

APPENDIX 23

Boco Rock Wind Farm General Environmental Risk Analysis

Eco Logical Australia Pty Ltd



BOCO ROCK WIND FARM

GENERAL ENVIRONMENTAL RISK ANALYSIS

PREPARED FOR	Wind Prospect CWP Pty Ltd
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Abbreviations

ABBREVIATION	DESCRIPTION
DECC	NSW Department of Environment and Climate Change
DoP	NSW Department of Planning
DPI	NSW Department of Primary Industries
DWE	NSW Department of Water and Energy

1 Introduction and Scope

The proposed wind farm is being assessed under Part 3A, Major Projects of the *Environmental Planning and Assessment Act 1979* (EP&A Act). A response from the Department of Planning (DoP) dated 7 October 2008 (Ref. S08/01118) detailed the Director-General's requirements (DGR) for the preparation of an Environmental Assessment (EA) for the project. One of the key assessment requirements was the preparation of a General Environmental Risk Analysis:

“Notwithstanding the above (other key assessment requirements), the EA must include an environmental risk analysis to identify potential environmental impacts associated with the project, proposed mitigation measures and potentially significant residual environmental impacts after the application of proposed mitigation measures. Where additional key environmental impacts are identified through this environmental risk analysis, an appropriately detailed impact assessment of the additional key environmental impacts(s) must be included in the EA”.

The risk analysis was undertaken for the whole of the proposed wind farm. The following potential environmental aspects were considered for the proposed wind farm:

- Atmospheric pollution;
- Dust generation;
- Enhanced greenhouse effect;
- Soil contamination;
- Groundwater contamination;
- Soil erosion;
- Water quality and sedimentation;
- Community impacts;
- Recreational impacts;
- Litter and waste disposal;
- Fire threats; and
- Public Safety.

The following environmental impacts were not addressed as these have been subject to detailed studies to meet other specific Director General requirements: visual, noise, flora, fauna, indigenous heritage, aviation hazards and risks, traffic and transport.

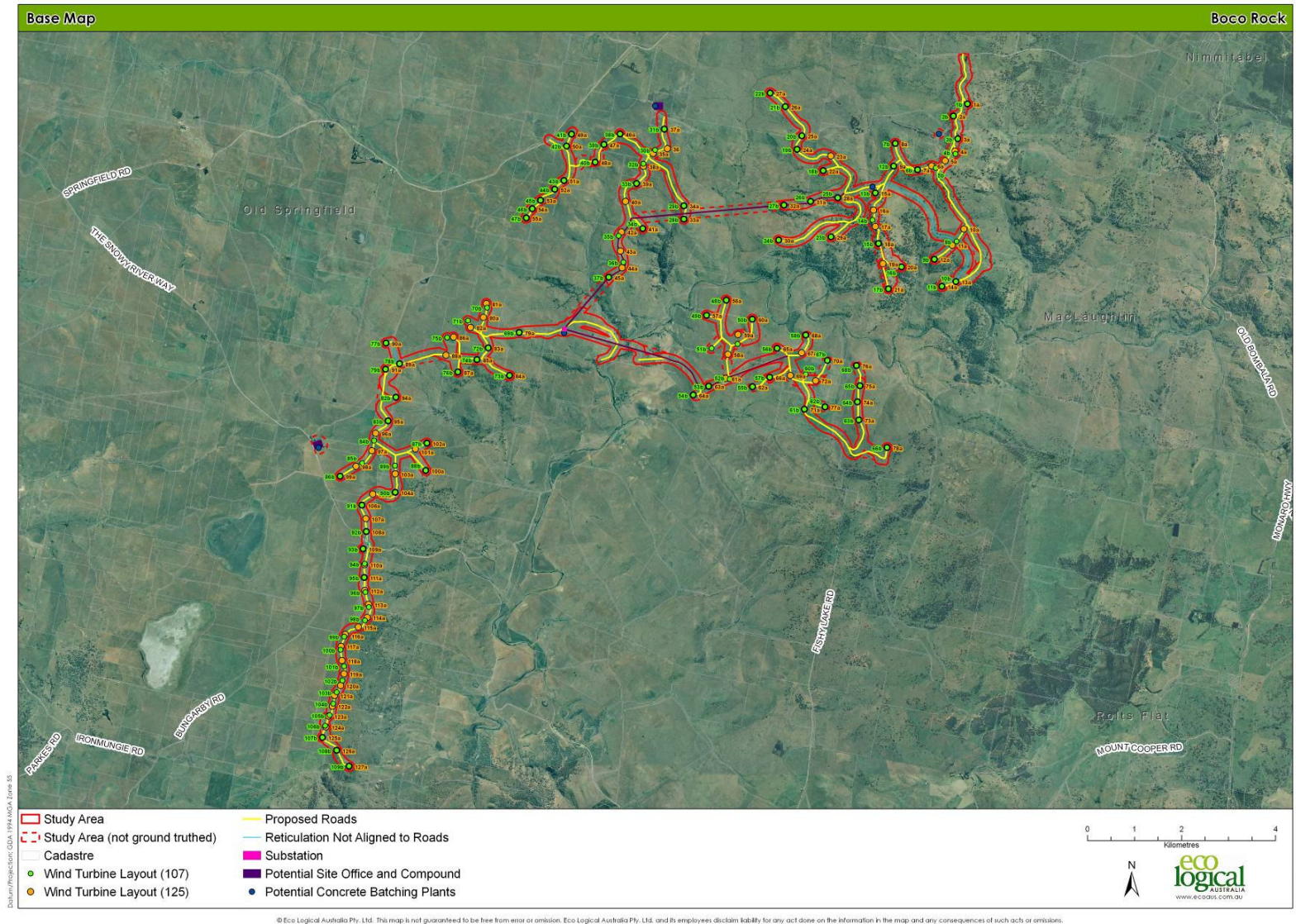


Figure 1: Study Area

2 Methodology

The risk analysis was carried out in general accordance with Australia Standard 4360: 2004 *Risk management* and Handbook HB 203:2006 *Environmental risk management – principles and processes*; and this process is detailed below.

2.1 DOCUMENTATION REVIEW

A desktop review of the proposed wind farm was undertaken with the aim to determine a complete list of activities, products and services to be carried out during the construction and operation of the wind farm. This documentation review included but was not limited to the following:

- Bega Duo Designs (April 2009). *Draft Traffic and Transport Study, Report on Link from Substation to Boco, Proposed Boco Rock Wind Farm.*
- Bega Duo Designs (March 2009). *Draft Traffic and Transport Study, Proposed Boco Rock Wind Farm*; and
- NSW Archaeology Pty Limited (March 2009). *Draft Archaeological and Heritage Assessment, Proposed Boco Rock Wind Farm.*

Mitigation measures identified within specialist studies should be carried out in addition to the general mitigation measures identified within Appendix B (Pre-Construction), Appendix C (Construction) and Appendix D (Operation) of this report, where possible ELA have avoided duplication.

2.2 CONTEXT

External and Internal Context

The Wind Prospect Group employs approximately 160 professional services personnel across the UK, NZ, Australia, Hong Kong, China, Canada, Ireland, France and the USA. The group has ten years of experience in the successful development, construction and operation of renewable energy solutions. In Australasia, the Group have formed a strategic alliance with Continental Wind Partners (CWP), furthering the Groups' ability to continually improve their environmental performance. The Group has also supported by a number of partners, including Babcock and Brown, Energy & Wind and Prowind.

Each wind farm is managed by a site specific Environmental Management Plan (EMP). The EMP will designate responsibility for environmental management of the site during construction, operation, maintenance and refurbishment/decommissioning activities. Designated personnel will either be internal to Wind Prospect or part of an external project team.

Risk Management Context

The objective of undertaking this risk analysis is to gain regulatory approval of the Environment Assessment of the proposed wind farm and to determine appropriate mitigation measures for environmental impacts that are yet to be assessed. ELA have been engaged by Wind Prospect CWP Pty Ltd to undertake this risk analysis in order to provide independent and specialist environmental risk advice to the project.

2.3 RISK EVALUATION CRITERIA

The following criteria form the basis against which potential environmental impacts have been assessed. This risk analysis does not constitute an environmental compliance audit, rather provides the framework for meeting these requirements generally:

- *Heritage Act 1977;*
- *Local Government (General) Regulation 1999;*
- *Occupational Health and Safety Regulation 2001;*
- *Protection of the Environment Operations Act 1997;*
- *Protection of the Environment Operations (Penalty Notices) Regulations 2004;*
- *Protection of the Environment Operations (Clean Air) Regulation 2002;*
- *Protection of the Environment Operations (Waste) Regulation 2005;*
- *Waste Avoidance and Resource Recovery Act 2001; and*
- *Waste Classification Guidelines, Part 1: Classifying Waste – April 2008, DECC.*

2.4 RISK IDENTIFICATION

A list of activities, products and services relating to the pre-construction, construction and operational stages of the wind farm was developed in consultation with Wind Prospect CWP Pty Ltd. This list was reviewed in order to identify potential sources or pathways (aspects) for environmental risks (impacts) to occur. This process is tabulated in Appendices A-D.

Risk Treatment

Each identified environmental impact was reviewed to determine effective and feasible risk treatment options, some treatment options are outlined below:

- Avoid the risk;
- Mitigate the risk;
- Reduce the likelihood;
- Reduce the consequences;
- Share the risk;
- Retain the risk;
- Physically separate;
- Duplicate resources; or
- Transform the risk (HB 203:2006).

Risk Analysis (Residual)

In accordance with the Director-General's requirements the risk analysis assessed 'residual' environmental impacts of the proposed wind farm. Residual risk is assessed by determining the 'likelihood' and 'consequence' of an environmental impact after implementation of risk treatment measures (e.g. mitigation measures).

Qualitative analysis of risk is useful for prioritising actions relating to a range of potential environmental impacts and for determining where more detailed analysis may be required (HB 203: 2006). Each environmental impact was assessed for the likelihood and consequence of its occurrence in light of the proposed risk treatment measure(s), per the matrix provided in Appendix A: Risk Matrix.

Risk Evaluation

Residual risks were applied a low, medium, high or extreme risk level, based on the assessment of likelihood and consequence. Further studies or detailed analysis is recommended for residual risks that result in high or extreme risk levels. These are discussed in Section 3 Findings and Recommendations of this report.

3 Findings and Recommendations

This section discusses the mitigation measures identified in the risk analysis, particularly where they relate to high residual risks. Mitigation measures have not been discussed here for all the low and moderate risks. Wind Prospect would use the Risk Treatment column in Appendices B to D when preparing project action plans and EMPs.

3.1 PRE-CONSTRUCTION ACTIVITIES

3.1.1 Construction Environmental Management Plan (EMP)

It is recommended a Construction EMP be developed prior to pre-construction activities in order to address the broad range of the environmental impacts identified in this risk analysis. The Construction EMP may be combined with the Operational EMP for the development. The Construction EMP will need to address the following:

- A Soil and Water Management Plan (SWMP) in accordance with Landcom (2004). *Managing Urban Stormwater: Soils and Construction*, 4th Edition.
- Measures to minimise atmospheric pollution include:
 - Scheduling works to minimise double handling, back tracking and idling of plant and equipment;
 - Dust suppression; and
 - Ensuring all plant and equipment is maintained in good working order.
- Manage site security and uncontrolled access via a lockable chain link fence around the temporary site facilities to minimise acts of vandalism and arson;
- Manage disturbance to 'no go' areas by flagging, fencing and including details on construction plans; and
- Designate environmental management responsibility to key personnel.

A number of other mitigation measures are outlined in Appendix B.

3.1.2 Soil Erosion and Sediment Management

A soil assessment was undertaken by ELA for the proposed development. The steep slopes within the Brothers Soil Landscape mean that more stringent erosion and sediment controls will be required to control the high erosion potential of these areas. Some of the Soil Landscape Units identified on site potentially contain dispersive soils, of which contaminated runoff can only be effectively treated by flocculation of the sediments.

The soils on site are subject to shrink and swell and this needs to be considered in determining suitable controls. Runoff from the site varies from low to very high potential and should be addressed by site-specific controls. Works within the Upper Cooma Creek Soil Landscape Unit will need to consider the potentially high water table.

A Soil and Water Management Plan (SWMP) would be prepared to address site specific soil and hydrology characteristics in order to manage soil erosion and sedimentation during pre-construction and construction activities. This plan should be prepared by an experienced professional in accordance with Landcom (2004) *Managing Urban Stormwater: Soils and Construction, 4th Edition*.

3.1.3 Contaminated Soil Disturbance

Exposure to contaminated soils presents a health risk to construction personnel, landowners and site visitors. Potentially contaminating activities associated with agricultural activities include sheep dips, import of fill material, stockpiling of wastes and demolition of old buildings.

In order to identify potential soil contamination issues, Wind Prospect sent a letter to relevant landowners on 16th April 2009. ELA reviewed the responses received from 10 of the 17 landowners (after a reasonable waiting period, the other 7 landowners are considered unlikely to reply).

No known contaminated areas were identified as part of this consultation. Many landowners indicated that whilst potentially contaminating activities (e.g. sheep dips, fuel storage, and herbicide spraying) have occurred on site, these are not within ridge top locations that will be disturbed by the proposed development. As such, Wind Prospect does not propose to relocate facilities/roads or to undertake soil sampling for potential contaminants in these areas.

Prior to pre-construction activities, it is recommended that Wind Prospect develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks. This procedure should remain within the Operational EMP, for any maintenance works that involve soil disturbance. The procedure will need to identify the following:

- Activities with the potential to disturb soils e.g. earthworks, soil erosion;
- Indicators of soil contamination e.g. staining, odour, building rubble, buried vegetation, fill material identifiable by visible change in soil profile; and
- Flow chart with step by step actions for reporting to management, liaising with a soil consultant, minimising personnel exposure, soil testing, reporting, remediation, waste disposal and site validation.

3.1.4 Licensing/ Permits

Wind Prospect will need to liaise with state agencies to obtain the following permits/ licences:

- A permit will be required with DWE and/or DPI for works within creek and riparian zones.
- Prior to pre-construction activities obtain an Environment Protection Licence from NSW DECC. Operate the batching plants in accordance with this licence and incorporate controls into the Construction EMP.

3.2 CONSTRUCTION ACTIVITIES

3.2.1 Construction Environmental Management Plan (EMP)

In addition to the above requirements listed in Section 3.1.1, the Construction EMP would also include:

- Water quality monitoring procedure for earthworks occurring in or adjacent to riparian areas;
- Water management strategy to minimise water quality impacts and to maximise capture and reuse of water within the site;
- Transport of oil (80,000 L for transformer and 1,000L per generator transformers) will be via purpose built vehicles/ tankers in accordance with the *Australian Dangerous Goods Code* and will be fitted with emergency spill equipment. Oil will be transferred to transformers by qualified personnel, who have training in emergency spill response. Spill control equipment will be available at the point of use.
- Incorporate licensing requirements for the concrete batching plants into the Construction EMP, including speed limits, portable spill kits, and management of concrete slurry;
- Incorporate permit/ approval requirements for work within creek and riparian zones;
- Avoid use of plant and equipment that can generate a spark in close proximity to vegetated areas, particularly during high fire danger periods;
- Hot works will not be conducted unless in accordance with a hot work permit and in consultation the Rural Fire Service (RFS) fire danger warnings. No hot works will be permitted when a bushfire in the local area is already burning;
- Vegetation clearing shall be sufficient to minimise the threat of fire to nearby vegetation, without removing excessive vegetation and will be in accordance with the flora and fauna studies;
- Use local water supplies, where possible, in written agreement with local farmers; and
- Community consultation strategy for the duration of the construction period, to keep community informed of progress/delays and to maintain a method for receiving and addressing community feedback.

A number of other mitigation measures are outlined in Appendix C.

3.2.2 Link Road and Crossing Environmental Assessment

This assessment has addressed environmental impacts associated with the proposed Link Road. The impacts on traffic and transport have been assessed by Bega Duo Designs. It is necessary that other specialist consultants also assess this part of the proposal for environmental impacts i.e. noise, heritage, flora and fauna, visual.

Likewise, prior to construction, it is recommended an assessment of the potential impacts of the proposed crossing on aquatic health, including flora, fauna and potential impacts to recreational trout fishing be assessed. Works within riparian zones and creeks will need to comply with Department of Water and Energy (DWE) guidelines for riparian management.

3.2.3 Natural Spring

It is reported there is a natural groundwater spring located in the vicinity of approach to the substation on site. The following mitigation measures are proposed to mitigate environmental impacts in this location:

- Locate road downstream of natural spring to avoid soil and water quality impacts; and
- Restrict vehicle and pedestrian access to the spring via barrier fencing during construction activities.

3.3 OPERATION ACTIVITIES

3.3.1 Operational Environmental Management Plan (EMP)

It is recommended an Operational EMP be developed prior to the completion of construction activities in order to address the broad range of the environmental impacts identified in this risk analysis. The Operational EMP may be combined with the Construction EMP for the development. The Operational EMP will need to address mitigation measures outlined in Appendix D.

References

HB 203: 2006 *Environmental risk management – Principles and processes*

AS/NZS 4360: 2004 *Risk management – Generic guide for establishing and implementing the risk management process.*

Appendix A: Risk Matrix

CONSEQUENCE			LIKELIHOOD		
LEVEL	DESCRIPTOR	DESCRIPTION	LEVEL	DESCRIPTOR	DESCRIPTION
1	Insignificant	Low financial loss, negligible environmental impact	A	Almost Certain	The impact is expected to occur in most circumstances
2	Minor	On-site release immediately contained, medium financial loss	B	Likely	The impact will probably occur in most circumstances
3	Severe	On-site release contained with outside assistance, high financial loss	C	Moderate	The impact could occur at some time
4	Major	Off-site release contained with outside assistance and little detrimental impact, major financial loss	D	Unlikely	The impact could occur at some time but is not expected
5	Catastrophic	Death, toxic release off-site with detrimental effect, huge financial loss	E	Rare	The impact occurs only in exceptional circumstances

MATRIX	CONSEQUENCE				
LIKELIHOOD	1	2	3	4	5
A	H	H	E	E	E
B	M	H	H	E	E
C	L	M	H	E	E
D	L	L	M	H	E
E	L	L	M	H	H

LEGEND	RISK LEVEL
E	Extreme – Immediate action required
H	High – Senior management attention needed
M	Moderate – Management responsibility must be specified
L	Low – Manage by routine procedures

Source: HB 203:2006 *Environmental risk management – Principles and processes*.

Appendix B: Pre-Construction Risk Analysis Table

This table has been prepared to address pre-construction and construction enabling activities.

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Geotechnical investigations, trial pits and/or boreholes	Disturbance of soil	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels	1	D	Low
		Soil erosion and sediment runoff	Prior to pre-construction activities develop a Soil and Water Management Plan (SWMP) to manage sediment and erosion, incorporate this into the Construction EMP.	2	D	Low
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	C	Moderate
	Refuelling/unplanned maintenance of drilling equipment	Water or land contamination	Scheduled maintenance of plant and equipment will not occur on site. Emergency maintenance and refuelling will not occur within 100 m of a water body and will be conducted in a manner to prevent release of contaminants to land or surface water.	2	C	Moderate
	Transport to/from and within the site	Atmospheric pollution	Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Road and access track upgrades, widening, entry/exit points, gateways	Road construction	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels	1	C	Low
		Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	C	Moderate
			During preparation of the SWMP, work with the Traffic Consultant to ensure proposed erosion and sediment controls on access roads are feasible and that traffic can be managed appropriately. Drainage, slopes and the level of ongoing maintenance for roads will be considered during design to protect water quality for the life of the operation.	2	C	Moderate
			Road runoff to be treated to reduce contaminants such as suspended solids, oil, grease and hydrocarbons, e.g. via swale drains.	2	C	Moderate
			Design of access tracks will be in accordance with relevant standards, e.g. Blue Book and <i>Guidelines for planning, construction and maintenance of tracks</i> (NSW Department of Land and Water Conservation, 1994).	2	C	Moderate
			Restrict traffic to designated roads and display speed signage for construction vehicles. Restrict vehicle access from 'no go' areas of the site, to minimise soil compaction and erosion.	2	C	Moderate
		Legal non-compliance	A permit will be required with DWE and/or DPI for works within creek and riparian zones.	2	C	Moderate
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Road and access track upgrades, widening, entry/exit points, gateways	Road construction	Enhanced greenhouse effect and atmospheric pollution	Design earthworks to balance cut and fill material requirements and to minimise the need to import fill materials from off site.	1	D	Low
			Use local suppliers of sand, cement and raw materials, where possible, in order to minimise transport emissions.	1	D	Low
			Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
Stripping of topsoil from tower bases Switchgear/ substation yard, access track areas, crane hardstand areas and temporary lay down/car park areas	Disturbance of soil	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works. Manage topsoil per the Ecological Assessment, including management of weeds.	2	C	Moderate
Install construction facilities including portable offices, car park, lay down yard and	Disturbance of soil	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	C	Moderate
	Uncontrolled access	Vandalism/ fire threat	Control access via a lockable chain link fence.	4	D	High

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
temporary toilet facilities	Wastewater management	Water pollution	Provide adequate portable toilets for construction personnel numbers and engage a contractor for their regular disposal off site. Contractors are to carry spill kits to enable clean up in an emergency event.	3	D	Moderate
Erection of signage on roads;	Signage	Public safety and soil erosion and sediment runoff	Display signage per the Traffic Management Plan to be prepared prior to pre-construction activities.	2	C	Moderate
Enabling works for the locating of a mobile concrete batching plants and rock crushing plant	Disturbance of soil	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	C	Moderate
	Wastewater management	Water pollution	Prior to pre-construction activities obtain an Environment Protection Licence from NSW DECC. Operate the batching plants in accordance with this licence and incorporate controls into the Construction EMP.	4	D	Moderate
	Environmental management	Noise, vibration, water and dust	Situate the rock crushing plant in the same location at the concrete batching plants to avoid additional sources of noise and vibration nuisance to neighbours. Minimise dust using water sprays and control water runoff for sediment in accordance with the SWMP.	2	C	Moderate
Project plan preparation	Environmental management	Failure to mitigate environmental impacts	Prior to pre-construction activities develop a Construction EMP, which designates roles and responsibilities for environmental management of the site. Key personnel will be competent and appropriately qualified/ experienced in construction environmental management.	2	D	Low
Survey of critical boundaries and pegging of infrastructure locations	Disturbance of soil	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	D	Low
	Waste generation	Litter/ waste left on site	Prior to pre-construction activities develop a Construction EMP, which outlines waste management procedures for the site. In this pre-construction phase engage contractors to remove all wastes from the site directly as part of their works.	1	C	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Pre-construction activities	Generation of wastes	Depletion of landfill space Waste disposal	Minimise waste generation during pre-construction activities in accordance with avoid, reduce, reuse and recycle principles. All wastes to be disposed off site, via licensed contractors to licensed facilities. Waste receipts are to be maintained as records of offsite disposal.	2	D	Low

Appendix C: Construction Risk Analysis Table

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Vegetation clearing and mulching	Disturbance of soil	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels.	1	D	Low
		Soil erosion and sediment runoff	Employ sediment and soil erosion controls per SWMP. Undertake regular inspection of disturbed areas to ensure erosion and sediment controls.	2	C	Moderate
	Generation of mulch	Depletion of landfill space	Reuse mulch on site (only where weeds were not present) or surrounding sites in agreement with landholders.	1	D	Low
	Loss of vegetation	Enhanced greenhouse effect	Action the recommendations of the flora and fauna studies and avoid use of sites that require extensive vegetation clearing.	2	C	Moderate
	Weed and sediment collected in stormwater runoff	Weed dispersal Water pollution	Remove weeds prior to vegetation removal, where possible. Employ sediment control devices per SWMP.	2	C	Moderate
Rock crushing plant	Extraction, crushing and transport of	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
	rock	Atmospheric pollution (dust) deposition	Use water spray to control dust levels	1	C	Low
		Enhanced greenhouse effect and atmospheric pollution	Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
Roadworks not finished during pre-construction activities	Road construction	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels.	1	C	Low
		Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	2	C	Moderate
			Road runoff to be treated to reduce contaminants such as suspended solids, oil, grease and hydrocarbons, e.g. via swale drains.	2	C	Moderate
			Restrict traffic to designated roads and display speed signage for construction vehicles. Restrict vehicle access from 'no go' areas of the site, to minimise soil compaction and erosion.	2	C	Moderate
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	C	Moderate
		Enhanced greenhouse effect and atmospheric pollution	Design earthworks to balance cut and fill material requirements and to minimise the need to import fill materials from off site.	1	D	Low
			Use local suppliers of sand, cement and raw materials, where possible, in order to minimise transport emissions.	1	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
			Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
Construct Link Road Access	Proximity to natural spring	Soil erosion and sedimentation	Locate road downstream of natural spring to avoid soil and water quality impacts. Restrict vehicle and pedestrian access to the spring via barrier fencing during construction activities.	2	D	Low
		Water pollution	Locate road downstream of natural spring to avoid soil and water quality impacts.	2	D	Low
		Litter/ waste left on site	Prior to pre-construction activities develop a Construction EMP, which outlines waste management procedures for the site.	2	D	Low
	Proximity to MacLaughlin's River	Soil erosion and sedimentation	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	3	C	High
		Water pollution	Prior to pre-construction activities develop a Construction EMP, which outlines a water quality monitoring procedure for earthworks occurring in or adjacent to riparian zones.			
			Consider the installation of swale drains down slope of the road that will be vegetated and continue to treat road runoff during construction and operation.	2	C	Moderate
Construction of creek crossing	Construction activities/ sedimentation	Water pollution	Prior to construction, assess the impacts of the crossing on aquatic health, including flora, fauna and potential impacts to recreational trout fishing.	3	C	High
		Bank stability and soil erosion	Rehabilitate disturbed creek bed as soon as practicable, using 'natural looking', rather than engineered solutions.	3	D	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
		Legal non compliance	Design and construction activities will comply with the DWE Guidelines for work within a riparian zone e.g. stormwater outlets, vegetation management plans.	2	D	Low
			A permit will be required with DWE and/or DPI for works within creek and riparian zones.	2	D	Low
Installation of underground electrical cables	Trenching and running cables	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels.	1	C	Low
		Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	1	C	Low
			Engage a contractor to locate existing underground services.	1	C	Low
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	C	Moderate
		Enhanced greenhouse effect and atmospheric pollution	Use materials excavated from trenches to cover cables.	2	D	Low
			Where additional materials are required, use local suppliers of sand, cement and raw materials, where possible, in order to minimise transport emissions.			
			Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
Excavation and installation of turbine bases	Excavation, soil disturbance, concrete and	Atmospheric pollution (dust) and dust deposition	Use water spray to control dust levels	1	C	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
	rock use	Soil erosion and sediment runoff	Prior to pre-construction activities develop a SWMP to manage sediment and erosion, incorporate this into the Construction EMP. Install controls prior to any works.	1	C	Low
			Engage a contractor to locate existing underground services.	1	C	Low
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	C	Moderate
		Enhanced greenhouse effect and atmospheric pollution	Use local suppliers of sand, cement and raw materials, where possible, in order to minimise transport emissions.	1	C	Low
			Use mobile concrete batching plants on site to minimise transport and see controls for batching plant.	1	A	High
			Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
	Containment of concrete	Water pollution Litter/ waste left on site	Communicate and enforce speed limits.	2	D	Low
			All drivers to carry spill kits and be trained in emergency response.	2	D	Low
			Concrete slurry is to be collected within a lined earthen depression for collection and disposal off site.	2	D	Low
	Waste generation	Litter/ waste left on site	Prior to pre-construction activities develop a Construction EMP, which outlines waste management procedures for the site.	2	D	Low
Temporary site infrastructure and construction activities	Operate offices and depots	Enhanced greenhouse effect	Switch off office equipment and lights, when not in use.	2	D	Low
		Soil and erosion	Establish soil erosion and sedimentation controls prior to establishing offices and depots, per the SWMP.	2	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
	General	Water pollution	Prepare a Water Management Strategy as part of the EMP for both construction and operational phases to minimise water quality impacts and to maximise capture and reuse of water within the site.	3	D	Moderate
			Minimise the installation of impervious areas, retain and plant native vegetation.	2	D	Low
			Portable toilet facilities must be located 100 m or more from drainage lines.	3	D	Moderate
			Wastewater shall be transported to an offsite waste facility via a licensed waste transporter.	3	D	Moderate
		Land contamination	Prior to pre-construction activities develop a Construction EMP, which includes a procedure for personnel to manage suspected contaminated soils disturbed during earthworks.	2	D	Low
		Chemical Management	Store chemicals within a roofed, bunded and well ventilated area to prevent the ingress of stormwater and the egress of leaks and spills to land and water.	2	D	Low
			Portable spill kits and fire extinguishers are to be stored on site during construction, in the vicinity of both where chemicals are stored and used.	2	D	Low
			Designate bunded area(s) for refuelling for site vehicles that are located 100m or more from drainage lines.	2	D	Low
		Air quality and dust deposition	Minimise dust during construction via the use of water carts. Due to high winds, stage disturbance areas and ensure sufficient local water supplies are available for the construction period.	2	D	Low
			All vehicles are to exit the site via a rumble grid to minimise soil leaving the site.	2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
		Litter/ waste left on site	Designated waste storage areas will be available and communicated to construction personnel. Wastes will be stored in lidded bins to minimise wind blown litter. The induction to the Construction EMP will need to highlight the importance of good waste management in a high wind environment.	2	D	Low
			All waste will be classified and disposed per the <i>Waste Classification Guidelines, Part 1: Classifying Waste</i> – April 2008, DECC.	2	D	Low
		Bushfire	Avoid use of plant and equipment that can generate a spark in close proximity to vegetated areas, particularly during high fire danger periods.	5	E	High
			Hot works will not be conducted unless in accordance with a hot work permit and in consultation the Rural Fire Service fire danger warnings. No hot works will be permitted when a bushfire in the local area is already burning.	5	E	High
		Damage to equipment during high wind	Erect turbines and other infrastructure during low wind conditions (e.g. early morning or late evening).	1	D	Low
	Extended construction period	Community nuisance	Develop a community consultation strategy for the duration of the construction period, to keep community informed of progress/delays and to maintain a method for receiving and addressing community feedback. This should form part of the Construction EMP.	1	D	Low
	Transport to, from and within site including haulage of over-mass and over-dimension parts	Atmospheric pollution and dust deposition	Use water spray to control dust levels.	1	D	Low
		Enhanced greenhouse effect	Use local suppliers, where possible, in order to minimise transport emissions.	1	D	Low
		Soil erosion	Restrict traffic to designated roads and display speed signage for construction vehicles.	2	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
	Crane operation and transport of parts	Atmospheric pollution and control of public safety	Schedule works to minimise double handling, back tracking and idling of plant and equipment.	1	A	High
			Ensure all plant and equipment is maintained in good working order.	1	A	High
	Transport of oversized vehicles, plant and equipment	Atmospheric pollution	Map routes to minimise vehicle access into 'no go' areas of the site, to minimise soil compaction and erosion.	1	A	High
		Weed spread		2	C	Moderate
		Public safety	Use oversize warning vehicles with flashing lights.	2	D	Low
		Community nuisance	Maintain clear lines of communication with land owners and neighbouring sites regarding site access, fencing and control of livestock. Program works such that any alterations to fencing or any damage will be repaired immediately.	2	D	Low
	Refuelling/unplanned maintenance of drilling equipment	Water or land contamination	Scheduled maintenance of plant and equipment will not occur on site. Emergency maintenance and refuelling will not occur within 100 m of a water body and will be conducted in a manner to prevent release of contaminants to land or surface water.	2	D	Low
	Transport of water to and from the site	Atmospheric pollution Enhanced greenhouse effect	Restrict traffic to designated roads and display speed signage for construction vehicles. Use local suppliers of water to minimise transport emissions, where possible, e.g. in written agreement with local farmers.	2	C	Moderate
		Soil erosion		2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Installation of overhead transmission lines and substation (incl. building, equipment, transformer and switchgear)	Transport of plant and equipment	Atmospheric pollution and enhanced greenhouse effect	Use local suppliers, where possible, in order to minimise transport emissions.	1	A	High
		Soil erosion and water pollution, including sedimentation	Restrict traffic to designated roads and display speed signage for construction vehicles. Restrict vehicle access from 'no go' areas of the site, to minimise soil compaction and erosion.	2	C	Moderate
	Transport of oil	Land or water contamination, fire threat	Transport of oil (80,000 L for transformer and 1,000L per generator transformers) will be via purpose built vehicles/ tankers in accordance with the <i>Australian Dangerous Goods Code</i> and will be fitted with emergency spill equipment.	2	C	Moderate
			Oil will be transferred to transformers by qualified personnel, who have training in emergency spill response. Spill control equipment will be available at the point of use.	3	C	High
			Install concrete bunding for each oil storage location, with spill retention of at least 110% of the largest container. Storage of oil will be in accordance with AS1940-2004 <i>The storage and handling of flammable and combustible liquids</i> .	2	C	Moderate
	Disturbance of soils	Weeds	Revegetate disturbed areas as soon as practicable with native species.	2	C	Moderate
		Spread of soils impacted by root rot	Clean earthmoving equipment before commencing earthworks in a different location.	2	D	Low
	Waste generation	Litter/ waste left on site	All wastes shall be stored safely and in a manner that prevents them from being carried away by wind or water. All wastes shall be taken off site and recycled where possible.	2	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
	Location of infrastructure	Fire threat	Vegetation clearing shall be sufficient to minimise the threat of fire to nearby vegetation, without removing excessive vegetation. All vegetation removal will be in accordance with the flora and fauna studies.	5	E	High
		Community nuisance	Community consultation will occur prior to determining the location of overhead powerlines.	2	D	Low
Mobile concrete batching plants	Installation and operation	Legal non compliance	Obtain an Environment Protection Licence from DECC under the NSW <i>Protection of the Environment Operations Act 1997</i> .	2	D	Low
		Atmospheric pollution and dust deposition	Minimise dust when sweeping dry concrete surfaces.	2	D	Low
		Enhanced greenhouse effect	Use local suppliers of sand, cement and raw materials, where possible, in order to minimise transport emissions.	1	B	Moderate
		Water pollution, including sedimentation	Establish soil erosion and sediment controls in accordance with SWMP. Capture all stormwater runoff for treatment or disposal off site, following water quality sampling and analysis.	2	D	Low
		Weeds	Minimise soil disturbance and restrict vehicle access from 'no go' areas.	2	D	Low
		Litter/ waste left on site	Collect all wastes within designated areas, within lidded bins. All concrete slurries are to be recycled where possible or deposited within designated storage areas that are unable to drain to stormwater. All wastes will be disposed off site.	2	D	Low
		Public safety	Batching plants will be secured from public access via a chain link fence and lockable gates.	1	D	Low
		Community nuisance	The locations of the mobile plant shall be discussed with local neighbours.	1	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Design of infrastructure	Manipulation of air flow	Air quality	Design turbines to minimise air turbulence.	1	B	Moderate
	Parts and materials	Enhanced greenhouse effect	Turbine components should be designed to consider long term energy efficiency, e.g. materials and form of rotor blades.	1	B	Moderate
			Consider longevity of parts and energy costs for replacement parts.	1	B	Moderate
			Order pre-fabricated construction materials, where possible.	1	B	Moderate
		Depletion of local water supply	Collect stormwater runoff where possible for reuse on site, e.g. within plant, fire fighting and irrigation.	1	D	Low
		Atmospheric pollution	Use local water supplies, where possible, in written agreement with local farmers.	1	A	High
		Water pollution	Design each facility such that contaminated fire water can be captured for clean up by emergency services crews, e.g. detention of a predetermined quantity of fire water, prior to entering a vegetated swale.	2	C	Moderate
		Land contamination	Plant and equipment would be designed to minimise the risk of spills to soil or areas where stormwater can carry off spill residues.	2	C	Moderate
Decommissioning/ refurbishment activities	Removal of plant/ equipment	Atmospheric pollution	Works will be scheduled to minimise truck movements. See also transport to and from site, during construction activities.	1	A	High
		Waste/ parts left on site	All plant and equipment will be carefully removed from the site and reused where possible.	2	D	Low
	Disturbance of soil	Soil erosion and sedimentation	The site will be revegetated and rehabilitated. Ongoing maintenance will be undertaken for a scheduled period of time, sufficient to restabilise the site.	2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Construction and decommissioning activities	Generation of wastes	Depletion of landfill space Waste disposal	Minimise waste generation during construction and decommissioning activities in accordance with avoid, reduce, reuse and recycle principles. All wastes to be disposed off site, via licensed contractors to licensed facilities. Waste receipts are to be maintained as records of offsite disposal.	2	D	Low

Appendix D: Operation Risk Analysis Table

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Operation and maintenance	Management	Lack of environmental resources	Assign responsibility for ongoing environmental management of the site, including Operational EMP, incident reporting, community consultation, designated parking areas.	2	D	Low
	Access/Security	Vandalism to wind farm or neighbouring properties	Restrict visitor access via signage/ security fencing.	2	D	Low
	Erosion	Soil erosion and sediment runoff	Post construction; continue to maintain revegetated areas to ensure these are established properly to provide effective soil erosion controls.	2	D	Low
			Vegetate swale drains on either side of access roads to allow treatment of surface water. Vegetate with native species that are good at absorbing pollutants.	2	D	Low
			Swale overflow will be directed into energy dissipating devices, prior to entry into natural waterways.	2	D	Low
			Maintain access track condition to prevent soil erosion, sediment runoff and dust potential.	2	D	Low
			Maintain boundary fencing to prevent access to wind turbine areas by livestock to avoid soil compaction and erosion hazards.	2	D	Low
			Provide signage and barriers to restrict visitors to access tracks.	2	D	Low

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Operation and maintenance	Chemical management	Water and land contamination	Chemicals will be stored in purpose built areas of the facilities, to allow for adequate ventilation, separation from incompatible materials, fire protection and containment of spills. If such an area cannot be built and maintained then chemicals should be stored off site.	2	C	Moderate
			Store lubricants and other chemicals per the <i>Occupational Health and Safety Regulation 2001</i> .	2	C	Moderate
			Maintain regular inspections for leaks within the Operational EMP.	2	C	Moderate
	Storage of oil in transformers and refilling	Land and water contamination	Concrete bunds built with spill retention of 110% of volume of oil stored at each transformer and generator transformer location.	2	C	Moderate
			Portable spill kits and fire extinguishers are to be stored on site during operation, in the vicinity of both where oil is stored and used.	2	C	Moderate
	Water management	Water pollution	Design stormwater drainage to avoid soil erosion (e.g. scours).	2	D	Low
		Water supply	A rainwater tank will be incorporated into the substation design, for additional internal water supply. Overflow will be directed to appropriate stormwater drainage to prevent scour erosion.	2	D	Low
		Toilets	Schedule regular maintenance of compost or septic system within the Operational EMP. The system will be installed by a licensed plumber.	2	C	Moderate
	Waste management	Litter/ waste left on site	No wastes will be stored outside on site, to prevent animals and pests being attracted to the area. Store wastes away from stormwater drains. All wastes generated on site during maintenance activities will be removed from the site. Temporary lidded bins may be used for larger maintenance projects. Any liquid and/or hazardous wastes will be transported via licensed waste transporters and disposed at licensed waste facilities.	2	C	Moderate

ACTIVITY/ PRODUCT/ SERVICE	ASPECT	IMPACT	RISK TREATMENT	C	L	RISK LEVEL
Operation and maintenance	Fire	Bushfire threat	Locate facilities clear of vegetation. Turbines to be earthed to arcing of electricity or surges due to lightning strike	3	D	Moderate
		Water pollution	Include procedures within the Operational EMP, which ensure immediate site cleanup post fire, to prevent the runoff of fire extinguisher foam and other wastes.	3	D	Moderate
	Vehicle use	Vehicle accidents	Maintain signage with speed limits.	2	D	Low
			Maintain roads to minimise soil erosion and accidents.	2	D	Low
	Electricity and remote use	Enhanced greenhouse effect and atmospheric pollution	Remote controlled access will limit physical visits to the site.	2	D	Low
			Equipment powered by electricity generated from wind power on site.	2	D	Low
	Maintenance, e.g. turbines, roads, fencing, grass/ weeds, building, air conditioning	Atmospheric pollution	Maintain all plant and equipment in good working order, schedule maintenance within the Operational EMP.	1	A	High
		Water quality within water cooled plant	Air conditioning (air cooled) installed in the facilities building will be maintained regularly, this will be scheduled within the Operational EMP. Should air conditioning plant be water cooled, the Operational EMP will need to have procedures to address maintenance and checking to control the risk of Legionnaires disease.	2	D	Low
		Land and water contamination	Any maintenance to vehicles is to occur off site.	2	D	Low
		Fire risk	Maintain vegetation clear of overhead power lines.	3	D	Moderate
	Refrigerant use	Ozone depletion	Use refrigerants with no ozone depleting potential.	2	D	Low

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