Water Management Plan

For the Invincible Open Cut Coal Mine Extension

June 2009

Coalpac Pty Ltd
Invincible Colliery
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Water Management Plan
Invincible Open Cut Coal Mine Extension

Revision History *

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1 INTRODUCTION

1.1 Background

The Invincible Open Cut Coal Mine Extension (the Project) is located approximately 20 km northwest of Lithgow and 3 km southeast of the township Cullen Bullen on the Castlereagh Highway. The Project is owned and managed by Coalpac Pty Ltd with Big Rim Pty Ltd being the mining operator.

The Project will employ open cut and highwall mining methods and progressively increase production from 500,000 tonnes per annum to an annualised rate of 1.2 million tonnes per annum or 100,000 tonnes per month.

Coalpac Pty Ltd (Coalpac) secured contracts with Delta Electricity to supply coal to the Mt Piper Power Station and to domestic locations other than power stations. A Project Application was subsequently submitted to the Department of Planning (DoP) for approval of the extension of open cut operations at Invincible Colliery. Project Approval 07_0127 for the extension was granted on the 4 December 2008 by the Minster for Planning, subject to a number of conditions.

This Water Management Plan (WMP) has been prepared in accordance with Schedule 3, Condition 13 of PA 07_0127, and defines the specific environmental objectives for the mine in relation to water management and monitoring. This WMP also sets out the strategies and operational procedures to be implemented on site to ensure all legislative requirements with respect to water management are met.

A site location plan is presented in Figure 1.

1.2 Scope

Project approval for the Project was granted on 4 December 2008, and is subject to a number of conditions, some of which relate to water management. Specifically, condition 13 of schedule 3 requires the development and implementation of a Water Management Plan, which includes:

(a) a Site Water Balance (Section 7);
(b) an Erosion and Sediment Control Plan (Section 8);
(c) a Surface Water Monitoring Program (Section 9).
(d) a Groundwater Monitoring Program (Section 10); and
(e) a Surface and Groundwater Response Plan (Section 11).

The specific project approval conditions relevant to this WMP, and where they are addressed in this document, are detailed below in Section 4.
Figure 1: Invincible Open Cut Coal Mine Extension Site Location Plan
2 DEFINITIONS

pH
measure of acidity and alkalinity

O & G
Oil and Grease

TSS
Total Suspended Solids

DECC
Department of Environment and Climate Change

EPA
Environmental Protection Authority

PA
Project Approval

Ec
Electroconductivity

WMP
Water Management Plan

ML
Megalitre (one million litres)

µS/cm
Microsiemens per centremeter standard measure of conductivity

EPL
Environmental Protection Licence

EA
Environmental Assessment

Aquifer
Water-bearing rock formation

AEMR
Annual Environmental Management Report.
3 CONSULTATION WITH RELEVANT AGENCIES REGARDING THIS WATER MANAGEMENT PLAN

Condition 34 of schedule 3 requires Coalpac to prepare the WMP in consultation with Department of Water and Energy (DWE). In accordance with the required condition, this WMP has been developed in consultation with the DWE. Contact between Coalpac and DWE was made on 19 May 2009 regarding any additional requirement other than those stipulated within PA 07_0127. No additional requirements were requested by the DWE.

4 STATUTORY REQUIREMENTS

4.1 Legislation and Guidelines

The relevant conditions of project approval PA 07_0127, and where they are addressed in this document, are detailed below in Table 1.
### Table 1
Relevant Conditions of Project Approval PA 07_0127

<table>
<thead>
<tr>
<th>Condition</th>
<th>Condition Requirement</th>
<th>Section in this WMP where addressed</th>
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| **Water Management Plan** | The Proponent shall prepare and implement a Water Management Plan to the satisfaction of the Director-General. This Plan must:  
(a) be prepared in consultation with DWE;  
(b) be submitted to the Director-General for approval prior to 30 May 2009; and  
(c) include:  
· a Site Water Balance  
· an Erosion and Sediment Control Plan;  
· a Surface Water Monitoring Program;  
· a groundwater management program; and  
· a surface and groundwater response plan. | Section 7 & 8 & 9 & 10 & 11 |

**Schedule 3 Condition 13**

| Water Management Plan | The Site Water Balance must include details of:  
(a) sources and security of water supply;  
(b) water use and management on site, as well as any off site water transfers; and  
(c) measures to minimise water use by the Project. | Section 7 & 7.2 & 7.3 & 7.4 & 7.5 |
| Erosion and Sediment Control Plan | The Erosion and Sediment Control Plan must:  
(a) be consistent with the requirements of Managing Urban Stormwater: Soils and Construction manual (Landcom 2004, or its latest version). | Section 8 |
| Surface Water Monitoring Program | The Surface Water Monitoring Program must include:  
(a) detailed baseline data on surface water flows and quality in the watercourses that could be affected by the development;  
(b) surface water impact assessment criteria, including trigger levels for investigation potentially adverse surface water impacts of the development; and  
(c) a program to monitor surface water flows and quality in watercourses that could be affected by the development. | Section 9 & 9.1 & 9.2 & 9.3 |
| Groundwater Monitoring Program | The Groundwater Monitoring Program must include:  
(a) baseline data of groundwater levels and quality in the region, including details of any privately-owned groundwater bores which could be affected by the development;  
(b) groundwater impact assessment criteria, including trigger levels for investigation potentially adverse groundwater impacts of the development; and  
(c) a program to monitor: (1) groundwater inflows to the open cut mining operations and (2) impacts of the development on the region’s aquifers, groundwater bores and surrounding watercourses. | Section 10 & 10.1 & 10.2 & 10.3 & 10.4 |
| Surface and Groundwater Response Plan | The Surface and Groundwater Response Plan which describes the measures and/or procedures that would be implemented to:  
(a) respond to any exceedances of the surface water and groundwater assessment criteria; and  
(b) compensate landowners of privately-owned land whose water supply is adversely affected by the development. | Section 11 & 11.1 & 11.2 |
4.2 Licences and Approvals

4.2.1 Environmental Protection Licence

Environmental Protection Licences (EPL) are administered by the Department of Environment and Climate Change (DECC), under the Protection of the Environment Operations Act 1997 (POEO Act 1997). Water quality criteria for the Project are detailed within sections L3.3 and M2.1 of EPL 1095.

4.2.2 Project Approval Consent

The Invincible Open Cut Coal Mine Extension project approval consent requires compliance with water management specifically outlined within conditions 12 and 13 of schedule 3.

4.3 Discharge

Except as may be expressly provided for by an EPL, or in accordance with section 120 of the Protection of the Environment Operations Act 1997 and condition 12 of schedule 3 Coalpac shall not discharge any mine water from the site.

4.4 Guidelines

Key guidelines which are relevant to the preparation and implementation of this WMP include:


4.5 Potential Impacts and Key Issues

Water discharged from the Project flows into the upper catchment of the Turon River. The potential for the Project to impact on water quality is the key environmental issue addressed within this WMP. The risk of contamination of surrounding watercourses as a result of mining activities is primarily due to the potential presence of the following in the discharge water.

(a) Excess total suspended sediment (TSS).

(b) The presence of oil and grease.

(c) pH levels outside the specified EPL range.

These risks are addressed by various pollution control structures, including sediment traps, ponds, oil/grease traps, and regular monitoring to identify any potential issues. Pollution control structures, including maintenance and monitoring procedures are described in detail in the following sections of this WMP.
5 OBJECTIVES

The principal objectives of this WMP at the Project include the following.

(a) To ensure all legislative requirements with respect to water management at the Project are met; including project approval conditions associated with 07_0127, as well as Environment Protection Licence (EPL) 1095 conditions.

(b) Maintain the segregation of ‘clean’ and ‘dirty’ water, and install and maintain appropriate pollution control structures to ensure any discharges are kept to a minimum and comply with water quality criteria outlined in EPL 1095.

(c) Implement best practice water management procedures across the site to ensure that any environmental impacts related to surface and ground water are minimised.

6 SURFACE WATER ENVIRONMENT

6.1 Rainfall and Climate

The Project lies within a cool-temperate climatic zone and is characterised by mild summers and cold winters. The local climate is largely influenced by factors such as topography, altitude, aspect and exposure.

Average annual rainfall at the Bureau of Meteorology station at Bathurst (Station No. 063291) is 578mm. At the higher elevation surrounding the Newnes Plateau average annual rainfall is greater, at 853.5 mm. Rainfall is seasonably distributed, with higher falls generally occurring in summer through to early autumn, and the lowest rainfall months generally being in winter and spring.

6.2 Topography

The Project is located on the western fall of the Great Dividing Range, which consists of an elevated plateau deeply intersected by rugged cliff lined valleys. The topography of the open cut extension area mainly consists of high Blue Mountains plateau terrain, with the western boundary running roughly parallel to, and west of, the outcrop of the Lithgow seam. The open cut extension area is located just within the outcrop of the seam and is characterised by flat undulating land adjacent to the outcrop rising to steeper land in the east.

6.3 Drainage

6.3.1 Regional Drainage

The Project is located within the upper extent of the Turon River catchment within the broader Burrendong Catchment Area, a catchment which drains to the west and is not in Sydney’s drinking water catchment. Burrendong Dam is located near Wellington, approximately 100 km northwest of the Project Site. Two towns, Sofala and Hill End, are located directly downstream of the site, however, neither draw surface nor groundwater for potable drinking water supplies.

Regional drainage flows in a northerly direction along the Turon River, then westerly into the Macquarie River and eventually into the Darling River which is the main natural drainage line in western NSW.
6.3.2 Local Drainage

Surface runoff from the Project flows in a westerly direction through grazing land along natural watercourses to Dullhunty Creek, which then flows northwards to the Turon River. There are no permanent water flows or creeks within the Project Site, and apart from surface water runoff, which is intermittent and occurs only in wet weather, the only surface water in the vicinity is the Main Colliery Dam, the large dam below the Invincible Coal Preparation Plant (ICPP) and ROM areas as shown in Figure 2.

6.4 Soils

The environmental assessment (EA) conducted as part of the development application process for the open cut coal mine extension identified three different soil landscapes in the area. These are briefly described below (Source: R.W.Corkery & Co., 2008). The soil characteristics of the three landscapes described below have all been taken into consideration when determining appropriate management and mitigation strategies in this WMP, leading to a conservative approach towards erosion and sediment control being applied.

Colluvial Landscape (Hassans Walls – hw)

This soil landscape comprises cliffs derived from the Narrabeen Group sandstones which are prone to weathering by undercutting and rock falls or creates severe rock fall hazards. The soils within this landscape tend to be shallow Lithosols / Siliceous Sands on cliff ledges, moderately deep Lithosols/ Siliceous Sands on the tops of talus slopes, yellow and brown moderately deep Podzolic soils on the mid-slopes of the talus slopes and shallow to deep Sand / Lithosols on the lower slopes and valley floors.

Erosion within this landscape is characterised by severe sheet erosion and rock falls.
Erosional Landscape (Cullen Bullen - cb)

This landscape comprises rolling low hills and rises on the Illawarra Coal Measures and the Berry Formation. Soils within this landscape range from shallow to moderately deep Yellow Podzolic soils and Yellow Earths on the crests, Yellow Podzolic Soils, Soloths, and Yellow Leached Earths of moderate depth on the upper and mid-slopes, and the lower slopes and in narrow drainage lines have moderately deep to deep yellow Solodic Soils and Yellow Podzolic Soils.

Erosion within this landscape includes minor sheet erosion and moderate gully erosion in drainage lines in areas where the ground has been disturbed by clearing activities. In specific areas on steeper slopes, severe sheet and rill erosion has occurred.

The topsoils are hard setting and the landscape is described as having a high water erosion hazard and high run-on.

Disturbed Landscape (xx)

This additional landscape unit was used in the environmental assessment to identify areas of land which have been extensively disturbed by previous or existing land-users, such as the previous mining activities at Invincible Colliery.

The erosion hazard within this unit varies, from level landfill areas which are generally topsoiled and stabilised so that erosion problems are limited, to sheet and rill erosion on bare topsoil batters, to some mass movement on highwalls and steep embankments.

7 SITE WATER BALANCE

This site water balance has been prepared in compliance with condition 13 of schedule of Project Approval 07_0127, and reviews site water requirements, available water storage and site transfers in order to present a water balance for the Project. More specifically, the water balance contains details of:

(a) Water requirements on site (Section 7.1);
(b) Water sources (Section 7.2);
(c) Water security (Section 7.3);
(d) Surface water management (Section 7.4);
(e) Site water transfers and discharge (Section 7.4.3);
(f) Measures to reduce water usage (Section 7.5);
(g) Groundwater Management (Section 7.6);
(h) Sewage Treatment (Section 7.7); and
(i) Project site water balance (Section 7.8).

This is meant to represent water management within the Project on an annual basis and provides an adequate overview of water management within the Project.

The water balance is provided for dry, average and wet years (10th, 50th and 90th percentile rainfall years). A summary of the water balance is detailed in Section 6.8.3.
7.1 Water Requirements

Water use onsite is primarily for the Invincible Coal Preparation Plant (ICPP), dust suppression on the internal haul road, and within active areas of the open cut. In addition, some potable water is used for drinking and bathhouse facilities which are supplied via the Fish River Dam Water Supply main pipeline.

The yearly potable water requirement for the Project is approximately 7KL/year (01/07/07 to 30/06/08).

Current dust suppression water usage for the Project is as follows.

(a) **Dry conditions**: 18 loads of a 30kL water cart, 5.4 days per week. This equates to a water usage of approximately 540kL/day.

(b) **Wet conditions**: 6 loads of a 30kL water cart, 5.4 days per week. This equates to a water usage of approximately 180kL/day.

The mean number of rainfall days in a year recorded at the Bureau of Meteorology’s Bathurst Station (No. 063291) is 126 days, which equates to wet days 35% of the time. Since current dust suppression equipment operates for approximately 5.4 days per week, or 281 days per year, based on the percentage of wet days it can be assumed that there are 98 wet days and 183 dry days during operation of the water cart. Using the dust suppression water usage figures above, this equates to approximately 116ML/year for dust suppression.

Projected ICPP daily water usage is as follows.

(a) **Average daily water usage for the Project**: the projected average daily water usage is approximately 0.466ML (based on the ICPP operating 250 days per year) or 116.55ML per year.

7.2 Water Sources

Potable water for the Project is sourced from the Fish River Dam Water Supply main pipeline system. Process water for dust suppression and the ICPP is generally supplied from water stored on site in the Main Colliery Dam.

Apart from the runoff received within the catchment of the Main Colliery Dam, this dam also receives water pumped periodically from:

(a) existing settlement ponds within the Project Site; and

(b) water accumulated in the open cut pits.

7.3 Water Security

Water security for the Project is reduced during periods of low rainfall and extended dry periods. The ability to pump water from the open cut and settlement ponds to the Main Colliery Dam allows for increased water supply during periods of unfavourable conditions.

Water from within the underground workings is currently accessed on a minimal basis through the use of one bore, although an additional bore has been installed but is not currently in use. The Project is predominantly reliant on surface water runoff and the re-use of primary filtered tailings water which is diverted into the Main Colliery Dam. The current use of underground workings water is estimated at approximately 0.071 ML per day, or 26 ML per year.
Approximately 25\% of the rainfall and runoff from the open cut mine extension may be captured and available for use.

An additional 52 ML of process water may be sourced from two bore pumps located behind the ICPP and site office. Additionally, Coalpac has commissioned an access and safety management plan for the recommissioning of air actuated pumps located within the main roadway of the underground workings. Previous flow rates of these underground pumps is estimated at approximately 0.1 ML per day or 0.3 to 0.4 ML per week as it is expected that these pumps would generally operate for approximately 3 to 4 days to allow for recharge.

The water balance for the Project (see Section 7.8.3) indicates a yearly water deficit of approximately 22.48ML during average rainfall and 111.35ML during reduced (dry) periods and an excess of 92.90ML during extended (wet) rainfall periods under projected operating conditions as described in Section 7.1.

In addition to current and future water requirements, Coalpac has investigated several options to cease and/or restrict the use of the ICPP during mining operations. This option would ultimately reduce operating costs and intern water consumption, which, may increase water availability and reduce the requirements for underground workings water from the Project Site.

### 7.4 Surface Water Management

#### 7.4.1 Water Streams

The water streams within the Project can be divided into the two categories listed below.

(a) **Dirty water.** This generally comprises stormwater runoff generated in disturbed areas of the open cut, around the pit top, ICPP area, and the rejects area east of the haul road. This water has the potential for contamination from sources such as sediment and coal fines and/or oil and grease.

(b) **Clean water runoff.** This comprises runoff from undisturbed parts of the lease and surrounding catchments.

Water management within the Project is centred on the separation of ‘clean’ and ‘dirty’ water. All attempts will be made to divert clean water runoff around the site so as to avoid contamination and reducing the pressure on the dirty water management system. The volume of dirty water to be treated is therefore minimised by both limiting the contamination of clean water, and through maximising the re-use of dirty water for dust suppression and other process water requirements as necessary (i.e. wetting down of coal stockpiles and use within the open cut).

The following sections describe the systems in place to manage these water streams. The physical attributes of the system are also described.

#### 7.4.2 Dirty Water Management

Dirty water is predominantly generated by stormwater runoff from a number of areas around the Project. The management of water from these areas is described below (see Figure 3).

**Open Cut Disturbed Areas**

The only water collected in the open cut mine extension area is generated from stormwater runoff, as there is minimal (if not no) groundwater seepage into the pit (see Section 9.3).
Water collected as run off in the open cut will generally drain to sumps within the active mining area(s) where it may naturally seep underground. Coalpac would generally pump water collected within these sumps to sediment dams for treatment prior to re-use for dust suppression as required. No water from the open cut will be pumped to underground workings for disposal, as was specified in the Environmental Assessment.

Runoff from the internal haul road is generally contained in road side sumps, which allow water to be treated and sediment to settle out prior to re-use for dust suppression. Sumps along the haul road are regularly cleaned to maintain sediment storage capacity.

Rehabilitated Areas

In addition to water collected in the open cut mine extension area, runoff from the rehabilitated landforms on the western side of the previous open cut operations is collected in existing settlement ponds. There is still some exposed ground in this rehabilitated area, and as such, runoff is treated as dirty water. The settlement ponds are connected via a drainage bund to the ‘existing settlement ponds’ (see Figure 2) where sediment is able to settle out of the water. From here, water is generally pumped preferentially for use in dust suppression. Water would only overflow from the existing settlement ponds via a spillway during prolonged periods of heavy rainfall (i.e. storm events). It is noted that in any event, overflow from the sediment ponds would traverse vegetated areas to a substantial dam west of the open cut coal mine extension, located on land owned by Coalpac.

The capacity of the ‘existing settlement ponds’ is estimated at 1.78ML. Based on Blue Book calculations for soils classified as Type F and D type, the required capacity of ponds to ensure adequate treatment of water prior to discharge is approximately 1.6ML. The current capacity of the settlement ponds exceeds this capacity, although the current management practice typically results in no direct overflow from these ponds to the downstream environment.

ICPP, Pit Top and Rejects Area

Stormwater runoff generated around the ICPP, reject area east of the haul road and the Pit Top flows into the Main Colliery Dam (see Figure 2). Discharge from this dam is via licensed discharge point 2 controlled by EPL 1095. This is a wet weather discharge point.
**Figure 3: Invincible Open Cut Mine Water Management Plan**
7.4.3 Clean Water Management

Open Cut Disturbed Areas

Clean water will generally be diverted around active areas of the open cut through the use of earth bunds and low flow contour banks were practicable. Due to the Project intersecting several remnant drainage lines the ability to completely control clean water flows during extended rainfall may be limited. As a result, the open cut may be utilised as a temporary storage facility during periods of extended rainfall. Water captured within the open cut may be used for dust suppression and/or pumped to sediment dams for additional treatment prior to re-use within the Project.

Rehabilitated Areas

Rehabilitated areas within the Project are not fully established due to their age structure. As a result, bare ground is visible in some areas of rehabilitation. Due to the increased likelihood of surface water runoff, rehabilitated areas have been classified as dirty water (see Section 7.4.2).

ICPP, Pit Top and Rejects Area

Clean water entering the ICPP, Pit Top and Rejects area is generally intersected by the underground workings through minor subsidence and surface cracking in areas which have been previously open cut mined (i.e. Cullen Main East Open Cut). Clean water is predominately diverted into the Main Colliery Dam during periods of extended rainfall as discussed in Section 7.4.2.

Current dam storage capacity volumes at the Project are detailed in Table 2.

Table 2: Dam storage capacities at Invincible Colliery

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<th>Water Storage</th>
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<tr>
<td>Main Colliery Dam</td>
<td>112,000</td>
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<td>Settlement ponds (includes ‘existing settlement ponds, and sumps along the haul road)</td>
<td>3,000</td>
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<td>TOTAL</td>
<td>115,000</td>
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7.4.4 Site Water Transfers and Discharge

Discharge from the Project can potentially occur at three points; licensed discharge points 1 and 2, and from the ‘existing settlement ponds’.

Licensed discharge point 1 is located east of the Project on the Cox’s River fan site. Water has not been discharged at this location since approximately August 2008, however, it may be an important control for the future dewatering of sections of the Invincible underground mine.

Licensed discharge point 2 is located on the overflow of the Main Colliery Dam. The capacity of the of the Main Colliery Dam is sufficient to ensure that water is adequately treated prior to any possible discharge during heavy rain events, which would be via overflow from the dam spillway.
Furthermore, water is typically not discharged from this dam mainly due to increased surface water management structures (i.e. haul road bunds and site rehabilitation).

Whilst discharges could potentially occur from the ‘existing settlement ponds’, the usage and transfer practices discussed in Section 7.3.2 ensure that minimal discharges would occur from these ponds under most rainfall conditions. Only during extreme rainfall events could a potential discharge occur from these ponds.

The open cut may act as a temporary water storage device during periods of extended rainfall. Where possible and practicable, Coalpac would create earth bund directly upstream of cleared and active mining areas, which would generally minimise clean water entering the Project Site. Water within cleared and active mining areas would be treated and managed as dirty water treated prior to re-use for dust suppression. Water entering the open cut would not be discharged from the Project Site during operations.

### 7.5 Measures to Reduce Water Usage

Coalpac is committed to reducing water usage from the ICPP and Site Offices through periodic inspections of water valves, pipelines and taps to ensure adequate seals and containment of process and potable water supplies. Replacement of valves, pipes etc will be required as soon as practicable as to limit the loss of water from within the ICPP and Site Office.

Limiting the throughput of the ICPP may significantly reduce the water usage within the Project. Current estimates of water usage within the ICPP are 333L of process water per tonne of ROM coal processed. A reduction in the processed tonnes through the ICPP would increase water availability within the Project Site.

Dust suppression requirements within the winter and/or cooler months may be reduced as evaporation rates would generally decrease as a result of low atmospheric temperatures. The requirements of water application to the internal haul road and the sealed road network may decrease, potentially allowing for a daily reduction in water requirements. Inspections of the haul road and sealed road networks would be carried out periodically throughout the life of the Project, with the aim of reducing water consumption for dust suppression whilst maintaining the haul road and sealed roads in such a manner that minimises additional or excessive dust generation.

### 7.6 Ground Water Management

There are no up-dip reservoirs of recharge waters in the vicinity of the open cut operations. Given that the seams are drained by underground workings to the east of, and lower than, the seams mined in the open cut extension, there is no groundwater seepage into the active pit. As such, the open cut operations have no predetermined significant effect on the local or regional water table or on groundwater quality located below the floor of the Lithgow seam.

### 7.7 Sewage Treatment

Sewage from the toilets and showers at the site office are treated by the existing septic tanks. Sewage from the toilets and showers for the open cut workforce are emptied periodically and maintained by licensed contractor(s).
7.8 Project Site Water Balance

7.8.1 Water Inputs

Given that there are no permanent water flows or creeks within the Project Site, the only input to this water balance is rainfall runoff, as detailed below.

Rainfall and Runoff

The water balance considers rainfall and runoff generated by low (annual 10th percentile), average (annual 50th percentile) and high (annual 90th percentile) rainfall years for the City of Bathurst. Rainfall data is provided by the Bureau of Meteorology (station number 063291). Statistical period is between 1994 and 2009.

Rainfall is as follows.

(a) Annual 10\textsuperscript{th} percentile (dry year): 365.8mm

(b) Annual 50\textsuperscript{th} percentile (average year): 578mm

(c) Annual 90\textsuperscript{th} percentile (wet year): 853.5mm

Rainfall is reasonably well distributed throughout the year, although fluctuations are experienced throughout each season.

To determine the annual average runoff generated, the Project has been divided into three catchments. These catchments are as follows.

(a) Rehabilitated areas;

(b) Open cut mining area; and

(c) ICPP, stockpiles, rejects and Pit Top Area.

The following key assumptions have been made in estimating the runoff from these catchment areas and in developing the water balance.

(a) A runoff coefficient of 0.4 has been applied to the open cut mine extension area and the ICPP area, given that these areas are disturbed;

(b) A runoff coefficient of 0.4 has also been applied to the rehabilitated areas, as the vegetation has not yet been successfully established on these areas, and hence there is still some exposed ground; and

(c) Runoff from the internal haul road between the open cut mine extension area and the Pit Top has been excluded from the water balance, as it is assumed that this runoff is adequately stored and treated in sumps along the haul road.

A summary of the annual runoff generated within the Project during average, wet and dry years based on the above assumptions is given in Table 3.
Table 3
Annual runoff generated during average, dry and wet rainfall years

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Area (ha)</th>
<th>Runoff Coefficient</th>
<th>Average Year</th>
<th>Dry Year</th>
<th>Wet Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rehabilitated Areas</td>
<td>4.7</td>
<td>0.4</td>
<td>10.87</td>
<td>6.88</td>
<td>16.05</td>
</tr>
<tr>
<td>Open Cut Mine Extension Area</td>
<td>55</td>
<td>0.4</td>
<td>127.16</td>
<td>80.48</td>
<td>187.77</td>
</tr>
<tr>
<td>ICPP &amp; Pit Top Area</td>
<td>45</td>
<td>0.4</td>
<td>104.04</td>
<td>65.84</td>
<td>153.63</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>242.07</strong></td>
<td></td>
<td><strong>153.20</strong></td>
<td><strong>357.45</strong></td>
<td></td>
</tr>
</tbody>
</table>

Invincible Coal Preparation Plant (ICPP)

It is estimated that the ICPP will require approximately 333L of process water per tonne of ROM coal processed. Based on these requirements, it is expected that a 116.55ML/yr of process water is required (based on a projected ICPP throughput of 350,000t/yr ROM coal).

Evaporation Losses

The average annual evaporation loss from the existing settlement ponds and the Main Colliery Dam is estimated at approximately 32ML/yr. The assumptions used in calculating this evaporation loss are as follows.

(a) Annual evaporation is estimated to be 1,340mm/yr. This has been derived from data obtained by the Bureau of Meteorology station 063291 at Bathurst (evaporation data is not collected at Lithgow).

(b) The average annual evaporation loss has been multiplied by a factor of 0.7, to account for the fact that the ponds are not always full. Average annual evaporation losses have been calculated as follows: Annual evaporation x Surface area x 0.7.

(c) The surface area of the Main Colliery Dam and the settlement ponds has been estimated at 3 hectares and 0.4 hectares respectively, when full.

7.8.2 Water Outputs

Dust Suppression

The use of water within the Project is primarily for dust suppression on the internal haul road, and within active areas of the open cut. The average annual usage of water for dust suppression has been estimated at 116ML/yr (see Section 7.1).
7.8.3 Water Balance

The water balance for the Project is provided for dry, average and wet years (10th, 50th and 90th percentile rainfall years) and is presented in Table 4.

<table>
<thead>
<tr>
<th>Inputs and Outputs</th>
<th>Avg Yr (ML)</th>
<th>Dry Yr (ML)</th>
<th>Wet Yr (ML)</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT: Surface Water Runoff</td>
<td>242.07</td>
<td>153.20</td>
<td>357.45</td>
</tr>
<tr>
<td>OUTPUT: Evap. Losses, Dust suppression &amp; ICPP</td>
<td>264.55</td>
<td>264.55</td>
<td>264.55</td>
</tr>
<tr>
<td>BALANCE</td>
<td>-22.48</td>
<td>-111.35</td>
<td>+92.90</td>
</tr>
</tbody>
</table>

The water balance presented in Table 4 demonstrates that there is an excess of water within the Project during wet years and deficit during average and dry years. During wet years it is expected that a portion of the 92.90ML of excess water may require storage for future usage. Current water storage capacity within the Project is approximately 115ML (i.e. 112ML in Main Colliery Dam and 3ML in settlement ponds). Additional water storage capacity may be required as to facilitate the water balance prediction during wet rainfall years and will be determined on an as needed basis to further increase water security and availability. During periods of extended rainfall the overflow spillway from the Main Colliery Dam is a licensed discharge point (LD002), which may overflow as a result of excess water.

As discussed above in Section 7.4.2, the existing settlement ponds collecting runoff water from the rehabilitated areas and internal haul road are of sufficient capacity according to Blue Book standards to ensure adequate settlement of sediment prior to discharge. However, water levels in these ponds are adequately maintained through management practices (see Section 7.4.2).

8 EROSION AND SEDIMENT CONTROL PLAN

8.1 Introduction

In compliance with condition 13 of schedule 3, this Erosion and Sediment Control Plan (ESCP) has been prepared in accordance with the Landcom’s Managing Urban Stormwater: Soils and Construction Manual, 2004 (the ‘Blue Book’).

The ESCP is structured as follows.

(a) Section 8.2 - identifies activities that could cause soil erosion and generate sediment.

(b) Section 8.3 – describes the management principles to be implemented, and measures to minimise soil erosion and the potential for the transport of sediment to downstream waters.
(c) **Section 8.4** – describes the actual and proposed functions and capacity of erosion and sediment control structures within the Project.

(d) **Section 8.5** – describes measures to be implemented to decommission structures over time.

### 8.2 Soil Erosion and Sedimentation Sources

During operations within the Project, erosion and sedimentation may result directly or indirectly from the following sources.

(a) Surface water runoff from active mining areas, including areas cleared ahead of mining;

(b) Surface water runoff from topsoil and overburden stockpile emplacements prior to rehabilitation works;

(c) Surface water runoff from the ICPP and its surrounds;

(d) Surface water runoff from rehabilitated areas prior to the successful establishment of vegetation; and

(e) Surface water runoff from the haul road and internal road network at erosive velocities.

### 8.3 Erosion and Sediment Management Principles

The principal objective of surface water management within the Project is to ensure that in the unlikely event of water discharging from the Project the water quality meets and/or exceeds the appropriate quality standards outlined in EPL 1095. **Figure 4** defines the local tributaries which the Project is situated in. This objective is intrinsic to erosion and sedimentation designs and controls, and is achieved by implementing where applicable the following principles.

(a) Separating undisturbed, ‘clean water’ runoff from disturbed, ‘dirty water’ runoff to minimise and isolate the amount of ‘dirty water’ to be treated and disposed off;

(b) Directing sediment-laden runoff into designated sediment control retention ponds and structures;

(c) Diverting ‘clean water’ runoff unaffected by the operations away from disturbed areas and if appropriate off the Project Site;

(d) Maintaining sediment control structures to ensure that the designed capacities are maintained for optimum settling and retention of sediments; and

(e) Implementing an effective revegetation and maintenance program for the Project Site.
Figure 4: Local and Project Site Drainage
8.4 Erosion and Sediment Controls

The following subsections detail erosion and sediment controls and management procedures for the Project.

8.4.1 Minimal Disturbance

Land disturbance will be minimised where practicable and feasible by clearing the land ahead of extraction activities and leaving this disturbed area for the shortest possible time. Generally vegetation clearing and soil stripping will not be undertaken until earthwork operations are ready to commence. The proposed erosion and sediment control measures outlined within this Plan will be implemented in advance of, or in conjunction with, clearing and stripping operations where applicable. All operations will be planned to ensure that there is minimal damage to trees outside the limits to be cleared, unless in the unlikely event of a bushfire and/or emergency.

8.4.2 Management of Soil Stockpiles

Top and subsoil stripping within disturbed area will be undertaken, as far as practicable, when the soil is in a slightly moist condition thus reducing damage to soil structure. Stripped soil will be placed directly onto the areas prepared for rehabilitation and spread immediately if excavation sequences, equipment scheduling and weather conditions permit.

If longer term stockpiling of topsoil is required (i.e. greater than 6 months) a maximum stockpile height of 2m for topsoil and 3m for subsoil will be maintained to preserve biological viability and reduce soil deterioration. Soil stockpiles will be sown when climatic conditions are favourable with a sterile cover crop (annual species) or pastoral seed mix. The maximum height for subsoil stockpiles will be three metres.

Where the soil stockpile(s) are not wholly contained within the mining area and associated “dirty” water management system, temporary sediment control measures such as sand bags and silt fences will be used to prevent sediment from leaving the area. Stockpiles will be placed in areas so as to avoid impediment of natural localised drainage lines and minimise the likelihood of water pooling against the stockpile.

Low flow contour banks as per SD 5-5 of Landcom (2004) would be constructed (see Figure 5) upstream and silt-stop fencing would generally be installed downstream (see Figure 6) of stockpiled material as per SD 6-8 of Landcom (2004) which was not designated to be re-spread within 3 months of the stockpile being established.

Topsoil will be re-spread in the reverse sequence to its removal, so that the organic layer, containing any seed or vegetation, is returned to the surface. Topsoil will be spread onto the contoured landscape to a minimum depth of 50mm on 1:3 (V:H) or steeper slopes and to a minimum depth of 100 mm on flatter slopes. Re-spraying on the contour will aid runoff control and may increases moisture retention for subsequent and future plant growth.

Re-spread topsoil will be levelled to achieve an even surface, avoiding a compacted or an over-smooth finish. Ripping of topsoil and contour drains will occur just prior to seed application. This process has been demonstrated at the Cullen Valley Mine and within the previous open cut operations with positive seed germination and subsequent plant growth. Ripped topsoil allows for greater water ingress and soil crusting, reducing evaporation and soil erosion.
Figure 5: Low flow contour bank

Figure 6: Silt-stop fencing
8.4.3 Clean Water Diversions

Clean water runoff from catchments to the north and east of the Project would generally be prevented from entering disturbed areas through the use of soil and vegetation bunds. These bunds generally divert and reduce the volume of clean water entering the open cut, minimising dirty water generation. In the event that clean water enters the open cut, which would act as a temporary storage device Coalpac would preferentially pump and treat this water in settlement dams located within the Project Site.

Clean water outside of the Project Site would not be interfered with by mining operations, with every effort made to minimise clean water entering the open cut area. In the event that clean water is stored outside of the open cut area Coalpac will generally construct a level spreader (see Figure 7) as per SD 5-6 of Landcom (2004) to ensure an even distribution of water during discharge.

![Figure 7: Level spreader](image-url)
8.4.4 Dirty Water

As the open cut area is progressively established to the west and south of the existing open cut area, land preparation activities such as vegetation clearing, soil stripping and overburden removal would be undertaken at or near surface level. During this stage, surface water flowing over these disturbed areas could potentially discharge from the Project Site and ultimately enter natural drainage lines. In order to prevent the discharge of dirty water flows during this phase of operations in the West Pit Area (Figure 2), a 15m high earth bund would be constructed downstream of the open cut, which may act as a water separation structure.

Dirty water generated as a result of mining operation upstream of the earth bund would be adequately stored in temporary dams and preferentially pumped to additional water storage devices and/or used for dust suppression.

The use of a low flow contour bank(s) (see Figure 5) within the Project would generally allow for water to be diverted to a sediment basin(s) which would store dirty water and provide an opportunity for suspended sediment to settle from the water before being re-used within the Project. The size and storage capacity of the sediment basin(s) would be designed (see Figure 8) in accordance with the design detail provided by SD 6-4 of Landcom (2004). The water captured in the sediment basins would generally be used preferentially for dust suppression.

![Figure 8: Sediment basin design](image-url)
8.4.5 In-Pit Water Management and Sediment Removal

Water collected in the active open cut mine extension area would generally be pumped to temporary and/or permanent settlement dams outside of the active mining blocks, allowing for suspended solids to settle out. Once this water has been treated it would generally be used for dust suppression or potentially for use in rehabilitated landforms within the Project. The potential for water to naturally seep into the underground is present during mining operations. No water from the open cut will be pumped directly into underground workings for disposal, as was specified in the EA.

Runoff from the internal haul road is contained in road side sumps, which allow water to be treated and sediment to settle out prior to entering additional settlement ponds or re-use for dust suppression.

Additional water management is through the use of the existing settlement ponds (Section 7.4.2) which are located downstream of the rehabilitated area west of the internal haul road. These dams have a combined storage capacity of approximately 1.78ML, which exceeds the required capacity of 1.6ML, based on Blue Book standards. Water from within these dams can be preferentially pumped for use by the water truck in dust suppression.

Stormwater runoff generated around the ICPP and the rejects area east of the haul road flows to the Main Colliery Dam through a series of surface diversion and subsurface drains. Discharge, although not desired may occur from this dam via licensed discharge point 2 (LD002).

8.4.6 Maintenance of Erosion and Sediment Control Structures

The regular and ongoing maintenance of pollution control structures is the key to ensuring the effective operations of these structures, and ensuring that discharge criteria limits are met. Inspections of these structures are to ensure there is no undesirable sediment build up in pollution control structures including ponds and drains, or noticeable increased discoloration in the ponds. Undesirable sediment build up in the ponds may include uneven sediment deposition, which may inhibit the controlled settling of materials in uniform layers.

Where sediment build up is observed in pollution control ponds and sumps, such as the Main Colliery Dam or sumps along the internal haul road, these ponds/sumps may be de-silted where practicable. If this silt is predominantly coal fines, it can be emplaced in a stable area of the coal stockpile and reclaimed as product or within the active dump for disposal.

Where controls are observed to not be functioning correctly (i.e. potential for discharge limits not to comply with criteria) the controls may be restored to a standard which generally meet the requirements of the Blue Book.

Erosion and sediment control structures within rehabilitated landforms (i.e. rock rip-raps and contour drains) will be maintained in accordance with the Landscape Management Plan.
8.5 Decommissioning of Temporary Water Structures

Following the cessation of mining, Coalpac proposes to reshape the areas disturbed during the open cut coal mine extension to integrate the rehabilitated areas with the surrounding landforms, and to establish stable drainage lines from the north and east to allow natural flow of waters onto, across, and from the previously disturbed areas.

The existing settlement ponds which currently capture runoff from the rehabilitated area to the west of the open cut will remain in place at closure, in accordance with MOP Plan 5. The other various sumps and sediment control structures will be appropriately rehabilitated, with any sediment removed and buried in the active void, as part of rehabilitation works at closure.

As the final landform is progressively created, contour banks would be constructed at 10m intervals (vertically) across the sloped surface. These contour banks may direct water to rock lined drainage channels designed to replicate the drainage of the pre-mining environment. Several dams would be retained in the final landform to reduce the erosive force of the runoff in these areas of the final landform as well as to provide water storages for potential future land uses.

9 SURFACE WATER MONITORING PROGRAM

This Surface Water Monitoring Program has been prepared in compliance with condition 13 of schedule 3 and includes:

(a) baseline data on surface water flows (Section 9.1);
(b) surface water assessment criteria (Section 9.2);
(c) a program to monitor quantity and quality of any off-site water discharges (Sections 9.4.1 and 9.4.2);
(d) a program to monitor surface water flows and quality in local watercourses (Section 9.4.3); and
(e) a protocol for the investigation, notification and mitigation of identified exceedances of the surface water assessment criteria (Section 9.5).

9.1 Baseline Data on Surface Water Flows

There are no flowing creeks or permanent surface water flows within the Project limits. Although unlikely to occur due to erosion and sediment control structures and mitigation measures to be employed within the Project, the possibility of down-stream water flows being affected by the Project such as Cullen Creek may exist. Baseline water quality data will be established from the two additional water monitoring points prior to the Project commencing in the area labelled “West Pit Area” identified in Figure 2.

In light of this, Coalpac will, where practicable, monitor water quality parameters listed in Table 5 after extended rainfall events during monthly sampling at or near the locations identified as Point 2 (LD002), “Existing Settlement Dams” and “Additional water monitoring points” (see Figure 2).
9.2 Surface Water Impact Assessment Criteria

Surface water impact assessment criteria applying to discharges from the two licensed discharge points for the Project are prescribed in EPL 1095, and reproduced in Table 5. Receiving waters must not be polluted by any other pollutant other than those specified in the table below. The concentration of a pollutant discharged must not exceed these concentration limits.

<table>
<thead>
<tr>
<th>Analytes</th>
<th>Units of Measure</th>
<th>100 percentile Concentration Limit/Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oil and Grease</td>
<td>mg/L</td>
<td>&lt;10</td>
</tr>
<tr>
<td>pH</td>
<td>pH</td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>&lt;50</td>
</tr>
</tbody>
</table>

All water quality results from water discharged will be compared to the assessment criteria detailed in EPL 1095. The recorded values of any other parameters measured (see Section 9.4.1) will be plotted and analysed to identify any trends over time.

In addition to water quality assessment criteria, the EPL specifies volume discharge limits for licensed discharge point 1, as detailed in Table 6.

<table>
<thead>
<tr>
<th>Point</th>
<th>Unit of measure</th>
<th>Volume/Mass Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>kL/day</td>
<td>2,000</td>
</tr>
</tbody>
</table>

Licensed discharge point 2 is a wet weather discharge point only, and as such no volume limits are specified for this point in the EPL.

9.3 Surface Water Trigger Levels

In the unlikely event that water quality results obtained through sampling approach (i.e. 90th percentile) and or equal those in Table 5 Coalpac will implement the mitigation strategies outlined in Section 8.4 of this Plan. In addition to this, further investigation may be undertaken to ensure the effectiveness of soil and erosion structures within the Project, as discussed in Section 8 of this Plan. Should these investigations determine the need for additional mitigation measures within the Project Coalpac may employ the most reasonable and practicable measures in a manner that generally allows for a further reduction of the criteria listed in Table 5.
9.4 Water Monitoring

Coalpac maintains a program of surface water monitoring in accordance with EPL 1095 and project approval requirements. The results obtained from the monitoring program are compiled and reported on an annual basis in the EPL Annual Return and AEMR.

9.4.1 Water Quality

The principal water monitoring points correspond to Coalpac’s licensed discharge points 1 and 2. Water monitoring is currently required to be undertaken monthly during discharge from these discharge points, as required by condition M2 of EPL 1095. Water samples are required to be analysed for the following parameters only during discharge (see Table 7).

Table 7
Monitoring Concentration of Pollutants from Discharge Point 1

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Units</th>
<th>Frequency</th>
<th>Sampling Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsenic</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Cadmium</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Carbonate</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Chloride</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Chromium (hexavalent)</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Conductivity</td>
<td>Microsiemens/cm</td>
<td>Monthly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Copper</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Hardness (Calcium Carbonate)</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Iron</td>
<td>mg/L</td>
<td>Monthly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Lead</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Magnesium</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Manganese</td>
<td>mg/L</td>
<td>Monthly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Nickel</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Oil &amp; Grease</td>
<td>mg/L</td>
<td>Monthly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Potassium</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Selenium</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Sodium</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Sulfate</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Temperature</td>
<td>Degrees Celsius</td>
<td>Monthly</td>
<td>In-Situ</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>mg/L</td>
<td>Monthly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>Zinc</td>
<td>mg/L</td>
<td>Yearly</td>
<td>Grab sample</td>
</tr>
<tr>
<td>pH</td>
<td>pH</td>
<td>Monthly</td>
<td>In-Situ</td>
</tr>
</tbody>
</table>
Water samples are currently taken on a monthly basis from the Main Colliery Dam and the existing settlement ponds, which collect run-off water from within the ICPP and water from the rehabilitated area to the west of the previous open cut operations and analysed for the analytes in Table 5.

Notwithstanding the current monitoring requirements nominated in EPL 1095, Coalpac intends to adjust the surface water monitoring program to include the following.

(a) Monthly monitoring of water quality will continue in the Main Colliery Dam and existing settlement ponds for the analytes referred to in Table 5.

(b) Monitoring of the dams labelled “Additional water monitoring points” on Figure 2 will occur after extended rainfall events during monthly sampling.

(c) Discharges at licensed discharge point 1 will be monitored as per EPL 1095, with one sample analysed per year of all the analytes listed in Table 7 only during discharge.

(d) Discharges at licensed discharge point 2 will be monitored within 24 hours of the commencement of any discharge and at an interval of at least monthly during periods when discharges continue to occur.

9.4.2 Water Quantity

In the event that water is discharged from licensed discharge point 1, the volume of water is monitored daily to demonstrate that discharges are below the EPL limit of 2,000 kL/day, in accordance with EPL condition L4.1. The quantity of water discharged is estimated by calculation (volume flow rate or pump capacity multiplied by operating time), as per EPL condition M6.1.

9.4.3 Local Surface Water Courses and Flows

Whilst there are no flowing creeks or permanent surface water flows within the open cut coal mine extension area, water samples may be taken and analysed from surrounding watercourses when in flow, to determine background water quality. Water samples may be analysed for the parameters listed above in Table 5. In the event that additional surface water flows are identified outside the limits of the Project, which under exceptional events may be affected directly by the Project, additional water samples may be taken and analysed for the parameters listed above in Table 5.

9.5 Reporting and Mitigation of Exceedances of Impact Assessment Criteria

Following the receipt of all monitoring results, the subject results would be compared against the criteria listed in Table 5 and if relevant Table 7.

Procedures/Reporting

In the unlikely event of an exceedance of the impact assessment criteria within EPL 1095, the nominated Environmental Officer and/or other Company nominated personnel will be notified immediately to attend the site of the apparent incident. The Environmental Officer will record the relevant details of the incident including:

(a) the time, date and nature of the incident;

(b) the duration of the incident; and

(c) the possible reason(s) for the apparent incident.
In the event of an exceedance causing environmental harm, the DECC will be notified as soon as practicable after becoming aware of the incident via the Pollution Line (131 555) as per Condition R2 of EPL 1095. Written details of the notification will be provided to the DECC within seven days of the incident occurring. In addition, a brief report will also be generated and sent to the DECC (EPA). This report will include:

(a) the cause, time and duration of the event;
(b) the type, volume and concentration of every pollutant discharged as a result of the event;
(c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event;
(d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort;
(e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants;
(f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and
(g) any other relevant matters.

Condition 12 of schedule 3 stipulates that except as may be expressly provided for by an EPL, or in accordance with section 120 of the Protection of the Environment Operations Act 1997, Coalpac shall not discharge any mine water from the lease.

Further to this, condition 2 of schedule 5 stipulates that within 24 hours of detecting the occurrence of an incident that causes (or may cause) material harm to the environment, Coalpac shall notify the Department and other relevant agencies of the incident.

Additionally, condition 3 of schedule 5 stipulates that within 6 days of notifying the Department and other relevant agencies of an incident, Coalpac shall provide the Department and these agencies with a written report that:

(a) describes the date, time, and nature of the incident;
(b) identifies the cause (or likely cause) of the incident;
(c) describes what action has been taken to date; and
(d) describes the proposed measures to address the incident.

**Mitigating Measures**

In the event of an unlikely exceedance of impact assessment criteria, and/or an exceedance causing environmental harm, the Environmental Officer will immediately conduct an investigation into the cause (or potential cause/s) of the exceedance. This will include a review of rainfall, an investigation regarding the water source in the event of a discharge, and an inspection of all pollution control structures to ensure they are functioning correctly. Aspects to be inspected include:

(a) integrity of all structures to capture/convey flows as designed;
(b) level of sediment in settling ponds and drains;
(c) amount of vegetation (i.e. reeds) in settlement ponds, which may effect the pH of the water;
(d) the location of the water source(s); and
(e) the presence of any hydrocarbon spills in the vicinity of pollution control structures.

In the event of an exceedance and the extent of the exceedance, the Environmental Officer will resolve and implement a plan of action. This may include the appropriate restoration of pollution control structures as soon as possible when deemed not to be functioning effectively. Restoration measures may include de-silting settling ponds and drains or removing reeds from ponds. Where a hydrocarbon spill has occurred, emergency clean up procedures will be implemented.

Following the rectification of the activity that caused the exceedance, water quality monitoring will again be carried out as per EPL requirements to monitor the success of the mitigation measure(s).

10 GROUNDWATER MONITORING PROGRAM

10.1 Baseline Data

Monitoring of underground water quality discharged from licensed discharge point 1 (LD001) between 1997 and 2002 was undertaken in accordance with EPL 1095. Monitoring results indicate that the quality of the discharged water generally met the criteria of EPL 1095 during this period. Table 8 presents the criteria of EPL 1095 and a summary of the monitoring results between 1997 and 2002.

Table 8
Underground Water Monitoring Results – LD001 (1997 to 2002)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>EPL 1095 Criteria</th>
<th>Average</th>
<th>Maximum</th>
<th>No. of Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5 - 8.5</td>
<td>7.6</td>
<td>8.23</td>
<td>35</td>
</tr>
<tr>
<td>Total Suspended Solids</td>
<td>&lt; 30 mg/L</td>
<td>10.1</td>
<td>134</td>
<td>35</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>&lt; 10 mg/L</td>
<td>&lt; 1</td>
<td>1</td>
<td>35</td>
</tr>
</tbody>
</table>

While the presence of iron oxide has been identified as a potential visual problem at the discharge point, monitoring completed throughout 2007 has confirmed that the water quality generally meets the criteria of EPL 1095.

10.1.1 Groundwater Levels in the Region

Underground water levels within the abandoned Tyldesley Mine have been monitored periodically since approximately the year 2000. A total of 17 measurements from a borehole within privately-owned land east of the Tyldesley Hill and adjacent to the Castlereagh Highway have been recorded between 2000 and 2009. As part of the Cullen Valley Mine Subsurface Fire Monitoring Program groundwater levels within this bore have been and continue to be recorded on a monthly basis since 6 November 2008. Table 9 summarise the water level within the abandoned Tyldesley Mine workings.
Table 9
Underground water level of Tyldesley Mine (abandoned) – (2000 to 2009)

<table>
<thead>
<tr>
<th>Date</th>
<th>Depth of Water in Bore</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/11/2000</td>
<td>11.5</td>
</tr>
<tr>
<td>4/03/2003</td>
<td>7.8</td>
</tr>
<tr>
<td>22/02/2004</td>
<td>8.5</td>
</tr>
<tr>
<td>8/04/2004</td>
<td>8.8</td>
</tr>
<tr>
<td>1/09/2004</td>
<td>7.5</td>
</tr>
<tr>
<td>23/11/2004</td>
<td>8.1</td>
</tr>
<tr>
<td>26/04/2005</td>
<td>8.9</td>
</tr>
<tr>
<td>9/02/2006</td>
<td>9.6</td>
</tr>
<tr>
<td>31/01/2007</td>
<td>7.8</td>
</tr>
<tr>
<td>10/10/2007</td>
<td>10.0</td>
</tr>
<tr>
<td>1/03/2008</td>
<td>9.6</td>
</tr>
<tr>
<td>6/11/2008</td>
<td>10.2</td>
</tr>
<tr>
<td>5/12/2008</td>
<td>9.4</td>
</tr>
<tr>
<td>7/01/2009</td>
<td>8.9</td>
</tr>
<tr>
<td>6/02/2009</td>
<td>10.5</td>
</tr>
<tr>
<td>6/03/2009</td>
<td>10.0</td>
</tr>
<tr>
<td>8/04/2009</td>
<td>9.0</td>
</tr>
</tbody>
</table>

Underground water levels within the Project are not measured. It is anticipated that the requirement for additional process water within the ICPP is needed due to the shortcomings identified in Section 7.8.3 of this Plan. The possibility of additional bores being drilled to access the underground water within the Project to supplement the predicated shortage of process water, primarily within the Main Colliery Dam is present. Although this is one of a possible many options to increase water security of the Project it may allow for the regular monitoring of the underground water level.

10.1.2 Groundwater Quality in Region

The underground water quality within the region may be typical of those detailed in Section 10.1. The location of LD001 is northeast of the Project, which, taking into account the natural dip of the coal seams within the Project is generally located near the end of the previous underground workings. The water analysis result tabulated in Table 8 may be representative of the typical underground water quality within the Project and region.

It is predicted within the EA that the previous and ongoing operations of the Invincible Open Cut Mine have demonstrated that the impact on local groundwater resources is minimal and restricted to the removal of the in-situ moisture of the mined coal. As the Project represents a continuation of the ongoing open cut mining activities, impacts on local hydrogeology would remain similarly minor. As a consequence, no specific management measures or operational controls were proposed.
10.2 Groundwater Impact Assessment Criteria

Current groundwater impact assessment criteria are outlined within EPL 1095 and tabulated in Section 9.2 (Table 5) of this Plan. It is anticipated should additional groundwater be accessed and used within the Project through the installation of additional or recommissioning of existing underground pumps the impact assessment criteria within EPL 1095 would be used to monitor the short and potentially long-term water quality within the Project.

10.2.1 Groundwater Trigger Levels

The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2000) (ANZECC) apply to the quality of both surface waters and groundwater. The quality of groundwater should be generally maintained so that in the event it reaches the surface it will not detrimentally impact the environmental values or water quality objectives of the surrounding ecosystem.

Wherever possible site-specific data may be used to define trigger values for physical and chemical factors which have the potential to adversely impact the environment. However, the default values provided by ANZECC (2000) can be used where there is insufficient baseline data available.

A site-specific trigger value for highly disturbed ecosystems is to formulate trigger values based on the 20th and 80th percentile of the site-specific monitoring data. The objective of this approach is to develop conservative, site-specific trigger values for use as a means to improve water quality in highly disturbed ecosystems.

Natural water quality variations due to water quality dynamics of the region need to be considered prior to applying the 20th and 80th percentile trigger value. Trigger values which do not adequately reflect the actual water quality in the region as a result of natural groundwater variation may present an issue within the Project.

The results of the baseline monitoring are discussed in Section 10.1.

In the event that suitable site-specific trigger values cannot be developed, the default trigger values defined by ANZECC (2000) for upland rivers (>150m elevation) in slightly disturbed ecosystems in south-east Australia are given in Table 10.

Table 10
ANZECC (2000) Upland Rivers Trigger Values – south-east Australia

<table>
<thead>
<tr>
<th>Water Quality Variable</th>
<th>Trigger Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>6.5 - 8.0</td>
</tr>
<tr>
<td>Conductivity (µScm⁻¹)</td>
<td>30 - 350</td>
</tr>
</tbody>
</table>

10.3 Groundwater Inflow Monitoring within the Project

Given the downward dip of the coal seams and other strata to the northeast, and the relatively thin water bearing zones (i.e. the coal seams) the Project is likely to continue to operate as a relatively dry mine as groundwater will be directed away from the active highwall in a northeast direction. As such, it is highly unlikely to have any impact on any aquifers of region hydrogeology, given the volume of water removed would be limited to the in-situ moisture of the coal mined.

The mining operation is generally based on a process with progressive cut and fill. This process generally results in interburden and overburden material being emplaced in previously mined voids, shaped and rehabilitated once clay, subsoil and topsoil has been applied. It is predicted that groundwater inflow entering the active open cut will be minimal as waste emplacement will generally occur directly behind the working areas of the open cut. The replacement of interburden and overburden material within voids in the reverse sequence that it was removed may enable the final landform to replicate the pre-mining environment strata. This process may allow for the natural subsurface and/or groundwater flows to continue in a northeast direction in a manner that is generally consistent with those found outside of the Project Site.

Should water inflow from the strata occur during the mining operations, and be of sufficient volume and require pumping to settlement dams Coalpac will record pump hire hours and typical flow rates to calculate the estimated volume of inflow water. This information will be reported within each relevant AEMR.

10.4 Potential Regional Impacts of the Development

It has been identified within the EA that the potential impacts of the Project on regional aquifers and groundwater would be negligible during the life of the operation. As discussed in Section 10.1 the typical groundwater quality is generally within the EPL 1095 assessment criteria (Table 8) and it is predicted that inflow into the open cut is generally not expected due to the natural downward north-easterly dip of the coal seams within the region.

Surface water within the Project would not be pumped into the underground workings, limiting the possible issue of contamination (i.e. suspended solids, oil and grease and pH variations).

Acid generating material may have the potential to form through the oxidation of sulphide minerals (i.e. Pyrite or iron-disulphide) when exposed to oxygen and allowed to react in solution. The potential of acid generating material to impact on the regional groundwater is considered low due to the minimal amount of expected course reject material to be emplaced within the voids of the active open cut. An estimated 52,000 tonnes of course reject may be emplaced within the open cut per annum. A worst case scenario has been established which estimates the maximum amount of total moisture held by coarse reject as 12 per cent. The estimated volume of potentially acid generating material (i.e. acid leachate) to be emplaced within the open cut per year is approximately 6.24m³. A current estimate of the volume of water held within the underground workings of the Old Invincible Colliery within the Project Site is 747,235m³ (Appendix 1).

It is estimated that any potential impacts of acid generating material on the regional groundwater quality would be negligible due to the significant effects of dilution within the underground workings. In the unlikely event that acid leachate enters the underground water system the proportion of acid leachate would be approximately 0.00000835% (6.24m³ / 747,235m³).
The use of underground water within the Project is currently employed to supply ‘top-up’ water to the Main Colliery Dam. At present it is estimated that a total of 52ML per year can be removed from the underground workings through the use of two bores in the Pit Top area. The option exists to either increase the number of bores within the Project and/or pump capacities to allow for a greater volume of water to be removed from the underground reservoir.

The Project currently operates one bore pump located behind the Pit Top area. This pump is restricted to extract approximately 0.071ML per day or 26ML per year of underground water. The restriction placed on this pump is via an adjustable valve, which is designed to ensure recharge of the underground workings and minimise water supply disruptions.

The regional impacts which may occur generally refer to the reduction of available water held within the underground workings. Although unlikely to occur as a direct or indirect result of removing additional underground water for the Project, these impacts are not predicted to be encountered during the life of the Project. Approximately 3.48% of the total volume of water currently held within the underground workings may be extracted per year (i.e. 26ML/year) assuming water did not enter the underground workings during the extraction period.

11 SURFACE AND GROUNDWATER RESPONSE PLAN

11.1 Response to Water Quality Assessment Criteria

In the unlikely event that mining operations within the Project Site result in actual harm to the surrounding surface waters and/or groundwater a series of appropriate response actions have been developed. Table 11 summarises the potential water management issues that may arise and the appropriate response protocol to be taken by relevant staff.
## Table 11
**Surface and Groundwater Response Protocol**

<table>
<thead>
<tr>
<th>Potential Water Management Issues</th>
<th>Appropriate Response</th>
</tr>
</thead>
</table>
| Water monitoring reports results outside the surface water and stream health impact assessment criteria or maximum reported groundwater quality results (outlines in both Surface Water and Groundwater Monitoring Plans respectively) | 1. Investigate results and trends, considering any mitigating factors where applicable.  
2. Report results to senior management.  
3. Where relevant initiate to protocol outlines in Section 8.5. |
| Receipt of community complaint | 1. Investigate complaint, considering any mitigating factors and provide feedback to complaint.  
2. Report complaint to senior management.  
3. Provide feedback to mine planning and production personnel, where relevant.  
4. Report back to complainant and provide mitigation measures that are to be implemented (if required) and current management strategies. |
| Unauthorised discharge | 1. Investigate discharge, considering any mitigating factors where applicable.  
2. Implement all reasonable mitigation controls to reduce or stop a discharge.  
3. Implement all reasonable mitigation controls to limit the actual or potential hard to the environment from a discharge.  
4. Report discharge to the DECC within 24 house on the EPA Pollution line 131 555 and submit report within 7 days of the incident occurring as per R2 or EPL 1905.  
5. Review adequacy of existing water management infrastructure and controls. |
| Loss of surface water availability for downstream water users determined as a direct result of the Project | 1. Investigate the cause(s) of any losses in downstream surface water availability as a direct result of the Project.  
2. Where relevant initiate the process outline in Section 10.2. |
| Loss of groundwater availability at private licensed bore as a direct result of the Project | 1. Investigate loss of groundwater availability, considering any mitigating factors where applicable as a direct result of the Project.  
2. Provide feedback to complainant if it is determine that the Project attributed to the loss of groundwater availability.  
3. Report complaint to senior management.  
4. Where relevant initiate the process outline in section 10.2. |
| Uncharacteristic water inflow into the active open cut | 1. Investigate the cause(s) of any increase seepage / inflow into the active open cut.  
2. Report to senior management.  
3. Modify mining operations accordingly. |
| Unforeseen impact | 1. Initiate protocol outlines in Section 8.5. |
11.1.1 Response to an Exceedance of Surface Water Criteria

In the unlikely event that surface water impact assessment criteria exceed the limits stipulated within EPL 1095 during discharge from Point 2 (LD002) the following protocol will be implemented by Coalpac;

(a) Confirm the approximate timing and general location of the exceedance(s);
(b) Confirm the meteorological conditions at the general time of the exceedance(s);
(c) Confirm operational information at the general time of the exceedance(s);
(d) Identify any potential and/or actual contributing factors within or outside the Project;
(e) Assess the monitoring result(s) against previous results and background trends as to identify any anomalies or potential cause(s);
(f) If the exceedance(s) is not attributable to the Project the Surface Water Monitoring Program may be reviewed for its effectiveness;
(g) Where the exceedance is potentially attributable to the Project appropriate mitigation and management measures and/or strategies will be reviewed and modified if applicable;
(h) Additional monitoring and regular reviews will be undertaken where mitigation and management strategies were located during the general time of the exceedance(s) for their effectiveness; and
(i) The exceedance(s) will be reported to the DoP as stipulated by condition 1 of schedule 4 and the DECC (EPA) as per condition R2 of EPL 1095 only during discharge from Point 2 (LD002).

11.1.2 Response to an Exceedance of Groundwater Criteria

In the unlikely event that underground water impact assessment criteria exceed the limits stipulated within EPL 1095 during discharge from Point 1 (LD001) the following protocol will be implemented by Coalpac;

(a) Confirm the approximate timing and general location of the exceedance(s);
(b) Confirm the meteorological conditions at the general time of the exceedance(s);
(c) Confirm operational information at the general time of the exceedance(s);
(d) Identify any potential and/or actual contributing factors within or outside the Project;
(e) Assess the monitoring result(s) against previous results and background trends as to identify any anomalies or potential cause(s);
(f) If the exceedance(s) is not attributable to the Project the Groundwater Monitoring Program will be reviewed for its effectiveness;
(g) Where the exceedance is potentially attributable to the Project appropriate mitigation and management measures and/or strategies will be reviewed and modified if applicable;
(h) Additional monitoring and regular reviews will be undertaken where mitigation and management strategies were located during the general time of the exceedance(s) for their effectiveness; and
(i) The exceedance(s) will be reported to the DoP as stipulated by condition 1 of schedule 4 and the DECC (EPA) as per condition R2 of EPL 1095 only during discharge from Point 1 (LD001).

11.2 Landowner Compensation due to adverse affects to water supply

Surface water availability to adjacent landowners or stormwater run-off flow rates may be affected, although unlikely, by mining activities associated with the Project. In the event that a formal complaint is received from a landowner downstream of the Project regarding the loss of a surface water supply or of an unusual flooding event the Complaints Management Procedure will be implemented. If the initial investigations conclude that the Project has potentially contributed to the event(s), the following steps will be implemented.

(a) The initial investigation(s) will aim to determine if changes to the landform and use within the Project may have affected surface water flows over the period to which the Project was active;
(b) Whether the event(s) is/are attributed solely to the operations within the Project Site;
(c) Should the initial investigation(s) conclude that the event(s) are attributable to the Project then appropriate mitigation and management measures, where relevant, will be developed and implemented, with consultation of the affected landowner(s); and
(d) In the event that additional mitigation and management measures have been implemented, Coalpac will implement additional monitoring and reviews to determine the effectiveness of the measure(s) employed.

12 COALPAC’S ROLES AND RESPONSIBILITIES

Operational specific roles and responsibilities under this Program are detailed as follows.

12.1 Compliance Manager

(a) Ensure all statutory requirements are meet for the Project;
(b) Notify regulatory authorities and affected landowners of any noise related exceedence and undertake associated reporting.
(c) Ensure the Water Monitoring Program is relevant and accurate for the life of the Project;
(d) Delegate and/or undertake any reviews, modifications or investigations of this Program; and
(e) Investigate exceedances and community complaints.

12.2 Open Cut Examiner

(a) Adequately respond due to an exceedence of the water quality criteria identified by the monitoring program;
(b) Review operations in response to an exceedence or when monitoring results indicate current operations are approaching criteria limits;
(c) Continually assess the need for erosion and sediment mitigations within the Project and implement mitigation measures according to operational requirements and climatic conditions; and
(d) Assist the Environmental Officer and Operations Manager with investigations into water quality exceedances, incidents, complaints or potential exceedances.

12.3 General Manager
(a) Ensure adequate resources are available to implement the requirements of this Program; and
(b) Notify regulatory authorities and affected landowners of any water quality related exceedence and undertake associated reporting.

12.4 Operations Manager
(a) Ensure adequate resources are available to implement the requirements of this Program;
(b) Ensure operations are conducted in a manner that complies with statutory requirements;
(c) Ensure that the Program is relevant to current mining operations;
(d) Oversee the implementation of the Program; and
(e) Investigate exceedances and community complaints.

12.5 Environmental Officer
(a) Oversee the implementation of the water monitoring program;
(b) Coordinate water monitoring and erosion and sediment mitigation measures in accordance with this Program;
(c) Develop and maintain a protocol for evaluation compliance with water quality criteria contained within this Program;
(d) Coordinate investigations of water quality exceedances or complaints; and
(e) Assist and jointly coordinate periodic reviews of this Program.

12.6 Site Personnel and Contractors
(a) All Coalpac, other employees and contractors are required to comply with the requirements of this Program; and
(b) Communicate with the Environmental Officer (through line managers) any issues, concerns or potential/actual exceedances of water quality criteria contained within this Program.
13 REPORTING AND REVIEWING

All water monitoring results and an assessment of water management and erosion and sediment controls within the Project will be included within the AEMR to be submitted to the relevant government agencies on an annual basis. All monitoring results will be assessed against the impact assessment criteria detailed in Table 5 and where relevant Table 7.

This WMP will be reviewed as part of the AEMR reporting process to assess its effectiveness. In addition, the Plan will be reviewed if there is a significant variation to the mine plan and/or surface activities.

Where any changes are recommended as a result of review, the WMP will be revised to increase its effectiveness. Any amendments to the WMP will be undertaken in consultation with the appropriate regulatory authorities where required.

14 REFERENCES


Environmental Protection Authority, 2000. New South Wales Industrial Noise Policy.


Appendix 1 – Plan 1: Estimate of Water Storage in Invincible Colliery