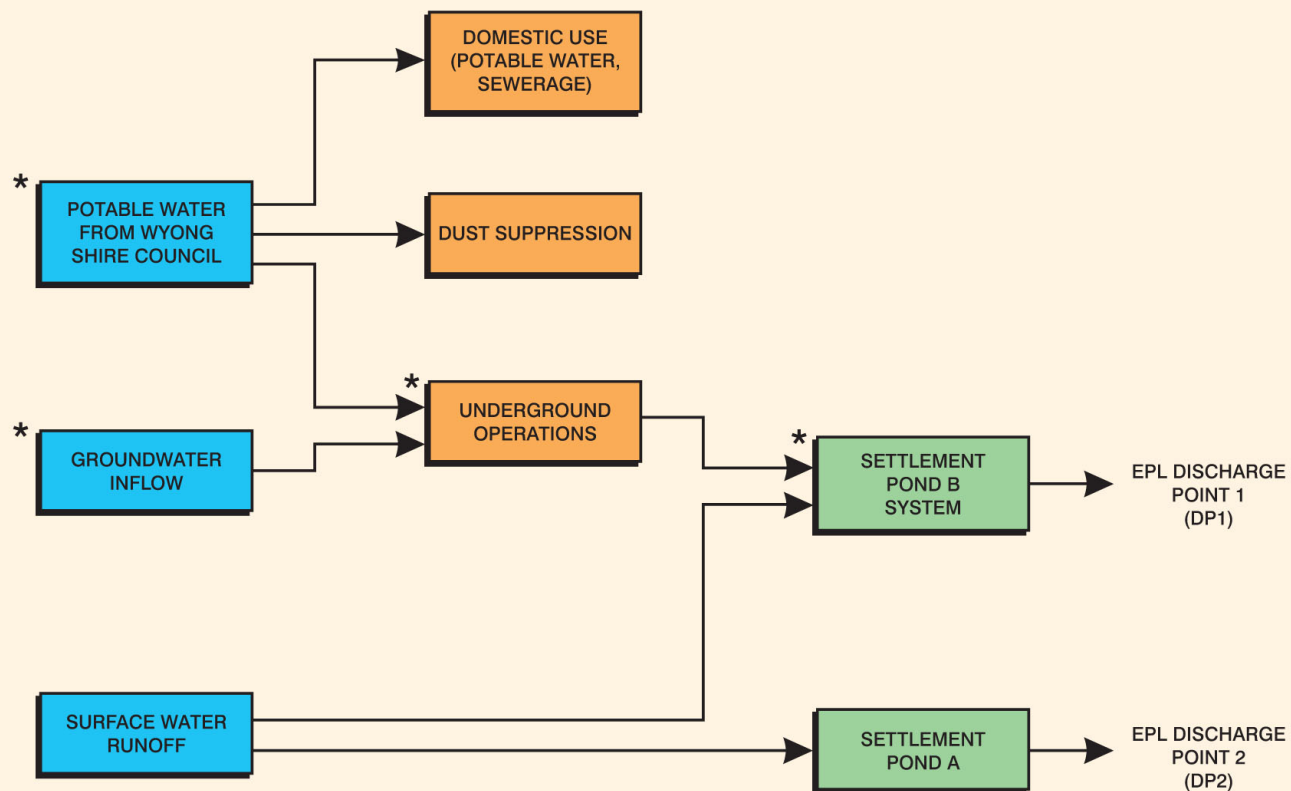


Juliet Bates
Senior Civil Engineer



James Bailey
Director

FIGURES



Water Supply/Source



Water Demand



Water Storage

*



Existing Water Supply/Demand Increased by the Project

Hansen Bailey



Centennial Coal

MANNERING COLLIERY

Water Management System

PLATES



Plate 1 Settlement Pond B System



Plate 2 EPL Licensed Discharge Point 1

APPENDIX A

Reference Document List

REFERENCES

Australasian Groundwater & Environmental Consultants Pty. Ltd. (2007) *Mannering Colliery Groundwater Impact Assessment*.

Centennial Mannering (2005) *Annual Environmental Management Report for Mannering Colliery 2004*.

Centennial Mannering (2006) *Mannering Colliery Annual Environmental Management Report 2005*.

Centennial Mannering Colliery (2004) *Centennial Mannering Colliery Mining Operation Plan for Period December 2004 to December 2011*.

Coal Mine Health and Safety Act 2002 (NSW).

Department of Primary Industries (1997) *Guideline EDG01 Borehole Sealing Requirements on Land: Coal Exploration*.

Seedsman Geotechnics Pty Ltd (2007) *Centennial Mannering Subsidence Predictions for Long-term Mine Plan*.