Appendix J

Preliminary Aquatic Assessment

EnergyCo

May 2024

Hunter Transmission Project

Desktop Aquatic Assessment Report

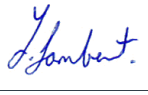
Question today
Imagine tomorrow
Create for the future

Hunter Transmission Project
Desktop Aquatic Assessment Report

EnergyCo

WSP
Level 3, 51-55 Bolton St
Newcastle NSW 2300
PO Box 1162
Newcastle NSW 2300

Tel: +61 2 4929 8300
Fax: +61 2 4929 8382
wsp.com

	Name	Date	Signature
Prepared by:	Joshua Freney	08/05/2024	
Reviewed by:	Toby Lambert	08/05/2024	
Approved by:	Alex Cockerill	08/05/2024	

PS201156-WSP-SYD-ECO-REP-002 RevC

May 2024

Table of contents

List of tables

List of figures

List of appendices

1 Introduction

1.1 Project overview

EnergyCo is proposing the construction and operation of new high voltage electricity transmission infrastructure, including new substation infrastructure and ancillary works, required to connect energy generation and storage projects to the existing electricity network within the Hunter. The project will strengthen energy security in New South Wales and the core electricity grid for the Hunter, Sydney, and Illawarra regions for generations to come. The project will achieve this by connecting a new overhead 500 kV transmission line between 2 new 500 kV substations at Bayswater and in Olney State Forest. The new substations will be connected to the existing 500 kV transmission lines near Bayswater and Eraring to unlock electricity supply from the Central West Orana and New England Renewable Energy Zones.

The nominal distance of the new transmission line will be approximately 100 km.

From the new 500 kV Bayswater Substation, the line will maximise use of existing disturbed mining areas to run south-easterly to Lemington before making several crossings of the Hunter River to pass through the Hunter Valley Operations (HVO) coal mine between the HVO North and HVO South operational areas. The line then heads south-east crossing Wollombi Brook and avoiding vegetation constraints in Gouldsville. The line continues southward through Mount Thorley, keeping east of Jerrys Plains Road, and into Broke, crossing Putty Road, a rail corridor, and Broke Road. The line navigates around Bulga Coal mine operations, continuing south to cross over the existing 330 kV lines – Lines 81 and 82, and then co-locates for approximately 4.5 km.

The line then continues south to maximise the use of public land into Pokolbin State Forest, emerging just east of Cedar Creek. It then traverses the Corrabare State Forest, Watagan State Forest and Olney State Forest before truncating at the new 500 kV Olney Substation and connection to the existing Eraring-Kemps Creek double circuit 500 kV transmission line.

The transmission line corridor has been developed to avoid and or minimise impacts on important environmental, land use and social values, where practical to do so. The final alignment of the transmission line within the transmission line corridor will be confirmed during detailed design with a view to further minimising environmental impacts, wherever practicable.

An overview of the project is shown in Figure 1.1 and key features include:

- a new double circuit 500 kV above-ground transmission line between Bayswater and Olney State Forest where it will join the existing 500 kV transmission line that connects Eraring and Kemps Creek
- adjustments to existing transmission lines to facilitate construction and operation of the project
- two new 500 kV substations at Bayswater (Bayswater substation) and in Olney State Forest (Olney substation)
- upgrades to the existing substations at Bayswater Power Station and Eraring Power Station
- upgrades to the existing public road network and new and upgraded access tracks for construction and operation of the project
- temporary construction infrastructure including four construction support sites including workforce accommodation, laydown areas, stringing sites, and utility adjustments and connections.

With projected commencement of construction for early 2026 and completion by late 2028 to ensure energy security, the project is subject to NSW Government and Australian Government planning approvals.

The project area includes a transmission line corridor of varying width in which the proposed transmission line and new substations would be located. A refined corridor for the project will be identified in the Environmental Impact Statement (EIS). Additional locations that may be required for specific uses (such as access tracks, construction compounds and workforce accommodation camps) will also be identified in the EIS.

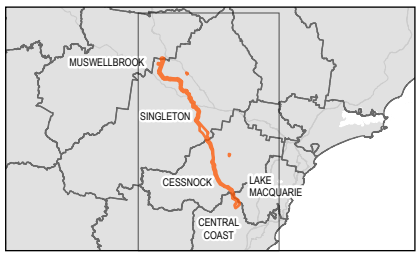
wsp

Hunter Transmission Project
Figure 1-1

Location of Project Area

Legend

- Project Area
- Highways
- Railway
- Existing Transmission Line
- Flora Reserve
- NPWS Reserve (all managed land)
- State Forest
- Watercourse
- Waterbody



0 5 10 15
Kilometers

Coordinate system: GDA2020 MGA Zone 56
Scale ratio correct when printed at A3

1:330,000 Date: 2/04/2024

GDA 2020

Data sources: EMM, Geoscience Australia, NSW State Government, WSP, Yancoal
World Imagery: Earthstar Geographics

1.2 Purpose of the report

This Desktop Aquatic Assessment has been prepared by WSP Australia Pty Ltd on behalf of EnergyCo for the proposed Hunter Transmission Project (HTP). The purpose of this report is to present preliminary aquatic ecology findings within the project area based on desktop assessment and determine if the proposed HTP is likely to result in any direct impacts on aquatic values.

This report identifies aquatic habitats within the project area and how they may be impacted by surrounding land use and anthropological activities. The report also identifies threatened aquatic species that have the potential to occur within the project area.

The report then considers how the construction and operation of the proposed HTP will impact upon these identified aquatic values, to determine if any direct impacts are anticipated, and if any further assessment is justified.

2 Methods

This chapter outlines the methods used to compile known or predicted aquatic values within the project area.

2.1 Database and literature review

2.1.1 *Database searches*

The aim of the database searches was to identify aquatic biodiversity values present within the project area. The following databases and existing mapping were used:

- Fisheries NSW Spatial Data Portal (freshwater threatened species maps)
- Protected Matters Search Tool
- Key Fish Habitat mapping

2.1.2 *Literature review*

The aquatic habitats within the project area were assessed against the following policy and guidelines for fish habitat conservation and management:

- *Policy and guidelines for fish habitat conservation and management* (DPI, 2013)
- *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull and Witheridge, 2003)
- Aquatic Ecology in Environmental Impact Assessment – EIA Guideline (Smith, 2003)

There is sufficient existing information from previous studies within the project area to describe the existing aquatic environment and to assess the quality and importance of the aquatic environments potentially impacted.

3 Existing environment

3.1 Key fish habitat

3.1.1 *Existing aquatic environment*

The project area is located within the Hunter-Central Rivers catchment. The project area crosses a large number of poor to good quality first, second and third order streams. Larger third and fourth order streams, fifth and sixth order creeks intersect the project area as well as the Hunter River. Streams within the project area and surrounding locality were assessed for Key Fish Habitat through a search on the Department of Primary Industries (DPI) Fisheries Spatial Data Portal (Table 3.1).

Streams with suitable habitat present in the project area include the upper catchments of Wollombi Brook, which flow towards the north, and crossing the project area again just before entering the Hunter River near Warkworth. Sections of the Dora Creek catchment also contain suitable habitat, which cross through areas of National Parks and Forestry Land throughout the south-east end of the project area. This catchment ends within Lake Macquarie, with the other catchments of the project area flowing through the Hunter River and into the Tasman Sea at Newcastle.

The catchments within which the project area is located have been impacted from a mixture of rural activities, forestry, urban development, and mining. These activities have modified the natural aquatic environment substantially, including major infrastructure developments, roads, rail, and agriculture.

The lower catchments of the Wollombi Brook consist of gently sloping rural land that is largely cleared. Land use in the project area from the north-west end to the south-east before Pokolbin State Forest consists mostly of cleared rural properties and coal mines. Very few patches of remnant bushland occur within this section of the catchment area. The project area is dominated by surface runoff from rainfall which concentrates into defined watercourse catchments.

Historic records of rainfall and flood events indicates that runoff is typically confined to the main channels and relatively quickly flow down to the lower portions of the catchments in the project area. Water quality, quantity, and velocity of flows within the project area have been influenced by agricultural activities. Vegetation removal, agriculture, de-snagging, and construction of in-stream dams has affected the physical stability of the waterways within the project area and streambank erosion is common, particularly in the north of the project area.

3.1.2 *Fish habitat and waterway classification*

There are a number of named and unnamed watercourses intersecting the project area which contain key fish habitat. Named watercourses in the project area containing key fish habitat are listed in Table 3.1 below.

The key fish habitat and associated sensitivity classification scheme is demonstrated in Table 1 of the *Policy and guidelines for fish habitat conservation and management* (DPIE, 2013). Under this scheme any known or expected protected or threatened species habitat or area of declared 'critical habitat' under the *Fisheries Management Act 1994* (FM Act) is defined as "TYPE 1 - Highly sensitive key fish habitat".

Table 3.1 Named watercourses and key fish habitat intersecting the project area

Strahler Order	Occurrences within Project area	Watercourse names
3	1	Parnells Creek
9	1	Hunter River
2	1	Hobden Gully
8	1	Wollombi Brook^

Strahler Order	Occurrences within Project area	Watercourse names
2	2	Doctors Creek
4	1	Loder Creek
5	1	Monkey Place Creek
3	1	Potholes Gully
5	1	Deep Creek
5	1	Cedar Creek
6	1	Congewai Creek^
4	2	Sweetmans Creek
4	1	Watagan Creek

Note: Several creek lines appear in more than one category. This reflects the multiple intersection of the creek line with the project area, and were in some locations, the creek may be of a difference size (or Strahler order)

^Southern Purple Spotted Gudgeon identified habitat

3.1.3 *Threatened aquatic species*

The desktop searches returned two threatened marine and estuarine species listed under the EPBC Act and FM Act as having the potential to occur within the locality. However, the project has no direct and / or indirect impacts on these species.

A search of the freshwater threatened species maps (DPI, 2023) identified habitat for the Southern Purple Spotted Gudgeon (*Mogurnda adspersa*) throughout all creeks/brooks of the Hunter River and specifically Congewai Creek and Wollombi Brook. These waterways are listed as key fish habitat within the project area and surrounds.

The projects interaction with the Hunter River is generally below the lowest extent of known habitat for the Hunter population of Darling River Hardyhead (*Craterocephalus amniculus*). Despite being outside of its known distribution this species is considered further on a precautionary basis.

An assessment of the likelihood of occurrence of all threatened aquatic species was undertaken to determine the potential for these species to occur within the project area (see Appendix A).

3.1.4 *Likelihood of occurrence assessment*

An assessment was completed to assess the likelihood of occurrence of each threatened fish species listed under the *Fishery Management Act (1994)* identified with the potential to occur in the project area.

The assessment also included consideration of the dates and locations of nearby records and information about species populations in the locality of the project area. The assessment results are summarised in Appendix A.

For this assessment, the likelihood of occurrence of threatened fish species was determined based on the criteria shown in Table 3.2 below.

Table 3.2 Likelihood of occurrence criteria for threatened species and populations

Classification	Definition
Present	Species has been recorded within the last 5 years within the project area by ecological survey.
High	It is highly likely that a species inhabits the project area and is dependent on identified suitable habitat (i.e., for breeding or important life cycle periods such as winter flowing resources), has been recorded recently within the locality and is known or likely to maintain resident populations in the project area. Also, includes known or likely to visit the project area during regular seasonal movements or migration.
Moderate	Potential habitat is present within the project area. Species unlikely to maintain sedentary populations; however, may seasonally use resources within the project area opportunistically or during migration. The species is unlikely to be dependent (i.e., for breeding or important life cycle periods such as winter flowing resources) on habitat within the project area, or habitat in a modified or degraded state. Includes cryptic flowering flora species that were seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the project area and has not been recorded recently in the locality (over 20 km). It may be an occasional visitor, but habitat similar to the project area is widely distributed in the local areas, meaning that the species is not dependent (i.e., for breeding or important life cycle periods such as winter flowing resources) on available habitat. Specific habitat is not present in the project area or the species are a non-cryptic perennial flora species that were specially targeted by surveys and not recorded.
None	Suitable habitat is absent from project area.

4 Project impacts on aquatic values

4.1 Waterbodies, water quality, and hydrological processes

The project crosses a number of waterways at various points throughout the project area. However, the extent of impact to waterbodies, water quality, and hydrological processes is expected to be minor throughout the project, subsequently reducing the risk of impacts on threatened aquatic species within the project area.

The anticipated works are mostly limited to above-ground construction, with appropriate ground disturbance and water management measures to be implemented i.e., project-specific erosion and sediment control plan.

The permanent disturbance area's (operational areas) of the project are located outside of core riparian zones. This is essential to prevent degradation of riparian areas, which can result in riverbank erosion, and sedimentation and nutrification of waterways. Degradation of riparian zones can also impact both aquatic and terrestrial biodiversity that are affiliated with the habitat. Consequently, in the event of any disturbance to riparian areas, only the vegetation of the tree-stratum will be cleared (with tree trunks to be retained) in order to protect the understory in such areas. Additionally, any riparian areas subject to disturbance would be stabilised and rehabilitated, using endemic vegetation, to restore the area to pre-existing conditions as far as reasonably practicable. As the project is unlikely to impact core riparian zones, no direct impacts are expected to occur to these aquatic values of reliant threatened aquatic species.

Transmission line towers will be located a minimum of 50 m from waterways, and transmission lines will span all waterway crossings, further reducing the risk of potential impacts to waterbodies, water quality, and hydrological processes.

The highest potential for impacts to waterbodies, water quality, and hydrological processes will be during construction, although these are subject to detailed management measures, to be included in environmental management plans for the project. Once operational, these impacts are considered to be negligible in an ongoing basis.

4.2 Key fish habitats

Impacts from the project on aquatic habitats, particularly mapped key fish habitats, as listed in Table 3.1, are considered likely to be negligible. Avoiding and minimising impacts on aquatic habitats would be a priority of detailed design and any residual indirect impacts would be subject to mitigation measures.

It is considered unlikely that temporary impacts associated with construction of the project would result in any long-term degradation of mapped key fish habitat areas.

4.3 Listed aquatic threatened species

The project area contains mapped habitat for the FM Act listed endangered species Southern Purple Spotted Gudgeon (*Mogurnda adspersa*), and slightly upstream of the project area is the lowest extent of mapped habitat for the FM Act listed endangered Hunter River population of Darling River Hardyhead (*Craterocephalus amniculus*).

The likelihood of occurrence assessment completed for threatened fish species under the FM Act (Appendix A) determined that the Southern Purple Spotted Gudgeon had a 'high' likelihood of occurrence, while the Darling River Hardyhead had a 'moderate' likelihood of occurrence. Due to the outcomes of the likelihood of occurrence assessment, a Test of Significance has been prepared for the Southern Spotted Purple Gudgeon (high likelihood of occurrence) and the Darling River Hardyhead (moderate likelihood of occurrence). Refer to Appendix B.

It is anticipated that the likelihood of impacts to these species will be minimised through restriction of direct impacts to the waterways which contain mapped species habitat. The proposed mitigation and management measures for impacts to fish habitat are likely to prevent any direct or indirect impacts to these rivers and their habitat. As outlined above, it is considered unlikely that temporary impacts associated with construction of the project would result in any long-term

degradation of mapped key fish habitat areas. The project's preference will be to utilise existing waterway crossings for construction and operation, and in the event additional waterway crossings are required by the project, they will be designed in accordance with the relative guidelines.

The extent of impact to waterbodies, water quality, and hydrological processes is also expected to be minor throughout the project, with appropriate management measures to be implemented.

As a result, the risk of impacts on threatened species is considered minor and there is no need for targeted threatened aquatic species surveys or standalone assessment as part of the EIS.

4.4 Mitigation and minimisation of impacts

The project's preference will be to utilise existing waterway crossings (i.e., bridges, culverts) for construction and operation, to avoid the need to construct additional crossings. Transmission line structures will be located a minimum of 50m from waterways, and transmission lines will span all waterway crossings to minimise impacts to riparian areas.

The only likely impact to occur in an area of key fish habitat would be the removal or trimming of tree canopy on creek / river banks to facilitate the construction and operation of the transmission line spanning each riparian area. All trunk bases and understorey would be retained in-situ. All potential impacts association with erosion and sedimentation impacts would be management and monitored through the implementation of erosion and sediment control plans to ensure that riparian areas are not impacted.

Where the project requires works within 40 m of the high bank of any river, lake, or wetlands (collectively waterfront land), such as waterway crossings, the work will be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land. In the event new crossings are required, they will be designed in accordance with the *'Why Do Fish Need to Cross the Road?'* booklet (Fairfull and Witheridge, 2003), and the *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (DPI, 2013).

5 Conclusion

This desktop assessment has presented the aquatic values considered to be present within the project area, including waterbodies, water quality and hydrological processes, key fish habitats, and listed aquatic threatened species. Both the anticipated temporary and permanent impacts on these values from the construction and operational phases of the proposed HTP was considered.

The project's preference is to utilise existing waterway crossings for construction and operation is unlikely to have any long-term impacts to mapped key fish habitat areas or aquatic threatened species. Standard mitigation measures such as specific erosion and sediment control plans, environmental management plans, locating transmission structures away from waterways, rehabilitation of disturbed riparian areas, and utilisation of existing waterway crossings is proposed and considered adequate.

Based on this desktop assessment, the proposed HTP is unlikely to have a direct impact on the aquatic values of the project area and therefore no targeted threatened aquatic species surveys or standalone aquatic report is recommended for the EIS.

References

Department of Climate Change, Energy, the Environment and Water (2023) Protected Matters Search Tool. Accessed August 2023 at Protected Matters Search Tool - DCCEEW

Department of Primary Industries (2013) Fisheries NSW Policy and Guidelines for Fish Habitat Conservation and Management (2013 update). Fisheries NSW, Wollongbar.

Department of Primary Industries (2022a) Fisheries Spatial Data Portal accessed August 2022 at Fisheries Spatial Data Portal (nsw.gov.au)

Fairfull, S. and Witheridge, G. (2003) Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. NSW Fisheries, Cronulla, 16 pp

Smith, M, L. (2003) Aquatic Ecology in Environmental Impact Assessment – EIA Guideline Series. Prepared on behalf of Department of Planning.

Appendix A

Threatened fish species in the locality of the project, likelihood of occurrence

Table A.1 Threatened fish species listed under Fishery Management Act (1994) likelihood of occurrence

Scientific name	Common name	FM Act[4]	EPBC Act[2]	SAII	Habitat	Source[5]	Likelihood of occurrence
Craterocephalus amniculus	Darling River Hardyhead population in the Hunter River Catchment	EP	-	No	The Darling River Hardyhead is found in the upper tributaries of the Darling River near the Queensland and New South Wales border. The Hunter River population is the only known occurrence of the species in an eastward flowing river. They are usually found in slow flowing, clear, shallow waters or in aquatic vegetation at the edge of such waters. The species has also been recorded from the edge of fast flowing habitats such as the runs at the head of pools.	Fisheries NSW Spatial Data Portal	Moderate Waterways present upstream of the project area are identified as habitat, with past records with the northern extent of the area.
Epinephelus daemelii	Black Rockcod	V	V	No	Generally inhabit near-shore rocky and offshore coral reefs at depths down to 50 m, but are occasionally recorded from deeper waters. In coastal waters adult black cod are found in rock caves, rock gutters and on rock reefs. Black cod are an aggressive, territorial species and individuals may occupy one particular cave for most of their adult lives. Recently settled juvenile black cod (i.e. individuals that have recently completed the pelagic larval stage) are often found in coastal rock pools while slightly older juvenile black cod are often found in estuary systems	PMST	Low The freshwater ecology of the project area is unsuitable for this salt water dependent species to occur.
Thunnus maccoyii	Southern Bluefin Tuna	E	CD	No	The forms a single widely distributed population in the southern, temperate oceans, but with a single known spawning ground in the Indian Ocean, between Java and northern Western Australia.	PMST	Low The freshwater ecology of the project area is unsuitable for this salt water dependent species to occur.
Mogurnda adspersa	Southern Purple Spotted Gudgeon	E	–	No	The Southern Purple Spotted Gudgeon occurs in the Murray-Darling basin as well as parts of coastal northern NSW and Queensland. The species can be found in a variety of habitats such as rivers, creeks, streams and billabongs with slow-flowing or still waters. Cover in the form of aquatic vegetation, overhanging vegetation from riverbanks, leaf litter, rocks or snags are important for the species.	Fisheries NSW Spatial Data Portal	High. Waterways present within the project area are identified as habitat, with a record upstream from the northern extent of the area.

(1) V = Vulnerable, E = Endangered, CE = Critically Endangered, EX = Presumed Extinct under the BC Act

(2) V = Vulnerable, E = Endangered, M = Migratory under the Commonwealth EPBC Act.

(3) Source: PMST = The Department of the Environment and Energy's EPBC Protected Matters Search Tool, BioNet = ESS's Bionet Atlas of NSW Wildlife

(4) Fisheries Management Act 1994

Appendix B

Test of significance

Test of Significance for Southern Spotted Purple Gudgeon & Darling River Hardyhead (as per Part 7. Division 1, Section 7.3 of the *Biodiversity Act 2016*)

The following is to be considered for the purposes of determining whether a proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats.

a) In the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The key impact on threatened fish species life cycles is waterway barriers which do not allow for fish passage. Fish passage is essential for migratory breeding and genetic diversity of fish species. The proposed development`s preference will be to utilise existing waterway crossings (i.e., bridges, culverts) for construction and operation, to avoid the need to construct additional waterway barriers. In the event new crossings are required, they will be designed in accordance with the *'Why Do Fish Need to Cross the Road?'* booklet (Fairfull and Witheridge, 2003), and the *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (DPI, 2013), to ensure impacts on fish passage are minimised.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

    i is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

    ii is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

Not applicable.

c) In relation to the habitat of a threatened species or ecological community:

    iii the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

    iv whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

    v the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

Degradation of riparian zones can also impact both aquatic and terrestrial biodiversity that are affiliated with the habitat. Consequently, in the event of any disturbance to riparian areas, only the vegetation of the tree-stratum will be cleared (with tree trunks to be retained) in order to protect the understory in such areas. Additionally, any riparian areas subject to disturbance would be stabilised and rehabilitated, using endemic vegetation, to restore the area to pre-existing conditions as far as reasonably practicable. As the project is unlikely to impact core riparian zones, no direct impacts are expected to occur to these aquatic values of reliant threatened aquatic species.

Habitat connectivity will be maintained through avoiding the construction of additional waterway barriers within waterways. The proposed development`s preference will be to utilise existing waterway crossings (i.e., bridges, culverts) for construction and operation, to avoid the need to construct additional waterway barriers. In the event new crossings are required, they will be designed in accordance with the *'Why Do Fish Need to Cross the Road?'* booklet (Fairfull and Witheridge, 2003), and the *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (DPI, 2013), to ensure impacts on fish passage and habitat connectivity are minimised.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposal will not impact on any declared area of outstanding biodiversity value.

e) Whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

A Key Threatening Process (KTP) is a process that threatens, or may have the capability to threaten, the survival or evolutionary development of species, population, or ecological community. Key threatening processes are listed under the BC Act and at the present there are currently 38 listed KTP's. Of the 38 listed KTP's under the BC Act, 2 are applicable to the threatened fish species subject to this assessment (Table B.1). However, minimisation of impacts to 'core' riparian areas, and preference for utilisation of existing waterway crossings would reduce or avoid the impact of both KTP's.

Table B.1 Key threatening processes relevant to the proposal (BC Act)

Key Threatening Process	Relevance to the Proposal
Alteration to the natural flow regimes of rivers, streams, floodplains & wetlands	Yes. The proposal will prioritise utilisation of existing waterway crossings for construction and operation, and in the event additional waterway crossings are required by the project, they will be designed in accordance with the *'Why Do Fish Need to Cross the Road?'* booklet (Fairfull and Witheridge, 2003), and the *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (DPI, 2013).
Clearing of native vegetation	Yes. The proposal will require clearing of native vegetation. However, impacts to riparian vegetation will be avoided or minimised where possible.

There are also KTP's specific to native fish and marine vegetation listed under the FM Act. Of the 8 listed KTP's under the FM Act, 5 are applicable to the threatened fish species subject to this assessment (Table B.2). However, minimisation of impacts to 'core' riparian areas, preference for utilisation of existing waterway crossings, and the proposal's support of renewable energy zones in the Hunter region, would reduce or avoid the impact of all KTP's.

Table B.2 Key threatening processes relevant to the proposal (FM Act)

Key Threatening Process	Relevance to the Proposal
Degradation of native riparian vegetation along New South Wales water courses	Yes. The proposal may require temporary degradation of native riparian vegetation, however this is limited to the trimming of tree canopy's to facilitate the construction and operation of the transmission line spanning each riparian area. All trunk bases and understorey would be retained in-situ. Additionally, any riparian areas subject to disturbance would be stabilised and rehabilitated, using endemic vegetation, to restore the area to pre-existing conditions as far as reasonably practicable.
Human-caused climate change	Yes. The proposal is likely to generate temporary emissions during construction. However, the purpose of the proposal is to facilitate development of renewable energy zones in the Hunter region, Central-West Orana and New England, which will strive to reduce climate change impacts associated with energy production.

Key Threatening Process	Relevance to the Proposal
Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams	Yes. The proposal will prioritise utilisation of existing waterway crossings for construction and operation, and in the event additional waterway crossings are required by the project, they will be designed in accordance with the *'Why Do Fish Need to Cross the Road?'* booklet (Fairfull and Witheridge, 2003), and the *Policy & Guidelines for Fish Habitat Conservation & Management (2013 update)* (DPI, 2013).
Removal of large woody debris from New South Wales rivers and streams	Yes. The proposal may require the removal of large woody debris to facilitate construction of waterway crossings, if required. Preference will be to utilise existing waterway crossings.

Conclusion

While there are several KTP's applicable to the threatened species subject to this assessment, and all of which are relevant to the proposal, it is anticipated that management and mitigation measures are sufficient to reduce or avoid impacts from the KTP's. Anticipated impacts (direct or indirect) from the proposal to the habitat of both the Southern Spotted Purple Gudgeon and Darling River Hardyhead are likely to only be temporary in nature and will be minimised through design and landscaping initiatives where possible. Consequently, the proposal is unlikely to have a significant impact on the applicable threatened species or their habitat.