Liddell Coal Operations Pty Limited

Liddell Colliery
Surface Water Monitoring Program

January 2008

Umwelt
Environmental Consultants

Liddell Colliery
Surface Water Monitoring Program

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

Liddell Coal Operations Pty Limited

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1.0 Scope

Liddell Colliery is located approximately 25 kilometres north-west of Singleton in the Hunter Valley of New South Wales (refer to **Figure 1.1**). The Colliery is operated by Liddell Coal Operations Pty Limited (Liddell Coal) on behalf of the Liddell Joint Venture between Xstrata Coal Australia Pty Ltd and Mitsui Matsushima Australia Pty Ltd.

This Surface Water Monitoring Program is part of a set of documents prepared to support a Water Management Plan required by the modified development consent (DA - 305-11-01). This program outlines the surface water monitoring required to be undertaken by Liddell Coal to ensure compliance with statutory requirements at Liddell Colliery. The program addresses the requirements contained in the modified development consent (DA - 305-11-01). The program also addresses the requirements of the Liddell Colliery Environmental Protection Licence (EPL).

This program also specifically satisfies Schedule 3, condition 26 of the development consent, which requires the preparation of a Surface Water Monitoring Program. The surface water monitoring program is required to be included as part of the Water Management Plan required by Schedule 3, condition 23 of the development consent.

Schedule 3, condition 26 of the development consent specifies the requirements for the Surface Water Monitoring Program. These requirements are summarised in **Table 1.1**.

Table 1.1 - Schedule 3, Condition 26 - Requirements for the Surface Water Monitoring Program

Condition	Requirements	Relevant Section of Program
26.	The Surface Water Management and Monitoring Plan must include:	
26. a)	detailed baseline data on surface water flows and quality in creeks and other waterbodies that could be affected by the development;	**Section 2.0**
26. b)	surface water impact assessment criteria;	**Section 3.0**
26. c)	a program to monitor the impact of the development on surface water flows and quality; and	**Section 4.0**
26. d)	procedures for reporting the results of this monitoring.	**Section 6.0**

Note: The surface water monitoring program must be consistent with the current version of Approved Methods for the Sampling and analysis of Water Pollutants in New South Wales (DECC, 2004).

All monitoring is to be undertaken in accordance with Liddell Colliery procedure for environmental monitoring and evaluation.

2.0 Baseline Data

A surface water quality monitoring program was established in the project area in July 2004 to provide baseline surface water data. Surface water quality has been monitored since this time at three locations on Bayswater Creek (BWKU, BWKM and BWKD) and 14 locations on Bowmans Creek (BCK1 to BCK6, BF1 to BF5) (refer to **Figure 2.1**). The water quality of surface dams and water discharged from Dam 13 has been monitored in accordance with the Hunter River Salinity Trading Scheme (HRSTS) regulations since July 2004 (refer to **Figure 2.1**).

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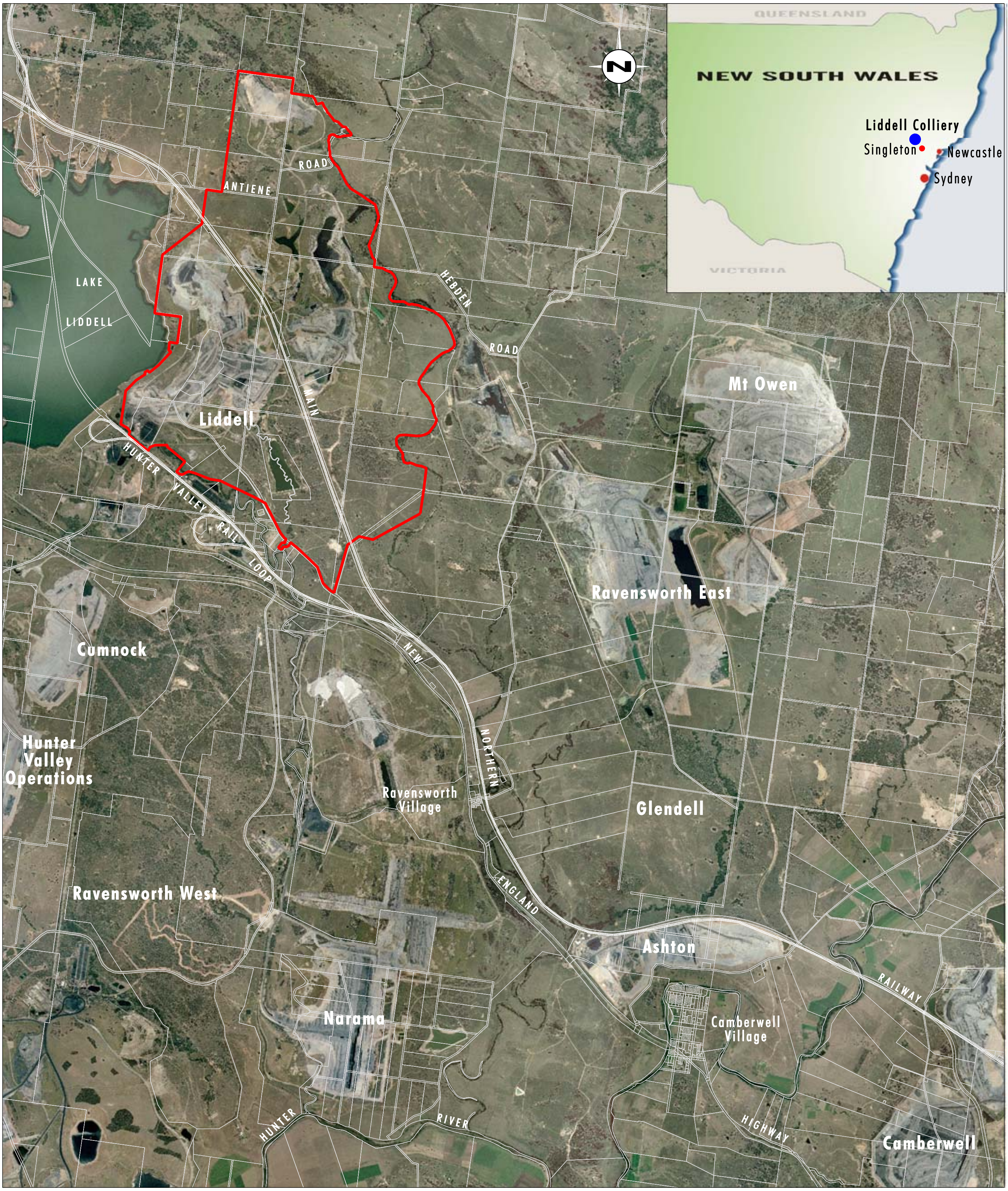
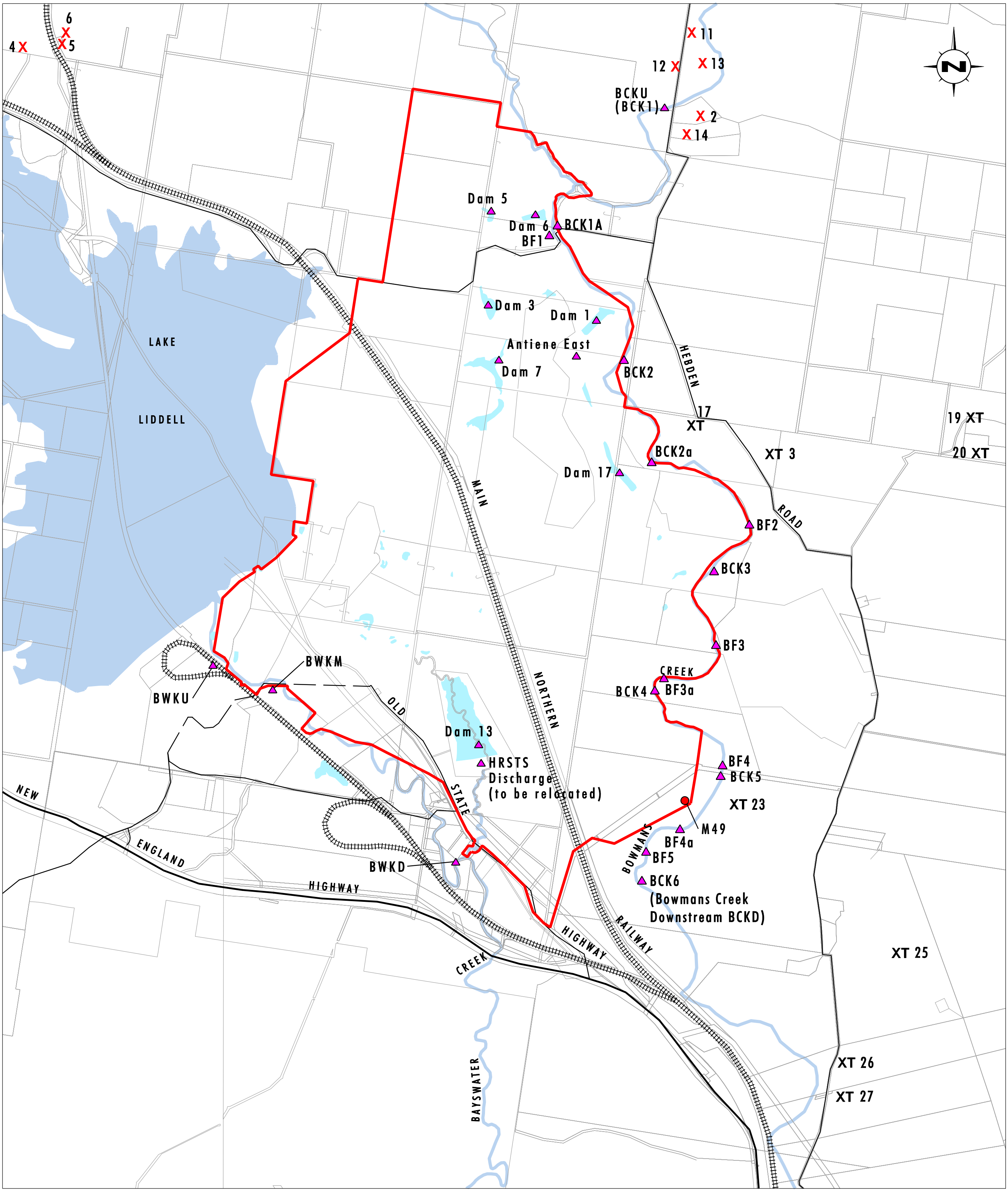


Source: Mt Owen 2005

0 1.0 2.0 4km
1:80 000

Legend
Liddell DA Boundary

FIGURE 1.1
Locality Map



Source: Liddell Coal

0 1.0 2.0 2.5km
1:50 000

Legend

- Liddell DA Boundary
- Surface Water Monitoring Site
- Private Residences
- XT Mine Owned Tenanted Residences
- Existing Dams

FIGURE 2.1

Liddell Colliery Surface Water Monitoring Locations

The monitoring frequency and parameters for each water sampling location are described in **Sections 2.1** to **2.4** and **Section 4.0**.

Schedule 3, condition 26 (a) of the development consent requires that detailed baseline data on surface water flows and quality in creeks and other waterbodies that could be affected by the development be detailed in this Program. The results of the monitoring program from 2004 to 2007 are summarised in **Sections 2.1** to **2.4**. Graphs of key parameters are presented in **Appendix A**.

2.1 Surface Water Monitoring of Bayswater Creek

Bayswater Creek (monitoring sites BWKU, BWKM and BWKD) has been highly modified due to mining activities and the contributing catchment is insufficient to maintain continuous flow in the creek (Umwelt, 2006). The creek system has been engineered in its upper section to accept discharges from Lake Liddell as the primary source of stream flow. This has been undertaken in compliance with the HRSTS. As a result the number of water quality samples collected has varied over time.

The range in water quality of Bayswater Creek for the period from July 2004 to June 2007, measured as part of the monthly surface water monitoring program, is outlined in **Table 2.2**. The trends in these water quality variables are illustrated graphically in **Figures 2.2** and **2.3**.

Table 2.2 - Monthly Water Quality Monitoring at Bayswater Creek

Water Quality Variable	Minimum	Maximum
pH	7.1	8.1
Conductivity (µS/cm)	258	7110
Total Suspended Solids (mg/L)	1	235
Total Dissolved Solids (mg/L)	166	6845

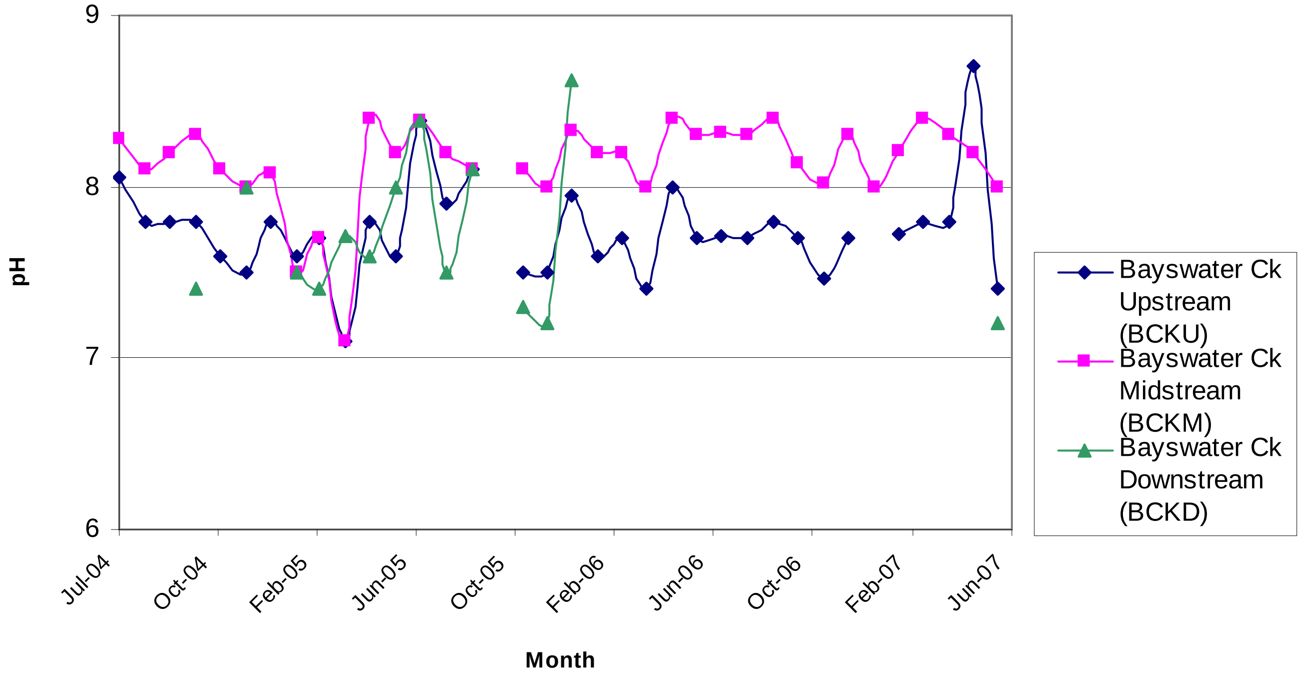
In addition to the monthly water quality monitoring program in Bayswater Creek, surface water samples are collected at each Bayswater Creek monitoring location every six months. These additional samples are analysed for a suite of inorganic substances. The results of this monitoring for the period January 2006 to January 2007 are presented in **Appendix A**.

2.2 Surface Water Monitoring of Bowmans Creek

Although substantially disturbed by agriculture and mining activity Bowmans Creek has a sufficient catchment size to maintain flow under most climatic conditions.

The surface water monitoring program for Bowmans Creek comprises monthly monitoring at locations BCKU (upstream) and BCKD (downstream) and quarterly monitoring at locations BCK1A to BCK6 (refer to **Figure 2.1**).

The range in water quality of Bowmans Creek for the period from July 2004 to June 2007, measured as part of the monthly water quality monitoring program, is outlined in **Table 2.3**. The trends in these water quality variables are illustrated graphically in **Figures 2.4** and **2.5**.



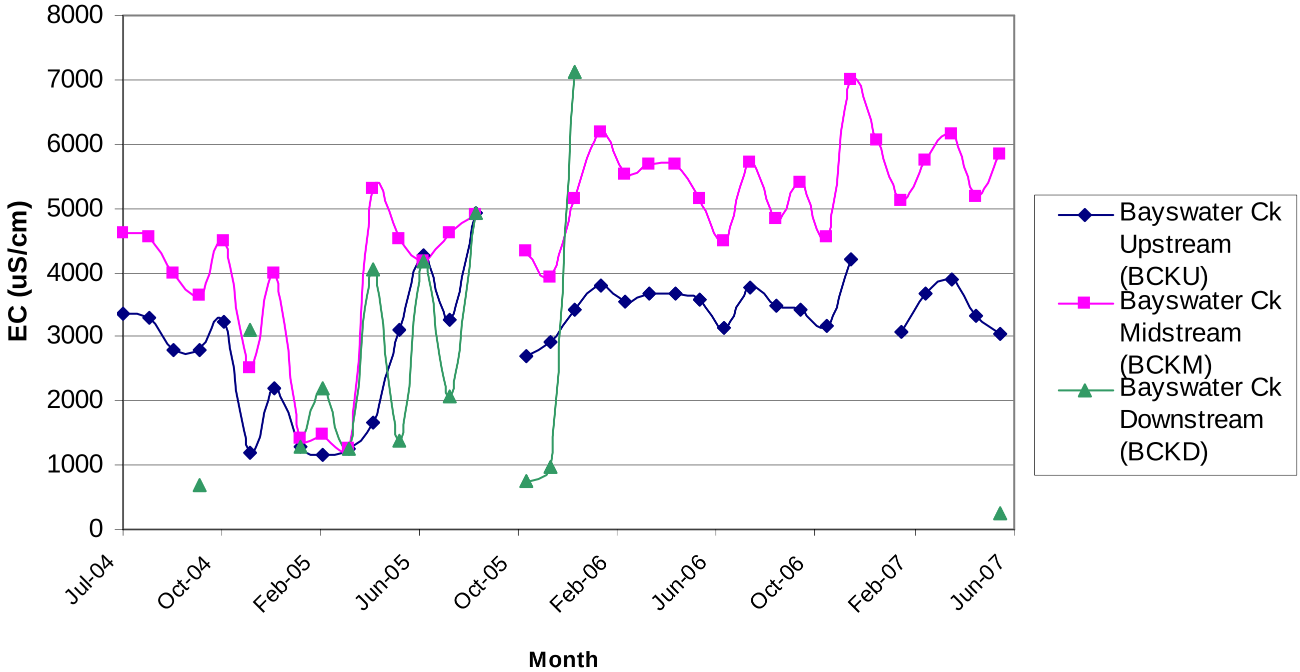
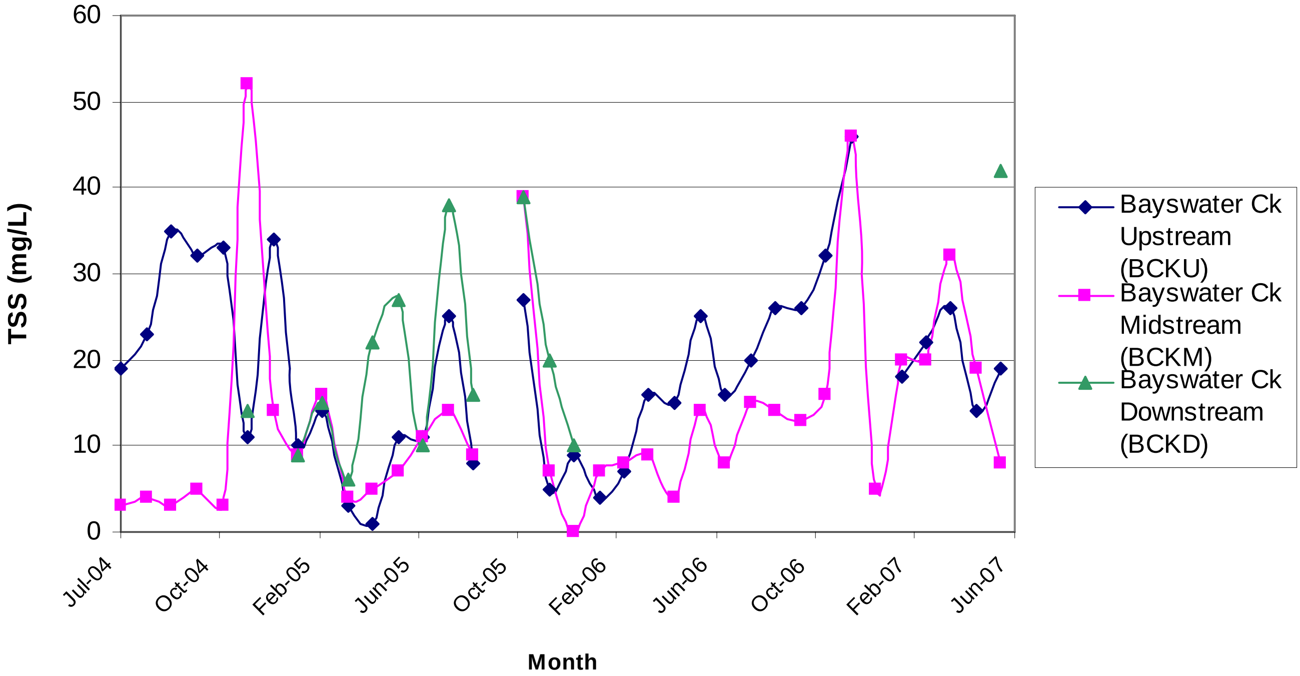


FIGURE 2.2

Water Quality Trends for Bayswater Creek (pH and EC)



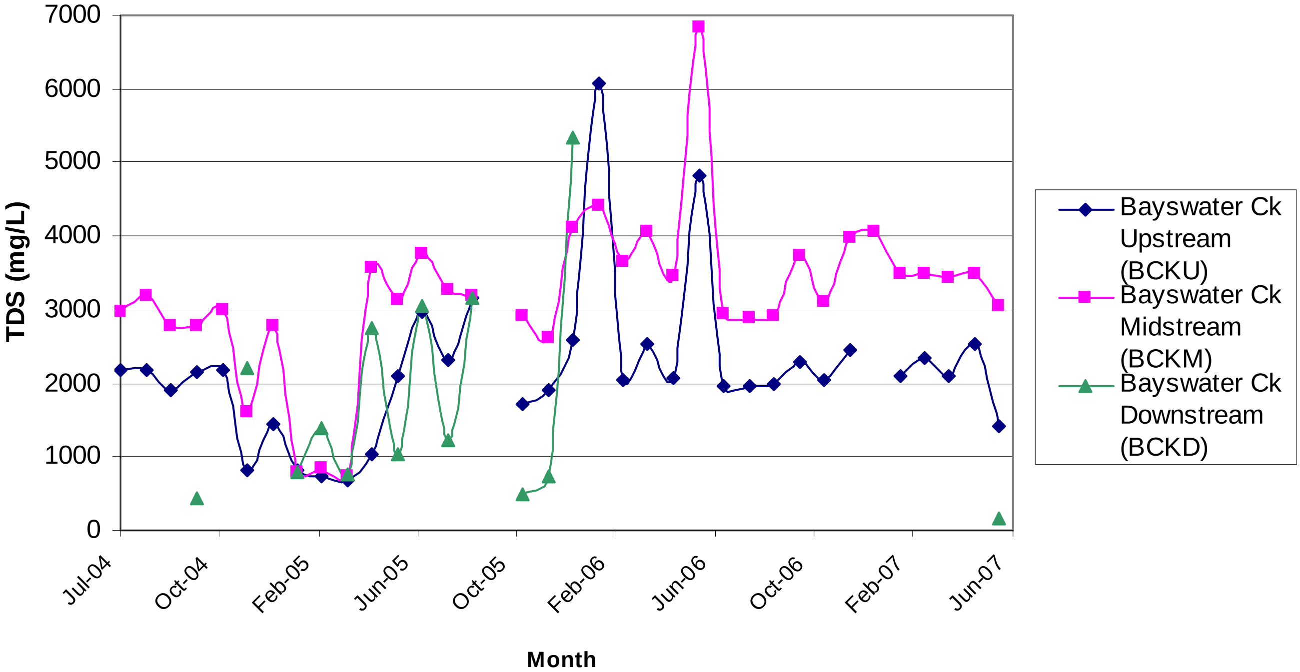
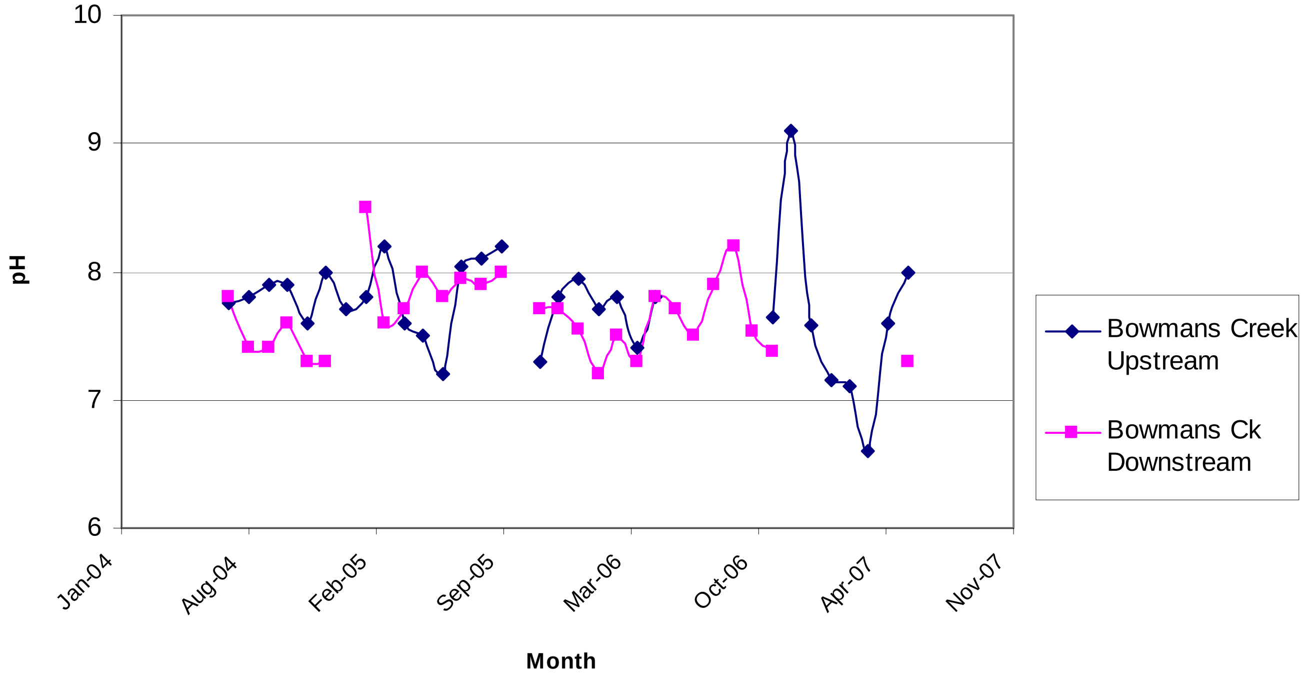


FIGURE 2.3

Water Quality Trends for Bayswater Creek (TSS and TDS)



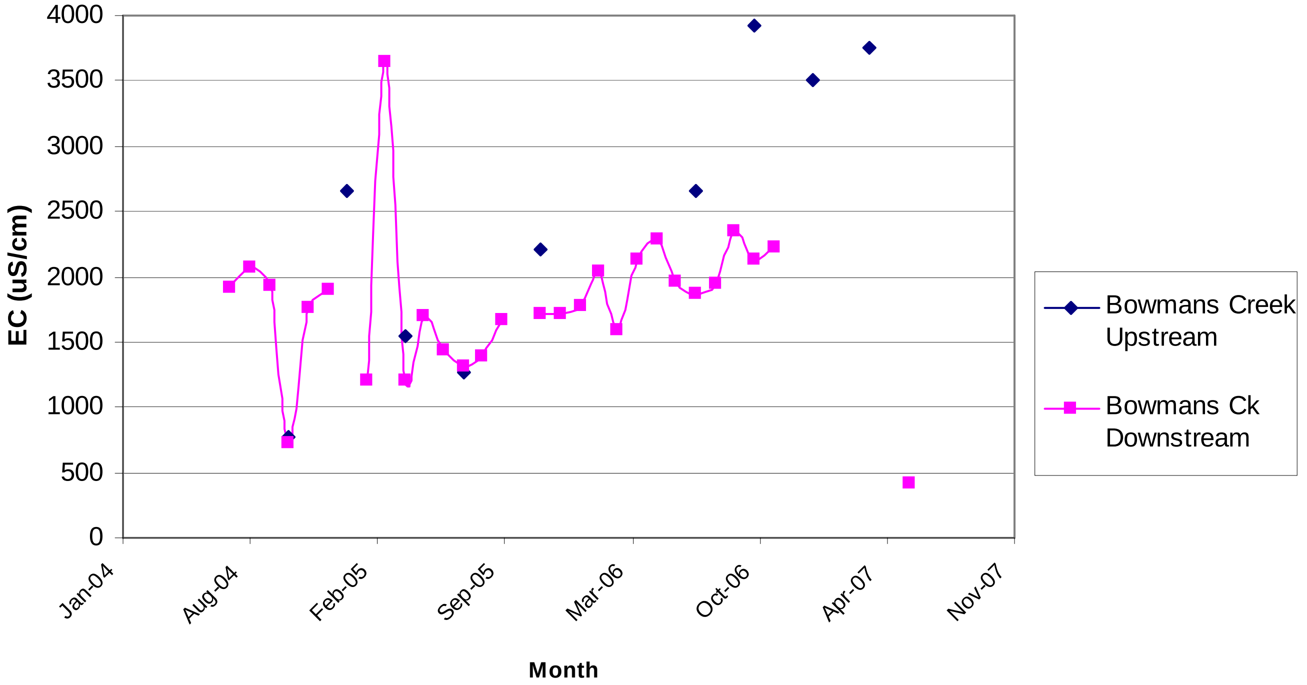
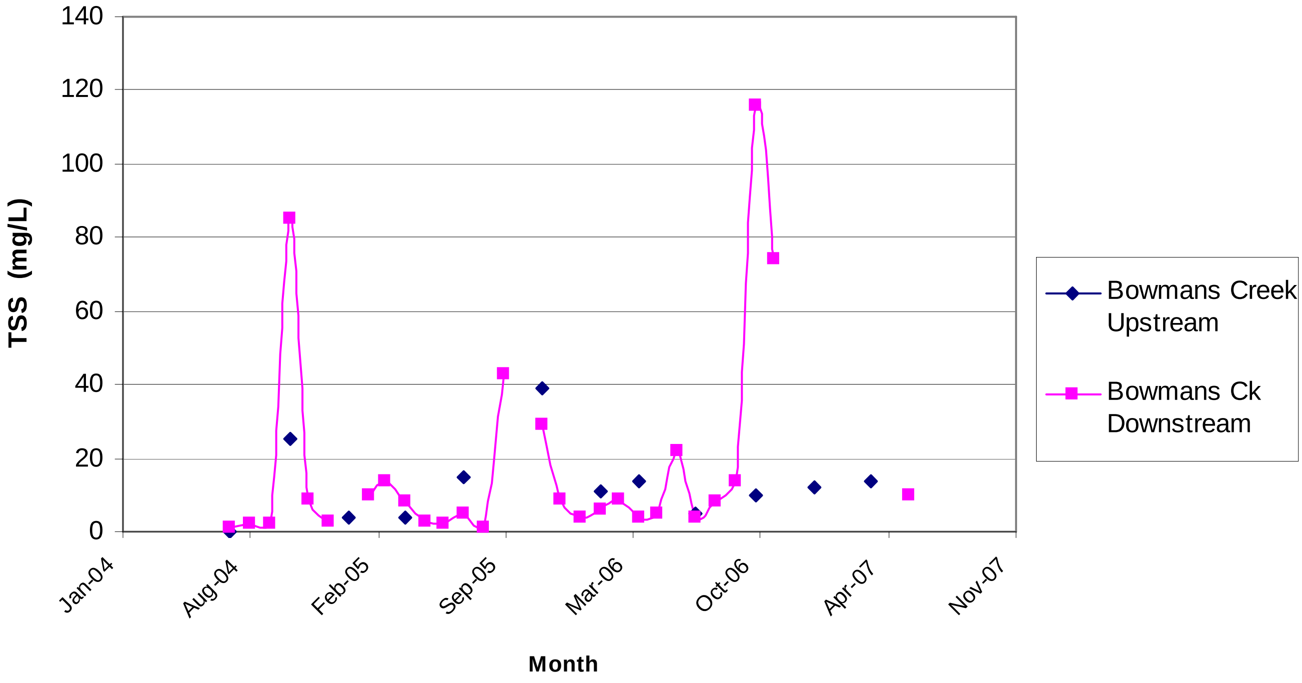


FIGURE 2.4

Water Quality Trends for Bowmans Creek Monthly Monitoring (pH and EC)



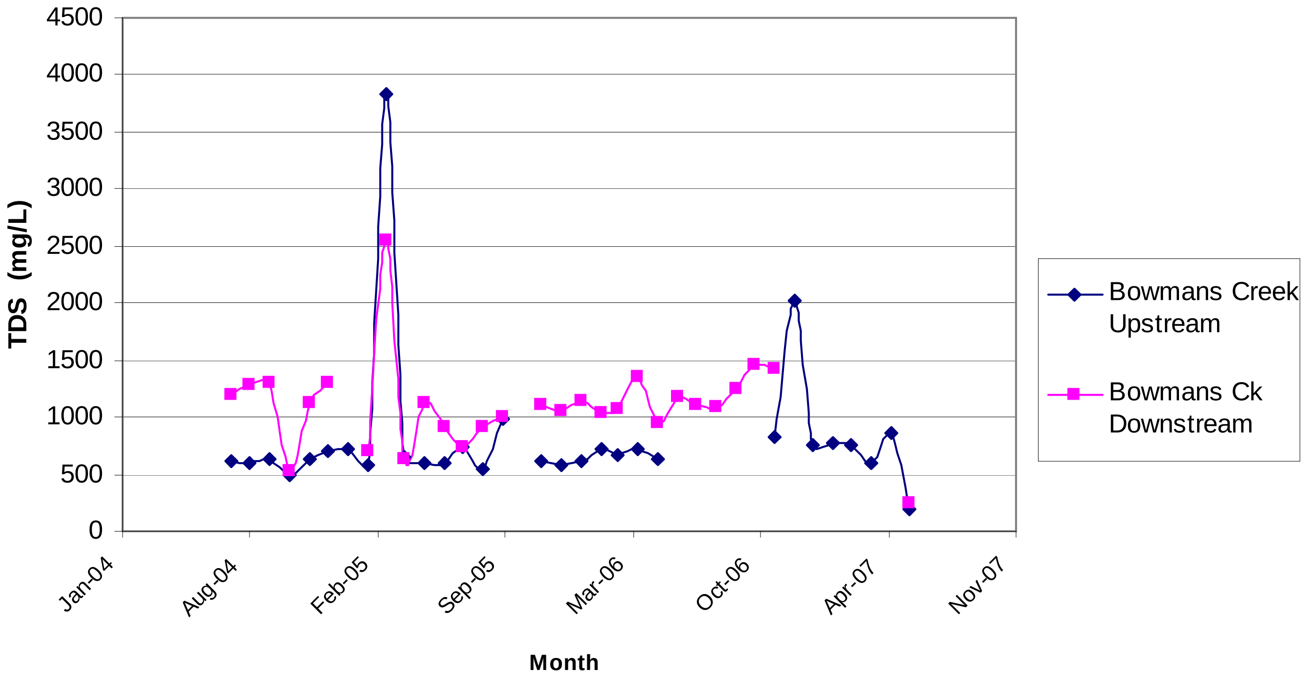


FIGURE 2.5

Water Quality Trends for Bowmans Creek Monthly Monitoring (TSS and TDS)

Table 2.3 - Monthly Water Quality Monitoring at Bowmans Creek

Water Quality Variable	Minimum	Maximum
pH	6.6	9.1
Conductivity (µS/cm)	385	5750
Total Suspended Solids (mg/L)	1	120
Total Dissolved Solids (mg/L)	198	3830

In addition to the monthly water quality monitoring program in Bowmans Creek, surface water samples are collected at the Bowmans Creek surface water monitoring locations every six months. These additional samples are analysed for a suite of inorganic substances. The results of this monitoring for the period January 2006 to January 2007 are presented in **Appendix A**.

The range in water quality of Bowmans Creek for the period from July 2004 to June 2007, measured as part of the quarterly water quality monitoring program, is outlined in **Table 2.4**. The trends in these water quality variables are illustrated graphically in **Figures 2.6** and **2.7**.

Table 2.4 - Quarterly Water Quality Monitoring at Bowmans Creek

Water Quality Variable	Minimum	Maximum
pH	7	8.5
Conductivity (µS/cm)	423	4980
Total Suspended Solids (mg/L)	0	157
Total Dissolved Solids (mg/L)	241	4278

2.3 Surface Water Monitoring of Onsite Dams

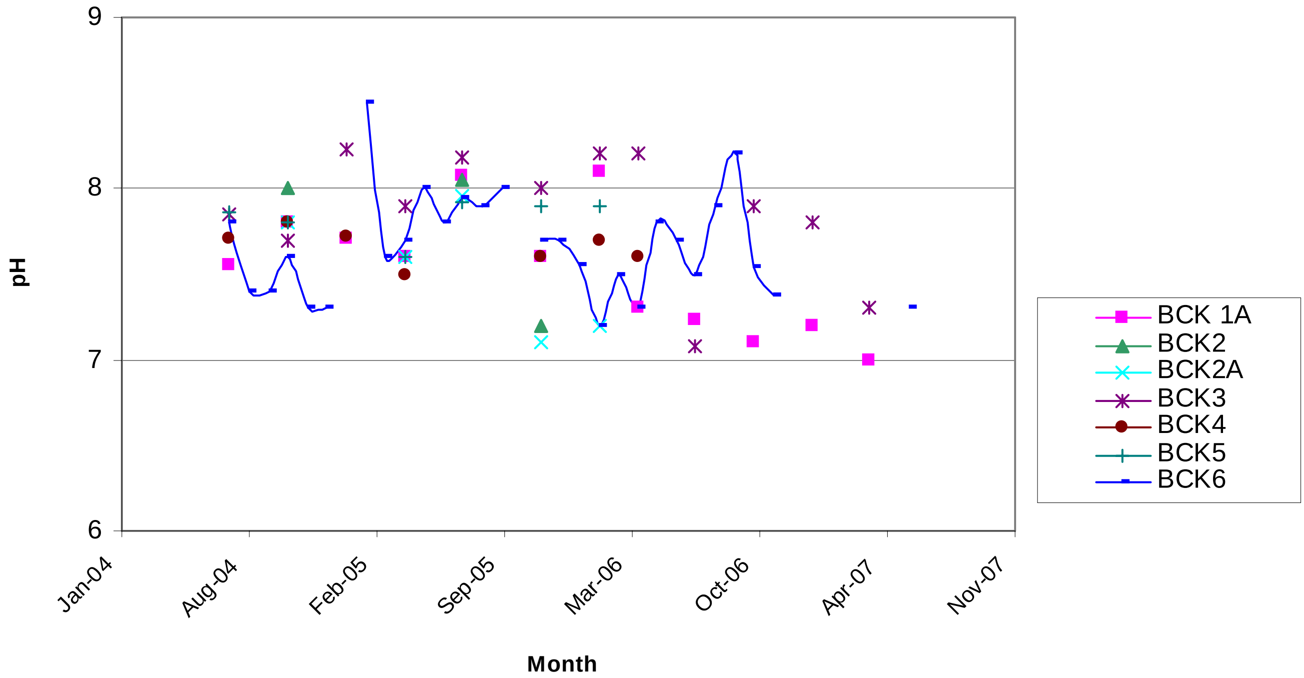
Surface water monitoring is undertaken monthly at Liddell Colliery's onsite Dams 1, 4, 7, 13, 17 and the tailings supernatant at the Antiene Void (refer to **Figure 2.1**).

The range in water quality of Liddell Colliery's onsite dams for the period from July 2004 to June 2007, measured as part of the monthly water quality program, is outlined in **Table 2.5**. The trends in these water quality variables are illustrated graphically in **Figures 2.8** and **2.9**. The Total Suspended Solids results recorded from the tailings supernatant at the Antiene Void were found to be significantly elevated during the period March 2005 to June 2006, increasing from an average concentration of 53 to 53,000 mg/L. The levels of Total Dissolved Solids recorded at this location were also found to be elevated during the period April 2005 to January 2006. It is understood that the increased levels recorded during this period may have been caused by the disturbance of the underlying sediment during the collection of the sample and have been disregarded for the purpose of this assessment.

Table 2.5 - Monthly Water Quality Monitoring at Onsite Dams

Water Quality Variable	Minimum	Maximum
pH	7.6	10.2
Conductivity (µS/cm)	490	12,000
Total Suspended Solids (mg/L)	1	386[1]
Total Dissolved Solids (mg/L)	390	6,510[1]

Note 1: Excludes data for tailings supernatant at the Antiene Void



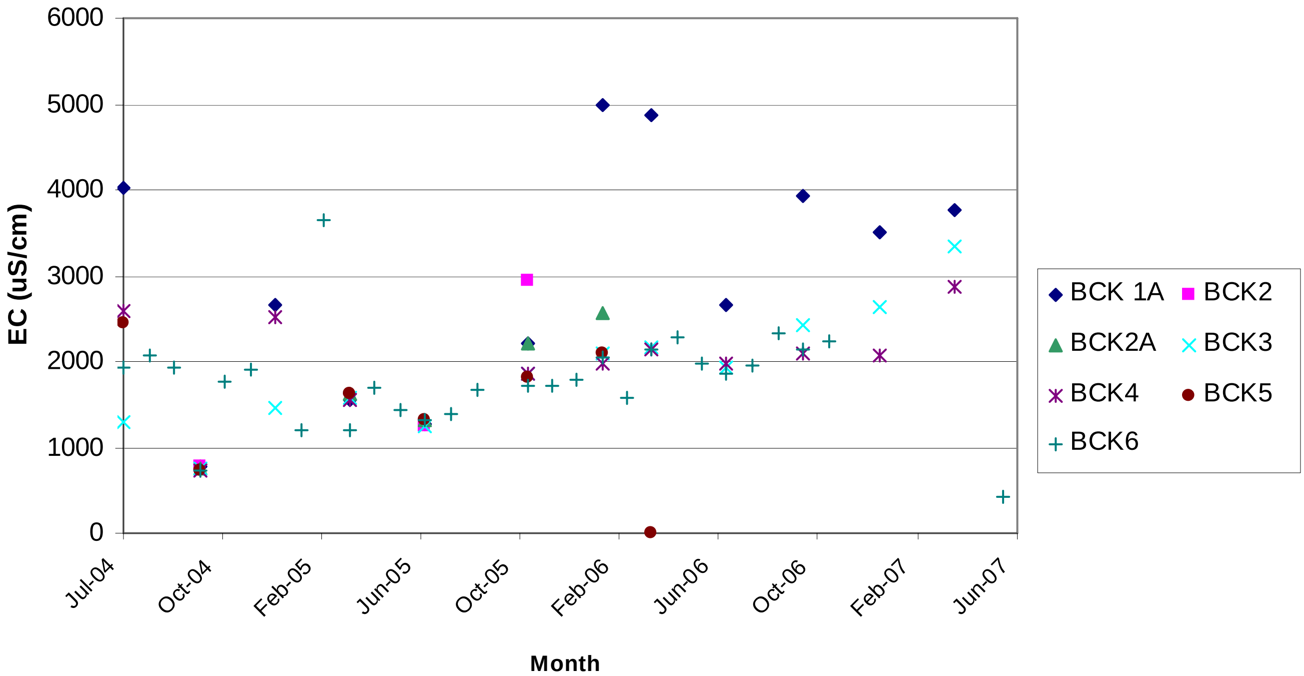
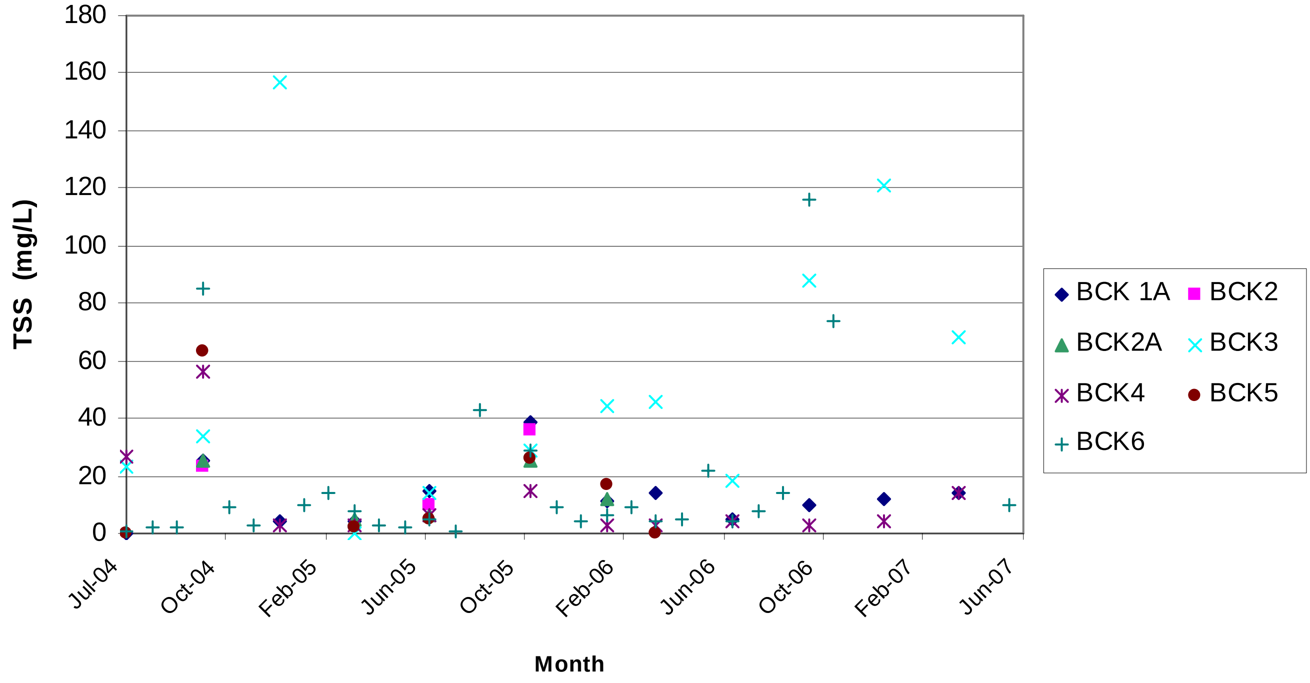


FIGURE 2.6

Water Quality Trends for Bowmans Creek Quarterly Monitoring (pH and EC)



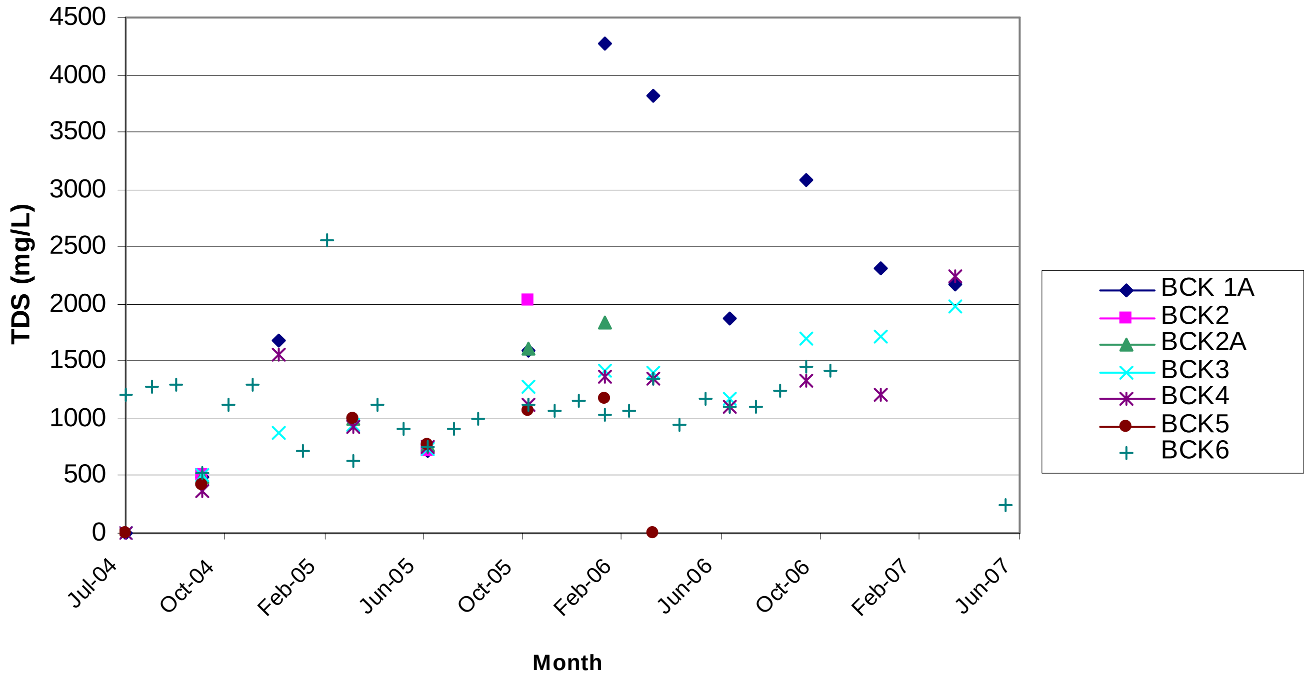
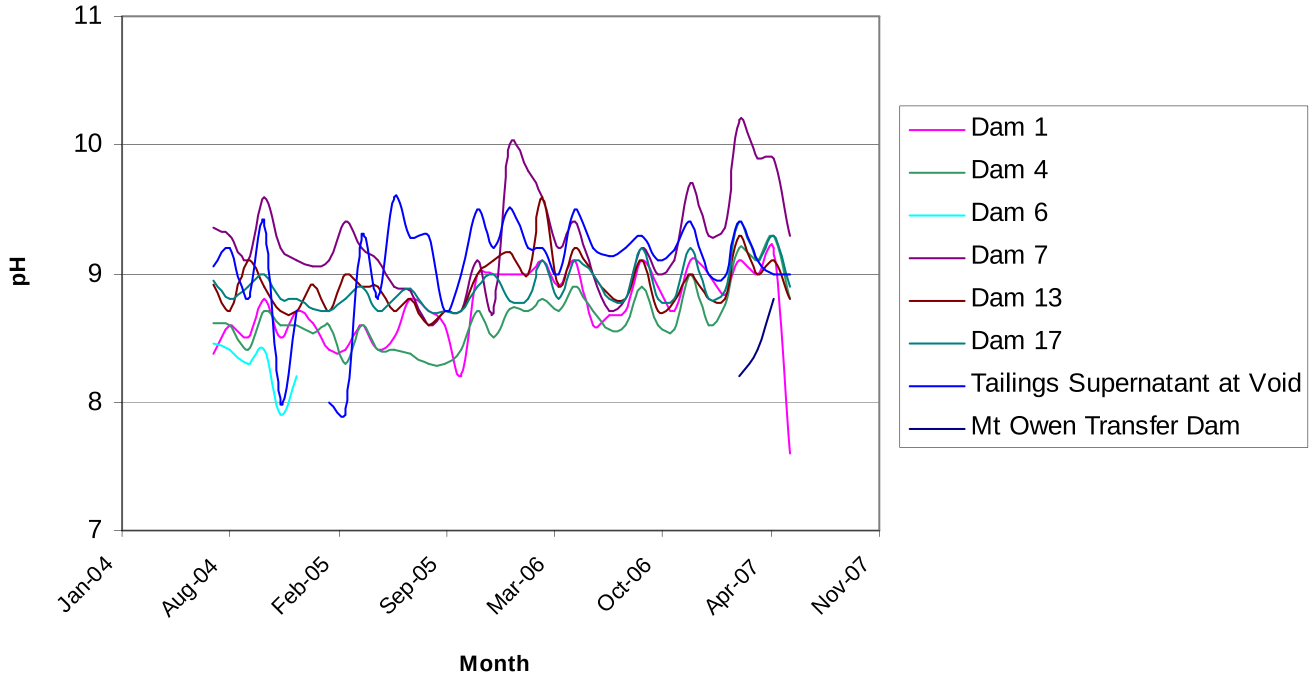


FIGURE 2.7

Water Quality Trends for Bowmans Creek Quarterly Monitoring (TSS and TDS)



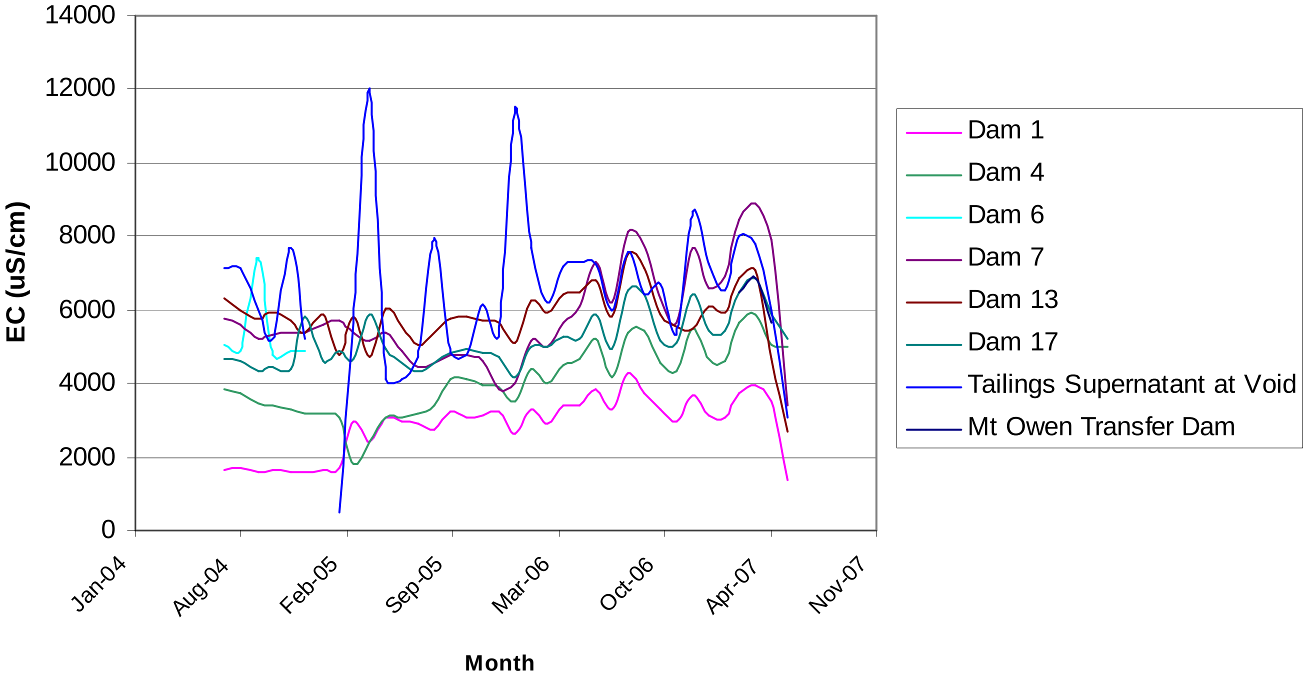
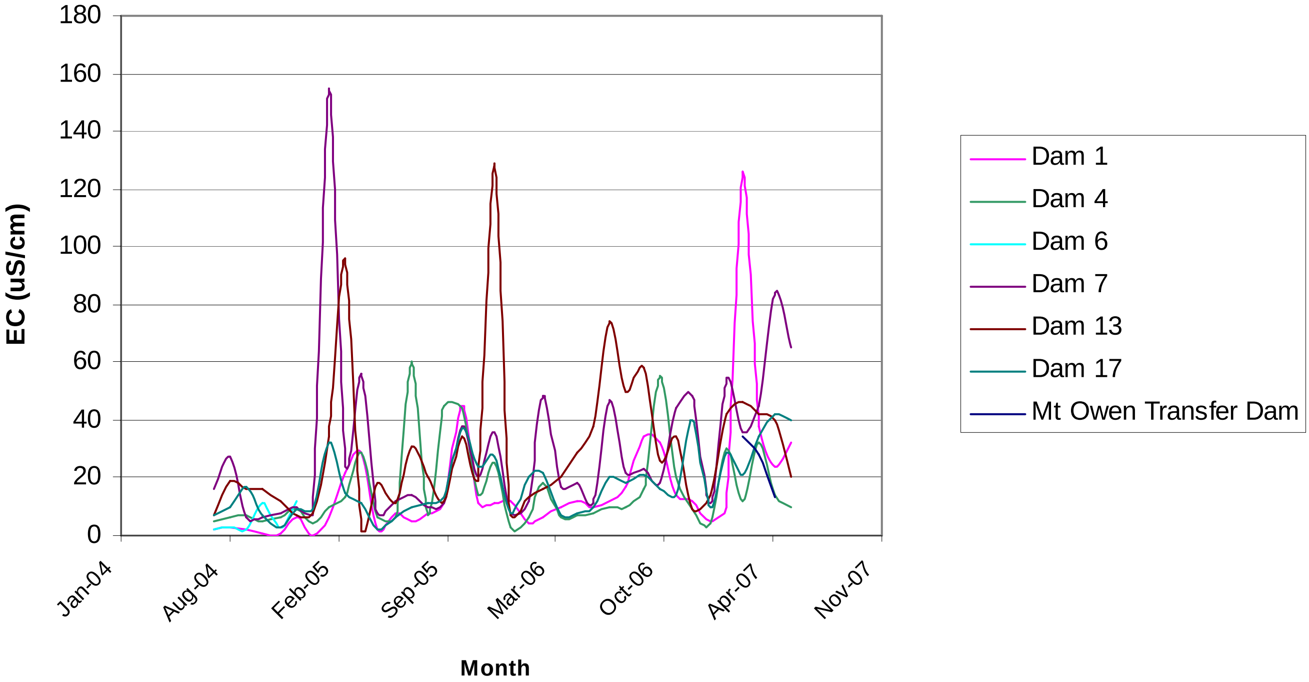


FIGURE 2.8

Water Quality Trends for Onsite Dams (pH and EC)



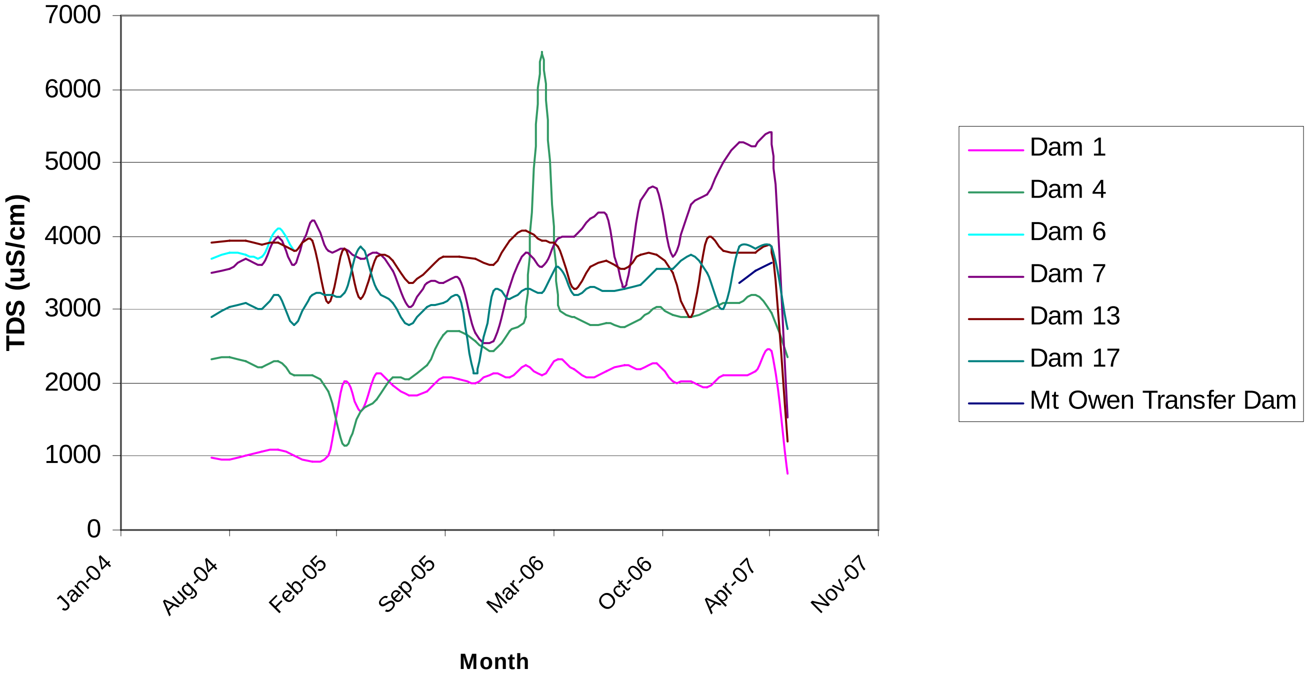


FIGURE 2.9

Water Quality Trends for Onsite Dams (TSS and TDS)

In addition to the monthly water quality monitoring program at the onsite dams, surface water samples are collected at each onsite dam monitoring point every six months. The additional samples are analysed for a suite of inorganic substances. The results for the period January 2006 to January 2007 are included in **Appendix A**.

2.4 Surface Water Monitoring of HRSTS Discharges

The quality of any waters discharged from the dams is monitored in accordance with the HRSTS. Dam 13 is the licensed discharge point under the HRSTS conditions outlined in the Liddell Colliery EPL (refer to **Figure 2.1**). Monitoring of pH, conductivity and TSS are undertaken daily during the discharge event, and flow rate and conductivity are continuously monitored during the discharge event.

The range in Liddell Colliery HRSTS discharges for the period from July 2004 to June 2007, measured as part of the monthly water quality monitoring program, is outlined in **Table 2.6**.

Table 2.6 - Water Quality Results during Dam 13 Discharge Events

Date	Time	Location	pH	EC	TSS
Water Discharged					
1/07/2005		Dam 13 Downstream	7.8	1310	181
		Dam13	8.4	5090	19
2/07/2005	1:30am	Dam 13 Stilling Basin	8.4	5130	28
	1:30am	Dam 13 Downstream	8.4	5080	28
	2:30am[1]	Dam13	8.4	5150	18
Receiving Waters					
1/07/2005		Bayswater Downstream	7.5	253	243
2/07/2005	1:10am	Bayswater Downstream	7.4	353	200
	2:10am	Bayswater Downstream	7.3	243	177

Note 1: Discharge stopped due to malfunction of monitoring equipment.

Details of the procedures to discharge under the HRSTS are presented in **Section 5.0**.

2.5 Surface Water Monitoring Trigger Values

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) (ANZECC Guidelines) define a number of default trigger values for physical and chemical factors which can adversely impact the environment. These factors and their impacts can be assessed using trigger values. ANZECC (2000) recommends the use of site-specific data to define trigger values, however the default values defined by ANZECC (2000) may be used where there is insufficient baseline data to derive site-specific trigger values.

The trigger values for lowland rivers in slightly disturbed ecosystems defined by ANZECC (2000) in south-east Australia are outlined in **Table 2.7**. These values can also be applied to highly disturbed ecosystems. However a lower level of protection is allowed for in the ANZECC guidelines based on site-specific monitoring that reflects the extent of the disturbance. This may be required because the ANZECC default trigger values for slightly disturbed ecosystems may be too stringent for the development.

Table 2.7 - ANZECC Default Trigger Values for Key Water Quality Parameters

Water Quality Variable	Trigger Value
pH range	6.5 – 8.0
Conductivity (µS/cm)	125 - 2200
TSS	0 - 50

Source: ANZECC (2000): *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

Comparison of the baseline monitoring results to the ANZECC trigger values contained in **Table 2.7** indicates that the existing water quality in the project area generally exceeds the ANZECC trigger values for pH and electrical conductivity indicating that the use of site-specific baseline monitoring data is more appropriate to define the trigger values for these parameters. The Total Suspended Solids levels measured were found to generally comply with the ANZECC default trigger value.

The approach recommended by ANZECC (2000) for highly disturbed ecosystems involves utilising site-specific monitoring data to formulate trigger values for surface water quality monitoring, and depending on the objectives of the site, applying a conservative percentile value with the objective of improving water quality. An 80th percentile value will be applied to define the site-specific trigger values. This percentile is consistent with the previous Liddell Colliery Site Water Management Plan (Umwelt, 2003). The key findings of the surface water monitoring are outlined below.

pH levels across the creeks generally ranged from 6.6 to 8.5, with one value of 9.1 recorded at BCK1 in December 2006. pH levels in the onsite dams ranged from 7.6 to 10.2.

Conductivity in the creeks generally ranged from 258 µS/cm to 5750 µS/cm, with samples collected in Bayswater Creek recording levels of up to 7110 µS/cm. Conductivity in the onsite dams ranged from 490 µS/cm to 12,000 µS/cm.

Total Suspended Solids generally ranged from 0 mg/L to 52 mg/L in the creeks, with a 235 mg/L concentration recorded at the Bayswater Creek Downstream monitoring location in October 2004. TSS levels were found to increase to 386 mg/L in the onsite dams (excluding the tailings supernatant at the Antiene Void which recorded average concentrations of up to 53,000 mg/L with peak concentrations of up to 197,188 mg/L).

Total Dissolved Solids generally ranged from 166 mg/L to 4278 mg/L in the creeks with samples collected from Bayswater Creek recording levels up to 6845 mg/L. TDS in the onsite dams were found to range from 390 mg/L to 6510 mg/L with levels of 9600 mg/L and 10,500 mg/L recorded in the tailings supernatant at the Antiene Void in April 2005 and January 2006 respectively.

ANZECC (2000) also outlines trigger values for a range of inorganic substances. There is not sufficient baseline data collected as part of the baseline monitoring of inorganics undertaken during the previous surface water monitoring program at Liddell Colliery to enable an analysis of the background trends. It is proposed that baseline monitoring of inorganics be continued as part of this monitoring program, and the results be reviewed progressively during the life of the monitoring program to help determine appropriate trigger values for inorganics at Liddell Colliery.

3.0 Surface Water Impact Assessment Criteria

The results of the surface water monitoring program have indicated that despite fluctuations in some water quality parameters, water quality at Liddell Colliery has remained fairly consistent at each sampling location throughout the period of monitoring. The surface water monitoring program has indicated that the baseline concentrations of pH and electrical conductivity throughout the Liddell Colliery surface water monitoring area generally exceed the ANZECC guidelines.

Due to the highly disturbed nature of the site, baseline monitoring data has been used to define the trigger values for electrical conductivity, TDS and the upper bound value for pH to be used in surface water monitoring at Liddell Colliery. An 80th percentile value has been applied to these values to account for the highly disturbed nature of the ecosystem. The trigger values for TSS and the lower bound for pH have been adopted from the default trigger value defined by ANZECC (2000). The trigger values based on the available baseline monitoring data to date and ANZECC (2000) guidelines are outlined in **Table 3.1**.

Table 3.1 - Trigger Values for Key Water Quality Parameters

Water Quality Variable	**Bayswater Creek Surface Water**		**Bowmans Creek Surface Water**		**Onsite Dams Surface Water**	
	80^{th} %ile	Maximum	80^{th} %ile	Maximum	80^{th} %ile	Maximum
pH	6.5[1] – 8.3	6.5[1] – 8.7	6.5[1] – 8.0	6.5[1] – 7.9	6.5[1] – 9.2	6.5[1] – 10.2
Conductivity (µS/cm)	5024	7110	2270	2450	6180	12,000
TSS (mg/L)	50[2]	235	50[2]	50[2]	50[2]	386
TDS (mg/L)	3460	6845	1420	1168	3880	10,500

Note 1: Use ANZECC criteria of 6.5 as the lower limit
Note 2: Use ANZECC criteria of 50 mg/L as the upper limit

Where the impact assessment criteria trigger values listed in **Table 3.1** above are exceeded, the Liddell Colliery Environment and Community Coordinator shall act in accordance with Section 3.3.2.3 of ANZECC (2000) as outlined in **Section 6.3**.

As part of the Liddell Colliery Surface Water Monitoring Program the key surface water parameters to be measured at are pH, conductivity and TSS (including TDS).

Measured values will be compared to background values and an investigation of potential cause only undertaken where a deviation from background trends is identified. Should an investigation be required it will be undertaken by the Liddell Coal Environment and Community Coordinator in accordance with **Section 6.0** of this report.

4.0 Program to Monitor Surface Water Flows and Quality

Surface water monitoring will continue throughout the construction and operational phases of the project at the monitoring locations described in **Section 2.0** (refer to **Figure 2.1**). Monitoring of Dam 13 (refer to **Figure 2.1**) will also continue prior to any active discharges being undertaken in accordance with an EPL granted by Department of Environment and Climate Change (DECC). This will enable demonstration of compliance with discharge water quality limits. Monitoring at Dam 13 is to comprise the collection of composite samples at sufficient depths to ensure that the samples are representative of the water quality of the water being discharged. This is specifically relevant to the potential effects of stratification associated with periods of rainfall which can lead to significant variations in water quality with depth. Monitoring of water quality in site water management dams may be undertaken at other times for site environmental management purposes.

The monitoring frequency and parameters for each water sampling location are described in **Table 4.1**.

Table 4.1 -Surface Water Monitoring Frequencies and Parameters

Name	Sampling Location	Measurement Parameter	Frequency
BWKU	Bayswater Creek upstream of CPP Also referred to as Saltwater creek	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
BWKM	Bayswater Creek midstream of CPP	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
BWKD (BCK6)	Bayswater Creek downstream of CPP	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
BCKU (BCK1)	Bowmans Creek upstream of Colliery	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
BCKD (BCK3)	Bowmans Creek downstream of Barrier Block	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
BCK1A	Bowmans Creek at Antiene Road crossing	pH, Conductivity, TSS, TDS	Quarterly
BCK2	Bowmans Creek upstream of Antiene Void	pH, Conductivity, TSS, TDS	Quarterly
BCK2a	Bowmans Creek downstream of Antiene Void	pH, Conductivity, TSS, TDS	Quarterly
BCK3	Bowmans Creek east of Barrier Block	pH, Conductivity, TSS, TDS	Quarterly
BCK4	Bowmans Creek downstream of Barrier Block	pH, Conductivity, TSS, TDS	Quarterly
BCK5	Bowmans Creek downstream of BCK4	pH, Conductivity, TSS, TDS	Quarterly
BF1	Bowmans Creek at Antiene Road crossing	Flow rate (at low flow only)	Quarterly
BF2	Bowmans Creek east of Entrance Block	Flow rate (at low flow only)	Quarterly
BF3	Bowmans Creek downstream of BF2	Flow rate (at low flow only)	Quarterly
BF3a	Bowmans Creek downstream of BF3	Flow rate (at low flow only)	Quarterly
BF4	Bowmans Creek downstream of BF3a	Flow rate (at low flow only)	Quarterly
BF4a	Bowmans Creek downstream of BF4	Flow rate (at low flow only)	Quarterly
BF5	Bowmans Creek immediately downstream of BF4a	Flow rate (at low flow only)	Quarterly

Table 4.1 -Surface Water Monitoring Frequencies and Parameters (cont)

Name	Sampling Location	Measurement Parameter	Frequency
1	Dam 1	pH, Conductivity, TSS, TDS	Monthly
		Speciation1	Biannually
4	East Antiene Dam (Dam 4)	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
6	Dam 6	pH, Conductivity, TSS, TDS	Monthly
7	Dam 7	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
17	Dam 17	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
Supernatant	Tailings supernatant at Antiene Void	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
Dam 13	Dam 13	pH, Conductivity, TSS, TDS	Monthly
		Speciation[1]	Biannually
HRSTS discharge	Stilling basin downstream of Dam 13 wall	pH, Conductivity, TSS	Daily during discharge event
		Flow rate, Conductivity	Continuously during discharge event

Note 1: Speciation analysis to be undertaken for S, Al, Ca, Fe-Sol, K, Mg, Na, Si, B, Cu, Ni, Zn, Mn, Cr, Sr, As, Ba, Hg, Pb, Cd, Co, Se, Li, Be, Rb, Cs, Cl, OH, CO_3, HCO_3, TDS on evap, pH

A monthly review of water quality data will be undertaken and will include consideration of flow and rainfall data.

If monitoring of these parameters is proposed to be discontinued, the DECC and the Department of Planning (DoP) will be consulted during the revision of the monitoring program. Should any change to monitoring under HRSTS be required a variation to the EPL will be required. Any revisions to the monitoring program will also be discussed in the AEMR.

5.0 HRSTS Discharges

The HRSTS is regulated by the Department of Environment and Climate Change under the licensing provisions of the *Protection of the Environment Operations Act 1997*. In order to participate in the HRSTS, mines and power stations are required to hold an Environment Protection Licence that permits water discharge based on salt credit holdings. A total of 1000 salt credits are available under the HRSTS. Each credit represents 1/1000 of the total amount of salt able to be discharged during a particular flow event.

Discharges from mines and power stations are not permitted during periods when flow in the Hunter River is low. Discharge is permissible when flow in the Hunter River is high, providing that sufficient salt credits and a discharge licence is held by the respective operation. When the river is in flood flow, discharges are permitted without the requirement to hold salt credits providing the salt concentration does not exceed 900 µS/cm. However, a discharge licence is still required for discharge when the river is in flood flow and compliance is required with any overriding limits applied by the DECC as a condition of the licence. Further details of the workings of the HRSTS are contained in the Protection of the Environment (Hunter River Salinity Trading Scheme) Regulation 2002.

Liddell Colliery discharges surplus water under the HRSTS into Bayswater Creek via Chain of Ponds Creek. The maximum licensed discharge rate from Dam 13 during flood flow in the Hunter River is currently 100 ML/day. Typical high-flow releases average about 50 ML/day. Due to low rainfall conditions at Liddell Colliery, off-site discharges have occurred on only three occasions from the period January 2002 to December 2007. Development Consent (DA 305-11-01) allows Liddell Colliery to discharge up to 500 ML/day of mine water from Dam 13 into Chain of Ponds Creek when infrastructure to facilitate this discharge volume is installed and a variation to the EPL is sought (Umwelt, 2006).

Liddell Coal currently holds 75 credits in the HRSTS, however, through short term trading of credits, up to 200 credits may be held during a discharge event (Umwelt, 2003). Compliance with HRSTS is based on flows of water in the Hunter River, which are divided into blocks. A block is defined by the DECC as a body of water that flows down the Hunter River and that is predicted to pass through the lower sector reference point, comprising a gauging station at Singleton, in a 24-hour period.

5.1 Discharge Procedure

Liddell Colliery discharges surplus mine water to the Middle Sector of the Hunter River. The salinity target in this sector of the river during high and flood flows is 900 µS/cm at Glennies Creek gauge station, which is located immediately upstream of the confluence of the Hunter River and Glennies Creek.

The flow categories for discharges to the Middle Sector are provided in **Table 5.1**.

Table 5.1 - HRSTS Discharge Opportunities

HRSTS Category	Hunter River Flow Rate (ML/day)	Discharge Opportunity[1]
Low Flow	0 -1800 ML/day	Discharge not permitted
High Flow	1800 - 6000 ML/day	Discharge permitted using credit system
Flood Flow	> 6000 ML/day	Unlimited discharges permitted as long as the salt concentration does not exceed 900 µS/cm

Source: *Hunter River Salinity Trading Scheme* (NSW EPA, 2003).

Note 1: The discharge rate is limited to the maximum limit on environment protection licence regardless of total allowable discharge under the HRSTS.

All discharges from Dam 13 will be undertaken in accordance with *LEMS Procedure - Procedure for Mine Water Discharge*. This procedure is contained in **Appendix B** and includes the following procedures.

Notification of Discharge Event

Notification of a discharge event is provided by DWE in the form of a River Register. The register shows:

- total allowable discharge in tonnes;
- the block classification for the sector; and
- the discharge start and stop times.

The current status of the flow rate in the Hunter River is available via the Hunter Integrated Telemetry System (HITS) website (www.hits.nsw.gov.au).

Calculating Discharge Volume

The volume able to be discharged into a particular block during a discharge event is calculated using the steps outlined in **Table 5.2**.

Table 5.2 - Calculation of Volume Discharge Limit

Step	Calculation[2]
1: Determine the number of credits the licence holder can use for the block [1]	Available credits: E = Cr x D (credits) Cr = credit holding D = discount factor on River Register (usually 1) *Liddell Colliery Available Credits: 75*
2: Determine the licence holder's individual salt discharge limit	Salt discharge limit: L = T x E/1000 (tonnes per day) T = total allowable discharge for the block (e.g. 100 tonnes per day) E = available credits *Liddell Colliery Salt Discharge Limit:* *100 tonnes/day*75 credits/1000 = 7.5 tonnes per day*
3: Calculate the salt concentration of the water to be discharged	Salt concentration C = EC x F/1000 (tonnes per ML) EC = mean electrical conductivity of discharge water (µS /cm) (e.g. 2000 µS/cm) F = 0.6 (conversion factor on EPL) *Liddell Colliery Salt Concentration:* *2000 µS/cm*0.6 = 1.2 tonnes/ML*
4: Determine the volume discharge limit	Volume discharge limit V = L/C (ML) *Liddell Colliery Volume Discharge Limit:* *7.5 tonnes/day/ 1.2 tonnes/ML = 6.25 ML/day*

Source: *Protection of the Environment (Hunter River Salinity Trading Scheme) Regulation* 2002.

Note 1: A block is defined by the EPA as a body of water that flows down the Hunter River and is predicted to pass through the lower sector reference point in a 24-hour period.

Note 2: Worked example based on a total allowable discharge to the block of 100 tonnes/day and salt concentration of 2000 *µS/cm.*

The discharge volume calculated using the method in **Table 5.2** is converted to a flume height using the flow rating table for Dam 13 (refer to **Appendix B**). Note that the daily discharge limit is the lesser of the volume discharge limit and the EPL licensed discharge limit (currently 100 ML/day).

Discharge Actions

The following actions are to be undertaken to initiate a discharge event and during a discharge event:

- open the siphons to reach the required height on the Dam 13 gauge;
- take at least three readings of water level and conductivity;
- revise the calculations if conductivity or water level varies from the initial calculation;
- continuously monitor flow and electrical conductivity during the discharge;
- take at least one water sample per block for analysis of pH and TSS; and
- record discharge details on the discharge worksheet.

6.0 Monitoring and Reporting

6.1 Monitoring Standards

Surface water monitoring at Liddell Colliery will be undertaken in accordance with relevant Australian Standards, legislation and the NSW DECC approved methods for sampling. The Australian Standards and the DECC approved methods relevant to the Surface Water Monitoring Program include (but are not limited to):

- NSW DECC, 2004, Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales;
- AS/NZS 5667.1:1998 Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques, and the Preservation and Handling of Samples; and
- AS/NZS 5667.10:1998 Water Quality – Sampling – Guidance on Sampling of Waste Waters.

6.2 Reporting and Review of Results

All monitoring is to be undertaken in accordance with Liddell Colliery procedures for environmental monitoring and evaluation and mine water discharge. Monitoring results will be reviewed on a monthly basis by the Liddell Coal Environment and Community Coordinator to assess compliance with the impact assessment criteria outlined in **Section 3.0**. Should any exceedances of the criteria be identified, the Environment and Community Coordinator will investigate the exceedance in accordance with the protocols outlined in the Surface and Groundwater Response Plan in the Liddell Colliery Water Management Plan.

Monitoring results will be reviewed annually and reported as required in the AEMR and reported to the Community Consultative Committee, in accordance with the Liddell Colliery procedure for environmental reporting. Reporting will include a comparison of data with previous years and will highlight any results that are inconsistent with baseline data.

All monitoring data will be retained in an appropriate format on site and will be used to review the effectiveness of the Liddell Colliery water management system on an ongoing basis.

6.3 Investigations

Where the surface water monitoring results exceed the trigger values listed in **Table 3.1** the Liddell Coal Environment and Community Coordinator shall act in accordance with Section 3.3.2.3 of ANZECC (2000) which is summarised as follows:

> *The guideline trigger values are the concentrations (or loads) of the key performance indicators, below which there is a low risk that adverse biological effects will occur. The physical and chemical trigger values are not designed to be used as 'magic numbers' or threshold values at which an environmental problem is inferred if they are exceeded. Rather they are designed to be used in conjunction with professional judgement, to provide an initial assessment of the state of a water body regarding the issue in question.*

Section 3.3.2.3 of ANZECC (2000) suggests that that if a trigger value is exceeded the aim of further site-specific investigations is to assess if a 'potential risk' or an actual problem exists. The trigger values listed in **Table 3.1** are the 80th percentile of the historical monitoring results. As a result it is possible that up to 20% of the monitoring results could exceed the trigger values. The Liddell Coal Environment and Community Coordinator will initiate further site-specific investigations when:

- in his/her professional judgement, the indicator value(s) could result in environmental harm;
- three (3) consecutive values are outside the trigger value; or
- any value exceeds the maximum trigger value presented in **Table 3.1**.

When an exceedence has been investigated the findings of the investigation will be reported in the Annual Environmental Management Report (AEMR).

6.4 Responsibility

The Liddell Coal Environment and Community Coordinator is responsible for managing the Surface Water Monitoring Program. This duty includes assessing Liddell Colliery's compliance with the conditions listed in the development consent and EPL. The Liddell Coal Operations Manager is responsible for providing adequate resources to undertake the activities required by this program.

If a contractor is engaged to undertake surface water monitoring on behalf of Liddell Coal, all monitoring undertaken by the contractor must be in accordance with this Surface Water Monitoring Program and all relevant monitoring standards (as outlined in **Section 6.1**).

The responsibilities of the relevant personnel at Liddell Colliery are summarized in **Table 6.1**.

Table 6.1 – Responsibilities at Liddell Colliery

Position	Accountability
Environment and Community Coordinator	Responsible for ensuring that monitoring, periodic environmental inspections and inspections after high rainfall events are undertaken
Operations Manager	Responsible for providing adequate resources to undertake the activities required by this plan

7.0 Program Review

The Liddell Coal Environment and Community Coordinator shall review this program annually or more often as the need arises, including review of monitoring locations and parameters for analysis. If any significant changes to the program are required as an outcome of the review, the DoP will be consulted and the revised program submitted to the DoP. Any revisions to the monitoring program will also be discussed in the AEMR.

8.0 Glossary and Abbreviations

Term	Meaning
Alluvium	Sediment deposited by a flowing stream, e.g., clay, silt, sand, etc.
AEMR	Annual Environmental Management Report
Aquifer	A water-bearing rock formation.
DA	Development Application
DECC	Department of Environment and Climate Change
DNR	Department of Natural Resources
DoP	Department of Planning
DWE	Department of Water and Environment
EA	Environmental Assessment
EIS	Environmental Impact Statement
Environmental Planning and Assessment Act 1979	NSW Government Act to provide for the orderly development of land in NSW.
Environment Protection and Biodiversity Conservation Act 1999	Commonwealth legislation that regulates development proposals that have an actual or potential impact on matters of national environmental significance.
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
HRSTS	Hunter River Salinity Trading Scheme
µS/cm	microSiemens per centimetre is the standard measure of conductivity
ML	megalitres or millions of litres, e.g. 5 ML is the same as 5 million litres
Mtpa	million tonnes per annum
Piezometer	A small diameter bore lined with a slotted tube used for determining the standing water level of groundwaters.
Protection of the Environment Operations Act 1997	NSW legislation administered by DECC that regulates discharges to land, air and water.
WMP	Water Management Plan

9.0 References

AS/NZS 5667.1:1998 Water Quality – Sampling – Guidance on the Design of Sampling Programs, Sampling Techniques, and the Preservation and Handling of Samples.

AS/NZS 5667.10:1998 Water Quality – Sampling – Guidance on Sampling of Waste Waters.

Australian and New Zealand Environment and Conservation Council, Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000.

LEMS Procedure - Environmental Monitoring and Evaluation.

LEMS Procedure - Environmental Reporting.

LEMS Procedure - Procedure for Mine Water Discharge.

Umwelt (Australia) Pty Limited, 2001, *Liddell Colliery Continued Operations Environmental Impact Statement Environmental*. Prepared for Liddell Coal Operations Pty Limited.

Umwelt (Australia) Pty Limited, 2003, *Liddell Colliery Site Water Management Plan*. Prepared for Liddell Coal Operations Pty Limited.

Umwelt (Australia) Pty Limited, 2006, *Liddell Colliery Environmental Assessment for Liddell Colliery Modification to Development Consent*. Prepared for Liddell Coal Operations Pty Limited.

NSW DEC, 2004, Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales.

NSW EPA, 2003, *Hunter River Salinity Trading Scheme*.

APPENDIX A

Results of Surface Water Monitoring Program

Appendix A – Liddell Colliery Monthly Surface Water Results for Bayswater Creek July 2004 to June 2007 pH, EC, TSS and TDS

Month	Bayswater Ck Upstream				Bayswater Ck Midstream				Bayswater Ck Downstream			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	8.1	3350	19	2170	8.3	4610	3	2970	Dry	Dry	Dry	Dry
Aug-04	7.8	3290	23	2180	8.1	4550	4	3190	Dry	Dry	Dry	Dry
Sep-04	7.8	2800	35	1900	8.2	3990	3	2775	Dry	Dry	Dry	Dry
Oct-04	7.8	2800	32	2140	8.3	3630	5	2790	7.4	680	235	436
Nov-04	7.6	3240	33	2186	8.1	4490	3	2986	Dry	Dry	Dry	Dry
Dec-04	7.5	1200	11	810	8.0	2500	52	1600	8.0	3100	14	2200
Jan-05	7.8	2190	34	1430	8.1	4000	14	2770	Dry	Dry	Dry	Dry
Feb-05	7.6	1300	10	820	7.5	1400	9	800	7.5	1300	9	790
Mar-05	7.7	1174	14	740	7.7	1460	16	850	7.4	2200	15	1390
Apr-05	7.1	1257	3	690	7.1	1250	4	740	7.7	1243	6	750
May-05	7.8	1651	1	1042	8.4	5310	5	3564	7.6	4050	22	2764
Jun-05	7.6	3120	11	2106	8.2	4530	7	3140	8.0	1389	27	1044
Jul-05	8.4	4260	11	2970	8.4	4180	11	3750	8.4	4180	10	3040
Aug-05	7.9	3250	25	2312	8.2	4610	14	3282	7.5	2068	38	1238
Sep-05	8.1	4910	8	3160	8.1	4900	9	3196	8.1	4910	16	3158
Oct-05	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Nov-05	7.5	2700	27	1706	8.1	4320	39	2910	7.3	745	39	498
Dec-05	7.5	2920	5	1894	8.0	3920	7	2610	7.2	963	20	724
Jan-06	7.95	3410	9	2580	8.33	5130	<1	4110	8.62	7110	10	5340
Feb-06	7.6	3790	4	6070	8.2	6180	7	4410	Dry	Dry	Dry	Dry
Mar-06	7.7	3550	7	2040	8.2	5530	8	3650	Dry	Dry	Dry	Dry
Apr-06	7.4	3660	16	2528	8.0	5690	9	4070	Dry	Dry	Dry	Dry
May-06	8.0	3680	15	2075	8.4	5680	4	3460	Dry	Dry	Dry	Dry
Jun-06	7.7	3580	25	4810	8.3	5140	14	6845	Dry	Dry	Dry	Dry
Jul-06	7.7	3130	16	1960	8.3	4490	8	2930	Dry	Dry	Dry	Dry
Aug-06	7.7	3770	20	1950	8.3	5720	15	2885	Dry	Dry	Dry	Dry

Appendix A – Liddell Colliery Monthly Surface Water Results for Bayswater Creek July 2004 to June 2007 pH, EC, TSS and TDS (cont)

Month	Bayswater Ck Upstream				Bayswater Ck Midstream				Bayswater Ck Downstream			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Sep-06	7.8	3470	26	1990	8.4	4830	14	2905	Dry	Dry	Dry	Dry
Oct-06	7.7	3420	26	2288	8.1	5390	13	3718	Dry	Dry	Dry	Dry
Nov-06	7.5	3170	32	2056	8.0	4550	16	3106	Dry	Dry	Dry	Dry
Dec-06	7.7	4210	46	2440	8.3	7000	46	3975	Dry	Dry	Dry	Dry
Jan-07	Dry	Dry	Dry	Dry	8.0	6050	5	4060	Dry	Dry	Dry	Dry
Feb-07	7.7	3070	18	2100	8.2	5100	20	3500	Dry	Dry	Dry	Dry
Mar-07	7.8	3680	22	2350	8.4	5740	20	3490	Dry	Dry	Dry	Dry
Apr-07	7.8	3905	26	2100	8.3	6150	32	3445	Dry	Dry	Dry	Dry
May-07	8.7	3310	14	2535	8.2	5180	19	3478	Dry	Dry	Dry	Dry
Jun-07	7.4	3040	19	1420	8.0	5835	8	3038	7.2	258	42	166
Average	**7.7**	**3096**	**19**	**2163**	**8.1**	**4658**	**14**	**3171**	**7.7**	**2443**	**36**	**1681**

Appendix A – Liddell Colliery Monthly Surface Water Results for Bowmans Creek July 2004 to June 2007 pH, EC, TSS and TDS

Month	BCK1 (Bowmans Creek Upstream)				BCK6 (Bowmans Creek Downstream)			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	7.75	1070	1	624	7.8	1920	1	1200
Aug-04	7.8	1118	1	604	7.4	2072	2	1280
Sep-04	7.9	1028	1	632	7.4	1933	2	1294
Oct-04	7.9	767	22	500	7.6	719	85	522
Nov-04	7.6	1051	2	628	7.3	1757	9	1122
Dec-04	8.0	980	4	700	7.3	1900	3	1300
Jan-05	7.71	1170	2	718	Dry	Dry	Dry	Dry
Feb-05	7.8	900	16	580	8.5	1200	10	710
Mar-05	8.2	5750	20	3830	7.6	3650	14	2550
Apr-05	7.6	1185	12	642	7.7	1206	8	630
May-05	7.5	1067	4	594	8.0	1701	3	1126
Jun-05	7.2	1040	2	602	7.8	1443	2	918
Jul-05	8.04	1240	9	740	7.95	1310	5	746
Aug-05	8.10	963	3	546	7.9	1390	1	912
Sep-05	8.2	1670	24	992	8.0	1670	43	1000
Oct-05	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Nov-05	7.3	1062	24	614	7.7	1718	29	1116
Dec-05	7.8	921	20	574	7.7	1718	9	1062
Jan-06	7.95	1060	<1	624	7.55	1780	4	1150
Feb-06	7.7	1163	1	716	7.2	2040	6	1038
Mar-06	7.8	923	10	672	7.5	1588	9	1068
Apr-06	7.4	1195	2	718	7.3	2130	4	1346
May-06	7.8	1290	14	632	7.8	2280	5	942
Jun-06	Dry	Dry	Dry	Dry	7.7	1968	22	1180
Jul-06	Dry	Dry	Dry	Dry	7.5	1870	4	1100
Aug-06	Dry	Dry	Dry	Dry	7.9	1953	8	1095

Appendix A – Liddell Colliery Monthly Surface Water Results for Bowmans Creek July 2004 to June 2007 pH, EC, TSS and TDS (cont)

Month	BCK1 (Bowmans Creek Upstream)				BCK6 (Bowmans Creek Downstream)			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Sep-06	Dry	Dry	Dry	Dry	8.2	2340	14	1242
Oct-06	Dry	Dry	Dry	Dry	7.5	2130	116	1454
Nov-06	7.6	1077	8	828	7.4	2230	74	1426
Dec-06	9.1	3680	12	2025	Dry	Dry	Dry	Dry
Jan-07	7.6	1284	14	762	Dry	Dry	Dry	Dry
Feb-07	7.2	1074	12	770	Dry	Dry	Dry	Dry
Mar-07	7.1	1096	30	748	Dry	Dry	Dry	Dry
Apr-07	6.6	1150	110	602	Dry	Dry	Dry	Dry
May-07	7.6	1243	120	860	Dry	Dry	Dry	Dry
Jun-07	8.0	385	4	198	7.3	423	10	241
Average	**7.7**	**1320**	**17**	**809**	**7.7**	**1787**	**18**	**1099**

Appendix A – Liddell Colliery Quarterly Surface Water Results for Bowmans Creek July 2004 to June 2007 pH, EC, TSS and TDS

Month	BCK 1A				BCK2				BCK2A			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	7.55	4020	<1	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Oct-04	7.8	778	25	494	8.0	787	23	502	7.8	763	25	482
Jan-05	7.71	2660	4	1680	Dry	Dry	Dry	Dry	-	Dry	Dry	Dry
Apr-05	7.6	1548	4	972	Dry	Dry	Dry	Dry	7.6	1619	5	994
Jul-05	8.07	1260	15	714	8.05	1240	10	718	7.96	1310	6	764
Nov-05	7.6	2210	39	1598	7.2	2950	36	2028	7.1	2220	25	1610
Feb-06	8.1	4980	11	4278	Dry	Dry	Dry	Dry	7.2	2560	12	1840
Apr-06	7.3	4880	14	3824	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Jul-06	7.2	2660	5	1880	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Oct-06	7.1	3930	10	3088	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Jan-07	7.2	3500	12	2312	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Apr-07	7.0	3760	14	2166	Dry	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Average	**7.5**	**3016**	**14**	**2091**	**7.8**	**1659**	**23**	**1083**	**7.5**	**1694**	**15**	**1138**

Appendix A – Liddell Colliery Quarterly Surface Water Results for Bowmans Creek July 2004 to June 2007 pH, EC, TSS and TDS (cont)

Month	BCK3				BCK4				BCK5			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	7.85	1290	23	-	7.71	2590	27	-	7.86	2450	<1	-
Oct-04	7.7	750	34	500	7.8	734	56	364	7.8	739	63	422
Jan-05	8.23	1450	157	883	7.72	2510	3	1560	-	-	-	-
Apr-05	7.9	1580	0	948	7.5	1553	3	920	7.6	1514	2	1000
Jul-05	8.18	1250	14	732	-	-	6	758	7.92	1320	5	766
Nov-05	8.0	1864	29	1280	7.6	1868	15	1122	7.9	1803	26	1060
Feb-06	8.2	2090	44	1416	7.7	1988	3	1358	7.9	2100	17	1168
Apr-06	8.2	2160	46	1408	7.6	2150	3	1346	-	-	-	-
Jul-06	7.1	1940	18	1170	7.88	1980	4	1110	Dry	Dry	Dry	Dry
Oct-06	7.9	2430	88	1706	7.60	2090	3	1322	Dry	Dry	Dry	Dry
Jan-07	7.8	2630	121	1714	7.50	2060	4	1200	Dry	Dry	Dry	Dry
Apr-07	7.3	3350	68	1986	7.30	2870	14	2240	Dry	Dry	Dry	Dry
Average	**7.9**	**1899**	**54**	**1249**	**7.6**	**2036**	**12**	**1209**	**7.8**	**1671**	**23**	**883**

Appendix A – Liddell Colliery Monthly Surface Water Results for Onsite Dams July 2004 to June 2007 pH, EC, TSS and TDS

Month	Dam 1				Dam 4				Dam 7			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	8.4	1650	2	974	8.6	3820	5	2330	9.4	5740	16	3510
Aug-04	8.6	1682	3	968	8.6	3710	6	2360	9.3	5580	27	3560
Sep-04	8.5	1605	2	1020	8.4	3440	7	2310	9.1	5220	6	3695
Oct-04	8.8	1669	1	1080	8.7	3390	5	2210	9.6	5320	6	3610
Nov-04	8.5	1570	1	1090	8.6	3300	6	2300	9.2	5400	8	4000
Dec-04	8.7	1600	6	1010	8.6	3200	9	2100	9.1	5400	10	3600
Jan-05	8.6	1640	<1	942	8.5	3210	4	2100	9.1	5600	8	4220
Feb-05	8.4	1700	6	1000	8.6	3100	10	1900	9.1	5700	155	3800
Mar-05	8.4	2950	22	2022	8.3	1790	13	1136	9.4	5400	26	3832
Apr-05	8.6	2434	29	1606	8.6	2434	29	1606	9.2	5160	56	3682
May-05	8.4	3080	2	2144	8.4	3090	6	1772	9.1	5400	8	3782
Jun-05	8.5	2940	8	1970	8.4	3090	6	2070	8.9	4910	12	3530
Jul-05	8.8	2910	5	1840	8.4	3170	60	2040	8.9	4430	14	3030
Aug-05	8.7	2750	8	1878	8.3	3380	7	2240	8.6	4580	10	3356
Sep-05	8.6	3240	11	2084	8.3	4140	45	2650	8.7	4790	11	3376
Oct-05	8.2	3100	45	2058	8.4	4130	44	2694	8.7	4780	38	3408
Nov-05	9.0	3150	11	1996	8.7	3970	14	2564	9.1	4590	20	2684
Dec-05	9.0	3230	11	2140	8.5	3890	25	2444	8.7	3860	36	2562
Jan-06	9.0	2660	12	2070	8.72	3530	3	2720	10.0	4030	8	3310
Feb-06	9.0	3270	4	2230	8.7	4390	6	2890	9.8	5150	12	3780
Mar-06	9.1	2910	6	2092	8.8	4000	18	6510	9.6	4980	48	3575
Apr-06	8.9	3390	10	2326	8.7	4490	6	3056	9.2	5630	17	3962
May-06	9.1	3410	12	2192	8.9	4680	7	2905	9.4	6070	18	3985
Jun-06	8.6	3870	10	2085	8.7	5210	8	2780	9.0	7320	11	4245
Jul-06	8.7	3280	12	2150	8.6	4200	10	2810	8.7	6180	47	4280
Aug-06	8.7	4300	17	2245	8.6	5400	10	2765	8.8	8150	22	3295
Sep-06	9.1	3750	34	2190	8.9	5460	16	2865	9.2	7730	23	4475
Oct-06	8.9	3320	32	2262	8.6	4530	55	3024	9.0	6330	18	4642
Nov-06	8.7	2980	14	2014	8.6	4340	20	2916	9.1	5680	44	3710
Dec-06	9.1	3680	12	2025	9.0	5500	9	2905	9.7	7670	48	4440
Jan-07	9.0	3110	5	1950	8.6	4660	4	2980	9.3	6590	11	4560
Feb-07	8.8	3050	10	2100	8.8	4620	30	3100	9.4	6930	54	5000
Mar-07	9.1	3720	126	2115	9.2	5650	12	3090	10.2	8430	36	5275
Apr-07	9.0	3940	38	2165	9.1	5890	32	3210	9.9	8920	45	5235
May-07	9.2	3500	24	2440	9.3	5075	14	2960	9.9	7910	84	5400
Jun-07	7.6	1379	32	778	8.8	5005	10	2364	9.3	3405	65	1540
Average	**8.7**	**2845**	**17**	**1813**	**8.7**	**4080**	**16**	**2630**	**9.2**	**5805**	**30**	**3832**

Appendix A – Liddell Colliery Monthly Surface Water Results for Onsite Dams July 2004 to June 2007
pH, EC, TSS and TDS (cont)

Month	Dam 13				Dam 17				Tailings Supernatant at Void				Mt Owen Transfer Dam			
	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)	pH	Conductivity (µS/cm)	TSS (mg/L)	TDS (mg/L)
Jul-04	8.9	6310	7	3900	8.9	4660	7	2910	9.1	7130	58	4540				
Aug-04	8.7	6010	19	3940	8.8	4610	10	3040	9.2	7120	91	4780				
Sep-04	**9.1**	5750	16	3925	8.9	4320	17	3080	8.8	5990	247	3800				
Oct-04	8.9	5920	16	3880	9.0	4470	7	3000	9.4	5230	47	3440				
Nov-04	8.7	5700	12	3900	8.8	4400	3	3200	8.0	7700	63	5600				
Dec-04	8.7	5360	7	3800	8.8	5800	9	2800	8.7	5200	8	3400				
Jan-05	8.9	5890	8	3940	8.7	4620	9	3200								
Feb-05	8.7	4800	34	3100	8.7	4900	32	3200	8.0	490	35	390				
Mar-05	9.0	5820	96	3826	8.8	4690	15	3238	7.9	5660	197188	4736				
Apr-05	8.9	4720	3	3144	8.9	5860	11	3854	9.3	12000	87464	9600				
May-05	8.9	6050	18	3708	8.7	4930	2	3284	8.8	4110	45064	3830				
Jun-05	8.7	5550	11	3674	8.8	4580	6	3078	9.6	4140	116	2994				
Jul-05	8.8	5060	31	3350	8.9	4310	10	2800	9.3	4710	71100	3160				
Aug-05	8.6	5380	20	3522	8.7	4540	11	3038	9.3	7950	11548	5522				
Sep-05	8.7	5780	12	3716	8.7	4840	13	3084	8.7	4830	545	3026				
Oct-05	8.7	5820	34	3732	8.7	4950	37	3174	9.0	4790	13610	3086				
Nov-05	9.0	5690	20	3692	8.9	4810	24	2130	9.5	6140	26	3728				
Dec-05	9.1	5650	129	3622	9.0	4740	27	3250	9.2	5300	9	4358				
Jan-06	9.2	5130	7	3950	8.8	4170	8	3150	9.5	11500	172	10500				
Feb-06	9.0	6280	13	4075	8.8	5020	20	3290	9.2	7690	40	4935				
Mar-06	9.6	5950	16	3945	9.1	5000	22	3220	9.2	6180	24	4140				
Apr-06	8.9	6420	20	3858	8.8	5250	7	3570	9.0	7210	83	4532				
May-06	9.2	6500	29	3290	9.1	5230	8	3210	9.5	7290	50	4385				
Jun-06	9.0	6800	38	3585	9.0	5880	10	3320	9.2	7270	24	3870				
Jul-06	8.8	5810	74	3660	8.8	4950	20	3260	9.1	5960	10	3820				
Aug-06	8.8	7540	50	3545	8.8	6520	18	3270	9.2	7590	19	3821				
Sep-06	9.1	7140	58	3735	9.2	6405	21	3335	9.3	6420	28	3980				
Oct-06	8.7	5860	26	3754	8.8	5180	16	3560	9.1	6710	19	4350				
Nov-06	8.8	5520	34	3498	8.8	5100	14	3564	9.2	5400	26	3438				
Dec-06	9.0	5500	9	2905	9.2	6400	40	3745	9.4	8660	110	4953				
Jan-07	8.8	6080	14	3960	8.8	5430	10	3510	9.0	7250	7	4620				
Feb-07	8.8	5950	42	3800	8.9	5430	29	3000	9.0	6530	46	4400				
Mar-07	9.3	6880	46	3770	9.4	6485	21	3850	9.4	8010	52	4650	8.2	6470	34	3355
Apr-07	9.0	7105	42	3770	9.1	6860	34	3828	9.1	7770	58	4135	8.4	6870	28	3520
May-07	9.1	4650	40	3860	9.3	5855	42	3860	9.0	5980	56	4060	8.8	5640	13	3650
Jun-07	8.8	2690	20	1198	8.9	5190	40	2730	9.0	3050	36	1366	No sample - inaccessible due to heavy rain and high creek.			
Average	**8.9**	**5807**	**30**	**3626**	**8.9**	**5177**	**18**	**3240**	**9.1**	**6427**	**12231**	**4284**	**8.5**	**6327**	**25**	**3508**

Appendix A – Liddell Colliery Six Monthly Speciation Surface Water Results for Bayswater and Bowmans Creeks

Samples Collected on 11 July 2006

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream	Bayswater Creek Downstream
pH	-		Dry	7.50	7.70	8.32	Dry
Conductivity @ 25°C	-	uS/cm	Dry	1870	3130	4490	Dry
Total Dissolved Solids	-	mg/L	Dry	1100	1960	2930	Dry
Total Suspended Solids	-	mg/L	Dry	4	16	8	Dry
Calcium - Filtered	-	mg/L	Dry	88	107	122	Dry
Magnesium - Filtered	-	mg/L	Dry	56	111	160	Dry
Sodium - Filtered	-	mg/L	Dry	274	473	785	Dry
Potassium - Filtered	-	mg/L	Dry	4	11	11	Dry
Hydroxide as $CaCO_3$	-	mg/L	Dry	ND	ND	ND	Dry
Carbonate as $CaCO_3$	-	mg/L	Dry	ND	ND	31	Dry
Bicarbonate as $CaCO_3$	-	mg/L	Dry	295	286	469	Dry
Alkalinity as $CaCO_3$	-	mg/L	Dry	295	286	500	Dry
Sulphate - Filtered	-	mg/L	Dry	234	583	920	Dry
Chloride	-	mg/L	Dry	328	546	806	Dry
Iron - Filtered	-	mg/L	Dry	ND	ND	ND	Dry
Silicon - Filtered	-	mg/L	Dry	12	3.43	5.87	Dry
Aluminium - Filtered	0.055	mg/L	Dry	ND	ND	ND	Dry
Arsenic - Filtered	0.024	mg/L	Dry	ND	ND	ND	Dry
Boron - Filtered	0.37	mg/L	Dry	0.07	0.69	0.58	Dry
Barium - Filtered	-	mg/L	Dry	0.059	0.08	0.056	Dry
Beryllium - Filtered	-	mg/L	Dry	ND	ND	ND	Dry
Cadmium - Filtered	-	mg/L	Dry	ND	ND	0.001	Dry
Cobalt - Filtered	-	mg/L	Dry	ND	ND	ND	Dry
Chromium - Filtered	-	mg/L	Dry	0.001	0.002	<0.005	Dry
Caesium - Filtered	-	mg/L	Dry	ND	ND	ND	Dry
Copper - Filtered	0.0014	mg/L	Dry	0.002	0.002	0.003	Dry
Lithium - Filtered	-	mg/L	Dry	0.005	0.127	0.126	Dry
Manganese - Filtered	1.9	mg/L	Dry	0.209	0.011	0.001	Dry
Nickel - Filtered	0.011	mg/L	Dry	ND	0.001	0.002	Dry
Lead - Filtered	0.0034	mg/L	Dry	ND	ND	ND	Dry
Rubidium - Filtered	-	mg/L	Dry	ND	0.004	0.003	Dry
Selenium - Filtered	0.0011	mg/L	Dry	ND	ND	ND	Dry
Strontium - Filtered	-	mg/L	Dry	1.04	2.03	2.4	Dry
Zinc - Filtered	0.008	mg/L	Dry	ND	ND	0.011	Dry
Mercury - Filtered	0.0006	mg/L	Dry	ND	ND	ND	Dry
Total Cations	-	me/L	Dry	21.1	35.3	53.7	Dry
Total Anions	-	me/L	Dry	20	33.2	51.9	Dry
Actual (Anion/Cation) Difference	-	me/L	Dry	2.61	3.05	1.74	Dry

1: ANZECC Water Quality Guideline for Fresh Water 95% Trigger Level :

Appendix A – Liddell Colliery Six Monthly Speciation Surface Water Results for Bayswater and Bowmans Creeks

Samples Collected on 4 January 2007

ANALYSIS DESCRIPTION	ANZECC Guideline[1]	UNIT	Bowmans Creek Upstream	Bowmans Creek Downstream	Bayswater Creek Upstream	Bayswater Creek Midstream	Bayswater Creek Downstream
pH	-		7.6	Dry	Dry	8.0	Dry
Conductivity @ 25°C	-	uS/cm	1284	Dry	Dry	6050	Dry
Total Dissolved Solids @180°C	-	mg/L	762	Dry	Dry	4060	Dry
Suspended Solids (SS)	-	mg/L	14	Dry	Dry	5	Dry
Hydroxide Alkalinity as CaCO3	-	mg/L	<1	Dry	Dry	<1	Dry
Carbonate Alkalinity as CaCO3	-	mg/L	<1	Dry	Dry	<1	Dry
Bicarbonate Alkalinity as CaCO3	-	mg/L	195	Dry	Dry	670	Dry
Total Alkalinity as CaCO3	-	mg/L	195	Dry	Dry	670	Dry
Sulphate as SO4 2-	-	mg/L	57	Dry	Dry	1120	Dry
Silicon	-	mg/L	10.2	Dry	Dry	5.05	Dry
Silicon	-	mg/L	-	Dry	Dry	-	Dry
Chloride	-	mg/L	260	Dry	Dry	1350	Dry
Calcium	-	mg/L	70	Dry	Dry	75	Dry
Magnesium	-	mg/L	31	Dry	Dry	201	Dry
Sodium	-	mg/L	143	Dry	Dry	1190	Dry
Potassium	-	mg/L	3	Dry	Dry	12	Dry
Aluminium	0.055	mg/L	<0.01	Dry	Dry	<0.01	Dry
Arsenic	0.024	mg/L	0.002	Dry	Dry	0.001	Dry
Beryllium	0.37	mg/L	<0.001	Dry	Dry	<0.001	Dry
Barium	-	mg/L	0.042	Dry	Dry	0.066	Dry
Cadmium	-	mg/L	<0.0001	Dry	Dry	<0.0001	Dry
Caesium	-	mg/L	<0.001	Dry	Dry	<0.001	Dry
Chromium	-	mg/L	<0.001	Dry	Dry	<0.005	Dry
Cobalt	0.001	mg/L	<0.001	Dry	Dry	<0.001	Dry
Copper	-	mg/L	<0.001	Dry	Dry	0.002	Dry
Lead	0.0014	mg/L	<0.001	Dry	Dry	<0.001	Dry
Lithium	-	mg/L	0.007	Dry	Dry	0.182	Dry
Manganese	1.9	mg/L	0.058	Dry	Dry	0.026	Dry
Nickel	0.011	mg/L	<0.001	Dry	Dry	0.002	Dry
Rubidium	0.0034	mg/L	0.001	Dry	Dry	0.004	Dry
Selenium	-	mg/L	<0.010	Dry	Dry	<0.010	Dry
Strontium	0.0011	mg/L	0.553	Dry	Dry	2.85	Dry
Zinc	-	mg/L	0.01	Dry	Dry	0.01	Dry
Boron	0.008	mg/L	0.12	Dry	Dry	0.77	Dry
Iron	0.0006	mg/L	<0.05	Dry	Dry	<0.05	Dry
Mercury	-	mg/L	<0.0001	Dry	Dry	<0.0001	Dry
Silica	-	mg/L	21.8	Dry	Dry	10.8	Dry
Total Anions	-	meq/L	12.4	Dry	Dry	74.8	Dry
Total Cations		meq/L	12.4	Dry	Dry	72.3	Dry
Ionic Balance		%	0.18	Dry	Dry	1.68	Dry

1: ANZECC Water Quality Guideline for Fresh Water 95% Trigger Level

Appendix A – Liddell Colliery Six Monthly Speciation Surface Water Results for Onsite Dams

Samples Collected on 11 July 2006

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 7	Dam 13	Dam 17	Tailings Supernatant
pH		8.68	8.56	8.70	8.83	8.81	9.13
Conductivity @ 25^{o}C	uS/cm	3280	4200	6180	5810	4950	5960
Total Dissolved Solids	mg/L	0	2810	4280	3660	3260	3820
Total Suspended Solids	mg/L	0	10	47	74	20	10
Calcium - Filtered	mg/L	40	66	36	17	27	19
Magnesium - Filtered	mg/L	121	146	219	59	150	84
Sodium - Filtered	mg/L	638	845	1310	1390	985	1360
Potassium - Filtered	mg/L	11	10	20	9	13	11
Hydroxide as $CaCO_3$	mg/L	ND	ND	ND	ND	ND	ND
Carbonate as $CaCO_3$	mg/L	75	52	122	209	94	285
Bicarbonate as $CaCO_3$	mg/L	344	413	512	1060	398	826
Alkalinity as $CaCO_3$	mg/L	419	465	634	1270	492	1110
Sulphate - Filtered	mg/L	798	895	1570	463	952	656
Chloride	mg/L	426	743	989	945	888	1140
Iron - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Silicon - Filtered	mg/L	5.43	3.81	1.99	6.08	2.08	3.53
Aluminium - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Arsenic - Filtered	mg/L	0.002	0.002	0.003	ND	0.002	0.015
Boron - Filtered	mg/L	0.16	0.12	0.19	0.19	0.11	0.17
Barium - Filtered	mg/L	0.046	0.068	0.087	0.184	0.03	0.185
Beryllium - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Cadmium - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Cobalt - Filtered	mg/L	ND	ND	ND	ND	ND	0.001
Chromium - Filtered	mg/L	0.002	<0.005	<0.005	<0.005	ND	<0.005
Caesium - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Copper - Filtered	mg/L	0.002	0.003	0.003	0.003	0.002	0.002
Lithium - Filtered	mg/L	0.083	0.102	0.18	0.278	0.156	0.254
Manganese - Filtered	mg/L	ND	0.001	0.002	ND	ND	0.005
Nickel - Filtered	mg/L	ND	0.002	0.002	0.001	0.001	0.003
Lead - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Rubidium - Filtered	mg/L	0.003	0.005	0.01	0.017	0.006	0.01
Selenium - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Strontium - Filtered	mg/L	1.29	3.01	3.58	4.77	1.97	4.78
Zinc - Filtered	mg/L	0.019	0.008	0.023	ND	ND	ND
Mercury - Filtered	mg/L	ND	ND	ND	ND	ND	ND
Total Cations	me/L	40.0	52.4	77.5	66.2	56.9	67.2
Total Anions	me/L	37.0	48.9	73.2	61.7	54.7	68.1
Actual (Anion/Cation) Difference	me/L	3.91	3.41	2.82	3.51	1.90	0.70

Appendix A – Liddell Colliery Six Monthly Speciation Surface Water Results for Onsite Dams

Samples Collected on 4 January 2007

ANALYSIS DESCRIPTION	UNIT	Dam 1	Dam 4	Dam 7	Dam 13	Dam 17	Tailings Supernatant
pH		9.0	8.6	9.3	8.8	8.8	9.0
Conductivity @ 25°C	uS/cm	3110	4660	6590	6080	5430	7250
Total Dissolved Solids @180°C	mg/L	1950	2980	4560	3760	3510	4620
Suspended Solids (SS)	mg/L	5	4	11	14	10	7
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	mg/L	80	57	215	134	88	180
Bicarbonate Alkalinity as CaCO3	mg/L	267	436	410	1040	400	721
Total Alkalinity as CaCO3	mg/L	347	494	625	1180	488	900
Sulphate as SO4 2-	mg/L	728	762	1430	525	974	994
Silicon	mg/L	-	2.33	2.2	4.04	1.7	1.21
Silicon	mg/L	5.99	-	-	-	-	-
Chloride	mg/L	463	959	1300	1390	1180	1710
Calcium	mg/L	34	34	24	6	20	19
Magnesium	mg/L	108	136	222	83	165	130
Sodium	mg/L	643	999	1490	1490	1180	1730
Potassium	mg/L	12	10	19	9	13	18
Aluminium	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	0.03
Arsenic	mg/L	0.003	0.005	0.012	<0.001	0.002	0.011
Beryllium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Barium	mg/L	0.031	0.067	0.098	0.153	0.021	0.054
Cadmium	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002
Caesium	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
Chromium	mg/L	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Copper	mg/L	0.002	0.003	0.002	0.002	0.002	0.003
Lead	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	0.073	0.133	0.226	0.33	0.194	0.262
Manganese	mg/L	0.003	0.004	0.002	0.002	<0.001	0.043
Nickel	mg/L	<0.001	0.002	0.002	0.002	0.002	0.004
Rubidium	mg/L	0.003	0.006	0.009	0.018	0.007	0.026
Selenium	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Strontium	mg/L	0.633	2.76	3.73	5.53	1.3	3.93
Zinc	mg/L	0.006	0.009	0.01	0.008	<0.005	0.014
Boron	mg/L	0.15	0.12	0.24	0.22	0.13	0.2
Iron	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Silica	mg/L	12.8	5	4.7	8.7	3.6	2.6
Total Anions	meq/L	35.1	52.8	79.1	73.5	63.50	86.90
Total Cations	meq/L	38.9	56.6	84.7	72.4	66.1	87.3
Ionic Balance	%	5.02	3.49	3.4	0.84	1.99	0.22

APPENDIX B

Liddell Colliery *LEMS Procedure for Mine Water Discharge*

LIDDELL COAL OPERATIONS PTY LIMITED

PROCEDURE FOR MINE WATER DISCHARGE

Liddell Environmental Management Systems
LEMS-014

Rev. 1 October 2005

OPERATIONS MANAGER'S STATEMENT OF COMMITMENT

This procedure has been prepared by an environmental consultant, the Environmental Manager and various mine personnel to ensure:

- All mine water discharge opportunities that are utilised are carried out in accordance with the general rules and guidelines of the Hunter River Salinity Trading Scheme (HRSTS) and the conditions of Liddell Coal Operations Environment Protection Licence

As Operations Manager, I hereby authorise the Procedure for *Minewater Discharge*.

Signature Operations Manager: [signature] Date 20/3/06

1.0 OBJECTIVES

To establish and maintain a mine water discharge management procedure that ensures:

- All authorised mine water discharges comply with the HRSTS rules and guidelines and conditions of the company's Environment Protection Licence (EPL 2094).
- No pollution of receiving waters.
- All discharge opportunities are fully utilised dependent upon current status of the mine water management system.
- Duly appointed company representatives are familiar with the discharge procedure and are competent to initiate discharge operations.

2.0 SCOPE

This procedure encompasses all mine water discharge operations associated with the release of mine water from Dam 13 at the discharge flume into Bayswater Creek. The following operations are not covered in the context of this procedure but are regulated by either general site water management protocol, legal agreements and inter-company agreements or other company initiatives:

- The import and export of mine water between consenting mining operations;
- Internal mine water operations including recirculation and general usage;
- Drain diversions and pipeline relocation;
- Research initiatives including the establishment of Reverse Osmosis Plant;
- Sewage Treatment Plant operation and maintenance.

3.0 DEFINITIONS

Authorised persons Means in the context of this procedure, those personnel who have authority to undertake actions in relation to mine water discharge operations. Authority is given by the Operations Manager only.

Procedure: System or operation that either may have an effect on the environment, or which is required in order to manage environmental impacts.

Licence: Refers to a licence held under section 55 of the *NSW Protection of the Environment Operations (POEO) Act 1997*.

River Register: Means the register held by the NSW Environmental Protection Agency (EPA) which contains the following information in relation to each block:

- Block Classification
- Block number

	• Block identification period • Total allowable discharge • Sector credit discount factor
Rulebook	Means the NSW EPA Hunter River Salinity Trading Scheme Rulebook.
Total Allowable Discharge:	Means the total amount of salt (i.e. the sum of the discharge of all the Licensees) that may be discharged into a Block, as stipulated on the River Register.

4.0 REFERENCES

- New South Wales Environment Protection Authority (EPA) - Hunter River Salinity Trading Scheme Rulebook, 31st December 2001
- Environment Protection Authority (EPA) Licence No. 2094
- Liddell EMS Register of Site Specific Consents, Licences and Permits

5.0 OVERVIEW OF THE HUNTER RIVER SALINITY TRADING SCHEME ACTIONS

The Hunter River Salinity Trading Scheme (HRSTS) was developed in 1995 and is the result of collaboration between the NSW Department of Land and Water Conservation (DLWC) and the NSW Environment Protection Authority (EPA). The Scheme aims to keep salinity levels in the Hunter River below the agreed trigger levels of 600EC at Denman and 900EC at the Glennies Creek/Hunter River confluence, while permitting participating companies to discharge saline water under certain river flow conditions.

The Scheme is managed through a system of discharge "credits" that determines the volumetric discharge of each participant (also licence holders).

For the purpose of the Scheme, the river has been geographically divided into three (3) sectors. Each sector has specific flow characteristics, for the purposes of this procedure only the flow parameters for the Middle Sector have been shown, as Liddell operations are situated in this sector (Table 1).

Table 1: HRSTS River Sectors and Flow Conditions

	Flow Parameters		
River Sector	Low	High	Flood
Upper	NS	NS	NS
Middle	<1800 ML/d	1800-6000ML/d	>6000ML/d
Low	NS	NS	NS

NS: Not Shown

6.0 ACTIONS

6.1 NOTIFICATION OF A DISCHARGE EVENT

It is the responsibility of the DLWC to inform participants of the Scheme of discharge events. A "River Register" is posted at the EPA's website i.e http://www.epa.nsw.gov.au/hrsts/ and participants are notified by fax of pending events.

The "River Register" details the "Total Allowable Discharge" (TAD) permitted for the event.

6.2 CALCULATION OF THE MINE'S DISCHARGE VOLUME

It is the responsibility of the Licence Holder (participant) to calculate their allowable volumetric contribution to the discharge event based upon the number of credits held (each credit entitles the holder to 0.1% of the TAD) at the time of notification of the event. Attention must also be paid to the company's licence provision (see L4.1) which states that no more than 100ML can be released from the authorised discharge point per day.

The company's credit holding should be verified before commencing any event. This can be done by accessing the abovementioned website.

Use Attachment A (Attachment 1 of this procedure) of the HRSTS Rulebook to calculate the following:

- Available credits
- Salt discharge Limit
- Salt concentration (Adopt a conservative approach adopt EC =6000uS/cm)
- Volume discharge Limit for respective Blocks (Licence Limit prevails over calculated Volume discharge limit, where calculated volume exceeds 100ML)

6.3 DISCHARGE ACTION CHRONOLOGY

After the Volume Discharge Limit has been calculated for the Block, the dam siphons may be opened (unlocked) to reach the appropriate height gradation on the gauge in the discharge flume at Dam 13 to achieve the corresponding discharge flow rate[1]. The appropriate height is obtained by reference to the following table:

[1] Correct height will require adjustment of siphon discharge over a period of approximately 15 minutes.

Table 2: Discharge Point Flow Rating Calculation

Gauge Height	Litres/s	ML/d
0.000	0	0
0.005	4.24	0.366
0.100	26.89	2.324
0.150	81.01	6.999
0.200	151.66	13.10
0.250	234.05	20.22
0.300	325.34	28.11
0.350	423.58	36.60
0.400	528.56	45.57
0.450	635.72	54.93
0.500	747.81	64.61
0.550	836.06	74.57
0.600	980.98	84.76
0.650	1101.20	95.14
0.700	1223.38	105.70
0.750	1347.22	116.41
0.800	1472.24	127.25
0.850	1599.50	138.20
0.900	1727.43	149.25
0.950	1856.36	160.39
1.000	1986.34	171.62
1.050	2112.761	182.94
1.100	2248.49	194.27
1.150	2380.67	205.69
1.200	2507.87	216.68

Note: It is important to ensure that the flow is moderated at a constant rate throughout the entire discharge period in accordance with recent instruction from the NSW EPA.

6.3.1 INFORMATION AND SAMPLING REQUIREMENTS

During the course of discharge operations it is a conditional requirement imposed by the EPA Licence to carry out monitoring of the concentration of certain pollutants. See Table 3 below.

Table 3: Discharge Water Monitoring Requirements

Pollutants	Units of Measure	Frequency	Sampling Method
Conductivity	uS/cm	Continuous during discharge	A probe designed to measure the range 0 to 10,000uS/cm
Total Suspended Solids	mg/L	Daily when wastes discharged	Representative Sample
pH	pH	Daily when wastes discharged	Representative Sample

At least three measurements (height and conductivity) should be collected over the course of the discharge event to ensure that the correct flow rate is being maintained and that the conductivity of the discharge water is not fluctuating. Accordingly when calculating the Volume Discharge Limit for the Block, it is better to adopt a conservative approach that allows for potential conductivity fluctuations.

Measurements are collected by the proprietary interface known as Campbell Scientific Software (PC208W 3.2). To Utilise this program, firstly ensure that the radio link has been established to the datalogger using the proprietary radio link. This software interrogates the information obtained from the datalogger and prepares the information in a suitable format. This program is available on the Environmental Coordinator's computer and also on the Project Engineer's computer.

After the interface program has compiled the information, the calculations previously undertaken relating to the Volume Discharge Limit, may need to be revised. This will only need to occur where the initial conductivity reading used in calculations is less than any reading obtained after the discharge commenced. If this occurs, the Volume Discharge Limit for the Block must be revised down.

A single representative water sample of the discharge water is to be collected during each Block release event in order to carry out a pH and Total Suspended Solids (TSS) analysis. Levels for pollutants are specified in Table 4 below. Relevant HLA personnel are to be contacted to arrange for this sampling to occur.

Table 4: Discharge Water Pollutant Limits

Pollutant	Units of Measure	50 percentile concentration limit	90 percentile concentration limit	3DGM concentration limit	100 percentile Concentration Limit
TSS	mg/L				120

6.3.2 REPORTING REQUIREMENTS

Licence condition R5.1 requires the licensee to compile a written report of its activities under the Scheme for each calendar year. This report must be submitted to the EPA no later than sixty (60) days after the end of each calendar year. The report must contain the following:

(a) The annual scheme report must contain a completed discharge and trading statement for the calendar year in the form of Attachment D to the Rulebook.
(b) Where the licensee has traded credits during the calendar year, the scheme annual report must contain a completed trading record sheet in the form of Attachment C to the Rulebook, showing all trades during the calendar year.
(c) Where the licensee has discharged wastes during the calendar year, the annual scheme report must contain a completed discharge record sheet in the form of Attachment E to the Rulebook showing all discharges during the calendar year.
(d) The results of all monitoring required under the Scheme undertaken during the calendar year
must be included in the scheme annual report.
(e) The annual scheme report must also contain a map showing the location of any Tributary Monitoring Points.

Copies of the reports are to be held in the environmental records system for a minimum retention time of four (4) years.

7.0 RESPONSIBILITIES

Operations Manager

The Operations Manager is responsible for approval and authorisation of this procedure and for the appointment of authorised persons.

Environmental Coordinator

The Environmental Coordinator is responsible for;

- The implementation of this procedure;
- The co-ordination of mine water discharge events including initiating the collection of water samples during a discharge event; and
- Completion of all Licence reporting requirements.

Project Engineer

The Project Engineer is responsible for;

- Siphons are unlocked, activated and that all communication devices (remote telemetry) are functional;
- The establishment of the correct discharge flow rate as measured by the gauge in the discharge flume and maintenance there of;
- Effective communication is maintained with the Environmental Coordinator pre, during and post operational (mine water discharge) events;
- The organisation of supplementary labour in conjunction with the Environmental Coordinator, for the purpose of undertaking mine water discharge operations; and
- Discharge infrastructure including remote telemetry, is maintained in a proper and efficient condition.

Specialist Environmental Contractor

The Specialist Environmental Contractor conducting monitoring is responsible for:

- The collection of water samples and their analysis in accordance with section 6.3.1 of this procedure.
- Reporting any non-conformance to the Environmental Co-ordinator immediately (<24 hours) after laboratory analysis of the sample has been received and reviewed. The consultant must report the non-conformance to the Environmental Co-ordinator by one of the following methods:
    - Fax
    - Telephone
    - Email

Assistant

The Assistant is responsible for undertaking any or all roles delegated to him by the Environmental Coordinator or Project Engineer in relation to mine water discharge operations and for carrying out routine inspections of infrastructure and discharge equipment to ensure that all are maintained in a proper and efficient condition.

7.1 AUTHORISED PERSONS

For the purpose of the execution of responsibilities under this management procedure, the following persons have been duly appointed and have authority to act under this procedure:

- Project Engineer (Doug Head)
- Environmental Coordinator (Ed Wegner)
- Assistant (Campbell Ball)
- Environmental Contractor (as inducted)

8.0 REVIEW

A review of this procedure will be conducted at least every two years or as required. Any revisions must be recorded on the footer, in colour.

9.0 ATTACHMENTS

Attachment 1 Hunter River Salinity Trading Scheme Rulebook

Attachment A

DISCHARGE WORKSHEET

* 1 per discharge per authorised discharge point

1. Application of Rulebook Formulae

1.1 Formula 1: Determine Available Credits

E ________ = Cr ________ X D ___________

1.2 Formula 2: Determine Salt Discharge Limit

L__________ = T__________ X E__________/1000

1.3 Formula 3: Determine Salt Concentration of Discharge Water

C__________ = EC__________x F__________ / 1000

1.4 Formula 4: Determine Discharge Volume Limit

V__________ = L__________/ C__________

1.5 Note Site Discharge Start and Finish Times (from River Register)

Allowable Start Time__________________

Required Finish Time __________________

2. Record of Actual Discharge

Time Discharge Commenced________________ Time Discharge Ceased ________________

3. Monitoring During Discharge

Time of Sampling	Release Rate (ML/day)		Conductivity (uS/cm)
MEAN of Samples			
TOTAL VOLUME		ML	
TOTAL SALT		TONNES	

All the above information is a true and accurate record of calculations, discharges and monitoring that took place on the date shown. I have completed this form within 2 days of discharge commencement.

Signed ________________________________ Date______________

Position______________ Licence Holder ______________ Licence Number ________