Centennial Coal

Lidsdale Siding Upgrade Project

Soils, Land Resources and Agricultural Assessment (CCC27-001B)

May 2012

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1.0 BACKGROUND

Centennial Coal commissioned GSS Environmental (GSSE) to undertake a Soils, Land Resources and Agricultural Assessment as part of the Environmental Assessment (EA) for the Lidsdale Siding Upgrade Project.

Centennial Coal proposes to upgrade the existing Lidsdale Siding rail loading facility by automating the train loading facility. This would significantly reduce the need for mobile plant and equipment to load rail wagons by establishing a main elongated conical stockpile with underground reclaimers feeding a ground conveyor elevating to a train loading bin.

Centennial Coal Lidsdale Siding is located immediately to the west of Wallerawang Power Station as shown on **Figure 1**.

GSSE conducted a site inspection of the Lidsdale Siding on the 19th January 2012 as the field component of the Agricultural Assessment. This report contains the methodology and results of the assessment.

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Lidsdale Siding
Regional Locality

FIGURE 1

2.0 METHODOLOGY

2.1 Soil Assessment

A soil map was developed using the following resources and techniques:

- Aerial photographs and topographic maps

  Aerial photo and topographic map interpretation was used as a remote sensing technique allowing analysis of the landscape and mapping of features expected to be related to the distribution of soils within the Study Area. Previous land resource mapping and a soil survey of the area was utilised to assist in defining boundaries of units and classes at a more intensive scale.

- Reference information

  Source materials, including cadastral data, prior and current physiographic, geological, vegetation, and water resources studies were used to obtain correlations between pattern elements and soil properties that were observable in the field.

- Stratified observations

  Exposed soil profiles throughout the proposed disturbance areas were visually assessed to verify soil types and delineate soil type boundaries.

2.2 Land Assessment

During the site assessment, information was collected to enable the Agricultural Assessment to be conducted in accordance with the draft NSW Strategic Regional Land Use Policy. Under this policy all new mining related project applications are required to undertake explicit agricultural productivity impact assessments as part of their environmental impact statement. To date, two Strategic Regional Land Use Plans (SRLUPs) have been released: the Upper Hunter and New England North West. No SRLUP has been released for the Central Western Tablelands area.

Two assessments were used in this study to evaluate physical agricultural productivity: land capability and agricultural suitability assessment. The methodology for each follows in **Sections 2.2.1** and **2.2.2.**

2.2.1 Land Capability

The land capability classification of the Study Area was conducted in accordance with the Office of Environment & Heritage (OEH) (incorporating the NSW Soil Conservation Service). The relevant guideline is called S*ystems Used to Classify Rural Lands in New South Wales* (Cunningham et al., 1988).

This system classifies the land on its potential for sustainable agricultural use if developed, rather than its current land use, and includes three types of land uses:

i. land capable of cultivation;

ii. land capable of grazing; and

iii. land not capable of rural production.

The system consists of eight classes, which classify the land based on the severity of long-term limitations. Limitations are the result of the interaction between physical resources and a specific land use. A range of factors are used to assess this interaction. These factors include climate, soils, geology, geomorphology, soil erosion, topography and the effects of past land uses. The principal limitation recognised by these capability classifications is the stability of the soil mantle and classes are ranked on their increasing soil erosion hazard and decreasing versatility of use.

Two supplementary classes, U and M, provide for areas that contain urban development and mining / quarrying areas, respectively.

A summary of the rural land capability classification system is provided in **Table 1**.

Table 1 – Rural Land Capability Classes

Class	Land Use	Management Options
I	Regular Cultivation	No erosion control requirements
II	Regular Cultivation	Simple requirements such as crop rotation and minor strategic works
III	Regular Cultivation	Intensive soil conservation measures required such contour banks and waterways
IV	Grazing, occasional cultivation	Simple practices such as stock control and fertiliser application
V	Grazing, occasional cultivation	Intensive soil conservation measures required such contour ripping and banks
VI	Grazing only	Managed to ensure ground cover is maintained
VII	Unsuitable for rural production	Green timber maintained to control erosion
VIII	Unsuitable for rural production	Should not be cleared, logged or grazed
U	Urban areas	
M	Mining and quarrying areas	

Source: Cunningham et al., 1988

2.2.2 Agricultural Suitability

The agricultural suitability classification of the Study Area was conducted in accordance with NSW Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) guideline known as the *Agricultural Suitability Maps – uses and limitations* (NSW Agricultural & Fisheries, 1990).

The system consists of five classes, providing a ranking of rural lands according to their productivity for a wide range of agricultural activities with the objective of determining the potential for crop growth within certain limits. Class 1 ranks the land as most suitable for agricultural activities and Class 5 the least suitable. Classes 1 to 3 are generally considered suitable for a wide variety of agricultural production, whereas, Classes 4 and 5 are unsuitable for cropping however are suitable for some grazing activities. A summary of the agricultural suitability classification system is provided in **Table 2**.

The main soil properties and other landform characteristics considered significant for the land suitability assessment are topsoil texture, topsoil pH, solum depth, external and internal drainage, topsoil stone content and slope as well as bio-physical factors such as elevation, rainfall and temperature.

The overall suitability classification for each specific soil type is determined by the most severe limitation, or a combination of the varying limitations.

Table 2 – Agricultural Suitability Classes

Class	Land Use	Management Options
1	Highly productive land suited to both row and field crops.	Arable land suitable for intensive cultivation where constraints to sustained high levels of agricultural production are minor or absent.
2	Highly productive land suited to both row and field crops.	Arable land suitable for regular cultivation for crops but not suited to continuous cultivation.
3	Moderately productive lands suited to improved pasture and to cropping within a pasture rotation.	Grazing land or land well suited to pasture improvement. It may be cultivated or cropped in rotation with pasture.
4	Marginal lands not suitable for cultivation and with a low to very low productivity for grazing.	Land suitable for grazing but not for cultivation. Agriculture is based on native or improved pastures established using minimum tillage.
5	Marginal lands not suitable for cultivation and with a low to very low productivity for grazing.	Land unsuitable for agriculture or at best suited only to light grazing.

Source: NSW Agriculture & Fisheries (1990)

3.0 RESULTS

3.1 Soil Assessment

The Project lies on the central western edge of the Sydney Basin within the siltstone dominated Berry Formation, which overlies the Megalong Conglomerate to form the Shoalhaven Group (King, 1992). The Illawarra coal measures sub-crop about 1 km to the north and continues over Coal Services.

Areas within the Illawarra Coal Measures consist of shale and sandstone in addition to conglomerate, limestone, dolomite, claystone, mudstone, coal and torbanite. Areas within the Berry Formation consist of grey siltstone with thin beds of limestone and sandstone. The Page: 6 Lidsdale Siding lies on Alluvium which is underlain by the Shoalhaven group. The Illawarra coal measures sub-crop lies about 1 km to the north and continues over Coal Services (refer Figure 6 of the Groundwater report).

Unconsolidated alluvium overlying the Illawarra Coal Measures in the drainage areas and their associated floodplains consist of shale, sandstone, conglomerate, limestone, dolomite, claystone, mudstone, coal and torbanite. The cliffs and rises of the upper landscape are composed of Narrabeen Group sandstones, which consist of quartz-lithic sandstones and quartz sandstones, inter-bedded with thin red, grey and green claystone shale and occasional conglomerate and ironstone lenses.

Soil Landscapes occurring in the Study Area are Cullen Bullen, Lithgow and Pipers Flat (refer **Figure 2**).

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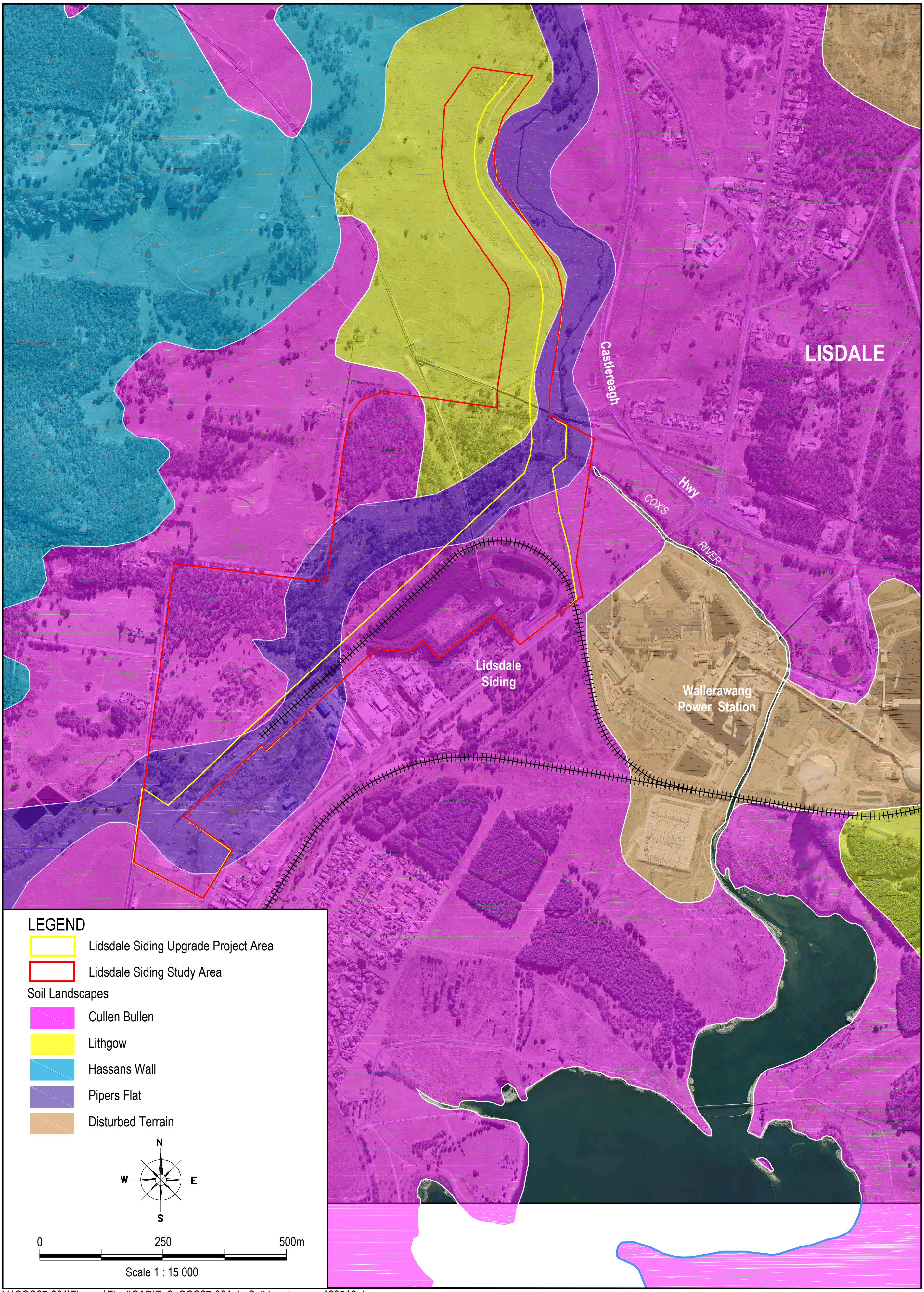

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Lidsdale
Soil Landscapes

FIGURE 2

The *Cullen Bullen* Soil Landscape contains soils that are shallow to moderately deep (<100 centimetres (cm)) with Yellow Podzolic Soils (Dy2.41, Dy2.51) and Yellow Earths (Gn2.21, Gn3.71, Gn3.84) occurring on crests. Moderately deep (<100cm) Yellow Podzolic Soils (Dy5.21), Soloths (Dy3.31, Dy3.41) and Yellow Leached Earths (Gn2.34, Gn3.84) occur on the upper and mid-slope areas. Moderately deep to deep (50-150cm) Yellow Solodic Soils (Dy2.32, Dy2.42, Dy4.42, Dy5.42) and Yellow Podzolic Soils (Dy5.21) occur on the lower slopes near and along narrow (<20m) drainage lines. Shallow (<80cm) Yellow Earths (Gn2.21, Gn3.71) and Lithosols (Uc1.24) are associated with low scarps.

The *Lithgow* Soils Landscape contains moderately deep (<120cm) Red Podzolics (Dr3.41), Yellow Podzolics (D2.11, Dy3.11) and Yellow Leached Earths (Gn2.34) on the upper slopes and well-drained areas. Moderately deep to deep (>170cm) Solods / Yellow Solodic Soils (Dy.2.41, Dy3.41) occur on the lower slopes and in areas of poor drainage.

The *Pipers Flat* Soil Landscape contains moderately deep to deep (>100 cm) Grey-brown Alluvial Soils, Leached Loams (Um2.22), Soloths (Dy3.11, Dy3.41), and Gleyed Podzolic Soils (Dg4.11).

Chemical and physical properties of these soils are summarised in **Table 3** below.

A significant amount of disturbed terrain from previous mining related infrastructure construction has also influenced soil distribution within the Study Area. The original soil from many areas has been removed, buried or greatly disturbed.

Table 3 - Soil Chemical and Physical Limitations

Soil Material	Physical Limitations				Erosion			Perme-ability		Toxicities					Fertility	
	Low wet bearing strength	Shrink-swell	Organic matter	Stoniness	Sodicity / dispersibility	Erodibility	Hard setting surface	High permeability	Low permeability	Acid sulphate potential	Acidity	Alkalinity	Salinity	Aluminium toxicity	Low fertility	Low available water-holding cap.
Cullen Bullen																
cb1			○			●	●								●	
cb2	●				●	●	●		●		●			●	●	
cb3				○		●			●		●			●	■	
Lithgow																
li1			○			○								○		
li2			○				●				●			●		
li3					○		●							●	●	
li4		○								○				●	●	
Pipers Flat																
pf1	●		●								●			●	●	
pf2						●	●								●	
pf3				○	○	●			●		●				●	

■: Severe limitation with widespread occurrence

●: High limitation with widespread occurrence

○: Localised occurrence

Soils in the Study Area typically have low to very low fertility. High erodibility is common as a result of hard-setting surfaces and low permeability. The widespread occurrence of acidic soils can explain the low fertility in the Study Area and prevalent aluminium toxicity (Hazleton & Murphy, 2009).

Plate 1: Yellow Lithosol in the Lidsdale Siding Study Area.

3.2 Land Assessment

3.2.1 Land Capability

The *Wallerawang 1:100,000 Sheet* Rural Land Capability Classification (Department of Natural Resources, 2005) maps the Lidsdale Siding area as Class U which is land disturbed by urban development, in this case mining related infrastructure (refer **Plate 2**).

3.2.2 Agricultural Suitability

The agricultural suitability classification of the Study Area is Class 5. This class of land is marginal land not suitable for cultivation and has very low potential for grazing production.

Plate 2: Lidsdale Siding Class U land.

4.0 AGRICULTURAL ASSESSMENT

The Study Area is characterised by mining related infrastructure and disturbed areas. The land capability classification of the area is Class U land. Agricultural suitability classification is Class 5 land, i.e. not suitable for cultivation or grazing.

There is no agricultural production land within the Study Area and no Strategic Land in accordance with the NSW Strategic Land Use Policy.

The potential impacts may occur from erosion of soil on the Project site. Areas that have been exposed through vegetation removal are more susceptible to erosion. Specific areas of the Project site that may potentially be impacted on due to exposed soils include the following:

- Areas cleared of vegetation;
- Stockpiles;
- Access roads, rail areas and associated infrastructure areas; and
- Areas under rehabilitation.

Environmental values may potentially be impacted on by soil erosion due to factors such as increased sediments in waterways, further loss of vegetation and a general decrease in waterway quality.

Soil chemical and physical parameters for the Study Area are included in **Table 3**. Both the *Cullen Bullen* and *Pipers Flat* soil landscapes are erodible and are infertile. Also, both soil landscapes, along with the *Lithgow* soil landscape, exhibit hard settingness.

Preparation and implementation of a detailed Erosion and Sediment Control Plan (ESCP) prior to commencement of construction works will be a key mitigation measure for minimisation of off-site impacts.

One of the primary design aspects of the Project is the prevention of clean water in ephemeral drainage channels entering the active disturbance area. This will be achieved through the use of cut-off drains, sediment traps and diversions, as well as the containment of dirty water via temporary sediment controls eg. sediment filter fencing, sand bags, straw bale filters, etc. within the active areas of the Project to limit any uncontrolled runoff.

Effective erosion and sediment control for the Project site will require appropriate activities to be carried out over the life of the Project including:

- Construction; and
- Operations.

The effectiveness of erosion and sediment controls during the operational and closure stages will be optimised through effective construction planning and design.

Sediment traps will be provided to intercept as much runoff from the Study area as possible. Sediment controls will be responsible for managing runoff from the site over the life of the project. The proposed sediment control locations will be selected so that runoff from disturbed areas will be intercepted and appropriately managed before release into the creek system.

Active construction areas including access roads and tracks will feature the abovementioned sediment controls. Appropriate material will be imported as reinforcement for track formation where warranted.. Areas of soil compaction will be deep ripped by bull dozers or graders to a minimum depth of 400 millimetres as part of rehabilitation works.

5.0 REFERENCES

Cunningham, G.A, Emery, K.A and Morse, R.J (1988). *Systems Used to Classify Rural Lands in New South Wales*. NSW Soil Conservation Service, Sydney.

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