

Risk and Hazard Assessment



Appendix 5

Environmental Risk Analysis

1.0 Environmental Risk Analysis

As required by the DGRs, an environmental risk analysis was undertaken for the Project to identify the key issues which warrant detailed assessment and further discussion in this EA. The methodology used for this process follows the general principles outlined in Australian Standard AS/NZS 4360:1999 Risk Management and Environmental Risk Management – Principles and Process (Standards Australia, 2000). The results of the risk analysis are included in **Attachment A**.

The method used for the Environmental Risk Analysis encompasses the following key steps:

1. Establish the context for the risk analysis process
2. Identify environmental risks
3. Analyse risks
4. Evaluate risks to determine significant issues

Each of these steps is discussed further below.

1.1 Establish the Context

The risk analysis undertaken for the Project considers risks to the natural environment, members of the public and heritage items. The 'Project' was considered to be the processes and activities described in Section 2.0 of the main text, categorised as shown in **Table 1**.

Table 1 - Process Areas and Activities Considered

Process Area	Process Boundary	Activities
Open Cut Mining	Exploitation of coal reserves through surface mining activities and return of land to proposed final land use	Clearing, topsoil stripping, drilling and blasting, overburden removal and placement, ROM coal removal and transport, rehabilitation
Coal Preparation	Preparation of coal for market, loading and transportation.	Construction, CPP operation, reject/tailings disposal, product coal transport
Ancillary Areas	Other activities undertaken to support mining and coal preparation activities	Construction, storage & handling of goods, maintenance

1.2 Risk Identification

The identification of environmental risks for the Project have been determined through a multi-disciplinary approach involving; technical experts, professional opinion, review of legislative requirements, review of Government requirements (through consultation), and consultation with the local community and other key stakeholders.

In order to provide a systematic framework to identify environmental risks, the following basic process was used:

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1. Select a component of the surrounding environment that may be impacted by the Project. These environmental 'values' included land resources, surface water, groundwater, ecology, air quality, noise and vibration amenity, European heritage, Aboriginal cultural heritage, visual amenity, roads and transport, resource utilisation, social aspects (including community profile, infrastructure and services), asset protection, and public safety.
 2. Identify the activities from **Table 1** that may affect the value.
 3. Identify the potential environmental impacts (positive or negative, acute or chronic) for each value, as a result of these activities.

1.3 Risk Analysis

Risks are typically analysed by combining possible consequences and their likelihood, in the context of existing measures to control the risk. The consequence and likelihood of each risk determines the level of risk.

Each risk was assessed using a five level qualitative ranking of consequence and likelihood as listed in **Table 2** and **Table 3** respectively. This yields a five by five risk analysis matrix and results in four levels of risk: "extreme", "high", "medium" and "low", as shown in **Table 4**.

Table 2 - Anvil Hill Project Qualitative Measures of Environmental Consequence

Severity Level	(1) Insignificant	(2) Minor	(3) Moderate	(4) Major	(5) Catastrophic
Natural Environment	No lasting effect. Low-level impacts on biological or physical environment. Limited damage to minimal area of low significance.	Minor effects on biological or physical environment. Minor short-medium term damage to small area of limited significance.	Moderate effects on biological or physical environment (air, water) but not affecting ecosystem function. Moderate short-medium term widespread impacts (eg. Significant tailings spill).	Serious environmental effects with some impairment of ecosystem function. Relatively widespread medium-long term impacts.	Very serious environmental effects with impairment of ecosystem function. Long term, widespread effects on significant environment (eg. unique habitat, National Park).
Heritage	Low-level repairable damage to commonplace structures.	Minor damage to items of low cultural or heritage significance. Mostly repairable. Minor infringement of cultural heritage values.	Substantial damage to items of moderate cultural or heritage significance. Infringement of cultural heritage/sacred locations.	Major permanent damage to items of high cultural or heritage significance. Significant infringement and disregard of cultural heritage values.	Total destruction of items of high cultural or heritage significance. Highly offensive infringements of cultural heritage.
Legal/ Government	Low-level legal issue. On the spot fine. Technical non-compliance. Prosecution unlikely. Ongoing scrutiny / attention from regulator.	Minor legal issues, non-compliances and breaches of regulation. Minor prosecution or litigation possible. Significant hardship from regulator	Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible. Significant difficulties in gaining approvals.	Major breach of regulation with potential major fine and/or investigation and prosecution by authority. Major litigation. Project approval seriously threatened.	Investigation by authority with significant prosecution and fines. Very serious litigation, including class actions. Licence to operate threatened
Community/ Reputation/ Media	Low level social impacts. Public concern restricted to local complaints. Could not cause injury or disease to people.	Minor medium-term social impacts on local population. Could cause first aid injury to people. Minor, adverse local public or media attention and complaints.	Ongoing social issues. Could cause injury to people which requires medical treatment. Attention from regional media and/or heightened concern by local community. Criticism by NGOs. Environmental credentials moderately affected.	On-going serious social issues. Could cause serious injury or disease to people. Significant adverse national media/public or NGO attention. Environment/management credentials are significantly tarnished.	Very serious widespread social impacts with potential to significantly affect the well being of the local community. Could kill or permanently disable people. Serious public or media outcry (international coverage). Damaging NGO campaign. Reputation severely tarnished. Share price may be affected.

Table 3 - Anvil Hill Project Qualitative Measure of Likelihood

Level	Descriptor	Description	Guideline
A	Almost Certain	Consequence is expected to occur in most circumstances	Occurs more than once per month
B	Likely	Consequence will probably occur in most circumstances	Occurs once every 1 month – 1 year
C	Possible	Consequence might occur at some time	Occurs once every 1 year - 10 years
D	Unlikely	Consequence could occur at some time	Occurs once every 10 years – 100 years
E	Rare	Consequence may only occur in exceptional circumstances	Occurs less than once every 100 years

Source: AS/NZS 4360: 1999 Risk Management

Table 4 - Anvil Hill Project Qualitative Risk Matrix

Likelihood of the Consequence	Maximum Reasonable Consequence				
	(1) Insignificant	(2) Minor	(3) Moderate	(4) Major	(5) Catastrophic
(A) Almost certain	High	High	Extreme	Extreme	Extreme
(B) Likely	Moderate	High	High	Extreme	Extreme
(C) Occasionally	Low	Moderate	High	Extreme	Extreme
(D) Unlikely	Low	Low	Moderate	High	Extreme
(E) Rare	Low	Low	Moderate	High	High

Source: AS/NZS 4360: 1999 Risk Management

The level of risk was assessed in two separate stages as follows:

- Raw risk, which is the risk assuming there are no environmental management controls.
- Revised risk, which is the risk assuming the controls proposed in each relevant section of this EA have been implemented.

The analysis of environmental risk often produces results with a high degree of uncertainty due to the complexity of impact, lack of reliable data, and time factors (acute versus chronic effects). Consequently, a description of the existing environment was provided for each environmental value to provide some context to the risk analysis process.

Although the risk rating gives no quantification of the actual value of the risk for a particular aspect, it does allow a relative comparison between issues to enable risks to be prioritised, facilitate informed decisions about treating risks and help identify whether a risk is acceptable.

Table 5 shows the format used for the Anvil Hill Project environmental risk analysis contained in **Attachment A**.

Table 5 – Format for Project Environmental Risk Assessment

Environmental Value	Project Activities	Potential Impacts/ Consequences	Existing Environment	Raw Risk Rating	Proposed Controls	Revised Risk Rating
Components of the surrounding environment that can be affected by the Project	Identifies the Project's activities that may affect the Environmental Value	This describes any change to the environment, whether adverse or beneficial, wholly or partly resulting from the Project's activities	Description of the existing environment based on the assessments conducted as part of this EA.	Assessment of likelihood, consequence and risk score. Assumes no controls.	Proposed measures to reduce the likelihood or consequence of the impact. These have been outlined in the relevant sections of this EA.	Assessment of likelihood, consequence and risk score. Assumes proposed controls are in place and are effective.

1.4 Risk Evaluation

Risk evaluation concerns setting priorities for decisions about risk. The purpose of risk evaluation is to compare risks against significance criteria to determine whether to proceed or continue with an activity, or if risk treatment is required. The application of significance criteria will reduce the number of activities that require specific management attention and provides an opportunity to prioritise environmental issues based on criteria generated by the organisation. For the purposes of this EA, significant risks have been defined as those with a risk rating of high or extreme, as defined by **Table 4**.

It is important to note that certain impacts associated with the Project's activities have been predetermined as significant by State and Federal environmental regulations and requirements (for example, Director General Requirements). These 'regulated' impacts, whilst not always rated as significant based on risk score alone, were assessed in a high level of detail in this EA.

2.0 SEPP 33 Assessment

State Environmental Planning Policy No. 33 (SEPP 33) – *Hazardous and Offensive Development* applies to all industries that are considered to be potentially hazardous industry or potentially offensive industry. The policy is designed to ensure industrial proposals only proceed if they are suitably located and able to demonstrate that they can be built and operated with an adequate level of safety (DoP, 1994).

Clause 3 of the policy contains the definitions of potentially hazardous industry and potentially offensive industry and the assessment for each is included below.

2.1 Assessment of Potential Hazard

In order to determine whether an industry is classified as 'potentially hazardous industry', DoP has developed a risk screening procedure based on the quantity of dangerous goods involved in the proposal and the distance of these materials from the site boundary. Hazardous materials are classified by the Australian Code for the Transport of Dangerous Goods by Road and Rail (Australian Dangerous Goods Code). If a project proposes to store quantities of these goods below the relevant thresholds it can be assumed there is unlikely to be a significant off-site risk and the proposal is therefore not classified as 'potentially hazardous industry'.

The hazardous materials proposed to be used by the Project and the maximum quantity of these materials likely to be stored on site at any one time, were assessed against the standard. All hazardous materials will be delivered to the site by appropriately licensed contractors, and the majority of land in the immediate vicinity of the proposed storage areas is owned by or controlled by Centennial (Figure 1.4 of the main text). In addition, the closest private residences to the proposed hazardous material storage locations are approximately 2.6 kilometres to the north east of the surface infrastructure and 1.9 kilometres east of the proposed explosives storage facility.

It was concluded that none of the relevant quantity screening thresholds or transportation screening thresholds will be exceeded for the Project. Therefore, the Project is not considered to be 'potentially hazardous industry' and SEPP 33 does not apply.

2.2 Assessment of Potential Offensiveness

In order to determine whether or not the proposal is potentially offensive, it is recommended by DoP (Department of Planning, 1994) to consider the following:

- Does the proposal require a licence under any pollution control legislation administered by DEC?
- Does the proposal require pollution control approval pursuant to any legislation or by-laws administered by Council?
- Does the proposal cause offence having regard to the sensitivity of the surrounding environment?

As outlined in Section 3.0 of the main text, the Project will require an EPL as coal mining activities are listed in Schedule 1 of the POEO Act. As such the development is considered to be 'potentially offensive development' under SEPP 33. DoP (Department of Planning, 1994) also states, however, that if an EPL can be obtained for a development, the development is not considered to be an 'offensive industry' and is permissible under SEPP 33.

Subject to approval being granted for the Project, Centennial will apply to DEC for an EPL. The final scope of the EPL will be determined in consultation with DEC during the licence application process. In accordance with the provisions of Part 3A of the EP&A Act, the EPL is required to be granted consistent with any development consent granted for the Project. Therefore, it is considered that as an EPL can be obtained, subject to the granting of development consent, it is not an offensive industry and SEPP 33 does not apply.

3.0 Bushfire Hazard

Under Section 63 of the *Rural Fires Act* 1997, Centennial is required to take all practical steps to prevent bushfires and minimise the danger of the spread of bushfires on or from land under its control. Centennial recognises its obligations in relation to the management of bushfire risk in relation to the Project and will undertake detailed assessments of site specific risk and potential ignition sources to determine the appropriate management strategies. Specific bushfire risk management and controls may include:

- Hazard reduction works including the creation and maintenance of firebreaks and asset protection zones.
- Maintenance of fire fighting water supply throughout the life of the Project and the use of water carts, fire extinguishers and hose reels.
- Incorporation of bushfire control techniques in emergency preparedness training of staff.

ATTACHMENT 1 - ANVIL HILL PROJECT: ENVIRONMENTAL RISK ANALYSIS

				Raw Risk Rating (No Controls)				Revised Risk Rating		
Environmental Value	Project Activities that may affect the Environmental Value ¹	Potential Impacts / Consequences	Existing Environment	Consequence Rating	Likelihood Rating	Risk Score	Proposed Controls (EA Section Reference)	Consequence Rating	Likelihood Rating	Risk Score
Land Resources	Vegetation clearing, topsoil removal, overburden removal & placement, reject/tailings disposal, change of land use, storage of goods, rehabilitation	Loss/deterioration of land capability, alteration of existing topography, loss of productive topsoil, introduction of pest species (flora/fauna), land contamination	The majority of the land within the Proposed Disturbance Area is Class VI land, which is generally suitable for grazing with intensive management measures. The existing landscape is not suitable for cultivation owing to a combination of limitations of slope, subsoil instability and potential for dispersion and gully erosion. The small area of Class VIII land within the Proposed Disturbance Area is associated with the rocky outcrops of Anvil Hill. There are no previous land use activities on the site that are likely to have caused land contamination.	2	C	M	Section 5.1	2	D	L
Surface Water	Vegetation clearing, topsoil removal, construction, overburden removal & placement, ROM coal removal & transport, CPP operation, reject/tailings disposal, storage/handling of goods, storage of goods, maintenance, rehabilitation	Pollution of local waterways	Background monitoring undertaken since 2002 results shows the variability of water quality in the local creeks. Big Flat Creek has high salinity. Wybong Creek generally has much lower salinity levels both upstream and downstream of the Project Area. Sandy Creek has the highest sediment concentrations.	4	D	H	Section 5.2	2	D	L
		Reduction in creek flow due to interception and capture by the Project, that affects downstream users, increased flood height and velocity	The Project Area is located within Clarks Gully, Anvil Creek and Big Flat Creek catchment areas. Clarks Gully and Anvil Creek are tributaries of Big Flat Creek. Big Flat Creek is a tributary of Wybong Creek, which in turn is a tributary of the Goulburn River. A small part of the Project Area is also located in the Sandy Creek catchment. Sandy Creek is a tributary of the Hunter River, and flows into the Hunter River at the township of Denman. The Goulburn River flows into the Hunter River downstream of Denman. The Proposed Disturbance Area covers approximately 42% of Big Flat Creek catchment, including the entire catchment of both Clarks Gully and Anvil Creek. The Project will disturb less than 3% of the Wybong Creek catchment, and 1% of the Sandy Creek catchment at any stage of mining. The vertical extent of flooding will not be significantly increased as a result of the Project in any reach of Big Flat Creek or Wybong Creek, and there will be no adverse impact on flooding in Sandy Creek.	2	C	H	Section 5.2	1	C	L
		Deterioration of channel stability in existing creeks	The Project is unlikely to adversely impact channel stability or instream habitat of Big Flat Creek, Wybong Creek, or Sandy Creek.	3	E	M	Section 5.2	2	E	L

Note:

1. Refer to Section 2.0 of the EA for a detailed description of the Project

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				Raw Risk Rating (No Controls)				Revised Risk Rating		
Environmental Value	Project Activities that may affect the Environmental Value ¹	Potential Impacts / Consequences	Existing Environment	Consequence Rating	Likelihood Rating	Risk Score	Proposed Controls (EA Section Reference)	Consequence Rating	Likelihood Rating	Risk Score
Groundwater	Vegetation clearing, topsoil removal, construction, overburden removal & placement, ROM coal removal & transport, CPP operation, reject/tailings disposal, storage/handling of goods, storage of goods, maintenance, rehabilitation	Reduction in groundwater flow and availability, which affects other groundwater users	The regional groundwater system comprises a shallow unconfined aquifer associated with alluvial deposits and weathered bedrock along the main drainages, and a deeper confined system associated with the coal seams. The coal measures strata provide limited groundwater storage and transmission capacity, and the interburden and overburden lithologies possess very low hydraulic conductivities. There are nine registered bores within approximately 1 km of the proposed mining areas.	2	C	M	Section 5.3	1	D	L
		Degradation of natural groundwater quality	In general, poor quality brackish to saline waters occur within the coal measures and within the alluvium of Big Flat Creek and Anvil Creek. There are occasional exceptions where the shallow weathered bedrock may host relatively fresh water springs.	2	C	M	Section 5.3	1	D	L
Ecology	Vegetation clearing, topsoil removal, overburden removal & placement, reject/tailings disposal	Loss of threatened flora species, endangered populations and endangered ecological communities	Approximately 42% of the Proposed Disturbance Area is unnatural grassland that was derived by previous clearing of woodland. Two threatened flora species, two endangered populations and one endangered ecological community was identified within this area.	4	C	E	Section 5.4	2	C	M
		Loss of threatened fauna species and habitat	13 threatened fauna & 3 migratory bird species were recorded within the Proposed Disturbance Area which included 2 parrots, 5 woodland birds, 1 arboreal mammal, and 5 micro-bats.	4	B	E	Section 5.4	2	C	M
Air Quality	Vegetation clearing, topsoil removal, construction, drilling & blasting, overburden removal & placement, ROM coal removal & transport, CPP operation, reject/tailings disposal, product coal transport, rehabilitation	Degradation of air quality from dust emissions and fumes and subsequent health impacts	The existing dust deposition and dust concentration levels measured in the area surrounding the Project are considered typical of a rural area remote from industrial emission sources. Air quality in the area is largely determined by emissions from natural sources, road traffic and residential and agricultural activities.	4	D	H	Section 5.5	1	C	L
	Electricity and diesel use associated with mining operations, methane from mining and explosives use	Increase in greenhouse gas emissions	The level of methane contained in the coal seams to be mined by the Anvil Hill Project is quite low ranging from 0.30-0.72 m3/tonne. The greenhouse index of 0.03 TCO _{2e} per tonne of saleable coal is less than the Australian open cut black coal mining industry average (0.05 TCO _{2e} /tonne).	1	C	L	Section 5.5	1	C	L

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1. Refer to Section 2.0 of the EA for a detailed description of the Project

ATTACHMENT 1 - ANVIL HILL PROJECT: ENVIRONMENTAL RISK ANALYSIS

				Raw Risk Rating (No Controls)				Revised Risk Rating		
Environmental Value	Project Activities that may affect the Environmental Value ¹	Potential Impacts / Consequences	Existing Environment	Consequence Rating	Likelihood Rating	Risk Score	Proposed Controls (EA Section Reference)	Consequence Rating	Likelihood Rating	Risk Score
Noise & Vibration Amenity	Vegetation clearing, topsoil removal, construction, drilling & blasting, overburden removal & placement, ROM coal removal & transport, CPP operation, product coal transport, storage/handling of goods, rehabilitation	Degradation of Noise Amenity	The existing noise environment around the Project is typical of a quiet rural area, with little exposure from existing traffic noise and no recorded exposure from any existing industrial noise. Measured background noise levels are generally below 30dBA.	3	C	H	Section 5.6	1	C	L
	Drilling & blasting	Annoyance or discomfort to residences or damage to structures (residences, 500kV power line, rockshelters) due to ground vibration or airblast overpressure	No existing industrial sources have been detected.	4	C	E	Section 5.7	1	C	L
European Heritage	Vegetation clearing, topsoil removal, overburden removal & placement, drilling & blasting, reject/tailings disposal	Disturbance of sites of European Significance	No items of State or National Heritage significance have been identified within the area potentially affected by the Project. Items of local historical significance have been identified both within and in close proximity to the Proposed Disturbance Area.	2	B	H	Section 5.8	1	C	L
Aboriginal Cultural Heritage	Vegetation clearing, topsoil removal, overburden removal & placement, drilling & blasting, reject/tailings disposal	Destruction of Aboriginal places or objects that are culturally significant	69 Aboriginal heritage sites (30 isolated finds and 39 artefact scatters) were recorded in the Proposed Disturbance Area. These include 69 sites assessed as having low research potential, three sites with low to moderate research potential, one site with moderate research potential and one site with high research potential.	3	C	H	Section 5.8	2	D	L
Visual Amenity	Vegetation clearing, topsoil removal, construction, overburden removal & placement, ROM coal removal & transport, CPP operation, reject/tailings disposal, product coal transport, rehabilitation	Degradation of visual amenity due to aesthetics of exposed infrastructure, earthworks, topsoil stockpiles, surface tailings dam	The scenic quality of the landscape across the Project Area ranges from moderately high for ridgelines and rocky outcrop landscape units through to moderate to low for undulating terrain and alluvial landscape units. The existing night time character of the Project Area and surrounding landscape is rural in character with scattered residences, predominantly along roads, and small concentrations of light in more densely populated areas.	3	C	H	Section 5.9	1	C	L
Roads & Transport	Access to site during construction and operational stages of Project	Increased traffic on rural roads, impact on existing transport infrastructure, noise impacts from elevated traffic levels	The proposed primary access route to the site is Wybong Road via Bengalla Link Road. Traffic counts indicate an existing Average Daily Traffic (ADT) of 500 vehicles per day (vpd) and an hourly peak flow of 50 vehicles per hour (vph) along Wybong Road. There are also a number of rural roads both within and surrounding the Project Area. These roads, including Mangoola Road and Roxburgh Road, are generally narrow, sealed roads that provide access to private properties within the surrounding area.	5	E	H	Section 5.10	2	C	M

Note:

1. Refer to Section 2.0 of the EA for a detailed description of the Project

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Environmental Value	Project Activities that may affect the Environmental Value ¹	Potential Impacts / Consequences	Existing Environment	Consequence Rating	Likelihood Rating	Risk Score	Proposed Controls (EA Section Reference)	Consequence Rating	Likelihood Rating	Risk Score
Resource Utilisation	All	Increased demand on water resources, affecting other users	Water demand over the life of the Project will vary between approximately 1ML and 4ML per day mainly for coal processing and dust suppression. This water will be collected from a variety of sources including the Hunter River, surface runoff from within disturbance areas and groundwater inflow into mining areas. Any water extracted from the Hunter River will require a licence.	2	C	M	Section 5.2	1	D	L
Social Profile, and Community Infrastructure and Services	All	Population impacts, community/institutional arrangements, changes in the nature of the community, individual, family and community level impacts, community infrastructure needs	Based on the 2001 census, 10036 people live in Muswellbrook, 1406 in Denman and 537 in Wybong. There is adequate accommodation, education and community services within the Muswellbrook Shire, although health services are generally at capacity.	4	C	E	Section 5.11	2	D	L
Asset Protection	All	Increased risk of bushfire and damage to infrastructure and property	The two main land based factors of fire are vegetation (fuel) and terrain (slope). The topography of the Proposed Disturbance Area varies from lower slopes towards the Hunter River, through undulating and hilly lands to rocky outcrops. Vegetation of the Project Area consists predominantly of woodlands and low open forests and has been heavily modified by past and ongoing agricultural activities and largely exists as large tracts of regenerating native vegetation.	4	D	H	Section 3.0 of Appendix 5	2	D	L
Public Safety (SEPP 33)	Storage/Handling of goods	Potentially hazardous or offensive industry	The majority of land in the immediate vicinity of the proposed hazardous materials storage areas is owned by or controlled by Centennial. The closest private residence to the proposed hazardous material storage locations is approximately 2.6 kilometres to the north east of the surface infrastructure and 1.9 kilometres east of the explosives magazine.	4	D	H	Appendix 5	2	D	L

Note:

1. Refer to Section 2.0 of the EA for a detailed description of the Project