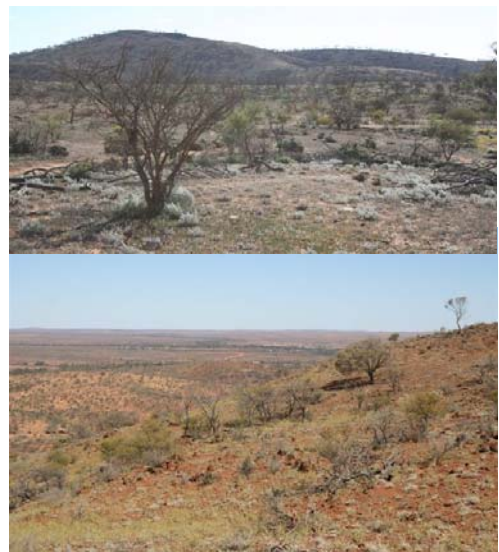




Modification 3 Report

SILVERTON WIND FARM



JULY 2016



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1 INTRODUCTION

1.1 OVERVIEW

1.1.1 Stage 1 Project Approval

The approved Silverton Wind Farm Project includes the construction and operation of 282 wind turbines, and associated infrastructure (Stage 1). The project was approved on 24 May 2009, under Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) (the Approved Project).

1.1.2 Stage 2 Concept Plan Approval

Concept Plan Approval was also granted at that time for the construction, operation and decommissioning of up to an additional 316 wind turbines and associated infrastructure (Stage 2), bring the total to 598 turbines for Stage 1 and 2 combined.

The Project is located in the Barrier Ranges of New South Wales approximately 5 km from the Silverton township and 25 km north-west of Broken Hill.

1.1.3 Modification 3

Modifications are now proposed to the Approved Project, to take advantage of advancements in wind technology since the project was approved. This Modification 3 Report assesses the proposed modifications to the Approved Project. The key modifications are to decrease the number of turbines from **282 to a maximum of 172**, while increasing the dimensions and capacity of each turbine.

The turbines and infrastructure relevant to the Concept Plan Approval (Stage 2) would no longer be developed. The proposed modifications are described in detail in Section 2 of this Report.

This Modification 3 Report considers the impacts of the proposed modifications and has determined they would generally have a lesser environmental impact than the Approved Project. Additional mitigation strategies have been proposed to ensure that any new impacts, where identified, would not be unacceptable or greater in magnitude than allowed by the original Project Approval. Several proposed changes to approval conditions as a result of this Modification Application are proposed where existing Project Approval conditions may no longer be relevant.

The Project is located in the Barrier Ranges of New South Wales approximately 5 km from the Silverton township and 25 km north-west of Broken Hill.

Generally, the modifications proposed would have a lesser environmental impact than the Approved Project.

1.2 THE APPROVED PROJECT

The Silverton Wind Farm Project was originally assessed in the Environmental Assessment (EA) report, finalised in May 2008 (NGH Environmental 2008).

The approved Silverton Wind Farm Project is described in the Preferred Project and Submissions Report (SR), finalised in January 2009 (Silverton Wind Farm Developments, with assistance from NGH Environmental 2009). The SR detailed changes to the exhibited EA, provided the results of additional assessments undertaken to address these modifications, and provided a set of updated Statements of Commitment.

Project Approval for the Silverton Wind Farm was granted to Silverton Wind Farm Developments Proprietary Limited (SWDPL) on 24 May 2009, which included the construction and operation of 282 wind turbines, and associated infrastructure including a 24km transmission line from the site to Broken Hill (NSW Government Department of Planning 2009).

1.3 PREVIOUS MODIFICATIONS

1.3.1 Modification 1

A modification to the Approved Project (documented in Modification Report 1; NGH Environmental 2013) was granted on 11 April 2014 to extend the commencement date of construction (NSW Government Department of Planning 2014). No other elements of the Approved Project were changed as a result of approval of Modification 1, although several conditions in the approval were amended.

1.3.2 Modification 2

A second modification to the project (documented in Modification Report 2; AGL 2016) was granted on 3rd June 2016. This extended the approval, stating that it shall lapse nine years after the date on which approval was granted (revised lapse date, 24 May 2018). No other elements of the Approved Project were changed as a result of approval of this modification. Minor changes were made to conditions in the approval.

1.4 COMMUNITY CONSULTATION

Following AGL's acquisition of the Silverton Wind Farm development proposal in May 2012, AGL engaged with the Silverton community by establishing the Silverton Wind Farm Community Consultative Committee (CCC), and has continued working consultatively with the community, sharing information, discussing topics of interest and addressing issues and concerns. Consultation with the CCC has been undertaken in accordance with the Department of Planning and Environment's *Community Consultative Committee Guidelines*.

Consultation specifically relating to Modification 3 has been undertaken as part of AGL's regular consultation program for the Project. This has included meetings with the CCC, Silverton Village Committee and Broken Hill Council, as well as one on one meetings with pastoralist turbine hosts and two members of the community. Correspondence has been sent to several agencies as well as Silverton community stakeholders. Consultation with the community and other stakeholders is detailed in full in Section 3.11.

Community consultation has occurred with regards to the proposed Project modifications and will continue, in accordance with a Community Stakeholder Engagement Plan.

1.5 PURPOSE AND STRUCTURE OF THIS REPORT

1.5.1 Modification 3

A third modification to the Approved Project is now proposed, being the following:

- Decrease in number of turbines overall (including removal of Stage 2 Concept Approval infrastructure)
- Increasing the capacity and height of remaining turbines
- Additional potential water source for construction
- Potential staging of construction; separating wind farm and electrical transmission scope.
- Changes to conservation status of specific entities, known to occur onsite, since the approval was originally granted (note: this is not a modification to the Approved Project, rather is provided as part of the updated assessment of the Project area).

The modification is described in detail in Section 2.

1.5.2 Scope determined by internal consistency review

Under Section 75W (2) of the EP&A Act, the Minister's approval for a modification is not required if the project as modified will be 'consistent' with the existing approval. An internal consistency review was undertaken to examine the following proposed changes to the project:

- Capacity, height and number of turbines; increasing the capacity and height while decreasing the overall turbine number.
- Water sources for construction; including additional water source.
- Staging of construction; separating wind farm and electrical transmission scope.
- Conservation status of specific entities, known to occur onsite, since the approval.

The review identified several elements of the proposed modification which were potentially inconsistent with the existing approval, and therefore need to be considered in a Modification Report as follows:

1. Changes to the overall project scope

- i Larger turbines than previously specified
- ii Sourcing construction water from additional sources than previously specified

These changes are discussed in Section 2 of this Modification Report.

2. Changes to the assessed level / nature of impacts

Revised assessments for the following issues (ordered as they appeared in the original EA) have been undertaken to assess changes to impacts and investigate if any further mitigation strategies are required:

- i **Visual**
- ii **Noise**
- iii **Bird and bat collision risk assessment**
- iv Biodiversity (vegetation clearance)
- v Hydrology and water quality and soils
- vi Traffic
- vii Indigenous and non-indigenous heritage
- viii Land use impacts
- ix **Aviation**
- x Tourism and lifestyle values
- xi Safety
- xii Community
- xiii Landowner / lease holder arrangements

These issues are evaluated in Section 3 of this Modification Report. Additional consultation, where undertaken, is discussed within these sections. Specialist studies (**bold**) have been prepared to assess visual, noise, bird and bat collision risks and aviation. They are included in full in Appendix B.

1.5.3 Matters raised by Department of Planning and Environment (DPE)

In considering the scope of the Modification 3 Report, a meeting was held on 6 May 2016 with AGL, NGH Environmental and the NSW Department of Planning and Environment (DPE). The section references, where matters required by the DPE are addressed in this report (see Table 1-1 below).

Table 1-1 Issues required by the DPE to be included in the Modification 3 Report

Key issues for consideration		Addressed in this report
General	Sufficient detail from the original project EA to describe overall project impacts.	Section 1.6 briefly describes the Approved Project and provides a context to key impact areas.
	Provide details on the proposed modified layout including site plans and maps at an adequate scale showing: <ul style="list-style-type: none"> • the location of turbines and "development corridor" • existing environmental features, infrastructure, land and dwellings 	Appendix A
	Description of the proposed modification, including project timeline for construction and operation.	Section 2.1
	Justification for modified project including associated benefits.	Section 1.7
	Whether the benefits of the modified project are still material from a strategic policy perspective.	Section 1.7
	Confirm changes in management / mitigation for any issues as a result of changes in land disturbance.	Summarised in Section 5.
	Changes to community enhancement funding / contributions / VPA with Council.	Sections 1.72 and 3.11
Noise	Background noise monitoring data is currently being undertaken.	Section 3.2

Key issues for consideration		Addressed in this report
	Update noise assessment.	Section 3.2
	Ability to comply with contemporary compliance requirements and conditions.	Section 3.2
	Additional mitigation if required.	None required
Visual	Comparative analysis of the visual impacts (approved vs modified project)	Section 3.1
	Identify any changes to the visibility of the project	Section 3.1
	Utilise recognised tools to assess the visual impacts of the proposed modification	Section 3.1
	Identify/review any proposed changes/additional mitigation if required.	None required
Biodiversity	Reflect change in conservation status for Porcupine Grass and Barrier Range Dragon.	Section 2.4
	Revise bird and bat strike risk assessment.	Section 3.3
	Changes/additional mitigation if required.	Section 3.3
Transport	Provide comparison of number/type of vehicles, transport routes, transport timeframes (approved vs modified project.)	Section 2.1 and 2.2 justifies this is not required.
	Update traffic assessment if alternative construction water supply option is proposed	No changes to traffic required.

1.6 SUMMARY OF PROJECT AND IMPACTS (APPROVED PROJECT)

1.6.1 Project description

The Project Approval for Silverton Wind Farm Project includes the construction and operation of 282 wind turbines, and associated infrastructure including a 24km transmission line from the site to Broken Hill. This was referred to as Stage 1. Infrastructure associated with the project includes the following:

- Up to 282 wind turbines, each with three blades mounted on a tubular steel tower and a generator transformer inside or adjacent to each tower
- Electrical connections between wind turbines and the site substations using a combination of underground cable and overhead concrete, timber or steel pole power lines
- Site substations to convert from reticulation voltages (22–66kV) to medium voltages (66–220kV) for connection with the transmission switchyard
- An onsite transmission switchyard that includes high voltage transformers and switchgear for connecting the output of the wind farm to offsite transmission lines
- A new 24 kilometre transmission line connecting the transmission switchyard with TransGrid’s existing Broken Hill substation (20 kilometres off site)
- Onsite control and maintenance buildings, including storage facilities for equipment, materials and spares and workers facilities building
- Internal access tracks, hardstand areas and other associated infrastructure required for the construction, installation and maintenance of the wind farm

The Concept Approval for Silverton Wind Farm Project includes development of an additional 316 turbines and associated infrastructure; bring the total to 598 turbines.

The impacts of the project were investigated and documented in the EA report (NGH Environmental 2008) and updated in the Preferred Project and Submission Report (Silverton Wind Farm Developments 2009). These contained the following specialist reports into visual, noise, biodiversity and heritage impacts:

- A Landscape and Visual Impact Assessment (LVIA) completed by URS and Green Bean Design
- Noise Impact Assessment completed by Heggies
- Biodiversity Assessment completed by NGH Environmental
- An Indigenous and Non Indigenous Heritage Assessment completed by NSW Archaeology

Specific to Stage 1, no environmental impacts were identified which, after the implementation of mitigation strategies were considered to be unacceptable. Key issues related to visual, noise, biodiversity, indigenous heritage and non-indigenous heritage impacts. Impacts relating to these issues are summarised below.

Changes to the type and level of impact resulting from this proposed modification are discussed in Section 3.

1.6.2 Key issues (Approved Project)

Visual

The wind farm would be viewed from up to 55 identified view locations and was assessed to have a moderate visual impact on the landscape character and on people travelling through, visiting and residing in areas surrounding the Project.

The required transmission lines would have a low cumulative impact on the landscape character and on people travelling through or residing in areas surrounding the Project.

Noise

The wind farm would be located in a low population density area with limited residential dwellings that surround the proposed wind farm site. Construction noise was considered to be manageable with the implementation of mitigation measures. Noise modelling of operational noise indicated that infrastructure would be compliant with the relevant noise criteria. The considerable distance between the residential dwellings and the proposed wind farm will provide a buffer during both the construction and operation of the project.

Biodiversity

No threatened plant species or Endangered Ecological Communities (EECs) were identified within areas that would be affected by Stage 1 works¹. However, significant vegetation communities (non-EEC at the time of the assessment) were identified on site and would be impacted by the Project. These included:

- Porcupine Grass / Red Mallee /Gum Coolabah / Hummock Grassland / Low Sparse woodland (now listed as a Critically Endangered Ecological Community, CEEC, under the New South Wales *Threatened Species Conservation Act 1995*).
- Mulga / Red Mallee Shrubland on Rocky Slopes of the Barrier Range.
- Chenopod – Red Mallee Woodland /Shrubland on Gravelly Lower Slopes.

¹ At the time the assessment.

Up to 13 threatened fauna species (birds, mammals and reptiles) were identified in the Project Area. None of these were considered to be significantly impacted by the Project. Impacts to the Tawny Rock Dragon, which was listed as Endangered under the Threatened Species Conservation Act (TSC Act), now known as the Barrier Range Dragon (also listed as Endangered under the TSC Act) were further investigated through additional site surveys. No significant adverse impact to the species was expected to result from the works, with the implementation of specific mitigation measures.

Indigenous heritage

The Aboriginal Heritage survey identified that the Stage 1 area contained an extensive distribution of aboriginal objects. The majority of recorded sites in the Project Area were found to be low or very low density stone artefact distributions and were assessed to be of low archaeological significance. In addition, a number of Aboriginal object locales were identified and assessed to be of low/moderate, moderate or high archaeological significance.

Non indigenous heritage

Non indigenous heritage items were identified at a number of locations within the Project Area however direct impacts would be avoided in relation to all identified heritage items.

1.6.3 Additional issues

The following issues were also considered (by desktop assessment and consultation) for the Project:

- Aviation hazard impacts
- Communication impacts
- Socio-economic impacts
- Traffic and transport impacts
- Electromagnetic fields (EMFs)
- Fire and bushfire impacts
- Hydrological impacts
- Mineral exploration impacts
- Cumulative impacts
- Community wellbeing
- Lifestyle impacts
- Tourism impacts
- Farming and grazing impacts
- Health and safety impacts
- Resource impacts
- Physical impacts
- Film and art
- Land value

All potential impacts relating to these addition issues were considered manageable with the implementation of specific mitigation measures.

1.6.4 Management strategies for impacts

Mitigation measures were developed and prescribed in the original assessment. These centred on avoiding or minimising impacts to identified constraints. These were primarily concerned with biodiversity, Indigenous and non- indigenous heritage impacts. This is reflected in the current turbine site layout which minimises impacts on these areas and through the implementation of environmental management principles that would be applied during the construction, operation and decommissioning phases of the development. A commitment to research (preparation of a recovery plan for the Porcupine Grass- Red Mallee- Gum Coolibah Hummock Grassland vegetation community) and works to improve habitat onsite for the Barrier Range Dragon and associated vegetation was provided, to mitigate residual impacts to this species.

The implementation of mitigation measures would be carried out under an overarching Project Environmental Management Plan comprising a Construction Environmental Management Plan (CEMP) and

an Operation Environmental Management Plan (OEMP). This would contain auditing and reporting requirements.

1.7 PROJECT BENEFITS AND JUSTIFICATION (APPROVED AND MODIFIED PROJECT)

The development of the Silverton Wind Farm will assist in realising the three goals in the NSW Renewable Energy Action Plan which was released in September 2013:

- Deliver renewable energy investment in NSW
- Build community support – AGL will continue engaging with the Silverton township and surrounding areas
- Grow renewable energy expertise – specifically, this Modification Application is seeking to deploy the latest development in wind turbine technology

The proposed changes outlined in this Modification 3 Report do not change the overarching objectives or benefits of the Silverton Wind Farm. Additionally, AGL considers that this project is justified for the reasons included in Modification 2 and shown below.

1.7.1 Renewable energy generation

The Silverton Wind Farm is proposed to have an initial installed capacity of up to 200MW of renewable energy generation. This would produce approximately 700,000 MWh of renewable electricity per year – enough to power more than 120,000 average Australian homes. The project could reduce greenhouse gas emissions by 580,000 tonnes of CO₂e annually which is the equivalent of taking 170,000 cars off the road.

The Silverton Wind Farm site has a high quality wind resource and the project will contribute to meeting the Australian Government, NSW Government and AGL greenhouse gas emissions and renewable energy policies. These include:

- The Australian Government's commitment to reduce the country's greenhouse gas emissions by between 26-28% below 2005 levels by 2050;
- The Australian Government's Renewable Energy Target scheme which aims to source 33,000 GWh of electricity from large-scale renewable power stations;
- The NSW Government's Renewable Energy Action Plan which aims to attract renewable energy investment, build community support and grow renewable energy expertise in the state;
- AGL's Greenhouse Gas Policy in which AGL commits to decarbonise its electricity generation portfolio by 2050 and to continue to invest in new renewable and near-zero emission technologies.

AGL is Australia's largest private developer and operator of renewable energy having already invested \$3 billion in renewable energy investments over the last decade. In addition to this, AGL announced the Powering Australian Renewables Fund (PARF) in February 2016 to support the commitments made in its Greenhouse Gas Policy.

The PARF is an innovative funding vehicle designed to stimulate investment in renewable energy projects. Instead of financing single renewable assets, the PARF provides an opportunity for investors to finance a portfolio of renewable assets. The PARF aims to initially invest in around 1,000 MW of large-scale

renewable assets with a value of up to \$3 billion. It is anticipated that the Silverton Wind Farm will be the first greenfield investment made by the PARF.

1.7.2 Economic and community benefits

The capital value of the Silverton Wind Farm will be between \$300 million and \$500 million. Construction of the project will provide significant benefit to the local and NSW economies. It is estimated² that the project could generate:

- Up to 150 jobs during the peak of construction, with the development of a local industry participation plan for the project.
- Regional project development and construction expenditure in the order of \$40 million.
- A community fund of approximately \$15,000 per year to assist in funding community and environmental projects that provide on-going benefits to the Silverton community.
- Increased local expenditure on food and accommodation due to the influx of workers to the region.
- Improvement in local infrastructure in the Silverton region.

The construction of the project will provide protection and improved management of sensitive local biodiversity features including the Barrier Range Dragon and a previously unrecorded spinifex ecological community.

The proposed changes outlined in this Modification 3 Report do not change the overarching objectives or benefits of the Silverton Wind Farm. The proposal would generate renewable energy and result in substantive community and economic benefits.

² Based on analysis of the economic impact of AGL's Hallett wind farms by Sinclair Knight Merz:
<https://www.agl.com.au/~media/AGL/About%20AGL/Documents/How%20We%20Source%20Energy/Wind%20Environment/Coopers%20Gap%20Wind%20Farm/Assessment%20and%20Reports/2011/Missing%20PDFs/South%20Australia%20Economic%20Impact%20Report%20Halletts.pdf>

2 DESCRIPTION OF MODIFICATION 3

The key changes proposed to the project and addressed in this Modification Report include:

- Fewer larger turbines than previously specified.
- Option of sourcing construction water from the Essential Water pipeline.
- Staging of construction; separating wind farm and electrical transmission scope.

These changes are described in detail below and assessed, where required, in Section 3. The revised indicative turbine layout is provided Appendix A.1.

Additionally, since Project Approval was granted, there have been changes to the conservation status of endangered species and communities identified as being present at the site. These have also been considered in this report. While not a change to the project, as such, this is included because of the significance of these issues to management strategies committed to as part of the Approved Project.

A summary of the changes to the Approved Project is provided below and discussed in detail in this section.

Table 2-1 Changes between Approved Project and Modification 3

Infrastructure component as described in the Approved Project	Change under Modification 3
Up to 282 wind turbines, each with three blades mounted on a tubular steel tower and a generator transformer inside or adjacent to each tower.	Up to 172 wind turbines (reduction of up to 110 turbines).
Electrical connections between wind turbines and the site substations using a combination of underground cable and overhead concrete, timber or steel pole power lines.	No change.
Site substations to convert from reticulation voltages (22–66kV) to medium voltages (66–220kV) for connection with the transmission switchyard.	No change.
An onsite transmission switchyard that includes high voltage transformers and switchgear for connecting the output of the wind farm to offsite transmission lines.	No change.
A new 24 kilometre transmission line connecting the transmission switchyard with TransGrid’s existing Broken Hill substation (20 kilometres off site).	No change. Refer Appendix A.1 Revised Modification 3 Layout.
Onsite control and maintenance buildings, including storage facilities for equipment, materials and spares and workers facilities building.	No change.
Internal access tracks, hardstand areas and other associated infrastructure required for the construction, installation and maintenance of the wind farm.	Reduced length of internal tracks required, to access reduced turbine number. Refer Appendix A.1 Revised Modification 3 Layout for indicative access track layout.

2.1 FEWER, LARGER TURBINES

2.1.1 Turbine parameters

The turbines now being considered are larger than those described for the Approved Project. In summary, the turbines would be modified as follows:

- Increase capacity of turbines utilised to a maximum of 5 MW.
- Increase maximum rotor diameter to approximately 140m.
- Increase the maximum turbine tip height to 180m.
- Decrease number of Stage 1 turbines.
- Removal of Stage 2 turbines and associated infrastructure.

Increase capacity of turbines utilised to 5 MW

The EA identified and considered a range of turbine models. The highest turbine capacity under consideration was the Siemens SW107 at 3.6 MW. The proposed generating capacity increase is 1.4 MW higher than that described in the EA. This would result in an increase of 28% in the greatest capacity originally proposed, per turbine. Despite the increased size of turbine proposed, the overall project capacity of the project would not increase.

Increase rotor diameter to approximately 140m

A range of turbine models were identified as under consideration (Table 3-1 EA). The largest rotor diameter under consideration was the Siemens SW107 at 107m. The proposed increase to rotor diameter is approximately 140m, or 33m longer than described in the EA, this being 23% longer than originally proposed. The project description section of the EA stated that the actual turbines installed may differ from those described.

Increase the turbine tip height to 180m

The maximum tip height proposed for the site was 155 metres above ground level (Section 3.2.1, NGH Environmental 2008). The proposed turbine tip height of approximately 180m, or 25m higher than described in the EA, is an increase of 16%.

2.1.2 Decrease in number turbines (282 reduced to a maximum of 172, Stage 1)

The Preferred Project and Submissions Report (Silverton Wind Farm Developments 2009) describes Stage 1 of the Silverton Wind Farm as 282 wind turbines (120 described in the EA and a further 162 elevated from Concept Approval to Project Approval in the Preferred Project and Submissions Report). This Modification proposes to reduce the total number of turbines to 172. The Stage 2 turbines (an additional 316 which took the total turbine number to 598) and associated infrastructure would not be developed.

This is a substantial reduction in turbine number, being only 61% of the original number proposed for Stage 1 in the Preferred Project Report and 29% of the full Project and Concept Plan Approval.

It is noted that the number of turbines for the initial install capacity (refer to Section 1.7.1) will likely be less than 172. The final number of turbines (which will remain within the approved disturbance footprints) will be known once the proponent has selected a construction tenderer. Any reduction in turbine numbers in the final layout would have a proportionate reduction in environmental impacts.

At least 110 fewer turbines would be constructed as a result of developing the Modification 3 Layout.

Turbines

In terms of quantifying the ground disturbance required to construct the wind turbines, the EA and SR had assumed a per turbine footing impact area of 15 x 15 m and an associated access and crane stand area of 22 m x 40 m. For the approved 282 turbines in Stage 1, this resulted in an impact area of approximately 31 ha.

While turbines would still be constructed within the micro siting allowance of the approved locations, the turbine footing impact areas are likely to increase on account of the larger turbines. AGL have confirmed that the larger turbine footing would have a typical diameter of 30 m (18-20 m with a 5m buffer) and typically an associated access and crane stand area of 30 m x 70 m. For a reduced number of turbines (up to 172), this results in an impact area of approximately 48.3 ha. This is an increase of approximately 17.1 ha or 55%.

Access tracks

Internal access tracks were assumed in the EA and SR to be 6m wide. For a total of 208.45 km of track, this equated to approximately 124.87 ha of disturbance.

To estimate the track impact areas, on account of the reduced number of wind turbines, tracks unlikely to be required have been deleted producing a reduced track length of 177 km. Using the same track width (6m), the revised impact area for track development calculated using GIS software would be 97.2 ha. This is a decrease of approximately 27.67 ha or 22%.

As per the original EA, it is noted that tracks will in some cases be required to be wider than 6m (for overtaking lanes) and in some cases less (for micro siting through biodiversity constraint areas). Further, it is noted that some access tracks may not be constructed, or their location changed within the Project Area, once the proponent selects the final tenderer, a constructability assessment is carried out and the environmental management strategies for avoidance and mitigation of impacts to cultural heritage, native vegetation, fauna and water/soil are developed and implemented. However, any changes to access tracks within the Project Area will:

1. Be carried out in consultation with relevant leaseholders;
2. Achieve a reduction in the overall area of disturbance from the Approved Project (as modified);
3. Will comply with:
 - i The Project Approval conditions;
 - ii Statements of Commitment (including commitments regarding visual impact, avoiding and minimising impacts to EEC, cultural heritage and soil/water impacts);and
4. A final plan will be submitted to the Secretary prior to the commencement of construction.

A net reduction of the disturbance footprint (turbine and tracks) by approximately 10 hectares has been estimated, in consideration of the Modification 3 Layout, Appendix A.1.

There would be no change in offsite haulage / access requirements.

Spatial arrangement

In terms of the spatial arrangement of the impact areas, the new layout would be more consolidated than the original layout. The most northern and southern sites would not be developed, slightly reducing the extent of the project area. Instead of up to 282 separate turbine sites, up to 172 sites would be constructed. Refer to Appendix A.1. Turbine sites coloured red would no longer be developed.

2.1.3 Requirement for further assessment

Section 3 of this Modification Report considers the implications of these changes to turbine size, impact area and spatial arrangement. NGH Environmental identified the following potential areas of relevance:

- Visual – changes to view shed and appearance of turbines.
- Noise – changes to operational noise.
- Biodiversity – changes to impact areas and bird and bat collision risk due to increased rotor diameters.
- Hydrology and water quality and soils – changes to the proximity of impact areas to sensitive areas (steep slopes, sites near waterways).
- Indigenous and non-indigenous heritage - changes to the proximity of impact areas to identified heritage sites³.
- Land use - changes to the proximity of impact areas to agricultural land.
- Aviation – changes to aviation risks and consultation requirements.

It is noted that the larger sized turbines are not anticipated to increase the construction haulage traffic volume and configuration (ie. additional oversized trucks). In fact, a reduction in the wind turbine numbers will reduce the haulage requirements relating to the transportation of infrastructure to site. No further assessment is provided with regard to traffic and access in relation to turbine size.

Haulage requirements of turbine infrastructure to the site would be reduced due to lower turbine numbers.

2.2 SOURCING CONSTRUCTION WATER FROM PIPELINE

The EA described the primary construction water supply as Umberumberka Reservoir, owned by Essential Energy. Ground water use was considered unlikely to be required. The SR, which updated the project description, specified that the water from Umberumberka Reservoir would be obtained via a temporary water pipeline, subject to the granting of all necessary licenses and permits (SR, Section 3).

AGL received several submissions on Modification 2 which raised the issue of construction water, and concern over the use of the Umberumberka Reservoir. While the potential source of project construction water was not relevant to Modification 2, AGL now proposes a further construction water option as part of Modification 3, in response to previous community feedback and taking into account the status of the Umberumberka Reservoir.

³ The Project Approval requires some sites be avoided whereas for others 'mitigated impacts' are allowed. The layout would need to ensure the required sites are avoided but may have a lesser impact if it can also avoid a greater proportion of sites where 'mitigated impacts' are allowed.

The modified project is proposing to secure primary construction water from the Stephens Creek Reservoir to Umberumberka Reservoir pipeline within the Project Area, subject to the grant of all necessary approvals and permits from Essential Water. Existing access points along the pipeline would be utilised, where practicable.

This option is considered to provide a more reliable water source for the project and would avoid the haulage of water from outside of the Project Area. Umberumberka Reservoir is currently at very low levels and extraction from this water supply (as originally proposed) is not currently possible. No additional impacts to Umberumberka Reservoir would apply under this option.

No additional water haulage would be required to source the construction water. The project, as approved, was anticipated to generate an additional 290 vehicles per day on the highways and heavy vehicle routes through Broken Hill (EA 2008). Traffic numbers, types of vehicles, transport routes and transport timeframes would remain the same as previously assessed.

The project would still meet its conditions of Approval by specifying this option in the project specific Water Management Plan, to be prepared to demonstrate adequate water supplies and source and associated licences / approvals (NSW Government Department of Planning 2014; Modification 1 approval, condition 5.3 f).

A more secure and reliable water supply option is proposed that would negate the need to extract water from Umberumberka Reservoir, an important water source for the Silverton and Broken Hill communities.

Water would be extracted from within the Project Area. No additional haulage would occur from this proposed change.

2.2.1 Requirement for further assessment

No additional water haulage would be required outside the Project Area, and therefore no additional traffic and transport assessment is required.

2.3 STAGING

The EA described the project to be staged such that the civil works to erect the wind turbines would occur in parallel with substation and grid connection construction works. The project now proposes to modify this arrangement to allow the construction works to be completed in separate stages, for example:

1. Transmission line and substation works (includes works on the wind farm site as well as offsite, within the proposed transmission corridors)
2. Wind turbines and remaining infrastructure (contained within the wind farm site).

This staging would allow for commencement of the transmission line and wind farm construction processes separately; under separate contracts, managed by separate contractors and under separate construction environmental management documents.

The following timeline is currently proposed for construction and operation:

Table 2-2 Current proposed time line for construction and operation

Milestone	Approximate date
Selection of Preferred Tenderer	October 2016
Project Investment Commitment	Early 2017
Mobilisation to Site	April 2017
Commencement of Commissioning	April 2018
Commencement of Operations	October 2018

2.3.1 Requirement for further assessment

Staging

The proposed changes to the staging of the construction works are considered to be consistent with the overall project objectives and would not result in any additional impacts.

To ensure the Department is kept informed and updated in relation to staging and project timeline, the following additional mitigation measures would be employed for the project:

- Prior to the commencement of the construction, operation and/or decommissioning of the development, the Proponent will notify the Department in writing of the date of commencement.
- If the construction, operation and/or decommissioning of the development is to be staged, then the Proponent will:
 - notify the Department in writing prior to the commencement of the relevant stage, and clearly identify the development that would be carried out during the relevant stage; and
 - inform the local community and the Community Consultation Committee about the proposed staging plans
- All strategies, plans or programs required by this approval would be submitted to the Department as required on a progressive basis and prior to the relevant construction works occurring. This includes any revised strategies, plans or programs that may be updated during the construction phase.

Early works / preconstruction

Additionally, to clarify works that can occur prior to the commencement of project construction, it is proposed that the following definition be added to the Approval, in line with recent wind farm approvals:

Pre-construction minor works include the following activities:

- Building/road dilapidation surveys
- Investigative drilling, excavation or salvage
- Minor clearing or translocation of native vegetation
- Establishing temporary site office (in locations meeting the criteria identified in the conditions of this approval)
- Installation of environmental impact mitigation measures, fencing, enabling works; and
- Minor access roads and minor adjustments to services/utilities, etc.

Conditions that require actions 'prior to commencement of construction' would therefore **not** apply to any preconstruction minor works.

Specific external and initial access roads which are proposed to be upgraded or constructed prior to the commencement of construction, include:

- Upgrade of Silverton Road
- Intersection of Daydream Road and Silverton Road
- Upgrade of Daydream Mine Road
- Construction of access road off Daydream Road into project site for access to temporary office site.

These proposed changes to conditions are included in the summary of additional mitigation measures in Section 4.

2.4 CONSERVATION STATUS OF SPECIFIC ENTITIES SINCE THE APPROVAL

Since the original assessment, the status / naming of two key biodiversity entities recorded onsite have been revised as follows:

1. Porcupine Grass/Red Mallee/Gum Coolibah/Hummock Grassland/Low Sparse Woodland (undescribed) now fits within the Porcupine Grass - Red Mallee - Gum Coolabah Hummock Grassland / Low Sparse Woodland in the Broken Hill Complex Bioregion - Critically Endangered Ecological Community (CEEC) listing.
2. The Tawny Dragon (*Ctenophorus decresii*), which was listed as Endangered in NSW, has been reclassified as the Barrier Range Dragon (*Ctenophorus mirrityana*). It remains listed as Endangered under the NSW TSC Act.

2.4.1 Porcupine Grass - Red Mallee - Gum Coolabah Hummock Grassland / Low Sparse Woodland

A new vegetation community was identified during the biodiversity assessment carried out for Silverton Wind Farm. This has subsequently been determined as a Critically Endangered Ecological Community under the NSW Threatened Species Conservation Act, and listed as the Porcupine Grass - Red Mallee - Gum Coolabah hummock grassland / low sparse woodland in the Broken Hill Complex Bioregion - critically endangered ecological community listing (Porcupine Grass CEEC).

The biodiversity assessment undertaken by NGH Environmental (2008b) identified that this community was undescribed and as such had not been identified elsewhere in NSW. It assessed that the study area provides the only known occurrence of this vegetation community in NSW and was therefore highly significant.

While it was not listed as an EEC at the time of the assessment, the occurrence of this vegetation community was considered to be significant and was treated as a constraint in the layout proposed.

2.4.2 Barrier Range Dragon

Extensive surveys were undertaken by NGH Environmental for Silverton Wind Farm Developments of the wind farm site. During these surveys the Barrier Range Dragon (formerly identified as *Ctenophorus decresii*) was identified at the site.

In 2013, taxonomic assessment (McLean et al 2013) identified that the species recorded in the Barrier Range, while being a member of the *C. decresii* species complex, is a new species and has since been identified as *Ctenophorus mirrityana*. This new species, which was formerly recognized as an outlying population of *C. decresii* is now known from four locations, including Mutawintji National Park, Broken Hill, Koonenberry Mountain and the Barrier Range (McLean et al 2013¹).

The biodiversity assessment prepared by NGH Environmental recognises the significance of the species. At the time of the assessment it was assessed that the only known population of this dragon, in NSW, was a population of at least 50 animals in Mutawintji National Park and a single museum specimen from Koonenberry Mountain.

At the time of the assessment, *C. decresii* was listed as Endangered under the NSW *Threatened Species Conservation Act* (TSC Act). The new species, *C. mirrityana* has an equivalent listing (Endangered) under the TSC Act.

NGH Environmental (2008a) assessed that the population of the study area was the NSW stronghold for this species. Therefore, the very high significance of this species has been recognised in the environmental assessment completed for Silverton Wind Farm.

2.4.3 Requirement for further assessment

Both threatened entities were treated as significant during the EA and Preferred Project Submission Report. The changes to the threatened entity listing do not affect the overall project objectives or scope. The following management strategies for minimising and mitigating impacts remain relevant for both entities:

- Design of layout of roads and turbine hardstands to minimise risk of impact to these threatened entities.
- Management of impacts (eg. from deposition of spoil, sediment and traffic movement) in Tawny Dragon hotspots.
- Application of a buffer to identified Tawny Dragon habitat.
- Preparation and implementation a goat management plan across vegetation in the stage one area with a particular focus on the Porcupine Grass CEEC.
- Preparation and implementation of a recovery plan for the Porcupine Grass - Red Mallee - Gum Coolibah hummock grassland vegetation community. This plan would aim to achieve a net gain within this ecological community.

No new management measures would be recommended on the basis of the conservation status changes. Impacts to these species as a result of changes to turbine parameters and development footprint are assessed in Section 3.4.

As a precautionary exercise, an updated search of the Department of the Environment Protected Matters search tool was undertaken on the 30 June 2016 to determine if any species listed under the EPBC Act since the Project Approval are known to occur in proximity to the site and could be potentially impacted. An additional one flora species and 3 fauna species were returned from the search as follows:

- Corben's Long-Eared Bat (*Nyctophilus corbeni*)
- Grey Wagtail (*Motacilla cinerea*)
- Yellow Wagtail (*Motacilla flava*)
- *Frankenia plicata*

Three Wetlands of International importance were also returned from the search:

- Banrock station wetland complex
- Riverland
- The Coorong, and Lakes Alexandrina and Albert Wetland.

The results of the search and a brief assessment of the impacts is included in Appendix C. The likelihood of each of these entities being impacted by Modification 3 is considered to be low.

The likelihood of impacts on MNES by Modification 3 is considered to be low, and therefore no referral under the EBPC Act is considered to be necessary.

3 CHANGES TO THE NATURE AND LEVEL OF IMPACT

Changes to the assessed nature and level of impact, as a consequence of the changes proposed in Section 2, are assessed below.

Revised specialist reports addressing the Modification 3 Report indicative layout have been prepared for visual, noise, aviation and bird and bad collision risk. These are provided in Appendix B and summarised below in terms of:

- Any additional potential impact types
- Any change to the level of impact
- Any changes to the mitigation strategies required to appropriately manage impacts

Desktop assessments have been undertaken to assess other potential impact areas. Where possible, the format of the EA is followed in terms of chapter sequence.

3.1 VISUAL

Green Bean Design Pty Ltd (GBD) was commissioned on behalf of Silverton Wind Farm Developments Pty Ltd to prepare a Visual Impact Assessment (VIA) report for the Silverton Wind Farm Modification 3 Application.

The following approach was undertaken:

- Desktop study reviewing the approved and proposed Mod-3 wind turbine layout.
- Preparation of a ZTV (Zone of Theoretical Visibility) diagram to illustrate the theoretical visibility of the original Stage 1 and Stage 2 wind turbines (tip height at 155 metres) and the proposed Mod-3 wind turbines (tip height at 180 metres).
- Assessment of significance of residual visual effects.
- Preparation of photomontages and illustrative figures including a shadow flicker diagram.

The review was undertaken based on the Landscape and Visual Impact Assessment Report that was exhibited in the Environmental Assessment (2008). This report assessed the impact associated with 598 turbines and is considered to fully address the Landscape and Visual Impact Assessment of the Preferred Project Stage 1 Project Approval and Stage 2 Concept Approval.

This section summarises the Modification 3 VIA, which is included in full in Appendix B.1.

3.1.1 Potential impact types

Visual effect

The VIA has been prepared to assess the potential visual effect of the proposed Modification 3 amendments to increase tip height to a maximum 180m against the Approved Project. To determine the visual impacts, Zone of Theoretical Visibility (ZTV) diagrams were prepared and an assessment of twelve residential dwellings within or proximate to 5 km of a wind turbine proposed in the Modification 3 Layout were undertaken.

The magnitude of the visual effect was measured using the criteria in Table 3-1 below.

Table 3-1: Criteria used for magnitude of visual effect of Silverton Wind Farm (SWF)

Visual effect	Magnitude
Amendments to the approved SWF would result in a major and prominent visual effect and introduce elements that contrast, or are not in character with the approved SWF development.	High
Amendments to the approved SWF would result in a partial visual effect and introduce elements which may be prominent, but not completely out of character with the approved SWF development.	Medium
Amendments to the approved SWF would result in minor visual effects and introduce elements which are not prominent or out of character with the approved SWF development.	Low
Amendments to the approved SWF would result in a very minor visual effect and introduce elements which are not prominent or uncharacteristic of the approved SWF development. There would likely be 'no change' to the approved SWF visual effect.	Negligible

Night time obstacle lighting

Night time obstacle lighting can pose a risk to civil aviation operations in the vicinity of the wind farm. It should be noted that specialist aviation advice does not recommend the installation of obstacle lights at this site (refer Section 3.8 and Appendix B.4).

Shadow flicker and blade glint

Due to their height, wind turbines can cast shadows on surrounding areas at a significant distance from the base of the wind turbine tower. Coupled with this, the moving blades create moving shadows. When viewed from a stationary position, the moving shadows appear as a flicker giving rise to the phenomenon of 'shadow flicker'. When the sun is low in the sky the length of the shadows increases, increasing the shadow flicker affected area around the wind turbine. Blade glint happens when the surface of wind turbine blades reflects the sun's light. Blade glint is not generally a problem for modern wind turbines, provided the blades are coated with a non-reflective paint. A shadow flicker diagram has been prepared for the Modification 3 Layout and is included in Appendix B.1.

3.1.2 Level of impact for the Approved versus Modified Project

Visual impacts

Table 3-2 sets out the assessment of visual effects from view locations up to 5 km from the Approved Project. Their locations are illustrated in Figure 3-1 and Figure 3-2, along with the full set of approved turbine locations and those that would be retained under this Modification 3.

The VIA considers the potential for the Modification 3 Layout to change the magnitude of visual effect associated with the original LVIA assessment using the criteria set out in Table 3-1 above.

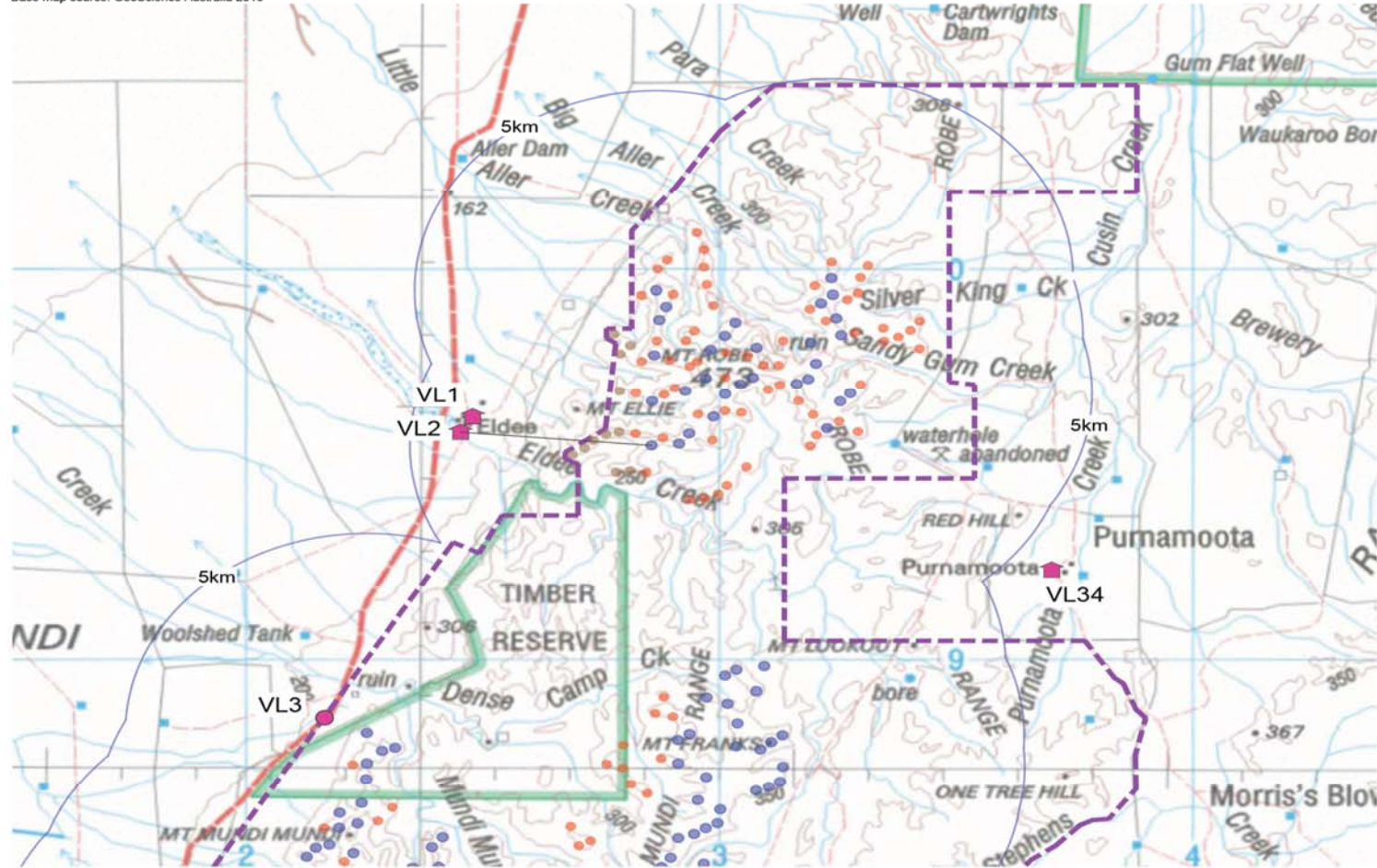
Four photomontages have been prepared to illustrate the location and extent of wind turbines for the Modification 3 turbine layout (Figure 10 of Appendix B.1). Please note that Photomontages 2-4 of Figure 10 compares the Modification 3 layout (ie, 172 turbines) to Stage 1 of the Approved Project only (ie, 120 turbines). For completeness, Section 5.3 of the Preferred Project and Submissions Report (2009) shows photomontages of the full Approved Project (282 turbines). However, as these photomontages were taken from different locations, they have not been reproduced in the VIA for comparison purposes.

Table 3-2: Visual effects matrix

Receiver location	Category of receiver location	Approximate distance to Modification 3 Layout wind turbine	Modification 3 layout assessment	Magnitude of changed visual effect
VL2a	Non residential location	3.8 km	Views toward the project would be altered by the removal of wind turbines within the cluster closest to the view location/dwelling. There would be limited change in the composition or contrast between the approved Project and the proposed Modification 3 Application and the surrounding landscape.	Low
VL2	Non associated residential dwelling	4.0 km		
VL9	Non associated residential dwelling	2.7 km		
VL19 – VL22	Non associated residential dwellings	4.4 km		
VL3	Motorist	900 m	The observable scale of change would be limited by distance between the location and closest wind turbine. There would be limited change in the composition or contrast between the Approved Project and proposed Modification 3 Application and the surrounding landscape.	Low
VL6	Non associated residential dwelling	1.5 km		
VL7	Motorist	2.7 km		
VL31	Motorist	7.9 km		
VL32	Motorist	5.0 km		
VL5	Visitors at Umberumberka reservoir car park and amenities building.	1.3 km	The observable scale of change would be limited by distance between the location and closest wind turbine. There would be very limited change in the composition or contrast between the approved and proposed Mod-3 development and the surrounding landscape.	Low
VL8	Lookout - visitor	3.2 km		
VL26	Non residential location, cemetery	2.9 km		
VL34	Non associated residential dwelling	6.0 km		

Receiver location	Category of receiver location	Approximate distance to Modification 3 Layout wind turbine	Modification 3 layout assessment	Magnitude of changed visual effect
VL27	Non associated residential location	5.0 km	<p>The observable scale of change would be limited by distance between the location and closest wind turbine. Views toward the Approved Project would be altered by the removal of wind turbines within the cluster closest to the dwelling. There would be very limited change in the composition or contrast between the approved and proposed Modification 3 Application and the surrounding landscape.</p> <p>The removal of Stage 2 wind turbines would reduce the level of visual impact from High to a Medium.</p>	Low

Base map source: GeoScience Australia 2016



Legend

- Approved SWF wind turbine layout subject to Mod-3 (indicative location)
- Approved SWF wind turbine not included in Mod-3 application (indicative location)
- SWF wind farm project boundary
- 5km distance from SWF wind turbine
- 🏠 Residential dwelling within 5km of approved SWF wind turbine
- Non residential view location within 5km of approved SWF wind turbine

Note: All house locations are indicative only



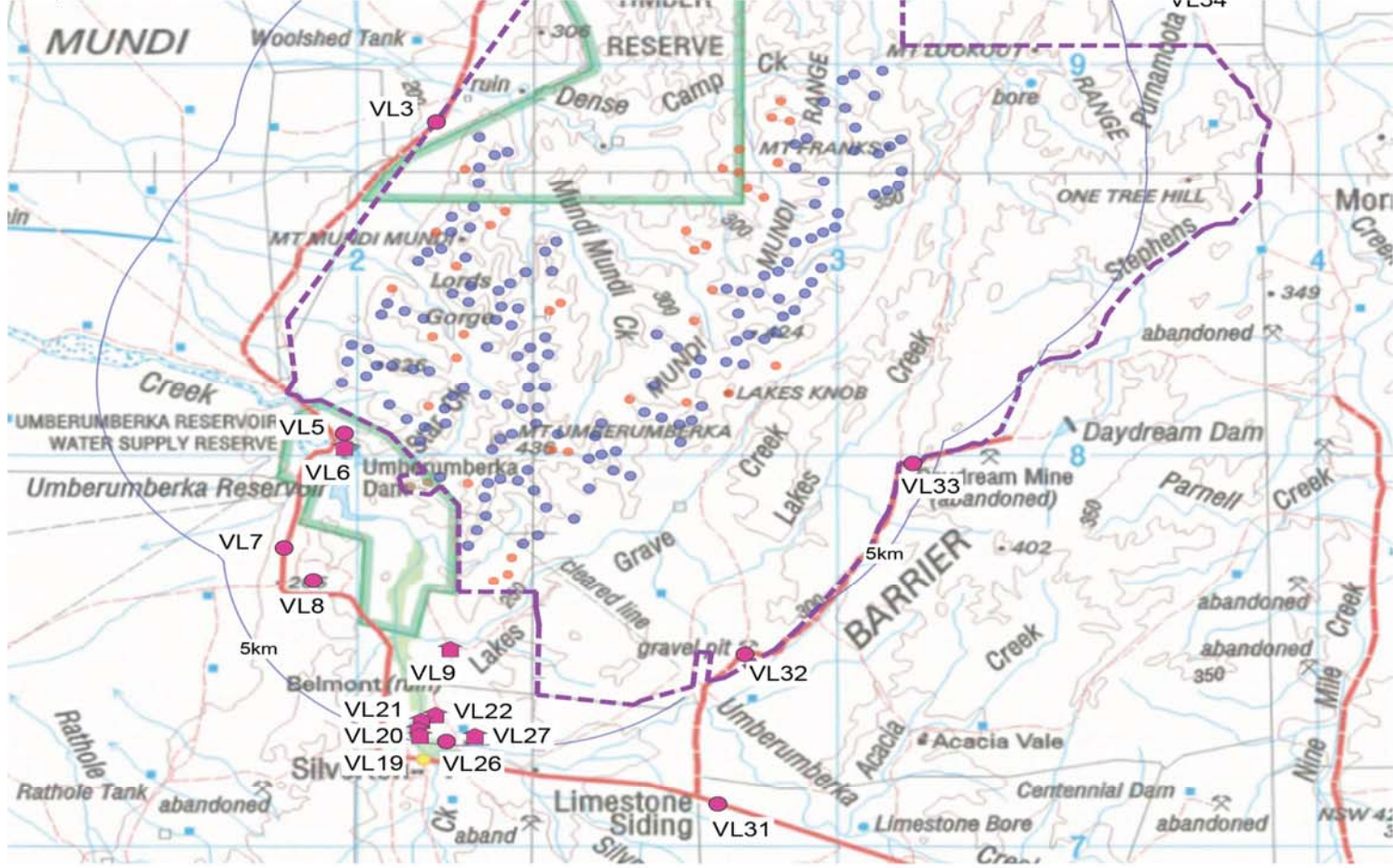
Figure 2 SWF Approved and Mod-3 wind turbine layout - detail north

Silverton Wind Farm Mod-3 Visual Impact Assessment



Figure 3-1 Approved and retained under Mod-3 wind turbines – north view locations (source GB VIA, Appendix B.1).

Base map source: GeoScience Australia 2016



Legend

- Approved SWF wind turbine layout subject to Mod-3 (indicative location)
- Approved SWF wind turbine not included in Mod-3 application (indicative location)
- - - SWF wind farm project boundary
- 5km distance from SWF wind turbine
- Residential dwelling within 5km of approved SWF wind turbine
- Non residential view location within 5km of approved SWF wind turbine

Note: All house locations are indicative only



Figure 3 SWF Approved and Mod-3 wind turbine layout

Silverton Wind Farm Mod-3 Visual Impact Assessment



Figure 3-2 Approved and retained under Mod-3 wind turbines – south view locations (source GB VIA, Appendix B.1).

Night time obstacle lighting

The aviation assessment (summarised in Section 3.8 and provided in full in Appendix B.4) has assessed that the risk to civil aviation operation in the vicinity of the wind farm is very low. The aviation assessment considers that the installation of obstacles lights is not required in accordance with CASA MOS 139.

The installation of obstacles lights is not required in accordance with CASA MOS 139.

Shadow flicker and blade glint

The proposed Modification 3 Layout shadow flicker diagram illustrates that none of the non-associated residential dwellings surrounding the proposed wind turbines would experience shadow flicker in excess of 30 hours per year.

This VIA determined that no non-associated residential dwellings surrounding the wind turbines would experience shadow flicker. This assessment also determined that blade glint would not be an issue subject to the correct surface treatment of wind turbine structures.

3.1.3 Mitigation strategies

A review of the conditions of approval relevant to visual amenity impacts found that the modification is consistent with the Project Approval and the conditions of approval. No additional conditions or mitigation strategies are required however, some existing Project Approval conditions may no longer be required / may be amended. These conditions are listed in Section 4.

Conclusion

As proposed modifications to the Approved Project are considered to result in low level visual effects, and introduce elements which are neither prominent nor out of character with the Approved Project, the potential for the proposed Modification 3 Layout wind turbines to result in any additional or cumulative visual effects is considered to be negligible.

The overall visual impact has been assessed as being less than the approved layout, due to the reduced number of turbines proposed and the removal of some turbines closest to the Silverton township.

Post Script:

Further layout modification

After finalisation of the Visual Impact Assessment (VIA), a further turbine layout change was made: of the Approved turbine locations, that A26 be retained and A33 be removed. This is now reflected in Appendix A.1 of this Modification Report but not within the VIA. In consideration of the location of these two turbines (shown in the figure below), it is NGH Environmental's assessment that this change would not alter the conclusions of the VIA given that:

- A26 is not on the edge of the layout and its inclusion would therefore not bring infrastructure any closer to any nearby receivers. The view from assessed location of V3, the closest location to this turbine in the VIA, would not be materially changed by the retention of this turbine location. This location is not a residence.
- A33 is within a cluster of turbines and its removal would, if discernible from V5, a residential dwelling, result in less visual impact.

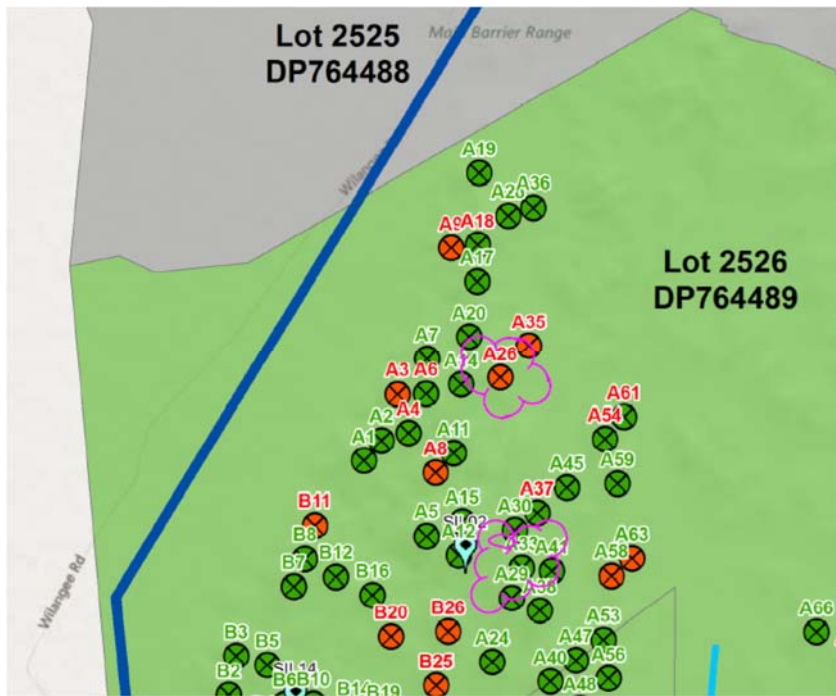


Figure 3-3 Layout assessed in the VIA, showing the final layout modification now included in Appendix A.1 map; that A26 be included and A33 be deleted.

Distance to key receivers

To assist the reader, revised distances from infrastructure components have been determined by NGH Environmental with reference to the Modification 3 layout as shown in Table 3-3, below:

Table 3-3 Distances from infrastructure components

Receiver	Distance to closest Modification 3 infrastructure component
SL3/BG1 - Purnamoota Station (SL3)	2.1 km east of access tracks
BG2 – Daydream Mine	4.7 km east of access tracks
S24a/BG3 – Penrose Park N (S24a)	5.3 km south of Turbine A013
S24b/BG4 – Penrose Park S (S24b)	5.3km south of Turbine A013
SL9/BG5 - Belmont Station (SL9)	2.6 km south of Turbine A013
SL6/BG6 - Umberumberka (SL6)	1.6 km west of Turbine B009
SL2/BG7 – Eldee Station (SL2)	3.8 km west of Turbine PO72
Living Desert and Sculptures	10 km south-west of transmission line

These receivers are mapped in Appendix A.4.

3.2 NOISE

SLR Consulting Australia Pty Ltd (SLR) was commissioned to complete a Noise Impact Assessment for the Silverton Wind Farm Modification 3 Application.

The following approach was undertaken:

- Community feedback - in response to a request from a local community feedback, additional comprehensive background noise monitoring has been undertaken. Background noise monitoring data has been re-collected in the region surrounding the project in order to establish a current, comprehensive data set.
- Legislation and guidelines - the noise criteria adopted for the original Noise Impact Assessment for the Silverton Wind Farm EIS in 2008 as well as this updated assessment are based on the South Australia EPA *Noise Guidelines for Wind Farms, 2003* (SA EPA Guidelines). The SA EPA Guidelines are still the current assessment guideline adopted in NSW. In December 2011 NSW Department of Planning and Infrastructure released a document for consultation, the *Draft NSW Planning Guidelines – Wind Farms*, which included “Appendix B: NSW wind farm noise guidelines”. Whilst these guidelines currently remain in draft status, the approach and methodology undertaken in this updated assessment of Silverton Wind Farm are consistent with the requirements of the draft guidelines.
- Assessment of tonality and infrasound
- Assessment of noise model predictions against noise criteria

The assessment was undertaken based on the Modification 3 Layout provided in Appendix A.1. This section summarises the Modification 3 Noise Impact Assessment, which is included in full in Appendix B.2.

3.2.1 Background noise monitoring

Background noise monitoring was completed at seven locations considered representative of the nearest receptors to the Silverton Wind Farm. The monitoring sites are shown in Appendix B.2 and tabulated below.

Table 3-4 Monitoring locations

Receptor ID	BG ID	Location	Description
SL3	BG1	Purnamoota Station	Project involved landholder residence located to the north-east of the project.
	BG2	Daydream Mine	Historic mine tourist attraction, non-residential, although frequented by the public.
S24a	BG3	Penrose Park N	Penrose Park is a Caravan / Camping park located on north side of Silverton township. This location is at the northern side of Penrose Park and is intended as being indicative of the noise conditions experienced at residential properties on the northern fringe of Silverton township.
S24b	BG4	Penrose Park S	Penrose Park is a Caravan / Camping park located on north side of Silverton township.

Receptor ID	BG ID	Location	Description
			This location is at the southern side of Penrose Park and is intended as being indicative of the noise conditions experienced in the Silverton township. This location was monitored in 2007 for the original EA.
SL9	BG5	Belmont Station	Project involved landholder residence located to the south of the project.
SL6	BG6	Umberumberka	Caretaker residence to Umberumberka Reservoir located to the south-west of the project. This location was monitored in 2007 for the original EA.
SL2	BG7	Eldee Station	Project involved landholder residence located to the north-west of the project. This location was monitored in 2007 for the original EA.

3.2.2 Worst case scenario turbine model

The modified project utilises a reduced number of wind turbines, each with greater size and capacity than previously assessed. A layout of up to 172 turbines is now being considered, whereas the approved wind farm had 282 turbines. Modification 3 is seeking to increase the tip height of the wind turbines to 180 m and the capacity to 5 MW to reflect improvements in wind turbine technology. This noise impact assessment is based on the wind turbines being considering in the current tender process being undertaken by the Proponent with a capacity of approximately 3.2 MW to 3.6 MW being considered.

Computer noise modelling using the standard ISO9613 algorithm was completed for a worst case noise profile based on data received for up to four alternative wind turbines models being considered. To determine the impacts, a worst case noise profile was developed through a process where the provided sound power levels for the four turbine models were normalised against a hub height wind speed.

The hub height of the proposed modification to Silverton Wind Farm will be higher than that assumed previously for the Approved Project however, this aspect of the project is not yet finalised as the tender bids being considered provide differing rotor diameter and tower combinations. For the purposes of the assessment being undertaken, a hub height of 110 metres above ground level has been adopted.

The ISO 9613 noise model incorporates a 'hard ground' assumption and includes one-third octave band calculated effects for air absorption, ground attenuation and topographic shielding. It is noted that ISO 9613 equations predict for average downwind propagation conditions and also hold for average propagation under a well-developed moderate ground-based temperature inversion. The estimated accuracy of the prediction model is approximately ± 3 dBA.

The approach taken is considered conservative. If the worst case approach undertaken is shown to comply then it can be safely assumed that any of the turbines being considered would comply by a more significant margin.

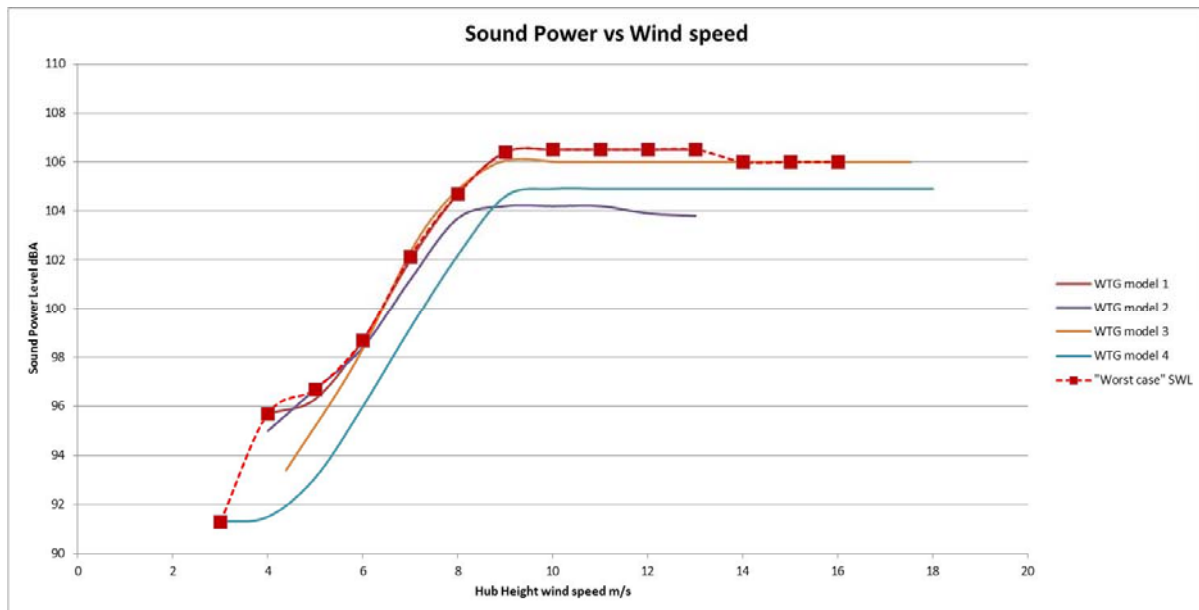


Figure 3-4 Worst case noise profile of four Wind Turbine Generator (WTG) models

Tonality and infrasound

Assessment of the audibility of any tones present, was assessed using methodology outlined in *Joint Nordic Method Version 2 – Objective Method for Assessing the Audibility of Tones in Noise*. Infrasound is not tested as an obligatory part of IEC 61400-11.

3.2.3 Level of impact for the Approved versus Modified Project

Noise model predictions

All receptor locations are predicted to be below the minimum 35 dBA limit with the exception of Receptor SL6 and SL9, refer to Table 3-5.

A detailed review of the noise assessment graphs (presented in the noise assessment in full, Appendix B.2), which considers the full range of wind speeds and the influence of ambient background noise masking, shows that predicted worst case profile turbine noise levels comply with the SA EPA Guideline criteria for all wind speeds at both receptor SL6 and SL9. Therefore, the SA EPA Guideline criteria are complied with at all surrounding receptors.

This worst case turbine noise profile and frequency spectrum modelling approach is anticipated to be between 2 dBA and 4 dBA higher in noise level when compared to what would have resulted were any specific turbine modelled. Therefore, it can be assumed that any wind turbine being considered would comply by a more significant margin than indicated in this worst case noise profile assessment.

Table 3-5 Predicted turbine noise levels

ID	Receptor	dBA Leq
S10	Silverton, Willangee Rd	30.3
S11	Silverton, Thackaringa St	29.9
S12	Silverton, Layard St	29.9
S14	Silverton, Silverton Rd	30.8
S15	Silverton, Burke St	30.5
S16	Silverton, Burke St	30.6
S17	Silverton, Layard St	30.9
S18	Silverton, Burke St	30.9
S19	Silverton, Gipps St	30.8
S20	Silverton, unnamed road	31.4
S21	Silverton, unnamed road	31.7
S22	Silverton, unnamed road	31.9
S24a	Silverton, Penrose Park 1	32.1
S24b	Silverton, Penrose Park 2	30.9
S25	Silverton, Burke St	30.9
S25	Silverton, Loftus	30.6
S27	Silverton, unnamed road	31.4
S28	Silverton, Silverton Rd	30.8
S29	Silverton, Silverton Rd	30
SL2	Eldee Station	31.7
SL3	Purnamoota Station	25.9
SL5	Limestone Station	12.3
SL6	Umberumberka	41.6
SL9	Belmont Station	35.3
SL10	Daydream Mine	31.2

A copy of the assessment graphs for each wind turbine model over the range of wind speeds is presented in Appendix B.2 of this Modification Report.

Tonality and infrasound

Of the four turbine manufacturers that have supplied tonal audibility values or statements, there is no evidence of any tones present of sufficient magnitude to justify a penalty. It is noted that, in general, modern wind turbines do not exhibit significant infrasound emissions.

3.2.4 Mitigation strategies

The noise assessment for the worst case noise profile shows that the SA EPA Guideline criteria are complied with at all surrounding receptors. No additional conditions or mitigation measures are required.

The results for the worst case noise profile turbine indicate that the SA EPA Guideline criteria are complied with at all surrounding receptors.

3.3 BIRD AND BAT COLLISION RISK

A comprehensive revision of risks to bird and bats arising from the indicative Modification 3 Layout was undertaken. The original assessments were reviewed and updated with reference to newer literature and guidance documents. The original assessments included the Biodiversity Assessment (BA) and the BA Addendum (NGH Environmental 2008a, 2008b) that accompanied the original Environmental Assessment (NGH Environmental 2008) and the Preferred Project and Submissions Report (Silverton Wind Farm Developments, with assistance from NGH Environmental 2009).

The full assessment is provided in Appendix B.3 and is summarised below. It includes additional input from two principal zoologists:

- Ian Smales, of Biosis Pty Ltd, who was the principal author of the bird and bat section of the *National Wind Farm Development Guidelines* (EPHC 2010).
- Jacqui Coughlan PHD Ornithology, who is the consultant expert on a number of wind farm monitoring programs in NSW.

3.3.1 Potential Impact types

During the operation of wind turbines there are risks presented to a range of birds and bats. The key impacts are mortality through collision with the moving turbine blades and 'alienation' or barrier effects that influence the use (or avoidance) of suitable habitat near the turbines.

Collision impacts

Injury and fatality may be caused by collision with the moving blades or being swept down by the wake behind the blade. When considering the potential rates of collision at a wind farm, key factors include are the infrastructure configuration in relation to habitat (such as quality forest and topographical features such as steep slopes providing updraughts).

As well as direct collisions with the infrastructure, the rotating blades produce a 'wake' with turbulence, eddies and blade-tip vortices, influenced by factors such as blade design and landscape location.

The wind turbines primarily present a collision risk to birds and bats that fly within the Rotor Swept Area (RSA) and so the risk increases with turbine size. The ground clearance of the RSA relative to the flying height of bird species is also a key consideration.

Alienation or barrier impacts

Operational wind turbines could cause changes in bird and bat behaviour. Such behaviour includes avoiding nesting or foraging resources or diverging around the broad area where the turbines are located. Birds and bats stop using this otherwise suitable habitat or movement pathways. Birds and Bats may be forced to change their flight behaviour to avoid collisions with turbines therefore impacting on their breeding and foraging success. The distance of disturbance effects that extend from a windfarm varies considerably. For both effects, many species appear to adapt to the presence of turbines after an initial period, reducing the ongoing impacts.

3.3.2 Level of impact for the Approved versus Modified Project

The level of impact can be influenced by several factors, including:

- Turbine parameters – increase RSA, closer blade to ground distance
- Site factors – proximity to habitat, updrafts, spacing between turbines, outliers
- Species ecology and morphology – manoeuvrability, foraging and migrating behaviour

Revised risk assessment

The revised risk assessment analysed the likely risks to birds and bats as a result of the proposed changes in turbine parameters (height increase, ground clearance decrease) and number. Proximity to vegetation communities (based on the indicative layout) and clearance between canopy height and rotor swept area have been considered. Additional species to those initially assessed have been assessed where warranted. The findings are summarised below in term of risk factors:

- **Closer to vegetation canopy and therefore foraging height:** The 29.5 metre RSA ground clearance presents a higher risk to birds and bats where turbines occur close to the Porcupine Grass – Red Mallee- Gum Coolibah Hummock Grassland / Low Sparse Woodland community (24 turbines).
- **Smaller proportion of the site defined as RSA:** The total rotor swept area for the approved wind farm and for the modified project were compared, as the physical volume of space occupied by the wind turbines provides an indication of potential overall collision risk to birds and bats. The modified project occupies a smaller proportion of airspace and therefore poses a lower overall risk than the original proposal, refer to Table 3-6 below.

Table 3-6 Comparison of total rotor swept area for the approved and modified project at Silverton Wind Farm

	Rotor diameter (m)	RSA (m ²)	Number of turbines	Total RSA (m ²)
Approval	110	9,499	282	2,678,577
Modification 3	140	15,386	172	2,646,392

- **Turbine configuration:** The potential for alienation and barrier effects was identified as a low to moderate risk. However, seven ‘outlier’ turbines that may present an increased collision risk to birds and bats were identified (P147, P113, P082, P080, A001, A066, B027, B021). While the overall number of turbines and collision risk area is reduced, outliers will always present an increased collision risk, being less discernible than more closely clustered turbines.
- **Species specific risks:** the modified project does not present a greater species specific risk than the Approved Project. However, other factors influenced assessment outcomes and nine additional bird and bat species were identified as ‘high risk’ species, on the basis of conservation status changes and / or new information:
 - Little Eagle – Vulnerable (NSW)
 - Black Kite – Not listed
 - Brown Falcon – Not listed
 - Spotted Harrier – Vulnerable (NSW)
 - Black-breasted Buzzard -Vulnerable (NSW)

- Square-tailed Kite – Vulnerable (NSW)
- Yellow-bellied Sheath-tail Bat – Vulnerable (NSW)
- White-striped Freetail Bat – Not Listed
- Gould’s Wattled Bat – Not Listed

3.3.3 Mitigation strategies

The key mitigation measure that forms a commitment of the project is to:

...design and implement an adaptive management monitoring program to document bird and bat mortalities, remove carcasses and assess the effectiveness of controls.

The commitment includes the provision that:

... if the results of assessment demonstrate that further mitigation is required, further turbine ridge habitat modification and enhancement of off-site habitats would be undertaken.

This measure is still considered appropriate to managing the operational impact of the wind farm on birds and bats. However, given the risks identified in this assessment, additional mitigation is considered warranted with regard to turbine placement. Mitigation strategies are discussed below.

Landscape position

This assessment has identified some higher risk sites not noted in the original assessments. It is recommended that:

- The final layout should avoid irregularly spaced ‘outliers’ where practical, which may have increased collision risk in the landscape.
- Higher risk sites (such as potential outliers) should initially be monitored more frequently in the adaptive management monitoring program and follow up management actions taken as required, in accordance with an adaptive management monitoring program.

Proximity to vegetation communities

For turbines adjacent to treed vegetation (Porcupine Grass – Red Mallee – Gum Coolabah hummock grassland, Mulga/Red Mallee shrubland and other woodland communities), it is recommended to:

- Apply a minimum buffer distance between turbines and treed vegetation⁴.

Species-specific risks

This assessment has identified some higher risk species not previously noted in the original assessments. It is recommended that:

- Higher risk species should initially be monitored more frequently in the adaptive management monitoring program and follow up management actions taken as required, in accordance with the plan.

⁴ Buffers are a generally accepted means to reduce risks to birds and bats (EPHC 2010). New England Technical Information Note TIN05 (2014) offers some guidance specific to tree height which may be appropriate to the site.

Conclusion

The risk assessment found that the Modified Project poses a lower overall risk of collision with birds and bats, due to the reduced total rotor swept area, when compared to the Approved Project and Project Approval. Even though the Modification 3 turbines will be larger, the reduced number of turbines offsets the total rotor swept area. An overall reduction of 32, 185 m² is achieved under the Modification 3.

However, the assessment identified that there may be an increased collision risk to birds and bats in specific locations (proximity to woodland vegetation communities and 'outlier' turbines) than previously identified. Species-specific collision risks would not be increased as a result of turbine design changes. Pre-emptive (turbine siting) in combination with reactive (monitoring during operation) mitigation measures are included to address the increased risks.

Taking into account proposed mitigation measures, the mitigated risk is assessed as less than the Approved Project.

3.4 BIODIVERSITY (VEGETATION CLEARING IMPACTS)

3.4.1 Approved layout

Flora

Table 3-7 outlines the Stage 1 estimated vegetation and species habitat impacts for the Silverton Wind Farm turbines and access tracks. The EA and SR also assessed the impact from other infrastructure including, substation, switchyard, building, compound and facilities, batch plants and underground cabling. There are no proposed changes to these infrastructure components and therefore they are not considered further in this assessment.

The EA and SR identified that the installation of wind turbines and access tracks would result in a total loss of 131.4 ha of native vegetation. None of the vegetation communities were at the time listed as Endangered Ecological Communities (EEC) however, three communities were considered significant:

- Porcupine Grass / Red Mallee /Gum Coolabah / Hummock Grassland / Low Sparse woodland (now listed as a Critically Endangered Ecological Community (now listed as CEEC under the New South Wales *Threatened Species Conservation Act 1995*).
- Mulga / Red Mallee Shrubland on Rocky Slopes of the Barrier Range.
- Chenopod – Red Mallee Woodland /Shrubland on Gravelly Lower Slopes.

Approximately 0.81 ha of the Porcupine Grass CEEC was proposed to be impacted by the Project. The EA and SR considered a significant adverse impact on threatened flora and vegetation was unlikely, with the implementation of mitigation measures to minimise impacts (such as minimal track widths) and research (a recovery plan for the Porcupine Grass community).

Approximately 0.77 ha of the Mulga / Red Mallee Shrubland on Rocky Slopes and Chenopod – Red Mallee Woodland /Shrubland was proposed to be impacted. The EA and SR considered a significant adverse impact on threatened flora and vegetation was unlikely, with the implementation of mitigation measures to minimise impacts.

Fauna

The habitat along the ridge lines of the project site were considered most likely to be impacted by the turbines and access tracks. The ridgelines provide habitat for reptiles and small mammals particularly in spinifex vegetation. Additionally, the mallee trees provide habitat for birds including perches for wedge-tail eagles and other raptors. The assessment found 0.81 ha of spinifex habitat (important to several reptile species and coinciding with the Porcupine Grass CEEC distribution onsite) would likely be impacted by the proposal.

There were two turbines located within identified Barrier Range Dragon ‘hotspots’⁵ and 14 turbines located within significant rock outcrops, considered to be potential dragon habitat. The EA and SR considered a significant adverse impact on threatened fauna was unlikely, with the implementation of mitigation measures to minimise impacts. Actions to arrest a threatening process (goat abundance) were included as commitments of the project.

3.4.2 Revised Modification 3 Layout

Table 3-7 sets out the layout described in this Modification Report 3, Appendix A.1. It outlines the vegetation impact areas for the reduced number of turbines, access track layout and increased impact area for the turbine footings (impact assumptions are stated in Section 2.1.2).

The total impact on native vegetation for the Modification 3 Layout turbines and access tracks is now 109.3 ha. This includes 1.05 ha of Porcupine Grass CEEC and 0.54 ha of the two additional vegetation communities considered significant, Mulga/Red Mallee Shrubland (VEG1) and Chenopod – Red Mallee Woodland/Shrubland (VEG2).

The revised turbine footings and access track impact areas would result in a disturbance of approximately 1.05 ha on spinifex habitat (coinciding with the Porcupine Grass CEEC). There are no turbines located within identified Barrier Range Dragon hotspots and four turbines located within significant rock outcrops (potential dragon habitat).

3.4.3 Assessment

The change to the number of turbines and impact areas of turbine footings and access tracks does not generate any new impact types than those considered in the EA and SR. The construction of the turbines and access tracks would still involve ground disturbance resulting in the removal of native vegetation and flora and fauna habitat.

The impact on native vegetation (all vegetation communities combined) would decrease by approximately 22.1 ha overall, based on the reduced number of turbines.

Breaking down the impact areas, there would also be a decrease in the impact to common vegetation types, a slight decrease in the impact to the two significant vegetation communities, Mulga/Red Mallee Shrubland (VEG1) and Chenopod – Red Mallee Woodland/Shrubland (VEG2), of approximately 0.23 ha. However, there would be an increase in Porcupine Grass CEEC impacts of 0.24 ha.

Considering fauna habitat, the number of turbines located within Barrier Range Dragon hotspots and significant rock outcrops (potential dragon habitat) has decreased to 0 and 4, respectively. As above, there

⁵ Areas of higher abundance
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would be an increase in spinifex habitat (comprising the Porcupine Grass CEEC) impacts of 0.24 ha. The differences in impact levels can be seen in Table 3-7.

There is an overall reduction of 22.1 ha of native vegetation that would be impacted for turbine and track construction. Less Barrier Range Dragon known habitat and potential habitat would be impacted.

Table 3-7 Summary of changes in areas of vegetation and habitat clearing requirements

Feature	Original (EA + SR)	Modification 3 Layout	Difference
Native vegetation total	131.4 ha	109.3 ha	-22.10 ha
Significant vegetation communities (2)	0.77 ha	0.54 ha	-0.23 ha
Spinifex habitat / Porcupine Grass CEEC	0.81 ha	1.05 ha	+0.24 ha
Barrier Range Dragon Hotspots	2 turbines	0 turbines	Reduction of 2 turbines
Significant rock outcrops	14 turbines	4 turbines	Reduction of 10 turbines

Table 3-8 and 3-8 provide a breakdown per vegetation type.

3.4.4 Mitigation strategies

The mitigation strategies outlined in the SR centre on protecting better areas of habitat onsite and implementing actions to improve habitat onsite. Particularly, goat numbers onsite were identified as having an ongoing adverse effect on native vegetation and fauna habitat. Competition and habitat degradation by Feral Goats is also listed as a Key Threatening Process under the *Threatened Species Conservation Act 1995*. Continued grazing and browsing by feral goats is a likely major contributing reason for the lack of apparent recruitment of tree and shrub species onsite. Habitat degradation by goats through browsing on vegetation and disturbance to rock habitat, including pollution of key crevice habitat by scats, along with a number of other factors, have been identified as a threat to the Barrier Range Dragon onsite. To manage impacts on biodiversity, a plan to manage goats and their impacts onsite was therefore a commitment of the project.

The Modification 3 layout shows an increase in Porcupine Grass CEEC / spinifex impacts, but an overall decrease in impacts to native vegetation and Barrier Range Dragon known and potential habitat. It is proposed to restrict clearing impacts on Porcupine Grass CEEC / spinifex to that assumed by the original assessment. Minimum track widths and other impact area minimisation strategies can be implemented to ensure that no more than the originally assessed area of 0.81 ha of Porcupine Grass CEEC / spinifex are impacted. It is noted that micro siting requirements, to minimise track widths in these areas have not been included in the impact area estimates above and therefore this strategy is considered feasible for the project.

To ensure that impacts are effectively minimised, the following additional mitigation measure would be employed for the project:

- A clearance limit of 0.81 ha of Porcupine Grass CEEC / spinifex habitat applies to the project, as per the existing Project Approval.

Table 3-8 Native vegetation breakdown: areas impacted under the Project Approval (EA + SR)

Infrastructure	Qty or length	Dimensions	Ha	Mulga - Dead finish (ID123)	Prickly wattle Shrubland (ID136)	Bluebush Shrubland (ID155)	River Red Gum woodland (ID41)	River Red Gum on rocky creeks	Porcupine Grass sparse woodland (ID359) CEEC	Black Bluebush Shrubland (ID153)	Black Oak Woodland (ID60)	Mulga/Red Mallee Shrubland (VEG1)	Chenopod – Red Mallee Woodland/ Shrubland (VEG2)
EA													
Turbine towers and footings	120	15x15m	2.70	2.68	0.02	0	0	0	0	0	0	0	0
Access tracks onsite	86.45km	6m wide	51.87	50.17	0.13	0.68	0.04	0.05	0.81	0	0	0	0
Total (ha)			54.57	52.85	0.15	0.68	0.04	0.05	0.81	0	0	0	0
SR													
Turbine towers and footings	162	15x15m	3.80	3.78	0	0	0	0	0	0	0.02	0.02	0
Access tracks onsite	122km	6m wide	73.03	70.8	0.09	0	0.24	0	0	1.14	0	0.66	0.09
Total (ha)			76.83	74.58	0.09	0	0.24	0	0	1.14	0.02	0.68	0.09
EA and SR total (ha)			131.4	127.43	0.24	0.68	0.28	0.05	0.81	1.14	0.02	0.68	0.09

It is noted that SR states temporary impact areas that could be rehabilitated after the construction phase total 11 ha. These are not included in the permanent impact areas (for life of project) tallied above. Areas which could be rehabilitated after the life of the Project were estimated to be 97.4 ha.

Table 3-9 Native vegetation breakdown: areas impacted under the Modification 3 Layout

Infrastructure	Qty or length	Dimensions	Ha	Mulga - Dead finish (ID123)	Prickly wattle Shrubland (ID136)	Bluebush Shrubland (ID155)	River Red Gum woodland (ID41)	River Red Gum on rocky creeks	Porcupine Grass sparse woodland (ID359) CEEC	Black Bluebush Shrubland (ID153)	Black Oak Woodland (ID60)	Mulga/Red Mallee Shrubland (VEG1)	Chenopod - Red Mallee Woodland/ Shrubland (VEG2)	Chenopod	Unknwn
Turbine towers and footings	172	15m radius	12.1	11.99	0	0	0	0	0.11	0	0	0	0	0	0
Access tracks onsite	177km	6m wide	97.2	84.15	0.13	3.85	0.51	0.3	0.94	0.08	0	0.43	0.11	0.70	6 ²
Total (ha)			109.3	96.14	0.13	3.85	0.51	0.3	1.05	0.08	0	0.43	0.11	0.70	6

¹it is noted that some sections of access tracks occur in areas that have no vegetation mapping.

There would be no change to the proportion of the project footprint that could be rehabilitated after construction (temporary works) and after decommissioning (permanent infrastructure).

3.5 HYDROLOGY AND WATER QUALITY AND SOILS

3.5.1 *Approved layout*

The EA and SR identified the Silverton Wind Farm would have potential to directly and indirectly impact on hydrology, water quality and soils at the site. The EA and SR identified that the installation of wind turbines and access tracks would result in a disturbance footprint of approximately 131.4 ha.

Turbines and access tracks would be constructed near the Umberumbeka Reservoir. The closest access track was that associated with turbine WB001, approximately 390 m east of the reservoir. Umberumbeka Reservoir is used primarily to augment supply to Broken Hill during summer peak demand or as an alternate supply during maintenance and repairs elsewhere in the system. A number of other drainage lines and creeks are within the wind farm site and flow to Umberumbeka Reservoir during wet weather events.

The construction of access tracks would intersect with approximately 368 mapped creeks and drainage lines⁶. During construction there would be potential for pollutants such as hydrocarbons and sediments to the waterways, as well as potential to alter hydrologic regimes with crossings.

Most turbine footing sites would be constructed on or close to ridges, avoiding drainage lines. However, the topography of the site, particularly the southern area site is steep and susceptible to erosion. Due to the topography and erodible soils, without appropriate environmental management procedures and controls, there is potential for pollutants such as hydrocarbons and sediments to the waterways. Additionally, any associated erosion would lessen the soil's ability to support native vegetation and associated flora and fauna.

The EA and PPR together calculate the creation of approximately 208.45 km of access tracks (refer to Table 3-8). This would increase the area of less permeable surface within the site, increasing runoff and its erosive potential therefore also increasing dust propagation in windy conditions.

It was also identified that the requirement of rock blasting for the 282 footings, resulting in approximately 6.5 ha of disturbance, could affect the integrity of perched aquifers and alter hydrology of the site.

3.5.2 *Revised Modification 3 Layout*

The disturbance footprint for the reduced number of turbines, access track layout and increased impact area for the turbine footings, associated with the Modification 3 is approximately 109.3 ha (refer to Appendix A.1).

The closest access track and associated turbine to Umberumbeka Reservoir is A013, approximately 890 m east of the reservoir. The updated access track footprint would intersect with approximately 232 drainage lines.

3.5.3 *Assessment*

The change to the number of turbines and impact areas of turbine footings and access tracks does not generate any new impact types than those considered in the EA and SR. The construction of the turbines and access tracks would still involve ground disturbance resulting in the potential to impact water quality,

⁶ Calculated using GIS mapped drainage lines and the approved track layout with 6m buffer, 8 July 2016).

hydraulic regimes and soils. However, the total amount of ground disturbance that would be associated with the modified project has decreased approximately 22.1ha based on the reduced number of turbines.

The potential to impact on waterways including Umberumbeka Reservoir, has been reduced with the turbines and access track now further away from Umberumbeka Reservoir and the number of drainage lines to be intersected by access tracks reduced. Turbines and access tracks are now 500 m further away from the reservoir. The number of crossings to be intersected by access track footprints has reduced from 368 to 232, a reduction of 136.

There is an increased amount of disturbance required for the increased individual turbine footing areas, 6.5 ha to 12.1 ha. However, the reduced number of turbines, 282 to 172 would reduce the number of steep and erodible areas to be impacted, and also reduce the amount of rock blasting to occur over the site.

The amount of impermeable surface within the site created by the construction of access tracks would be reduced from 208.45 km to 177 km.

3.5.4 Mitigation strategies

The mitigation strategies outlined in the EA and SR focus on minimising the risk to deteriorating water quality. The new layout shows an increase disturbance footprint for turbines but an overall decrease in disturbance footprint considering tracks. Further the turbines and access tracks have become further away from the Umberumbeka Reservoir. No changes to the mitigation strategies are required.

3.6 INDIGENOUS AND NON-INDIGENOUS HERITAGE

3.6.1 Approved layout

The construction of the wind turbines and associated access roads were assessed as having the potential to impact indigenous and European heritage items that may be located in the vicinity. The EA and SR identified that the installation of wind turbines and access tracks would result in a disturbance footprint of approximately 131.4ha. Within this disturbance footprint:

- Within the EA and SR area a total of 403 Aboriginal object locales were recorded.
- Within the EA and SR area a total of 65 European heritage items were recorded.

The majority of Aboriginal object locales recorded in the Project area were assessed to be of low or low/moderate significance, although some were assessed as moderate significance and several were assessed as to be of high significance.

A number of environmental controls and mitigation strategies were proposed in the EA and SR to minimise as far as possible, potential impacts in heritage items. These controls were reflected in the Project Approval conditions and Statements of Commitment.

3.6.2 Revised Modification 3 Layout

The disturbance footprint for the reduced number of turbines, access track layout and increased impact area for the turbine footings, associated with the Modification 3 is approximately 109.3 ha. Within the Modification 3 disturbance footprint:

- A total of 296 Aboriginal object locales are recorded; and
- A total of 34 European heritage items are recorded.

3.6.3 Potential impact types and level of impact

The change to the number of turbines and disturbance footprint of turbine footings and access tracks does not generate any new impact types than those considered in the EA and SR. The construction of the turbines and access tracks would still involve ground disturbance resulting in the potential to impact on aboriginal artefacts and non-indigenous heritage items. However, the total amount of ground disturbance has decreased by approximately 22.1 ha based on the reduced number of turbines.

The total amount of ground disturbance has decreased by approximately 22.1 ha, based on the reduced number of turbines.

The number of Aboriginal artefacts with potential to be impacted by the proposed works has also reduced due to the reduced number of turbines and changed access track layout. There would be a reduction in the number of Aboriginal object locales and European heritage items impacted, as shown in Table 3-10.

As a result of the Modification 3 there is a reduced impact to Aboriginal object locales and European heritage items.

Table 3-10 Heritage sites to potentially be impacted

Originally assessed as being impacted	Impact under Mod 3 Application	Net
403 Aboriginal artefacts	296 Aboriginal artefacts	107 less Aboriginal artefacts
65 non-indigenous heritage features	34 non-indigenous heritage features	31 less non-indigenous heritage features

3.6.4 Mitigation strategies

The mitigation strategies outlined in the EA and SR for indigenous and non-indigenous heritage focus on minimising the impact to Aboriginal artefacts and non-indigenous heritage features within the Project Area. No changes to the mitigation and management measures as outlined in the original two heritage reports are required; some sites require mitigated impacts and some avoidance, as detailed by site within the original assessments.

3.7 LAND USE

3.7.1 Approved layout

The EA identified that the proposed wind farm has potential to reduce the amount of habitat for feral goats and result in a minor loss of grazing area. The site does not sustain sheep grazing. Harvesting feral goats provides an income stream for leaseholders, however. No other agricultural income or land use is relevant to the Project Area.

The EA and SR identified that the installation of wind turbines and access tracks would result in a disturbance footprint of approximately 131.4 ha, effectively reducing areas available for goat browsing.

However, the project also committed to management of feral goats. This would further reduce goat numbers and incomes derived from this activity, in the medium to long term.

Competition and habitat degradation by Feral Goats is also listed as a Key Threatening Process under the *Threatened Species Conservation Act 1995*. Continued grazing and browsing by feral goats is a likely major contributing reason for the lack of apparent recruitment of tree and shrub species onsite. Habitat degradation by goats through browsing on vegetation and disturbance to rock habitat, including pollution of key crevice habitat by scats, along with a number of other factors, have been identified as a threat to the Barrier Range Dragon onsite. To manage impacts on biodiversity, a plan to manage goats and their impacts onsite was therefore a commitment of the project.

3.7.2 Revised Modification 3 Layout

The disturbance footprint under the Modification 3 application, for the reduced number of turbines and access tracks, is approximately 109.3 ha.

3.7.3 Potential impact types and level of impact for the Approved versus Modified Project

The changes proposed under the Modification 3 application do not generate any new land use impact types than were considered in the EA. The total amount of disturbance has decreased by approximately 22.1 ha, based on the reduced number of turbines and access tracks.

The total amount of disturbance has decreased by approximately 22.1 ha, based on the reduced number of turbines and access tracks.

It is noted that management of feral goats would be facilitated by an extensive internal track network to assist with control and monitoring measures. The reduced turbine number will result in a lesser number of tracks, although the revised layout (Appendix A) shows the general extent of the Stage 1 project would be similar. It is noted that the northernmost extent and some central turbine sites would now not be developed, however in Stage 1 and that the residual turbines (up to 598, under the approval) would now not be developed.

3.7.4 Mitigation strategies

The mitigation strategies outlined in the EA focused on minimising the impact to current land uses. The new layout shows an overall decrease in disturbance footprint and is therefore consistent with this strategy. No changes to the mitigation strategies are required.

3.8 AVIATION

SGS HART Aviation undertook an aviation assessment to determine the potential impact on aviation operations of the Modification 3 Layout and increase in size of turbines proposed.

The assessment included an investigation of the following:

- Assessment and review of all aviation related elements associated with the site including charts, maps, airspace, airfield and airstrip guides/directories, en route and visual terminal charts and Notices to Airmen, amongst other matters.

- A review of all aviation activities and potential aviation activities occurring or likely to occur within the boundaries of the proposed wind farm or potentially affected by the presence of the wind farm, including both civil and military operations.
- Consideration of the relevance of any Australian regulatory authority requirements and international standards, recommendations and guidelines.
- On the basis of the above assessments, an assessment of risks associated with aviation operations and the need or otherwise for obstacle lighting.

The full assessment is provided in Appendix B.4 and is summarised below.

3.8.1 Potential impact types

The aviation assessment identified that the installation of wind turbines and reference masts for meteorological monitoring has the potential to impact the following:

- Airfields (both licensed and unlicensed wind farms) in the vicinity of the proposed wind farm
- General aviation operations including VFR (Visual Flight Rules) Operations, IFR (Instrument Flight Rules and Night VFR Operations, gliding operations, hang gliding, paragliding and ultralight operations
- Airspace control zones, air traffic controls or any areas classified by the Civil Aviation Safety Authority (CASA) as being a Restricted or Danger area
- Aerial firefighting activities
- Aerial agricultural operations
- Rural ambulance services

3.8.2 Level of impact for the Approved versus Modified Project

Overall, SGS HART Aviation assessed that the risk to civil aviation operations in the vicinity of the proposed Silverton Wind Farm is **very low**. This was based on the outcomes of the investigation described below.

Proximity to airfields

No airfields or aerodromes were identified in the vicinity of the wind farm site (approximately 55km) which would be impacted by the development.

No obstacle limitation surfaces would be affected.

The closest licensed aerodrome is at Broken Hill, approximately 26km south-east of the nearest point of the wind farm. Operations at the aerodrome would not be impacted by the windfarm.

Nine unlicensed aerodromes were identified within approximately 55km from the wind farm site. Most of these are private station airstrips suitable for small light aircraft VFR operations only. None of these would be impacted by the wind farm and proposed turbine layout.

Aviation operations - general

The extent of aviation operations in the area of the proposed Silverton Wind Farm was determined to be very low to almost non-existent.

All VFR operations should be above the level of any wind turbines and the turbines should be clearly visible to pilots undertaking VFR operations. However, it is noted that 180 metres is above 500ft (152.4metres), the lowest allowed flying height, and the tips of the blade will penetrate navigable airspace.

All IFR and Night VFR Operations must not fly below the relevant specified Lowest Safe Altitude (LSALT) except when landing or taking off. This requires that where the highest obstacle is more than 360 ft (109.73) above the height determined for terrain, the LSALT must be 1,000ft above the highest obstacle. As such, the Silverton Wind Farm should have no impact on civil Night VFR or IFR operations which may occur in the vicinity.

Gliding operations are not known to occur within the vicinity of the proposed Silverton Wind farm. Ultralight operations are known to exist originating from the Broken Hill Aerodrome. Gliding and ultralight operations would be subject to the same constraints as VFR operations and the wind farm should not impact on operations.

There is no evidence of hang gliding and paragliding occurring in the region.

Reference masts

A total of approximately 10 permanent meteorological met masts / wind monitoring masts are proposed for the site to assist with operations. The existing development met masts would be removed.

The permanent met masts would be installed to hub height level depending on the final turbine selection (tip height minus rotor radius - approximately 110 metres). They are considered by CASA to be a 'Tall Structure' and are required to follow certain reporting features as outlined in the CASA Advisory Circular AC 139-08(0).

Generally, wind monitoring masts, particularly those of a light lattice structure, can be difficult to see which may be a concern to local aerial agricultural operations. While there is no evidence of these operations occurring, advice concerning the presence of these masts should be readily available.

Airspace considerations

The location of Silverton Wind Farm is well clear of any of the airspace control zones and the operating height of aircraft over the area is such that the presence of any wind farm would have no effect.

There are no aircraft traffic control issues nor is there any potential influence on any instrument approach procedures or aeronautical navigation aids.

There are no Restricted or Danger Areas anywhere in the vicinity of the Silverton Wind Farm.

Consultation with the following government departments and agencies was undertaken prior to lodgement of the Modification 3 application:

- Civil Aviation Safety Authority (CASA)
- Airservices Australia
- Department of Defence
- Broken Hill Council
- Aerial Agricultural Association of Australia (AAAA)

Each organisation was forwarded copies of the draft aviation assessment including updated wind turbine plans, as of 26 June 2016. Acknowledgements were received from CASA, Airservices and the Department of Defence. The Department of Defence responded in detail expressing no concerns subject to an assessment by CASA as to the need or otherwise for obstacle lighting. No other comments have been received (as of 14 July 2016).

A further turbine layout change was made after this consultation. Of the Approved turbine locations, that A26 be included and A33 be deleted. This is now reflected in Appendix A.1 and within the Aviation

Assessment. Each organisation was forwarded copies of the updated wind turbine plans, as of 26 June 2016.

Aerial firefighting activities and agricultural operations

Aerial firefighting activities and aerial agricultural operations may be impacted by the wind farm. The report recommended that helicopter or fixed wing aircraft operations within the confines of any wind farm and below the top of the wind turbines are not to be undertaken.

Rural ambulance service

Whilst the existence of wind turbines does have potential to limit the flexibility of operations of helicopter ambulance services within the confines of the wind farm, it would not be an issue outside the boundaries of the wind farm. There would be little effect on the provision of rural air ambulance services currently available in the region.

Obstacle lighting

Due to the very low levels of aviation activity in the vicinity of the wind farm, obstacle lighting is not considered to be necessary for the Silverton Wind Farm. This is consistent with other wind farm developments around Australia which have no obstacle lights installed or have had their lights turned off as a result of a low aviation risk assessment.

Obstacle lighting is not considered to be necessary for the Silverton Wind Farm.

3.8.3 Mitigation strategies

To ensure the aviation impacts are adequately mitigated, the following additional mitigation measures would be employed for the project, as recommended by SGS HART Aviation:

- The top one third of existing and proposed met masts and/or wind monitoring towers will be painted in alternating contrasting bands of colour and marker balls. Alternatively, high visibility flags or sleeves will be placed on the outside guy wires consistent with the recommendations of the National Airports Safeguarding Advisory Group (NASAG) Guideline D.
- Ongoing consultation with all relevant government agencies, organisations and potentially affected aviation authorities would take place when issues which may affect aviation operations and safety arise.
- Identification of the wind turbines on the relevant aeronautical charts, both the civil WACs and RAAF produced chart series.

3.9 TOURISM, LIFESTYLE (VIEW SHED IMPACTS)

The use of larger turbines could lead to an increased 'Zone of Theoretical Visibility' (ZTV) which may mean that additional areas surrounding the wind farm site may be able to see wind farm infrastructure. The impact on residences is specifically considered in Section 3.1 however, the internal consistency review identified that any increased view shed may also be relevant to:

- The local and broader community
- Tourism facilities and values

- Lifestyle impacts

A revised ZTV was produced for the Modification 3 Layout (included in Appendix B.1). It is considered a 'worst case' as it considered the maximum number of turbines that may be developed. It demonstrates no additional areas will be visible, based on the new turbine parameters. Therefore, no additional impacts on community, tourism or lifestyle impacts are anticipated on the basis of view shed.

3.10 SAFETY

Consideration of the following issues has been undertaken with reference to increasing the height of the turbines and potential safety issues:

- Structural stability of the standing wind turbine
- Working at height issues for construction staff during turbine installation.

3.10.1 Structural stability

The wind turbines proposed in this Modification 3 Application have increased power output compared to those proposed in the original EA. The turbines proposed have an increased turbine tip height and rotor diameter. The weight of the components in the nacelle on top of the tower is also greater. Increases in these parameters have the following potential implications.

- The increase in height of a turbine may require additional tower sections. This may be influenced by weight and size thresholds relating to haulage of components. If additional sections are required, these would be similar to the other sections.
- An increase in height of the tower and the rotor diameter will increase forces on the turbine structures and its attachment to the underlying foundations. To offset the additional forces on the larger structure, the size of the footing would be increased both in size and weight to balance the additional forces and provide the necessary structural foundation to support the larger wind turbines.

The design of structures, foundations and associated equipment is from materials with properties that are well understood and together with the safety factors that are applied, based on the design codes, mitigate any risk associated with increases in size and capacity of wind turbines. The forces imposed by the wind are determined by assessment of the wind conditions over a number of years and the imposition of safety factors for significant wind events. At high wind speed, the wind turbine is shut down to prevent damage to the equipment. The result is that safety is maintained and the risk of damage to equipment is mitigated.

3.10.2 Working at height

The increased weight of the generators, hubs and the nacelle and increased turbine tip height and rotor diameter would require larger cranes that can lift heavier loads to greater heights. The cranes necessary to lift such loads are available and suitable for purpose. The crane operators also consider the ambient conditions to ensure that safety standards are not compromised by high wind levels during lifting operations. All construction and operational work will be carried out in accordance with appropriate safety standards and codes.

Safety risks associated with taller turbines can be effectively managed.

3.11 COMMUNITY AND STAKEHOLDER ENGAGEMENT

3.11.1 Background: community profile

Silverton was established in 1880 and at the time was the area's largest township. The town is managed by the Silverton Village Committee that has representatives from government as well as the local community.

Silverton's economy is focused on historical tourism and the town is popular with landscape artists. Local enterprises include a pub, cafe and historic artefacts.

The nearest major regional centre is Broken Hill which is located appropriately 25 kilometres south east of Silverton. Broken Hill is predominantly a historically a mining industry town, and is also a popular tourist destination.

3.11.2 Community engagement objectives and principles

Effective engagement with the local community and stakeholders is critical throughout all stages of the Silverton Wind Farm project lifecycle. AGL understands that building lasting relationships with local communities, based on mutual trust and respect, is vital to project success. AGL seeks to become a trusted member of each community it operates in, engage with local communities from the outset, and create long term, positive relationships with local stakeholders.

Following AGL's acquisition of the Silverton Wind Farm development proposal in May 2012, AGL engaged with the Silverton community by establishing the Silverton Wind Farm Community Consultative Committee (CCC), and has continued working consultatively with the community, sharing information, discussing topics of interest and addressing issues and concerns. Consultation with the CCC has been undertaken in accordance with the Department of Planning and Environment's *Community Consultative Committee Guidelines*.

A Community Stakeholder Engagement Plan is being implemented for the Project. The plan sets out the framework for how AGL engages with the project's community and stakeholders. The plan's preparation has taken into consideration:

- *Community Engagement Guidelines for the Australian Wind Industry* (Clean Energy Council, 2013)
- *Best Practice Community Engagement in Wind Development*, (Lane and Hicks, 2014)
- *Foundations of Public Participation* (International Association for Public Participation (IAP2), 2013)

The plan also takes into account the Draft *NSW Planning Guidelines Windfarms 2011*.

AGL's primary objective is to deliver best practice community engagement throughout the project stages.

The objectives of AGL's ongoing consultation include:

- To ensure the community continues to be fully informed about the Project, including Modification 3
- To provide opportunities for the community to receive information and provide feedback about the Project, including Modification 3
- To consider suggestions, concerns and complaints, and embed feedback in the development of the Project, where possible
- To provide opportunities for ongoing dialogue with the community

- To be a trusted member of the local community, and to build trust-based, long term relationships with the local community

Through consultation with the Silverton community, AGL has learned that the community has long lasting and deep connection to the Silverton area. AGL acknowledges that the wind farm will result in a change to the area, and is ultimately working to build trust and a high level of community support for the Project.

This is being done through:

- Delivering a robust and consistent approach to community engagement
- Implementing effective engagement processes and tools
- Facilitating effective community input to the project
- Acknowledging concerns raised by the community and addressing the concerns transparently
- Communicating how concerns raised have been addressed or are intended to be addressed
- Building trust and constructive relations between AGL and the community
- Building confidence in the community about the project benefits and impacts, and how negative impacts can be mitigated
- Improving AGL's reputation and the broader credibility of the wind industry
- Providing consistent and agreed mechanisms for accountability for AGLs actions

Four foundation principles guide AGL's community engagement approach:

Principle 1 – Openness

Principle 2 – Inclusiveness

Principle 3 – Responsiveness

Principle 4 - Accountability

To ensure these principles are achieved, AGL employs appropriately experienced stakeholder engagement professionals to manage, deliver and monitor best practise community consultation activities and initiatives.

3.11.3 Demonstration of engagement with the Silverton community

Since acquiring the Project in 2012, AGL has carried out an ongoing consultation program with the local community and other key stakeholders. This has included CCC meetings, numerous face to face meetings, media releases, briefing sessions, correspondence, phone calls, information sheets, a dedicated Project web page, 24 hour Project contact phone number and email address.

The below table sets out the key stakeholders for the Project and their areas of interest/issues which have been raised with AGL during ongoing consultation.

Table 3-11 Silverton Wind Farm stakeholders and areas of interest

Stakeholder Group	Representatives	Area of interest
Decision makers		
Local Government	Broken Hill City Council	<ul style="list-style-type: none"> • Compliance • Health and safety of local residents • Impact on local business • Local impacts – noise, visual amenity, property values, construction disruption • Amenity • Community consultation • Community wellbeing • Economic benefits
State Government	The Hon. Anthony Roberts NSW Minister for Industry, Resources and Energy	<ul style="list-style-type: none"> • Community wellbeing • Impact on local and regional business • Employment opportunities • Economic benefits
State Government	The Hon. Kevin Humphries MP Member for Barwon NSW	<ul style="list-style-type: none"> • Community wellbeing • Impact on local and regional business • Employment opportunities • Economic benefits
Federal Government	The Hon. Mark Coulton MP Member for Parkes NSW	<ul style="list-style-type: none"> • Community consultation • Community wellbeing • Impact on local and regional business • Economic benefits
Crown Land	Western Lands Commissioner	<ul style="list-style-type: none"> • Use of Crown Land • Special purpose lease • Pastoral leaseholders' concerns • Adherence to planning permit
Department of Trade & Investment		<ul style="list-style-type: none"> • Potential interaction with/impact on local mineral resources
Office of the Environment and Heritage		<ul style="list-style-type: none"> • Potential impacts on native vegetation/flora/fauna
CASA/Air Services/ Department of Defence/ Aerial Agricultural Association of Australia		<ul style="list-style-type: none"> • Potential aviation impacts
Utilities/ service providers	Essential Water, Manager Planning and Design TransGrid RMS, Roads Safety & Traffic Officer	<ul style="list-style-type: none"> • Impact to utilities and services • Restoration to impacted services • Access to site • Road works • Traffic impacts – Traffic Management Plan

Stakeholder Group	Representatives	Area of interest
Silverton community		
Turbine Hosts/leaseholders		<ul style="list-style-type: none"> • Access to private property • Environmental management • Health and safety of local residents • Local impacts – sound, visual amenity, property values, construction disruption • Sourcing supplies locally • Economic benefits
Other landholders	Neighbours around the wind farm Easement landowners	<ul style="list-style-type: none"> • Access to private property • Environmental management • Health and safety of local residents • Local impacts – sound, visual amenity, property values, construction disruption • Sourcing supplies locally • Economic benefits
Silverton Village Committee	Local community members	<ul style="list-style-type: none"> • Economic benefits/impacts (including Community Benefit Fund) • Impact from construction traffic • Impact on roads • Impact on local businesses and tourism • Umberumberka Reservoir
Businesses	Silverton Hotel Horizon Gallery Beyond 39 Dips The Silverton Café Blue Bush Country Cottage Silverton Gaol Museum Barrier Ranges Camel Safaris Day Dream Mine Silverton Outback Art Gallery Mad Max Museum Silverton Memorial Youth Camp Broken Hill Chamber of Commerce	<ul style="list-style-type: none"> • Access to business for customers and deliveries • Use of local businesses and resourcing during construction • Local impacts – noise, visual amenity, property values, construction disruption • Impact on roads from construction • Economic benefits/employment opportunities • Impact of Project on local flora/fauna • Source of construction water • Soil/water impacts and management
Traditional Owners	Wilyakali Traditional Land Owners – Maureen O'Donnell Broken Hill Local Aboriginal Land Council – Ray O'Donnell	<ul style="list-style-type: none"> • Impact on cultural heritage • Indigenous project participation plan and employment opportunities

Stakeholder Group	Representatives	Area of interest
Broader community		
Community	Visitors to Silverton Tourists Film and art community Broken Hill community	<ul style="list-style-type: none"> • Impact of construction traffic on travel time into Silverton • Employment opportunities • Tourism benefits
Businesses and groups	Businesses operating in Broken Hill Business Broken Hill Broken Hill Visitor Information Centre Far West NSW Tourism Task Force NSW Department of State and Regional Development Regional Development Australia Far West NSW Broken Hill Community Foundation Broken Hill Community Inc.	<ul style="list-style-type: none"> • Economic benefits / impacts • Benefits and impact on tourism • Local employment opportunities • Education and training for locals
Other	Local emergency services	<ul style="list-style-type: none"> • Access to site • Risk of fire • Use of water / water supply
Media and social media	ABC Broken Hill (999 am) 2BH FM 87.6 2 DRY FM 107.7 Hill FM 96.5 Barrier Daily Truth Southern Cross TV	<ul style="list-style-type: none"> • Community and environmental benefits and impacts • Delivery / Cost • Local employment opportunities • Project updates and events

Consultation specifically relating to Modification 3 has been undertaken as part of AGL's regular consultation program for the Project, as well as specific meetings with key stakeholders. Table 3-12 below outlines the consultation activities undertaken for Modification 3. Please note that while a number of activities have taken place, there are further consultation activities planned upon Modification 3 being finalised and becoming publicly available for comment.

Feedback received from the community and interested stakeholders will be considered and addressed through ongoing engagement and in the Response to Submissions report.

Table 3-12 Community and stakeholder consultation Modification 3 Silverton Wind Farm Project

Stakeholder and activity	Date – 2016	Issue raised	Response
Pastoralist turbine hosts – face to face meetings	February	Larger turbines potentially meaning hosts may get less turbines per property, resulting in less negotiated income stream Turbines potentially affecting view from tourism accommodation on one host's station	MOD 3 includes an updated visual impact assessment. Approved turbine locations closest to Silverton have now been removed.
Various Stakeholders - Modification 2, submissions	March – April	Several issues were raised in submissions on the Modification 2 report, which were not directly relevant to an extension of the lapse date. While a response to these issues was provided in the Modification 2 Response to Submissions Report, they have also been addressed where relevant to Modification 3, including: <ul style="list-style-type: none"> • Background noise levels and data • Potential impacts to Barrier Ranges Dragon and other EEC • Umberumberka Reservoir and source of water for construction • Water/soil impacts • Visual and noise impacts • Potential impacts to mineral tenement holders 	Issues have been addressed throughout the Modification 3 EA and specialist reports, and during consultation with Department of Industry and mineral tenement holders. A further background noise monitoring program has been carried out. Mitigation measures for EEC have been reviewed and validated. An addition construction water source has now been proposed.
Community Consultative Committee meeting	28 April	Noise from larger turbines Visibility of larger turbines Location and visibility of turbines in relation to Silverton village Construction water	MOD 3 provides updated noise and visual impact assessments, as well as distances of closest turbine to Silverton Approved turbine locations closest to Silverton have now been removed. Closest approved turbine location is around 5.5 kms from the Silverton township. Additional background noise monitoring has been carried out

Stakeholder and activity	Date – 2016	Issue raised	Response
			An additional construction water option has been proposed in Mod 3
Silverton Village Committee (as part of CCC group)	28 April	Noise from larger turbines Visibility of larger turbines Location of turbines in proximity to Silverton village	MOD 3 provides updated noise and visual impact assessments, as well as distances of closest turbine to Silverton Approved turbine locations closest to Silverton have now been removed. Closest approved turbine location is around 5.5 kms from the Silverton township.
Broken Hill City Council – meeting	19 April	Visibility of larger turbines Visibility of transmission line from Desert Sculpture Park Location of turbines in proximity to Silverton village	MOD 3 provides updated visual impact assessment, as well as distances of closest turbine to Silverton Approved turbine locations closest to Silverton have now been removed. Closest approved turbine location is around 5.5 kms from the Silverton township.
CCC and Silverton community stakeholder list, including Silverton residents and businesses - Emails with all CCC documents and modification information	10 May	Two CCC members wrote to the National Wind Farm Commissioner with general project objections noting impacts from noise, changes to visual amenity and display of project information in Silverton	MOD 3 provides updated noise and visual impact assessments, as well as distances of closest turbine to Silverton Approved turbine locations closest to Silverton have now been removed. Closest approved turbine location is around 5.5 kms from the Silverton township. Advised through phone calls and follow up letters that larger turbines will likely result in less turbines and reduced visual impacts. Advised project information will be displayed through shop front display and or in suitable locations be available
Silverton community stakeholders - Letters	15 May	Two Silverton residents and business operators who are also	MOD 3 provides updated noise and visual impact

Stakeholder and activity	Date – 2016	Issue raised	Response
and all CCC documents and information about the modifications		<p>CCC members raised their ongoing concerns via letters to the National Wind Farm Commissioner:</p> <p>Noise from turbines</p> <p>Visibility of turbines</p> <p>Location of turbines in proximity to Silverton village</p> <p>Provision of project information in Silverton</p>	<p>assessments, as well as distances of closest turbine to Silverton</p> <p>Approved turbine locations closest to Silverton have now been removed. Closest approved turbine location is around 5.5 kms from the Silverton township.</p> <p>Phone calls made to both residents explaining all concerns are being considered with turbine located reasonable distances from Silverton.</p> <p>Advised project information will be displayed through shop front display and or in suitable locations be available</p> <p>Letters formally responded to.</p>
Department of Industry (Resources and Energy) – correspondence and face to face meeting	May	Update on project, discussion of Mod 3, current mineral exploration tenements, updated plans.	Provided updated project plan; will provide final turbine layout with current mineral tenements; will consult with current tenement holders.
CASA/Air Services/ Department of Defence/ Aerial Agricultural Association of Australia	June	MOD 3- draft specialist aviation report provided for feedback.	See section 3.8 and specialist aviation report at Appendix B.4.
EPA (Office of Environment and Heritage) – correspondence, draft reports and phone conference	June	Update on project, discussion of MOD 3 and potential impacts on native vegetation, flora/fauna.	Issues addressed in Mod 3 EA and Statements of Commitment.
ANDBAC Mining Exploration	July	ANDBAC’s exploration licence and wind farm site.	<p>Consulted with ANDBAC and confirmed ANDBAC’s exploration licence is not over the Silverton Wind Farm area and will not be affected by the project.</p> <p>Provided all contact details and website information for the wind farm project.</p>

Stakeholder and activity	Date – 2016	Issue raised	Response
Silver City Minerals	July	Exploration licences being affected by the wind farm site. Steel reinforcement in turbine foundations affecting mineral detection equipment.	Met with Silver City Minerals and agreed to provide work program information as the development progressed to coordinate our proposed construction works with their exploration activities. Agreed to provide as-built information to avoid the steel reinforcing and electrical cables impacting their mineral exploration activities.
National Windfarm Commissioner	July	Location of turbines and environmental impacts of construction, on behalf of two complainants.	Discussion on turbine layout, and opportunities to reduce impacts of project.
Local community member	July	Concerns included construction impacts, siltation, run-off and potential health effects.	AGL discussed the concerns and agreed to set out at the forthcoming CCC meetings detailed responses for further consideration.
Local community member	July	Construction, flora, fauna, water and energy market impacts. CCC Chair.	AGL discussed the concerns and agreed to set out at the forthcoming CCC meetings detailed responses for further consideration.
Upcoming Modification 3 consultation activities			
Distribution of link Modification 3 on Department of Planning and Environment website to all CCC members and wider stakeholder distribution list	Once Mod 3 is completed and available on website		
Information about Mod 3 on AGL Energy's microsite for the Silverton Wind Farm https://www.agl.com.au/about-agl/how-we-source-energy/renewable-energy/silverton-wind-farm	Once Mod 3 is completed and available on website		
Community Consultation Committee	28 July 2016 Community Consultative Committee meeting, Silverton		
Advertisements placed in Barrier Daily Truth newspaper with an invitation to the wider community to the CCC	23 and 25 July 2016		

Stakeholder and activity	Date – 2016	Issue raised	Response
Mod 3 and project information available through the project shopfront at Silverton or other suitable Silverton location for public information display			Once Mod 3 is completed and available on website
Information sessions			August 2016
Advertisements in the Barrier Daily Truth promoting the information sessions to the wider community			Prior to information sessions
Emails and letters by post to all Silverton residents and businesses informing them about the information sessions and Mod 3			Prior to information sessions
Feedback received from the community and interested stakeholders will be considered and addressed through ongoing engagement and in the Response to Submissions Report.			

3.12 LAND OWNER / LEASEHOLDER ARRANGEMENTS

While *involved* landowners are usually considered part of the project and not considered in the environmental impact assessment, tenure arrangements for the Silverton Wind Farm involve:

- A government agency as the land owner: Crown Lands
- Current leases over the Crown Land; agricultural

For Silverton Wind Farm, in accordance with the existing Project Approval, lease arrangements would be undertaken directly with the land owner: Crown Lands and not with any existing lease holders. While the lesser number of turbines will affect the lease arrangements with the Crown, no other changes would result from the Modification 3 changes.

4 CHANGES TO CONDITIONS AS A RESULT OF THE MODIFICATION

Proposed changes to approval conditions as a result of modification are set out below. These include:

- **Existing Project Approval conditions that are no longer relevant:-** consideration to deleting or amending these conditions is being sought, in consultation with DPE and the local community (Table 4-1).
- **A definition of pre-construction minor works:-** this would clarify works that could occur prior to construction and without the provisions that relate construction activities.
- **New mitigation measures necessary as a result of this updated impact assessment: –** these relate to staging, biodiversity and aviation (Table 4-2).

4.1 EXISTING CONDITIONS OF APPROVAL FOR CONSIDERATION

The following comments are provided regarding existing conditions of approval.

Table 4-1 Existing conditions of approval for consideration

Existing condition	Comment
DP&E Mod 1 PA 1.12 Requirement to prepare a Decommissioning and Rehabilitation Plan prior to the commencement of construction and update every 5 years from the date of preparation.	It is proposed that this condition be modified to reflect the requirement prior to the commencement of decommissioning. Given changes to appropriate rehabilitation methods and agency requirements that may occur over the life of the project (anticipated to be 30 years) this plan is better provided prior to the relevant stage.
DP&E Mod 1 PA 2.2A Prior to the construction of turbines, the Proponent shall submit a plan of the final turbine number and layout for the approval of the Director-General. The plan must be developed in consultation with Trade & Investment – Crown lands, leaseholders and the CCC. The plan must include photomontages and demonstrate the satisfaction of the Director-General how the visual impacts have been reduced, including by maximising the distance from dwellings, tourist development and other sensitive receivers.	It is noted that the visual assessment in this Modification Report contains montages and assessment of the revised Modification 3 layout and assesses that the Modification 3 layout provides a reduction in visual impacts.
DP&E PA 2.6 No external lighting other than low intensity security night lighting of infrastructure associated with the project, including wind turbine generators is permitted; unless otherwise agreed or directed by the Director-General and/or safety requirements.	It is noted that the aviation assessment in this Modification Report states that the installation of obstacle lights is not required, in accordance with CASA MOS 139.
DP&E PA 2.17 The Proponent shall consult with and comply with the requirement of the Dam Safety Committee relating to the safety of Umberumberka Reservoir under the Dams Safety Act 1978.	It should be stipulated that this condition only applies if water is being sourced from the Reservoir.

Existing condition	Comment
<p>DP&E PA Mod 1 2.21 The Proponent shall prepare a revised Noise Assessment for the final turbine model and turbine layout selected which shall be submitted to the Secretary prior to commissioning of the WTGs. The revised Noise Assessment shall include the noise predictions of the final turbine model and layout selected at each of the receiver locations. The assessment will demonstrate consistency with the Environmental Assessment and the ability of final turbine model and layout to meet the requirements of condition 2.20. Where noise predictions are found to be below the limit specified in condition 2.20 a) then these revised predictions will become the new limit. The assessment must outline the methodology used to assess tonality.</p>	<p>It is noted that the noise assessment in this Modification Report contains a worst case assessment of the revised Modification 3 layout and assesses that the Modification 3 layout is well able to comply.</p>
<p>DP&E PA 2.53 The Proponent shall within six months of this approval, update DPI Minerals Resources of the progress of the consultation process identified in condition 2.51 and 2.52 and provide updates at maximum of 6 month intervals from the date of providing the initial update.</p>	<p>It is proposed that this condition be modified to reflect any change to project status. For example, 6 monthly reports could be removed unless the project were in active development.</p>

4.2 NEW DEFINITION SUGGESTED

To clarify works that can occur prior to the commencement of project construction, it is proposed that the following definition be added to the Approval, in line with recent wind farm approvals:

Pre-construction minor works include the following activities:

- *Building/road dilapidation surveys*
- *Investigative drilling, excavation or salvage*
- *Minor clearing or translocation of native vegetation*
- *Establishing temporary site office (in locations meeting the criteria identified in the conditions of this approval)*
- *Installation of environmental impact mitigation measures, fencing, enabling works; and*
- *Minor access roads and minor adjustments to services/utilities, etc.*

Conditions that require actions 'prior to commencement of construction' would therefore **not** apply to any preconstruction minor works.

Specific to the Silverton Wind Farm, specific access roads which are proposed to be upgraded or constructed **prior** to the commencement of construction, include:

- Upgrade of Silverton Road
- Intersection of Daydream Road and Silverton Road
- Upgrade of Daydream Mine Road
- Construction of access road off Daydream Road into project site for access to temporary office site.

These upgrades have been added to Table 4-2.

4.3 ADDITIONAL MITIGATION MEASURES RECOMMENDED BY THIS ASSESSMENT

The following additional mitigation measures are recommended.

Table 4-2 Additional mitigation measures, based on updated impact assessment of Modification 3.

Additional mitigation measures
Staging requirements - new measures set out in Section 2.3
<ul style="list-style-type: none"> • Prior to the commencement of the construction, operation and/or decommissioning of the development, the Proponent will notify the Department in writing of the date of commencement.
<ul style="list-style-type: none"> • If the construction, operation and/or decommissioning of the development is to be staged, then the Proponent will: <ul style="list-style-type: none"> ○ notify the Department in writing prior to the commencement of the relevant stage, and clearly identify the development that would be carried out during the relevant stage; and ○ inform the local community and the Community Consultation Committee about the proposed staging plans
<ul style="list-style-type: none"> • All strategies, plans or programs required by this consent would be submitted to the Department as required on a progressive basis and prior to the relevant construction works occurring. This includes any revised strategies, plans or programs that may be updated during the construction phase
<ul style="list-style-type: none"> • Road upgrades - Prior to the commencement of construction (other than pre-construction minor works), the Applicant shall undertake: <ul style="list-style-type: none"> Upgrade of Silverton Road Intersection of Daydream Road and Silverton Road Upgrade of Daydream Mine Road Construction of access road off Daydream Road into project site for access to temporary office site
Bird and bat collision risk
<ul style="list-style-type: none"> • The final layout should avoid, where practical, irregularly spaced 'outliers' which may have increased collision risk in the landscape.
<ul style="list-style-type: none"> • Higher risk sites (such as potential outliers) should initially be monitored more frequently in the adaptive management monitoring program and follow up management actions taken as required, in accordance with an adaptive management monitoring program.
<ul style="list-style-type: none"> • Apply a minimum buffer distance between turbines and treed vegetation.
<ul style="list-style-type: none"> • Higher risk species should initially be monitored more frequently in the adaptive management monitoring program and follow up management actions taken as required, in accordance with the plan.
Biodiversity (vegetation clearance)
<ul style="list-style-type: none"> • A clearance limit of 0.81 ha of spinifex habitat (Porcupine Grass CEEC) applies to the Project, as per the existing Project Approval.

Additional mitigation measures

Aviation

- The top one third of existing and proposed met masts and/or wind monitoring towers will be painted in alternating contrasting bands of colour and marker balls. Alternatively, high visibility flags or sleeves will be placed on the outside guy wires consistent with the recommendations of the National Airports Safeguarding Advisory Group (NASAG) Guideline D.
- Ongoing consultation with all relevant government agencies, organisations and potentially affected aviation authorities would take place when issues which may affect aviation operations and safety arise.
- Identification of the wind turbines on the relevant aeronautical charts, both the civil WACs and RAAF produced chart series.

5 CONCLUSION

This assessment has demonstrated that, for most impact areas, the proposed modifications (when considered with the proposed mitigation measures) would have a lesser environmental impact than the Approved Project (Stage 1). Compared to the Stage 1 approved layout (282 turbines), a reduction to of 110 turbines to a maximum of 172 turbines would be significant. A lesser number of turbines will reduce impact on:

- Visual amenity impacts for several viewpoints including from the Silverton township
- Bird and bat collision risk
- Native vegetation (when all vegetation types are combined)
- Barrier Range Dragon (*Ctenophorus mirrityana*) 'hot spots' and significant rock outcrop habitat
- Soil and water (potential for erosion and impacts on drainage lines and sensitive features)
- Less heritage sites would be affected, original mitigation strategies would still apply

Additionally,

- Noise impacts would remain compliant with the relevant criteria.
- Aviation risks remain low

If less than 172 turbines are constructed for the initial installed capacity (refer to Section 1.7.1), then there would be a corresponding decrease in visual, noise, native vegetation, Barrier Range Dragon habitat (potential and known) as well as soil and water impacts.

Compared to the original Project and Concept Plan approval (Stage 2) for up to 598 turbines, the reduction is substantial.

Additional mitigation strategies have been proposed to ensure that any new impacts, where identified, are restricted and would not be unacceptable. Additionally, several proposed changes to approval conditions as a result of this Modification Application are proposed where existing Project Approval conditions may no longer be relevant.

The Silverton Wind Farm site has a high quality wind resource and the project will assist in realising the three following goals in the NSW Renewable Energy Action Plan:

- Deliver renewable energy investment in NSW
- Build community support
- Grow renewable energy expertise

The wind farm development would also contribute to meeting the Australian Government and AGL greenhouse gas emissions and renewable energy policies. The project could reduce greenhouse gas emissions by 580,000 tonnes of CO₂ emissions annually. The changes proposed in this modification would improve the commercial viability of the project by allowing construction staging flexibility and making use of efficiencies in power generation (due to the larger turbine models). The latter would produce ongoing benefits for the life of the project.

6 REFERENCES

- AGL 2016. Silverton Wind Farm Modification Report 2, submitted to NSW Department of Planning and Environment, 25 February 2016.
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- NGH Environmental 2008. Silverton Wind Farm Environmental Assessment 2008. Report prepared May 2008.
- NGH Environmental (2008a), Proposed development of Stage 1b and 1c, Silverton Wind Farm, far western New South Wales, Status and distribution of the Tawny Rock Dragon and their habitat, report prepared for Silverton Wind Farm Developments.
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- NSW Government Department of Planning 2009. Project Approval for the Silverton Wind Farm, 24 May 2009.
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- Silverton Wind Farm Developments, with assistance from NGH Environmental 2009. Preferred Project and Submissions Report. Report prepared January 2009.

APPENDIX A MAP SETS

A.1 REVISED MODIFICATION 3 LAYOUT

A.2 VEGETATION TYPES

A.3 FAUNA FEATURES

A.4 HERITAGE FEATURES

A.5 RECEIVERS

APPENDIX B SPECIALIST ASSESSMENTS

B.1 VISUAL

B.2 NOISE

B.3 BIRD AND BAT RISK ASSESSMENT

B.4 AVIATION

APPENDIX C MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

A search of the Commonwealth Department of the Environment Protected Matters search tool was undertaken on the 30 June 2016. This search identified matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999 (Cth)* within an area 30 kilometres radius from the centre of the proposed works area.

The following matters of national environmental significance were returned from the search.

Table 6-1 Matters of national environmental significance

Matter	
World Heritage Properties	None
National Heritage Places	1 (City of Broken Hill)
Wetlands of International Importance	3
Great Barrier Reef Marine Park	None
Commonwealth Marine Area	None
Listed Threatened Ecological Communities	None
Listed Threatened Species	8
Listed Migratory Species	4
Commonwealth Land	6
Commonwealth Heritage Places	None
Listed Marine Species	8
Whales and Other Cetaceans	None
Critical habitats	None
Commonwealth Reserves Terrestrial	None
Commonwealth Reserves Marine	None

The following threatened species not previously considered by the Project were returned from the updated search:

- Corben's Long-Eared Bat (*Nyctophilus corbeni*)
- Grey Wagtail (*Motacilla cinerea*)
- Yellow Wagtail (*Motacilla flava*)
- *Frankenia plicata*

It is noted that the Barrier Range Dragon (*Ctenophorus mirrityana*) is not listed under the EPBC Act at this time.

Corben's Long-Eared Bat is listed as Vulnerable under the EPBC Act. The species has a limited distribution that is restricted around the Murray-Darling Basin in south-eastern Australia. It is known to occur in a

range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands and is thought to roost solitarily under exfoliated bark and in the crevices on trees. There are no known records on the Bionet Wildlife Atlas. Given the extent and pattern of clearing proposed in relation to habitat preferences, the potential for the species to be impacted by the Project is considered to be low.

The Grey Wagtail and Yellow Wagtail are listed as Migratory Species under the EPBC Act. Both species are generally found around lakes, coasts or other watery habitats. For the Grey Wagtail, the wind farm site is located on the eastern edge of the known species distribution with it mostly found in the western part of Australia. Given that the species are highly mobile and migratory, and given the extent and pattern of clearing proposed in relation to habitat preferences, the potential for the species to be impacted by the Project is considered to be low.

Frankenia plicata is listed an Endangered under the EPBC Act. The shrub is known to occur in the central arid parts of Australia with the wind farm site located on the south-eastern edge of its known distribution. The species grows in a range of habitats, including on small hillside channels, which take the first run-off after rain, and swales of loamy sands to clay in the Simpson Desert (Australian Government 2008). The species is found in a wide range of vegetation communities that have good drainage including woodland and grassland communities. Given the extent and pattern of clearing proposed in relation to habitat preferences, the potential for the species to be impacted by the Project is considered to be low.

In addition, the following wetlands of International Importance not previously considered by the proposal were returned from the search:

- Banrock station wetland complex
- Riverland
- The Coorong, and Lakes Alexandrina and Albert Wetland.

The closest wetland, Banrock station wetland complex, is located 200-300 kilometres upstream of the Project. No wetlands would be impacted by the Project.

Overall, the proposed modification to the Approved Project is not likely to have a significant impact on a Matter of National Environmental Significance under the EPBC Act, and therefore no referral is required under that Act.