



Australian Government

Department of the Environment, Water, Heritage and the Arts

Referral of proposed action

Sapphire Wind Farm

Inverell and Glen Innes, NSW

February 2011



Project title: Sapphire Wind farm

1 Summary of proposed action

1.1 Short description

Wind Prospect CWP Pty Ltd is proposing to develop and build a wind energy facility known as Sapphire Wind Farm. The proposed project is located 28km east of Inverell and 18km west of Glen Innes in the north east of NSW.

Sapphire Wind Farm is proposed in the context of growing global recognition of the need to mitigate the environmental effects associated with fossil fuel energy generation. The project will provide an important contribution to the Federal Government's proposed Mandatory Renewable Energy Target (MRET) of 20% by 2020. Sapphire Wind Farm will potentially supply over 138,000 households with energy and save approximately 863,000 tonnes of CO₂-e per annum.

The wind farm will have a capacity of 238 – 425 megawatts (MW), depending on the use of one of two current options, being: one-hundred-and-fifty-nine (159) 1.5 MW turbines or one-hundred-and-twenty-five (125) 3.4 MW turbines. A range of wind turbines will be considered, with these MW capacities representing the min/max anticipated turbine rating.

1.2 Latitude and longitude

Location Point	Latitude (S)			Longitude (E)		
	degrees	minutes	seconds	degrees	minutes	seconds
	29	38	46.531	151	32	44.727
	29	46	30.524	151	32	44.727
	29	46	30.524	151	22	25.089
	29	38	46.531	151	22	25.089

NB. Please refer to [Figure 1](#) and [Figure 2](#) for a map outlining the location and layout of the proposed action.

1.3 Locality and property description

The area of the wind farm is located north of the Gwydir Highway approximately 18km west of Glen Innes and 28km east of Inverell, New South Wales. The turbines extend over a 10km span north-south and 15km span east-west. The individual turbine positions are located on land with elevations ranging from approximately 750m to 1,100m Australian Height Datum (AHD).

The project site is on rural land within the Inverell Shire and Glenn Innes Severn Council areas and includes twenty two (22) privately owned properties.

- 1.4 **Size of the development footprint or work area (hectares)** The site of the proposed action and its surrounds (see [Figure 2](#)) will be referred to throughout the referral by the following terms:

Study Area / Development Envelope: Defined by the 100 metre buffer around the development footprint as seen in [Figure 2](#) (i.e. 200 metre survey corridor). The study area is approximately 1,982.13 hectares and was the area subject to survey effort.

Development Footprint: The area directly impacted upon by the construction of the proposed action. The development footprint is a maximum of 297.08 hectares (for 1.5 MW turbines - 50m x 50m clearance required for each turbine and a 12m easement for roads with varying clearance width for cut and fill areas).

Table 1: Shows the area in hectares for each area.

Region		Area in hectares
Study Area / Development Envelope		1,982.13 ha
Development Footprint	159 turbines	297.08 ha
	125 turbines	277.16 ha

The development footprint of the proposed wind facility will have a maximum area of approximately 297.08 ha (1.5 MW turbines). This includes turbines, access tracks and the associated ancillary structures required for the running of the wind farm. Temporary impacts needed to allow construction (e.g. widening roads), will be rehabilitated post construction.

Note: To provide for consistency throughout the referral, further calculations and any future approvals/assessment documentation, the development footprint for the proposed action from here-in will be referenced as the larger of the two impact footprint areas, being 297.08 ha (relating to the option for construction of 159 x 1.5 MW turbines).

- 1.5 **Street address of the site** Roads of significance are Gwydir Highway to the south and Waterloo Rd running through the centre. Waterloo Rd, Western Feeder, Eastern Feeder, Kings Plains Rd and Polhill Rd are adjacent to the project site.

1.6 **Lot description**

The development site consists of twenty two (22) different private land holdings. See below for a breakdown of all Lot and DP's.

Lot 1	DP435844	Lot 270	DP750076
Lot 1	DP231665	Lot 271	DP750076
Lot 1	DP128314	Lot 277	DP750076
Lot 1	DP500954	Lot 278	DP750076
Lot 1	DP589446	Lot 279	DP750076
Lot 100	DP750121	Lot 280	DP750076
Lot 103	DP651984	Lot 281	DP750076
Lot 104	DP753316	Lot 284	DP750076
Lot 108	DP750121	Lot 285	DP750076
Lot 119	DP753260	Lot 46	DP750121
Lot 125	DP753319	Lot 5	DP778366
Lot 126	DP750076	Lot 52	DP750121
Lot 127	DP750076	Lot 53	DP750121
Lot 128	DP750076	Lot 54	DP753319
Lot 13	DP750121	Lot 54	DP750121
Lot 131	DP753320	Lot 6	DP603327
Lot 132	DP753305	Lot 61	DP753319
Lot 135	DP753305	Lot 68	DP750121
Lot 138	DP750121	Lot 7	DP603327
Lot 139	DP750121	Lot 70	DP753320
Lot 142	DP750076	Lot 72	DP750121
Lot 15	DP750121	Lot 73	DP750121
Lot 16	DP750121	Lot 80	DP753305
Lot 17	DP750121	Lot 81	DP753305
Lot 18	DP750121	Lot 9	DP750121
Lot 185	DP750121	Lot 90	DP750121
Lot 196	DP750076	Lot 91	DP750121
Lot 197	DP750076	Lot 92	DP750121
Lot 2	DP872156	Lot 93	DP753320
Lot 2	DP1072905	Lot 93	DP750121
Lot 2	DP231665	Lot 96	DP753320
Lot 2	DP1045296	Lot 97	DP753320
Lot 200	DP753320	Lot 99	DP753316
Lot 212	DP750121	Lot 266	DP750076
Lot 235	DP750076	Lot 267	DP750076
Lot 265	DP750076	Lot 268	DP750076
		Lot 269	DP750076

1.7 **Local Government Area and Council contact (if known)**

Inverell Shire Council (contact: Brett McInnes, Head of Planning, 02 6728 8002)

Glen Innes Severn Council (contact: Graham Price, Head of Planning, 02 6730 2365)

1.8 **Time frame**

Construction would commence following the completion of all pre-construction consent commitments and the awarding of the final construction contract. Assuming satisfactory progress of the pre-construction stage and construction works it is anticipated that the wind farm will be commissioned late in 2012 (see Table 2).

Table 2: Timeframe for the Sapphire Wind Farm

Project Stage	Duration	Completion
Planning and Environmental assessment	6 months	May 2011
Consent authority review and approvals	6 months	November 2011
Financial Close	3-6 months	1 st Quarter 2012
Wind farm construction and grid connection	18 months	3 rd Quarter 2013
Commissioning	3 months	4 th Quarter 2013
Operation	20 years	4 th Quarter 2032

1.9 Alternatives to proposed action	X	No
		Yes, you must also complete section 2.2
1.10 Alternative time frames etc	X	No
		Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.12 State assessment		No
	X	Yes, you must also complete Section 2.4
1.12 Component of larger action	X	No
		Yes, you must also complete Section 2.6
1.13 Related actions/proposals	X	No
		Yes, provide details:
1.14 Australian Government funding	X	No
		Yes, provide details:
1.15 Great Barrier Reef Marine Park	X	No
		Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

2.1 Description of proposed action

The Sapphire Wind Farm proposal comprises a wind farm with one-hundred-and-fifty-nine (159) 1.5 MW wind turbines or one-hundred-and-twenty-five (125) 3 MW wind turbines or equivalent to be constructed over twenty-two (22) different properties. The varying number of turbines is an outcome of the relative size of the wind turbines being considered for the project, the final configuration and number of turbines is yet to be determined.

Ultimately the choice between these two design layouts is largely dependent on the availability of wind turbines to the project, selection based on a competitive tendering basis post-consent. It is important to note that the same 'Study Area' will be utilised irrespective of the final selection whereas the development footprint will differ slightly with respect to the two layouts (see [Figure 2](#)). It is expected that some adjustment of the turbine locations will occur during the planning and assessment phase in response to findings of the various planning studies.

The wind farm layout will be prepared to maximise utilisation of the available wind resource whilst gaining regulatory and broad community acceptance of the development. The planning and design stages of the wind farm layout have and will continue to consider any potential environmental impacts on flora communities, fauna habitat, heritage aspects as well as the location of neighbouring human residences. Some of the impacts from the development footprint will be for the duration of the wind farm operation and some are temporary impacts during the construction phase to allow for a temporary increase in traffic volume and over-sized traffic.

The proposed Project will have an installed capacity of up to 238 – 425 MW, depending on the model of the turbine selected, and will consist of the following components:

- the installation of up to one-hundred-and-fifty-nine (159) wind turbines 28km east of Inverell and 18km west of Glen Innes, NSW (refer to [Figure 1](#) and [Figure 2](#));
- one or more collector substations comprising cable marshalling, switchgear and transformer, site operations facilities and services building;
- underground electrical interconnection lines (33 kilovolt (kV) capacity) and control cables within each of the wind turbine clusters, connecting to the collector substation;
- overhead power line approximately 10km in length, either 66, 132 or 330kV capacity including a 45m easement;
- access roads to the turbine locations and substation;
- crane hardstand areas for the erection, commissioning, maintenance, recommissioning and decommissioning of the wind turbines;
- temporary construction facilities including site office, parking and materials storage areas;
- appropriate wind farm signage both during the construction and operational phases of the proposed development; and
- mobile concrete batching plant(s) and rock crushing facilities.

Details of each of the component parts of the development are described in the following sections and in the accompanying images. An outline of the construction and operational phases of the development are also provided. A detailed site plan is presented in [Figure 2](#), showing the two potential turbine layout designs. These layouts are based on a number of technical, environmental and social factors and more detailed site assessments. The layouts ensure optimum, undisturbed use of the measured and predicted wind resource, after accommodating constraints, for the range of turbines currently being considered for the wind farm.

Table 3: Project Components and Approximate Dimensions.

Project Component	Approximate Dimensions
Turbine footings	15 x 15 m
Collector Substation (Up to two (2))	100 x 100 m
Switching Substation	100 x 100 m
Facilities building	30 x 6 m
Site access: new roads *	91 km x 12 m
Underground cabling on-site	160 km x 1m
Internal overhead electrical interconnection / easement #	10 km x 45 m
Temporary construction facilities	
Concrete batch plant (8)	50 x 100 m (ea.)
Rock crushing facility (3)	50 x 60 m (ea.)
Site office (3)	40 x 100 m (ea.)
Construction compound (3)	150 x 200 m (ea.)

* It is expected that up to 6m of road width will be rehabilitated after the infrastructure has been installed (post construction phase).

The estimated easement width is 45m, however the actual impact area has been estimated to be 5% of this total area given the sparse vegetation cover along the selected routes.

Given the scale of the proposed wind farm it is likely that 'clusters' of turbines will be constructed and commissioned in stages. Consequently, and for the benefit of stakeholder understanding, the project has been broken down into three (3) clusters (see [Table 4](#) below).

Table 4: Wind Turbine Clusters.

Turbine Cluster	2.05MW Turbines (80m)	3MW Turbines (112m)	General location
Sapphire	56	45	western cluster
Swan Vale	66	51	southern cluster
Wellingrove	37	29	eastern cluster

Wind Farm Infrastructure

It is not yet known which model of wind turbine will be used for the development as final turbine selection will occur through a competitive tender process pending development approval. However, in terms of generation capacity, the wind turbines under consideration for this project vary in the range from between 1.5 and 3.3 MW. By way of example the Suzlon S88, 2.1MW machine (as installed at the Capital wind farm, east of Lake George, NSW) is typical of the type of wind turbine that could be installed.

Turbines

The turbines used for the project will be three-bladed, semi-variable speed, pitch regulated machines with rotor diameters between 80m and 112m ([Figure 3](#) and [Figure 4](#) depict the respective layouts). Typically turbines of this magnitude begin to generate energy at wind speeds in the order of 4 ms^{-1} (14.4 kilometres per hour (kph)) and shut down (for safety reasons) in wind speeds greater than 25 ms^{-1} (90 kph). Wind turbine blades are typically made from glass fibre reinforced with epoxy or plastic attached to a steel hub, and include lightning rods for the entire length of the blade. The blades typically rotate at about 12 revolutions per minute (rpm) at low wind speeds and up to 18 rpm at higher wind speeds.



Image 1: Component Parts of a Wind Turbine

Towers

The supporting structure is comprised of a reducing cylindrical steel tower fitted with an internal ladder or lift. The largest turbine under consideration could require a tower height of 100m with an approximate diameter at the base of 4.5m and 2.5m at the top. Typically the tower will be manufactured and transported to site in three (3) or four (4) sections for on-site assembly.

Nacelle

The nacelle is the housing constructed of steel and fibreglass that is mounted on top of the tower and can be 10m long and 4m high and 4m wide. It encloses the gearbox, generator, transformers, motors, brakes, electronic components, wiring and hydraulic and lubricating oil systems. Weather monitoring equipment located on top of the nacelle will provide data on wind speed and direction for the automatic operation of the wind turbine.

Footings

Three types of foundation for the turbines will be considered pending geotechnical investigation of the ground conditions at the site.

- Slab (gravity) foundations will involve the excavation of 15 x 15m area to a depth of approximately 3m. Approximately 300m³ of excavated material will, if suitable, be used as backfill around the turbine base. A slab foundation would involve installation of shuttering and steel reinforcement, followed by the pouring of concrete.
- If slab plus rock anchor foundations are required, the construction of the foundation for each machine would involve the excavation of approximately 300m³ of ground material to a depth of approximately 2m. Slab plus rock anchor foundations require shuttering and steel reinforcement, drilling of rock anchor piles up to a depth of approximately 20m, concrete pour, after which the rock anchors are stressed and secured once the concrete has cured sufficiently.

- Alternatively, if a single mono-pile foundation is required (rock anchor), approximately 50m³ of ground material would be removed by a rock drill to a depth of approximately 10m, of which 30m³ would, if suitable, be used as back fill. If a mono-pile foundation is used, a tubular section with tower connection flange attached is inserted in the hole and concrete is then poured in-situ.



Image 2 (a) & (b): Typical Gravity (left) and Rock Anchor (right) Footings

Detailed geotechnical surveys will be carried out during pre-construction work to determine the necessary foundation type per turbine. It is feasible that more than one type of turbine foundation may be required for the project, following the assessment of the individual turbine locations. New turbines are continually coming on to the market and it is possible that minor variations to these typical dimensions could occur prior to final turbine selection.

Crane Hardstand

Site access roads would have areas of hardstand (approximately 45m by 45m) adjacent to each wind turbine for use by cranes during construction. The clearing of native vegetation for the construction of access roads and hardstand areas will be avoided where possible. If clearing is found to be unavoidable, this will be appropriately managed and carried out in accordance with the Environmental Management Plan. The roads would be surfaced with local stone (where possible) to required load bearing specifications. The nature and colour of surfacing would be selected to minimise visual impact prior to construction. The roads and hardstand areas would be maintained throughout the operational life of the wind farm and used principally for the periodic maintenance of the wind turbines.



Image 3: Typical Hardstand area adjacent to a Rock Anchor footing

Monitoring Masts

Up to six (6) permanent wind monitoring masts up to 100m high, two per cluster, are proposed to be installed on-site. The purpose of the additional monitoring masts is to provide information for the performance monitoring of the wind turbines. The wind monitoring masts would be of a guyed, narrow lattice or tubular steel design.



Image 4: Wind monitoring mast

Electrical Infrastructure

The electrical works, including those incorporated in the wind turbine structures, will involve:

- up to one-hundred-and-fifty-nine (159) wind turbine generator transformers;
- the establishment of one or more 100m by 100m collector substations and switching substation with 33-to-132kV or 33 kV-to-330kV transformer circuit breakers and isolators;
- approximately 160km of 33kV underground cables;
- approximately 10km of 66, 132 or 330kV overhead electrical interconnection cables;
- approximately 170km of control cables (10km may be underground or overhead); and
- the establishment of a 30m by 6m operation facilities building to house control and communications equipment.

Generator Transformer

The wind turbine generators typically produce electricity at nominally 0.69kV which is raised to 33kV by the transformer located either in the nacelle, the base of the tower or close to the base of the tower on a concrete pad.



Image 5: Transformer adjacent to wind turbine

The generator transformer may be oil-filled or a dry type depending on the wind turbine. Where oil-filled transformers are used, appropriate measures will be incorporated to prevent any oil loss reaching local water courses. The volume of oil used for generator transformers is in the order of 1,000 litres (l). The output from each of the turbines will be directed via 33kV underground cables and 66, 132 or 330kV overhead line that link to a 33/330kV or 66/330kV or a 33/132kV or 66/132kV collector substation.

Collector Substations

Substation location(s) will be chosen to minimise access distance and electrical losses, and to reduce their visibility from surrounding public viewpoints. Following construction, and if warranted, small areas of tree planting could be undertaken to screen any part of the substation that are visible from the surrounding country to reduce visual impact.

The collector substations will include two 150 or 200 megavolt ampere (MVA) transformers to step-up the voltage from 33kV or 66kV to 132kV or 330kV (equivalent to the rating of the destination overhead powerline), together with ancillary equipment. It will occupy an area approximately 100m by 100m and will be surrounded by a 2m high security fence, surmounted by four (4) strands of barbed wire. A buried earth grid will extend one metre beyond the fence on all sides. The ground surface within the substation enclosure will be covered partly with a layer of crushed rock and partly by concrete slabs. As the transformer may contain upwards of 80,000 litres of oil, provision will be made in the design for primary and secondary containment of any oil that may leak or spill from the transformers or associated components. This would involve constructed concrete bunds around each transformer and a spill oil retention basin or oil/water separator outside the substation compound. The 1 ha area includes a provision for a 20m buffer of land surrounding the equipment. The likely location of the collector substation is shown in [Figure 2](#) however this location is yet to be confirmed.

Switching Substation

The switching substation will be located with the western collector substation, adjacent to the 330kV powerline for direct connection into the grid. The substation arrangement will include an array of busbars, circuit breakers, isolators, various voltage and current transformers and a static compensator-capacitor as agreed with Transgrid. The switching substation will be located in the same compound as the collector substation and include the same type of design for construction, fencing, etc.

Overhead and Underground Cables

A combination of overhead and underground cables will be used. The underground cable routes will generally be between the turbines and, where possible, follow the route of the internal access roads. The final route will minimise clearing and avoid potential erosion and heritage sites and will also depend on the ease of excavation, ground stability and cost. Markers may be placed along the route of the underground cables. Placement of these cables below ground will result in minimal visual impact.

Control cables will interconnect the wind turbine generators and the operation facilities building. Computerised controls within each wind turbine will automatically control start-up, speed of rotation and cut-out at high wind speeds. Recording systems will monitor wind conditions and energy output at each of the turbines. Remote monitoring and control of the wind farm will also be possible. Control cables will consist of optic fibre, twisted pair or multi-core cable and will be located underground within the groups of turbines or above ground. Above ground control cables, if used, would be strung from the poles of the internal 132kV or 330kV overhead lines.

The installation of buried earthing conductors and electrodes will also be required in the vicinity of the turbines, the facilities building and the substation.



Image 7: Laying underground electrical cable within road network

Operation Facilities Building

A facilities building approximately 30m by 6m will be constructed at the same location as the switching substation. The general location has been chosen to minimise the length of overhead lines and underground cables and also to minimise the visibility of the facilities building and substation. The building will house instrumentation, electrical and communications equipment, routine maintenance stores, a small work area and staff amenities.

The structure is proposed to be a slab on ground construction with steel frame, metal or brick walls and a sheet steel roof or alternatively a transportable type building constructed on piers. It will be of sturdy construction, suitable for the weather conditions it will be exposed to and will be compatible with the rural environment. Roof drainage will collect rainwater for domestic use. A septic system or composting toilet system, which complies with Council requirements, will be installed to treat the small amount of waste water produced.

The design of the switching substation, electrical installations and operation facilities building will be developed in conjunction with Transgrid and comply with relevant technical, electrical and planning standards.

Site Entry

All entrances to the wind farm site from the existing arterial roads will be designed to allow long vehicles to safely exit from or re-enter the site without disrupting traffic. Further consultation will be undertaken with Council and the Roads and Traffic Authority to confirm the final design.

On-site Access Roads

Other access consists of on-site roads between turbines and hardstand areas. The on-site access road system will be rationalised and, where possible, these roads will follow existing farm tracks that traverse the ridgelines and plateaus. All roads leading from the arterial roads and all on-site access roads are likely to require a full or partial upgrade to accommodate the construction traffic loads, as well as for maintenance purposes during operation.

Access roads will be up to 12m wide in parts during construction to allow for safe passage of construction traffic and wind turbine components, and at least 6m wide once the wind farm is operational. Additional areas of cut and fill clearance will also be required. The roads will be surfaced with compactable, engineered base material with suitable drainage. Materials will be sourced locally where possible and in consultation with the local councils. Measures will be taken to minimise the risk of the spread of weeds and disease from materials brought in for construction purposes.

Ancillary Roads and Remediation

Some additional roads may also be required for construction of the overhead transmission line, cable routes and for access to erosion control sites. The erosion control sites will benefit from the use of excess rock excavated from turbine footings and will be chosen based on the availability of excess material, the need for erosion repair, and minimising the distance for material transport.

If roads are not required for the ongoing operation and maintenance works of the project they will be removed and revegetated on completion of the construction phase, and in accordance with landowner preferences where possible.

Pre-construction Works

Prior to the main construction commencing, a number of enabling works and further site planning would be undertaken by the selected Contractor, including:

- Detailed site investigation including geotechnical investigations involving a series of trial pits and/or boreholes;
- Upgrading the surfaces of local roads and access roads where required;
- Widening the junctions or corners of local roads, entrance/access points where required;
- Upgrading of causeways and bridges where required;
- Widening the existing gateways, or inserting new gateways as necessary along fencelines;
- Stripping and careful storage of existing soil from the areas which would be affected by construction activities, including the tower bases, switchgear/substation yards, access road areas, crane hardstand areas and temporary laydown/car park areas;
- The construction of a secure works facility, with project owner and subcontractors field offices (portables), car park, laydown yard and toilet facilities (temporary).
- Erection of signage on roads;
- Enabling works for the locating of a mobile concrete batching plant(s) (temporary, if required);
- Enabling works for the locating of a rock crushing plant(s) (temporary, if required);
- Environmental survey and refinement (if necessary) of the Environmental Management Plan in line with the Draft Statement of Commitments, Health and Safety Plan, Traffic Management Plan and any other documentation as required under the planning authorisation;
- Survey of critical boundaries and pegging of infrastructure locations;
- Detailed cultural heritage and flora/fauna surveys across entire site (if required);
- Preparation of works procedures and Project Implementation Plan; and
- Engineering design works and submission for Building Rules Consent.

Construction Works

Construction activities include activities that cross over with pre-construction works and comprise site establishment, earthworks for access roads, footings and crane hardstand areas, erection of up to one-hundred-and-fifty-nine (159) wind turbines, four (4) permanent wind monitoring masts, collector substations, switching substation, above and below ground cabling and temporary site facilities. Construction activity is likely to occur over a period of approximately 18 to 24 months with restoration following the completion of works.

Community Construction Awareness Program

Prior to the commencement of the site construction activities, a program of community awareness initiatives will be implemented. Information will be disseminated to the local community through the Wind Prospect CWP website, local newspapers and direct mail to advise them of the nature of the construction activities, their timing and potential impacts. Contact details will be provided for individuals to gain further information or if required to express concerns or complaints. Updates on the progress of construction works and relevant impacts will be provided during the construction period.

Site Establishment and Temporary Site Infrastructure

Site works will require the erection of temporary infrastructure such as portable field offices, toilet facilities, materials storage areas and parking bays. This infrastructure will be typical of that used at construction sites; however it is unlikely to include full accommodation facilities.

Traffic signage required as part of traffic safety during construction will be installed by the contractor, in compliance with relevant regulations and in accordance with any permits obtained for traffic management.

Signage will be erected on the Gwydir Highway and other critical locations from the outset of construction, directing all vehicles associated with the construction site to the site office. Additional signage would be located near to the site, providing information about the turbines, the companies involved in the projects and essential safety information and telephone numbers. Negotiations with the Inverell Shire Council and Glen Innes Severn Council, NSW Road Transport Authority and other affected parties will be initiated to determine final signage locations and various works required.



Image 8: Temporary site infrastructure

Ancillary Construction Activities: On-site Concrete Batch Plant(s) / Rock Crusher(s)

A concrete batching plant may be required on-site for construction at each cluster, to supply concrete for the wind turbines foundations. An on-site batching plant would occupy an area of approximately 50 by 100m and likely consist of a trailer-mounted concrete mixer, cement bins, sand and aggregate stockpiles and a storage container for various equipment and tools. Sufficient area will be required for the use of front-end loaders, delivery of materials and entry and exit of vehicles. A batch plant would be powered by a diesel generator and have a production capacity of approximately 50m³/hour. The location of the concrete batch plant(s) within the proposed site will be selected to ensure no impact to matters of National Environmental Significance.

An alternative source of concrete will be to supply by cement mixer from the nearby town of Inverell. This would remove the need for on-site concrete batching. The decision to use on-site or off-site cement supply will be determined during the pre-construction phase and tendering process.

Rock crushers will be used to prepare aggregate for use in the preparation of internal access tracks. A rock crusher would occupy an area approximately 50 by 60m, including crushing equipment and aggregate stockpiles. As with cement batching, sufficient area will be required for the use of front-end loaders, delivery of materials and entry and exit of vehicles. A rock crusher would also be powered by a diesel generator. The location of the rock crushers within the proposed site will be selected to ensure no impact to matters of National Environmental Significance.



Image 9: Temporary on-site concrete batching plant

Site Access Roads and Crane Hardstand Areas

Site access roads and crane hardstand areas require surfacing in order to cater for construction traffic and machinery. This involves the excavation of the roads and hardstand areas to an agreed depth, prior to the laying of a compacted quarry rubble base. It is anticipated that the majority of material retrieved from cuttings and excavations will be used on-site or in the immediate vicinity of the site. Site access points would be gated and secured, and appropriate warning signs erected.

During construction, site access roads are to be constructed at a width of 6m, with a maximum passing width of up to 12m (14m on corners) to allow for passing construction traffic, large mobile cranes, and other long and wide loads. Additional cut and fill clearance will also be required in some areas. Once the wind farm is operational, the access roads will be reduced in size to 6m in width, acknowledging that traffic from this point onwards will principally involve commercial vehicles. The crane hardstand areas will be sized at approximately 45m by 45m.

Footing Construction

Should gravity foundations be required, the construction of the foundation for each wind turbine will involve the excavation of approximately 675m³ of ground material to a depth of 3m. Shuttering and steel reinforcement would then be put in place and concrete poured to form the base in-situ. The upper surface of each base would finish approximately 0.5-1m below ground level with either a central reinforced concrete plinth to support the tower, or a base steel tower section set into the concrete.

If rock anchor foundations are required, the construction of the foundation for each wind turbine would involve the excavation of approximately 300m³ of ground material to a depth of approximately 2m. The rock anchor cores are drilled into the bed-rock prior to concrete pour, and are up to a depth of approximately 20m. The rock anchor tendons are grouted into place, stressed and secured once the concrete has cured sufficiently. Steel forms shuttering and steel reinforcement would then be put in place and concrete poured to form the base in-situ. The upper surface of each base would finish at ground level with either a central reinforced concrete plinth to support the tower, or a base steel tower section set into the concrete.

On-site Electrical Retlculation

Either prior to or during turbine base construction, the underground site electrical system would be installed. This would involve the cutting or excavation of trenches to a depth of up to 1.2m, for the laying of the underground cabling that links the turbines. All trenches would be backfilled and marked with warning tape once the cables were laid.

The majority of the underground cabling will be located adjacent to the access roads. The general procedure followed for the laying of underground cables will be:

- Preparation work, including installation of gates/temporary removal of fences as required;
- Use of an excavator or rock saw to dig a trench (0.45m wide by 1.2m deep);

- Material excavated is stored adjacent to the trench for subsequent back-filling;
- Laying of bundled cables within a bed of protective sand; and
- Backfilling and compaction of previously excavated material in layers by use of a vibration plate compactor, all in accordance with Engineering Specifications.

On completion the cable route may be marked with small marker posts and the surrounding vegetation will be allowed to regrow.

Turbine Erection

The turbine components would be delivered to the site on semi-trailers. The method of construction would involve the use of a small mobile crane (up to 100 tonne) for the ground assembly operation. A larger 600-1000 tonne mobile crane (or alternatively a 300-400 tonne crawler crane) together with the small mobile crane, would be required to erect the turbines once ground assembly is complete. Assembly of the rotor blade to the turbine requires a defined working area; accordingly a 25m radius buffer (involving clearing of vegetation) has been used to ensure safe construction. Erection is likely to take approximately 2-3 days per turbine. Depending on the configuration, the crane may require up to 2 days to disassemble and remobilise to a new site.



Image 10: A range of typical turbine construction photographs

Operation

Once operational, the wind farm would be monitored both by on-site staff and through remote monitoring. Aspects of the wind farm operation to be dealt with by on-site staff would include safety management, environmental condition monitoring, landowner management, routine servicing, malfunction rectification and site visits. Those functions to be overseen by remote monitoring include turbine performance assessment, wind farm reporting, remote resetting and maintenance coordination. Pro-active computer control systems monitor the performance of the wind turbines and ensure that any issues are dealt with by on-site staff or contractors, as appropriate.

Servicing and Maintenance

Maintenance staff are likely to be on-site throughout the year, making routine checks of the wind turbines on an ongoing basis. Major planned servicing would be carried out approximately twice a year on each wind turbine. Each major service visit would potentially involve a number of service vans (two technicians per van) on-site.

Refurbishment

After approximately 20-25 years of operation (or sooner if deemed economically viable) the blades, nacelles (top section of the turbine) and towers could be removed and replaced. Old blades, nacelles and towers are removed from site for recycling and new components installed on existing or new foundations, as appropriate. Refurbishment would extend the life of the wind farm for a further twenty (20) years.

Any material change to the wind farm layout, or significant changes to the turbine technology, will be referred to the Department of the Environment, Water, Heritage and the Arts as an amended proposal. It would also be subject to the regulations and guidelines of the day, including a new planning consent for the proposed redevelopment. Refurbishment requires the transportation and installation equipment and facilities, similar to that used during initial construction.

De-commissioning

At the end of the operational life of the wind farm, the turbines and all above ground infrastructure will be dismantled and removed from the site. This includes all the interconnection and substation infrastructure. The tower bases would be cut back to below ploughing level or topsoil built up over the footing to achieve a similar result. The land will be returned to prior condition and use. A compressor and rock breaker may be needed to carry out the cutting work.

The access roads, if not required for farming purposes or fire access, would be removed and the site reinstated to its original condition and use. Access gates, if not required for farming purposes, would also be removed. Individual landowners will be involved in any discussion regarding the removal or hand-over of infrastructure on their property.

The underground cables are buried below ploughing depth and contain no harmful substances. They can be recovered if economically viable or left in the ground. Terminal connections would be cut back to below ploughing levels.

2.2 Alternatives to taking the proposed action

Not applicable.

2.3 Alternative locations, time frames or activities that form part of the referred action

Not applicable.

2.4 Context, planning framework and state/local government requirements

Sapphire Wind Farm is proposed in the context of growing global recognition of the need to mitigate the environmental effects associated with fossil fuel energy generation. The project will provide an important contribution to the Federal Government's proposed Mandatory Renewable Energy Target (MRET) of 20% by 2020, by potentially supplying over 138,000 households with energy per annum and saving approximately 863,000 tonnes of CO₂-e per annum.

A list of legislation, policies and guidelines applying to the project are:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *NSW Environmental Planning and Assessment Act 1979* (EP&A Act), Part 3A

- *NSW Threatened Species Conservation Act 1995 (TSC Act)*
- *Renewable Energy (Electricity) Act 2000 and related 2007 MRET target*
- *NSW Protection of the Environment Operations Act 1997*
- *NSW Water Management Act 2000*
- *NSW Fisheries Management Act 1994*
- *NSW Catchment Management Authorities Act 2003*
- *NSW Native Vegetation Act 2003*
- *NSW Noxious Weeds Act 1993*
- *State Environmental Planning Policies (SEPPs)*
 - *SEPP (Major Projects) 2005*
 - *SEPP (Rural Lands) 2008*
 - *SEPP (Infrastructure) 2007*
 - *SEPP 44 Koala Habitat*

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

The project falls within the Inverell Shire Council and Glen Innes Severn Council areas. The proposal is to be assessed under Part 3A of the EP&A Act and therefore the NSW Department of Planning (DoP) will be the consent authority. Councils (Inverell and Glen Innes) and the Department of Environment, Climate Change and Water (DECCW) were provided with the opportunity to have input into the Director General's Requirements (DGRs) for the proposal.

Eco Logical Australia Pty Ltd (ELA) conducted multiple surveys of the Sapphire Wind Farm proposed site from October 2008 which continued through to January 2011. Following the completion of surveys and studies, and extensive consultation with local residents; a comprehensive Environmental Assessment (EA) will be compiled and submitted to the NSW Department of Planning for determination by the Minister under Part 3A of the EP&A Act. It is anticipated that the completed Environmental Assessment will be submitted May 2011.

Methodologies for surveys conducted were discussed and determined in consultation with DECCW and experts working with the key target species. The methods included targeted surveys for both NSW TSC Act and EPBC Act listed species (see [Table 5](#)). Survey locations for listed threatened species are shown in [Figure 5](#) and [Figure 6](#) (see section 3.1 (d) for a list of EPBC Act species surveyed).

Table 5: Summary of required survey effort for threatened species

Target Species	Sampling Technique	Survey Period	Survey Effort
Endangered Ecological Communities			
<i>White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland</i>	Vegetation validation and quadrats	December 2008 – January 2011	<ul style="list-style-type: none"> Vegetation validation and mapping 58 Biobanking and full floristic quadrats (some within and some adjacent to study area) 18 Local benchmark plots
<i>Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland</i>	Vegetation mapping, quadrats, traverses	December 2008 – January 2011	
Threatened Flora			
Threatened Flora Requiring Survey.	Seasonal and systematic searches (random meander transects) across all areas of potential habitat within a 200 m wide corridor.	<ul style="list-style-type: none"> 27 – 30 October 2009 10 – 14 November 2009 1 – 3 December 2009 20 – 24 April 2009 4 – 15 May 2009 20 – 29 September 2010 13 – 15 October 2010 1 – 3 December 2010 10 – 14 January 2011 17 – 21 January 2011 	Approximately 376 person hours
Threatened Fauna			
Booroolong Frog	Surveys not conducted as the species is considered to be extinct within the locality.		
Border Thick-tailed Gecko	Rock Rolling	10 – 14 November 2009 1 – 3 December 2009 4 – 15 May 2009	6 person hours plus opportunistic rolling
Threatened Birds	Diurnal Bird Surveys Incidental Observations	<ul style="list-style-type: none"> 27 – 30 October 2009 10 – 14 November 2009 1 – 3 December 2009 20 – 24 April 2009 4 – 15 May 2009 	48 Diurnal Bird Surveys – 16 person hours (20 min each)

Additional surveys (Table 6) were conducted as a precautionary measure for EPBC Act listed species with either a 'potential' or 'likely' probability of occurrence or for fauna groups that may be impacted by the proposal.

Notable amongst these are the Anabat echolocation surveys for two microbat species: *Chalinolobus dwyeri* (Large-eared Pied Bat) and *Nyctophilus timoriensis* (South Eastern Long-eared Bat), although their probability of occurrence is considered to be low.

Spotlighting and call playback was also conducted for arboreal mammals and owls. Nineteen (19) nights of infra-red remote camera surveys were included to detect *Dasyurus maculatus* (Spotted-tailed Quoll), despite the improbability that the proposal would affect this species or its potential habitat.

Table 6: Additional Survey Effort

Target Species	Sampling Technique	Survey Period	Survey Effort
Mammals	Spotlighting	10 – 14 November 2009	16 person hours
	IR Camera	4 – 15 May 2009 20 – 29 September 2010	11 nights 8 nights
Owls	Call playback	10 – 14 November 2009 20 – 29 September 2010	4 call playback nights 7 call playback nights
	Spotlighting	10 – 14 November 2009	16 person hours
Microbats	Anabat Detection	1 – 3 December 2009	47 Anabat nights
		4 – 15 May 2009	
		20 – 29 September 2010	13 Anabat nights

The survey effort and study design optimised the potential for species to be recorded during a range of climatic situations and over a number of seasons. Nonetheless, it is not possible to record every species that may either be resident across a site as some species may have been inactive, dormant, cryptic, nomadic or migratory in nature. Additionally, some fauna species are mobile or transient in their use of resources. For this reason the likelihood of occurrence within the study area of some threatened species was assessed based on the presence of suitable habitat.

Given the limitations associated with all surveys, this assessment was not intended to provide an inventory of all species present across the site but instead aims to provide an overall assessment of the ecological values of the site with particular emphasis on threatened biodiversity and key habitat features.

2.6 Public consultation (including with Indigenous stakeholders)

Wind Prospect CWP has during the process of developing this project contacted a range of stakeholders, including local Aboriginal groups for consultation. This has occurred initially through early notification of the proposal to registered Aboriginal groups in the region prior to the submission of the Preliminary Environmental Assessment to the NSW DoP. More formally, and for the purposes of carrying out an archaeological and heritage assessment of the Project, this occurred in accordance with the NSW National Parks and Wildlife Service (NPWS) guidelines for archaeological reporting and the NSW DECC Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation.

The on-site walkover and assessment of Cultural Heritage impacts was undertaken in January 2011.

2.7 A staged development or component of a larger project

Not applicable.

3 Description of environment & likely impacts

3.1 Matters of national environmental significance

3.1 (a) World Heritage Properties

Description

No World Heritage Properties occur within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely impact

Not applicable.

3.1 (b) National Heritage Places

Description

No National Heritage Properties occur within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely impact

Not applicable.

3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

Description

No Wetlands of International Importance occur within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely impact

Not applicable.

3.1 (d) Listed threatened species and ecological communities

Description

A total of thirty-three (33) listed threatened species and four (4) listed threatened ecological communities were identified from the search undertaken using (2 February 2011) the DEWHA online Protected Matters Search Tool. An analysis of this list of species and ecological communities is provided below.

Nature and extent of likely impact

An ecological assessment of matters of National Environmental Significance (NES) relevant to the EPBC Act has been undertaken across the study area, which included:

- vegetation mapping
- flora and ecological community surveys and analysis
- fauna surveys and analysis

Flora, fauna and ecological community surveys were conducted throughout October 2008 to January 2011. No other surveys on this site have been previously conducted. A summary of the total survey effort pertaining to threatened communities, species and migratory species listed under the EPBC Act is shown in [Table 5](#) and [Table 6](#) (section 2.4) and all survey locations are shown on [Figure 5](#) and [Figure 6](#).

Using database or other records, presence or absence of suitable habitat, features of the proposed site, results of field surveys and professional judgement, the probability of occurrence of listed species and communities has been determined and is presented in the table below. Five terms for the probability of occurrence of species and communities used are defined as follows:

- “Known” = the species or ecological community was or has been observed on the site
- “Likely” = a medium to high probability that a species uses or ecological community occurs on the site
- “Potential” = suitable habitat for a species or ecological community occurs on the site, but there is insufficient information to categorise the species or ecological community as likely to occur, or unlikely to occur
- “Unlikely” = a very low to low probability that a species uses or ecological community occurs on the site
- “No” = habitat on the site and in the vicinity is unsuitable for the species or ecological community

An analysis of the likely level of impact from the proposed project on species and communities with a probability of occurrence of “Known”, “likely” or “potential” (highlighted in blue) is presented below.

Birds

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Anthochaera phrygia</i>	Regent Honeyeater	Endangered	Potential
<i>Lathamus discolor</i>	Swift Parrot	Endangered	Potential
<i>Poephila cincta cincta</i>	Black-throated Finch (southern)	Endangered	Unlikely
<i>Rostratula australis</i>	Australian Painted Snipe	Vulnerable	Unlikely

Diurnal surveys and incidental observations were used to record the presence of bird species within the proposed Sapphire Wind Farm development area. No EPBC listed threatened bird species were recorded.

Regent Honeyeater

The Regent Honeyeater mostly occurs in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations, but when food resources are low they are known to forage in EPBC Act listed Box-Gum Woodland (DEWHA 2009b). They may also be found open forest including forest edges, wooded farmland and urban areas with mature eucalypts, and riparian forests of River Oak (*Casuarina cunninghamiana*).

The Regent Honeyeater primarily feeds on nectar from box and ironbark eucalypts and occasionally from banksias and mistletoes (DEWHA 2009b). As such it is reliant on locally abundant nectar sources with different flowering times to provide reliable supply of nectar.

While there are no records of the species within the proposed development area, the species has been recorded

near the site in the past. The presence of Box-Gum Woodland suggests that the species may be present from time to time, particularly while migrating or searching for food sources. Given this limited potential for the Regent Honeyeater to be present within the Sapphire Wind Farm proposed area and the low levels of vegetation clearance that will occur, it is considered unlikely for the proposed development to lead to significant impacts on this species.

Swift Parrot

The Swift Parrot breeds in Tasmania between September and January and over-winters on the mainland of Australia. On the mainland the species inhabits mainly dry open eucalypt forests and woodland where it forages on profuse flowering eucalypts (DEWHA 2009e).

Despite no records of the species within the proposed development area, the presence of Box-Gum Woodland within the proposed development area suggests the species may be present from time to time. It is however considered very unlikely for the proposed development to lead to significant impacts on this species.

Frogs

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Litoria booroolongensis</i>	Booroolong Frog	Endangered	Unlikely, but previously recorded
<i>Litoria castanea</i>	Yellow-spotted Tree Frog, Yellow-spotted Bell Frog	Endangered	Unlikely

The majority of the subject site and the broader study area occurs on ridges within the locality and does not, for the most part, intersect with habitats that are considered ideal for amphibians. Both species are considered to be extinct within the locality (if not on the New England Tablelands) and, as the proposal is unlikely to impact on frog habitat, no targeted amphibian surveys were conducted.

Booroolong Frog

The Booroolong Frog is restricted to the tablelands and slopes from 200 to 1300 m above sea level in NSW and north-eastern Victoria. It is predominantly found along the western-flowing streams and their headwaters of the Great Dividing Range. Currently the known geographic distribution of this species extends from near Tamworth in northern NSW to the Southern Highlands in Victoria (DEWHA 2009f).

The species was considered common throughout the Northern Tablelands in the 1980s. Over the past two decades, the Booroolong Frog has apparently undergone a severe contraction across its former known range.

A desktop review by expert ecologists was conducted for the Booroolong Frog to consider if the presence of this species was likely and if targeted surveys were warranted. The review concluded that the study area is not considered to represent potential habitat for the Booroolong Frog, due to:

1. It is currently considered that the Booroolong Frog has disappeared from the Northern Tablelands of NSW. In this region the species has not been re-located at any previously known localities, despite extensive and intensive targeted surveys for the species being undertaken in the past two decades;
2. Although there is one historical record of Booroolong Frog in the far south-west of the study area, it is considered that this species is now extinct from that locality; and
3. The study area generally does not support habitat considered to represent suitable breeding, foraging, or sheltering habitat for the Booroolong Frog, as waterways in the study area are mostly non-permanent and lack essential habitat elements such as rocky banks and shallow rocky riffles in the stream beds."

Mammals

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Chalinolobus dwyeri</i>	Large-eared Pied Bat, Large Pied Bat	Vulnerable	Potential
<i>Dasyurus maculatus maculatus</i> (SE mainland population)	Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	Endangered	Potential
<i>Nyctophilus timoriensis</i> (South-eastern form)	Eastern Long-eared Bat	Vulnerable	Potential
<i>Petrogale penicillata</i>	Brush-tailed Rock-wallaby	Vulnerable	Unlikely
<i>Potorous tridactylus tridactylus</i>	Long-nosed Potoroo (SE mainland)	Vulnerable	Unlikely
<i>Pseudomys novaehollandiae</i>	New Holland Mouse	Vulnerable	Unlikely
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	Vulnerable	Unlikely

Two threatened microbat species, as listed under the EPBC Act, may occur in the study area: Eastern Long-eared Bat and the Large-eared Pied Bat. Anabat echolocation surveys were conducted for the microbat species (Table 5 and Table 6, section 2.4).

Large-eared Pied Bat

The Large-eared Pied Bat is found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. It is generally rare with a very patchy distribution in NSW. There are scattered records from the New England Tablelands and North West Slopes (NSW DECC 2009g).

This species roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Hirundo ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. They are also found in well-timbered areas containing gullies (NSW DECC 2009g).

The presence of Large-eared Pied Bat within the proposed development site was not recorded during the Anabat surveys. Limited roosting habitat locations are found on-site or in nearby areas. Therefore it is unlikely that the proposal will affect an important population of this species or its potential habitat.

Eastern Long-eared Bat

The Eastern Long-eared Bat is found from Cape York through eastern Queensland to the far north-east corner of NSW. In NSW they appear to be confined to the coastal plain and nearby coastal ranges, extending south to the Clarence River area, with a few records further south around Coffs Harbour. The species can be locally common within its restricted range (NSW DECC 2009a).

The species is generally found in lowland subtropical rainforest and wet and swamp eucalypt forest, extending into adjacent moist eucalypt forest. It roosts in hollows in trees and also in the hanging foliage of palms, in dense clumps of foliage of rainforest trees and under bark (NSW DECC 2009a).

The presence of Eastern Long-eared Bat within the proposed development site was not recorded during the Anabat surveys. Suitable habitat for this species does not occur on the site. It is unlikely that the proposal will affect an important population of this species or its potential habitat.

Spotted-tail Quoll

The Spotted-tailed Quoll inhabits a range of forest communities including wet and dry sclerophyll forests, coastal heathlands and rainforests (DEWHA 2009d), but more frequently have been recorded near the ecotones of closed and open forest. This species requires habitat features such as maternal den sites, an abundance of food (birds and small mammals) and large areas of relatively intact vegetation to forage in. Maternal den sites are logs with cryptic entrances; rock outcrops; windrows; burrows (DEWHA 2009d).

The presence of this species within the proposed development site was not recorded during the targeted surveys.

It is unlikely that the proposal would significantly affect this species or its potential habitat.

Reptiles

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Delma torquata</i>	Collared Delma	Vulnerable	Unlikely
<i>Elseya belli</i>	Bell's Turtle	Vulnerable	Unlikely
<i>Underwoodisaurus sphyrurus</i>	Border Thick-tailed Gecko	Vulnerable	Potential

Bell's Turtle was considered unlikely to have potential habitat within the study area but the Border Thick-tailed Gecko was considered to have marginal habitat in the limited acid volcanic rock outcrops throughout the study area.

Border Thick-tailed Gecko

The Border Thick-tailed Gecko is found only on the tablelands and slopes of northern NSW and southern Queensland, reaching south to Tamworth and west to Moree. Most common in the granite country of the New England Tablelands (DEWHA 2009h). The Border Thick-tailed Gecko favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter, which is indicative of rocky hills with dry open eucalypt forest or woodland (DEWHA 2009h).

Six person hours and opportunistic rock-rolling were conducted in potentially suitable habitat areas during field survey. No specimens of Border Thick-tailed Gecko were recorded during these field surveys.

Plants

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Acacia pubifolia</i>	Velvet Wattle	Vulnerable	Potential
<i>Astrotricha roddii</i>	Rod's Star Hair	Endangered	Potential
<i>Boronia granitica</i>	Granite Boronia	Endangered	Unlikely
<i>Bothriochloa biloba</i>	Lobed Bluegrass	Vulnerable	Known
<i>Callistemon pungens</i>	Callistemon pungens	Vulnerable	Unlikely
<i>Dichanthium setosum</i>	Bluegrass	Vulnerable	Known
<i>Digitaria porrecta</i>	Finger Panic Grass	Endangered	Potential
<i>Diuris pedunculata</i>	Small Snake Orchid	Endangered	Potential
<i>Eucalyptus mckieana</i>	McKie's Stringybark	Vulnerable	Known
<i>Eucalyptus nicholii</i>	Narrow-leaved Peppermint	Vulnerable	Potential
<i>Lepidium peregrinum</i>	Wandering Pepper-cress	Endangered	Unlikely
<i>Picris evae</i>	Hawkweed	Vulnerable	Potential
<i>Rutidosia heterogama</i>	Heath Wrinklewort	Vulnerable	Potential
<i>Thesium australe</i>	Austral Toadflax, Toadflax	Vulnerable	Known
<i>Tylophra linearis</i>	Tylophra linearis	Endangered	Unlikely
<i>Zieria ingramii</i>	Ingram's Zieria	Endangered	Unlikely

Targeted seasonal and systematic searches for the above EPBC Act threatened plant species were undertaken during October 2008 to May 2009 and September 2010 to January 2011 (Table 5, section 2.4).

Four threatened flora were recorded within the study area during the field surveys:

- *Bothriochloa biloba* (Lobed Bluegrass);
- *Dichanthium setosum* (Bluegrass);
- *Eucalyptus mckieana* (McKie's Stringybark); and
- *Thesium australe* (Austral Toadflax).

The locations of each of these species are shown in [Figure 6](#) and population estimates are provided in [Table 7](#).

Table 7: Population estimates for EPBC listed threatened flora found within the Sapphire Wind Farm study area.

Species	Study Area (individuals)	Development footprint (Individuals impacted)
Lobed Bluegrass	9372	0
Bluegrass	6353	0
McKie's Stringybark	10	0
Austral Toadflax	7350	0

Velvet Wattle

Velvet Wattle occurs in NSW and Qld. In NSW it is known from two main populations, one north of Emmaville and the other near Warrabah National Park. It generally grows in dry shrubby woodland on granite and metasediment soils (DEWHA 2009a).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and September 2010. Results of the target surveys found no record of the species on-site. Therefore, it is unlikely for an important population of Velvet Wattle to exist within the proposed development areas or for a significant impact to occur on an important population.

Rod's Star Hair

Rod's Star Hair grows in low dry sclerophyll woodland on granite and porphyry outcrops in the Ashford area. The dull purplish flowers grow on stems up to 40 cm long, and appear during October-February. It is thought to be only short-lived, with a life-span of possibly less than 10 years. Occurs in NSW in the Ashford area north of Inverell, including Kwiambal and Kings Plains National Parks, Severn River Nature Reserve and Severn River State Forest, and has also been recorded at one site in southern Queensland. Rod's Star Hair usually grows in low dry woodland and shrublands on granite and acid volcanic outcrops, often in rock crevices (NSW DECC 2009j).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and September 2010. Results of the target surveys found no record of Rod's Star Hair on-site. Therefore, it is considered unlikely for the proposed development to lead to significant impacts on this species.

Lobed Bluegrass

Lobed Blue-grass grows in woodland on poorer soils flowering in summer (DEWHA 2009c).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009, September 2010 and January 2011. Results of the target surveys detected the presence of approximately 9400 individuals of Lobed Blue-grass within the study area. This is considered to be an under-estimate of the population of the plant in the locality which was found commonly along roadside easements during the survey period.

Approximately 690 individuals of this species were recorded within close proximity to the development footprint. Poweline easements, roads and turbine hardstands have been designed to ensure direct impacts (clearing) of any individuals of this species are avoided. During construction mitigation measures (fencing, signs and "no go" areas will be employed to protect known occurrences of this species.

Despite the presence of Lobed Blue-grass within the proposed development site, the Sapphire Wind Farm study area is not known to contain an important population of this species. Therefore it is considered unlikely that the project will lead to significant impact on an important population of this species. Furthermore, the species is considered to be common on the NSW Tablelands and has consequently been delisted as a vulnerable species from the NSW *Threatened Species Conservation Act 1995* (this listing advice can be found at <http://www.environment.nsw.gov.au/determinations/BothriochloaBilobaListingRemoval.htm>).

Bluegrass

Bluegrass occurs on the New England Tablelands, North West Slopes and Plains and the Central Western Slopes of NSW. It is associated with heavy basaltic black soils and is often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture (NSW DECC 2009b). Regionally it occurs widely on private property, including in the Inverell, Guyra, Armidale and Glen Innes areas. It is considered locally common or found as scattered clumps in populations (NSW DECC 2009b).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and January 2011. Results of the target surveys detected the presence of a single population of Bluegrass within the study area of approximately 6360 individuals. None of these plants fall within the development footprint and thus the species is will not be directly impacted by the proposal.

Finger Panic Grass

Finger Panic Grass is found in native grassland, woodlands or open forest with a grassy understorey, on richer soils. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire (NSW DECC 2009d).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and January 2011. Results of the target surveys found no record of Finger Panic Grass on-site. Therefore, it is considered unlikely for the proposed development to lead to significant impacts on this species.

Small Snake Orchid

The Small Snake Orchid grows in moist grassy areas in sclerophyll forest, grassy slopes or flats. It is often found on peaty soils in moist areas, shale and trap soils, on fine granite, and among boulders. It was originally found scattered from Tenterfield south to the Hawkesbury River, but is now mainly found on the New England Tablelands, around Armidale, Uralla, Guyra and Ebor (NSW DECC 2009k).

Vegetation surveys and target surveys for EPBC Act listed threatened flora were conducted across the proposed development site in suitable habitat during October 2008 and October 2010. Results of the target surveys found no record of Small Snake Orchid on-site. Therefore, it is considered unlikely for the proposed development to lead to significant impacts on this species.

McKie's Stringybark

McKie's Stringybark has a restricted distribution on the North West Slopes and New England Tablelands, from Kings Plains to Bundarra and to west of Uralla. The community has been severely fragmented, and generally occurs on private property and along roadsides and Travelling Stock Routes. It is often found on laterite soils in low-lying areas and open depressions (NSW DECC 2009h).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and September 2010. Results of the target surveys detected the presence of 10 individuals of McKie's Stringybark within the study area. All of these are avoided by the development footprint and thus McKie's Stringybark is unlikely to be directly impacted by the proposal.

It is considered unlikely that the proposal will have a significant impact on an important population of this species.

Narrow-leaved Peppermint

Narrow-leaved Peppermint grows in dry grassy woodland, on shallow and infertile soils, mainly on granite ((NSW DECC 2009i). This species is widely planted as an urban street tree and in gardens but is quite rare in the wild. It is confined to the New England Tablelands of NSW, where it occurs from Nundle to north of Tenterfield (NSW DECC 2009i).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and September 2010. Results of the target surveys found no record of Narrow-leaved Peppermint on-site. Therefore, it is unlikely for an important population of this species to exist within the proposed development areas or for a significant impact to occur on an important population.

Hawkweed

Hawkweed is known in NSW north from the Inverell area, in the north-western slopes and plains regions. All

recent collections appear to come from modified habitats such as weedy roadside vegetation (NSW DECC 2009e). Its main habitat is open *Eucalyptus* forest and *Dichanthium* grassland, roadsides and cultivated areas (paddocks). Soils are black, dark grey or red-brown (specified as shallow, stony soil over basalt for one collection) and reddish clay-loam or medium clay soils (NSW DECC 2009e).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009 and September 2010. Results of the target surveys found no record of Hawkweed on-site. Therefore, it is unlikely for an important population of this species to exist within the proposed development areas or for a significant impact to occur on an important population.

Heath Wrinklewort

Heath Wrinklewort is a small perennial herb up to 30cm. Its flowers are yellow and up to 2 cm wide and flowering time is chiefly in Autumn (NSW DECC 2009f). Scattered coastal locations between Wyong and Evans Head and on the New England Tablelands from Torrington and Ashford south to Wandsworth southwest of Glen Innes. This species grows in heath on sandy soils and moist areas in open forest, and has been recorded along disturbed roadsides (NSW DECC 2009f).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008 and May 2009. Results of the target surveys found no record of Heath Wrinklewort on-site. Therefore, it is unlikely for an important population of this species to exist within the proposed development areas or for a significant impact to occur on an important population.

Austral Toadflax

Austral Toadflax is a small, straggling herb up to 40 cm tall with pale green to yellow-green leaves. Austral Toadflax is found in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. It occurs in grassland or grassy woodland and often found in damp sites in association with Kangaroo Grass (*Themeda australis*) (DEWHA 2009g).

Vegetation surveys and target surveys for EPBC Act listed threatened flora species were conducted across the proposed development site in suitable habitat during October 2008, May 2009, December 2010 and January 2011. Results of the target surveys detected the presence of approximately 7350 individuals within the study area. None of these individual Austral Toadflax specimens fall within the development footprint.

Threatened Ecological Communities

Common name	EPBC listing status	Likelihood of Occurrence
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Unlikely
Weeping Myall Woodlands	Endangered	Unlikely
Upland Wellands of the New England Tablelands and the Monaro Plateau	Endangered	Unlikely
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)	Critically Endangered	Known

Box-Gum Woodland

This ecological community is described under the EPBC Act listing as being:

".....characterised by a species-rich understorey of native tussock grasses, herbs and scattered shrubs, and the dominance, or prior dominance, of White Box, Yellow Box or Blakely's Red Gum trees.

In the absence of the dominant overstorey mentioned above, the ecological community must have a patch of at least 0.1 ha in size of a perennial vegetation ground layer dominated by native species, and which contains at least 12 native, non-grass understorey species (such as forbs, shrubs, ferns, grasses and sedges). At least one of the understorey species must be an important species (e.g. grazing-sensitive, regionally significant or uncommon species; such as Kangaroo grass or orchids) in order to indicate a reasonable condition. Areas with both an overstorey and understorey present are also considered of sufficiently good condition to be part of the listed

ecological community if the understorey meets any of the conditions above, or if they have a predominantly native understorey, are two hectares or above in size, and have either regeneration of the overstorey species or 20 or more mature trees per hectare” (DEH 2006b).

Community Context

Box-Gum Woodland has been heavily cleared across most of its range having undergone a decline of approximately 95%. The remaining extent of the ecological community is highly fragmented, occurring in small isolated patches within a cleared environment, or within a landscape of other disturbed woodlands. Of the remaining Box-Gum Woodland, a large proportion of it has been modified and occurs as trees over a predominantly exotic understorey. The community occurs in an arc along the western slopes and tablelands of the Great Dividing Range from Southern Queensland through NSW to central Victoria (Threatened Species Scientific Committee 2006).

Study Area Community Description

The mapping of Endangered Ecological Communities within the proposed Sapphire Wind Farm area was undertaken using vegetation types (see Table 10, section 3.3(a)) equivalent to (meeting the definition of) Box-Gum Woodland as described under the EPBC Act definition. It was determined that the following two vegetation types met the description:

1. Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tablelands
2. White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions

Within the study area Box-Gum Woodland was present as an open forest type or woodland and was associated with the basalt flows of the study area. Clearing and grazing were substantial within this vegetation type. Some areas retained some resilience with a variety of native grasses and herbs present but for the most part was degraded due to soil disturbance, tilling and pasture improvement and subsequent weed invasion.

Box Gum Woodland in the study area, is dominated by *Eucalyptus blakeleyi* (Blakley's Red Gum), *E. melliodora* (Yellow Bloodwood) and *Eucalyptus albens* (White Box) with *A. floribunda* as an associated species. *Acacia implexa* (Hickory Wattle), *Exocarpos cupressiformis* (Native Cherry) and *Lespedeza juncea* subsp. *sericea* were only present as a sparse layer of shrubs at the benchmark plots. The ground layer was often dominated by a variety of herbs and grasses including *Aristida* spp., *Asperula conferta* (Common Woodruff), *Carex inversa* (Knob Sedge), *Cymbopogon refractus* (Barbed Wire Grass), *Desmodium varians* (Slender Tick-trefoil), *Wahlenbergia communis* (Tufted Bluebell) and *Themeda australis* (Kangaroo Grass). Although, within some areas associated with White Box shrubs were often absent, while the ground layer was typical of the other units associated with basalt flows.

Site Context

Vegetation surveys revealed the presence of 296.3 ha of EPBC listed Box-Gum Woodland within the Sapphire Wind Farm study area. The proposed development footprint will result in the loss of approximately 35.3 ha of Box-Gum Woodland. The proposed total impacted area has been calculated from the following project requirements (see Table 8):

- Turbine clearance/construction and buffer
- Roads including required cut and fill
- Powerlines
- Substations
- Concrete batching plants
- Site offices; and
- Temporary construction

Table 8: Summary of component construction to impact Box-Gum Woodland

Impact	Permanent (ha) [Cut & Fill + 25m Radius Turbine Buffer]	Permanent (ha) Preferred Powerline [Trees]	Temporary (ha) Preferred Powerline [Grassland]	Permanent (ha) Substation 330kV	Total (ha)
Area	35.3	0	0	0	35.3

Given the large extent of Box-Gum Woodland present within the Study Area (296.3 ha) and the large area of the community proposed to be retained (261 ha or 88% of the community on-site), it is considered that the proposed development will not have a significant impact on this ecological community. Additionally, the impacts to Box Gum Woodland (and to other NSW listed ecological communities) on site are to be offset (using the Biobanking

process) to ensure no net loss and provide for an improved ecological outcome for the community.

3.1 (e) Listed migratory species

Description

A total of twelve (12) listed migratory species were identified from the search undertaken using the DEWHA online EPBC Act Protected Matters Search Tool (PMST). A condensed listing of these species is provided below (the Great Egret and Cattle Egret were included in both Marine and Wetland sections).

Nature and extent of likely impact

Migratory Birds

Scientific name	Common name	EPBC listing status	Likelihood of Occurrence
<i>Haliaeetus leucogaster</i>	White-bellied Sea-Eagle	Migratory	Unlikely
<i>Hirundapus caudacutus</i>	White-throated Needletail	Migratory	Potential
<i>Merops ornatus</i>	Rainbow Bee-eater	Migratory	Potential
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	Migratory	Unlikely
<i>Xanthomyza phrygia</i>	Regent Honeyeater	Migratory	Potential
<i>Ardea alba</i>	Great Egret, White Egret	Migratory	Potential
<i>Ardea ibis</i>	Cattle Egret	Migratory	Potential
<i>Gallinago hardwickii</i>	Latham's Snipe,	Migratory	Unlikely
<i>Rostratula benghalensis</i>	Painted Snipe	Migratory	Unlikely
<i>Apus pacificus</i>	Fork-tailed Swift	Migratory	Potential

None of the migratory species listed above were recorded on site during field surveys. Each of these species travel long distances between sites and therefore has the potential to be impacted by operational turbines, should they visit the site. However, impacts in terms of disturbance to potential habitat for these species within the study site are likely to be negligible.

3.1 (f) Commonwealth marine area

Description

No Commonwealth Marine Areas occur within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely impact

Not applicable.

3.1 (g) Commonwealth land

Description

There is no Commonwealth land within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely Impact

Not applicable.

3.1 (h) The Great Barrier Reef Marine Park

Description

The Great Barrier Reef Marine Park does not occur within the vicinity of the proposed Sapphire Wind Farm.

Nature and extent of likely impact

Not applicable.

3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park

3.2 (a)	Is the proposed action a nuclear action?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (b)	Is the proposed action to be taken by the Commonwealth or a Commonwealth agency?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment

3.2 (c)	Is the proposed action to be taken in a Commonwealth marine area?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

3.2 (d)	Is the proposed action to be taken on Commonwealth land?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))

3.2 (e)	Is the proposed action to be taken in the Great Barrier Reef Marine Park?	X	No
			Yes (provide details below)

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))

3.3 Other important features of the environment

3.3 (a) Flora and fauna

Six Vegetation Types are present throughout the study area as outlined in the table below. Given the study area is used for agricultural purposes these vegetation types are impacted by varying degrees of weed invasion, grazing intensity and soil disturbance depending on the land use practices on each property.

Vegetation Types and TSC Act and EPBC Act equivalents

Vegetation Type	TSC Act EEC	EPBC Act EEC
Black Cypress Pine – Tumbledown Gum – Narrow-leaved Ironbark open forest of northern parts of the Nandewar Bioregion	-	-
Blakely's Red Gum – Rough-barked Apple – Red Stringybark grassy open forest of the Western New England Tablelands	-	-
Blakely's Red Gum – Yellow Box grassy open forest or woodland of the New England Tablelands	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)
Manna Gum – Rough-barked Apple – Yellow Box grassy woodland/open forest of the New England Tablelands and North Coast	Ribbon Gum, Mountain Gum, Snow Gum Grassy Forest/Woodland of the New England Tableland Bioregion	-
Tenterfield Woollybutt – Silvertop Stringybark open forest of the New England Tablelands	-	-
White Box grassy woodland of the Nandewar and Brigalow Belt South Bioregions	White Box Yellow Box Blakely's Red Gum Woodland (Box-Gum Woodland)	White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland)

Fauna Habitat

The study area is largely comprised of grassy woodland or grassland areas with very small areas of volcanic outcrop. A number of hollow-bearing trees are present and a large variety of microchiropteran bats were recorded utilising the study area. Table 2 summarises the fauna habitat features present across the study area and those guilds / species for which they would provide habitat.

Habitat Feature	Guild / Species
Woodland and scattered trees	Birds, microchiropteran bats (microbats), arboreal mammals, reptiles
Hollow-bearing trees	Birds, microbats, arboreal mammals, amphibians, reptiles
Stags	Birds, particularly birds of prey, reptiles, amphibians, bats
Rock outcrops (limited)	Reptiles, ground mammals, invertebrates.
Leaf litter	Reptiles, some amphibians
Trees with defoliating bark	Microbats, reptiles

Riparian habitat	Birds, amphibians, mammals, reptiles
Grass tussocks	Reptiles, amphibians, ground dwelling mammals

3.3 (b) Hydrology, including water flows

The study area is within the administrative catchment of the Border Rivers - Gwydir CMA and is divided into two CMA sub-regions; Seven River Volcanics and Glenn Innes - Guyra Basalts. Geographically, drainage to the north, west and south is into the McIntyre River catchment via one of five creeks; Kings Plains Creek, Spring Valley, Frazers Creek, Horse Gully and Swan Brook. Drainage to the east is into the Seven River catchment via Wellingrove Creek. The waterways within the locality are typified by low-flows and dry creek-beds. Some farm dams occur within the locality. The development area is mostly confined to the ridges of the locality with limited direct impact on waterways.

3.3 (c) Outstanding natural features

There are no outstanding natural features within the proposed Sapphire Wind Farm site.

3.3 (d) Remnant native vegetation

requires explanation of the BR codes from 3.1d

3.3 (e) Current state of the environment

There has been ongoing grazing of cattle and sheep on-site. Despite this, some stands of significant native vegetation remain in relatively good or moderate condition, with very little weed incursion.

3.3 (f) Commonwealth Heritage Places or other places recognised as having heritage values

There are no Commonwealth Heritage Place or other places recognised as having heritage values within the proposed Sapphire Wind Farm site.

3.3 (g) Indigenous heritage values

There are no known indigenous heritage values within the site

3.3 (h) Other important or unique values of the environment

There are no other important or unique values within the site

3.3 (i) Tenure of the action area (eg freehold, leasehold)

There are twenty six (26) different private land holdings across the development site.

3.3 (j) Existing land/marine uses of area

The development site is currently used for pastoral and grazing activities. There are no marine areas within the Sapphire Wind Farm proposed site

3.3 (k) Any proposed land/marine uses of area

Other than the proposed Sapphire Wind Farm facility, there are no other proposed land or marine uses for the development site.

4 Measures to avoid or reduce impacts

Conservation and Environmental Management Plan

A conservation and Environmental Management Plan (EMP) will be developed for Sapphire Wind Farm. The EMP will provide a framework for environmental management and conservation at Sapphire Wind Farm. Wind Prospect CWP will operate under this site specific EMP and also under their Environmental Policy and Carbon Neutral Policy, to ensure that correct environmental procedures and minimal environmental impacts occur during the construction and operation phases.

Further and more detailed mitigation measures are provided in [Appendix 2](#). These measures will be incorporated into the EMP. Mitigation measures have been divided into sections appropriate to the construction timeline.

Impact Avoidance

Wind Prospect CWP has made a number of amendments to the proposed layout to minimise impacts of the proposal on the ecological values of the site. The linear layout of turbines along ridgelines, required for the wind farm to function at maximum capacity and be economically feasible, in some cases limits the areas to which turbines can be moved to avoid impacts.

The areas which have been designated as development land have been selected to avoid and minimise impacts on land with environmental and ecological significance, as far as possible. Turbine sites have been relocated across the development footprint to avoid listed species and communities, significant trees, or hollow bearing trees (where possible) which might provide suitable habitat for fauna species inhabiting the site. In particular:

- There is approximately 296.31 ha of EPBC listed Box-Gum Woodland mapped within the study area. The development footprint of Sapphire Wind Farm is estimated to be approximately 297.08 ha. Within this footprint it is proposed to retain approximately 261 ha of Box-Gum Woodland. The area of clearing of this listed ecological community has been minimised where possible.
- The following measures have been incorporated into the design of the wind farm layout in order to avoid impacts:
 - Turbines placed in woodland areas have been located such that tree clearing is, where possible, avoided;
 - Turbines and access routes have been placed in areas of disturbed and exotic improved pasture or existing surface disturbance such as roads and tracks where possible;
 - Reticulation has been placed underground to allow for temporary rather than permanent disturbance;
 - Population of *Dichanthium setosum* (Bluegrass) and *Bothriochloa biloba* (Lobed Bluegrass) have been avoided through the realignment of access routes, turbine locations and power line easements.
 - The main population of *Thesium australe* (Austral Toadflax) has been avoided through the re-alignment of access routes in these areas. Due to ongoing re-alignment of the project footprint, it was possible to avoid impacts on all areas of potential *T. australe* habitat; and
 - Temporary construction facilities will be located in disturbed areas and within the current development envelope wherever possible. However, the exact location of these facilities is still to be determined.

Direct Impacts

Vegetation clearance

Although the proposal involves the removal of vegetation across a large area, impacts are restricted to a primarily narrow linear pathway with clearance occurring in relatively narrow bands throughout the landscape. The proposal is comprised of both temporary and permanent vegetation removal with areas such as underground reticulation requiring trenching for installation which can then be filled and revegetated once

installed. The removal of some vegetation for the proposal is unavoidable. However, all native vegetation clearance will be offset and has been minimised wherever possible.

There is approximately 296.31 ha of EPBC listed Box-Gum Woodland mapped within the study area. Vegetation clearance of this community will result in a loss of about 35.3 ha of Box-Gum Woodland. The area of clearing of this listed ecological community has been minimised where possible (Table 10). Areas have been calculated using the worst case scenario (pertaining to the installation of 159 x 2.05 MW wind turbines); accordingly actual proposed clearance values for Box Gum Woodland may be less depending on final turbine choice.

Table 10: Impacts on EPBC listed Box-Gum Woodland

EPBC Act Listed Ecological Community	Present In the Study Area (ha)	Area impacted (ha)
White Box - Yellow Box - Blakely's Red Gum Grassy Woodland and Derived Native Grassland	296.3	35.3

Loss of fauna habitat

The proposal involves the removal of approximately 275 hectares of vegetation of all types. Given that the proposal is linear in structure, tree removal has been avoided where possible. The clearing of potential habitat area is unlikely to be considered large with respect to the remaining areas of potential habitat present throughout the study area. Furthermore, the proposed clearance is unlikely to isolate areas of potential habitat or create permanent barriers to fauna movement.

Indirect Impacts

Collisions with turbines

Impacts of the proposal on bird and bat species will largely be during the operational phase as tree clearance during construction has, where possible, been avoided. Indirect impacts associated with the proposal include the potential for birds and bats to accidentally collide with moving turbines. Much literature has been produced regarding potential impacts of wind farms on birds and bats although most of the studies have been undertaken overseas.

The Sapphire Wind Farm site does not contain important habitat or populations for any EPBC Act listed threatened or migratory birds that are likely to be significantly impacted by moving turbine blades.

Runoff, sedimentation and erosion

There are only minor creeks and tributaries which pass through or occur adjacent to the study area. Therefore there is the potential for indirect impacts on these water bodies during and following construction from runoff, erosion and sedimentation if management measures are not implemented. There is also a high potential for seeds of exotic species present at the site to be spread into adjacent areas and creeks and be transported downstream during construction works. Therefore a Construction Environmental Management Plan (CEMP) will be implemented to prevent such an occurrence. Measures to prevent pollutants from being transported from the site into the creeks and tributaries will also be addressed in this plan.

Soils within the study area are mobile and therefore will require dust suppression, erosion prevention and sediment control measure to be implemented.

Hydrological changes

The proposal involves the establishment of large impervious surfaces in the form of turbine footings and areas of soil compaction that will have a decreased porosity for roads. Impervious surfaces and changes to natural hydrological processes can have a number of potential effects including:

- limiting groundwater recharge by preventing rainwater from infiltrating through the ground;
- alter the ecology of an area including the vegetation composition and loss of fauna habitat;
- changes in soil moisture content; and
- may create conditions conducive to invasion by exotic species.

Given the mobility of the soils, water will need to be continuously added to areas of bare earth during construction for dust suppression. The runoff produced from this water addition will need to be trapped and managed to prevent changes to the hydrology of the site. However, any increase will be temporary and only occur during the construction phase of the project.

Increased weed invasion

Stringent weed management measures will be implemented during and post construction to ensure weed invasion and edge effects do not increase across the study area. These measures will include the control of runoff that may contain weed seeds and the washing down of vehicles to prevent the spread of weeds between areas.

Predation by feral animals

The potential for the proposal to increase predation by feral animals across the study area is considered limited due to the open nature of the vegetation at the site. In heavily vegetated areas, feral animals often use tracks and open areas for movement. However, in the study landscape it is unlikely that restrictions to feral animal movement due to vegetation cover occur. Furthermore, the linear nature of the proposal, through an open landscape, means large open areas will not result.

Preparation of Management Plans

A comprehensive suite of management plans and mitigation measures have been prepared to enable works and concurrently protect and manage important features within the site. [Appendix 2](#) provides a full breakdown of mitigation measures proposed during construction and maintenance at Sapphire Wind Farm.

Offsets

Wind Prospect CWP is committed to providing dedicated outcomes for the ongoing protection of key vegetation on site. Several mitigation and management measures are proposed to reduce impacts on matters of NES that may be potentially affected by the development. Mitigation is focussed on reducing any impacts associated with clearing of vegetation considered to be associated with Box Gum Woodland.

Unavoidable biodiversity impacts from the project are to be addressed through a systematic and scientific approach to offsetting. Offsets will focus on delivering a 'maintain and/or improve' outcome to address the residual impacts of the project.

Wind Prospect CWP will continue to examining offset options as part of the assessment phase (NSW and Commonwealth) of the project. Offset options being considered at this stage include:

- Establishment of a Biobanking Site providing in-perpetuity protection and security, this will include direct "like for like" offsets for any matters of NES impacts (eg Box-gum Woodland).
- Direct purchase and dedication of land for conservation purposes at suitable ratio to provide an improved outcome for the ecological communities.
- Securing in-perpetuity conservation agreements and covenants on site and on adjacent properties at suitable ratio to provide an improved outcome for impacted ecological communities and habitat.

5 Conclusion on the likelihood of significant impacts

5.1 Do you THINK your proposed action is a controlled action?

- | | |
|-------------------------------------|---------------------------|
| <input checked="" type="checkbox"/> | No, complete section 5.2 |
| <input type="checkbox"/> | Yes, complete section 5.3 |

5.2 Proposed action IS NOT a controlled action.

Wind Prospect CWP believes that the Sapphire Wind Farm will not have significant impacts because:

- There are no World Heritage Areas or National Heritage Places within or near the wind farm site, thus the project will not have an impact on these matters.
- There are no Wetlands of International Significance (Ramsar Sites) within or near the wind farm site, thus the project will not have an impact on the ecological character of any Ramsar wetland.
- There are no Commonwealth marine areas within or near the wind farm site, thus the project will not have an impact on Commonwealth marine environments.
- Of the three EPBC listed threatened ecological communities highlighted by the 'Protected Matters' report, only one of these communities (Box-Gum Woodland) was recorded within the proposed development footprint during surveys. The wind farm has been designed to avoid and minimise impacts where possible on this ecological community and only approximately 35.3 ha of the mapped Box-Gum Woodland will be permanently impacted. This equates to over 88% of the community on site to be protected within the study area. Accordingly this will not lead to a significant impact on the Box Gum Woodland community within the Sapphire Wind Farm study area.
- Of the thirty-three EPBC listed threatened flora and fauna species highlighted by the 'Protected Matters' report, none of the fauna and four of the flora species were observed within the proposed development footprint during surveys. The wind farm has been re-designed to avoid impacts where possible on these species. Further, proposed turbine locations have been moved to avoid potential disturbance resulting in no loss of listed vulnerable (or endangered) species.
- Of the eleven listed migratory species highlighted by the 'Protected Matters' report, none of these species was recorded within the vicinity of the site. It is therefore considered unlikely for there to be significant impacts on any of these species.
- Securing of suitable offsets that will provide a significant area improvement for conservation purposes.

The wind farm has been designed to avoid and/or minimise impacts on identified areas of environmental importance. A conservation and environmental management plan (EMP) will be developed and will inform the construction and operational phases of the project in order to minimise environmental impacts.

5.3 Proposed action IS a controlled action

Matters likely to be impacted

- | | |
|--------------------------|--|
| <input type="checkbox"/> | World Heritage values (sections 12 and 15A) |
| <input type="checkbox"/> | National Heritage places (sections 15B and 15C) |
| <input type="checkbox"/> | Wetlands of International importance (sections 16 and 17B) |
| <input type="checkbox"/> | Listed threatened species and communities (sections 18 and 18A) |
| <input type="checkbox"/> | Listed migratory species (sections 20 and 20A) |
| <input type="checkbox"/> | Protection of the environment from nuclear actions (sections 21 and 22A) |
| <input type="checkbox"/> | Commonwealth marine environment (sections 23 and 24A) |
| <input type="checkbox"/> | Great Barrier Reef Marine Park (sections 24B and 24C) |
| <input type="checkbox"/> | Protection of the environment from actions involving Commonwealth land (sections 26 and 27A) |
| <input type="checkbox"/> | Protection of the environment from Commonwealth actions (section 28) |
| <input type="checkbox"/> | Commonwealth Heritage places overseas (sections 27B and 27C) |

6 Environmental record of the responsible party

	Yes	No
<p>6.1 Does the party taking the action have a satisfactory record of responsible environmental management?</p> <p>Provide details Wind Prospect CWP, through its parent company Wind Prospect, has over 18 years of experience of successful wind farm development worldwide, and has been involved in over 2,500MW of approved wind generation (both onshore and offshore) with 380MW under construction or in operation throughout Australia. The South Australian office has significant experience in the mid-north region of South Australia, having successfully developed 265MW of wind energy projects in the area since 2003. Wind Prospect CWP has significant experience in the Monaro region having gained recent approval for the Boco Rock Wind Farm (2010).</p> <p>Wind Prospect CWP is committed to renewable energy projects that respect the environment and benefit communities. For all of its projects Wind Prospect CWP ensures that wind farm planning and design is carried out to avoid significant environmental areas and minimise environmental impacts, and prepares a detailed Environmental Management Plan.</p>	x	
<p>6.2 Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?</p> <p>If yes, provide details</p>		x
<p>6.3 If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?</p> <p>If yes, provide details of environmental policy and planning framework Wind Prospect operates under the following environmental policies:</p> <ul style="list-style-type: none"> • Environmental Policy • Carbon Neutral Policy • Project-specific Environmental Management Plans 	x	
<p>6.4 Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?</p> <p>Provide name of proposal and EPBC reference number (if known) Wind Prospect has previously referred the following actions under the EPBC Act:</p> <ul style="list-style-type: none"> • Energy generation and supply, Boco Rock Wind Farm (Ref: 2009/4905) • Construction and operation of electrical connection line for Barunga Wind Farm (Ref: 2004/1803) • Energy generation and supply, Hallett Wind Farm (Ref: 2004/1715) • Energy generation and supply, Barunga Wind Farm (Ref: 2004/1357) • Construction of a 14km, 33kV distribution line, including connection to the Lake Bonney Central Wind Farm and Snuggery sub-station (Ref: 2003/1108) • Transmission line servicing Yabmana Wind Farm (Ref: 2003/981) • Energy generation and supply, Troubridge Point Wind Farm (Ref: 2003/952) • Energy generation and supply, Lake Bonney Central Wind Farm (Ref: 2002/691) • Energy generation and supply, Yabmana Wind Farm (Ref: 2001/530) • Energy generation and supply, Green Point Wind Farm (Ref: 2001/529) 	x	

7 Information sources and attachments

(For the Information provided above)

7.1 References

Department of the Environment and Heritage (2006a) *EPBC Act Policy Statement 1.1: Significant impact guidelines - matters of national environmental significance.*

Department of the Environment and Heritage (2006b) *EPBC Act Policy Statement 3.5: White Box - Yellow Box - Blakely's Red Gum Grassy Woodlands and Derived Native Grasslands.*

Department of the Environment, Water, Heritage and the Arts (2009a). *Acacia pubifolia* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment, Water, Heritage and the Arts (2009b). *Anthochaera phrygia* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>.

Department of the Environment, Water, Heritage and the Arts (2009c). *Bothriochloa biloba* in Species Profile and Threats Database, Department of the Environment, Water, Heritage and the Arts, Canberra. Available from: <http://www.environment.gov.au/sprat>.

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7.2 Reliability and date of information

Information used in the preparation of this referral is based on a number of reports and studies developed to inform both the NSW and Commonwealth approval processes. These studies have been undertaken by professional consultants who are expert in their respective fields.

All ecological studies have been undertaken by expert ecologists with practical experience in surveying and monitoring the local environment.

7.3 Attachments

		✓ attached	Title of attachment(s)
You must attach	figures, maps or aerial photographs showing the project locality (section 1)	✓	Appendix 1
	figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3)	✓	Appendix 1
If relevant, attach	copies of any state or local government approvals and consent conditions (section 2.3)		
	copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.4)		
	copies of any flora and fauna investigations and surveys (section 3)		
	technical reports relevant to the assessment of impacts on protected matters and that support the arguments and conclusions in the referral (section 3 and 4)		
	report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)		

8 Contacts, signatures and declarations

Project title:

8.1 Person proposing to take action:

Name: Adrian Maddocks
Title: Senior Development Manager
Organisation: Wind Prospect CWP Pty Ltd
ACN / ABN (if applicable): 57 127 205 644
Postal address: PO Box 1708, Newcastle, NSW 2300
Telephone: 02 4013 4640 / 0488 798311
Email: adrian.maddocks@windprospect.com.au
Declaration: I declare that the information contained in this form is, to my knowledge, true and not misleading. I agree to be the proponent for this action.
Signature: *A Maddocks* Date: 17/2/11

8.2 Person preparing the referral information (if different from 8.1)

Name: Tom Kaveney
Title: Senior Consultant, Eco Link Australia
ACN / ABN (if applicable): 87096512088
Postal address: GPO Box 1558, Canberra, ACT 2601
Telephone: 02 6103 0143
Email: tomk@ecolink.com.au
Declaration: I declare that the information contained in this form is, to my knowledge, true and not misleading.
Signature: *Tom Kaveney* Date: 18/2/11

Appendix 1: Maps of Sapphire Wind Farm

Figure 1: General location of Sapphire Wind Farm

Figure 2: Turbine layout and infrastructure (including 1.5MW and 3.4MW turbine locations)

Figure 3: Turbine clusters

Figure 4: 80m Turbine layout

Figure 5: 110 m turbine layout

Figure 6: Threatened fauna survey results

Figure 7: Threatened flora survey results

Figure 8: Vegetation communities

Figure 9: EPBC listed species and ecological communities

Appendix 2: Mitigation measures for construction and maintenance of Sapphire Wind Farm.

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
Prior to construction			Preparation of Construction Environmental Management Plan (CEMP)	Prior to commencement of construction works	WPCWP
Prepare Management Plans	NA	All	Preparation of Operations Environmental Management Plan (OEMP)	Prior to commencement of construction works	WPCWP
			Preparation of a Conservation Management Plan (CMP)	Prior to commencement of construction works	WPCWP
			Preparation of Weed Management Plan (WMP)	Prior to commencement of construction works	WPCWP
Site induction	Accidental injury to threatened species	Any	Preparation of Soil and Water Management Plan (SWMP)	Prior to commencement of construction works	WPCWP
	Spread of noxious weeds	All	All on-site staff and contractors should undergo a brief induction regarding the known threatened species at the site and the management protocol should any be encountered during construction works.	Prior to commencement of construction works	WPCWP / CC
Marking construction boundaries	Boundary encroachment	All	All on-site staff and contractors should be made aware of noxious weeds present at the site and ways to prevent their spread.	Prior to commencement of construction works	WPCWP / CC
			The boundaries of the construction area will be clearly marked to prevent construction works breaching the	Prior to commencement of construction	WPCWP / CC

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
			boundaries.	works	
During Construction					
	Spread of weeds	All	Piling of soil that may contain seeds of exotic species at least 50m away from the creeks, drainage lines and other areas of native vegetation, where possible, to prevent spread into adjacent areas of ecological significance during rainfall or wind events.		WPCWP / CC
		All	All stockpiles should be covered to prevent the loss of material during high wind and rain events. Where practicable stock piles should be placed in areas sheltered from the wind.		WPCWP / CC
		All	Soil remediation may include deep ripping to alleviate soil compaction and to increase water infiltration and reduce surface run off. Before any remediation works that will further disturb the soil, grazing will be removed and the grass sward allowed time to recover and minimise any areas of bare soil.		WPCWP / CC
Soil disturbance	Sedimentation, and soil erosion		Topsoil recovery will be undertaken in areas that have a high proportion of native vegetation and few weeds in the ground layer of vegetation. Topsoil is harvested to salvage the native soil seed bank and reintroduce seed bank back into areas where it has been depleted by past land use such as intensive grazing.		WPCWP / CC
		All	The site receiving the topsoil has its topsoil including the weed growth stripped and disposed of. The relocated topsoil is spread evenly and mulched lightly using the vegetation and leaf litter removed from the source site.		WPCWP / CC
		All	Implement provisions of SWMP.		WPCWP / CC
		All	All erosion and sedimentation control devices should be regularly monitored.		WPCWP / CC

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
			cleared and repaired, particularly after periods of heavy rainfall.		
		All	All disturbed soil surfaces shall be stabilised as soon as practicable after works have ceased in the area.		WPCWP / CC
Uncontrolled runoff	Reduced water quality	Aquatic species	Management measures implemented to prevent sediment and runoff entering the watercourse in accordance with SWMP.		WPCWP / CC
			All erosion and sedimentation control devices should be regularly monitored, cleared and repaired, particularly after periods of heavy rainfall.	Monthly and after heavy rainfall	WPCWP / CC
			Management measures implemented to prevent pesticide drift and runoff entering the watercourse in accordance with SWMP.		WPCWP / CC
	Spread of pesticides	All	All erosion and sedimentation control devices should be regularly monitored, cleared and repaired, particularly after periods of heavy rainfall.		WPCWP / CC
			Management measures implemented to prevent sediment and runoff entering the watercourse in accordance with SWMP.		WPCWP / CC
Vegetation clearance	Sedimentation and erosion	All	All erosion and sedimentation control devices should be regularly monitored, cleared and repaired, particularly after periods of heavy rainfall.	Monthly and after heavy rainfall	WP / CC
			Piling of soil that may contain seeds of exotic species at least 50m away from the creeks, drainage lines and other areas of native vegetation, where possible, to prevent spread into adjacent areas of ecological significance during rainfall or wind events.		WPCWP / CC
	Spread of weeds	All	All machinery, equipment and vehicles are to be washed down before entering and leaving a site.	Prior to entering and leaving a site	WPCWP / CC
			All disturbed soil surfaces shall be stabilised as soon as practicable after works have ceased in the area.		WPCWP / CC
	Sedimentation and erosion	All	Management measures implemented to prevent sediment and runoff entering the watercourse in accordance with SWMP.		WPCWP / CC
	Accidental fauna strike	Ground-dwelling	A qualified ecologist should be on-site	During clearing	WPCWP / CC

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Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
		fauna	during construction to safely remove any fauna found within the construction area. Any fauna captured at the site, managed in accordance with the provisions of the EMP and if threatened, the TSMF.	and trenching	
	Damage to surrounding tree roots	NA	Care is to be taken when working near treed areas to prevent damage to adjacent tree roots. Where possible, trenches should be dug at least 1 m away from the base of trees.		WPCWP / CC
Removal of fauna habitat	Removal of general fauna habitat	All fauna	Impacts on fauna habitat should be avoided wherever possible and measures implemented to prevent encroachment of development activities on adjacent fauna habitat.		WPCWP / CC
Stock access	Soil compaction, trampling and weed spread		Management of stock access during periods of vegetation and soil disturbance to prevent weed spread.	During periods of soil and vegetation disturbance	WPCWP / CC
Movement of vehicles and machinery between site	Vegetation disturbance	All	All vehicles are to remain on formed roads or tracks designed specifically for the purposes of the wind farm construction.		WPCWP / CC
	Weed spread	All	All machinery, equipment and vehicles are to be washed down before entering and leaving a site.		WPCWP / CC
	Soil compaction	All	All vehicles are to remain on formed road or tracks designed specifically for the purposes of the wind farm construction		WPCWP / CC
Importation of soil, rubble etc.	Spread of weeds	All	It should be ensured that any soil, rubble etc imported to the site is certified that it is free of weeds and weed seeds.		WPCWP / CC
Temporary vegetation clearance			Revegetation with locally native endemic species characteristic of the cleared vegetation type (i.e. NTG or SGW).		WPCWP / CC
			Species used in revegetation works must be sourced locally to protect the genetic integrity of the area.		WPCWP / CC
		All	In situations where perennial weed grasses are more persistent, the focus will be on over planting with vigorous native tussock grasses such as <i>Themeda australis</i> and <i>Poa labillardieri</i> to out compete and replace it.		WPCWP / CC
	Slashing, burning or grazing to prevent				WPCWP / CC

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
			seed set and herbicide spraying to kill large tussocks will also be used to control perennial weed grasses.		
	Sedimentation and erosion	All	Management of stock access during periods of vegetation and soil disturbance to prevent weed spread. Access tracks should be positioned to minimise the need for cut and fill activities and effective drainage shall be designed and installed to minimise future soil erosion.		WPCWP / CC
	Temporary removal of fauna habitat	Ground-dwelling species	All logs and large rocks removed from within the proposed development areas are to be returned following the completion of works in temporary clearance areas.		WPCWP / CC
	Accidental fauna strike	Ground-dwelling species	A qualified ecologist should be on-site during construction to safely remove any fauna found within the construction area. Any fauna captured at the site, managed in accordance with the provisions of the EMP and if threatened, the TSMP.		WPCWP / CC
	Damage to surround tree roots		Care is to be taken when working near treed areas to prevent damage to adjacent tree roots. Where possible, trenches should be dug at least 15m away from the base of trees.		WPCWP / CC
Trenching for reticulation	Accidental fauna capture	Ground-dwelling species	Trenches should be checked daily by a qualified ecologist. Fencing should be erected along trenches to prevent fauna falling into trench.	Daily during construction	WPCWP / CC
Back filling underground cabling	Soil disturbance	All	All trenches will be backfilled and marked with warning tape once the cables are laid. The backfilling and compaction of previously excavated material in layers. On completion, the cable route will be marked with small marker posts to allow the controlled revegetation with locally endemic species.		WPCWP / CC
	Vegetation clearance		Clearing of hollow-bearing trees is to be avoided.		WPCWP / CC
Hollow-bearing tree clearance	Removal of habitat for hollow-dependant species	Hollow-dependant species	Any hollow-bearing trees to be removed are to be lower gently and hollows checked for fauna by qualified ecologist.		WPCWP / CC

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
Removal of fallen logs	Removal of fauna habitat	Hollow-dependant species	All logs within the proposed development areas are to be moved to adjacent areas.		WPCWP / CC
Upgrading of creek crossing	Bank instability	Aquatic species	Measures implemented to ensure bank stability. Jute matting or similar used in any revegetation to prevent weed invasion and increase bank stability. Hazardous materials be stored on or off-site in specific lay-down/storage areas, and will be handled and stored according to regulatory requirements and Australian Standards AS1940.		WPCWP / CC
Storage of hazardous materials	Spills of hazardous material (eg. Oil)	All	The transformer as part of the collector substation may contain upwards of 20,000 litres of oil. Provisions will be made as part of the design for containment of any oil which may leak or spill. Prevention and containment of an potential spills will be described in detail in the Sapphire Wind Farm EMP.		WPCWP / CC
Dust	Smothering of vegetation	All	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.		WPCWP / CC
Accidental fire	Loss of vegetation, injury to fauna and fauna habitat	All	Implementation of fire prevention measures in accordance with Bushfire Emergency Plan.		WPCWP / CC
Operations					
Wind Prospect CWP will operate under this site specific Operations Environmental Management Plan (OEMP) and also under their Environmental Policy and Carbon Neutral Policy			Implement Operations Environmental Management Plan.		WPCWP
Transport to, from and within site	Spread of weeds		All machinery, equipment and vehicles are to be washed down before entering and leaving a site.		WPCWP
	Soil disturbance - soil erosion and sediment runoff		All erosion and sedimentation control devices should be regularly monitored, cleared and repaired, particularly after	Monthly and / or after rainfall	WPCWP

Activity	Impact	Relevant Species / Guild	Mitigation Measure	Timeframe	Responsibility
			periods of heavy rainfall. Manage in accordance with SWMP. Access tracks should be positioned to minimise the need for cut and fill activities and effective drainage shall be designed and installed to minimise future soil erosion.		WPCWP
Revegetation	Revegetation failure		Monitoring of revegetation works to ensure revegetation success. At least 85 % survival rate of all revegetation within 4m ² is required otherwise replanting at a rate of six plants per square metre will be required. Monitoring of the revegetation will be undertaken annually to ensure revegetation is successful.		WPCWP
Accidental fire	Invasion of revegetated areas by weeds Loss of vegetation, injury to fauna and fauna habitat		Monitoring and treatment of weeds for a period of 3-5 years following construction with a particular focus on noxious weeds. Implementation of fire prevention measures in accordance with Bushfire Emergency Plan.	Quarterly	WPCWP
Bird and bat strike	Loss of birds and bats		Attempts to reduce the likely occurrence of bird and bat strikes have been made through placement of turbines away from potential flight paths wherever possible.		WPCWP
Note: WPCWP – Wind Prospect CWP; CC = Construction contractor					

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