

9 ENVIRONMENTAL MANAGEMENT

The environmental impacts related to the proposal would be managed by the proponent's commitment to all mitigation measures identified in previous sections of this Environmental Assessment (EA), together with additional measures, as summarised in the Draft Statement of commitments (Section 9.2). Implementation of procedures, including monitoring and auditing, to ensure that mitigation measures are thoroughly implemented and if found to be inadequate, that additional measures are put in place (Section 9.1).

9.1 Implementation of environmental mitigation measures

Implementation of mitigation measures would be by way of a Project Environmental Management Plan (PEMP), comprising a Construction Environmental Management Plan (CEMP) and an Operation Environmental Management Plan (OEMP). This process is illustrated in

Figure 9.1. The PEMP would include performance indicators, timeframes, implementation and reporting responsibilities, communications protocols, a monitoring program, auditing and review arrangements, emergency responses, induction and training and complaint/dispute resolution procedures.

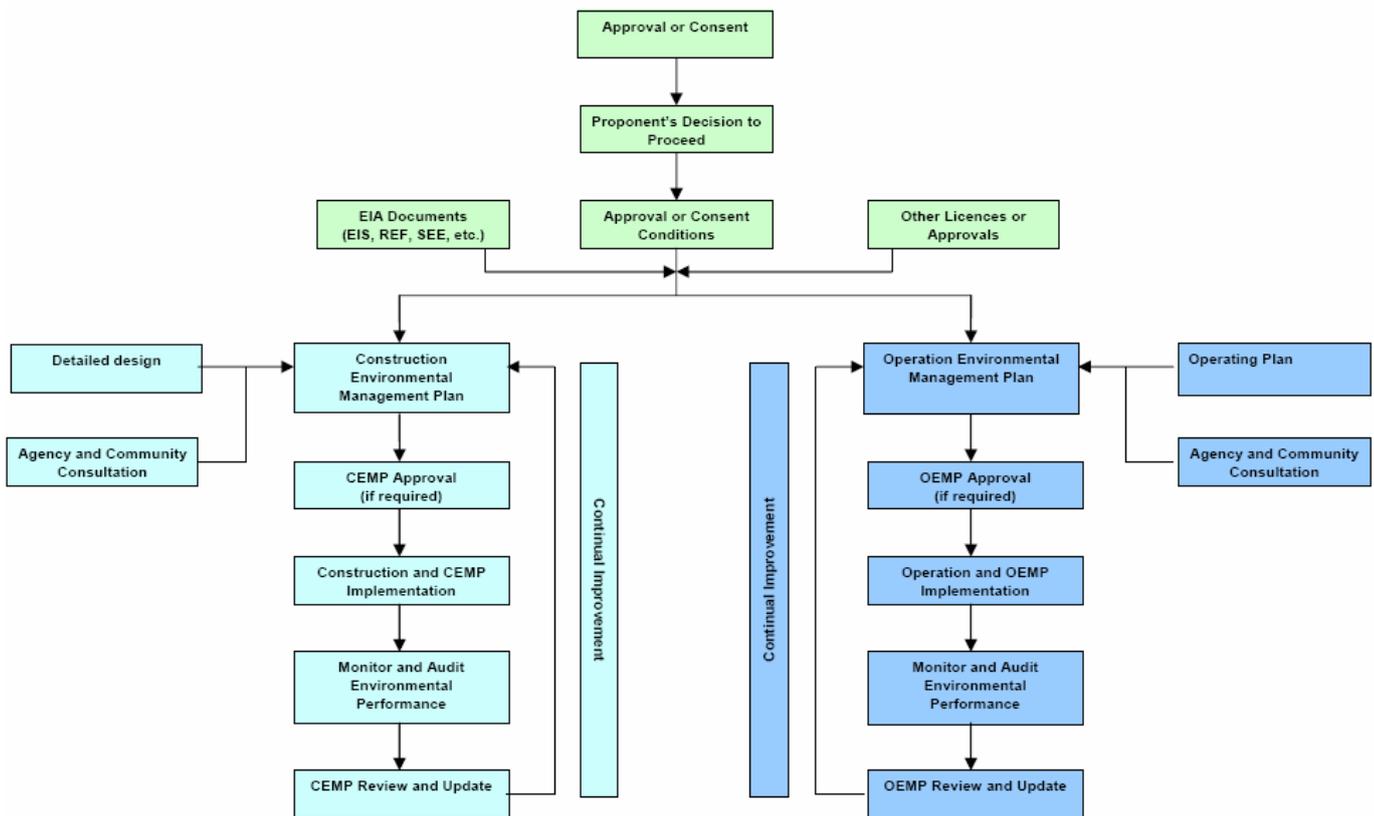


Figure 9.1 Post approval Project Environmental Management Plan (PEMP) process

Source: DIPNR 2004a

9.2 Draft Statement of commitments

Under the Part 3A reforms, proponents are required to provide a Statement of commitments on how they propose to manage the project to minimise, and where possible avoid, impacts. Avoidance and mitigation measures have been developed for the design, construction, operation and decommissioning phases of the project. As decommissioning would take place in 30 years time, mitigation measures for this phase are indicative only. Superior mitigation strategies are likely to be available closer to the date of decommissioning.

The commitments in this section have been developed into a comprehensive set of environmental impact avoidance and mitigation measures which incorporate:

- Specific recommendations contained in the specialist reports;
- Additional measures identified during the preparation of this Environmental Assessment (in consultation with the community and government agencies).

To avoid duplication in this section, mitigation measures are located under the most appropriate heading only and are not repeated in subsequent tables.

9.2.1 Visual

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC1. View of construction traffic.	Minimise construction traffic through Breadalbane and other highly populated areas.	<ul style="list-style-type: none"> • Develop and implement traffic management plan (TMP) which restricts all construction traffic to a predefined route that avoids Breadalbane and other highly populated areas. <ul style="list-style-type: none"> ○ A route has been identified which minimises traffic through local townships and on local roads: northern site access via Hume Hwy, Lerida Rd North, Old Hume Hwy, Old Sydney Road. 	Traffic consultant.	Before construction phase commences.	TMP lodged with RTA and council. Post construction monitoring of road condition.	Approval from RTA and council that TMP is adequate.
SoC2. View of proposal infrastructure (off site).	Minimise the visual impact of the proposal, particularly on areas categorised as having moderate-high impact and population centres.	<ul style="list-style-type: none"> • Areas 8, 9, 10 and 17 (refer to Figure 7.1) were identified as being exposed to moderate to high visual impact. Houses in these areas with a direct view of the site (from the house or outdoor entertaining area) could be highly impacted. Mitigation will centre on liaison with residences in these areas to help reduce the visual impact. <ul style="list-style-type: none"> ○ Screening by way of tree planting will be offered to all residences within 2km of a turbine (also expected to address potential for blade glint). ○ Screening will be provided to other residences in areas 8, 9, 10 and 17 which have high visual impact, at their request (also expected to address potential for blade glint). 	Taurus Energy.	Within 3 months of construction completion.	Record of liaison with property owners.	Agreement with majority of landholders.

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC3. View of proposal infrastructure (onsite).	Minimise the contrast of the development to the existing onsite environment.	<ul style="list-style-type: none"> Locate infrastructure in areas that minimise removal of native vegetation and maximise the potential for screening by onsite vegetation and landforms. Plant additional screening (native) vegetation to minimise the view of substation and control building. 	Landscape planning contractors.	Design stage. Within 3 months of construction completion.	Plans submitted to DoP before construction. Monitoring to ensure that planting is adequate (ie. replacement of dead plants) on a 6 monthly basis for the first three years.	80% survival of planted screens after three years.
SoC4. As above.	As above.	<ul style="list-style-type: none"> Wind turbines will be coloured light off white/light grey to help reduce visual impact of the towers (also expected to address potential for blade glint). The substation and other onsite structures will be coloured grey to blend into the surrounding landscape and surrounding vegetation. 	Taurus Energy.	Before construction phase commences.	Design details submitted to DoP before construction.	Approval from DoP.
SoC5. Shadow flicker	Minimise effect on residences	<ul style="list-style-type: none"> Taurus have committed to shutting down relevant turbines during all periods of shadow flicker at residences within 1km of a turbine (Springvale). 	Taurus Energy.	During periods when flicker affects residences.	Record of liaison with property owner.	Agreement with property owner.

9.2.2 Operational noise

If Layout A is implemented, no mitigation is required. If Layout B is implemented, the following measures will be undertaken.

	Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC6.	Excessive operational noise from proposal at residences within 5km of the proposal.	To comply with SA EPA or WHO (as appropriate) in relation to noise criteria and thereby minimise the noise impact of the turbines and infrastructure on nearby residences to an acceptable level.	<ul style="list-style-type: none"> Additional modelling at Springvale: The predicted marginal exceedance for this location will be re-evaluated in detail with house orientation and final turbine selection and layout taken into consideration. Should any residual impact be predicted for facades that include noise sensitive uses, such as bedrooms, then consideration will be given to providing mechanical ventilation (to remove requirement for open windows) or building acoustic treatments (improved glazing for example). 	Heggies Australia.	Subsequent to DA approval and prior to construction commencement.	Design details submitted to DoP prior to construction.	SA EPA Guideline noise criteria or WHO limits (as appropriate)
SoC7.	As above.	As above.	<ul style="list-style-type: none"> Additional monitoring and modelling for Faybri and Illawambra: The predicted marginal exceedances for these locations will be re-evaluated based on final turbines selection and layout. If this additional modelling continues to indicate exceedances, additional modelling and monitoring will be carried out with monitoring to be conducted at the actual property. If additional monitoring and modelling continue to indicate exceedances, offending turbines will be removed from the proposal. 	As above.	As above.	As above.	SA EPA Guidelines for noise
SoC8.	As above.	As above.	<ul style="list-style-type: none"> Final assessment of noise will be calculated prior to construction based on the final turbine selection and layout, and the results of this provided to the Department of Planning. Taurus Energy will ensure that these layouts meet the SA EPA Guidelines (for non-involved houses) or WHO Guidelines (for involved houses) as appropriate (refer to Section 9.2.2 Operational noise). 	Heggies Australia and Taurus Energy	Prior to construction commencement.	Design details submitted to DoP prior to construction.	SA EPA Guideline noise criteria or WHO limits (as appropriate)

9.2.3 Community

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC9. Stress in community.	Minimise community dissention and stress as a consequence of the proposal.	<ul style="list-style-type: none"> • Accessible and independent educational material will be disseminated to the public about the impacts of wind farms. Using Upper Lachlan Shire Council records, information will be mailed to residences within 10km of the site. 	Taurus Energy.	Before construction phase commences.	Record of mail out.	100% of addresses on council records reached.
SoC10. Inequitable distribution of proposal benefits.	Increase local ownership of the proposal.	<ul style="list-style-type: none"> • Establishment of a community fund and ongoing income stream of \$25,000 per annum for the life of the project to assist local community organisations. Examples of possible assistance may include: <ul style="list-style-type: none"> ○ Landcare ○ Weed and pest management ○ Local sporting facilities ○ Local public services (e.g. libraries) ○ Community parklands ○ Academic scholarships ○ Rural Fire Service support ○ Event sponsorship ○ Road improvements ○ Local heritage management • The structure of the fund is to be determined, and could involve management by or joint management with the local Council and/or local community representatives. • The proponent will seek local input into the structure of the fund. 	Taurus Energy in liaison with Upper Lachlan Shire Council, D.N.R and local community groups.	Within 3 months of construction completion.	Annual report on spending submitted to DoP and local community.	Release of funds.

9.2.4 Economic

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC11. Inequitable distribution of proposal benefits.	Maximise the use of local contractors and manufacturing facilities in the construction phase of the project.	<ul style="list-style-type: none"> Liaise with local industry representatives to maximise the use of local contractors and manufacturing facilities in the construction phase of the project. 	Taurus Energy in liaison with local industry representatives.	Before construction phase commences.	List of contractors and suppliers submitted to DoP before construction.	High proportion of local industry used in construction, wherever possible.

9.2.5 Land value

The commitments to screening and the community fund are considered to be sufficient to address this issue. No other mitigation is deemed to be required.

9.2.6 Aboriginal archaeology

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC12. Destruction of aboriginal heritage sites.	Minimise impact on aboriginal heritage.	<ul style="list-style-type: none"> Management and mitigation of Aboriginal artefact locales and Survey Units as outlined in the attached Aboriginal Archaeological Assessment, specifically: unmitigated impact. 	Taurus Energy in consultation with archaeological consultant and local aboriginal land councils.	Before construction phase commences.	Sign-off obtained from archaeological consultant submitted to DoP.	Minimal impacts on sensitive archaeological sites.
SoC13. As above.	Maximise involvement of the local aboriginal land councils.	<ul style="list-style-type: none"> Consultation with the Aboriginal communities who have participated in the assessment in regard to impacts to the Aboriginal objects found in the proposal area. 	Taurus Energy in liaison with involved local aboriginal land councils.	Before construction phase commences.	As above.	As above.

9.2.7 Biodiversity

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC14. Loss or modification of native vegetation.	Minimise impacts to habitat and species / communities of conservation significance.	<ul style="list-style-type: none"> Protect the Northern Slope (NS, refer to Figure 7.18) from primary disturbance due to the proposal. This area is of moderate conservation significance. All EMPs will restrict access to and works within this area. Protect additional areas circled in green on Figure 7.18 from impact during works. Proposal infrastructure will be located to avoid treed areas and isolated paddock trees. Recommendations for widening specific parts of the proposed route will be adhered to (Attachment 3.4, Appendix F). 	Taurus Energy.	Throughout life of project.	Written into PEMP. Post construction monitoring.	Comply with all stated mitigation measures.
SoC15. As above.	Avoid habitat degradation.	<ul style="list-style-type: none"> Weed and sediment erosion controls will be implemented during and following the proposed works. After the installation of the infrastructure, disturbed soil should be rehabilitated as soon as practicable in order to resist erosion and colonisation by weeds. This may require restricting stock access and implementing revegetation activities. All vehicles onsite will follow established trails and minimise onsite movements. Chemicals, including fuels and lubricants, will be stored and handled as per manufacturer's instructions. Where practical, they will be stored offsite. Where they must be stored onsite, they will be housed in a secure building bunded to contain any leakages. Turbines will be designed to accommodate the full capacity of the fuels and lubricants contained within. 	Taurus Energy.	During the construction and decommissioning phase.	Written into PEMP. Post construction monitoring.	Comply with all stated mitigation measures.

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC16. Loss or modification to native fauna habitat.	Minimise impacts to habitat and species of conservation significance.	<ul style="list-style-type: none"> Retain all hollow bearing trees and locate infrastructure at the maximum distance possible from them, to avoid disturbance to roosting individuals (particularly in areas specified in the Biodiversity Assessment, Attachment 3.4). 	Taurus Energy.	During the construction and decommissioning phase.	Written into PEMP. Post construction monitoring.	Comply with all stated mitigation measures.
SoC17. Collision or avoidance of habitat during the operational phase.	Reduce the attractiveness of the ridge to foraging raptors and waterbirds.	<ul style="list-style-type: none"> Rabbits should be controlled on the turbine ridges, carrion should be removed from the site as quickly as possible, and young lambs should not graze on the turbine ridges. Dams / wet depressions on the main ridge line will be filled to remove the potential to attract microbats, waterbirds and prey for raptors under the turbines. Alternative watering points will be constructed in consultation with affected property owners. (This is only required on properties involved in the project and therefore lease agreements are considered sufficient to compensate for this action). 	Taurus Energy	During the construction and operational phase.	Written into PEMP.	Comply with all stated mitigation measures.
SoC18. As above.	Determine if impacts are unacceptable and mitigate if required.	<ul style="list-style-type: none"> A monitoring program using adaptive management will be employed to ensure impacts are identified and managed to acceptable levels, as follows: <ul style="list-style-type: none"> Implementation of a rigorous and properly timed monitoring of collision impacts and protocols so that action can be taken if unacceptable levels of mortalities occur onsite. If mortalities exceed a pre-determined threshold, additional mitigation measures should be considered, such as diversion structures, blade painting (refer Hodos <i>et al.</i> 2001), turning off blades at critical times, further turbine ridge habitat modification and enhancement of off-site habitats and prey populations. The monitoring program will be designed in such a way so that standardised procedures could be established. The monitoring results will be made available to other wind farm developers upon request. 	Biodiversity consultant and Taurus Energy.	Before construction and throughout first three years of the operational phase.	Monitoring program.	Design and implement monitoring program. Comply with all stated mitigation measures.

9.2.8 Land use

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC19. Disruption to agricultural use of site and surrounding areas.	Minimise impact on grazing onsite and horse riding in the area.	<ul style="list-style-type: none"> Liaison with involved landowners to restrict stock access to the construction zones during the period of construction. Liaison with involved landowners to explore the possibility of enhancing the native component of the understorey in pasture production. This could be incorporated into the site restoration plan which will dictate protocols for the rehabilitation of areas disturbed during construction. Signage should be placed on local roads within 1km of turbines to warn horse riders of the risks due to sudden start-up of turbines and shadow flicker. 	Taurus Energy.	<p>Before the construction phase.</p> <p>Before the operational phase.</p>	<p>Signed agreements submitted to DoP.</p> <p>Preparation of a site restoration plan with a monitoring component.</p> <p>Photos of signage to DoP prior to operation of turbines.</p>	<p>Achieve agreements with involved landowners.</p> <p>Comply to site restoration plan.</p> <p>Install signage.</p>
SoC20. Disruption to lifestyle values.	Minimise impact on lifestyle values of the site and surrounding properties.	<ul style="list-style-type: none"> Advertisement of the period of construction in a prominent position onsite as well as in local media, to inform the community of the disruption to affected areas. 	Taurus Energy.	<p>Before the construction phase.</p> <p>During the construction phase.</p>	PEMP auditing.	Advertise in local media.

9.2.9 Traffic and transport

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC21. Safety of motorists.	Minimise safety risks.	<ul style="list-style-type: none"> • Develop and implement traffic management plan (TMP). <ul style="list-style-type: none"> ○ A site access route has been identified which maximises use of highways, avoiding small townships. ○ The TMP will incorporate measures identified in Section 7.8.1 of this document. Namely: a signposting plan, interim information bays, clearing of sight lines, line marking, upgrades to pavement and drainage structures, sealing a junction, shoulder widening, reduced speed limits for the period of construction, scheduling of high traffic flows, implementation of dust suppression. ○ Construction phase monitoring will include dust and noise. If levels exceed predetermined criteria, additional suppression measures will be implemented. ○ Post construction monitoring will target road condition and shadow flicker. ○ The proponent commits to liaise with the owners of residences on Lerida Road North (two, Springvale and Wandella, both involved with the proposal via lease agreements) as well as an additional residence within 1km of the Hume Highway – Lerida Road North Junction (Illawambra), to ensure that owners have advanced notification of traffic timing. 	Traffic consultant.	Before construction phase commences.	<p>TMP lodged with RTA and council.</p> <p>Post construction monitoring of road condition.</p>	Approval from RTA and council that TMP is adequate.
SoC22. Dust and noise generation.	Minimise dust and noise levels on local residences.	<ul style="list-style-type: none"> • As above 	As above	As above	As above	As above
SoC23. Deterioration of road pavement.	Ensure roads are not degraded by the proposal	<ul style="list-style-type: none"> • As above 	As above	As above	As above	As above

9.2.10 Aircraft hazard

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC24. Interference with landing fields.	Advise relevant authorities of the location of turbines.	<ul style="list-style-type: none"> Provide the location and height of each tower to the Australian Aerial Agriculture Association. 	Taurus Energy.	Prior to the construction phase	Record of liaison provided to DoP.	Record of liaison provided to DoP.
SoC25. Intrusion into air traffic zones.	Advise relevant authorities of the location of turbines.	<ul style="list-style-type: none"> Provide the location and height of each tower to Civil Aviation Safety Authority (CASA), for inclusion in relevant databases, maps and charts. Provide the location and height of each tower to the Royal Australian Air Force (RAAF), for inclusion in relevant databases, maps and charts. 	Taurus Energy.	Prior to the construction phase	Record of liaison provided to DoP.	Record of liaison provided to DoP.
SoC26. Interference with aerial spraying.	Advise relevant authorities of the location of turbines.	<ul style="list-style-type: none"> Liaise with landowners whose properties will not be able to be treated using aerial based methods. 	Taurus Energy.	Prior to the construction phase	Record of liaison provided to DoP.	Record of liaison provided to DoP.

9.2.11 Telecommunication

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC27. Television and Radio Broadcast Services	Maintain signal strength	<ul style="list-style-type: none"> • Use of equipment complying with the Electromagnetic Emission Standard, AS/NZS 4251.2:1999. • Monitoring post construction of houses within 5km of the wind farm to determine any loss in television signal strength. • In the event that TVI is experienced by existing receivers within 5km of the wind farm, the source and nature of the interference will be investigated by Taurus Energy. Should investigations determine that the cause of the interference is due to the wind farm, Taurus Energy will put in place mitigation measures at each of the effected receivers in consultation and agreement with the landowners. Mitigation measures may include: <ul style="list-style-type: none"> ○ Modification to or replacement of receiving antenna; ○ Provision of a land line between the effected receiver and an antenna located in an area of favourable reception; ○ Improvement of the existing antenna system; or ○ In the event that interference cannot be overcome by other means, negotiating an arrangement for the installation and maintenance of a satellite receiving antenna at Taurus Energy's cost. 	Telecommunications contractor and Taurus Energy.	Pre and post construction phase.	Results of before and after monitoring submitted to DoP.	Comply with all stated mitigation measures.
SoC28. Radio Communication Services	Maintain or improve signal strength	<ul style="list-style-type: none"> • In the event that any issues with additional license links are identified as a result of the wind farm, whether prior to or post construction, Taurus Energy will consult with the operator and undertake appropriate remedial measures, which may include: <ul style="list-style-type: none"> ○ Modifications to or relocation of the existing antennae; ○ Installation of a directional antennae and/or amplifier to boost the signal. 	Telecommunications contractor and Taurus Energy.	Post construction phase.	Results of monitoring submitted to DoP.	Complete monitoring and address issues raised.

9.2.12 Bushfire

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC29. Affect of the proposal on ignition and control of bushfire.	Reduce risk of fire and risk to fire fighters in the vicinity of the proposal.	<ul style="list-style-type: none"> • A set of protocols will be developed in consultation with the Rural Fire Service in regard to bushfire prevention measures to be implemented onsite during construction, operation and decommissioning phases. These measures will in particular cover hot-work procedures, asset protection zones, safety, communication, site access and response protocols. Measures will include: <ul style="list-style-type: none"> ○ Flammable materials and ignition sources brought onto the site, such as fuels, will be handled and stored as per manufacturer's instructions. ○ During construction, appropriate fire fighting equipment will be held on site when the fire danger is very high to extreme, and a minimum of one person on site will be trained in its use. ○ The substation facility will be bunded with a capacity exceeding the volume of the transformer oil to contain the oil in the event of a major leak or fire. The facility will be regularly inspected and maintained to ensure leaks do not present a fire hazard, and to ensure the bunded area is clear (including removing any rainwater). ○ The substation will be surrounded by a gravel and concrete area free of vegetation to prevent the spread of fire from the substation and reduce the impact of bushfire on the structure. The substation area will also be surrounded by a security fence as a safety precaution to prevent trespassers and stock ingress. ○ Asset protection zones, based on RFS advice, will be maintained around the control room, sub-station and electricity transmission easements. Workplace health and safety protocols will be developed to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities. ○ Shut down of turbines will commence if components reach critical temperatures. ○ Fire extinguishers will be stored onsite in the control building. 	Taurus Energy in consultation with the RFS.	Before construction phase.	Written endorsement of procedures by the RFS, submitted to DoP. Auditing as part of PEMP.	RFS endorsement of protocols. Compliance with protocols.

9.2.13 Cumulative

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC30. Local identity.	Minimise cumulative impact of many wind farm developments in the area.	<ul style="list-style-type: none"> • Taurus Energy commit to the following strategic measures when designing the Cullerin Range site layout: <ul style="list-style-type: none"> ○ Siting the development so that it does not contribute to surrounding a property or locality. ○ Commitment to screening, as discussed in SoC2 and SoC3. ○ Siting the development so that a continuous experience of similar infrastructure is not unavoidable (such as parallel to the transport corridors). ○ Reducing the number of turbines and regularity of arrangement (by clustering turbines rather than spacing them uniformly and by development of only small and medium scale wind farms). 	Taurus Energy.	Before construction phase.	Final plans submitted to DoP.	Comply with mitigation tasks.

9.2.14 Removal of infrastructure

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC31. Redundant infrastructure.	Reduce the amount of redundant infrastructure onsite and rehabilitate site as soon as practicable after works.	<ul style="list-style-type: none"> • Wind turbines, substation, control building, and the associated above ground electricity infrastructure will be removed and the site restored within 12 months of the wind farm being decommissioned. Details will be provided in a Site Restoration Plan. • Written evidence will be provided to the Director General, that the lease agreement(s) with the site landowners have adequate provisions to meet the decommissioning requirements, that the site be restored to a similar condition as existed before the development, by way of a specific site restoration plan. 	Taurus Energy in consultation with DoP.	As stated. Before construction phase.	Written evidence of adequacy of provisions to meet the decommissioning submitted to DoP.	Site restored within 12 months of decommissioning.

9.2.15 Climate

No mitigation deemed to be required.

9.2.16 Physical (air, soils and landforms, water)

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC32. Air quality	Minimise emission and dust generation.	<ul style="list-style-type: none"> • Implementation of protocols during construction, contained in the CEMP. These will include: <ul style="list-style-type: none"> ○ Should controlled blasting be required, it will be carried out in accordance with all relevant statutory requirements. ○ Nearby residences will be informed prior to blasting. ○ ANZECC guidelines for control of blasting impact at residences will be adhered to. ○ Dust levels at stockpile sites will be visually monitored. Dust suppression (eg. water sprays) will be implemented if required. ○ Product stockpiles will be protected from prevailing weather conditions. ○ Loads of dry materials will be covered where appropriate. ○ Dust filters will be installed on silos. ○ Only machinery compliant with emission standards will be used. ○ Machinery and vehicles will not be left running or idling when not in use. ○ Excavation will only be commenced during stable, dry weather conditions, operational requirements permitting. ○ On the steeper slopes check banks will be installed across the trenchline, approximately 50 metres apart, following closure of the trench. These will discharge runoff to areas of stable vegetation. ○ Excavation will only be commenced during stable, dry weather conditions, operational requirements permitting. ○ Should dust generation be of a high level during the transport of machinery near residences, watering of sections of the route will be undertaken to reduce dust. ○ Vehicles and motorised equipment will be maintained so that emissions are minimised 	Construction contractors	Before and during construction phase.	As per CEMP, to be submitted to DoP.	CEMP deemed adequate by DoP.
SoC33. Soils and landforms	Minimise disturbance to	<ul style="list-style-type: none"> • Implementation of protocols during construction, contained in the CEMP. These will include: 	Landscape planning	Before and during	As per CEMP, to	CEMP deemed

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
	soils and landforms, prevent erosion and soil contamination.	<ul style="list-style-type: none"> o A site restoration plan will be prepared to ensure landforms are stabilised and rehabilitated as soon as practicable after works (see Section 3.5 for rehabilitation principles). As a proactive measure, this will include some areas not affected by works onsite but which require works to mitigate ongoing erosion. o Subsoil will be separated from topsoil for rehabilitation purposes. All topsoil from the excavation sites will be stockpiled and replaced to its original depth for seeding and fertilising. On steep slopes, topsoil will need to be stabilised using, for example, jute matting. Any excess subsoil will be removed from the site and disposed of at an appropriate fill storage site. o Tracks onsite will be graded to enhance stability. o Routes will be confined to already disturbed areas, where possible. o Site storage areas will be identified, and be bunded to prevent loss of any pollutants. o Hydrocarbon spill kits will be stored at the site. o Machinery will be operated and maintained in a manner that minimises risk of hydrocarbon spill. o Maintenance or re-fuelling of machinery will be carried out in hard-stand areas (ie. existing or proposed road surface or hard-stand areas beneath turbines, not on areas that either contain native vegetation, or will be revegetated). o Where chemicals are used, their application and disposal will comply with manufacturers recommendations. o Concrete wash will be deposited in an excavated area, below the level of the topsoil. o Provide toilet facilities for construction workers. 	<p>contractors</p> <p>Construction contractors</p>	construction phase.	be submitted to DoP.	adequate by DoP.
SoC34. Water quality and water table	Reduce the risk of adverse impact on water quality.	<ul style="list-style-type: none"> ● Implementation of protocols during construction, contained in the CEMP. These will include: <ul style="list-style-type: none"> o Sediment traps will be installed wherever there is potential for sediment to collect and enter waterways. o Stockpile sites will be identified and turbid water discharged from these treated by a combination of silt fencing and temporary mulching/seeding. 	Construction contractors	Before and during construction phase.	As per CEMP, to be submitted to DoP.	CEMP deemed adequate by DoP.

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
		<ul style="list-style-type: none"> ○ The concrete batch plant would include an in-ground water recycling / first flush pit to prevent dirty water escaping onto the site, and would be fully remediated after the construction phase. 				

9.2.17 Construction noise

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC35. Noise impact on nearby residences.	Comply with all relevant standards to reduce noise to an acceptable level.	<ul style="list-style-type: none"> ● Implementation of protocols during construction, contained in the CEMP. These will include: <ul style="list-style-type: none"> ○ Works will comply with the Environment Protection Authority's construction noise criteria for working times and emission levels. ○ Machinery will use appropriate and effective exhaust mufflers and compressor silencers. ○ Works will be staged in the vicinity of Springvale to minimise impacts. ○ Noise complaints will be responded to rapidly using monitoring equipment. ○ If EPA Guideline restrictions are being exceeded, appropriate noise reduction strategies will be employed, such as the re-orientation or re-positioning of machinery, re-scheduling of noisy activities, installation of temporary noise barriers, improved vehicle noise control, reduced work times and the use of 'quiet work practices'. ○ The need for, and the timing and location of the proposal will be well publicised and explained to improve community tolerance of noise emissions. ○ ANZECC guidelines for control of blasting impact at residences will be met. 	Construction contractors	Before and during construction phase.	As per CEMP, to be submitted to DoP.	CEMP deemed adequate by DoP.

9.2.18 Safety and health

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC36. Construction risks to workers, public and stock.	Minimise risks by adherence to guidelines and protocols.	<ul style="list-style-type: none"> • Implementation of protocols during construction, contained in the CEMP. These will include: <ul style="list-style-type: none"> ○ Workplace health and safety protocols will be developed to minimise the risk of fire for workers during construction and during maintenance in the control room and amenities. ○ The safety of the workforce will be managed by strict safety procedures, good design of site tracks, and regular maintenance. If an incident occurs, communications to ambulance or medical services will be via phone or radio. ○ Site fencing will be installed where work staff consider that there is a risk to the safety of the general public (ie. when the trench is left open for extended periods). ○ During construction and decommissioning, stock will be excluded from the works area (excluding road works). 	Construction contractors	Before and during construction phase.	As per CEMP, to be submitted to DoP.	CEMP deemed adequate by DoP.
SoC37. Operational risks to workers, public and stock.	Minimise risks by installation of barrier.	<ul style="list-style-type: none"> • The substation area will be surrounded by a security fence as a safety precaution to prevent trespassers and stock ingress. 	Construction contractors.	During construction phase.	As per CEMP, to be submitted to DoP.	Installation of barrier.
SoC38. Generation of electromagnetic fields	Minimise risks by adherence to guidelines and protocols.	<ul style="list-style-type: none"> • Appropriate substation design criteria of Country Energy will be adhered to. • Onsite, underground cabling will be used where practicable to reduce the electric component of EMFs. • The turbines, substation and transmission lines will be located as far as practicable from residences (to reduce the potential for both chronic and acute exposure) of the electric and magnetic component of EMFs. 	Taurus Energy in liaison with appropriate consultants.	Prior to construction phase.	Operation phase monitoring	Comply to recommended mitigation measures.

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC39. Generation of shadow flicker	Minimise risks by adherence to guidelines and protocols.	<ul style="list-style-type: none"> If shadow flicker is found to be a nuisance to residents or motorists, conditions will be pre-programmed into the control system and individual wind turbines automatically shut down whenever these conditions are present. 	Taurus Energy.	Operational phase.	Monitoring will be conducted during the first year to assess this.	Measures implemented as required by monitoring results.

9.2.19 Non-indigenous heritage

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC40. Construction phase impact on listed and unlisted heritage items.	Avoid any impact on such items.	<ul style="list-style-type: none"> Inform the Upper Lachlan Shire Council and NSW Heritage Council regarding the proximity of final access routes to listed heritage items. Implementation of a Traffic Management Plan to define appropriate access routes and measures needed to ensure that the additional traffic load required during construction and decommissioning does not adversely affect buildings nearby as well as road infrastructure. 	Taurus Energy.	Prior to construction phase.	Record of notification.	Record of notification.
Operation phase impact on listed and unlisted heritage items.	Avoid any impact on such items.	<ul style="list-style-type: none"> Visual impact mitigation, as stated in Section 9.2.1 				

9.2.20 Resources

Impact	Objective	Mitigation tasks	By	Timing	Auditing	Criteria
SoC41. Creation of waste.	Reduce creation of waste, maximise reuse and proper disposal.	<ul style="list-style-type: none"> Waste will be reused or recycled whenever possible. Separate recyclable materials receptacles will be provided (eg. For glass, plastics and aluminium). Packaging materials and general construction wastes will be disposed, with Council's approval, at Council operated waste disposal centres. Toilet facilities will be provided for onsite workers and sullage from contractor's pump out toilet facilities will be disposed at the local sewage treatment plants or other suitable facility agreed to by Council. Surplus topsoil will be stockpiled on site during construction, and following construction will be spread on the site (particularly over hardstand areas and access roads) to assist in revegetation. Excavated material will be used in road base construction and as aggregate for footings where possible, surplus material will be disposed of in appropriate locations on site (on agreement with the landowner), finished with topsoil, and revegetated. Risk of chemical spills will be minimised and protocols will be in place to ensure prompt and effective clean up of any accidental spills. <p>The contractor will implement a Spill Control Plan as part of its Erosion and Sediment Control Plan. Spill Control Plans will identify persons responsible for implementing the plan if a spill of a dangerous or hazardous waste should occur. Any spill that occurs, regardless of size or type of spill, will be reported to the Construction Manager. The event and clean up processes will be recorded and passed to the Upper Lachlan Shire Council. If the spill or hazard should reach surface waters the EPA will be notified.</p>	Construction contractors	Before and during construction phase.	As per OEMP, to be submitted to DoP.	OEMP deemed adequate by DoP.

9.3 Monitoring example

Monitoring and adaptive management mechanisms will be in place to reduce the operational impact of the proposal, should unforeseen impacts result. The proposal has a degree of flexibility to address unforeseen impacts to biodiversity or social values. Specific management responses will be determined by the nature and extent of impacts, but could include adjustments or enhancements to turbine and associated infrastructure, periodic shutdown, vegetation screening and other impact mitigation measures, or indirect compensatory measures such as contribution to community resources and services and off-site habitat protection or enhancement.

The OEMP will employ adaptive management in response to monitoring results and other inputs. For example, specific monitoring activities will include:

- Bird and bat collision monitoring, bird and bat habitat utilisation monitoring,
- Shadow flicker monitoring,
- TV reception monitoring.

as committed to in the Statement of commitments.

Due to the level of detail and site specific investigation required, monitoring programs will not be designed prior to project consent. However, an indicative program is outlined below to assess the impact of the operational proposal on birds and bats.

9.3.1 Bird and bat impact monitoring

In the case of bird and bat mortality, threshold mortality rates for threatened or sensitive bird and bat species will be determined for each of the three monitoring periods. The thresholds will trigger a management response, which will vary depending on the nature and extent of the impact.

The OEMP will contain details of a three-tiered monitoring program for bird and bat mortalities and habitat utilisation impacts:

1. First six months of operation

- An intensive period of monitoring required because birds and bats are in the process of habituating to the new development, and sensitive species may experience higher levels of mortality during this period.
- During this period all turbine sites will be surveyed to determine variation in impact over the study area. Surveys will include monthly dead bird searches (with at least two scavenging trials), bird utilisation surveys, observation of avoidance/diversion behaviour and targeted surveys for species of concern (such as raptor nest sites).
- Monitoring will examine collision mortalities and habitat utilisation, targeting potentially vulnerable species (such as threatened species, waterbirds and raptors).

2. First two years of operation

- Monitoring to assess mortality rates and trends over several seasons and longer term changes to local species abundance, habitat use patterns and possibly breeding success.
- The survey may be limited to representative or higher risk turbine sites, based on the results of the first six months of monitoring.
- Surveys will include monthly dead bird searches (with at least two scavenging trials), bird utilisation surveys, observation of avoidance/diversion behaviour and targeted surveys for species of concern (such as raptor nest sites).

- Dead bird searches may be extended beyond two years if thresholds are exceeded and adaptive management responses are required to be implemented.

3. Ongoing monitoring

- Mortality inspection and reporting to be continued for the life of the wind farm. The inspection regime will be linked to turbine inspection and maintenance cycles. Mortalities of any significant species will be reported to DEC.
- Monitoring methods and data standards for dead bird searches, indirect disturbance impact assessment and habitat avoidance studies will be based on protocols in the Interim Standards for Assessing the Risks to Birds from Wind Farms in Australia (Brett Lane and Associates 2005).

10 CONCLUSION

This Environmental Assessment (EA) has assessed the likely environmental impacts that may result from the proposed construction, operation and decommissioning of a 30MW wind farm at the Cullerin Range site.

Benefits of the proposal have been identified at the broad, regional and local scale. While operational, the proposal would provide a greenhouse gas emission-free source of locally generated electricity; for each Megawatt-hour of electricity generated, the emission of at least 1,000 kilograms of greenhouse gases would be avoided. Furthermore, the proposal would address a New South Wales listed Key Threatening Process, Anthropogenic Climate Change, by reducing the proportion of the electricity demand supplied by burning fossil fuels. The impacts of human-induced climate change are particularly relevant in Australian agricultural production environments, lending support to the appropriateness of the development for the region.

The EA has identified negative environmental impacts which could be generated by the development and outlines mitigation measures to address them which, if implemented adequately, are considered to reduce the environmental impacts associated with the proposal to a lower level. As well, opportunities exist to be proactive with regard to the specific features of the site. All measures to which the proponent will commit are detailed in the draft Statement of commitments, Section 9.2.

The key impacts of the proposal are interrelated with regard to the physical, biological and social parameters. The ability to avoid, mitigate or be pro-active differs with regard to these impacts. The key issues are summarised below.

10.1 Key issues

10.1.1 Justification

Taurus Energy is committed to developing the Cullerin Range Wind Farm in a way which minimises the local impacts and maximises the benefits of the project. The project has been specifically designed as a small wind farm with only 15 turbines. The project offers:

- Up to 15 wind turbines, each with three blades up to 46m long mounted on a tubular steel tower up to 80m high;
- Production of up to 95,000 GWh of renewable electricity per annum, sufficient for the average consumption of up to 12,200 homes;
- Reduction in greenhouse gas emissions of up to 95,000 tonnes of carbon dioxide (equivalent) per annum, equivalent to taking up to 19,000 cars off our roads for 30 years;
- Savings in water consumption of 110 to 125 Million litres per annum of potable water used in coal fired power stations;
- Annual savings in pollution from coal fired power stations of up to 538,000 kilograms of sulfur dioxide, up to 233,000 kilograms of nitrogen oxides, and up to 2090 kilograms of particulates;
- Provision of a community fund of \$25,000 per annum for local community and environmental projects;
- Provision of local jobs and injection of up to \$10 Million into the local economy;
- Improved security of electricity supply through diversification.

10.1.2 Community

Opposition to the wind farms exists in the region and on a local level specifically to the Cullerin Range proposal. During the consultation process, which involved speaking to people with differing views on the acceptability of the proposal, it became clear that the proposal is already acting to exacerbate divisions and tension in the community and also that the emotional content of community meetings is no longer conducive to the collective discussion of proposal impacts and mitigation strategies.

This situation may have wide-reaching impacts on a local community characterised by long family associations. Furthermore, it is not conducive to the community having the maximum input into measures aimed to make the proposal more equitable in terms of the distribution of benefits (for example, suggestions about allocation of funding to community projects). Taurus Energy would focus future community consultation efforts on engaging community groups, in preference to individuals, in the development of a community fund and other measures aimed at addressing community level impacts.

The proponent has committed to strategies, including a community fund, aimed at addressing the impacts to community wellbeing generated by this proposal and allowing for the development of wind power as a viable contribution to future energy demands.

10.1.3 Visual impact

Visual impact was the key impact identified by the local community (ahead of noise and land value impacts). The proponent has committed to several strategies aimed at minimising views of the wind farm, focussing on those that would experience the highest level of impact. However, it is likely that there are some individuals for whom no amount of screening would make the proposal acceptable.

The proponent acknowledges that the benefits of the proposal come at this cost. Mitigation strategies aimed at addressing the impacts to community wellbeing are the only recourse available to the proponent in this case. As discussed above, these measures have been taken seriously by the proponent.

10.1.4 Physical impacts

Erosion, particularly gully erosion and creek bank erosion, is a feature of the soil type onsite and is widespread in the area. The Upper Lachlan Catchment frequently has nutrient concentrations higher than those recommended for the protection of modified aquatic ecosystems, primarily related to turbidity (Thurtell 2003). Measures recommended by a catchment-based study include addressing erosion in the catchment, in-stream erosion as well as the degradation of stream banks and riparian areas (Thurtell 2003).

An opportunity exists to improve gully erosion during earth works undertaken onsite. This would be carried out as part of the site restoration plan, in association with the earthworks onsite. Additionally, the community fund could be appropriately spent on stabilising active gullying and revegetating riparian areas offsite. These commitments would be carried out in consultation with appropriate organisations, such as Landcare and Department of Natural Resources. The resultant benefits would be to soil conservation, water quality, native flora and fauna and the community (in the form of beautification and preservation of natural resources in a production landscape).

10.1.5 Native vegetation

The ongoing expense of resowing exotic species as well as the resultant loss of soil condition and ingress of weeds are good reasons to investigate the sustainability of using native species rather than replacing them during onsite restoration works. The Cullerin Range site retains some areas of native understorey which, although patchy and degraded, have a level of

conservation significance. The rehabilitation and encouragement of native grasses onsite could have production and conservation benefits and should be explored as a potential offset to clearing during the construction phase of project development. This would be carried out as part of the site restoration plan, revegetating disturbed areas with species such as *Danthonia*, rather than exotic species, if involved landowners consent to this.

10.1.6 Bird and bat impacts

A lack of information on the specific impacts of wind farms affects the validity of the assessment of significance of potential impacts on Australian birds and bats. This is further complicated by the variability of migration paths in Australia; most Australian species are classified as only partial migrants (Dingle 2005), changing their routes based on ephemerally available resources. Therefore, avoiding locating wind farms on routes that may at some time be used as migration paths, when few of these routes are documented is problematic. The potential for an increasing number of wind turbines on the Southern Tablelands increases the importance of determining regionally specific information.

To date, monitoring of operational wind farms is rarely scientifically rigorous and therefore does not assist proponents of future proposals or their assessors understand the existing impacts. This can be rectified by implementing standardised monitoring at all wind farms as a condition of consent. Some issues will be site specific however, the wealth of information that could be collected and its ability to improve the assessment of impacts and management of impacts would address to a large degree the uncertainty that plagues the siting of wind farms in New South Wales. This is particularly relevant for a region like Goulburn where high and reliable wind speeds suggest future proposals will be put forward. The proponent is committed to implementing a monitoring program to assist adaptive management of bird and bat impacts onsite. The proponent is also committed to ensuring the maximum use is obtained from monitoring data; the monitoring results would be made available to other wind farm developers upon request.

10.1.7 Implementation of environmental safeguards

The success of the proposal in mitigating environmental impacts hinges on the development and implementation of the Project Environmental Management Plan and its associated Construction and Operation Environmental Management Plans.

Taurus Energy is committed to ensuring the measures developed in these plans are best practice and is committed to working with the Department of Planning and environmental consultants to ensure the best possible result is achieved for the Cullerin Range site. This not only has immediate benefits for the site and locality which will house the project; it will also set a high standard for the development of wind energy resources in the region.

11 ASSESSMENT PERSONNEL

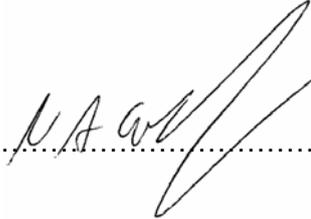
This report was prepared by **nghenvironmental**. Specific sections were drawn from consultants reports or from the proponent, as detailed in the table below.

Table 11.1 Preparation of this document

Section		
1	Executive summary	nghenvironmental
2	Introduction	nghenvironmental
3	Description of the proposal	Taurus Energy (Section 3.4: nghenvironmental)
4	Project justification	Taurus Energy
5	Planning context	nghenvironmental
6	Consultation	nghenvironmental
7	Key issues	
7.1	Scoping and prioritisation of issues	nghenvironmental
7.2	Visual	Scenic Landscape Architecture, nghenvironmental
7.3	Operational noise	Heggies Australia, nghenvironmental
7.4.1	Community impacts	nghenvironmental
7.4.2	Economic impacts	nghenvironmental
7.4.3	Land value impacts	Henderson and Horning Property Consultants, nghenvironmental
7.5	Aboriginal archaeology	NSW Archaeology, nghenvironmental
7.6	Biodiversity	nghenvironmental
7.7	Land use (agriculture, tourism, lifestyle values)	nghenvironmental
7.8.1	Traffic and transport	Bega Duo Designs, nghenvironmental
7.8.2	Aircraft hazard	Taurus Energy
7.8.3	Telecommunication	Taurus Energy
7.9	Bushfire	nghenvironmental
7.10	Cumulative impacts	nghenvironmental
7.11	Removal of infrastructure	nghenvironmental
8	Lesser priority issues	nghenvironmental
8.1	Physical impacts	nghenvironmental
8.2	Construction noise	nghenvironmental
8.3	Safety and health	nghenvironmental
8.4	Non-indigenous heritage	nghenvironmental
8.5	Resource impacts	nghenvironmental
9	Environmental management	nghenvironmental
10	Conclusion	nghenvironmental

Nick Graham-Higgs and Brooke Marshall of *ngh*environmental constitute the document's primary authors. The information contained in this document is neither false nor misleading. All information is considered by the authors to be correct at the time of writing.

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Authors	Experience
Nicholas Graham-Higgs <i>Bachelor of Applied Science</i>	<p>Nick has worked as an environmental planning consultant since 1992, specialising in environmental impact assessment and natural resource management. His work demands an in-depth knowledge of current planning and environmental legislation coupled with a comprehensive understanding of development-related impacts, especially those relating to the development of sustainable power generation facilities, including hydro and wind generated electricity. Nicholas has acquired his knowledge in this field over the last 17 years, during which he has worked with a number of land management organisations within and outside Australia.</p> <p>Much of the work undertaken has been within sensitive areas, including major works for infrastructure development; the augmentation of water supplies at Perisher Range and Adaminaby, the development of mini-hydro plants at Jounama, Khancoban and Geehi and environmental assessment for a wind farm on the Snowy Plains, near Kosciuszko National Park.</p>
Brooke Marshall <i>Bachelor of Natural Resources (Hons)</i>	<p>Since joining nghenvironmental in 2004, Brooke has prepared impact assessment reports relating to residential developments, road construction, water supply infrastructure, river modification and prescribed burning activities. These reports have included threatened flora and fauna species assessments requiring research, fieldwork and GIS components. She has also prepared REFs and EMPs for sensitive areas including sub-alpine areas. Recent projects involve wind farm environmental impact assessment and natural values strategic assessment, both projects were in the Snowy River Shire.</p> <p>Brooke is currently focusing on environmental impact assessment, biodiversity assessments and wildlife management issues. She has carried out comprehensive faunal surveys on the south coast, in the southern tablelands and snowy mountains region and has experience with cage and Elliot traps, hair tubes, spotlighting, call play-back, scat and sign searches and bird / reptile / amphibian searches and anabat recording.</p>

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