Hexham Wind Farm

Chapter 26

Cumulative effects

WIND PROSPECT

26.1 Overview

Some residual environmental, social and economic impacts associated with the project may not be significant when considering the construction, operation, and decommissioning of the project in isolation. However, these residual impacts may become significant when considered in combination with other existing or proposed projects. The specialist studies supporting this EES have considered the potential cumulative effects of the project and other relevant existing and planned projects within the region and occurring at the same time as the project, including cumulative effects that may be positive or negative, direct or indirect, and long-term or short-term.

Cumulative impacts were assessed for potential residual adverse effects associated with the project and informed the development of design measures and management controls. The EES scoping requirements specify key areas for which cumulative impacts should be assessed including landscape values, considering other operating and approved wind farms in the region, and relevant listed threatened and migratory species and communities of flora and/or fauna. In particular these include, but are not limited to:

- **Brolga** (*Antigone rubicunda*)
- **Southern Bent-wing Bat** (*Miniopterus orianae bassanii*)
- **Grey-headed Flying-fox** (*Pteropus poliocephalus*)
- **White-throated Needletail** (*Hirundapus caudacutus*)
- **Black Falcon** (*Falco subniger*).

The assessments presented in this chapter have been informed by publicly available data, specialist studies, and stakeholder feedback. Both the spatial and temporal overlap of projects, particularly other wind energy developments, have been considered in the assessment of potential cumulative environmental, social and economic impacts. These assessments recognise that cumulative impacts may occur as a result of both physical proximity to the project and the concentration of similar activities within the region, such as the clustering of wind farms in Moyne Shire.

Several potential cumulative impacts have been identified, including:

- **Impacts to biodiversity**, particularly to threatened species such as the Southern Bent-wing Bat, Brolga, and Black Falcon, which are susceptible to turbine collisions and habitat disruption across multiple wind farms in the region.
- **Impacts to landscape character and visual amenity**, with the clustering of wind farms contributing to a shift in regional identity and the potential for sequential views of wind farms from public roads and travel routes.
- **Impacts to social values**, including community cohesion, housing availability, and demand on health services, especially in areas with concentrated development.
- **Impacts to air quality**, which may be amplified during overlapping construction periods with nearby projects, although cumulative impacts are generally expected to be low.
- **Impacts from noise and vibration**, which are expected to be minor but may affect sensitive receivers near shared infrastructure or overlapping project zones.
- **Impacts to traffic and transport**, particularly during peak construction periods due to increased vehicle movements and oversize and overmass transport requirements.
- **Impacts to telecommunications and broadcasting**, with electromagnetic interference potentially affecting mobile and digital television signals in areas with marginal coverage, especially where multiple wind farms lie between users and transmission towers.

A number of Environmental Management Measures (EMMs) have been developed to specifically address cumulative impacts, including the development of an Accommodation and Employment Strategy and the requirement to co-ordinate with relevant projects prior to the commencement of construction. Following the application of these EMMs, residual cumulative impacts are not anticipated to be significant.

26.2 EES objectives and key issues

The EES scoping requirements specify that cumulative effects are to be addressed by the EES, particularly in relation to *'biodiversity / ecology, social and landscape values, given the proximity to other proposed, approved and operating windfarms'*.

Evaluation objectives and key issues are provided in the EES scoping requirements for seven environmental aspects. Of these, two specify cumulative effects (or impacts) as a key issue: biodiversity and habitat, and landscape and visual. These evaluation objectives and key issues, outlined in Table 26.1. have guided this assessment.

For other environmental aspects, while cumulative impacts are not specifically noted in the EES scoping requirements, these have also been considered in this assessment where relevant.

Table 26.1 EES evaluation objective and key issues

Evaluation objective	
Biodiversity and habitat: *To avoid, and where avoidance is not possible, minimise potential adverse effects on biodiversity values within and near the site including native vegetation, listed threatened species and ecological communities, and habitat for these species. Where relevant, offset requirements are to be addressed consistent with state and Commonwealth policies.* **Landscape and visual:** *Avoid and, where avoidance is not possible, minimise and manage potential adverse effects on landscape and visual amenity.*	
Key issues	• Potential cumulative effects on relevant listed threatened and migratory species and communities of flora and/or fauna, in particular, but not limited to, **Brolga**, **Southern Bent-wing Bat**, **Grey-headed Flying-fox**, **White-throated Needletail and Black Falcon** from the project in combination with the construction and operations of other energy facilities. • Potential cumulative impacts of other operating and approved wind farms on landscape values of the region.

26.3 Legislation, policy and guidelines

Legislation, policies and guidelines relevant to the cumulative impact assessment are summarised in Table 26.2 below.

Table 26.2 Relevant legislation, policies and guidelines

Legislation, policy and guidelines	Description	Relevance to the project
Significant Impact Guidelines 1.1 – MNES, EPBC Act (Significant Impact Guidelines) (DoE, 2013a)	The Significant Impact Guidelines outline criteria against which a project is assessed to determine whether it is likely to have a significant impact on MNES.	Potential impacts to MNES from the project were considered in accordance with the Significant Impact Guidelines.
Planning Guidelines for Development of Wind Energy Facilities (DTP, 2023a)	The Planning Guidelines for Development of Wind Energy Facilities provide a framework for the planning, assessment, and development of wind energy facilities in Victoria. They include requirements for environmental assessments, community consultation, visual and landscape impact assessments, and biodiversity considerations, particularly in relation to native vegetation and fauna.	These guidelines require that the net impacts of wind farms on biodiversity values, especially threatened species, are considered.
Interim Guidelines for the Assessment, Avoidance, Mitigating and Offsetting of Potential Wind Farm impacts on the Victorian Brolga Population (Interim Brolga Guidelines) (DSE, 2012)	The Interim Brolga Guidelines respond to the perceived risk posed to Brolga by the wind industry by outlining an approach to achieving a zero net impact to the Victorian Brolga population.	The project has been assessed in accordance with the Interim Brolga Guidelines.
Guidelines for Landscape and Visual Impact Assessment - Third edition (Landscape Institute, 2013)	This guidance document is the industry-standard reference for assessing how developments can potentially impact landscape character and visual amenity. It includes a structured approach to identifying and assessing the combined effects of multiple developments, such as wind farms, and outlines how cumulative effects may arise from developments that are concurrent, sequential, or spatially overlapping.	The Landscape and Visual Impact Assessment (provided in Appendix F1 - ***Landscape and Visual Impact Assessment***) adopts the definition of cumulative landscape and visual effects provided in the relevant guidance document and is informed by the recommended assessment approach.

26.4 Method

The potential for cumulative impacts was assessed by technical specialists within their respective discipline as part of the specialist studies, which informed the development of this EES. These studies are appended to this EES and summarised in Chapters 8 – ***Biodiversity and habitat*** through Chapter 25 – ***Traffic and transport***.

The existing or planned activities considered by each technical specialist in their assessment of cumulative effects was specific to the discipline. Selecting relevant existing or planned activities included consideration of:

- the type of action: Some disciplines considered a wide array of activities, such as terminal station upgrades and the development of battery energy storage systems. These projects may have associated noise generation or air quality impacts, for example, leading to cumulative effects. However, others including the shadow flicker assessment and bird and bat collision assessment only considered wind farm projects.
- the timing of the activities: Nearby projects that have not yet started construction have the potential to overlap in construction timeframes or involve only short time gaps between projects. This could result in both positive and negative effects in the project site and region.

- the location of the activity: For example, cumulative noise impacts can only occur when projects are sufficiently close enough to result in a combined noise at a specific location that is louder than that from just one project alone. Alternatively, impacts on Southern Bent-wing Bat need to be considered more broadly since a small impact on this threatened species can have a broader (cumulative) impact on the population.

A description of all the existing or planned activities considered by technical specialists in the assessment of cumulative effects are presented in Section

The key steps involved in assessing cumulative impacts involved:

- identifying existing and planned activities that have potential to interact with the project
- quantitative and/or qualitative assessment of predicted cumulative impacts (or the predicted risk of cumulative impacts) considering the design mitigations and management controls nominated for the project, based on assessments undertaken for the project and publicly accessible information on the environmental, social and economic impacts of the identified existing or planned activities
- proposing additional design mitigation and management controls, as required, to address potential significant cumulative impacts
- assessing the residual cumulative impacts, following the implementation of management measures.

Detailed descriptions of cumulative impact assessment methods specific to the relevant disciplines, including impact and risk level definitions where used, can be found in:

- Appendix B – ***Surface Water and Groundwater Impact Assessment***
- Appendix C1 – ***Brolga Impact Assessment***
- Appendix C2 – ***Bat Assessment***
- Appendix D – ***Flora and Fauna Impact Assessment***
- Appendix E1 – ***Environmental Noise & Vibration Assessment***
- Appendix F1 – ***Landscape and Visual Impact Assessment***
- Appendix G – ***Traffic and Transport Impact Assessment***
- Appendix H – ***Land Use and Planning Report***
- Appendix I – ***Social and Economic Impact Assessment***
- Appendix J – ***Aboriginal Cultural Heritage Impact Assessment***
- Appendix K – ***Historical Heritage Impact Assessment***
- Appendix L1 – ***Air Quality Impact Assessment***
- Appendix L2 – ***Greenhouse Gas Impact Assessment***
- Appendix M – ***Shadow Flicker and Blade Glint Impact Assessment***
- Appendix N – ***Electromagnetic Interference Impact Assessment***
- Appendix O – ***Aviation Impact Assessment***
- Appendix P – ***Fire Risk Impact Assessment***

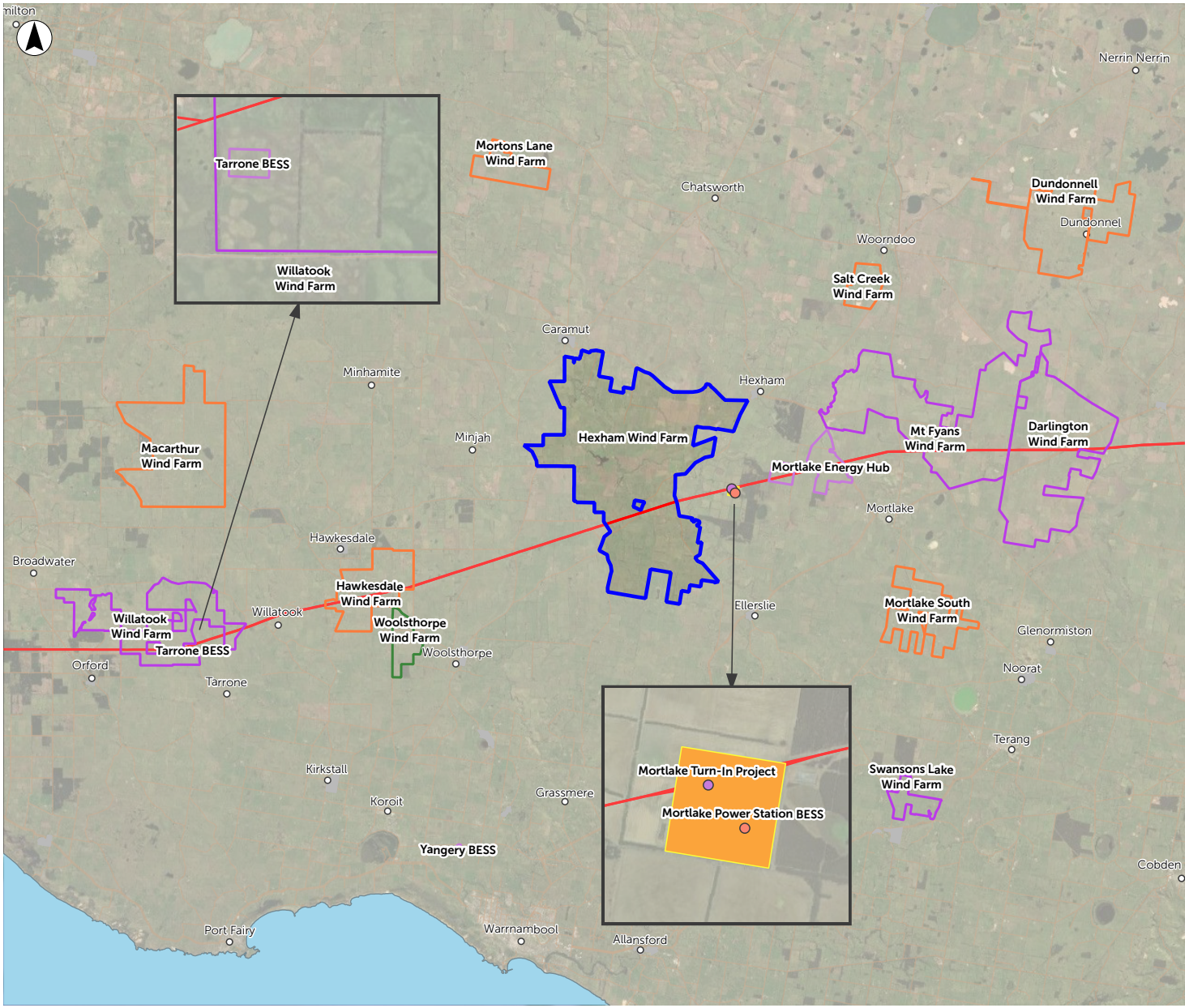
No cumulative effects were determined to occur for some disciplines. For example, due to the nearest proposed or operating wind turbine (located at the approved Mt Fyans Wind Farm) being greater that 10 kilometres from any project turbines, no identified dwellings would be impacted by shadow flicker by additional wind farm projects. No cumulative effects were also identified associated with historical cultural heritage or fire risk.

26.5 Existing and planned activities assessed

Activities that were considered in the specialist studies as potentially resulting in cumulative impacts included those that are progressing through planning approvals, are approved, under construction, in the process of being commissioned or are operational. These were identified based on publicly available information.

The majority of activities considered are related to wind farms located in the Moyne Shire, in western Victoria. These wind farms are shown in Figure 26.1 and described in Table 26.3 An indicative development schedule for these projects, based on public information released by the developer and electricity generation information published by the Australian Energy Market Operation (AEMO), is shown in Figure 26.2.

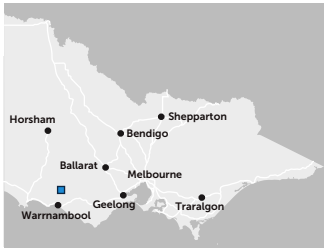
Other projects considered by technical specialists, where relevant to their discipline, included upgrades to the electricity transmission network, the development of battery energy storage systems, and one solar farm.



Legend

- Wind farm boundary
- Wind farm boundary 25km distance band
- Approved projects
- Operational projects
- Proposed projects
- Township
- 500kV Transmission Line Moorabool Terminal to Tarrone Terminal

Scale 10,000 m



Data: State of Victoria (DECCA/Land Use Victoria), Commonwealth of Australia, Wind Prospect, and specialist studies/reports. Data is indicative only; accuracy and completeness are not guaranteed. © State of Victoria and other data providers

Figure 26.1 Existing and planned activities considered in cumulative impact assessments

Table 26.3. Existing and planned activities considered in cumulative impact assessments

Activity	Type of activity	Timing of activity	Location of activity
Mt Fyans Wind Farm	This activity is a **wind farm** that is planned to include 80 wind turbines with a tip height of up to 200 metres. It also includes the development of 18 kilometres of **220 kV overhead transmission line** connecting to Mortlake Substation.	**Approved** The Planning Permit Application for this activity was lodged in late 2022 and was approved in August 2025. It is anticipated to be fully operational by the end of 2026.	Mt Fyans Wind Farm is located between Hexham and Mortlake, and is approximately 4 kilometres east of the project site. The Mt Fyans Wind Farm site is approximately 10,500 hectares.
Mortlake South Wind Farm	This activity is a **wind farm** comprising 35 turbines with a tip height of up to 186 metres. It also includes an **underground transmission line** connecting to Terang Substation.	**Operational** Construction commenced in 2019, and the Mortlake South Wind Farm became fully operational in 2024.	Mortlake South Wind Farm is located between Mortlake and Noorat, and is 15 kilometres south-east of the project site. The Mortlake South Wind Farm site is approximately 1,200 hectares.
Woolsthorpe Wind Farm	This activity is a **wind farm** with development approval for up to 13 wind turbines with a tip height of 230 metres It also includes the development of 11 kilometres of **66 kV overhead transmission line** connecting to the Koroit Zone Substation.	**Approved** This activity is currently at the financing stage, with construction expected to commence following final approvals. It is anticipated to be fully operational by the end of in 2027.	Woolsthorpe Wind Farm is located between Woolsthorpe and Hawkesdale, and is approximately 17 kilometres south-east of the project site. The Woolsthorpe Wind Farm site is approximately 460 hectares.
Hawkesdale Wind Farm	This activity is a **wind farm** comprising 23 turbines with a tip height of up to 180 metres. It also includes 14-16 kilometres **132 kV overhead transmission line** connecting to the Tarrone Terminal Station.	**Operational** Construction commenced in 2023, and the Hawkesdale Wind Farm became fully operational in 2024.	Hawkesdale Wind Farm is located near the township of Hawkesdale, and is approximately 14 kilometres south-west of the project site. The Hawkesdale Wind Farm site is approximately 2,280 hectares.
Mortons Lane Wind Farm	This activity is a **wind farm** comprising 13 turbines with a tip height of approximately 125 metres.	**Operational** Planning approval was granted in 2007 and the Mortons Lane Wind Farm became fully operational in 2012.	Mortons Lane Wind Farm is located east of Penhurst, and is approximately 16 kilometres north-west of the project site. The Mortons Lane Wind Farm site is approximately 1,100 hectares.
Salt Creek Wind Farm	This activity is a **wind farm** comprising 15 turbines with a tip height of up to 180 metres. It includes a 50.5-kilometre **66 kV overhead transmission line** connecting to the Terang Terminal Station.	**Operational** Construction commenced in 2017, and the Salt Creek Wind Farm became fully operational in 2018.	Salt Creek Wind Farm is located near Woorndoo, and is approximately 14 kilometres north-west of the project site. The Salt Creek Wind Farm site is approximately 1,200 hectares.
Dundonnell Wind Farm	This activity is a **wind farm** comprising 80 turbines with a tip height of 189 metres. It includes a 38-kilometre **220 kV overhead transmission line** connecting to the Mortlake Terminal Station.	**Operational** Construction commenced in early 2019 and the Dundonnell Wind Farm became fully operational in 2020.	Dundonnell Wind Farm is located near Dundonnell, and is approximately 28 kilometres north-west of the project site. The Dundonnell Wind Farm site is approximately 4,200 hectares.

Activity	Type of activity	Timing of activity	Location of activity
Darlington Wind Farm	This activity is a **wind farm** that is planned to include up to 45 turbines with a tip height of up to 240 metres. It includes a new **on-site substation** connecting to the existing 500kV Haunted Gully–Tarrone transmission line.	**Planned** The activity is currently undergoing environmental assessment and planning approvals. It is anticipated to be fully operational by the end of 2028.	Darlington Wind Farm is located between Darlington and Mortlake, and is approximately 24 kilometres east of the project site. The Darlington Wind Farm site is approximately 5,645 hectares.
Macarthur Wind Farm	This activity is a wind farm comprising 140 turbines with a tip height of up to 112 metres. It includes associated substation infrastructure and a 12-kilometre **132 kV overhead transmission line**.	**Operational** Construction commenced in 2010, and the wind farm became fully operational in 2013.	Macarthur Wind Farm is located east of Macarthur, and is approximately 28 kilometres west of the project. The Macarthur Wind Farm site is approximately 5,500 hectares.
Willatook Wind Farm	This activity is a wind farm planned to include up to 59 turbines, a **battery energy storage facility**, and supporting infrastructure.	**Planned** The activity is progressing through planning approvals and environmental assessment stages. It is anticipated to be fully operational by the end of 2029.	Willatook Wind Farm is located between Orford and Hawkesdale in south-west Victoria, and is approximately 24 kilometres south-west of the project. The Willatook Wind Farm site is approximately 4,000 hectares.
Swansons Lane Wind Farm	This activity is a wind farm comprising up to 5 turbines with a maximum rotor swept height of 252 metres. It includes an **on-site substation**, underground and aboveground cabling, and a meteorological mast.	**Planned** The activity is currently undergoing environmental assessment and planning approvals. Details of its timeline have not been publicly released.	Swansons Lane Wind Farm is located adjacent to the Princes Highway, south-east of Terrang, and is approximately 28 kilometres south-east of the project. The Swansons Lane Wind Farm site is approximately 688 hectares.
Mortlake Turn-In Project	This activity involves the upgrade of **Mortlake Terminal Station** at Mortlake Power Station, including the connection of a second **500 kV line to the substation** by upgrading existing equipment.	**Under construction** This activity commenced construction in 2023. It is anticipated to be fully operational by the end of 2025.	Mortlake Power Station is located to the west of Mortlake, and is approximately 3 kilometres east of the project site.
Mortlake Power Station BESS	This activity is a large-scale 300 MW **Battery Energy Storage System (BESS)**, located at the Mortlake Power Station. It includes the development of associated **transmission infrastructure**, including an extension of the existing switchyard and a new transformer compound.	**Approved** Construction is expected to commence in 2024. It is anticipated to be fully operational by the end of 2026.	Mortlake Power Station is located to the west of Mortlake, and is approximately 3 kilometres east of the project site. The Mortlake Power Station BESS site is approximately 104 hectares.
Mortlake Energy Hub	This activity is a large-scale 300 MW **BESS** and 360 MW **solar farm**, with a planned output of 650 MWh. It would be located adjacent to Mortlake Power Station and the Mortlake Turn-In Project.	**Approved** Approvals for this activity were fast-tracked and construction is expected to commence in 2025. It is anticipated to be fully operational by the end of 2026 or early 2027.	Mortlake Power Station is located to the west of Mortlake, and is approximately 3 kilometres east of the project site. The Mortlake Energy Hub site is approximately 1,060 hectares.

Activity	Type of activity	Timing of activity	Location of activity
Yangery BESS	This activity is a utility-scale 120 MW **BESS**, located next to the Koroit Zone Substation.	**Approved** Construction is expected to commence in 2025. It is anticipated to be fully operational by the end of 2026.	Yangery BESS is located northwest of Warrnambool, and is approximately 30 kilometres south of the project site. The Yangery BESS site is approximately 23,300 hectares.
Tarrone BESS	This activity is a utility-scale 120 MW **BESS**, located next to the Tarrone Terminal Station.	**Approved** Approvals for this activity were fast-tracked and construction is expected to commence in 2025. It is anticipated to be fully operational by the end of 2026 or early 2027.	Tarrone BESS is located north of Tarrone, and is approximately 30 kilometres south-west of the project site. The Tarrone BESS site is approximately 23 hectares.

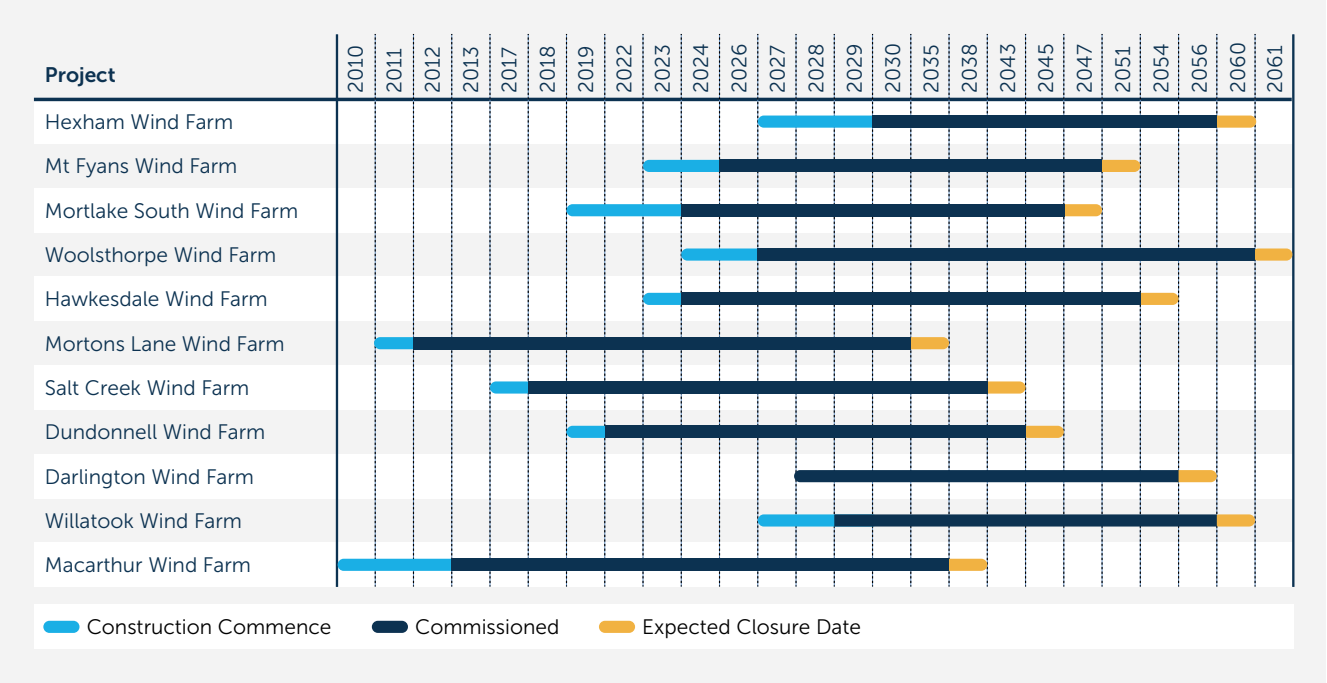


Figure 26.2 Indicative development schedule for wind farm projects

26.6 Cumulative impact assessment

26.6.1 Biodiversity and habitat

As discussed in Chapter 8 – ***Biodiversity and habitat***, potential cumulative impact pathways include the direct clearing of native vegetation and associated loss of flora and fauna habitat during construction, possible barrier effects and collision of bats and avifauna with the wind turbines during operation. Collision or electrocution due to the presence of overhead transmission lines has also been considered as a potential impact.

Barrier effects occur when wind farms disrupt the movement of animals by creating physical or behavioural obstacles that prevent them from accessing important habitats or migration routes. This can cause habitat isolation and reduce the ability of species to move through the landscape.

The EES scoping requirements specify that the potential for impacts associated with collisions with turbines or overhead powerlines should be considered in combination with other nearby wind energy projects for listed threatened, migratory and other protected fauna species under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the *Flora and Fauna Guarantee Act 1988* (FFG Act). This includes, but not limited to:

- **White-throated Needletail**
- **Black Falcon**
- **Grey-headed Flying-fox** (discussed in Section 26.6.2)
- **Southern Bent-wing Bat** (discussed in Section 26.6.2)
- **Brolga** (discussed in Section 26.6.3)

The biodiversity and habitat cumulative impact assessment considered operational, approved, and planned wind farms within 25 kilometres of the project site, which captured the region of Moyne Shire and nearby townships such as Mortlake, Caramut, Woolsthorpe, Hawkesdale and Koroit. This distance was considered broad enough to capture other proposed, approved or operating wind farms in the region that may interact with the biodiversity values considered in the ***Flora and Fauna Assessment*** (Appendix D), and is consistent with other recently exhibited wind farm proposals in Victoria.

The project may add to cumulative impacts on the EPBC Act listed Natural Temperate Grasslands of the Victorian Volcanic Plain (a threatened ecological community) and Striped Legless Lizard habitat. Both have been, or are proposed to be, affected by other activities within 25 kilometres. The potential impacts of the project to these communities and species, as well as cumulative impacts arising from other wind farm projects, are presented in Table 26.4.

Table 26.4 **Cumulative impacts to threatened ecological communities and species habitat**

Development	Natural Temperate Grasslands of the Victorian Volcanic Plain (hectares)	Striped Legless Lizard habitat impacts (hectares)
Hexham Wind Farm (this project)	0.585 – 0.605	1.74 – 1.91
Salt Creek Wind Farm	0.26	0.26
Dundonnell Wind Farm	1.572	-
Mt Fyans Wind Farm	0.4	3.773
Total	**2.85**	**5.9**

These communities and species are listed under the EPBC Act and cumulative impacts are addressed in the Matters of National Environmental Significance: Significant Impact Guidelines (DoE, 2013), which considers the long-term viability of Matters of National Environmental Significance (MNES) as a whole. Assessments against the Significant Impact Guidelines for all MNES present, or with the potential to be present within the project site are provided in Chapter 27 – ***Matters of National Environmental Significance***. The project has the potential to result in significant impacts to the Natural Temperate Grasslands of the Victorian Volcanic Plain and Striped Legless Lizard. These impacts will be offset in accordance with the EPBC Act Environmental Offsets Policy (DSEWPaC, 2012), which has a requirement for additionality and security above what is being impacted

Offset Requirements under the EPBC Act

Where significant residual impacts to MNES cannot be avoided or mitigated, environmental offsets may be required under the EPBC Act. These include **species offsets**, which must deliver a measurable benefit for listed threatened species or ecological communities, and **native vegetation offsets**, which compensate for the loss of habitat by protecting or enhancing vegetation of a similar type and condition.

As these threatened species and ecological communities have the potential, or are likely, to be impacted as a whole, cumulative impacts are anticipated. However, these will be minimal considering the implementation of appropriate offsets and additional design mitigations or management controls have not been recommended to address cumulative impacts.

Cumulative impacts from the operation of wind farms in the area are difficult to quantify as there is little data available on the extent of impact of operational wind farms on biodiversity and uncertainty about the future extent of impacts arising from each wind farm. Based on a review of publicly available documentation, 10 wind farms were assessed as potentially resulting in cumulative operational impacts, as presented in Table 26.5 This assessment included referrals under the *Environment Protection and Biodiversity Conservation Act 1999*, Environmental Management Plans, Bat and Avifauna Management Plan Reports, Environmental Effects Statements, Planning Permits, and supporting specialist studies as listed in Appendix D – ***Flora and Fauna Assessment***. Potential cumulative impacts to the White-throated Needletail and Black Falcon are discussed below, and impacts to the Grey-headed Flying-fox and Southern Bent-wing Bat and Brolga are discussed in the Sections 26.6.2 and 26.6.3, respectively.

Table 26.5 Project screening for operational cumulative impacts through collision

Development	Threatened species				
	White-throated Needletail	Black Falcon	Grey-headed Flying-fox	Southern Bent-wing Bat	Brolga
Mortlake South Wind Farm (operational)	✓	✓		✓	
Salt Creek Wind Farm (operational)		✓	✓		
Dundonnell Wind Farm (operational)	✓	✓		✓	✓
Mortons Lane Wind Farm (operational)		✓			
Hawkesdale Wind Farm (operational)		✓		✓	✓
Macarthur Wind Farm				✓	✓
Woolsthorpe Wind Farm (approved)	✓	✓	✓	✓	
Mt Fyans Wind Farm (approved)	✓	✓			
Swansons Lane Wind Farm (planned)	✓	✓	✓	✓	
Darlington Wind Farm (planned)		✓		✓	

White-throated Needletail is considered as having a very low risk of collision as it was not observed in the investigation area during any surveys, and species records are scarce (occurring approximately 30 to 40 kilometres from the project site). Three targeted surveys were undertaken for the species between December 2022 and March 2023, a period during which the White-throated Needletail is known to occur in Victoria. Weather conditions during the surveys were conducive to observations, however there are limitations for human based surveys for this species due to its brief, variable and often weather dependent seasonal presence. These involved repeated fixed-point counts at 10 locations across the project site. Further detail on the targeted surveys undertaken is provided in Section 9.2 of Appendix D – ***Flora and Fauna Assessment***.

The wind farms assessed for cumulative impacts, listed in Table 26.5, are in similar habitats comprising of mostly cleared land where the species is not favoured for foraging or roosting. While the species may occasionally pass through non-forested areas during summer cold fronts, these brief and irregular appearances would result in a low level of cumulative impact. As such, a significant cumulative impact from the proposed project is considered unlikely.

The Black Falcon is considered to have a low risk of collision as it is only occasionally present within the project site and surrounding area. Raptors, including the Black Falcon, are generally more susceptible to collisions due to their foraging behaviour and some collisions have been recorded at other wind farms in Western Victoria and New South Wales in recent years. As such, cumulative impacts to the species are considered to be medium. Specific management measures have been included to limit construction within 200 metres of active breeding nests [EMM BH11] and temporarily curtail wind turbines within 300 meters of active breeding nests during daytime operations [EMM BA01-1]. The wind farm operator will also liaise with relevant landowners to minimise the occurrence of stubble burning and tractor activity near turbines that could potentially attract Black Falcon to the area due to displacing small birds and providing a hunting opportunity [EMM BA01-7]. These are expected to reduce the overall cumulative collision risk to low, making a significant cumulative impact from the project unlikely.

Cumulative operational impacts will be addressed through Attachment V - ***Bat and Avifauna Management Plan*** [EMM BA01] developed and implemented for each wind farm project in the region. These management plans will include impact triggers and adaptive management controls in the case of collision to limit cumulative impacts so far as reasonably practicable. The Bat and Avifauna Management Plan for the project will include species-specific management strategies for both the White-throated Needletail and the Black Falcon.

26.6.2 Bats

Several wind farms within 25 kilometres of the project site have the potential to impact the **Southern Bent-wing Bat**, listed as critically endangered under the EPBC Act, and the **Grey-headed Flying-fox**, listed as vulnerable under the FFG Act (Table 26.5).

It is difficult to determine the cumulative impacts bat species without a central registry of operational monitoring data of wind farms in Victoria, with most mortality data from Victorian wind farms not publicly available.

Cumulative analysis of collision rates of different bird and bat species at wind farms in Victoria showed that between 7 and 10.8 bat mortalities occur per turbine per year in western Victoria, with the two most common bat species found to collide with wind turbines being the White-striped Freetail Bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*) (Stark and Muir, 2020). These species are both widespread species of micro-bat in Australia (Stark and Muir, 2020). This analysis did not provide specific mortality estimates for the **Southern Bent-wing Bat.** However, recent data from DEECA confirms the mortality of at least 32 Southern Bent-wing Bats have occurred to-date at a variety of wind farms in southwest Victoria[1].

With the implementation of design mitigation and management measures, including Attachment V - ***Bat and Avifauna Management Plan*** [EMM BA01], the risk of collision and overall impact to the Southern Bent-wing Bat due to the project is likely to be low as detailed in Chapter 9 - ***Bats***. However, as collisions of this species with other wind farms in southwestern Victoria have been recorded, and with seven wind farms (operational, approved or planned) in the region assessed as having the potential for collisions (Table 26.5), it is possible that despite design mitigations and management controls proposed, mortality will occur due to the project and surrounding actions, resulting in a low level of residual cumulative impact. Attachment V - ***Bat and Avifauna Management Plan*** includes escalating mitigation measures to be implemented if mortalities are recorded, such as acoustic deterrents and adaptive curtailment conditions that increase the minimum wind speed required for higher-risk turbines to operate. This approach is informed by analysis showing that Southern Bent-wing Bat activity decreases as wind speed increases. Ultrasonic acoustic bat deterrents have not undergone rigorous testing at Australian wind farms to determine their effectiveness, however this emerging technology will be investigated in consultation with the Department of Energy, Environment and Climate Action as required by the Bat and Avifauna Management Program. With the application of these adaptive measures, as required, it is considered unlikely that the project will lead to a long-term decrease in the size of the population or compromise its future survival. Significant impacts Warrnambool maternity cave population, estimated at 17,000 to 18,000, individuals are considered highly unlikely.

1 Data as of March 2025, noting that this figure will continue to evolve as collisions continue.

Grey-headed Flying-fox are considered unlikely to visit the project site regularly to feed, however they may occasionally fly across the site. Three wind farms in the region identified a collision risk for the Grey-headed Flying fox (Table 26.5). While it is unlikely that the project will contribute significantly to cumulative impacts to this species, specific measures will be included in Attachment V - ***Bat and Avifauna Management Plan*** [EMM BA01] to manage potential impacts.

Potential impacts to bat species from the project construction and operation are further detailed in Chapter 9 – ***Bats***.

26.6.3 Brolga

Three wind farms within 25 kilometres of the project are considered to have the potential to impact to Brolga, which are listed as endangered under the FFG Act (Table 26.5). These potential impacts include collisions with wind turbines or powerlines, and disruption to breeding, foraging and roosting behaviours as they may also avoid area, or be less likely to use habitats, near wind turbines.

The Interim Guidelines for the Assessment, Avoidance, Mitigating and Offsetting of Potential Wind Farm impacts on the Victorian Brolga Population (Interim Brolga Guidelines) (DSE, 2012) require wind farms to avoid cumulative impacts on the Victorian Brolga population, with the specific objective of achieving a zero net impact on the Brolga population.

As a requirement of the Interim Brolga Guidelines, only very low levels of residual risk are acceptable for wind farm projects in Victoria. For the project, modelling under the conservative turbine avoidance scenario (where Brolga avoid wind turbines 90% of the time) identified that between one and ten birds may be affected over the 30-year life of the project, with the Victorian Brolga population expected to reduce by 5.3 birds due to collision with the project's infrastructure. This impact will be fully offset through implementation Brolga Compensation Plan [EMM BR01] in accordance with the Interim Brolga Guidelines. With all wind farms required to implement management controls and compensation to meet these requirements, it is unlikely that there will be cumulative impacts to Brolga. Additionally, the distance between wind farms in the region means that the turbines will not form a large cluster that could pose a barrier to Brolga movements across the landscape during flocking season.

Potential impacts to Brolga due to the project construction and operation are further detailed in Chapter 10 – ***Brolga***.

26.6.4 Groundwater and surface water

Residual impacts to groundwater and surface water following the implementation of design measures and management controls were assessed to be very low to low, with impacts being temporary (i.e., during the construction of the project) and localised as described in Chapter 11 – ***Groundwater*** and Chapter 12 – ***Surface water***. While the construction of other approved wind farms such as Mt Fyans Wind Farm, located approximately four kilometres east of the project site, is likely to result in similar groundwater and surface water impacts these are not predicted to result in cumulative effects as the project's impacts to groundwater and surface water environments will be localised within the project site.

The surface water and groundwater environments within and surrounding the project site are inherently linked. This linkage is due to natural processes such as rainfall infiltrating the ground and recharging groundwater, plants drawing water from the ground and releasing it through transpi ,ration, groundwater being extracted through wells, and groundwater naturally flowing into springs and waterways. Because of these connections, any changes to one system (such as groundwater extraction or surface water diversion) can potentially affect the other, resulting in a different form of cumulative impact (combined impacts). Potential combined impacts include:

- reduced groundwater recharge due to surface water diversions
- contaminated surface water entering the groundwater system
- contaminated groundwater entering the surface water system
- reduced surface water flows due to groundwater extraction.

The combined residual impact significance for these impacts was assessed as low.

26.6.5 Landscape and visual

Cumulative landscape and visual impacts can result from changes to the landscape or visual amenity caused by a proposed development in conjunction with other related or unrelated developments or actions that occurred in the past, present or are likely to occur in the near future (Landscape Institute et al., 2008). These can affect the way a landscape is experienced, both positively and negatively.

As discussed in Chapter 14 – ***Landscape and visual,*** the project has the potential to cause visual impacts to views from publicly available viewpoints and dwellings and change the existing landscape character of the region. Visual impacts may also occur due to operational lighting on the nacelle of wind turbines and ancillary structures. Measures incorporated into the design process, in conjunction with on-site and off-site landscape and visual screening plans (for dwellings within six kilometres of a project turbine) [EMMs LV01 and LV02], are anticipated to have a positive effect on reducing visual impacts of the project to an acceptable level.

Mt Fyans Wind Farm is the closest activity to the project site with the potential to result in cumulative impacts, with nine dwellings located within the six-kilometre zone of visual influence for both projects, as shown in Figure 26.3. Within this zone, wind turbines with a blade tip height of up to 260 metres would be theoretically visible without screening, structures or vegetation. However, with existing screening, including existing vegetation and structures, these dwellings are likely to have limited or no views to either the project or Mt Fyans Wind Farm. Public viewpoints between the project and Mt Fyans Wind Farm, including areas along Hamilton Highway, Hopkins Highway and Connewarren Lane, are likely to have views to both wind farms. However, considering the direction and speed of travel, opportunities to view these wind farms simultaneously would be limited for motorists. Stretches of dense vegetation along these roads will also limit cumulative visual impacts.

Despite limited opportunities to simultaneously view the project and other operational, approved, and planned wind farms from private dwellings and public viewpoints, the project may contribute to cumulative impacts on the broader landscape character of the region. The reoccurrence of wind farms within a region has the potential to alter the perception of the overall landscape character as the visual effect of multiple wind farms and other major infrastructure within the region can combine to become the dominant visual element. Sequential views of wind farms can also result in cumulative effects as a traveller moves through the landscape (e.g., on roads or walking tracks).

Due to its proximity to Mt Fyans Wind Farm, it is likely that the project will be viewed as an extension of this wind farm. As such, the broader character of the region is likely to be perceived as a landscape that is characterised by wind farms.

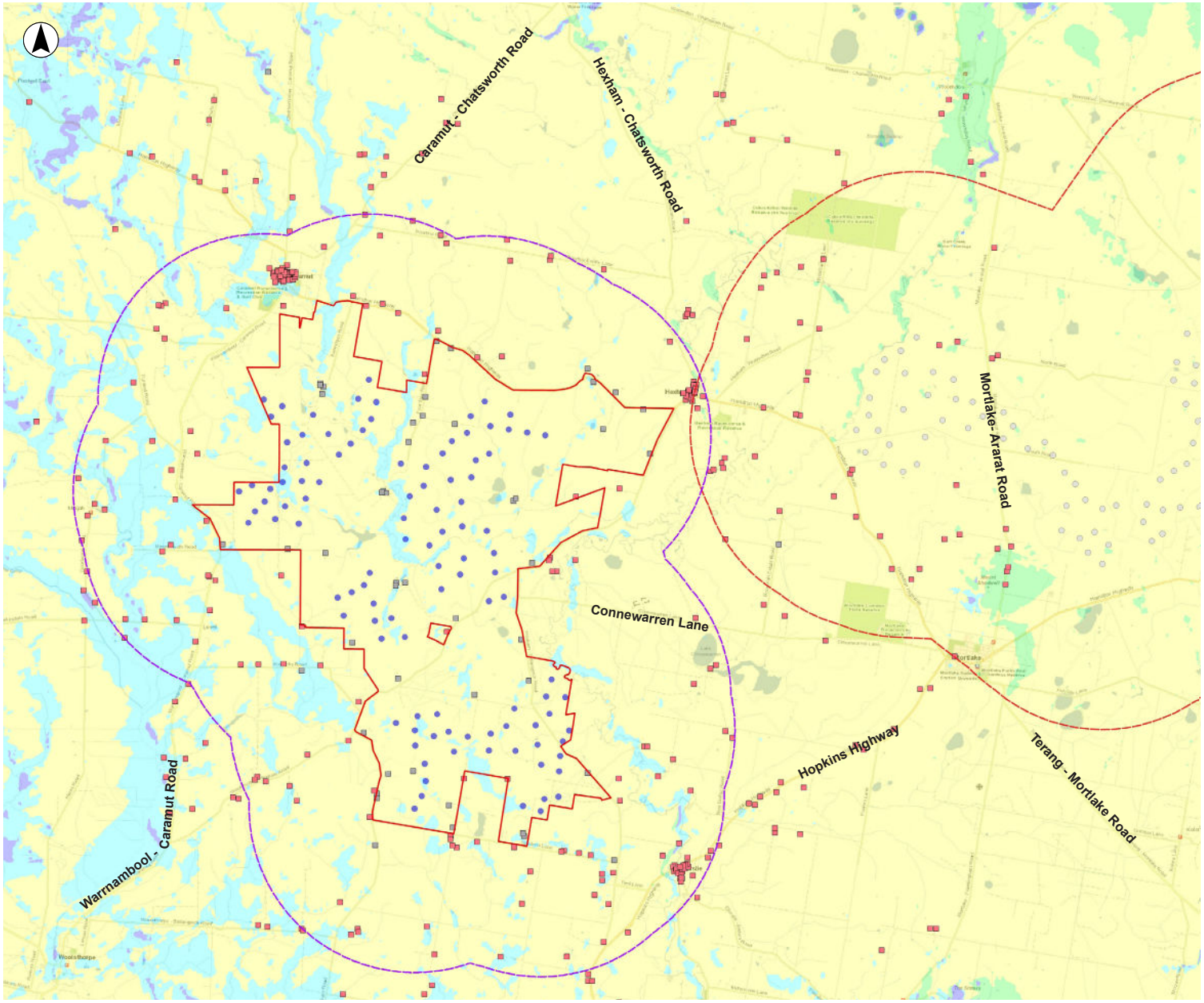


Figure 26.3 Cumulative zones of visual influence between the project and Mt Fyans Wind Farm

26.6.6 Shadow flicker and blade glint

Shadow flicker and blade glint may impact dwellings within five kilometres of the project site boundary, as described in Chapter 15 – ***Shadow flicker and blade glint***.

Wind turbines at the nearest operational, approved, or planned wind farm to the project (i.e., Mt Fyans Wind Farm) are more than 10 kilometres from any project wind turbine. As such, no dwellings are within the extent of modelled shadow flicker for multiple wind farms, and no cumulative shadow flicker impacts are expected as a result of the project.

26.6.7 Air quality and greenhouse gas

As described in Chapter 16 – ***Air quality and greenhouse gas***, the project has the potential to impact air quality through the generation of dust and exhaust emissions from the combustion of fossil fuels in vehicles, plant and equipment. Greenhouse gases associated with the project include carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), which can be attributed to energy related emissions (such as exhaust emissions) and non-energy related emissions such as embedded emissions (e.g., emissions associated with the production of materials used in construction), emissions from chemical reactions or direct releases of greenhouse gas from activities such as land clearing.

Air quality

The future construction of three projects (Mt Fyans Wind Farm, Mortlake Turn-In Project and Mortlake Energy Hub), located within five kilometres of the project site, were determined to potentially result in cumulative impacts to air quality. Cumulative impacts to surrounding sensitive receptors are dependent on the timings and sequencing of these projects and the Hexham Wind Farm project. As such, the project will co-ordinate with these nearby projects [EMM AQ01], so far as reasonably practicable, to avoid and/or minimise circumstances where the same sensitive receptors are jointly affected. With this planning and co-ordination, it is expected that residual cumulative impacts would be low, with impacts considered unlikely and only occurring on very rare occasions during exceptional circumstances.

Greenhouse gas

As the emission of greenhouse gases impacts the global atmosphere, the cumulative greenhouse gas impact assessment considered the contribution of the project to total greenhouse emissions rather than greenhouse gas emissions associated with existing and planned activities in the region.

The project will result in a cumulative impact in the context of state, Commonwealth, and global greenhouse gas emissions, adding greenhouse gas emissions (mostly related to construction) to the existing emissions being produced.

While the project is contributing to the continued accumulation of greenhouse gases in the atmosphere and the resulting climate impacts, it is also assisting in the reduction in greenhouse gas emissions by increasing the supply of renewable energy in Victoria and reducing the reliance on fossil fuels. This contribution to emissions reduction is in line with the goals of the Victorian *Climate Change Act 2017* and Commonwealth 2030 Emissions Reduction Target. Depending on the fuel sources the project will replace (e.g., black coal or gas), the carbon payback period (i.e., the time taken for the project to offset the emissions generated due to its construction) is estimated to be approximately 0.59 to 0.80 years. This means that within the first year of project operation it will have a positive impact on cumulative greenhouse gas emissions.

26.6.8 Noise and vibration

Construction of the project, including traffic movements and operation of the proposed on-site quarry and concrete batching plants, has the potential to cause noise and vibration impacts to nearby sensitive receivers. Operation of the wind turbines, on-site substation, battery energy storage system and ancillary activities may also result in noise and vibration impacts, as described in Chapter 17 – ***Noise and vibration***.

The cumulative noise and vibration impact assessment considered the operational Mortlake Power Station, approved Mortlake Energy Hub, and approved Mortland Power Station Battery Energy Storage System as potential contributors to cumulative effects. The location of sensitive receivers near these project sites will inform their individual noise control requirements. Given this, cumulative noise is not expected to reach noise limits in construction (including operation of the on-site quarry or concrete batching plants) or operation. For example, the receivers to the east of the project site, nearest to the Mortlake Power Station and Mortlake Energy Hub projects, are anticipated to experience a combined predicted noise level from the project's proposed on-site quarry and batching plants of less than 30 dB Effective Noise Level (ENL), which is below the daytime noise limit of 46 dB ENL. Activity at the Mortlake Power Station and Mortlake Energy Hub sites are not anticipated to increase the predicted noise levels above this limit and would not materially affect compliance margins for these receivers.

Due to the significant distance to the nearest operational, approved and planned wind farms, cumulative operational impacts due to wind turbine noise from the project are not anticipated. The minimum distance between the noise generating infrastructure associated with the terminal station and battery energy storage system and the other existing and planned activities is approximately eight kilometres. This means that the nearest receivers are sufficiently far from the other activities such that the noise from these sites is unlikely to approach the relevant noise limits.

26.6.9 Aboriginal cultural heritage

Cumulative impacts to known Aboriginal cultural heritage values were assessed by estimating the known or permitted (likely) impacts on different Aboriginal place types in the geographic region based on the conditions in existing approved Cultural Heritage Management Plans (CHMPs). Potential impacts of the project itself and relevant management conditions are presented in Chapter 18 – ***Aboriginal cultural heritage.***

Six existing CHMPs were identified in the project geographic region, associated mainly with utility projects including power stations, wind farms and transmission lines. Of these, only four CHMPs found Aboriginal cultural heritage. The Aboriginal places within the region were assessed using the following criteria:

1. **Total Harm Permitted**. A CHMP has permitted the entire Aboriginal place to be harmed. Salvage may or may not be required.
2. **Partial Harm Permitted.** A CHMP has permitted part of the Aboriginal place to be harmed by part must be preserved. Salvage may or may not be required.
3. **No Harm Permitted.** A CHMP has not permitted harm to occur.
4. **Salvage Required**. A CHMP required archaeological salvage to manage harm, and it has been or will be conducted.
5. **No CHMP – Destroyed.** There is no approved CHMP and the available evidence (e.g., aerial imagery) suggests that all known tangible components have been removed by a recent change in activity.
6. **No CHMP – Unharmed.** There is no approved CHMP and there is no available evidence (e.g., aerial imagery) to suggest that the place has been destroyed. It may still be impacted by historic and current land use (e.g., stock trampling, ploughing).

Table 26.6 shows most Aboriginal places in the geographic region have not been impacted by development. However, Aboriginal places are still impacted by current land uses, primarily by ploughing for agriculture. The existing CHMPs have permitted total harm at only three Aboriginal places and partial harm at one Aboriginal place, with salvage being required at two of these sites. This included:

- total harm of two artefact scatters for the Mortlake Power Station gas pipeline
- total harm of one low density artefact scatter for the Salt Creek Wind Farm power transmission line, permitted only because the Aboriginal place was harmed in its entirety through complex assessments undertaken to inform the CHMP
- partial harm of one artefact scatter for the Mt Fyans Wind Farm, permitted only for the purposes of upgrading an existing track

The data shows that the cumulative impact of development by utilities and wind farms is low. Wind farms, in particular, have the capacity to modify their design through the development process to avoid impacts to Aboriginal places. However, this is more challenging for utilities where infrastructure typically is constrained by easements and there is less flexibility to modify the design to avoid impacts. The CHMPs that have permitted harm to Aboriginal places have been utilities, such as pipelines and power lines, as opposed to wind farms. This suggests that the cumulative impact for the project should be considered to be very low.

Table 26.6 Estimated impacts on Aboriginal places in the geographic region

Aboriginal place type	Total Harm Permitted	Partial Harm Permitted	No Harm Permitted	Salvage Required	No CHMP - Harmed	No CHMP - Unharmed
Mound	–	–	–	–	–	182
Hearth	–	–	–	–	–	1
Soil Deposit	–	–	–	–	–	5
Artefact Scatter	2	1	–	1	1	82
Low Density Artefact Distribution	1	–	3	1	–	5
Scarred Tree	–	–	1	–	–	37
Ancestral Remains	–	–	–	–	–	1
Aboriginal Cultural Place	–	–	–	–	–	1
Stone Feature	–	–	–	–	–	1

26.6.10 Historical cultural heritage

As detailed in Chapter 19 – ***Historical cultural heritage***, the project is not expected to impact any registered historical heritage places, and the risk of harming unknown historical heritage or archaeological sites was assessed as negligible. As such, the cumulative impact of the project is also considered negligible, with potential disturbance or partial removal of locally significant heritage features or sites anticipated to occur only in exceptional circumstances.

26.6.11 Land use and planning

The project has the potential to impact values associated with agricultural land use, and the residential land use of existing dwellings and potential new dwellings as described in Chapter 20 – ***Land use and planning***. Other existing and planned wind farms within 25 kilometres of the project site have the potential to impact these same values, as described in the following sections.

Agricultural land use

Cumulative impacts on agricultural land use may arise from the overall reduction of available land for cropping and grazing due to multiple existing and planned wind farms in the region. Across multiple projects within Moyne Shire, this reduction is generally limited to 1-3% of land area per wind farm. However, due to the nature of wind farms and their small operational footprint, agricultural activities can continue during the operational phase, and land can be returned to agricultural use following decommissioning. As such, agriculture (predominant land use in the region) is able to continue and co-exist with wind energy development, with a minor level of impact.

During project construction and decommissioning, temporary impacts may affect larger areas of land, particularly if multiple projects undertake these stages simultaneously. While this could increase the magnitude of impact in the short term, these impacts are considered minor and reversible with appropriate coordination and management. If the project and other actions are not constructed or decommissioned at the same time, cumulative impacts will be negligible as there will be no spatial or temporal overlap. However, project-specific impacts to agricultural land use will remain as described in Chapter 20 – ***Land Use and Planning.*** Cumulative impacts associated with disrupted property access and land use compatibility are also anticipated to be negligible. As such, additional design mitigations or management controls have not been recommended to address cumulative impacts

Residential land use

The operation of multiple wind farms will not alter the residential use of existing dwellings, provided compliance with relevant regulations (e.g., noise and shadow flicker) is maintained. As such, cumulative impacts on residential land use are expected to be negligible to minor. The potential cumulative noise and vibration impacts are discussed in Section 26.6.8, and cumulative shadow flicker and blade glint impacts are discussed in Section 26.6.6. During project construction and decommissioning, temporary disruptions to land use, such as property access limitations and increased traffic, may occur. This could result in minor temporary impacts, depending on the number of existing or planned wind farms undertaking these development stages simultaneously. Given the large numbers of vehicle movements associated with the construction and decommissioning of wind farms, simultaneous construction or decommissioning would have a noticeable impact on local road use. In comparison to the construction period, the traffic generated during decommissioning of the site will be significantly less. The extent and magnitude of the cumulative impact on road infrastructure and traffic management is discussed separately in Section 26.6.16.

26.6.12 Socio-economic

The project has the potential to influence the social and economic values of the local and regional community, as described in Chapter 21 – ***Socio-economic***. It is recognised that the majority of the social and economic impacts of the project have the potential to also result in cumulative impacts when considered in conjunction with the multiple renewable energy developments within the South West Renewable Energy Zone, where the project is located. Project impacts will be managed through the application of controls, which will also minimise the potential for cumulative impacts. These include the development and implementation of a Community and Stakeholder Engagement Plan [EMM02], Neighbour Benefit Sharing Program [EMM04], and an Accommodation and Employment Strategy [EMM05] which will include measures to manage workforce influx [EMM SE01] including the construction of temporary workforce accommodation [EMM SE03]. Through the application of these controls, social impacts due to the project, initially ranging from very high to low, are reduced (ranging from medium to low).

Wind farm developments in the region are occurring predominantly in two distinct geographical clusters: one in the west of Moyne Shire near Hawkesdale, Macarthur and Woolsthorpe, and the other in the north-east of Moyne Shire (where the project is proposed) surrounding Mortlake. The communities in these areas are more likely to experience more significant cumulative impacts in comparison to residents in other areas of Moyne Shire, including impacts related to changes in sense of place due to industrialisation of the landscape. Regionally, there are mixed views on wind farm developments and in recent years there has been significant opposition to their development in the Moyne Shire local government area, which has prompted the local Council to recommend that any new wind farm permits be paused until strategic land use planning is complete. Feedback from the community and other stakeholders is further discussed in Chapter 7 – ***Stakeholder consultation.***

Table 26.7 provides an overview of projects within 30 kilometres of the proposed Hexham Wind Farm which may have the potential to generate cumulative effects. Based on the cumulative workforce predictions, it is estimated that there would be a peak cumulative construction workforce of 1,200 full-time equivalents (FTEs) in the region (within 80 kilometres of project site) in 2026, with multiple renewable energy developments in the area collectively anticipated generate large scale economic benefits across the region, including an increase in commercial activity for local businesses and services. However, adverse cumulative impacts have been assessed as likely, as detailed in Further detail on the existing and planned activities considered is provided in this assessment is provided in Section 26.5

Table 26.7 Relevant activities with the potential to cause cumulative impacts

PROJECT	COMMUNITY ENGAGEMENT/ COUNCIL SUBMISSIONS	CONSTRUCTION PERIOD & EMPLOYMENT NOS.	CUMULATIVE IMPACT
Mt Fyans Wind Farm	Moyne Shire established a Community Engagement Committee (CEC) in August 2018 to provide advisory recommendations to the Council. Local coverage of the Mt Fyans wind farm referenced the reduction in wind turbines and changed transport routes due to community feedback (Lovell, 2022), and given Moyne Shire Council's unanimous objection to the farm (Western District News, 2023; Silvester, 2023) which resulted in 90 community submissions and 608 letters received by the Council. Key concerns included bushfire risk, visual amenity, noise and disruptions to community cohesion (Western District News, 2024).	*Construction:* 100 local jobs over 20 months. *Operations:* 10 local jobs 25 years	Cumulative impacts are likely to be experienced, such as traffic congestion during construction period as project is adjacent to the Hamilton Highway and the Mortlake-Ararat Road is within the project site. Competing demands on the local workforce may also be experienced, as well as competition for local resources for workforce, including accommodation and other key services.
Swansons Lane Wind Farm	Public notice has not yet been provided on the planning permit application.	*Construction*: 1 year *Operations*: 25–30 years	Cumulative impacts are likely to be experienced resulting from competing demands on local Wworkforce, as well as competition for local services including Aaccommodation and other key services.
Darlington Wind Farm	The draft EES scoping requirements were on public exhibition between June and July 2024. Community open day hosted in July 2024. EES preparation between 2024-2025. Council has raised concerns regarding the potential cumulative impacts of this Project on environmental, social and landscape matters as the site is known for its wetland and Brolga breeding area (Moyne Shire Council, n.d.).	*Construction:* 300 FTE over a 22-month period *Operations:* 6 FTE for up to 30 years	
Woolsthorpe Wind Farm	Moyne Shire Council established a CEC in 2012 to provide recommendations to the Council regarding the Project. The CEC last met in June 2024. During public information sessions, residents were primarily interested in noise, visual impact and structure of the Ccommunity Bbenefit scheme. Some residents noted concern about the view of turbines from the township. The planning permit amendment application received 47 submissions, including from 7 government agencies, with most submissions from individuals objecting to the changes, citing concerns around landscape and visual amenity, noise and dangers to local fauna (Vorrath, 2023).	*Construction*: up to 2 years	Proposed site access is via Princes Highway, which may have implications in relation to traffic congestion for road users in the Shire.

PROJECT	COMMUNITY ENGAGEMENT/ COUNCIL SUBMISSIONS	CONSTRUCTION PERIOD & EMPLOYMENT NOS.	CUMULATIVE IMPACT
Salt Creek Wind Farm	The CEC operated for several years between the permit being issued, throughout construction, and was dissolved after the wind farm had been operating for 2 years in 2023. Moyne Shire Councillors expressed concerns regarding the increased number of bat and bird carcasses found on the site. Initially reported in the Warrnambool Standard, the article was picked up by several individuals and organisations online and focused on the 3–4% increase in bat and bird deaths since the wind farm commenced operation. Mitigation measures to reduce these deaths by the wind farm operator were covered in the original story (Silvester, 2022). The proponent provided Grant Program funds initiatives that protect the Grey-headed Flying-foxes during heat stress events as a means of contributing to the sustainability and conservation of this species.	Unknown operational workforce	Due to proximity cumulative impacts such as visual, noise and impacts to sense of place may occur. No cumulative workforce impacts.
Mortlake South Wind Farm	The Moyne Shire Council supported the establishment of a CEC to support Council decision making. The CEC is comprised of Council and community representatives and last met in June 2023. As there is an abundance of above ground transmission lines in the Shire due to development of wind farms, all transmission lines for the Mortlake South Wind Farm were placed underground to try and minimise cumulative impacts (Davis, 2022).	*Operations:* 10 jobs	
Morton's Lane Wind Farm	Morton's Lane Wind Farm has contributed over $10,000 to study the behaviour of Brolga and Southern Bent-wing Bat and the cumulative impact of human activities on these species; and has worked closely with local residents and CFA workers around bushfire risk and management.	*Operations:* 25–30 jobs	
Hawkesdale Wind Farm	A CEC was established by the Moyne Shire Council. The committee last met in February 2024. In a 2021 amendment submission, Council has stated that they believe the wind farm is too close to the township of Hawkesdale due to bushfire risk, impacts on noise and visual amenity. Council requested that if any turbines are to be removed from the Project, they should be those located closest to the town (Meade, 2021).	*Coperations*: 6 jobs Some of the construction workforces were housed in Koroit Caravan Park (Regional Development Victoria, n.d.).	Due to proximity cumulative impacts such as visual, noise and impacts to sense of place may occur.
Dundonnell Wind Farm	A CEC was established by the Moyne Shire Council in 2017. The CEC last met in March 2024.	Unknown operational workforce	Due to proximity cumulative impacts such as visual, noise and impacts to sense of place likely to be experienced. No cumulative workforce impacts.

26.6.13 Aviation

Residual impacts to aviation safety, following the implementation of design measures and management controls, including raising the 10 nautical miles (nm) Minimum Safe Altitude (MSA) from 2200 feet to 2300 feet at Warrnambool certified aerodrome, and the reporting of tall structures in accordance with Advisory Circular AC 139.E-01 v1.0, were assessed to be low. With each additional wind farm that is constructed, there are more large structures (i.e., wind turbines) that pilots must avoid, resulting in a more complex operating environment. However, given that the permitting of wind farms in Victoria is required to consider, where appropriate, the impact of wind farm developments on aircraft safety under Clause 52.32-5 of the Victoria Planning Provisions, these projects will or have been subject to individual aeronautical assessments and risk mitigation measures. As a result, cumulative impacts to aviation safety are not anticipated to be significant.

26.6.14 Fire risk

Due to the separation distance between the project and other existing or planned wind farms in the region, it is considered unlikely that a bushfire would impact multiple wind farms at the same time or result in cumulative effects.

Similarly, no cumulative impacts related to the use of firefighting aircraft, firefighting strategies or bushfire ignition risk and spread are anticipated following the application of management controls for the project, as described in Chapter 23 – ***Fire Risk***.

26.6.15 Electromagnetic interference

Wind turbines associated with operational, approved, and planned wind farms in the region can cause electromagnetic interference by blocking or scattering transmission paths. Where transmission paths pass through multiple wind farms, these impacts can be compounded, resulting in a higher level of cumulative impact.

In the case of the project, this scenario is unlikely to occur. The nearest wind farms are located more than 10 kilometres away, and the transmission paths for most services (including fixed point-to-point links, fixed point-to-multipoint links, NBN fixed wireless signals, satellite television and internet) are not impacted by interference zones associated with separate wind farms.

There is some potential for increased interference to point-to-area style services such as mobile phone and radio broadcasting signals in areas with marginal coverage, or where there may be multiple wind turbines between the user and the transmission tower. Cumulative impacts are considered unlikely for the Optus and Telstra mobile phone networks, however Vodafone may be more susceptible due to the small number of towers servicing the area and existing poor coverage in areas to the north and west of the project (and within the project site boundary).

What is EMI?

Electromagnetic interference (EMI) refers to disruptions to wireless signals caused by physical obstructions or reflections. These signals are commonly used by mobile phones, internet, television broadcasting, and emergency communications.

Wind turbines can affect these signals if they block or scatter transmission paths.

Similarly, there is some potential for increased interference to Digital Television (DTV) broadcasting signals in areas where there are multiple wind farms between the user and the transmission tower. The area is serviced by the Ballarat (Lookout Hill), Western Victoria (Mt Dundas), Warrnambool (Tower Hill) and Warrnambool City transmitters, with most residents near the project site serviced by the Ballarat transmitter. The signal coverage and potential for cumulative impacts for at each transmission tower are presented in Table 26.8.

Table 26.8 Potential for cumulative impacts to Digital Television (DTV) signals

	Transmission tower			
Project	**Ballarat (Lookout Hill)**	**Western Victoria (Mt Dundas)**	**Warrnambool (Tower Hill)**	**Warrnambool City**
Mt Fyans Wind Farm (approved)	Good to variable coverage – potential for cumulative impact in some areas	No coverage – no cumulative impact	No coverage – no cumulative impact	No coverage – no cumulative impact
Salt Creek Wind Farm (operational)	Good to variable coverage – potential for cumulative impact in some areas	No coverage – no cumulative impact	No coverage – no cumulative impact	No coverage – no cumulative impact
Mortlake South Wind Farm (operational)	Good to variable coverage – potential for cumulative impact in some areas	No coverage – no cumulative impact	Variable to no coverage – potential for cumulative impact in some areas	No coverage – no cumulative impact
Hawkesdale Wind Farm (operational)	Good to poor coverage – potential for cumulative impact in some areas	Poor to no coverage – very low potential for cumulative impact (unlikely to be used)	Variable to no coverage – potential for cumulative impact	Poor to no coverage – very low potential for cumulative impact (unlikely to be used)
Woolsthorpe Wind Farm (approved)	Good to poor coverage – potential for cumulative impact in some areas	Poor to no coverage – very low potential for cumulative impact (unlikely to be used)	Variable to no coverage – potential for cumulative impact	Variable to no coverage – potential for cumulative impact
Mortons Lane Wind Farm (operational)	Good to poor coverage – potential for cumulative impact in some areas	Poor to no coverage – very low potential for cumulative impact (unlikely to be used)	Variable to no coverage – potential for cumulative impact	No coverage – no cumulative impact

Consultation will be undertaken with relevant service operators, including radio service operators, telecommunications carriers and the Bureau of Meteorology, to confirm potential impacts (or lack thereof) to services prior to construction [EMMs EMI01, EMI02 and EMI03]. Management controls have been proposed to minimise or avoid interference so far as reasonably practicable, as described further in Chapter 24 – ***Electromagnetic Interference***.

26.6.16 Traffic and transport

Construction, and to a lesser extent decommissioning, of the project and other existing and planned wind farms will generate significant traffic on local and major roads. As such, cumulative traffic impacts are most relevant during overlapping construction periods, particularly where multiple projects rely on the same haulage routes or oversize and overmass transport corridors.

At the time of this cumulative impact assessment, the Mt Fyans Wind Farm and Willatook Wind Farm projects are more advanced than the project and are expected to complete major materials haulage before substantive construction of the project begins. However, some overlap between projects may occur resulting in potential cumulative impacts. This includes potential for:

- Overlap of light (staff) vehicle traffic, however this would be limited to arterial roads.
- Overlap of materials haulage routes, depending on the source locations used by each project and whether some materials are sourced on-site. The project proposes to construct an on-site quarry to supply road base and stone aggregate for construction, which will reduce reliance on shared haulage routes.
- Coinciding oversize and overmass movements, however these movements will be coordinated through the Department of Transport and Planning and the National Heavy Vehicle Regulator, ensuring appropriate scheduling and route management.

Due to the conservative approach taken by the ***Traffic and Transport Impact Assessment*** in Appendix G., it is likely that any cumulative traffic volumes would be less than the peak project-generated traffic volumes presented in Chapter 25 – ***Traffic and transport***. Road condition monitoring undertaken by the project [EMM TT01] will identify any deterioration resulting from construction-related traffic, including changes associated with the Mt Fyans Wind Farm and Willatook Wind Farm.

No overlap with other wind farm projects in the region is anticipated during the construction stage.

26.7 Conclusions

Cumulative impacts can arise when individual effects from multiple activities within a region combine to produce a greater overall impact than would occur in isolation. The specialist assessments have considered the potential cumulative effects of the project in combination with other existing, approved and planned activities within the region, with a particular focus on other wind energy projects within Moyne Shire. Key areas with potential for cumulative impacts relate to biodiversity, landscape character, social values, and infrastructure.

Cumulative biodiversity impacts are primarily associated with threatened species such as the Southern Bent-wing Bat, Brolga and Black Falcon, which may be affected by turbine collisions and habitat fragmentation across multiple wind farms. With proposed management controls, such as Bat and Avifauna Management Plans, responsive curtailment of wind turbines and offset strategies, residual cumulative impacts are expected to be reduced and considered to have a low to medium impact.

Cumulative landscape and visual impacts may arise due to the clustering of wind farms in the region, contributing to a shift in the perceived landscape character of the area. While simultaneous views from individual dwellings are limited, sequential views from public roads and travel routes may result in a more industrialised visual landscape. The project is likely to be perceived as an extension of the nearby Mt Fyans Wind Farm, reinforcing the perception of the area as being characterised by wind farms.

Social impacts may be amplified in areas with concentrated development, particularly those impacts associated with housing availability, health service demand and community cohesion. The project proposes targeted mitigation measures including a Temporary Workforce Accommodation Facility and community benefit programs to address these concerns. Cumulative economic benefits are also expected, with increased employment and investment in local infrastructure.

Cumulative impacts to air quality, noise and vibration are expected to be low and not impact compliance with relevant standards. Traffic and transport impacts may be more pronounced during overlapping construction periods, particularly in relation to materials haulage and oversize and overmass movements. However, these will be managed through scheduling and regulatory coordination of oversize and overmass vehicle movements.

Electromagnetic interference may occur in areas with marginal coverage, particularly for mobile and digital television signals where multiple wind farms lie between users and transmission towers. However, these impacts are considered unlikely to be significant and will be addressed through consultation and proposed management controls prior to the commencement of construction.

Overall, the cumulative impacts of the project are expected to be manageable with the implementation of the proposed Environmental Management Measures. Following their application, residual cumulative impacts are not anticipated to be significant.