8 AQUATIC ECOLOGY

8.1 INTRODUCTION

This chapter of the supplementary environmental impact statement addresses the aquatic ecology related submissions that were received with regard to the Pipeline Component of the draft EIS. In addition to addressing submissions, this chapter also discusses the findings of additional studies and field assessments that have been conducted to both supplement the aquatic ecology information presented in the draft EIS and to assess potential impacts that may arise from amendments to the Project description of the Pipeline Component of the Queensland Curtis LNG (QCLNG) Project.

The amendments to the Project description of the Pipeline Component are detailed in *Volume 2*, *Chapter 12*.

8.2 RESPONSES TO SUBMISSIONS

Table 4.8.1 provides a summary of the comments received on aquatic ecology for the Pipeline Component. The table indicates the submission and either outlines the response or indicates where in this chapter or elsewhere in the sEIS, the comment is addressed.

Table 4.8.1 Summary of aquatic ecology submissions on the draft EIS.

Summary of Submission	Response	Submitter
The analysis of aquatic flora species should be expanded to include species which have strong associations with, or form important fringing habitat to, wetlands.	Field surveys along the Export Pipeline found that almost all freshwater wetland habitats are ephemeral in nature and subject to prolonged periods without water. The only exceptions are a number of artificial water sources such as dams and tanks that might be considered as permanent. Thus freshwater aquatic flora species that characteristically occur in association with aquatic systems are relatively diminished. Flora species that may occur in association with wetland systems are described in the draft EIS in *Volume 4*, *Chapter 8*, *Section 8.1.2.1* and include three endangered, vulnerable or rare (EVR) flora species (*Aponogeton queenslandicus, Eleocharis blakeana* and *Fimbristylis vagans)*. This notwithstanding, no EVR aquatic flora species were found during the field surveys.	32 (101)
The analysis of aquatic species should be expanded to include species which have strong associations or depend on wetlands for significant breeding or feeding habitat.	Species that have close associations with wetland habitats for breeding or foraging include waterfowl and other bird species that require dense grass or reeds (for example birds such as Reed Warblers, Snipe and some species of Quail), some mammals (such as the Rufous Bettong) and also a number of reptiles (e.g. Dunmall's Snake) and amphibians (e.g. frogs). In the case of reptiles and frogs, most species show strong affiliation with seasonally and ephemerally wet habitats such as black soil gilgais, and not with wetlands *per se*. In the case of bats, the only known Australian species dependent on aquatic habitats for foraging is the Large-footed Myotis. This species has not been recorded from the Project area but may occur close to the coast in the Gladstone area. Other tree-dwelling species may be closely associated with riparian areas where they make use of tree hollows in the larger eucalypts for roosting and maternity purposes. All of these species are considered in the draft EIS. In particular, EVR species, including some of the aforementioned mammals, reptiles and frogs, are detailed in *Appendix 4.2* of the draft EIS. *Appendix 4.2* of the draft EIS describes the anticipated degree of impact that may occur to these species. *Volume 3*, *Sections 7* and *8* of the draft EIS describe the mitigation measures that will be employed to minimise impacts on aquatic and terrestrial species. In nearly all cases, the potential level of impact for wetland dependent species is projected to be low (the exception is Painted Snipe: moderate). This is because of the very limited extent of freshwater wetlands in the vicinity of the alignment, the characteristics of those wetlands (i.e. predominantly ephemeral watercourses) and the temporary nature of the anticipated disturbance. The mitigation measures already developed for the protection of riparian corridors and other habitats of potentially high conservation value will be sufficient to protect freshwater wetland-associated flora and fauna. These measures include the reinstatement of drainage patterns after construction, erosion management, and minimal clearing of native vegetation (such as the clearing of creek lines and watercourses. Detailed pre-clearance surveys will be used to identify key ecological values, including habitat trees and other key microhabitat features for protection. The draft EIS also recognises riparian areas (among others) as priority habitats for the Offsets Strategy.	32 (103)

Summary of Submission	Response	Submitter
Reference should be made to least concern, near threatened, rare, vulnerable, endangered wildlife and Department of Environment and Resources Management (DERM) Back on Track species prioritisation process.	Throughout the sEIS the term EVR has been used to describe all species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) as extinct in the wild, critically endangered, endangered, vulnerable, and conservation dependent and under the *Nature Conservation Act 1992 (Qld)* (NC Act) as extinct in the wild, endangered, vulnerable, rare, and near threatened. The DERM Back on Track species prioritisation framework has been referenced and will be used in the management plans for EVR species that have the potential to be impacted on by the proposed development. See *Volume 4*, *Chapter 7*, *Section 7.6*.	32 (16)
The sEIS should consider the establishment of buffer zones between the various construction and operational activities and significant wetland areas and watercourses including reference to width, cover, slope and drainage requirements.	With the exception of the marine estuary wetlands adjacent to The Narrows, which are discussed in *Volume 5, Chapter 7* of the draft EIS, the only watercourses present along the proposed alignment are dry ephemeral creeks. Where creek crossing is unavoidable mitigation measures will include stockpiling of topsoil and trench soil outside of the riparian vegetation area. Other mitigation measures for riparian areas are detailed in *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS. Where possible, crossing of riparian areas by linear infrastructure will be done at 90 degrees to avoid unnecessary clearing.	32 (105)
Other sources of information, including the Queensland Wetlands Mapping and field surveys, should be used and reviewed to identify important wetland areas in proximity to, or likely to be affected by the proposed Pipeline Corridor.	Refer to *Section 7.3.1* of this chapter.	32 (100)
The sEIS should identify the impacts of weed introduction to wetlands and watercourses; direct interference to the direction and volume of flows and appropriate mitigation measures.	Very few natural, permanent wetlands exist in the area and the watercourses are ephemeral. Potential impacts to wetlands and watercourses include weed infestation, erosion and the alteration of drainage patterns. Larger ephemeral watercourses, such as the Condamine River, provide sufficiently moist habitats for the establishment of weeds that may not occur elsewhere. These include Castor Oil Bush and Noogoora Burr. In many cases such species have already established in these areas quite independently of any Project activities. The draft EIS recommends stringent weed management guidelines (*Appendix 4.2, Section 8.3*) and these will help to protect wetlands, watercourses and riparian areas from the introduction and spread of weeds (including aquatic and aquatic-related weed species). Erosion is currently widespread across the large portions of the traversed landscape in susceptible habitats as a result of cattle grazing and other farming and construction activities. Pre-testing of soil types and erosion control plans will be implemented for all Project activities, as described in the draft EIS, and corrective actions will be undertaken as required in order to control erosion. One such control, the rapid rehabilitation of watercourse crossings will be undertaken as a matter of priority. The main infrastructure that may be required to cross watercourses consists of linear elements such as pipelines and associated access roads. In all cases, these will either be built to an appropriate standard, such that water flows are unimpeded, or shall be contoured after construction to follow natural contours so that no alteration of natural flows will occur. In all cases, the impacts on the direction of flow and volume of water are projected to be negligible.	32 (104)

Summary of Submission	Response	Submitter
A field assessment of aquatic ecological values should be undertaken for the sEIS. These field surveys should target areas identified from the desktop assessments as providing suitable habitat for EVR species. The sEIS should provide details of both the values identified from these surveys and any specific mitigation measures that may manage potential impacts.	As detailed in *Volume 4, Chapter 8, Section 8.3.1* of the sEIS, aquatic ecology values associated with the Pipeline Component of the Project are generally limited to watercourse crossings. Since the release of the draft EIS, detailed field inspections for flora and fauna habitat values have been undertaken for all proposed watercourse crossings along the Export Pipeline Corridor. The crossing points were generally found to be appropriate in relation to minimising potential environmental impacts. Where improvements were suggested by the inspecting ecologists, these have been incorporated into the refined alignment. All watercourses transected by the Export Pipeline Corridor are ephemeral and the majority were dry at the time of survey. No EVR flora species were recorded at these crossing points. Implementation of the mitigation measures described in *Volume 4, Chapter 8* of the draft EIS at the inspected crossing points will be adequate to avoid significant impacts to EVR or other flora or fauna values. As a result of land access constraints and continual route refinements, to date, the proposed watercourse crossings along the Collection Header and the Woleebee Creek Pipeline have not been inspected by field ecologists. Detailed ecologist inspections will be undertaken for each proposed crossing point (as well as any refinements to watercourse crossings locations along the Export Pipeline Corridor) prior to alignment finalisation. Should additional values be identified during these surveys, the potential to impact on these values will be assessed and if/where necessary additional mitigation measures will be identified and incorporated into site specific management plans.	32 (99)
Details should be provided in relation to the proposed strategy and methodologies to be employed to rehabilitation works. This detail should include an indication of specific performance measures, thresholds and monitoring for determining the success of proposed rehabilitation works.	Rehabilitation measures are discussed in *Volume 4, Chapter 7, Section 7.5.2* of the draft EIS. A detailed monitoring plan will be developed prior to construction and implemented in order to monitor the success of rehabilitation and help identify where rehabilitation procedures require modification. Monitoring sites will be established in disturbed and adjacent undisturbed sites to allow comparisons to be made, while controlling for variables relating to factors other than the Project activities. Monitoring sites will also provide data on changes occurring in disturbed areas over time. Monitoring of disturbed areas will continue until success thresholds are achieved or cessation of monitoring is otherwise justified (e.g. effective soil stabilisation achieved). The performance objective is to achieve 50 per cent of native and/or exotic pasture ground covers of adjoining areas within two years.	32 (106)
The draft EIS failed to address any potential impacts on the *Environment Protection and Biodiversity Conservation Act* (*EPBC)*-listed threatened ecological community 'The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'.	Refer to *Section 8.3.2* of this chapter.	32 (89)

Summary of Submission	Response	Submitter
The EIS should ensure that environmental values of groundwater-dependent ecosystems are recognised, potential impacts are fully assessed and appropriate mitigation measures are adopted.	Groundwater-dependent ecosystems (GDEs) are typically associated with surface drainage features or shallow groundwater resources related to aquifer recharge and discharge zones. The extent of GDE dependency on groundwater can range from being marginally to entirely dependent on groundwater. The Hydrogeological Framework Report for the Great Artesian Basin Water Resources Plan Area (2005) includes a discussion of the two types of GDEs that are most relevant to the QCLNG Project area: • springs, including recharge, discharge, and/or mound springs of the Great Artesian Basin (GAB) • rivers receiving baseflow. No springs are located along or in close proximity to the proposed Pipeline corridors and therefore will not be impacted on by Pipeline construction activities. Wherever the pipelines cross watercourses stringent mitigation measures will be in place to avoid disturbance to associated GDEs. These mitigation measures are discussed in Pipeline EMP (*Volume 10* of the draft EIS). Subterranean ecosystems and phreatophytic terrestrial vegetation are not included within the scope of the Terms of Reference for this EIS.	32 (82)

8.3 ADDITIONAL STUDIES

Additional aquatic ecology studies undertaken since the release of the draft EIS include:

- a review of the Queensland Wetlands Mapping
- Review of the Springs of Queensland Dataset to determine whether any EPBC Act-listed threatened communities of ''native species dependent on natural discharge of groundwater from the Great Artesian Basin'' occur within or in proximity to the Pipeline Component of the Project.

8.3.1 Queensland Wetlands Mapping

8.3.1.1 Export Pipeline

Review of the Queensland Wetlands Mapping identified several water bodies and wetlands regional ecosystems (REs) as occurring within 500 m of the Export Pipeline. The majority of these are artificial wetlands such as dams and/or ringtanks, the remaining are lacustrine wetlands, riverine or fringing riverine wetlands which are made up of the REs 11.3.27b, 11.3.27f, and 11.3.25 (*Table 4.8.2*). Only at five locations does the Export Pipeline actually traverse a wetland, these being fringing riverine wetland RE 11.3.25 (i.e. 217.5, 290, 291, 291.5 and 331). At all of these locations the "wetland" is a commonly dry, ephemeral watercourse.

Subsequent to the publication of the EIS, the Pipeline route has been inspected on foot and the nature and quality of wetlands and wetland RE's were noted. In most cases, the Pipeline has been aligned to avoid habitats containing wetlands and riverine areas. However, where this was not possible, it was noted that they consisted of narrow, ephemeral streams and small depressions which may hold water for a short period after heavy rain events.

Table 4.8.2 Wetlands mapped as occurring within 500 m of the Export Pipeline

KP	Distance from Pipeline	Upstream / Downstream	Wetland - REs	Comment
13.1	85 m	Upstream	Artificial wetland – dams, ringtanks – RE 11.3.27b	
57.8	480 m	Downstream	Artificial wetland – dams, ringtanks	
80.5	115 m	Upstream	Artificial wetland – dams, ringtanks	

KP	Distance from Pipeline	Upstream / Downstream	Wetland - REs	Comment
84.8	380 m	Downstream	Artificial wetland – dams, ringtanks	
217.5	Intersects		11.3.25 - riverine	Commonly dry ephemeral watercourse
221.3	400 m	Downstream	Artificial wetland – dams, ringtanks	
260	400 m	Upstream	Artificial wetland – dams, ringtanks	
281	470 m upstream		Modified - dam or weir – Callide Dam	
282-284	180 m		Four patches of RE 11.3.25 – riverine – Callide creek	
290	Intersects		RE 11.3.25 – riverine – Rainbow Creek	Commonly dry ephemeral watercourse
291	Intersects		RE 11.3.25 – riverine – Rainbow Creek	Commonly dry ephemeral watercourse
291.5	Intersects		RE 11.3.25 – riverine – Rainbow Creek	Commonly dry ephemeral watercourse
331	Intersects		RE 11.3.25 – riverine – Harper Creek	Commonly dry ephemeral watercourse
332	290 m	Upstream	RE 11.3.27f	Non remnant in Qld Herbarium mapping
333-334	30 to 130 m	Intersects	Three patches of RE11.3.27b	Non remnant in Qld Herbarium mapping
334.5	225 m	Upstream	Artificial wetland – dams, ringtanks	Non remnant in Qld Herbarium mapping
337	160 m	Downstream	RE 11.3.25 – riverine – Calliope river	Non remnant in Qld Herbarium mapping

8.3.1.2 Woleebee Creek Pipeline route

Review of the Queensland Wetlands Mapping identified only one fringing riverine (RE 11.3.25) habitat, along Juandah Creek, which the Woleebee Creek Pipeline route traverses at approximate KP 42. This is a commonly dry ephemeral watercourse.

8.3.1.3 Collection Header Pipeline

Three riparian wetland regional ecosystems (i.e. RE 11.3.25) are mapped by the Queensland wetlands mapping as occurring along the Collection Header pipeline. These are:

- Nine Mile Creek at KP 55
- Condamine River at KP 72.5
- Wallan Creek at KP 136.5.

Nine Mile Creek and Wallan Creek are commonly dry ephemeral watercourses. The Condamine River is periodically dry at the crossing location but is a regionally significant river.

8.3.2 Great Artesian Basin Water Resource Plan

Review of the Distribution and Assessment of the Queensland Herbarium Springs of Queensland Dataset (Version 4.0) indicates that no *EPBC Act*-listed threatened communities of ''native species dependent on the Great Artesian Basin'' are in the proximity of, or will be affected by the proposed Pipeline corridors (See *Figure 4.8.1*).

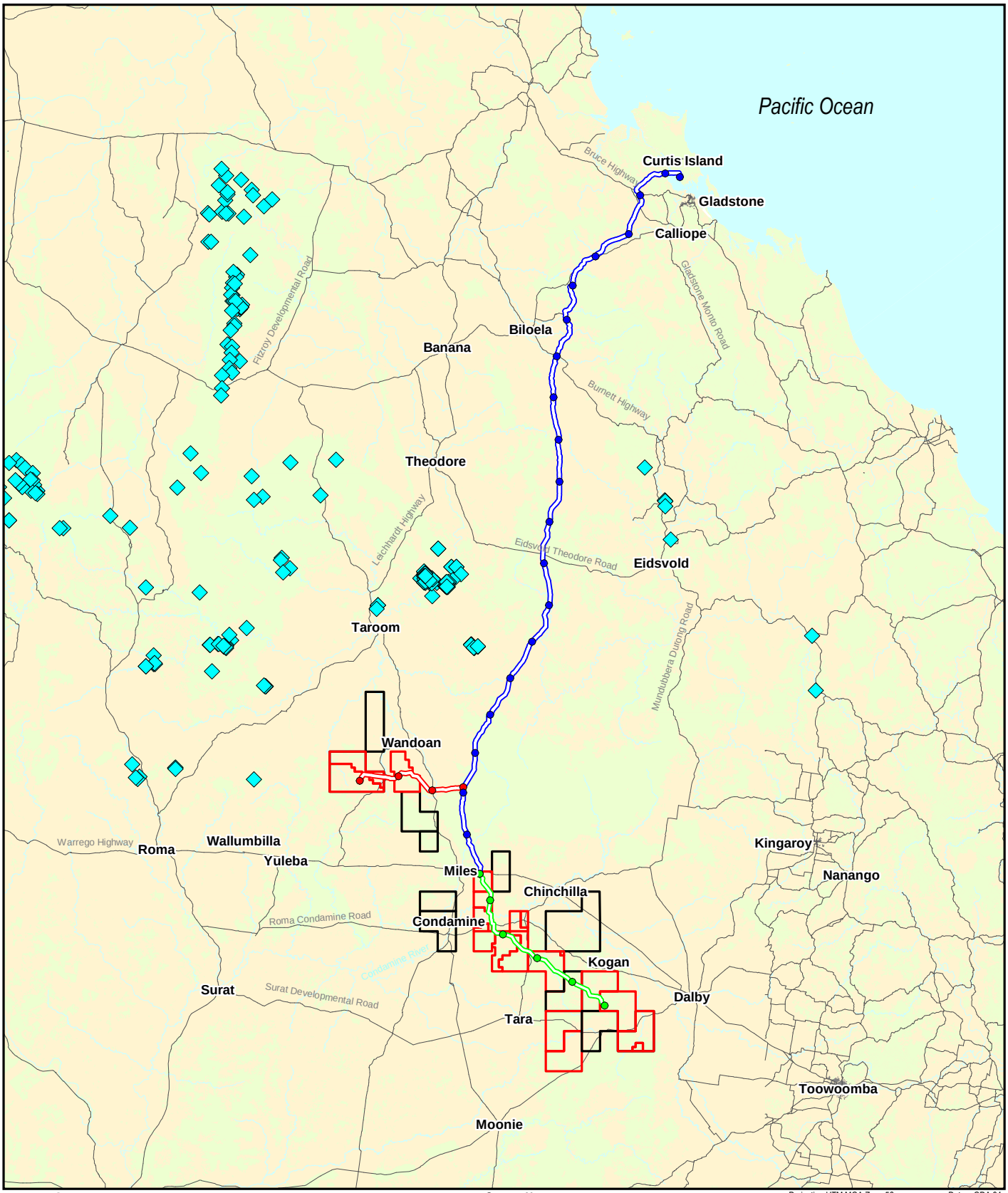
8.4 UPDATE OF AQUATIC ECOLOGY IMPACTS

The amendments to the project description of the pipeline component of the Project will not result in impacts to aquatic environments additional to those identified in *Volume 4, Chapter 8, Section 8.2* of the draft EIS.

8.5 MITIGATION

The Project identifies wetland systems, including ephemeral drainage lines, as key areas for biodiversity. Mitigation measures to minimise impacts on these areas and values are detailed in *Volume 4*, *Chapter 8*, *Section 8.3.1* of the draft EIS. These measures include minimal disturbance to riparian and wetland systems, with clearances in riparian areas only to occur when no other practicable alternatives exist.

Given that the majority of watercourses are dry ephemeral systems, these mitigation measures will result in the proposed pipelines being unlikely to significantly impact on aquatic ecology.



Legend:

- Export Pipeline & 20 Kilometre Point
- Woleebee Creek & 20 Kilometre Point
- Upstream Infrastructure Corridor & 20 Kilometer Point
- CSG Fields - PL & PLA
- CSG Fields - ATP
- Great Artesian Basin springs

Source Note:

1:250,000 Topographic vector copyright Geoscience Australia

Mining Tenement Information copyright State of Queensland (Dept. Mines and Energy)

Projection UTM MGA Zone 56 Datum GDA 94

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Environmental Resources Management Australia Pty Ltd

Project	Queensland Curtis LNG Project
Client	QGC - A BG Group business

Title **Pipelines in relation to Great Artesian Basin springs.**

Drawn	Mipela	sEIS Volume 4 Figure	S4.8.1
Approved	CDP	File No:	E05-P-MA-96225
Date	02.12.09	Revision	Supplementary

8.6 CUMULATIVE IMPACTS

The Export Pipeline and the southern portion of the Collection Header are in close proximity to the Surat Gladstone Pipeline. The Export Pipeline may be co-located with a number of other pipelines within Queensland Government designated corridors from the Callide Range northwards.

Co-location of a number of adjoining pipelines, if and when they are constructed, could potentially create a greater impact on traversed watercourses, particularly due to the creation of a wider break in the vegetation belt along these watercourses. This would result in reduction of wildlife movement along these corridors.

However, according to information provided in the Surat to Gladstone Pipeline Project EIS, the proposed alignment passes through similar vegetation and topography. The long-term cumulative impacts from both projects are likely to be similar to those proposed for each individual project, that is, loss of vegetation/habitat and fragmentation within contiguous expanses of remnant vegetation.

Provided that both projects develop mitigation measures to minimise impacts on remnant vegetation and key fauna habitats as well as providing offsets for unavoidable impacts, cumulative impacts are projected to be minor. Additionally, the co-location of Pipeline infrastructure within the CICSDA will reduce the cumulative impacts of multiple pipeline projects between the Callide Range and Gladstone.