















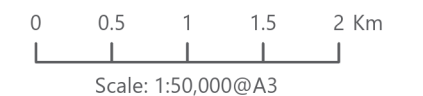
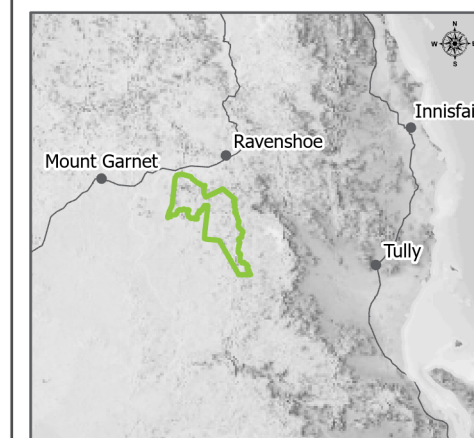
Chalumbin Wind Farm
Impacts to Koala habitat
Sheet 3 of 4

Figure 8.3

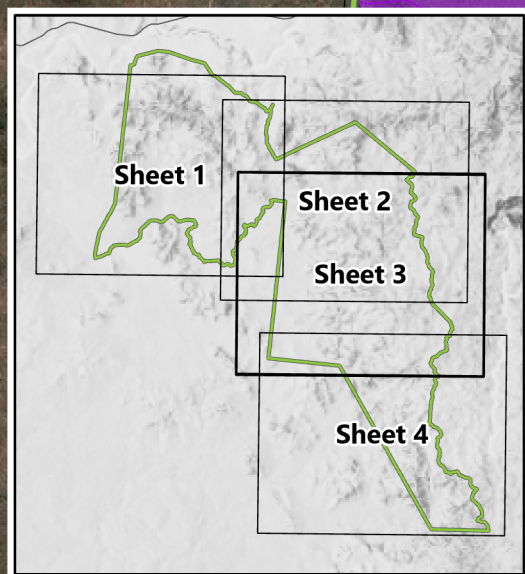
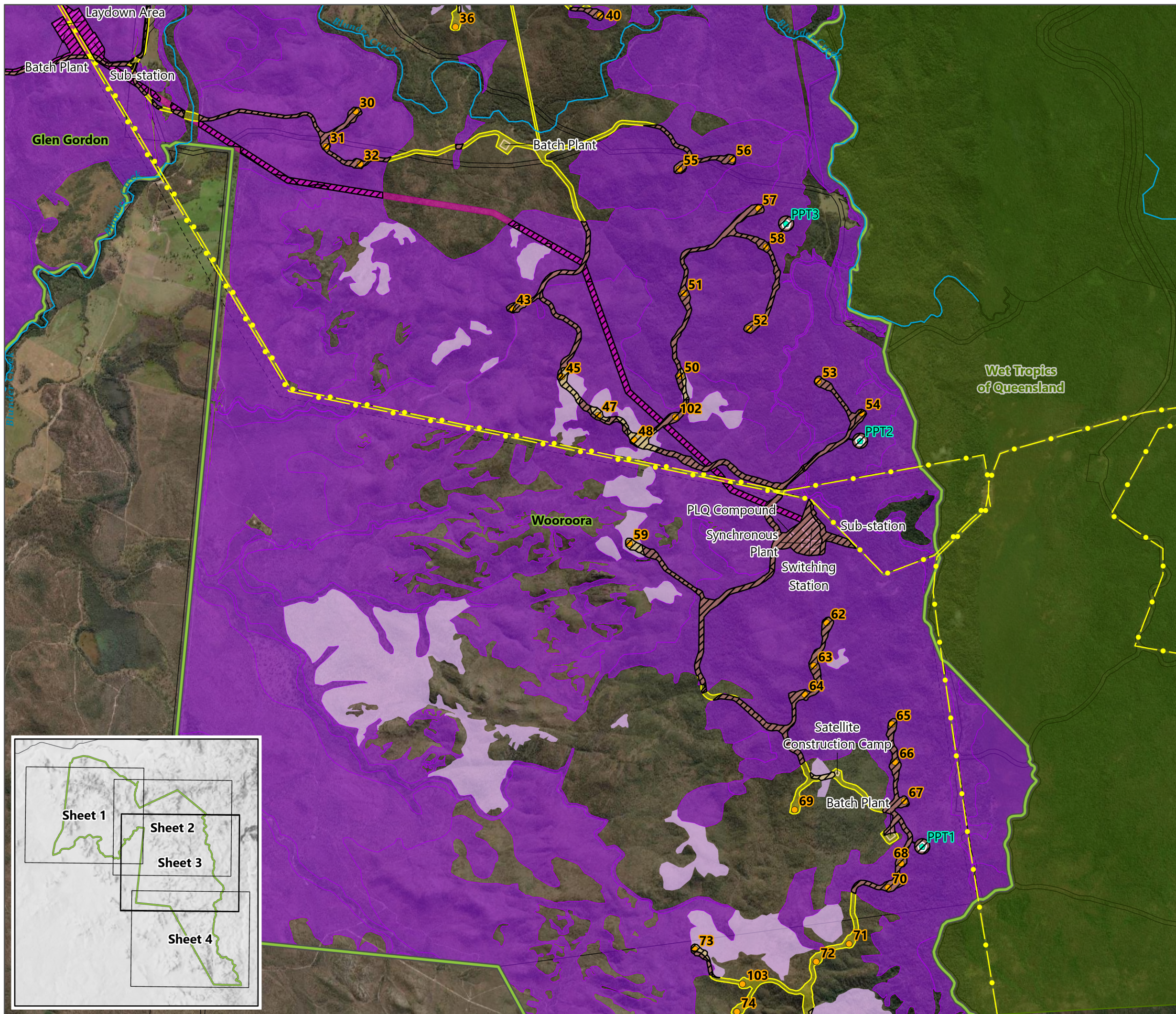
-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope
-  Stage 1
-  Stage 2
-  Significant Residual Impact
-  Locally important koala trees
-  Ancillary habitat trees
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement

Date: 10/10/2022
Project: EPU-004

Author: TOD
Reviewed: NOD

















Data Source(s):
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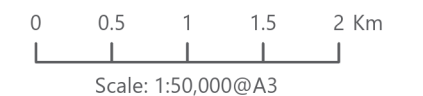
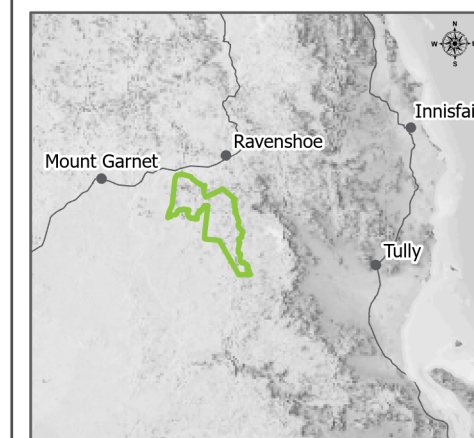
Chalumbin Wind Farm
Impacts to Koala habitat
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Figure 8.3

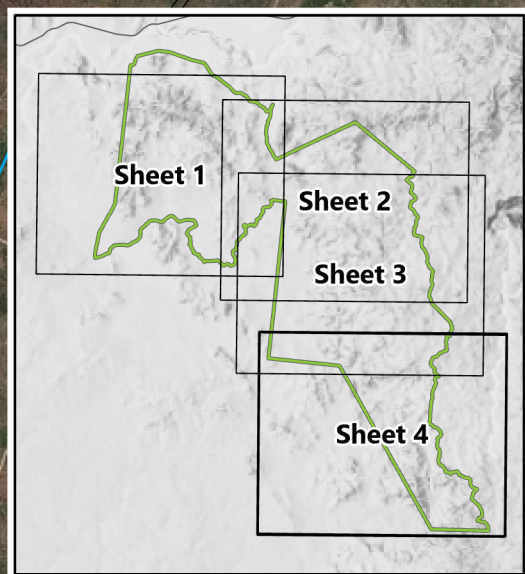
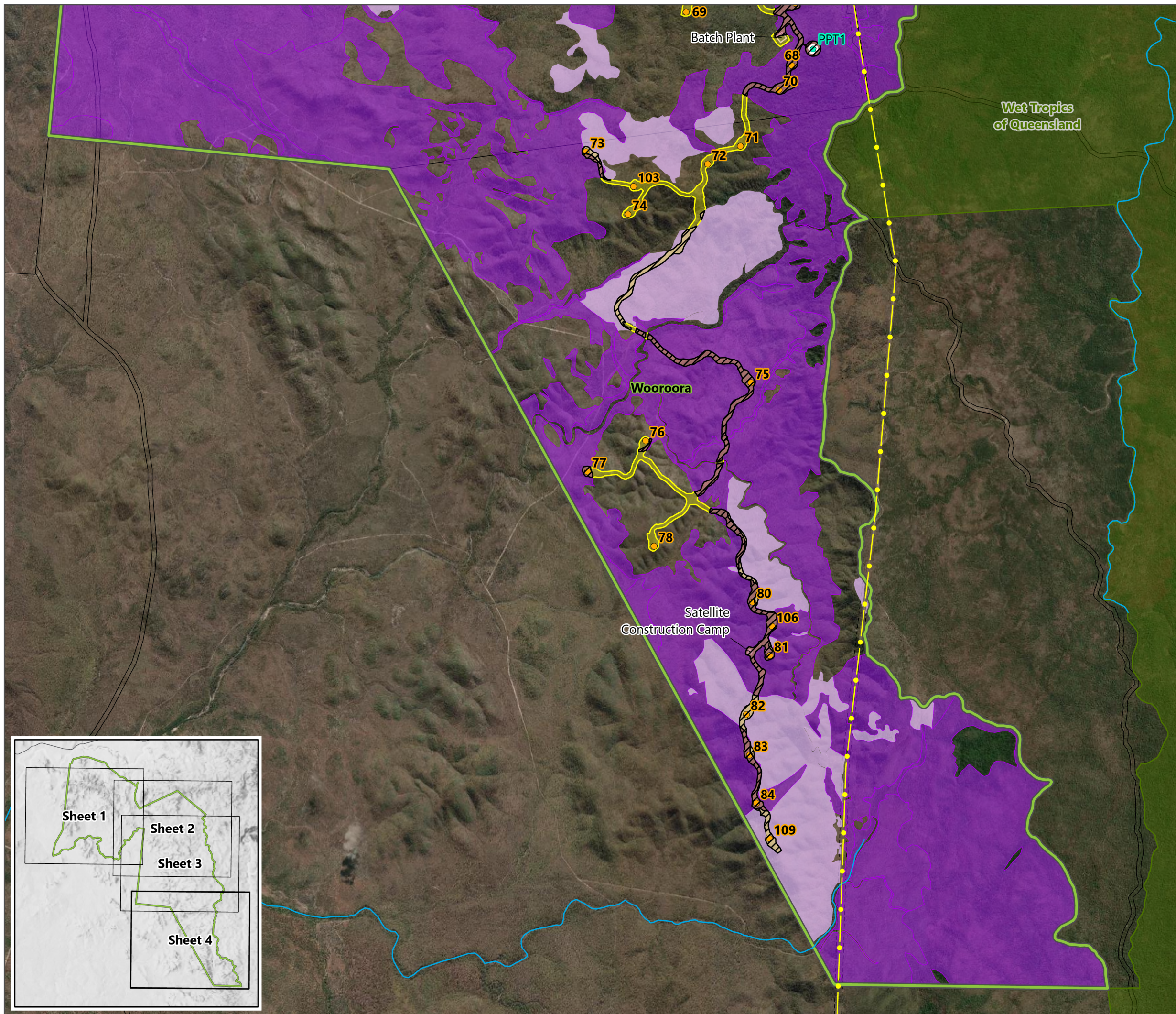
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8.6.3.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential operational impacts and proposed mitigation measures for the koala are discussed in **Table 8-52**.

Table 8-52 Potential Operational Impacts and Proposed Mitigation – Koala

Potential Impact	Assessment	Proposed Mitigation
Species mortality (vehicle collision)	Increased traffic around the Project area has the potential to kill or injure fauna on impact although traffic levels will be greatly reduced during operations compared to the construction phase and more geared towards light or medium vehicles.	Mitigation measures outlined in Section 6.0 will reduce risks associated with increased vehicle presence on site.
Bushfire risk	During operational activities, there is potential for heightened fire risk due to the increased presence of maintenance and monitoring vehicles and personnel in the Project area. This is through the use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. Wild dog control will be undertaken – this will assist to reduce predation on koalas.

8.6.3.3 Assessment of Significant Residual Impacts

The Project could potentially have a significant residual impact on the koala (assessed as Vulnerable in accordance with Department advice, despite the species being up-listed to Endangered in February 2022). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-53**.

Table 8-53 Significant Residual Impact Assessment – Koala

Significant Impact Criteria	Assessment
Lead to a long-term decrease in the size of an important population of a species	Unlikely



Significant Impact Criteria	Assessment
<p>Reduce the area of occupancy of an important population</p> <p>Fragment an existing important population into two or more populations</p>	<p>The Project may lead to the clearing of 843.8 ha of potential habitat for the species. There is no confirmed population of koala within the Project area. Historic records occur more than 5 km from the Project footprint and are rare. The landowners of Glen Gordon and Wooroora stations have not seen koalas on their properties. Koalas were also not recorded during Project field surveys, either directly or indirectly.</p> <p>The Project area is not considered to support an important population of koala. .</p> <p>Therefore, the Project is unlikely to (a) lead to a long-term decrease in the size of an important population of the koala, (b) reduce the area of occupancy of an important population of the koala, or (c) fragment an existing important population into two or more populations.</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>Likely</p> <p>The Project will involve the removal of 843.8 ha of potential habitat for koala. This clearing represents approximately 3.4 % of the potential habitat for the species mapped within the Project area.</p>
<p>Disrupt the breeding cycle of an important population</p>	<p>Unlikely</p> <p>There is no confirmed population of koala within the Project area. The Project area is not considered to support an important population of koala. Female koalas have the potential to produce one offspring each year, with births occurring between October and May (McLean 2003). The Project activities are not expected to disrupt the breeding cycle of a population of koalas. Habitat areas and movement corridors will be retained in the Project area; these can be utilised for breeding by the species should it be present in the Project area.</p>
<p>Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Unlikely</p> <p>The Project may lead to the clearing of 843.8 ha of potential habitat for the species. There is no confirmed population of koala within the Project area. Historic records occur more than 5 km from the Project footprint and are rare. The landowners of Glen Gordon and Wooroora have not seen koalas on their properties. Koalas were also not recorded during Project field surveys, either directly or indirectly.</p> <p>Taking into account the avoidance, minimisation and mitigation measures proposed, and the fact that extensive areas of habitat will be retained throughout the Project area, it is considered unlikely that the Project will modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the koala is likely to decline.</p>
<p>Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat</p>	<p>Unlikely</p> <p>Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pest fauna.</p> <p>Areas of retained vegetation will be managed, including weed and pest animal control to maintain the retained areas in good condition and reduce threats. Hygiene protocols in the operational areas will also be</p>



Significant Impact Criteria	Assessment
	<p>implemented to reduce any weeds or disease being introduced to the Project area or spread from the Project area.</p> <p>Based on observation of tracks and scats in the field, as well as numerous individuals recorded on remote cameras, wild dogs are abundant in the Project area. There is potential for the Project to increase the existing impact of wild dogs on the species, either through attracting more individual dogs or facilitating their ability to attack koalas through habitat clearance. Mitigation measures such as disposing of rubbish appropriately, controlling wild dog populations and monitoring clearing activities will reduce this risk.</p> <p>Based on implementing the proposed mitigation measures it is not expected the Project will result in an increase of invasive species in the potential koala habitat.</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>The most well-known disease present in the koala population is associated with particular strains of Chlamydia. Koala Retrovirus was recently identified and is thought to be responsible for a range of conditions, including leukaemia and an immunodeficiency syndrome (DSEWPC, 2012c). The Project is not likely to directly result in an increase in Chlamydia in koalas. This is a broader issue for the population.</p>
Interfere substantially with the recovery of the species	<p>Unlikely</p> <p>DAWE (2022b) identifies a number of recovery and conservation objectives. The Project will not interfere substantially with any of these objectives.</p>

8.6.4 Large-eared Horseshoe Bat

As discussed in **Section 4.7.4.4**, the large-eared horseshoe bat has not been recorded within the Project area. Based on the assessment work undertaken, the presence of large-eared horseshoe bat within the Project area is considered highly unlikely. Nonetheless, small areas of potential habitat for the species have been mapped as rainforest, riparian forest and densely vegetated gullies within open eucalypt woodland.

8.6.4.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 1,579.2 ha of potential habitat is present within the Project area and approximately 47,430.3 ha within the broader Study area. In the absence of confirmed species presence, habitat critical to the survival of the species has not been identified within the Project area.

The Project will require clearing of approximately 15.4 ha of potential habitat for large-eared horseshoe bat during Stage 1 and approximately 10.5 ha during Stage 2 (25.9 ha in total across both Stages). Potential construction impacts and proposed mitigation measures for large-eared horseshoe bat are discussed further in **Table 8-54**.



Table 8-54 Potential Construction Impacts and Proposed Mitigation – Large-eared Horseshoe Bat

Potential Impact	Assessment	Mitigation
Vegetation and habitat clearance	The Project may lead to the clearing of 25.9 ha of potential habitat for the species.	<p>Large areas of potential habitat for large-eared horseshoe bat throughout the Project area will be retained.</p> <p>Design has sought to avoid and minimise clearing within these areas of potential habitat. Vegetation clearing will be minimised as much as practicable through micrositing within the proposed Project footprint.</p> <p>Project infrastructure including laydown areas, construction compounds and substation have been sited in cleared areas where practicable to avoid clearing of potential habitat.</p> <p>Existing access tracks within the Project area are prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Clearing of potential large-eared horseshoe bat habitat will occur sequentially and in accordance with an approved Species Management Program.</p>
Fragmentation (of populations and habitat)	The Project may lead to the clearing of 25.9 ha of potential habitat for the species.	<p>Existing access tracks within the Project area were prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Project design has sought to minimise the width of access tracks in areas of potential habitat.</p> <p>Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.</p> <p>Areas cleared for construction that are not required for the operational footprint will be sequentially rehabilitated as soon as practicable following construction.</p>
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.



Potential Impact	Assessment	Mitigation
		<p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
<p>Species mortality (vehicle collision, vegetation clearance)</p>	<p>During vegetation clearing, there is potential for direct mortality if large-eared horseshoe bats are present (i.e. roosting in the hollow-bearing trees to be cleared).</p>	<p>Clearing of habitat could potentially result in significant injury or death to individual large-eared horseshoe bats, however clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher and retention of potential roosting habitat overnight. The process will significantly mitigate any potential impacts associated with clearing operations ensuring large-eared horseshoe bats are detected, provided procedures are followed and spotters are allowed ample opportunity to check areas prior to construction. Hollow-bearing trees and hollow logs will be marked and inspected where possible for the presence of fauna prior to clearing. Clearing protocols will be developed including methods for clearing hollow-bearing trees (e.g. remove surrounding trees on previous day) and check for any injured species. Capture and release those healthy individuals. Any injured bats will be taken to a vet for treatment.</p> <p>Standard construction hours (6.30am to 6.30pm) will reduce the likelihood of construction vehicles driving within large-eared horseshoe bat habitat when this nocturnal species is active. Construction personnel will be educated on the potential presence of large-eared horseshoe bats. Off-track driving will not be permitted and reduced speed limits will be enforced in areas of potential bat habitat, with appropriate signage on site.</p>
<p>Erosion and sedimentation</p>	<p>The large-eared horseshoe bat is unlikely to be directly impacted by erosion and reduced water quality resulting from Project construction.</p>	<p>A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site.</p>



Potential Impact	Assessment	Mitigation
		Implementation of these plans will minimise soil loss from the disturbance areas.
Dust emissions	There is limited scope for indirect impacts from dust emissions on this species resulting from Project construction.	Generally, dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary.
Noise and lighting	As the large-eared horseshoe bat is a nocturnal species, there is the potential for it to be disturbed by noise and lighting impacts during Project construction.	Standard construction work hours will generally be between 6.30am and 6.30pm, therefore site lighting will be kept to the minimum required for safety. Where necessary, construction lighting will be directed to the required areas and designed to minimise light spill to adjacent areas. Construction equipment will be fitted with noise reduction devices where practicable and switched off when not in use
Bushfire risk	Modification of foraging habitat due to bushfire is a potential threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

8.6.4.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential operational impacts and proposed mitigation measures for the large-eared horseshoe bat are discussed in **Table 8-55**.

Table 8-55 Potential Operational Impacts and Proposed Mitigation – Large-eared Horseshoe Bat

Potential Impact	Assessment	Mitigation
Collision risk	The risk of large-eared horseshoe bats colliding with wind turbines during Project operation is considered negligible as the species does not fly within the RSA height.	None required.
Barotrauma	As the large-eared horseshoe bat does not fly within RSA height, the risk of barotrauma is considered negligible.	None required.



Potential Impact	Assessment	Mitigation
Bushfire risk	During operational activities, there is potential for heightened fire risk due to the increased presence of maintenance and monitoring vehicles and personnel in the Project area. This is through the use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.
Noise and lighting	There is potential for indirect impacts such as noise and lighting on this species resulting from Project operation.	Noise-generating activities during the operations phase will be negligible. Night lighting during the operations phase will be limited to that required for safety and security. Low luminance, directional lighting will be used in proximity to environmentally sensitive areas.
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts, with feral cats prevalent across the site. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.

8.6.4.3 Assessment of Significant Residual Impacts

The Project is not expected to have a significant residual impact on the large-eared horseshoe bat (Vulnerable). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-56**.

Table 8-56 Significant Residual Impact Assessment – Large-eared Horseshoe Bat

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of an important population of a species	Unlikely The presence of large-eared horseshoe bat has not been confirmed within the Project area, and the Project area is unlikely to support an important population of the species. Nonetheless, small areas of potential habitat have been mapped within the Project area on a precautionary basis. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a long-term decrease in the size of the Project area's large-eared horseshoe bat population, should it be present.
Reduce the area of occupancy of an important population	Unlikely The presence of large-eared horseshoe bat has not been confirmed within the Project area, and the Project area is unlikely to support an



Significant Impact Criteria	Project Outcome
	important population of the species. The proposed removal of potential large-eared horseshoe bat habitat associated with the Project is not concentrated in a manner that will remove one or more 4km ² grid squares from the species' area of occupancy.
Fragment an existing important population into two or more populations	<p>Unlikely</p> <p>The presence of large-eared horseshoe bat has not been confirmed within the Project area, and the Project area is unlikely to support an important population of the species. The Project area contains some potential habitat for the species. The vast majority of this habitat will be retained within the Project area.</p> <p>Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to fragmentation of an existing population into two or more populations.</p> <p>Large tracts of large-eared horseshoe bat habitat will remain within the Project area post clearing which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity. Rehabilitation activities will also aim to restore vegetation communities that will provide large-eared horseshoe bat foraging habitat over the short to medium term.</p>
Adversely affect habitat critical to the survival of a species	<p>Unlikely</p> <p>In the absence of confirmed species presence, habitat critical to the survival of the large-eared horseshoe bat has not been identified within the Project area. Given the extent of potential habitat remaining in the locality, coupled with the implementation of the proposed mitigation measures, the Project is not considered likely to adversely affect habitat critical to the survival of the species.</p>
Disrupt the breeding cycle of an important population	<p>Unlikely</p> <p>The species has not been confirmed present within the Project area. The Project is not expected to disrupt the breeding cycle of an important population.</p>
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	<p>Unlikely</p> <p>The Project area contains potential roosting and foraging habitat for the species. The vast majority of this habitat will be retained within the Project area. Nevertheless, the Project will involve the removal of 25.9ha of potential habitat for the large-eared horseshoe bat.</p> <p>Large tracts of large-eared horseshoe bat habitat will remain within the Project area post clearing which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity. Rehabilitation activities will also aim to restore vegetation communities that will provide large-eared horseshoe bat foraging habitat over the short to medium term. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and</p>



Significant Impact Criteria	Project Outcome
	fragmentation are expected to be effective in ensuring that the Project does not lead to a decline in the species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	<p>Unlikely</p> <p>Feral cats and cane toads are prevalent within the Project area. Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pest fauna.</p> <p>Areas of retained vegetation will be managed, including weed and pest animal control to maintain the retained areas in good condition and reduce threats. Hygiene protocols in the operational areas will also be implemented to reduce any weeds or disease being introduced to the Project area or spread from the Project area.</p> <p>Based on implementing the proposed mitigation measures it is not expected the Project will result in an increase of invasive species in the large-eared horseshoe bat habitat</p>
Introduce disease that may cause the species to decline	<p>Unlikely</p> <p>It is not expected that the Project will introduce disease that may cause the species to decline.</p>
Interfere substantially with the recovery of the species	<p>Unlikely</p> <p>The Project is not expected to interfere substantially with the recovery of the species, the presence of which has not been confirmed within the Project area. Clearing of habitat will be undertaken sequentially, and large areas of potential roosting and foraging habitat will be retained across the Project area. This availability and connectivity of foraging and breeding habitat will ensure any large-eared horseshoe bats within the Project area will have available foraging resources. Fire will also be managed on site to ensure hot wildfires are minimised and potential roost sites protected.</p> <p>Large tracts of habitat will remain within the Project area which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity and maintain gene flow for the species.</p>

8.6.5 Mahogany Glider

As discussed in **Section 4.7.5.4**, the mahogany glider has not been recorded previously within the Project area nor the broader Study area. The Project area is outside the species' known range as reported by Burnett et al 2016a, Jackson and Diggins 2021 and SPRAT 2022. The entire Project area is also significantly higher than the species' reported upper elevation limit of 120 m (Burnett et al 2016a, Jackson and Diggins 2021 and SPRAT 2022). The Project area is therefore not thought to provide habitat for the mahogany glider.



8.6.5.1 Potential Construction Impacts from the Project and Relevant Mitigation

The Project area is considered highly unlikely to support the mahogany glider and hence construction impacts on this species are not anticipated.

8.6.5.2 Potential Operational Impacts from the Project and Relevant Mitigation

The Project area is considered highly unlikely to support the mahogany glider and hence operational impacts on this species are not anticipated.

8.6.5.3 Assessment of Significant Residual Impacts

The Project is unlikely to have a significant residual impact on the mahogany glider (Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-57**.

Table 8-57 Significant Residual Impact Assessment – Mahogany Glider

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of a population	Unlikely The Project area is highly unlikely to support a population of mahogany glider, which has never been recorded in the broader Study area. The entire Project area is above the reported upper elevation limit of the species and outside the species' range, and therefore does not provide habitat for the mahogany glider.
Reduce the area of occupancy of the species	Unlikely The Project area does not overlap with the species' area of occupancy as presented by Burnett et al 2016a, Jackson and Diggins 2021 and SPRAT 2022.
Fragment an existing population into two or more populations	Unlikely The Project area is highly unlikely to support a population of mahogany glider as it is outside the species' known range.
Adversely affect habitat critical to the survival of a species	Unlikely The Project area is highly unlikely to support a population of mahogany glider. The Project area does not provide critical habitat for this species.
Disrupt the breeding cycle of a population	Unlikely The Project area is highly unlikely to support a population of mahogany glider.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Unlikely The Project area is outside the known range of the mahogany glider.
Result in invasive species that are harmful to the critically endangered or endangered	Unlikely



Significant Impact Criteria	Project Outcome
species becoming established in the critically endangered or endangered species' habitat	The Project area does not provide habitat for the mahogany glider. The Project area is already subject to established populations of weeds and invasive species (such as feral cat, feral pig). A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) which includes management of invasive species populations and monitoring the effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Introduce disease that may cause the species to decline	Unlikely The mahogany glider may be susceptible to myrtle rust. However, the Project area is outside the known range of this species.
Interfere with the recovery of the species	Unlikely The Project is not expected to interfere substantially with the recovery of the species. The Project area does not provide habitat for the mahogany glider.

8.6.6 Northern Bettong

As discussed in **Section 4.7.6**, the northern bettong has not been recorded within the Project area despite a survey effort of nearly 6,000 camera trap nights over the course of 11 months. In the absence of a confirmed population of northern bettong, no habitat critical to the survival of the species has been mapped within the Project area. Potential habitat has been mapped as wet sclerophyll forests and vegetation communities dominated by *Corymbia citriodora* and *C. platyphylla*.

8.6.6.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 1,952 ha of potential habitat for northern bettong has been mapped within the Project area, and approximately 6,209 ha within the broader Study area.

The Project will require clearing of approximately 81.2 ha of potential habitat for northern bettong during Stage 1 and zero during Stage 2. Potential construction impacts and proposed mitigation measures for the northern bettong are discussed further in **Table 8-58**.

Table 8-58 Potential Construction Impacts and Proposed Mitigation – Northern Bettong

Potential Impact	Assessment	Mitigation
Vegetation and habitat clearance	The Project will result in the clearing of 81.2 ha of potential habitat for the species.	Large areas of potential habitat throughout the Project area will be retained. Design has sought to avoid and minimise clearing within wet sclerophyll forests which are the species' preferred habitat. Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.



Potential Impact	Assessment	Mitigation
		<p>Project infrastructure including laydown areas, construction compounds and substation have been sited in cleared areas where practicable to avoid clearing of potential northern bettong habitat.</p> <p>Existing access tracks within the Project area are prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Clearing of potential habitat will occur sequentially and in accordance with an approved Species Management Program.</p>
<p>Fragmentation (of populations and habitat)</p>	<p>The Project may lead to the clearing of 81.2 ha of potential habitat for the species.</p>	<p>Existing access tracks within the Project area were prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Vegetation clearing will be minimised as much as practicable through micrositing within the proposed Project footprint.</p> <p>Retained vegetation will be maintained through implementation of a Vegetation Management Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.</p> <p>Project design has sought to minimise the width of access tracks in areas of potential northern bettong habitat.</p> <p>Construction personnel will be educated on the potential presence of northern bettong. Off-track driving will not be permitted and reduced speed limits will be enforced in areas of potential habitat, with appropriate signage on site.</p> <p>Areas cleared for construction that are not required for the operational footprint will be sequentially rehabilitated as soon as practicable following construction.</p>
<p>Weed and pest incursion</p>	<p>The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area. Degradation of habitat by weeds, predation by feral cats and foraging competition from</p>	<p>The Project area is currently subjected to existing weed and pest impacts, with weeds, feral pigs and feral cats prevalent across the site. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. This will include support of feral cat control to reduce predation on the northern bettong.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes</p>



Potential Impact	Assessment	Mitigation
	feral pigs are known threats to the northern bettong.	management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.
Species mortality (vehicle collision, vegetation clearance)	During vegetation clearing, there is potential for direct mortality if northern bettongs are present. There is also a risk of vehicle strike during construction.	<p>Clearing of habitat could potentially result in significant injury or death to individual northern bettong; however, clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher and retention of potential shelter habitat overnight. The process will significantly mitigate any potential impacts associated with clearing operations ensuring northern bettong are detected, provided procedures are followed and spotters are allowed ample opportunity to check areas prior to construction. Capture and release those healthy individuals. Any injured bettongs will be taken to a vet for treatment.</p> <p>Standard construction hours (6.30am to 6.30pm) will reduce the likelihood of construction vehicles driving within northern bettong habitat when this nocturnal species is active. Construction personnel will be educated on the potential presence of northern bettong. Off-track driving will not be permitted and reduced speed limits will be enforced in areas of potential habitat, with appropriate signage on site.</p>
Erosion and sedimentation	Construction activities may alter surface water overland flow, leading to increased erosion of suitable habitat.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Dust emissions	Construction activities have the potential to degrade northern bettong habitat through smothering by dust.	Generally, dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary.
Noise and lighting	As the northern bettong is a nocturnal species, there is the potential for it to be disturbed	Standard construction work hours will generally be between 6.30am and 6.30pm, therefore site lighting will be kept to the minimum required for safety. Where necessary, construction lighting will be



Potential Impact	Assessment	Mitigation
	by noise and lighting impacts during Project construction.	directed to the required areas and designed to minimise light spill to adjacent areas. Construction equipment will be fitted with noise reduction devices where practicable and switched off when not in use
Bushfire risk	Inappropriate fire regimes are a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.

8.6.6.2 Potential Operational Impacts from the Project and Relevant Mitigation

Potential operational impacts and proposed mitigation measures for the northern bettong are discussed in **Table 8-59**.

Table 8-59 Potential Operational Impacts and Proposed Mitigation – Northern Bettong

Potential Impact	Assessment	Mitigation
Species mortality (vehicle collision)	Increased traffic around the Project area has the potential to kill or injure fauna on impact although traffic levels will be greatly reduced during operations compared to the construction phase and more geared towards light or medium vehicles.	Mitigation measures outlined in Section 6.0 will reduce risks associated with increased vehicle presence on site.
Bushfire risk	During operational activities, there is potential for heightened fire risk due to the increased presence of maintenance and monitoring vehicles and personnel in the Project area. This is through the use of machinery that may generate sparks, use of flammable liquids and idling vehicles being present in areas of ground vegetation.	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.
Noise and lighting	There is limited scope for indirect impacts such as noise and lighting on this species resulting from Project operation.	Noise-generating activities during the operations phase will be negligible. Night lighting during the operations phase will be limited to that required for safety and security. Low luminance, directional lighting will be used in proximity to environmentally sensitive areas.



Potential Impact	Assessment	Mitigation
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	The Project area is currently subjected to existing weed and pest impacts, with feral cats and pigs prevalent across the site. During operation of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue. Feral cat control activities within the Project area will be supported by CWF – this will assist to reduce predation on northern bettongs.

8.6.6.3 Assessment of Significant Residual Impacts

The Project is not expected to have a potential significant residual impact on the northern bettong (Endangered). A full significance assessment following the Significant Impact Guidelines (DoE 2013) is presented in **Table 8-60**.

Table 8-60 Significant Residual Impact Assessment – Northern Bettong

Significant Impact Criteria	Project Outcome
Lead to a long-term decrease in the size of a population	Unlikely Desktop assessment and extensive field surveys have not confirmed the presence of northern bettongs within the Project area. Potential habitat has been mapped within the Project area on a precautionary basis. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a long-term decrease in the size of the Project area's northern bettong population, should it be present.
Reduce the area of occupancy of the species	Unlikely The proposed removal of potential habitat associated with the Project is not concentrated in a manner that will remove one or more 4km ² grid squares from the northern bettong's area of occupancy, should it be present.
Fragment an existing population into two or more populations	Unlikely The presence of northern bettong has not been confirmed within the Project area, despite extensive surveys. The Project area contains potential habitat for the species and the majority of this habitat will be retained within the Project area. Risks of fragmentation are likely to be highest where access roads cross areas of potential habitat. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to fragmentation of an existing population into two or more populations.



Significant Impact Criteria	Project Outcome
	<p>Large tracts of northern bettong habitat will remain within the Project area post clearing which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity. Rehabilitation activities will also aim to restore habitats that will provide northern bettong foraging habitat. The Project is not expected to fragment an existing population into two or more populations.</p>
<p>Adversely affect habitat critical to the survival of a species</p>	<p>Unlikely The Project will not involve the removal of habitat critical to the survival of the species, the presence of which has not been confirmed within the Project area.</p>
<p>Disrupt the breeding cycle of a population</p>	<p>Unlikely Northern bettongs breed year-round. The species presence has not been confirmed within the Project area, To avoid and minimise potential impacts on northern bettong breeding habitat and young, fauna spotter catchers will be present prior to and during clearing to check for the presence of the species and potential dens. If potential dens are to be cleared procedures will be put in place to minimise impacts to the species as outlined in a Species Management Plan. The Project is not expected to disrupt the breeding cycle of a population.</p>
<p>Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline</p>	<p>Unlikely The northern bettong has not been confirmed present but the Project area does contain potential habitat for the species. The majority of this habitat will be retained within the Project area. Nevertheless, the Project will involve the removal of 81.2 ha of potential habitat for the northern bettong.</p> <p>Large tracts of northern bettong habitat will remain within the Project area post clearing which are connected to larger habitats in adjacent areas. These retained and adjacent habitats will support the species and provide connectivity. Rehabilitation activities will also aim to restore habitats that will provide northern bettong habitat. Aside from the sensitive design measures already employed for the Project, the measures proposed to manage vegetation clearing and fragmentation are expected to be effective in ensuring that the Project does not lead to a decline in the species.</p>
<p>Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the critically endangered or endangered species' habitat</p>	<p>Unlikely Feral cats and feral pigs are both prevalent within the Project area. Clearing activities associated with the Project have the potential to open up areas that may be subject to weed incursion and increased prevalence of pest fauna.</p> <p>Areas of retained vegetation will be managed, including weed and pest animal control to maintain the retained areas in good condition and reduce threats. Hygiene protocols in the operational areas will also be implemented to reduce any weeds or disease being introduced to the Project area or spread from the Project area.</p>



Significant Impact Criteria	Project Outcome
	Based on implementing the proposed mitigation measures it is not expected the Project will result in an increase of invasive species in the northern bettong habitat.
Introduce disease that may cause the species to decline	Unlikely It is not expected that the Project will introduce disease that may cause the species to decline.
Interfere substantially with the recovery of the species	Unlikely The Project is not expected to interfere substantially with the recovery of the species, the presence of which has not been confirmed. Clearing of habitat will be undertaken sequentially, and large areas of potential habitat will be retained across the Project area. This availability and connectivity of habitat will ensure any northern bettong within the Project area will have available foraging and breeding resources. Fire will also be managed on site to ensure hot wildfires are minimised and potential den sites protected.

8.6.7 Northern Greater Glider

As discussed in **Section 4.7.4**, the northern greater glider was recorded at multiple locations across the Project area, with a total of 64 gliders being observed within a combined survey duration of 103 person hours. The Project area represents habitat critical to the survival of the species, with denning and foraging habitat mapped as described in **Section 4.7.7.4**.

8.6.7.1 Potential Construction Impacts from the Project and Relevant Mitigation

Approximately 23,301 ha of critical habitat for northern greater glider occurs within the Project area, of which approximately 13,316 ha is suitable for denning and foraging, and 9,985 ha is suitable only for foraging. There are approximately 90,119 ha of greater glider habitat within the broader Study area (there are insufficient tree height and density data to categorise this as either denning or foraging habitat, or both).

The Project will require clearing of critical habitat for the northern greater glider as summarised in **Table 8-61**.

Table 8-61 Proposed Clearing of Northern Greater Glider Habitat

	Stage 1 Clearing	Stage 2 Clearing	Total Clearing
Denning habitat	350.3ha	179.3ha	529.6ha
Foraging habitat	170.1ha	188.3ha	358.4ha
Total greater glider habitat	520.3ha	367.6ha	887.9ha

Potential construction impacts and proposed mitigation measures for northern greater glider are discussed in **Table 8-62**.



Table 8-62 Potential Construction Impacts and Proposed Mitigation – Northern Greater Glider

Potential Impact	Assessment	Proposed Mitigation
Vegetation and habitat clearance	The Project will result in the clearing of 887.9 ha of northern greater glider habitat.	<p>Large areas of habitat throughout the Project area will be retained.</p> <p>The Project design has sought to avoid and minimise clearing within habitat suitable for denning.</p> <p>If practical during construction, micro-siting of access tracks will seek to avoid large hollow-bearing trees.</p> <p>Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.</p> <p>Project infrastructure including laydown areas, construction compounds and substation have been sited in cleared areas where practicable to avoid clearing of potential habitat.</p> <p>Clearing of northern greater glider habitat will occur sequentially and in accordance with an approved Species Management Program.</p> <p>Unavoidable impacts to denning trees will be mitigated through installation of nest boxes and/or translocated stags within retained habitat on a 2:1 basis. The success of artificial nest boxes is driven by design and situation within the landscape; a recent study by ANU has demonstrated uptake success of high-tech nest boxes by greater gliders in the aftermath of the 2019-2020 bushfires²⁵. In addition, the re-use (i.e. translocation) of large hollows has been demonstrated to have potential for greater uptake success in comparison to artificial nest boxes (Central Coast Council, 2016).</p>
Habitat fragmentation	The Project will result in the clearing of 887.9 ha of northern greater glider habitat.	<p>Existing access tracks within the Project area were prioritised as part of the design to minimise any further clearing and fragmentation of vegetation communities.</p> <p>Vegetation clearing will be minimised as much as practicable through micro-siting within the proposed Project footprint.</p> <p>Retained vegetation will be maintained through implementation of a Vegetation Management</p>

²⁵ <https://www.anu.edu.au/news/all-news/hi-tech-nest-boxes-to-help-greater-gliders#:~:text=Tree%20hollows%20that%20are%20used,greater%20gliders%20to%20extreme%20temperatures;>
[https://www.abc.net.au/news/rural/programs/landline/2022-03-18/plastic-nest-boxes-for-tree-hollow-shortage-gliding-possums/100920240;](https://www.abc.net.au/news/rural/programs/landline/2022-03-18/plastic-nest-boxes-for-tree-hollow-shortage-gliding-possums/100920240)
<https://www.abc.net.au/news/2020-10-27/3d-printed-plastic-hollows-for-threatened-australian-species/12812606>

















Potential Impact	Assessment	Proposed Mitigation
		<p>Plan to reduce hazards from fire, pest species, degradation and other potential impacts. This will assist in maintaining the integrity of the vegetation as habitat and will reduce disturbance to surrounding habitat and conservation areas.</p> <p>Given the broad and generally linear nature of the Project footprint (narrow in the context of the broader retained vegetation), the Project is unlikely to lead to fragmentation impacts. Areas cleared for construction that are not required for the operational footprint will be sequentially rehabilitated as soon as practicable following construction. Glider poles will be installed as part of the rehabilitation works to maintain connectivity whilst the vegetation re-establishes and their use will be monitored.</p>
Weed and pest incursion	The Project has the potential to facilitate the spread of weeds and pest fauna through machinery, vehicles and materials brought to site from outside the Project area.	<p>The Project area is currently subjected to existing weed and pest impacts. During construction of the Project, weed and pest control measures will be established to minimise the risk of the Project further exacerbating the issue.</p> <p>A preliminary Weed and Pest Management Plan has been prepared (see Appendix F) and includes management of weed spread (with specific advice for key identified species), management of pest infestations and monitoring effectiveness of control measures. This plan will be further developed by the Construction Contractor prior to works commencing on site.</p>
Species mortality (vehicle collision, vegetation clearance)	During vegetation clearing, there is potential for direct mortality if greater gliders are present (i.e. denning in the hollow-bearing trees to be cleared). The risk of vehicle strike is negligible.	Clearing of habitat could potentially result in significant injury or death to individual greater gliders, however clearing operations will be conducted in accordance with the provisions outlined in a sequential clearing procedure including the use of a fauna spotter catcher and retention of habitat trees overnight. The process will significantly mitigate any potential impacts associated with clearing operations ensuring greater gliders are detected, provided procedures are followed and spotters are allowed ample opportunity to check trees before felling. Hollow-bearing trees will be marked and hollows inspected where possible for the presence of arboreal fauna prior to tree-felling. Clearing protocols will be developed including methods for clearing hollow-bearing trees (e.g. remove surrounding trees on previous day) and



Potential Impact	Assessment	Proposed Mitigation
		<p>check for any injured species. Any injured individuals will be taken to a vet for treatment.</p> <p>Where practicable, dead standing timber and living, hollow-bearing trees should be retained.</p>
Erosion and sedimentation	The greater glider is unlikely to be directly impacted by erosion and reduced water quality resulting from Project construction.	A preliminary Erosion and Sediment Control Plan (ESCP) (Appendix I) and a Sediment and Erosion Management Plan (Appendix J) have been prepared for the Project and will be further developed by the Construction Contractor prior to works commencing on site. Implementation of these plans will minimise soil loss from the disturbance areas.
Bushfire risk	Inappropriate fire regimes are a threat to this species. The Project is not expected to increase the risk of high intensity bushfires in the Project area	A Bushfire Management Plan will be prepared prior to construction and will be implemented during all on-site activities. Fuel loads will be monitored and managed through activities such as controlled grazing, cool mosaic burns and weed management.
Noise and lighting	As the northern greater glider is a nocturnal species, there is the potential for to it be disturbed by noise and lighting impacts during Project construction.	Standard construction work hours will generally be between 6.30am and 6.30pm, therefore site lighting will be kept to the minimum required for safety. Where necessary, construction lighting will be directed to the required areas and designed to minimise light spill to adjacent areas. Construction equipment will be fitted with noise reduction devices where practicable and switched off when not in use
Dust emissions	There is limited scope for indirect impacts from dust emissions on this species resulting from Project construction	Generally, dust is not expected to pose a significant risk in this high-rainfall area. Dust generating activities will be minimised during dry, windy conditions and areas of exposed soils will be rehabilitated as soon as practicable, to minimise dust emissions. Dust suppression (water spraying) will be used during the dry season as necessary.

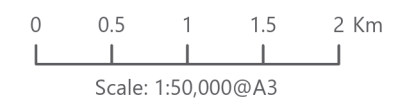
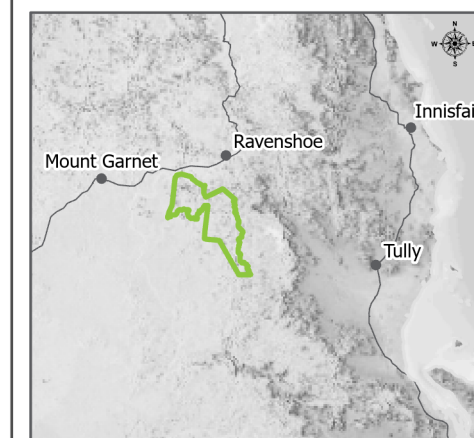
Chalumbin Wind Farm
Impacts to Greater glider habitat
Sheet 1 of 4

Figure 8.4

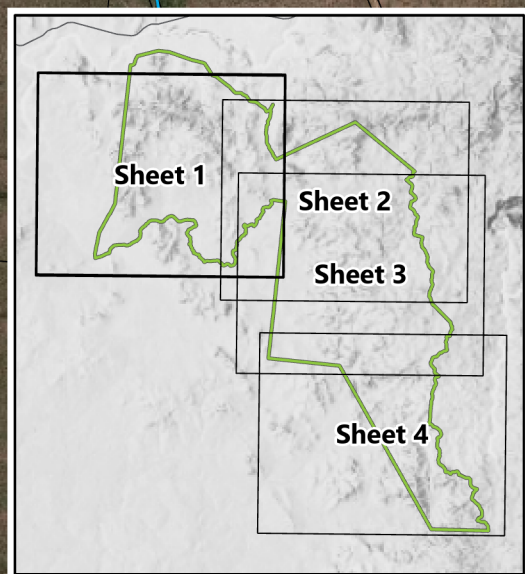
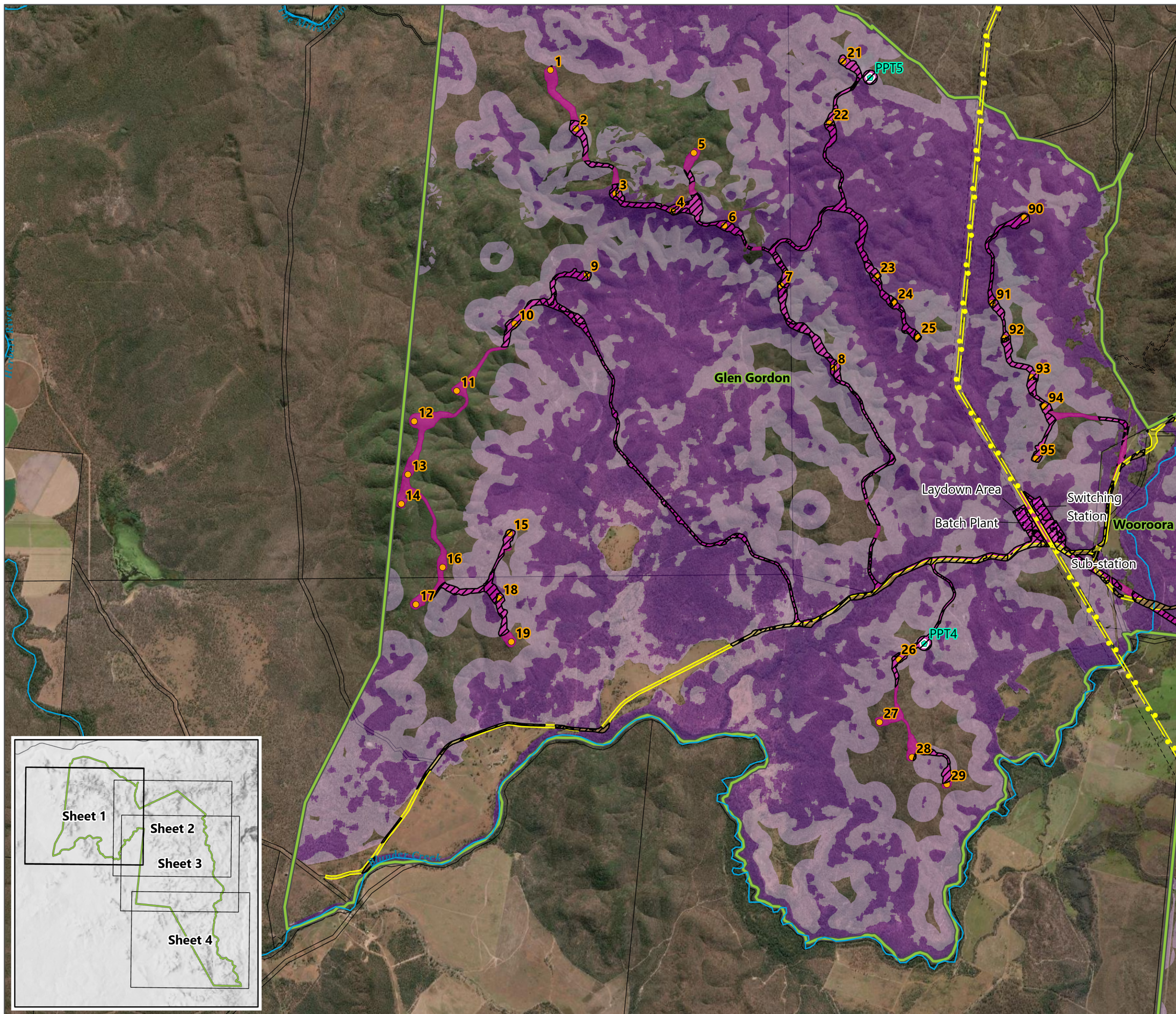
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-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope
-  Stage 1
-  Stage 2
-  Significant Residual Impact
-  Denning Habitat
-  Foraging Habitat
-  Existing HV Transmission Line
-  Watercourse
-  WTQ Boundary
-  Lot Boundary
-  Easement

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Project: EPU-004

Author: TOD
Reviewed: NOD

















Data Source(s):
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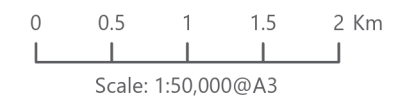
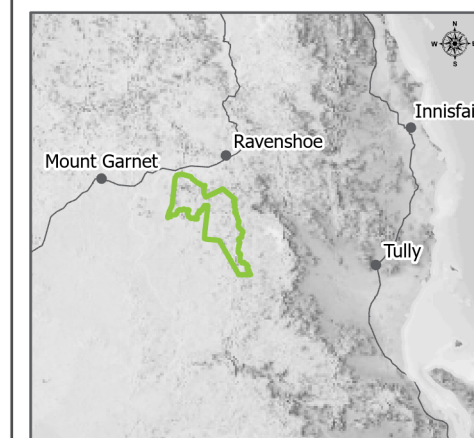
Chalumbin Wind Farm
Impacts to Greater glider habitat
Sheet 2 of 4

Figure 8.4

-  Project Area Boundary
-  Turbine
-  Met-mast
-  Facilities
- Clearance Envelope
 -  Stage 1
 -  Stage 2
-  Significant Residual Impact
-  Denning Habitat
-  Foraging Habitat
-  Existing HV Transmission Line
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