Centennial Charbon Colliery

Charbon Coal Pty Ltd

Final

Erosion and Sediment Control Plan

Charbon Colliery

April 2012

CCC04-012

GSS ENVIRONMENTAL
Environmental, Land and Project Management Consultants

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1.0 INTRODUCTION

1.1 Background

The Charbon Colliery is owned by a joint venture between Centennial Coal Company Limited (95%) and SK Energy Australia Pty Ltd (5%), a wholly owned subsidiary of SK Corporation, Korea. The colliery is operated by Charbon Coal Pty Limited, the Proponent for the Project. Charbon Coal Pty Limited is a wholly owned subsidiary of Centennial Coal Company Limited and operates the Colliery under a management agreement for the joint venture parties.

The Charbon Colliery has been operating since the 1920s, initially supplying coal to the former Charbon Cement Works, located adjacent to the northern boundary of the Colliery. The Colliery was upgraded in 1985, including the installation of the rail loop, CHPP and an increase in the rate of production to allow the mine to produce a washed coal for export. In 1994, Centennial purchased the colliery from Blue Circle Southern Cement Ltd.

Established in 1989 and listed on the Australian Stock Exchange in 1994, Centennial Coal Company Limited is a coal mining and marketing company supplying thermal and coking coal to domestic and export markets.

Charbon Colliery is located approximately 3 kilometres to the south of Kandos and 50 kilometres south east of Mudgee in the western coalfields of NSW as shown on **Figure 1**.

Figure 1 also highlights the project site boundary in relation to major roads, rivers and the railway line that passes by the Charbon Colliery.

The Project Site (**Figure 2**) incorporates all areas of disturbance associated with proposed project-related activities presented in the *Charbon Colliery Environmental Assessment (EA) for Continued Operation of the Charbon Colliery (R.W Corkery & Co. Pty. Ltd, 2009)*. The area of the Project Site is approximately 2,662ha and incorporates all areas of mineral authorities held by the Charbon Colliery.

On 7th September 2010 the Minister for Planning issued a Project Approval for the project (PA 08_0211), subject to the preparation and approval of an Erosion and Sediment Control Plan (ESCP) and a Soil Management Plan (SMP).

1.2 Scope

Charbon Colliery has implemented a number of erosion and sediment control (ESC) initiatives around the current operation to mitigate potential impacts on company owned and surrounding lands. The purpose of this ESCP is to ensure the effectiveness of these initiatives, and ensure that regulatory obligations are being met. This ESCP also incorporates the SMP for the site.

The ESCP is intended to fulfil the requirements of the Project Approval Conditions (PA 08_0211). This ESCP should be applied to the Charbon Colliery Mine and therefore is required to be implemented for both the open cut and underground operations, but excludes land owned by the company that is outside the operational footprint such as buffer land. The ESCP must be implemented in conjunction with the Water Management Plan (WMP) to ensure the effectiveness of all ESC controls.

1.3 Purpose

The primary objective of the ESCP is to implement a system to safeguard against soil loss and in turn, minimise the risk of water quality impacts.

The primary objective of the SMP is to ensure that surface soils are appropriately stripped and placed onsite to minimise soil degradation and maximise availability of suitable soils for rehabilitation.

The generic objectives of the ESCP and the SMP are the following:

- To meet the requirements of the Project Approval (PA 08_0211) relevant to the operations at Charbon Colliery;

- To meet the requirements of Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E- Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008;
- To identify activities that could cause soil and erosion and could generate sediment;
- To describe the location, function and capacity of erosion and sediment control structures;
- To describe the measures to minimise soil erosion and the potential for the mitigation of sediment to downstream waters; and
- To describe the generic soil stripping and stockpiling procedures in order to effectively manage these activities onsite.

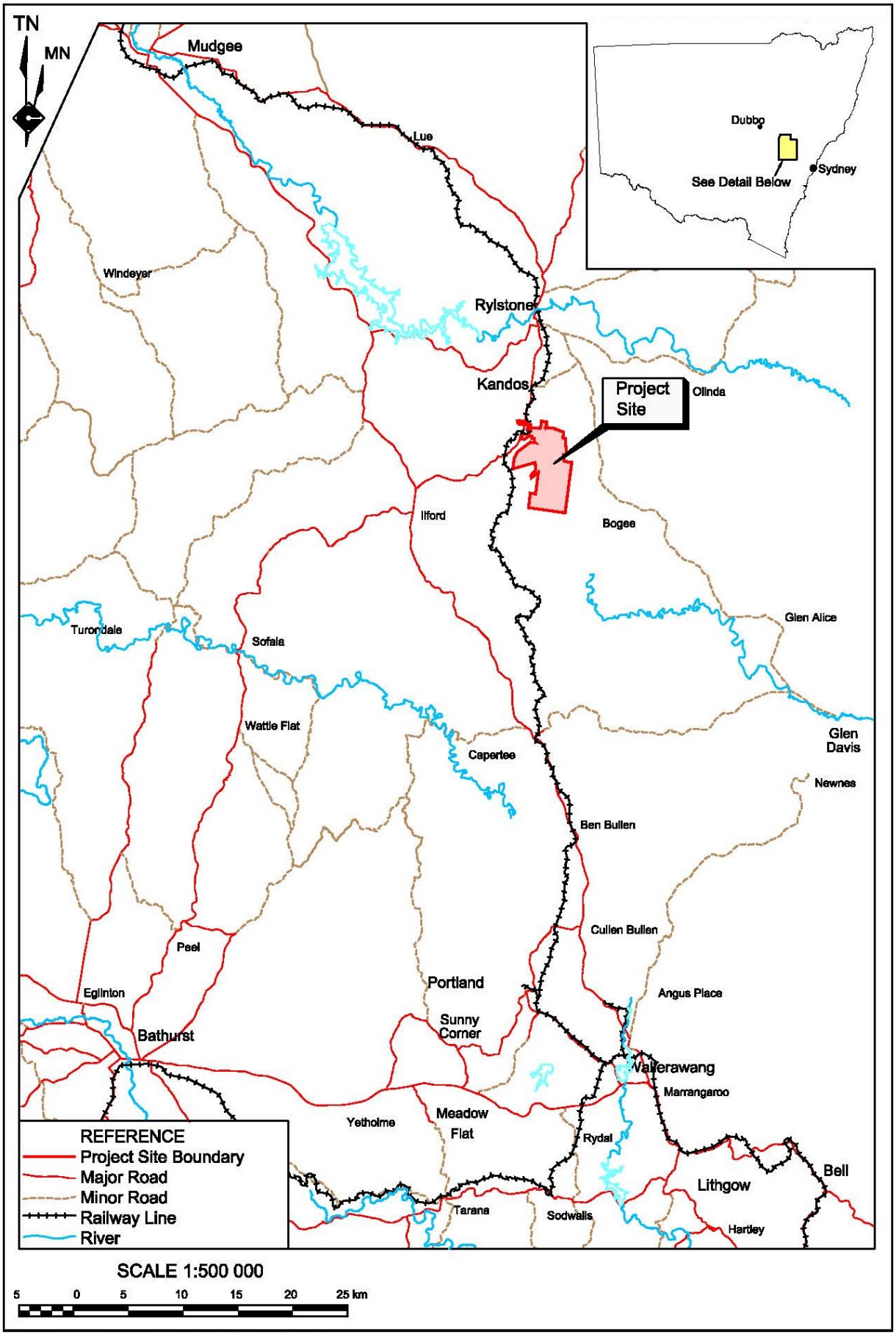


Figure 1: Locality Plan

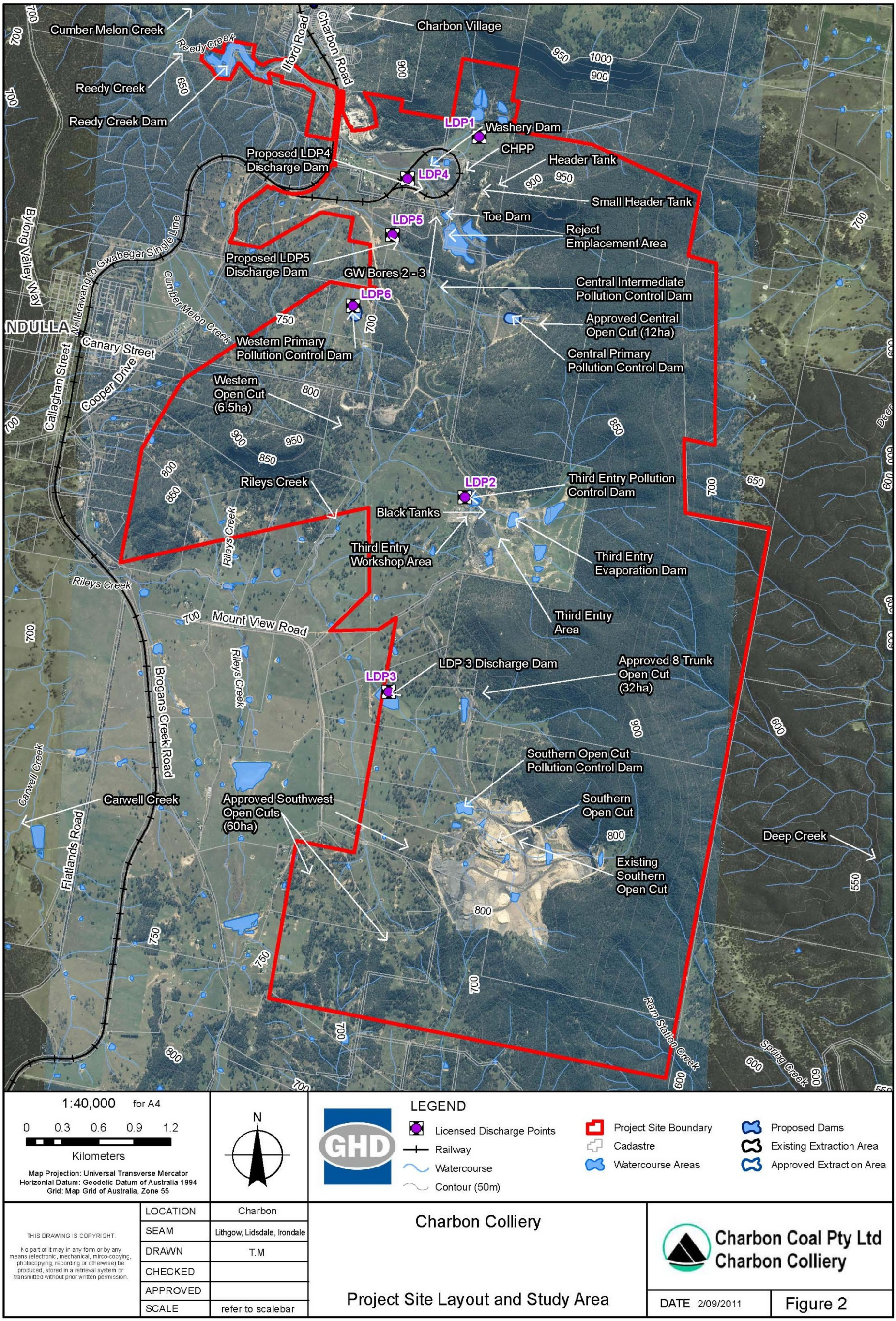


Figure 2: Project Site Layout and Study Area

1.4 EMS Framework

Charbon Colliery operates under an Environmental Management System (EMS) developed to adhere to Centennial's and Charbon's Environmental Policies by promoting environmental awareness and committing to a strategy to minimise the impacts of the operation.

The Charbon Colliery Environmental Management System provides an effective management framework to identify and control potential environmental impacts and to achieve compliance with environmental legislation and regulatory requirements applicable to Charbon Colliery. This EMS applies to all of Charbon Colliery's employees and contractors' associated with Centennial and is based around the framework provided by ISO 14001.

The Charbon Colliery EMS incorporates four components (refer to **Figure 3**):

- Environmental Management System Framework Document (Volume 1);
- Environmental Management System Procedures (Volume 2);
- Environment and Community Management Standards (Volume 3); and
- Environment and Community Management Plans (Volume 4).

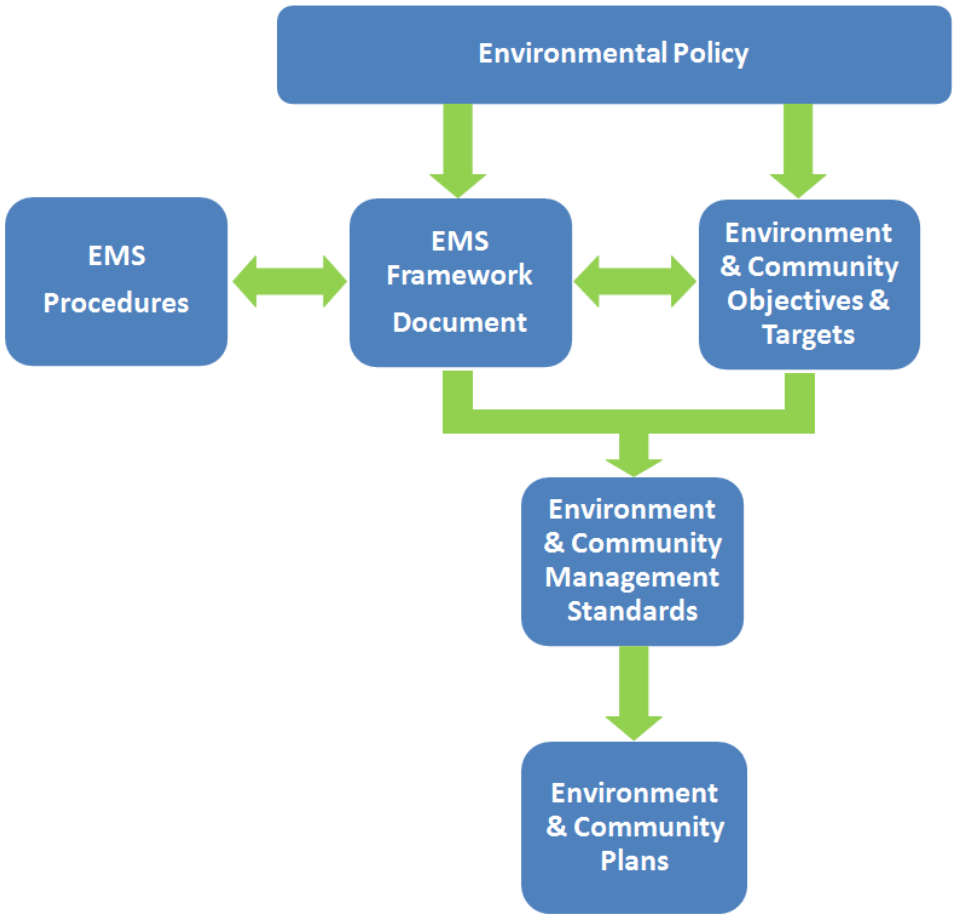


Figure 3: Framework of the Charbon Colliery Environmental Management System

2.0 REGULATORY REQUIREMENTS

2.1 Project Approval Conditions

While this ESCP has been developed specifically to address the requirements of the Project Approval (PA 08_0211), the general principles embodied in the ESCP are to be applied to all activities at Charbon Colliery. **Table 1** provides a summary the relevant conditions that relate to the specific requirements for the preparation of the ESCP including the SMP.

Table 1 – Project Approval Conditions Relevant for Preparation of an ESCP and SMP

Condition #	Project Approval 08_0211 Condition
Schedule 3 Condition 29	The Proponent shall prepare and implement a Water Management Plan for the project to the satisfaction of the Director-General. This Plan must: (a) be prepared in consultation with NOW and DECCW; and be submitted to the Director-General for approval within 12 months of the date of this approval; and (b) include a: - Site Water Balance; - Erosion and Sediment Control Plan; and - Surface Water and Groundwater Monitoring Programs.
Schedule 3 Condition 31	The Erosion and Sediment Control Plan must: (a) be consistent with the requirements of Managing Urban Stormwater: Soils and Construction, Volume 1 and 2E, 4th Edition, 2004 (Landcom); (b) identify activities that could cause soil erosion and generate sediment; (c) describe measures to minimise soil erosion and the potential for the transport of sediment to downstream waters; (d) describe the location, function and capacity of erosion and sediment control structures; and (e) describe what measures would be implemented to maintain the structures over time.

2.2 Statement of Commitments

In addition to the conditional requirements of PA 08_0211, the Project will be managed in accordance with commitments made in a Statement of Commitments submitted to the Department of Planning prior to the granting of project approval. **Table 2** below presents the statement of commitments related to ESC and soil management based on the *Charbon Colliery EA for Continued Operation of the Charbon Colliery (R.W Corkery & Co. Pty. Ltd, 2009).*

Table 2 – Statement of Commitments for Site Operations and Management

Objective	Commitment	Timing
Surface and Groundwater		
All surface water and groundwater managed such that water-related impacts are minimised to the greatest extent practicable	Prepare a Sediment and Erosion Control Plan.	Prior to land preparation operations in each area of proposed disturbance.
Soil Management		
The Proponent's activities do not result in soil degradation or loss.	Prepare and implement a Soil Management Plan. This plan may be prepared as a component of the Surface and Groundwater Management Plan, or the Sediment and Erosion Control Plan or the Rehabilitation and Vegetation Management Plan.	Within 6 months of the receipt of Project approval.

2.3 Environmental Protection Licence

The Charbon Colliery currently operates under Environmental Protection Licence (EPL) 528. An amendment to the existing EPL 528, issued under the Protection of the Environment Operations Act 1997 would be required from the Office of Environment and Heritage (OEH) for further site expansions. The amended EPL would reflect the proposed mining activities and additional proposed licensed discharge points.

As part of the proposed upgrades to the site, three new licensed discharge points are recommended and include the following:

- LDP4, downstream of the Pit Top Area and Rail Loop;
- LDP5, at the proposed LDP 5 Discharge Dam downstream of the Central Intermediate Pollution Control Dam; and
- LDP6, at the Western Primary Pollution Control Dam.

2.4 Relevant Legislation

A number of legislative requirements, government policies and guidelines relating erosion and sediment control and soil management have been considered in the preparation of this ESCP and WMP. The key pieces of legislation are as follows:

- The Protection of the Environment Operations Act 1997 ; and
- The Water Act 1912 and Water Management Act 2000.

Further details on how these acts relate to the Charbon Colliery are contained in the Continued Operation of the Charbon Colliery Surface Water Assessment (GSSE, 2009b)

2.5 Guidelines

The key guidelines applicable to the project are:

- Managing Urban Stormwater: Soils and Construction (the Blue Book), Volume 1 and Volume 2E-Mines and Quarries (Landcom, 2004 and Department of Environment and Climate Change (DECC), 2008; and
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000).

The typical trigger values presented in ANZECC 2000 for slightly disturbed upland rivers in NSW are shown below in **Table 3**.

Table 3 – Default Trigger Values for Slightly Disturbed Upland Rivers in NSW (ANZECC 2000)

Parameter	Trigger Value
pH	6.5 – 8.0
Conductivity (uS/cm)	30 -- 350
Turbidity (NTU)	2 – 25

3.0 ENVIRONMENTAL ASSESSMENT

3.1 Existing Environment

The project area lies on the western slopes of the north-south oriented sandstone ridgeline of the Great Dividing Range. Topography within the project area generally consists of asymmetric rolling hills with elevations up to 900m AHD and valley floors at around 700m AHD to 750m AHD. The hill slopes are steep and rocky, with the valley floors being areas of low gently sloping to flat land where the Illawarra coal measures are present beneath a thin cover of colluvial and alluvial deposits.

Four catchments exist within the Study Area, namely the Reedy Creek, Rileys Creek, Stony Creek and Deep Creek Catchments. Deep Creek flows to the east of the Great Dividing Range, with part of the existing Charbon Underground Mine located beneath this catchment.

Reedy Creek flows to the Reedy Creek Dam before then flowing into Cumber Melon Creek, the Cudgegong River and into Lake Windamere. Rileys Creek also drains into Lake Windamere through Carwell Creek. Lake Windamere (or Windamere Dam as it is sometimes referred to) forms part of the Macquarie-Bogan River Catchment in central New South Wales. The Bell, Talbragar, Cudgegong, Turon, Fish and Campbells Rivers are the major tributaries within this catchment.

The Study Area is located on the edge of the Macquarie-Bogan catchment, with the Great Dividing Range forming the boundary on the eastern side of the catchment areas. The Southwest Open Cuts are located on a ridgeline that forms a catchment between the Macquarie-Bogan River Catchment to the north and the Hawkesbury-Nepean Catchment to the south. It is noted however that the majority of the Southwest Open Cuts, including the entire Western Outlier and most of the Southern Outlier, lie within the Macquarie-Bogan Catchment.

Stony Creek has a catchment area of approximately 945ha and runs into Ulumbro Creek, which flows south west into the Capertee River, the Colo River and Hawkesbury River. It is also noted that only a very small portion of the Stony Creek Catchment lies with the Study Area.

3.2 Soils/Geology

Soils within the project area generally consist of Red, Yellow and Brown Podzolics (GSSE, 2009a).

Red Podzolics within the project area generally consist of brown to reddish brown sandy loam topsoils, that are weak in structure, overlying light to medium reddish brown clays that are angular blocky and moderate to strong in structure.

Yellow Podzolics soils also feature throughout the project area. They consist of hard setting weakly structured brown loams to sandy loams. The subsoils generally display yellowish brown or yellowish orange medium to heavy clays, and are moderately structured with coarse angular blocky rough faced pods.

Smaller portions of the project area contain bleached loams which belong to the Three Sisters soil landscape unit. Topsoils generally display dark brown sandy to fine loams. Bright yellowish-brown sandy clay loams which are weakly structured are present in the subsoils.

A more comprehensive detail on the soil characteristic within the project area is contained in the Continued Operation of the Charbon Colliery Soils Assessment (GSSE, 2009a).

3.3 Risks Identified

Erosion and sediment controls are required in order to safeguard against soil loss and in turn, minimise the risk of water quality impacts. Some additional risks that erosion and sedimentation may cause include:

- Increased runoff volumes and velocities from the removal of vegetation, land disturbance and the introduction of impervious surfaces on the hard stand areas;

- Increased potential for sedimentation to occur from increased erosion and runoff associated with open cut mining, stockpiling of material and the construction of surface facilities, and access roads/tracks;
- Potential for increased scoring during the construction of surface facilities adjacent to watercourses; and
- Potential decline in water quality and degradation of local amenities through increased potential for transfer of sediment and dust to nearby watercourses.

Proper soil management techniques can assist with reducing erosion and sedimentation. In addition, if proper soil management techniques and stripping procedures are not followed this may lead to the degradation of valuable topsoil and subsoil that is required in rehabilitation.

3.4 Assessment Criteria

Charbon Colliery currently has three DECCW licensed discharge points (LDPs) covered under the EPL 528. These points relate to the spray irrigation disposal of treated sewage (LDP 1), discharge from the Third Entry Erosion Pond to Rileys Creek (LDP 2) and discharge from the Southern Open Cut (SOC) discharge dam to Rileys Creek (LDP 3). The locations of the LDPs and the proposed LDP's are shown on **Figures 2**.

The concentration limits for LDP 2 and LDP 3 are presented in **Table 4**.

Table 4 – Concentration Limits for LDP 2 and LDP 3

Pollutant	Unit of Measure	100 percentile Concentration Limit
Oil and Grease	milligrams per litre	10
pH	pH	6.5 – 8.5
Total Suspended Solids	milligrams per litre	50
Source: EPL 528		

The volumetric limits associated with all three of the discharge points are presented in **Table 5**.

Table 5 – Volume Limits for LDP 2 and LDP 3

Pollutant	Unit of Measure	100 percentile Concentration Limit
LDP 2	kilolitres per day	5000
LDP 3	kilolitres per day	5000
Source: EPL 528		

4.0 EROSION AND SEDIMENT CONTROL AND SOIL MANAGEMENT

Erosion and sediment controls are to be implemented across the Charbon Colliery for all phases of the operation including construction/maintenance activities, operational activities and during rehabilitation to mitigate the impacts of the operations on watercourses and the surrounding environment. Standard ESC techniques and management principles will be used in accordance with the requirements of the Blue Book.

Soil management techniques should be implemented during stripping and stockpiling of soils prior to commencing mining activities.

4.1 General Erosion and Sediment Controls and Management Principles

Erosion and sedimentation controls for Charbon Colliery may be achieved by implementing the following key principles:

- Conducting best practice land clearing procedures for all proposed disturbance areas;
- Minimising the disturbance footprint;
- Coordinating mining sequences to minimise exposure of disturbed soils to the elements;
- Separation/diversion of 'clean' water catchment runoff from disturbed areas runoff to minimise sediment-laden and mine water volumes for management;
- Ensuring sediment-laden runoff is treated via designated sediment control devices;
- Appropriate storage of topsoil stockpiles in areas away from roadways and other drainage lines;
- Revegetation of disturbed areas as soon as possible following the completion of construction activities; and
- Implementing an effective maintenance program for the site.

4.2 Minimising Disturbances

Land disturbance will be minimised by clearing the smallest practical area of land ahead of construction and mining activities, whilst also ensuring that the land is disturbed for the shortest possible time. This will be achieved by:

- Limiting the cleared width to that required to accommodate excavation plus areas required for overburden placement and topsoil stockpiling; and
- Programming the works so that only the areas which are under active excavation are cleared.

General vegetation clearing and soil stripping will not be undertaken until earthwork operations are ready to commence and all proposed ESC measures are implemented. All operations will be planned to ensure that there is no damage to any trees and pasture areas outside the limits to be cleared.

4.3 Stripping of Topsoil

Careful planning and supervision of topsoil stripping activities is critical in ensuring all suitable material is recovered, while avoiding unsuitable, subsoil materials ie dispersive soils. Where practicable, topsoil from the woodland and pasture areas will be preferentially stripped and stockpiled separately so that it can be placed in designated areas in accordance with the revegetation types on the site. The woodland topsoil will be placed in the tree lot and corridor areas, while the topsoil from the pasture areas will be placed in those areas identified for grassland.

Topsoil stripping will be undertaken when the soil is in a slightly moist condition thus reducing damage to soil structure, achieving a higher standard of revegetation and reducing maintenance requirements. Soil materials will not be stripped in either a dry or wet condition.

Topsoil can be potentially destroyed in the stripping process, therefore particular attention is given to the following matters:

- Vehicular traffic is kept to a minimum on those soils which are to be stripped to reduce soil compaction and structural decline;
- Soil should be stripped, where possible, when it is in a slightly moist condition. Material should not be stripped in either a dry or wet condition because the possibility of soil structural decline;
- Use of a combination of a dozer and front end loader, or less preferably a scraper to strip soil material;
- Vegetation clearing will avoid contamination of the topsoil with large quantities of green material as this promotes biological degradation (composting) of runners, roots and seeds which would otherwise be a source of regrowth when topsoil is respread;
- Timber, logs, rubbish and other vegetative matter which will interfere with respreading applications or surface stability are removed. Large rocks, road base, concrete and debris are also removed;
- Equipment operators involved in topsoil stripping are instructed on topsoil identification to maximise recovery and to avoid contamination of the target soil with subsurface material; and
- Where possible soil material is directly used in rehabilitation rather than stockpiled.

4.4 Topsoil Stripping Depth

Table 6 outlines the stripping depths recommended for the various soil types as presented in the Continued Operation of the Charbon Colliery Soil Assessment (GSSE, 2009a).

Table 6 – Recommended Topsoil and Subsoil Stripping Depths

Pollutant	Recommended Stripping Depth (cm)	
	Topsoil Below Surface (cm)	Subsoil Below Base of Topsoil (cm)*
Yellow Duplex Soil	10	20
Brown Duplex Loam	20	20
Red Uniform Clay Loam	12	20
Skeletal Soil	Not recommended for stripping	

* NB – All subsoils should be used as an intermediate layer between overburden and the topdressing in rehabilitation.

4.5 Topsoil Handling Minimisation

Topsoil will generally be stripped ahead of the mining activities using a bulldozer and transported by front end loader and truck then immediately re-spread, where practicable scrapers may also be used. Direct placement is the best management option as it reduces soil degradation and minimises later compaction. Where direct placement is not possible stockpiling will be utilised.

4.6 Stockpiling

Ideally, topsoil should not be stockpiled. Stripped material should be placed directly onto the disturbed areas and spread immediately if construction sequences, equipment scheduling and weather conditions permit.

Where longer term (i.e. greater than 6 months) stockpiling is required, a maximum stockpile depth of approximately 3 m will be maintained to preserve viability and reduce soil deterioration of seed, nutrients and soil biota by avoiding topsoil collection when saturated following rainfall. Longer term soil stockpiles will be sown with fast-growing species as soon as possible after stockpiling. Appropriate temporary sediment controls will be installed and maintained until the crop becomes established. Soil stockpiles will be constructed with a slope no greater than 2:1 (H:V) and the stockpile surface left slightly roughened. Placement within natural or constructed drainage lines will be avoided. Stripped topsoil will be windrowed

adjacent to the amenity bunding or placed within the stockpiling and handling area footprint to eventually stabilise the amenity bunding.

4.7 Temporary Erosion and Sediment Controls

Prior to any construction activity (including soil stripping, road construction, bulk earthworks), temporary erosion and sediment control measures will be installed. The following are temporary ESC features that may be utilised at the site.

4.7.1 Sediment Filter Fences

There may, on occasion, be a disturbance area which is either not protected by existing structures or requires additional temporary protection against erosion and sedimentation. In these cases it may be suitable to install sediment filter fencing. Sediment filter fences filter run-off leaving the site, trapping sediment and allowing filtered water to pass. Sediment silt fences should be constructed around the base of any areas of exposed land that are not subject to concentrated overland flow and that are not adequately protected by existing structures. Sediment filter fencing should be installed around the extent of the disturbance area where sediment-laden water could potentially enter clean downstream receiving waters.

Sediment filter fences are normally placed on the contour or slightly convex to the contour. The contour on each end of the fence should be turned to create a stilling pond up slope of the fence. Where possible, a silt fence system should consist of a series of overlapping fences. Each fence should be no longer than about 40 metres. They should not intercept large concentrated or channelised flows. The fences should be constructed in accordance with the Sediment Fence Standard Drawing (SD6-8) of the 'Blue Book'. Silt fences require regular maintenance. Trapped sediments should be removed, pickets straightened, filter cloth re-secured and tightened.

4.7.2 Sandbag Weirs

Sandbag weirs may be installed within existing swale drains or existing drainage channels, which are not able to be regularly graded. The use of these devices must be limited to temporary erosion and sediment control in channels during construction or high disturbance phase mining.

The weirs should typically be installed at a minimum of 40 metre intervals. As with sediment filter fences, sandbag weirs may be installed prior to any works commencing on the site in existing channels and immediately after the construction of new channels. Inspections of the sandbag weirs after rain should take place with removal of the collected sediment as required. Damaged/shifted bags should be repaired or replaced.

It is important not to overfill the sandbags as this can cause gaps when the sandbags are wedged together. Three quarters to two thirds full is generally the right amount of material within each sandbag.

4.7.3 Temporary Drains

Runoff from areas exposed during the works is to be controlled by construction of temporary contour and diversion drains. These drains generally take the form of channels constructed across a slope, with a ridge of the lower side. Contour drains are drains which follow points of the land of approximately the same elevation. They should be implemented immediately after a construction site is cleared to intercept and divert runoff from the site to nearby stable areas at non-erosive velocities. The drains should be formed with a gentle grade of approximately 1.2%.

4.7.4 Temporary Silt Traps

Temporary sediment trapping devices may be required during construction to filter sediment-laden runoff from small areas (0.5 ha or less). They are to be used to filter sediment from runoff before entering the natural watercourses or to protect adjacent lands.

4.8 Specific Erosion and Sediment Control Structures

The previous section presented general controls and management principles to be used at the Charbon Colliery. This section contains the details of more specific erosion and sediment devices for Charbon

including their location, function, and capacity. **Figure 2** shows the position of these devices within the Charbon Colliery.

The main runoff classifications to be managed by the Complex include:

- Clean water – surface water runoff from undisturbed areas of the Project Site.
- Dirty water – surface water runoff from disturbed areas of the Project Site.
- Mine water – water extracted from underground mining areas.

Key strategies that would be implemented by Charbon Colliery includes:

- Clean water diversions would be constructed, where practicable, upstream of proposed disturbance areas prior to commencement of ground disturbing activities. As a result of steep slopes in sections of the Project Site, such diversions may not be practicable in some areas. Where this is the case, clean water would be managed in conjunction with dirty water.
- Dirty water generated within the existing and proposed open cuts would be managed within in-pit sumps. If required, this water may be directed to one or more pollution control dams and, where practicable, would be re-used for operational purposes.
- Mine water extracted from the underground workings would be directed to one or more pollution control dams and, where practicable, would be re-used for operational purposes.
- As disturbed areas are progressively rehabilitated, small sedimentation ponds would be constructed within the final landform to contain and treat runoff until vegetation becomes sufficiently established. These structures would then be removed or would, where appropriate, remain within the final landform.

4.8.1 Clean Water Diversions

An objective of water management within the Project Site is to segregate clean and dirty water flows where possible. Diverting surface water flows away from the active extraction areas and pollution control dams helps achieve this objective. Uncontrolled water flows over disturbed areas would also greatly increase the risk of erosion. By diverting clean water flowing from undisturbed areas away from the active areas of disturbance at non-erosive velocities to stable areas in adjacent drainage lines, the risk of erosion would be greatly reduced. Clean water diversions would therefore be constructed wherever possible.

Due to the steep gradient of the slopes along the high walls of the Central, 8 Trunk and Western Open Cuts, constructing clean water diversions above the disturbance area may not be possible. Slopes on the upper side of the disturbance areas are estimated to be typically 25% to 35%, with clean water diversions best suited for slopes up to 18.5%, and ideally less than 10%. Without these control measures in place, clean water runoff generated from catchments above the surface excavation areas are anticipated to flow into the active extraction area. For this reason, the dirty water management in these three areas are important in ensuring downstream drainage lines and creeks are not polluted.

The Southwest Open Cuts are located at the top of a ridgeline, with no upstream catchment. Subsequently, clean water diversions are not required for the Southwest Open Cuts.

Where clean water diversions can be implemented, the diversion banks would be constructed generally in accordance with Blue Book Standard Drawing (SD) 5-6, refer to **Figure 4** below. A summary of the general minimum design specifications is as follows:

- Gradient of the diversion banks should be approximately 1%;
- Height of the bank should be at least 300mm;
- Channel depth should be at least 400mm;
- A level spreader (or sill) should be constructed at the bank discharge point to reduce the risk of erosion at this point, as per SD 5-5; and
- Within ten days of construction, pasture should be sown to prevent erosion of the bank and drain.

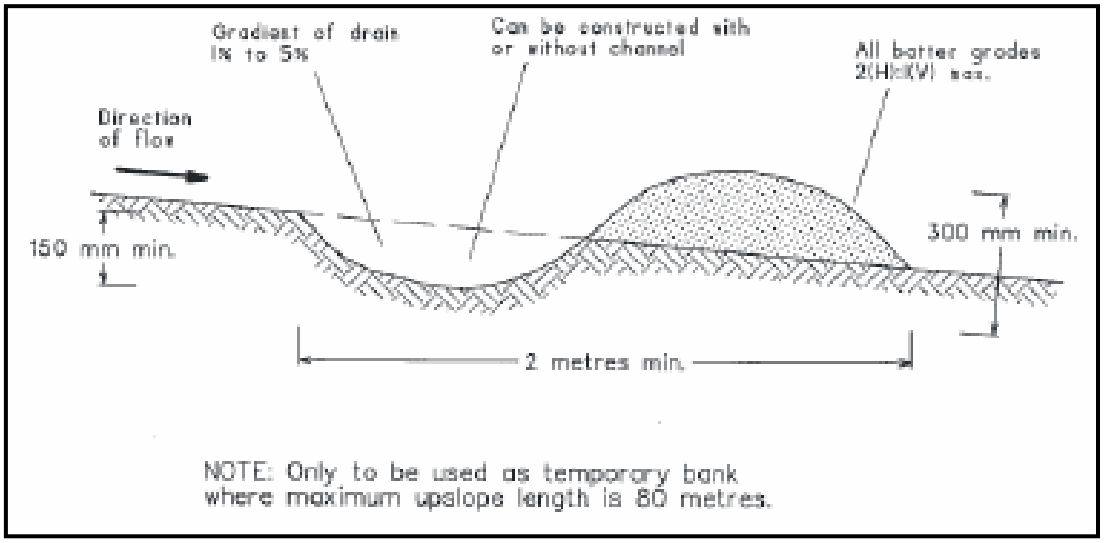


Figure 4: Example of Clean Water Diversion Bank taken from the Blue Book Standard Drawing SD 5-6

The size of these clean water cut-off drains may be restricted by the steep topography and shallow nature of the soils overlying bedrock. A risk based approach can be adopted to allow flows up to a designated storm event to be diverted, beyond which clean water would be permitted to flow into the active work area. Clean water diversion channels would be designed to convey the 20 year ARI storm, as recommended by Volume 2E of the Blue Book for temporary drainage controls, where the duration of disturbance is greater than three years.

The diversion banks should be inspected monthly, or following a significant rain event to ensure that they are capable of carrying the surface water flow of the catchment at non-erosive velocities or concentrations. In the event that significant erosion is observed, the diversion bank should be upgraded to cater for high flows in accordance with Blue Book SD 5-6 (See **Figure 4**).

Pit Top Area

Clean water runoff upstream of the Rail Loop drains through a culvert in the Rail Loop. This water is discharged off site via proposed LDP 4. The quality of this water will be monitored according to the EPL conditions.

Third Entry Open Cut

The Third Entry Open Cut has been successfully rehabilitated and is considered to be a clean water catchment, excluding the workshop areas. The workshop and hardstand areas located in the vicinity of the Third Entry Open Cut are situated in such a way as to not receive large amounts of run-on flows (i.e. only a small clean water catchment area). Where practical, clean runoff from upstream areas should be diverted around LDP 2 (provided that it can be separated from the access road runoff).

Southern Open Cut

Clean water from the upper catchments is diverted around the Southern Open Cut area and directed into the LDP 3 Discharge Dam, or, to the Stony Creek catchment to the south.

Western Outlier and Southern Outlier Open Cuts

There will be minimal clean water entering the disturbance area at the Western and Southern Outliers due to these areas being located at the top of catchments.

8 Trunk Open Cut

Clean water diversions are recommended to be installed above the proposed mining area where slopes are less than 10 degrees. They should be constructed so they spill ahead of the stripped areas in preparation

for mining. Unfortunately, due to the steep nature of the terrain in the vicinity of the 8 Trunk Open Cut, it is believed that surface water diversions would be limited to small, isolated areas, however, such clean water diversions should be implemented where possible to minimise the dirty water collected in the in-pit sumps.

Western Open Cut, Underground and Associated Areas

Due to the steep nature of the upstream clean water catchment, construction of clean water diversions around the Western Open Cut would not be possible. Therefore any runoff generated upstream of the Western Open Cut would be managed within the in-pit sump. In addition, no upstream catchments report to the proposed ROM stockpile areas within Area 4 and as such, there is no clean water diversions installed here.

Clean water diversions will be constructed near the Western Primary Pollution Control Dam and the LDP 5 Discharge Dam to limit the amount of runoff reporting to these dams.

Central Open Cut

The steep nature of the terrain in the area makes clean water diversions difficult to construct, however, they should be installed where practical. Clean water diversions appear to be possible for the southern part of the upstream catchment.

4.8.2 Dirty Water Capture and Treatment

Construction of a number of sediment basins would be required to ensure dirty water generated throughout the continued operations of Charbon Colliery is appropriately captured and treated to ensure the risk of any offsite impacts relating to surface water is minimised.

The sizing of the sediment dams to be constructed in the final landform has been calculated in accordance with the guidelines laid out in the Blue Book Volume 2E, for areas with disturbance greater than three years with a capacity such that they would be able to effectively treat runoff from up to the 90th percentile, five day rainfall event for the region. **Table 7** below is a summary of the existing dams and **Table 8** provides a summary of the proposed dams at the Charbon Colliery.

Table 7 – Existing Dams

Location	Purpose	Total Capacity (ML)
Southern Open Cut Pollution Control Dam	Pollution control of excess dirty water from the Southern Open Cut operations, and from the majority of the proposed 8 Trunk Open Cut. Provides a source of dust suppression water.	46
Western Primary Pollution Control Dam	Pollution control of excess dirty water from the Western Open Cut and Underground. Provides source of dust suppression water.	4.8
Third Entry Pollution Control Dams	Pollution control of excess dirty water from the northern end of the 8 Trunk Open Cut. Provides source of dust suppression water.	50

Table 8 – Proposed Dams

Location	Purpose	Total Capacity (ML)
During Mining		
Central Primary Pollution Control Dam	Pollution control of excess dirty water from the Central Open Cut	3.4
Central Intermediate Pollution Control Dam	Additional pollution control of excess dirty water from the Central Open Cut	2
LDP 4 Discharge Dam	Containment of dirty water runoff from the REA and infrastructure area	15*
LDP 5 Discharge Dam	Enable controlled discharges from LDP 5	2
LDP 3 Discharge Dam	Enable controlled discharges from LDP 3	50
Final Landform		
Southern Outlier (one or more)	Sediment control during rehabilitation	3.8
Western Outlier (one or more)	Sediment control during rehabilitation	3.6
Western Open Cut (southern section)	Sediment control during rehabilitation	3.1
8 Truck Open Cut (with clean water diversions)	Sediment control during rehabilitation	9.4
8 Truck Open Cut (without clean water diversions)	Sediment control during rehabilitation	20.1
Central Open Cut – Central Primary Pollution Dam and small sediment basins	Sediment control during rehabilitation	10.2**
*GHD (2009) ** this required volume at the Central Open Cut can be made up from the 7 ML pollution control dams and 3 x 1ML dams constructed within the final landform.		

The Soil Assessment conducted at Charbon (GSSE, 2009a) concluded that some of the Brown duplex clays / subsoils present in the project area have a moderate erosion potential, with Emerson ratings of 3(1) to 3(3), which indicates a moderate to slight potential for dispersion and hardsetting surfaces. If the topsoil of these soil units is disturbed or removed and the subsoils are exposed, the potential for erosion may be increased. Disturbance occurring within the vicinity of a drainage line could impact on downstream water quality through an increase in sediment loads. These soils should, therefore, be managed to ensure that the subsoils are not exposed without suitable controls being implemented.

Some Red and Yellow duplex clays/ subsoils are present and displayed structural stability and little erosion potential, with Emerson ratings of 8/3/(1) and 8/5 respectively. These soils are likely to occur in the Southern Outlier and should therefore be managed to ensure that the subsoil are not exposed without suitable controls being implemented.

Given that the characteristics of the underlying material to be exposed during active extraction and replaced in the final landform is uncertain, the sediment control structures have been conservatively designed for Type D/F soils, which assumes that material may be dispersive.

Pit Top Area

The Pit Top Area incorporates the Reject Emplacement Area (REA), ROM Stockpile, Product Stockpile, Surface Facilities and CHPP. This area is considered to be a closed system as it is isolated via clean water cut-off drains. All dirty water ultimately drains through a culvert in the rail loop (via the mine dam) and into Reedy Creek Dam (capacity of >100ML), which is the primary source for process water.

A toe dam collecting runoff and seepage exists at the base of the REA. The height and footprint of the REA is to be increased during the MOP period, resulting in the removal of the existing toe dam. A new pollution control dam will be constructed within the rail loop (referred to as the LDP 4 Discharge Dam). The water levels in the LDP 4 Discharge Dam would be managed via the existing pipe and pump network within the rail loop to minimise discharges from this dam. Water from this dam will be preferentially re-used as process water in the CHPP and in underground workings.

Should water discharge from the LDP 4 Discharge Dam in extreme rainfall events, the water would flow offsite into Reedy Creek Dam via the culvert in the rail loop. A v-notch weir will be installed to monitor the volume and frequency of discharges.

Third Entry Open Cut

The dirty water associated with the Third Entry (open cut rehabilitation site, workshop and contractor facilities) drains to two large pollution control dams, referred to collectively as the Third Entry Pollution Control Dam, where water is discharged, when required, through LDP 2.

Southern Open Cut

The Southern Open Cut operation has a self-contained water management system utilising large existing farm dams and constructed pollution control ponds to manage dirty water before discharging through LDP 3, when required. The primary water storage dams associated with this mining area are the Southern Open Cut Pollution Control Dam and the LDP 3 Discharge Dam, which each have approximate capacities of 50ML. It should be noted that the capacity of the LDP 3 Discharge Dam is a conservative estimate since Charbon Colliery was unsure of its actual capacity at the time that this ESCP was developed.

There are two (2) additional 3 ML pollution control ponds located at the base of the out of pit emplacement. These ponds discharge into the Southern Open Cut Pollution Control Dam.

LDP 3 has been proposed to be moved further downstream to the LDP 3 Discharge Dam to manage dirty water generated within the Southern Open Cut extension more effectively during this MOP period.

Western Outlier and Southern Outlier Open Cuts

Dirty water in the Western and Southern Outliers will be contained within the disturbance areas (i.e. within the open cut pits). The extraction levels are below the adjoining natural surface levels on all sides, thereby proving an effective bund containing all dirty water. The dirty water generated will be directed to in-pit sumps, where the water will be temporarily contained. When required, this water will be pumped via pipes to the Southern Open Cut Pollution Control Dam where it will be managed in accordance with the Southern Open Cut water management system detailed above.

8 Trunk Open Cut

Dirty water generated within the extraction area of the 8 Trunk Open Cut would be contained within the extraction area by directing the water to an in-pit sump. When required, water would then be pumped from the in-pit sump to either the Southern Open Cut Pollution Control Dam (southern 75% (approximately 940m) of the 8 Trunk) or the Third Entry Pollution Control Dam (northern 25% (approximately 310m) of the 8 Trunk). If required, water will then be discharged through LDP 3 or LDP 2 respectively.

Where dirty water cannot be directed to an in-pit sump, dirty water diversions would be constructed to direct water into the haul road table drains. Here water can be treated via mitre drains with temporary sedimentation controls at their outlets (e.g. sand bag weirs, sediment fence weirs), or directed to the Southern Open Cut Pollution Control Dam or the Third Entry Pollution Control Dam. However, only minimal runoff will have to be managed in this manner.

Western Open Cut, Underground and Associated Areas

Dirty water collected within the extraction area of the Western Open Cut will be directed into an in-pit sump. When required, water would be pumped out of this in-pit sump and into the Western Primary Pollution Control Dam, located to the north and downstream of the Western Open Cut. The Western Primary Pollution Control Dam will be constructed with a capacity of 4.8 ML, and is designed to contain a 90th percentile, five day rainfall event for the region. Future works will require this capacity to increase to in the order of 10 ML.

Runoff from the proposed ROM stockpile and infrastructure areas (Area 3 and Area 4) will also be directed to in-pit sumps to ensure containment. Water from these sumps will then be transferred to the Western Primary Pollution Control Dam as required. Some water would be extracted from this dam to be used for dust suppression.

Rainfall infiltration collected in the underground workings would be pumped to an in-pit sump located within the disturbance area of the Western Open Cut and managed in accordance with the methods detailed above. During rainfall events where rainfall infiltration (maximum of 20.5 kL/day) and additional water from the underground (56kL/day from the continuous miner) is higher than water being sourced from this dam (i.e. for dust suppression), the underground water would be periodically held in the open cut sump, until such time as the water level in the Western Primary Pollution Control Dam is drawn down providing sufficient capacity.

Central Open Cut

Dirty water generated within the extraction area of the Central Open Cut would be maintained within the disturbance area by directing the water to an in-pit sump. Calculations indicate that 7.0 ML storage capacity is required to contain the 90^{th} percentile, five day rainfall event for the region, to be constructed downstream and adjacent to the Central Open Cut. This capacity is to be contained within the Central Primary Pollution Control Dam (3.4 ML), Central Intermediate Pollution Control Dam (2 ML) and the LDP 5 Discharge Dam (2 ML).

When required, water would be pumped from the in-pit sump to the Central Primary Pollution Control Dam. Overflow from this dam would drain into the Central Intermediate Pollution Control Dam prior to the LDP 5 Discharge Dam. Discharge from this dam will (as the name suggests) occurs via LDP 5, with the dam enabling any discharge to be controlled and measured.

4.9 Haul Roads

To ensure any potential surface water impacts associated with the upgrade are minimised, the following measures should be undertaken:

- Roadside drainage, such as table drains, should be incorporated into the construction of the haul road, and be maintained regularly throughout the life of the Project;
- A series of mitre drains should be constructed to take water from the table drains away from the haul road to appropriate disposal areas. The runoff would be split at regular intervals to keep the volume of water in each mitre drain to an appropriate level. This could be achieved by spacing the drains as close together as practicable. The spacing would not exceed 50m, with the drains spaced closer together on higher gradients. Mitre drains would be revegetated as soon as practical after construction; and
- Sediment fencing or sand bags could be used to control the sediment at the end of the mitre drains, and controls would be periodically inspected to maintain their performance.

A new drainage line crossing may be required near the Western Underground, where a new section of the haul road from the Western Underground would join the existing haul road. This crossing would be constructed in accordance with the Blue Book and OEH requirements. It is not anticipated that the upgrade to the haul road would require any further new crossings to be constructed. Once constructed, more long term sediment controls such as sediment dams will be constructed at the outlet points of the mitre drains to treat sediment-laden runoff from the haul road. These dams will be constructed following the guidelines and requirements presented in the Blue Book.

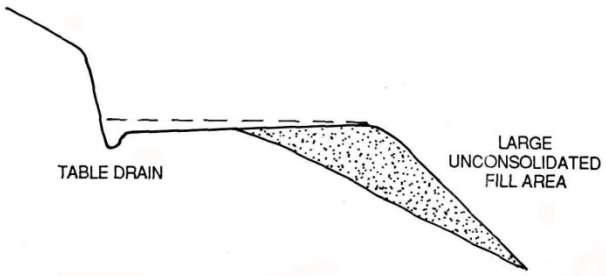
4.10 Fire Trails and Access Tracks

Fire trails and/or access tracks should be constructed in accordance with appropriate standards such as those described in *Managing Urban Stormwater: Soils and Construction Vol. C - Unsealed Roads* and/or described by the NSW Rural Fire Service. Surface drainage is optimised and stabilised, thereby reducing roadside erosion and sedimentation. Appropriate control measures will be constructed on all fire/access roads with cross fall drainage at 3% either side of the road crown to be largely responsible for immediate water shed from the road surface. Techniques that could be used to provide crossfall on the track include crowing, infall and outfall:

- Crowning

Crowning allows water to be shed on both sides

- Infall



- Outfall

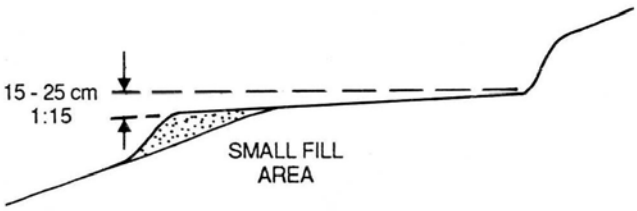


Table Drains, Mitre Drains, Culverts and Cross Drians will be used to safely convey the water from the track surface so to prevent runoff from eroding them or adjacent land. Mitre Drain spacing should not exceed 50m even on soils with low erodibility. Cross Drains will be placed every 20m to 90m depending on the road grade and soil erodibility.

Cut and fill batters associated with service tracks will be formed to a safe slope and stabilised by vegetation. Where cut batters are greater than 1.5m, stabilisation methods will be applied to these areas such as laying back, revegetation and drainage. Stabilisation will be assisted by spreading topsoil and/or by applying chemical or organic mulch over the exposed batter surface. Where fill batters are greater than 2:1, re-grading may be required.

Where access tracks are required to cross any watercourses, they will generally be constructed so that they cross perpendicular to the watercourse, subject to other constraints.

The tracks will be inspected following heavy traffic usage or exceptionally large storm events, to determine maintenance requirements. Periodic maintenance will include checking the drainage systems to remove any debris that bay block culverts, cross rain outlets and table drains.

4.11 Rehabilitation of Drainage Lines

The proposed mining operations would disturb some ephemeral drainage lines, namely:

- one first order stream in the Central Open Cut;
- the extreme upper sections of first order streams in the Southern Open Cut Extension; and
- one first order and one second order stream within the 8 Trunk Open Cut.

Where drainage lines are to be rehabilitated the channel will be designed and constructed so that it will be stable for the long-term, and temporary erosion controls will be implemented to provide for the short-term stabilisation of the riparian corridor.

The rehabilitation of these drainage lines is addressed within the Rehabilitation and Vegetation Management Plan (GSSE, 2010).

5.0 MONITORING PROGRAM

5.1 Monitoring and Maintenance of Erosion and Sediment Controls

The Charbon Colliery environmental office will need to ensure that regular general inspections of the site are undertaken to ensure that all the environmental controls outlined in this report are functioning effectively. These inspections should coincide with regular environmental inspections and monitoring undertaken on site and after runoff events (>20 mm of rain). Monthly checks will target temporary measures and permanent features. Any signs of erosion along the length of the drains should be noted and remedial works undertaken as required. Where significant erosion is observed, additional erosion controls will be constructed eg. establishment of vegetation cover, armouring of the channel surface and construction of rock scour protection at the entry and discharge locations.

Regular visual checks should be made of any temporary sediment controls such as sediment filter fences; sandbag weirs etc to ensure that they are functioning adequately and repaired where required.

An inspection of the proposed sediment basins, once constructed, should be undertaken as part of the routine site environmental inspection program or following significant rainfall (i.e. >20mm within 24hrs) with the information such as the general condition of the dam, evidence of overflow, condition of downstream catchments, water colour, evidence of eroding surfaces and approximate retained capacity recorded.

5.1.1 Roads

The internal roads will be visually inspected to ensure that the appropriate mitigation measures are functioning to convey the surface flows from the road and work areas without causing erosion to the road or work areas on the adjacent land. Where significant erosion is observed to be occurring on a regular basis, additional controls such as additional mitre drains, scour protection of road drainage, and re-grading of the road surface, will be implemented.

5.1.2 Dams and Diversion Works

Regular visual checks will be made of the clean water dams to ensure that there is no noticeable increased discolouration or undesirable sediment build up in the dams, and that dams are in a stable condition. The inspections also enable correct scheduling of de-silting works and prompt repairs and/or replacement of damaged works. Flocculants may be employed to assist in the removal of fine dispersive sediment from the water column in turbid dams. When the design capacity of a sediment dam has been reduced by more than 20%, then the dam is to be de-silted. The silt from the dam is removed so that it is not able to be washed back into the dam.

Any pipelines or waterways constructed to transfer water from these dams will be inspected to ensure that there are no leaks, erosion or blockages to flow. Any signs of erosion at the points of discharge will be noted and remedial works undertaken as required. Where significant erosion is observed additional erosion controls will be constructed such as new rock scour protection at the discharge locations.

5.1.3 Sediment Controls

Regular visual checks will be made to ensure that there is no noticeable increased discolouration or undesirable sediment build up in the dams, and that the dam is in a stable condition. Any sediment fencing and sand bag sediment filters will also be inspected to ensure that they are functioning adequately.

6.0 REPORTING

The effectiveness of sediment and erosion control measures adopted on the site will be assessed and reported to site management as part of the environmental officer's monthly inspection. Requirements for corrective actions identified during monthly inspections are to be reported and corrective actions should be implemented in a timely manner.

A summary of any ESC management issues and actions arising throughout the year will generally be presented in the Annual Environmental Management Report (AEMR). The Proponent shall prepare and submit an AEMR to the Director-General of the Department of Planning and other relevant agencies, which includes the following:

a. identify the standards and performance measures that apply to the Project;
b. describe the works carried out in the last 12 months;
c. describe the works that will be carried out in the next 12 months;
d. include a summary of the complaints received during the past year, and compare this to the complaints received in previous years;
e. include a summary of the monitoring results for the Project during the past year;
f. include an analysis of these monitoring results against the relevant:
    - impact assessment criteria;
    - monitoring results from previous years; and
    - predications in the EA.
g. identify any trends in the monitoring results over the life of the Project;
h. identify any non-compliance during the previous year; and
i. describe what actions were, or are being, taken to ensure compliance.

In accordance with Environmental Protection Licence requirements an Annual Return will also be prepared and submitted to the OEH (formally DECCW) using the proforma provided by OEH.

7.0 ROLES AND RESPONSIBILITIES

7.1 Responsibilities

The Charbon Environmental Officer will be responsible for:

- overseeing the implementation of this ESCP;
- ensuring that monitoring, periodic environmental inspections and inspections after high rainfall events are undertaken;
- investigating water complaints and/or enquiries;
- co-ordinating additional water monitoring as required;
- managing the water quality of sediment dams such that should any water leave the site due to a high rainfall event, it does not cause pollution to any receiving waters;
- providing adequate training to employees and contractors regarding their requirements under this ESCP; and
- consulting with the relevant government departments as required and providing the relevant information/reports to all stakeholders as necessary.

The Operations Manager is responsible for providing adequate resources to undertake the activities required by the plan.

Operations and general contractors should be made aware of the existing erosion and sediment control structures onsite to ensure that they are not damaged during operations.

7.2 Training

It will be the responsibility of the Charbon Environmental Officer to provide training to Charbon staff and contractors on ESC and soil management. The training should include a review of this ESCP and WMP.

Specific training should be provided to operators and site contractors prior to soil stripping and stockpiling to ensure effective management of soils.

General training should be given to all staff to ensure that ESC structures and features are properly managed at the site.

8.0 PERIODIC REVIEW

The Charbon Environmental Officer shall review this Plan every three years or earlier as the need arises. A range of items could potentially trigger a review of this plan including:

- A statutory requirement (eg POEO Act, EPL 528);
- A regulatory authority request (eg OEH, DTIRIS Minerals Resources, DoPI, NOW);
- Environmental change, or significant event (eg intense or prolonged rainfall events);
- Significant discharge incident; or
- Significant changes to water control structures.

If any significant changes to the Plan are required as an outcome of the review, the revised Plan will be issued to OEH for approval as required by the Development Consent.

9.0 REFERENCES

ANZECC (2000), Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

Centennial Coal Company Limited (June 2007), Charbon Colliery Water Management Plan and Erosion and Sediment Control Plan.

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GSS Environmental (2009a), Continued Operation of the Charbon Colliery, Soils Assessment.

GSS Environmental (2009b), Continued Operation of the Charbon Colliery, Surface Water Assessment.

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