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Amendment Report

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Chapter 5

Additional assessment

Sections 5.1 – 5.8

5. Additional assessment

5.1 Overview

This chapter provides an outline of additional assessments carried out by TfNSW since exhibition of the EIS in response to the proposed design changes detailed in **Chapter 2, Design changes** and the changes to the proposed approach to construction of the project described in **Chapter 3, Construction updates**. The concept design for the project has incorporated the proposed design and construction changes and is referred to as the amended design.

A screening assessment was carried out to determine where additional assessment for the design and construction changes was required. Each design and construction change was assessed against each of the key issues, as set out in the revised SEARs issued for the project on 30 October 2017 by DPIE **(Table 5.1-1**).

The assessment process involved desktop studies and/or field investigations for particular issues where required. Where additional impacts were identified, or extra mitigation proposed, these are detailed in the assessment. Where required, updated or supplementary technical reports were prepared and are included in Appendices A to H of this report. Updated technical papers present the same level of assessment and content as carried out for the EIS. These were prepared where there was a large amount of numerical changes as an outcome of the design and construction changes.

Supplementary technical papers have been prepared where the changes to the potential impacts as a result of design and construction changes are relatively simple such as for traffic and transport, urban design, landscape and visual amenity and land use and property. **Table 5.1-2** provides a summary of updated and supplementary technical papers prepared for the project.

For completeness, the design refinements as described in Chapter 1, Introduction of the Submissions Report (see Section 1.4) and determined to be consistent with the project description in the EIS, have been considered as part of the amended design, eg when undertaking any modelling. However, these design refinements will not be explicitly considered further in the impact assessment described below.

Table 5.1-1 Screening assessment for design and construction changes

Design and construction change	Traffic and transport	Noise and vibration	Biodiversity	Urban design, landscape and visual amenity	Land use and property	Agriculture	Socio economic	Aboriginal cultural heritage	Non Aboriginal cultural heritage	Flooding and hydrology	Soils and contamination	Surface water quality	Groundwater	Air quality	Waste	Sustainability	Hazard and risk	Cumulative impacts
Englands Road interchange	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	Y	N	N	N	N	N
North Boambee Valley vertical alignment	N	Y	Y	Y	N	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N
Coramba Road bus stop	Y	Y	N	Y	N	N	Y	N	N	N	N	Y	N	N	N	N	N	N
Coffs Creek flood mitigation	N	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N	N	N	N	N	N
Korora Hill interchange	Y	Y	Y	Y	Y	N	Y	N	N	Y	Y	Y	Y	N	N	N	N	N

Design and construction change	Traffic and transport	Noise and vibration	Biodiversity	Urban design, landscape and visual amenity	Land use and property	Agriculture	Socio economic	Aboriginal cultural heritage	Non Aboriginal cultural heritage	Flooding and hydrology	Soils and contamination	Surface water quality	Groundwater	Air quality	Waste	Sustainability	Hazard and risk	Cumulative impacts
Kororo Public School bus interchange and Luke Bowen footbridge	Y	Y	Y	Y	Y	N	Y	Y	N	Y	N	Y	N	N	N	N	N	N
Pine Brush Creek and Williams Creek realignment	N	N	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	N	N	N	N	N
New and revised operational water quality basins	N	N	Y	N	Y	N	Y	Y	N	N	Y	Y	N	N	N	N	N	N
Additional blasting	N	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
New and revised ancillary sites	Y	Y	Y	Y	Y	N	Y	Y	N	Y	Y	Y	N	N	N	N	N	N

Design and construction change	Traffic and transport	Noise and vibration	Biodiversity	Urban design, landscape and visual amenity	Land use and property	Agriculture	Socio economic	Aboriginal cultural heritage	Non Aboriginal cultural heritage	Flooding and hydrology	Soils and contamination	Surface water quality	Groundwater	Air quality	Waste	Sustainability	Hazard and risk	Cumulative impacts
Revised construction traffic management	Y	Y	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N
New and revised construction sediment basins	N	N	N	N	Y	Y	Y	Y	N	N	Y	Y	N	N	N	N	N	N

Table 5.1-2 Summary of updated and supplementary technical papers

EIS technical paper	Assessment approach
Traffic and transport assessment	A supplementary technical paper has been prepared to assess the design and construction changes and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.2, Traffic and transport** and the technical paper is provided in **Appendix A, Supplementary traffic and transport assessment**.
Noise and vibration assessment	An updated technical paper has been prepared to assess the design and construction changes, minor design refinements and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.3, Noise and vibration** and the technical paper is provided in **Appendix B, Updated noise and vibration assessment**.
Biodiversity assessment report	An updated biodiversity assessment report has been prepared to assess the design and construction changes and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.4, Biodiversity** and the report is provided in **Appendix C, Updated biodiversity assessment report**.
Threatened species management plan	An updated Threatened Species Management Plan (TSMP) has been prepared to reflect the changes to impact identified in the updated biodiversity assessment report and to address issues raised in EIS submissions. The management plan is provided in **Appendix D, Updated threatened species management plan**.
Urban design, landscape character and visual impact assessment	A supplementary technical paper has been prepared to assess the potential change in impacts associated with the design and construction changes and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.5, Urban design, landscape character and visual amenity** and the technical paper is provided in **Appendix E, Supplementary urban design, landscape character and visual impact assessment**.
Land use and property	A supplement to Appendix K1 of the EIS has been prepared to document the potential change in property impacts associated with the design and construction changes. The potential impacts are summarised in **Section 5.6, Land use and property** and provided in **Appendix F, Supplementary property impacts**.
Agricultural assessment	The potential change in impacts as a result of the design and construction changes are relatively minor when compared with those identified in the EIS.

EIS technical paper	Assessment approach
	As such, this technical paper has not been updated. An assessment of changes to potential impacts is included in **Section 5.7, Agriculture**.
Aboriginal cultural heritage assessment report	An updated technical paper has been prepared to assess the design and construction changes and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.9, Aboriginal cultural heritage** and the technical paper is provided in **Appendix G, Updated Aboriginal cultural heritage assessment report**.
Non-Aboriginal heritage assessment	The potential impacts as a result of the design and construction changes are consistent with those identified in the EIS. As such, this technical paper has not been updated and no further assessment because of the amended design is required. However, as a result of detailed survey, an additional culvert under the North Coast Railway was recorded. An addendum assessment was carried out and is summarised in Chapter 5, Clarifications, corrections and further information of the Submissions Report. The full addendum report is provided in Appendix C, Supplementary non-Aboriginal cultural heritage addendum report of the Submissions Report.
Groundwater assessment	The potential change in impacts as a result of the design and construction changes are relatively minor when compared with those identified in the EIS. As such, this technical paper has not been updated. An assessment of changes to potential impacts is included in **Section 5.13, Groundwater**.
Flooding and hydrology assessment	An updated technical paper has been prepared to assess the design and construction changes, minor design refinements and to address issues raised in EIS submissions. The results of this assessment are summarised in **Section 5.10, Flooding and hydrology** and the technical paper is provided in **Appendix H, Updated flooding and hydrology assessment**.
Air quality assessment	The potential impacts as a result of the design and construction changes are consistent with those identified in the EIS. As such, this technical paper has not been updated and no further assessment is required.
Human health risk assessment	The potential impacts as a result of the design and construction changes are consistent with those identified in the EIS. As such, this technical paper has not been updated and no further assessment is required.

5.2 Traffic and transport

5.2.1 Assessment methodology and approach

A traffic and transport assessment was prepared as part of the EIS (Chapter 8, Traffic and transport). The supplementary traffic and transport assessment is detailed in **Appendix A, Supplementary traffic and transport assessment** and has been prepared in accordance with the SEARs to assess the potential impacts of the project, including the design and construction changes. The supplementary assessment only includes information that has changed since the EIS.

Consistent with the EIS, the supplementary traffic and transport assessment involved:

- Computer-based transport modelling based on a three-tiered modelling approach to assess changes in traffic because of the proposed design changes, this included:
    - A regional strategic model, the Coffs Harbour Strategic Transport Model (CHSTM), used to forecast future traffic demand/growth and redistribution for the wider region with and without the project. There was no change to this model for the assessment of the proposed design changes
    - A detailed project specific mesoscopic model, the Coffs Harbour Traffic Model (CHTM) using Aimsun Next (Aimsun) to assess the future traffic performance with and without the project. This model was updated to include the relevant design changes for the project outlined in **Chapter 2, Design changes**
    - A detailed intersection model – microscopic simulation (Aimsun) and detailed intersection assessment using the SIDRA Intersection program to determine operational demand of interchanges and performance of intersections. These models were updated to include the relevant design changes for the project outlined in **Chapter 2, Design changes.**
- Assessment of impacts associated with the relevant construction changes, using the same assessment methodology that was used for the EIS.

In addition to the traffic model analyses identified above, a travel time assessment (using the VEHSIM program) was carried out to compare the potential travel time savings associated with differences in vertical alignment between the EIS design and the amended design.

5.2.2 Existing environment

The existing traffic and transport environment is described in Chapter 8, Traffic and transport of the EIS is still applicable to this assessment.

5.2.3 Assessment of construction impacts

Changes to the proposed approach to the construction of the project are shown in **Figure 3-1-01** to **Figure 3-1-06** and outlined in **Chapter 3, Construction updates.** The changes relevant to the traffic and transport assessment include:

- New and revised ancillary facilities - four new ancillary sites and two amended ancillary sites have been identified for the project
- Revised traffic management - Buchanans Road and Gatelys Road have been identified as new construction access roads needed for the project. Russ Hammond Close would also be required for local access during construction.

All other elements for the construction of the project relevant to traffic and transport are consistent with the details provided in Chapter 6, Construction in the EIS.

The ancillary sites would be located within the construction footprint, except for new site 1A which would be located on adjacent land within Coffs Coast Resource Recovery Park with access via Englands Road. The majority of the ancillary sites would include hardstand areas for parking of staff vehicles, site vehicles and for visitors. Temporary on-site parking areas would be designed to ensure enough car parking provision is available for the peak construction period to minimise on-street parking impacts on surrounding local roads.

The change in impacts because of the construction changes are considered to be minimal. The likely change in traffic and transport impacts associated with the construction changes compared to the impacts identified in the EIS are described in **Table 5.2-1.**

Table 5.2-1 Changes to construction traffic and transport impacts from the impacts documented in the EIS

Construction change	Change to impact on traffic and transport
New and revised construction ancillary facilities	**Construction zone 1** New ancillary sites in construction zone 1 include site 1A and site 1J, and the boundary of site 1C has been amended to accommodate the proposed design changes. The new ancillary sites in this construction zone would be accessed via Englands Road. Amended site 1C is also proposed to be accessed via Englands Road consistent with the EIS. While the new and amended sites may operate simultaneously* with the other site (site 1D) identified in the EIS, the peak construction traffic demand on Englands Road is expected to be the same as the peak demand identified in the EIS. This is because there are no changes to the expected workforce and construction resources for the project from what was identified in the EIS. As such, no additional traffic demand on Englands Road during construction is anticipated because of the changes to the proposed ancillary sites, and this local sub-arterial road would continue to operate with volumes less than its nominal upper limit capacity. **Construction zone 3** New ancillary sites in construction zone 3 include site 3A and site 3F, and as a result of the proposed design amendments the boundary of site 3D has been amended and site 3C has been removed. The new ancillary site 3A and the amended site 3D would be accessed via Bruxner Park Road. Consistent with the EIS, there would be three potential ancillary sites accessed from Bruxner Park Road with the addition of site 3A and the removal of site 3C, and as such, the peak construction traffic demand on Bruxner Park Road is expected to be the same as the peak demand identified in the EIS. No additional traffic demand on Bruxner Park Road during construction is anticipated because of the changes to the proposed ancillary sites, and the road would operate with acceptable travel times and level of service. The extent of Bruxner Park Road potentially affected by construction traffic could be slightly

Construction change	Change to impact on traffic and transport
	less than the extent identified in the EIS because the access to site 3A is close to the intersection of Bruxner Park Road and the existing Pacific Highway. New ancillary site 3F is proposed to be accessed via the existing Pacific Highway, near the intersection of Opal Boulevard and the existing Pacific Highway. Access to site 3F would include appropriate traffic management controls to ensure local access to Opal Boulevard is maintained throughout construction. The increase in construction traffic would represent an increase of less than five per cent of existing daily traffic volumes and a noticeable impact to travel time or level of service on the Pacific Highway because of site 3F would not be expected. Ancillary site 3C was described in the EIS, however this is no longer proposed.
Revised traffic management	**Buchanans Road** The total predicted traffic on Buchanans Road, inclusive of construction traffic, is estimated to be 200 vehicles per day, increased from the existing traffic volume of 50 vehicles per day. The nominal capacity of this road is 300 vehicles per day and it is not anticipated construction traffic would significantly impact the operation of this road. Given the predicted increase (greater than 100 per cent) in daily traffic volumes on Buchanans Road, the potential impacts on the operation of its intersection with Coramba Road have been considered. The practical absorption capacity of Coramba Road during the peak construction period would be in the order of 300 vehicles per hour based on Austroads guidance. This means the predicted daily volume of 200 vehicles per day on Buchanans Road during the peak construction period would not have a significant impact on the operation of the Coramba Road and Buchanans Road intersection. **Gatelys Road** The total predicted traffic on Gatelys Road, inclusive of construction traffic, is estimated to be 350 vehicles per day. The nominal capacity of this road is 2000 vehicles per day and it is not anticipated construction traffic would significantly impact travel time or service on this road. **Russ Hammond Close** Russ Hammond Close is anticipated to experience relatively high increases in estimated daily traffic volumes while it is used as a temporary traffic diversion as it currently carries a low level of traffic (estimated at about 200 vehicles per day). The total predicted daily traffic volumes on this road with the addition of redistributed school traffic are expected to be about 370 vehicles per day. The nominal capacity of this road is 300 vehicles per day, which suggests that Russ Hammond Close would be operating at capacity while this arrangement is in place.

*While the ancillary sites may operate simultaneously, it is unlikely that every site identified would be utilised. While that decision would be made during construction, the worst case has been assessed.

Consistent with the EIS, a Traffic Management Plan (TMP) is to be prepared by the construction contractor to manage impacts during construction. As part of the TMP measures (eg restricted delivery hours, staging and programming, speed limit restrictions and traffic controls) would be put in place to manage additional vehicle movement impacts on the existing road network, particularly at access points to the proposed ancillary sites and construction footprint access roads. Specific to the impacts described for Russ Hammond Close, the TMP would identify appropriate traffic control measures to regulate traffic movement, particularly at the peak times of school drop-off and pick-up, ensure the local community and school bus operators are well-informed of changes to the network and provide a monitoring framework to confirm controls are working and/or the need for contingency measures.

Additionally, as per the EIS, haulage of excavated material would be along the project corridor to minimise additional traffic volumes on the local road network.

There would be no additional traffic and transport impacts to all other modes of transport (ie heavy vehicles, North Coast Railway, public transport, pedestrians and cyclists, parking and property access), beyond those identified in Chapter 8, Traffic and transport of the EIS, because of the proposed construction changes. In addition, and as discussed in Section 8.3.4 of the EIS, under , Impacts on other transport users, the new Luke Bowen footbridge would be constructed before the removal of the existing bridge where possible with any disruptions to access occurring outside of school terms and in consultation with Kororo Public School and School Infrastructure NSW (see new environmental management TT15 in **Section 5.2.5**).

5.2.4 Assessment of operational impacts

An assessment has been carried out using the CHTM to determine the change in potential operational impacts because of the proposed design changes described in **Chapter 2, Design changes**.

Traffic volumes on the project

The CHTM was updated to include the proposed design changes for the project. The design changes modelled in the CHTM have resulted in minor changes in the overall traffic volumes on the project over the design horizon, previously reported in the EIS.

The forecast daily traffic volumes for the proposed design changes and the EIS design for the 2024, 2034 and 2044 design years are summarised in **Table 5.2-2**. The table includes the total two-way traffic volumes for all vehicle types (vehicles per day), with percentage of heavy vehicles shown in brackets below the traffic volumes.

The results indicate the amended design would have similar overall traffic patterns to the project described in the EIS, including similar results for the percentage of heavy vehicles. Daily traffic volumes on the project are shown to increase when compared to the EIS design. This is primarily because of the proposed design changes at the Englands Road interchange where the two signalised intersections are replaced with a roundabout. This results in reduced travel times for traffic accessing the project compared to the EIS design which increases the attractiveness of using the project.

The increased attractiveness associated with accessing the project at the southern end results in increased traffic volumes for the full length of the project when compared to the EIS design. The proposed design changes at the Korora Hill interchange will improve traffic flow and reduce delays for most movements, except for those motorists travelling from south of Korora Hill interchange and entering the project to travel southbound from the existing Pacific Highway south of the interchange. As such the overall increase in traffic demand on the project is slightly lessened on the northern

section with some motorists travelling to/from the catchment located in the vicinity of Bray Street are predicted to find it more attractive to access the project through the Coramba Road interchange instead of the Korora Hill interchange.

It should be noted that actual driver behaviour and route choice during operation may be different to model predictions. As such, as part of environmental management measure TT11, a review of the operational network performance will be carried out to confirm impacts of the project on the surrounding road network.

Table 5.2-2 Forecast daily weekday volumes (two-way) for the project (vehicles per day)

Location	Design	Two way daily average volume [vpd (% HV)]		
		2024	2034	2044
Project, south of Coramba Road	Amended design	24,700 (13%)	27,800 (13%)	29,000 (14%)
	EIS design	23,400 (14%)	26,400 (14%)	27,900 (14%)
Project, north of Coramba Road	Amended design	19,700 (15%)	22,900 (14%)	24,200 (15%)
	EIS design	19,300 (15%)	22,300 (15%)	24,000 (16%)

Traffic impacts on the existing road network

The traffic modelling of the proposed design changes provides an indication of the traffic impacts on the existing road network over the design horizon (from year of opening in 2024 to 2044) when compared with results from the EIS. The results of the modelling, with a comparison to the previous EIS assessment are presented in **Table 5.2-3.**

Table 5.2-3 Forecast traffic volumes on existing road network (vehicles per day)

Location	Design	2024 daily volumes [vpd]			2034 daily volumes [vpd]			2044 daily volumes [vpd]		
		Without project	With project	Change	Without project	With project	Change	Without project	With project	Change
Project										
South of Coramba Road	Amended design	-	24,700	24,700	-	27,800	27,800	-	29,000	29,000
	EIS design		23,400	23,400		26,400	26,400		27,900	27,900
North of Coramba Road	Amended design	-	19,700	19,700	-	22,900	22,900	-	24,200	24,200
	EIS design		19,300	19,300		22,300	22,300		24,000	24,000
Existing Pacific Highway										
South of Englands Road	Amended design	34,700	38,100	3400	37,400	42,800	5400	40,400	45,600	5200
	EIS design		38,600	3900		43,100	5700		45,800	5400
South of Albany Street (south of CBD)	Amended design	31,700	18,100	-13,600	33,300	19,500	-13,800	33,500	19,900	-13,600
	EIS design		19,100	-12,600		20,400	-12,900		20,600	-12,900
North of Orlando Street (north of CBD)	Amended design	43,900	33,100	-10,800	47,300	35,100	-12,200	49,900	37,400	-12,500
	EIS design		33,900	-10,000		35,900	-11,400		38,000	-11,900
South of Bruxner Park Road	Amended design	38,000	32,800	-5200	42,600	36,100	-6500	45,900	38,800	-7100
	EIS design		32,500*	-5500		36,000*	-6600		39,200*	-6700

Location	Design	2024 daily volumes [vpd]			2034 daily volumes [vpd]			2044 daily volumes [vpd]		
		Without project	With project	Change	Without project	With project	Change	Without project	With project	Change
Local and regional road network										
Hogbin Drive (north of Park Beach Road)	Amended design	9300	6700	-2600	11,300	7800	-3500	10,000	8000	-2000
	EIS design		6600	-2700		7800	-3500		8100	-1900
Hogbin Drive (north of Harbour Drive)	Amended design	18,300	13,100	-5200	19,500	14,000	-5500	19,200	14,300	-4900
	EIS design		13,100	-5200		13,900	-5600		14,300	-4900
Hogbin Drive (north of Stadium Drive)	Amended design	29,900	20,300	-9600	32,700	20,800	-11,900	33,100	22,100	-11,000
	EIS design		20,700	-9200		20,900	-11,800		22,500	-10,600
Stadium Drive (east of Pacific Highway)	Amended design	11,700	11,000	-700	12,800	12,200	-600	15,000	13,000	-2000
	EIS design		10,700	-1000		11,900	-900		12,700	-2300
Englands Road (west of Pacific Highway)	Amended design	8700	12,500	3800	11,600	15,100	3500	12,500	16,800	4300
	EIS design		10,300	1600		13,000	1400		14,300	1800
Isles Drive (west of Pacific Highway) ^	Amended design	6000	4100	-1900	6100	4600	-1500	6500	4300	-2200
	EIS design		5000	-1000		5500	-600		5400	-1100
Bray Street (east of Joyce Street)	Amended design	9800	7500	-2300	10,500	7600	-2900	11,300	7700	-3600
	EIS design		7400	-2400		7300	-3200		7500	-3800

Location	Design	2024 daily volumes [vpd]			2034 daily volumes [vpd]			2044 daily volumes [vpd]		
		Without project	With project	Change	Without project	With project	Change	Without project	With project	Change
Coramba Road (Robin Street to Shephards Lane)	Amended design	11,300	9600	-1700	12,000	10,100	-1900	12,700	10,900	-1800
	EIS design		9500	-1800		10,000	-2000		10,700	-2000
Coramba Road (Shephards Lane to project)	Amended design	8300	9400	1100	8600	10,200	1600	9000	11,000	2000
	EIS design		8900	600		9600	1000		10,500	1500
Coramba Road (west of project)	Amended design	6800	6700	-100	7000	7000	0	7100	7000	-100
	EIS design		6800	0		7000	0		7100	0
Bennetts Road (west of Coramba Road)	Amended design	400	400	0	500	500	0	500	500	0
	EIS design		400	0		500	0		500	0
Bruxner Park Road (west of Pacific Highway)	Amended design	1200	1200	0	1600	1600	0	1800	1800	0
	EIS design		1200	0		1600	0		1800	0
James Small Drive south (east of Pacific Highway)	Amended design	4000	3600	-400	4200	3900	-300	5100	4700	-400
	EIS design		5900	1900		6200	2000		7500	2400

* The traffic volume outputs previously reported in the EIS for the existing Pacific Highway south of Bruxner Park Road included values of 28,800 vpd, 31,500 vpd and 34,500 vpd for the with project scenario at 2024, 2034 and 2044 respectively. These previous volumes were incorrect as they did not include southbound traffic volumes from Bruxner Park Road and from the project northbound at this location. These values have been updated in the above table to ensure all two-way volumes south of the interchange are being reported.

^ Note the daily traffic volumes on Isles Drive were not reported in the EIS.

Predicted daily traffic volumes compared to EIS design

The predicted daily traffic volumes for the amended design are generally similar to the EIS design with small differences across the network caused by changes in the level of delay experienced at the Englands Road and Korora Hill interchanges. However, some areas of the network are predicted to experience traffic volume of greater changes than five per cent compared to the EIS design and these are discussed further below.

The proposed design changes at the Englands Road interchange results in reduced travel time to access the project because of the replacement of two signalised intersections with a single large roundabout. The amended design also provides right-turn access into Isles Drive from Englands Road, which was not available in the EIS design. These changes mean the predicted volumes on Englands Road between the project and the existing Pacific Highway would increase by an additional 2200 vehicles per day (up to 3800 vehicles per day), when compared to the EIS results. This section of Englands Road is only about 200 metres in length and the interchange has been designed to accommodate this increase in traffic volume in the amended design.

The proposed design changes improve access to Isles Drive from the Englands Road interchange. With this improved access, analysis was carried out to identify whether Isles Drive would be used by motorists rather than the Pacific Highway, particularly when accessing the Coffs Harbour Health Campus. The assessment demonstrates that while this may be an attractive route during the morning peak period, the proposed design changes result in an overall reduction of daily trips on Isles Drive when compared to the EIS. The proposed design changes decrease delays for traffic travelling through the interchange, reducing the attractiveness of Isles Drive as an alternative route to the existing Pacific Highway.

It should be noted that actual driver behaviour and route choice during operation may be different to model predictions. As such, as part of environmental management measure TT11 a review of the operational network performance will be carried out to confirm impacts of the project on the surrounding road network.

Traffic volumes on Coramba Road between Shephards Lane and the project have increased by 600 vehicles per day to an increase of 1100 vehicles per day, compared with an increase of 500 vehicles per day reported in the EIS. The proposed design changes at the Korora Hill interchange will improve traffic flow and reduce delays for most movements, except for those motorists entering the project southbound from the existing Pacific Highway south of the interchange. As such the overall increase in traffic demands on the project is slightly lessened on the northern section. Some motorists travelling to/from the catchment located near Bray Street are predicted to find it more attractive to access the project through the Coramba Road interchange instead of the Korora Hill interchange. This results in a further increase in traffic volumes on Coramba Road between Shephards Lane and the project.

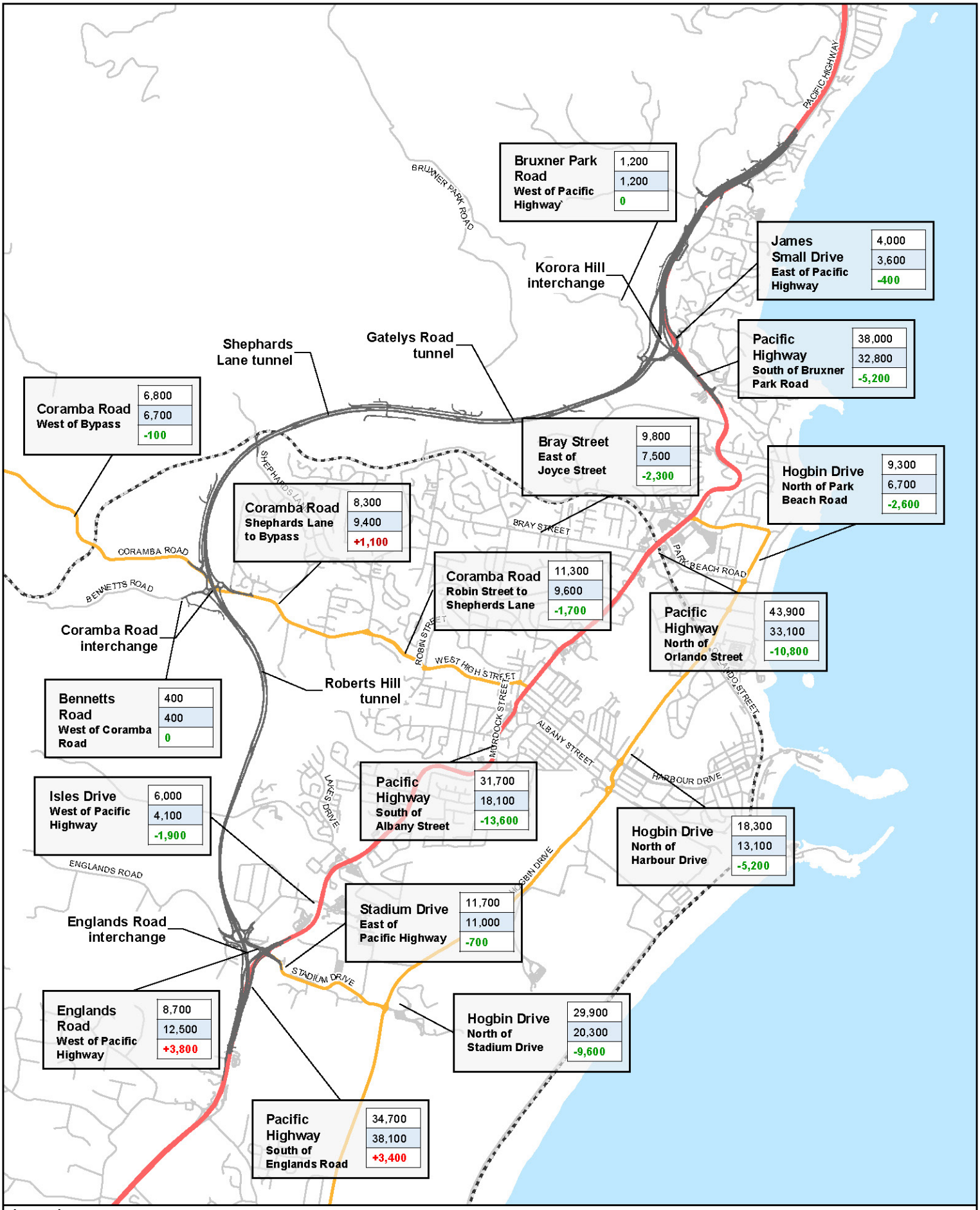
Traffic volumes on the southern section of James Small Drive are shown in **Table 5.2-3** and are expected to reduce in comparison to the EIS design. The EIS overestimated the increase of traffic demands at the southern end of James Small Drive. This was because the EIS model did not include the proposed parking and pick up/drop-off opportunities on the service road and instead modelled all traffic accessing Kororo Public School via James Small Drive. The amended design model has been corrected to ensure traffic accessing the Kororo Public School can do so by either James Small Drive or the service road. As such, the revised modelling approach combined with the improvements associated with the amended design results in a reported decrease of 2300 vehicles per day at the southern end of James Small Drive when compared to the EIS.

Predicted daily traffic volumes compared to 'without project' scenario

The key findings from the assessment of traffic and transport impacts on the existing road network are listed below. The findings compare predicted traffic volumes for the amended design for opening year (2024) conditions to the without project predicted traffic volumes (2024):

- Volumes on the Pacific Highway south of Albany Street are expected to decrease by 13,600 vehicles per day. This equates to a 43 per cent decrease because of the project
- Traffic volumes on the Pacific Highway north of Orlando Street are expected to decrease by 10,800 vehicles per day with the project. This equates to a 25 per cent decrease because of the project
- The project is expected to reduce traffic volumes on the Pacific Highway south of Bruxner Park Road by 5200 vehicles per day, which is a 14 per cent decrease compared to without the project at this location
- The project is expected to reduce traffic volumes on Hogbin Drive, north of Stadium Drive by 9600 vehicles per day. This equates to a 32 per cent decrease as compared to without the project at this location.

The predicted traffic volumes for the amended design at opening year are presented in **Figure 5.2-1**.



Coffs Harbour Bypass
Amended design - forecast daily volumes (average two-way)
Figure 6.2-1

Network performance

The network performance of the project has been determined using the CHTM. The modelling of the proposed design changes has resulted in minor improvements in the overall network performance of the study area with and without the project over the design horizon (to 2044), compared with the network performance results reported in the EIS.

Total travel time is a measure of the total travel time of all vehicles on the network during the modelled peak period. The total travel time anticipated at the 2024, 2034 and 2044 design years during the morning and afternoon peak hours was determined using the CHTM. The total travel time savings per day are calculated by taking the difference between the base case and project case and converting the morning and afternoon peak hour total to a daily equivalent using expansion factors determined using the strategic model (CHSTM) outputs.

A comparison of the travel time savings between the amended design and the EIS design is presented in **Table 5.2-4**. The results show the amended design would continue to result in significant network wide improvements in total travel time. Across each of the modelled years, the amended design demonstrates greater daily travel time savings than those reported for the EIS design. These are because of the attractiveness of the project resulting from reduced delays at the Englands Road interchange. By improving the attractiveness of the project, demands and delays on the existing Pacific Highway are further reduced.

Table 5.2-4 Travel time savings comparison

Scenario		Total travel time (hours)					
		2024		2034		2044	
		AM	PM	AM	PM	AM	PM
Base case (without project)		3427	3116	4008	3659	4607	4152
Project case (with project)	Amended design	2981	2747	3205	3102	3503	3273
	EIS design	2995	2794	3240	3141	3554	3336
Difference	Amended design	-446	-369	-804	-557	-1104	-879
	EIS design	-432	-322	-768	-518	-1053	-816
Daily travel time savings (hours)							
Travel time saving (hours per day)	Amended design	**-4479**		**-7472**		**-10,885**	
	EIS design	**-4142**		**-7059**		**-10,262**	

Total distance travelled is a measure of the total distance travelled by all vehicles in the network during the modelled peak period. The total distance travelled anticipated at the 2024, 2034 and 2044 design years during the morning and afternoon peak periods was determined using the CHTM. The total change in distance travelled has been calculated by converting morning and afternoon peak hour totals to a daily equivalent by using expansion factors determined using the strategic model (CHSTM) outputs.

A comparison of the total distance travelled between the amended design and the EIS design is presented in **Table 5.2-5**. The results show a slight peak hour increase in total distance travelled (ie less than one per cent in total difference) because of the project when compared to the base case for both the amended design model and EIS design model. This is because the project would provide a longer but faster alternative to travelling on the existing Pacific Highway through Coffs Harbour CBD. However, this is offset by the travel time savings the project provides.

Table 5.2-5 Total distance travelled comparison

Scenario		Total distance travelled (km)					
		2024		2034		2044	
		AM	PM	AM	PM	AM	PM
Base case (without project)		141,665	136,461	152,709	151,250	160,679	159,041
Project case (with project)	Amended design	150,487	142,631	163,925	159,756	175,925	168,998
	EIS design	150,333	142,804	163,758	159,831	176,030	169,310
Difference	Amended design	8822	6170	11,216	8506	15,246	9957
	EIS design	8668	6343	11,049	8581	15,351	10,269
Daily total distance travelled (km)							
Change in distance travelled (km per day)	Amended design	**76,158**		**100,183**		**128,031**	
	EIS design	**76,253**		**99,722**		**130,150**	

The traffic model results indicate the network wide average speed for the amended design would be up to one km/h faster in the peak hour when compared to the EIS design, refer to Table 5 of **Appendix A, Supplementary traffic and transport assessment.**

Consistent with the EIS, the travel time savings for road users travelling through Coffs Harbour continue to be significant with the introduction of the project, with travel time savings reflecting the higher posted speed limit and free-flow conditions of the project. When compared to the EIS, the predicted travel time results from the CHTM for the amended design are essentially the same with some values changing slightly. **Table 5.2-6** shows the predicted travel time savings for road users travelling through Coffs Harbour for the amended design compared to the project described in the EIS.

Table 5.2-6 Predicted travel time for vehicles passing through Coffs Harbour

Scenario	Direction	Model	Travel times (minutes)					
			2024		2034		2044	
			AM	PM	AM	PM	AM	PM
Without project	Southbound	Base	21.0	19.3	20.7	20.7	29.2	21.8
	Northbound		19.6	19.6	20.5	21.4	20.4	23.7
With project	Southbound	Amended design	8.5	8.5	8.5	8.6	8.6	8.6
		EIS design	8.5	8.6	8.6	8.6	8.6	8.6
	Northbound	Amended design	8.3	8.4	8.3	8.5	8.4	8.5
		EIS design	8.3	8.4	8.4	8.5	8.4	8.5
Travel time savings	Southbound	Amended design	12.5	10.8	12.2	12.1	20.6	13.2
		EIS design	12.5	10.7	12.1	12.1	20.6	13.2
	Northbound	Amended design	11.3	11.2	12.2	12.9	12.0	15.2
		EIS design	11.3	11.2	12.1	12.9	11.9	15.2

VEHSIM travel time assessment

As part of the amended design, the vertical alignment of the project has been lowered through the North Boambee Valley floodplain and through the Englands Road interchange. A travel time assessment (using the VEHSIM program) of the proposed changes to the vertical alignment for the amended design has been carried out for both light and heavy vehicles separately. Overall, the assessment demonstrated savings of 20 to 35 seconds for heavy vehicles for the amended design when compared to the EIS design, with no significant change for light vehicles.

Intersection performance

The performance of key intersections is assessed by assigning a level of service based on the length of time a vehicle must wait at the intersection. Level of service ranges from A (very good) to F (unsatisfactory), as shown in **Table 5.2-7**.

Table 5.2-7 Level of service criteria

Level of service	Average vehicle delay (seconds)	Traffic signals and roundabouts
A	< 14	Free flowing traffic virtually unaffected by other road users
B	15 to 28	Steady flow of traffic allowing manoeuvrability
C	29 to 42	Stable flow of traffic restricting manoeuvrability
D	43 to 56	Limited stable flow and all drivers restricted in movement
E	57 to 70	Operating at capacity with unstable traffic flow
F	> 70	Traffic approaching the intersection exceeds ability for traffic to pass resulting in queueing

An assessment of the intersection performance for the amended design was completed considering predicted traffic redistribution because of the project. The results of the assessment for both the amended design and the EIS design are presented in **Table 5.2-8** for Englands Road interchange, **Table 5.2-9** for Korora Hill interchange and **Table 5.2-10** for the service road. The Coramba Road interchange was also assessed for the amended design and the results are consistent with the performance reported in the EIS.

The intersection performance for the amended design in 2044 is also shown in **Figure 5.2-2**.

The Englands Road interchange would continue to operate within acceptable limits with a critical level of service of B at the proposed roundabout and a critical level of service of C at the proposed signalised intersection (Pacific Highway/Englands Road/Stadium Drive). There is also improved operation at the Pacific Highway and Isles Drive intersection when compared to the EIS, reflecting the improved access to Isles Drive from Englands Road and the project.

Table 5.2-8 Intersection performance for Englands Road interchange in 2044

Intersection	Control	Overall level of service		Worst movement level of service		Critical level of service
		Morning	Afternoon	Morning	Afternoon	
EIS design						
Englands Road/the project	Signals	A	B	B	B	B
Isle Drive/the project	Priority	A	A	A	A	A
Englands Road/the project/access road	Signals	A	B	D	D	B
Pacific Highway/Englands Road/Stadium Drive	Signals	C	C	D	D	C
Pacific Highway / Isles Drive	Signals	D	C	F	E	D
Amended design						
Englands Road/Isles Drive/the project	Roundabout	B	B	B	B	B
Pacific Highway/Englands Road/Stadium Drive	Signals	C	C	D	F	C
Pacific Highway/Isles Drive	Signals	C	B	F	D	C

The Korora Hill interchange would continue to operate within acceptable limits with the proposed service road roundabout (east) operating with a critical level of service C, and the Korora Hill (west) roundabout operating with a critical level of service B.

The newly proposed intersection of James Small Drive and the service road is anticipated to operate with a critical level of service C in 2044 (ie within acceptable limits of operation over the design horizon, to 2044).

The signalised Pacific Highway and Charlesworth Bay Road intersection is anticipated to operate with a critical level of service of A in 2044.

Table 5.2-9 Intersection performance for Korora Hill interchange in 2044

Intersection	Control	Overall level of service		Worst movement level of service		Critical level of service
		Morning	Afternoon	Morning	Afternoon	
EIS design						
Korora Hill (east) signals	Signals	A	B	D	E	B

Intersection	Control	Overall level of service		Worst movement level of service		Critical level of service
		Morning	Afternoon	Morning	Afternoon	
Korora Hill (west) signals	Signals	B	B	D	E	B
James Small Drive roundabout	Roundabout	A	A	B	B	B
Pacific Highway/ Charlesworth Bay Road**	Priority	-	-	F	F	F
Amended design						
Korora Hill (west) roundabout	Roundabout	B	A	B	A	B
Service road roundabout	Roundabout	C	C	C	C	C
Service Road/ James Small Drive south	Priority	-	-	C	A	C
Pacific Highway/ Charlesworth Bay Road	Signals	A	A	F	E	A

** Intersection performance of the priority-controlled Pacific Highway/Charlesworth Bay Road not previously reported in the EIS

The service road/Opal Boulevard intersection is anticipated to continue to operate within acceptable limits with a critical level of service B in 2044. This was incorrectly reported in Appendix F, Traffic and transport assessment of the EIS to be operating at level of service A[1] (rather than level of service B) with the project and as such no change in the modelling results of this intersection are expected with the amended design.

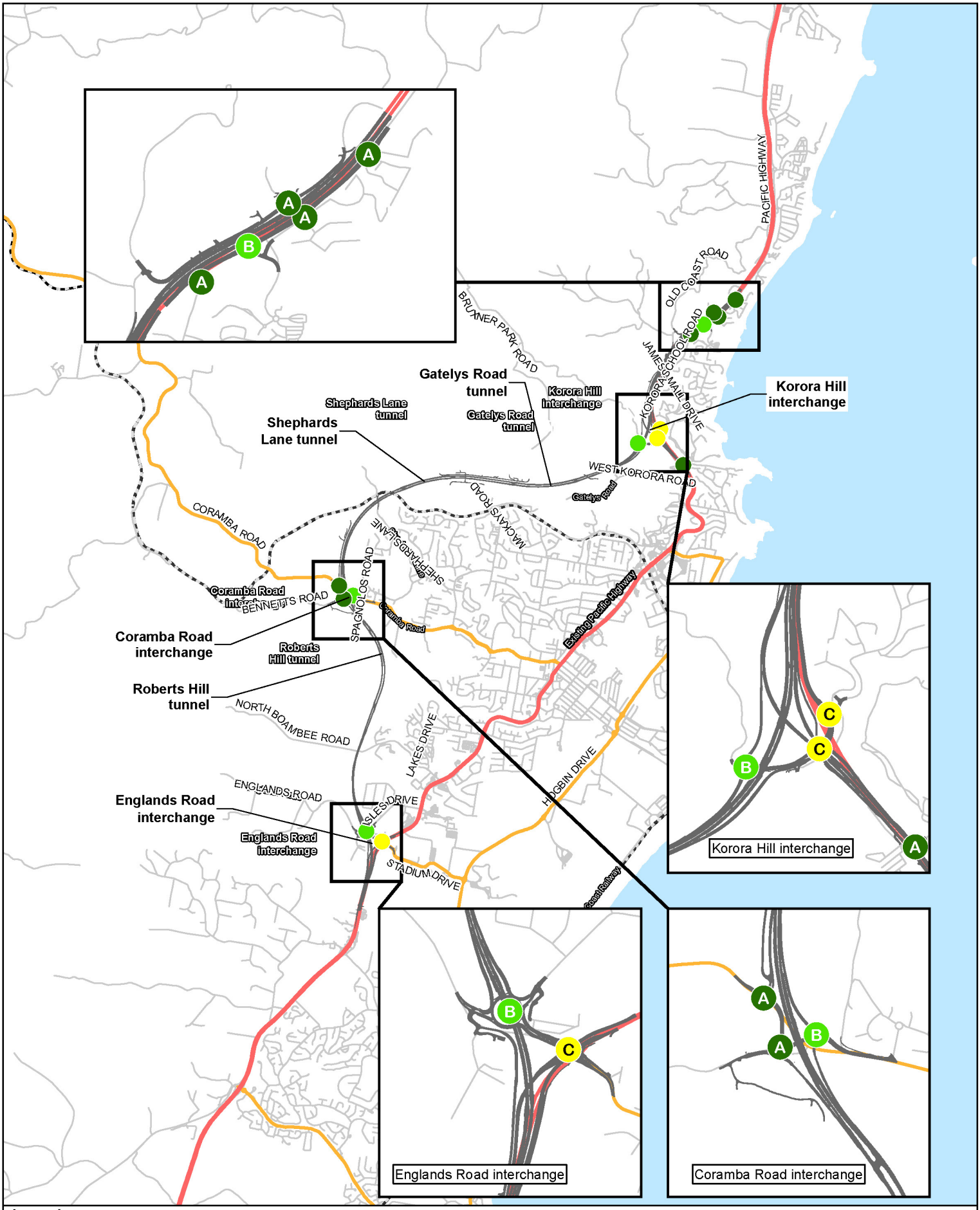
All other intersections with the service road are predicted to operate at a level of service of A in 2044.

[1] Performance of the intersection of Opal Boulevard and the service road incorrectly reported as level of service A in Table 8-14 of the EIS and in Appendix F, Traffic and transport assessment of the EIS. This should have been reported as level of service B. This correction is noted in Chapter 5, Clarifications, corrections and further information of the Submissions Report.

Table 5.2-10 Intersection performance for service road in 2044

Intersection	Control	Overall level of service		Worst movement level of service		Critical level of service
		Morning	Afternoon	Morning	Afternoon	
EIS design						
Service road/ James Small Drive	Roundabout	-	-	A	A	A
Service road/ Opal Boulevard	Priority	-	-	A	A	B*
Service road/ Seaview Close	Priority	-	-	A	A	A
Service road/ Highway underpass	Priority	-	-	A	A	A
Service road/ Solitary Island Way	Priority	-	-	A	A	A
Amended design						
Service road/ James Small Drive North	Roundabout	A	A	A	A	A
Service road/ Opal Boulevard	Priority	-	-	B	A	B
Service road/ Seaview Close	Priority	-	-	A	A	A
Service road/ Highway underpass	Priority	-	-	A	A	A
Service road/ Solitary Island Way	Priority	-	-	A	A	A

* Value incorrectly reported in Appendix F, Traffic and Transport Assessment of the EIS as level of service A


PACIFIC HIGHWAY
OLD COAST ROAD
BRUNNER PARK ROAD
JAMES SCHOOL ROAD
KORORA MAIL DRIVE
Gatelys Road tunnel
Korora Hill interchange
Shephards Lane tunnel
Shephards Lane tunnel
Gatelys Road tunnel
Korora Hill interchange
WEST KORORA ROAD
Gatelys Road
MACKAYS ROAD
SHEPHARDS LANE
CORAMBA ROAD
Coramba Road interchange
BENNETTS ROAD
SPAGNOLOS ROAD
Coramba Road
Existing Pacific Highway
Coramba Road interchange
Roberts Hill tunnel
Roberts Hill tunnel
NORTH BOAMBEE ROAD
LAKES DRIVE
HOGBIN DRIVE
ENGLANDS ROAD
ISLES DRIVE
Englands Road interchange
Englands Road interchange
STADIUM DRIVE
coast railway
Korora Hill interchange
Englands Road interchange
Coramba Road interchange
Legend
Design
Existing Pacific Highway
Regional roads
Local roads
North Coast Railway
Critical level of service
A
B
C
Coffs Harbour Bypass
Amended Design – Critical level of service at modelled intersections (2044)
Figure 5-2-2
0
0.75
1.5
2.25
km
N
Scale @A4: 1:74,367
GDA 1994 MGA Zone 56

Road safety

The road safety assessment for the EIS design is documented in Section 5.7 of Appendix F, Traffic and transport assessment of the EIS. The proposed design changes have been reassessed and safety benefits of the amended design are consistent with the safety benefits identified in the EIS.

The proposed design changes would result in a reduction of 16 crashes in 2044 on the existing Pacific Highway, compared to the EIS which had a reduction of 14 crashes in 2044.

There are several localised road safety improvements anticipated with the proposed design changes, as follows:

Coramba Road bus stop:

- Improve the safety of the school bus stop by increasing the space between the bus stop and the proposed roundabout on Coramba Road, east of the project.

Korora Hill interchange:

- By upgrading the Pacific Highway/Charlesworth Bay Road intersection to traffic lights, motorists entering/exiting Charlesworth Bay Road have dedicated phases and are no longer required to wait for a gap in the Pacific Highway stream of traffic. This reduces delays significantly for these turning movements, and minimises likelihood of conflict between through and turning traffic at the intersection
- The provision of traffic lights at the intersection of the existing Pacific Highway and Charlesworth Bay Road would allow for the provision of signalised pedestrian/cycle crossings of the existing Pacific Highway, improving road safety for pedestrians and cyclists crossing the existing highway.

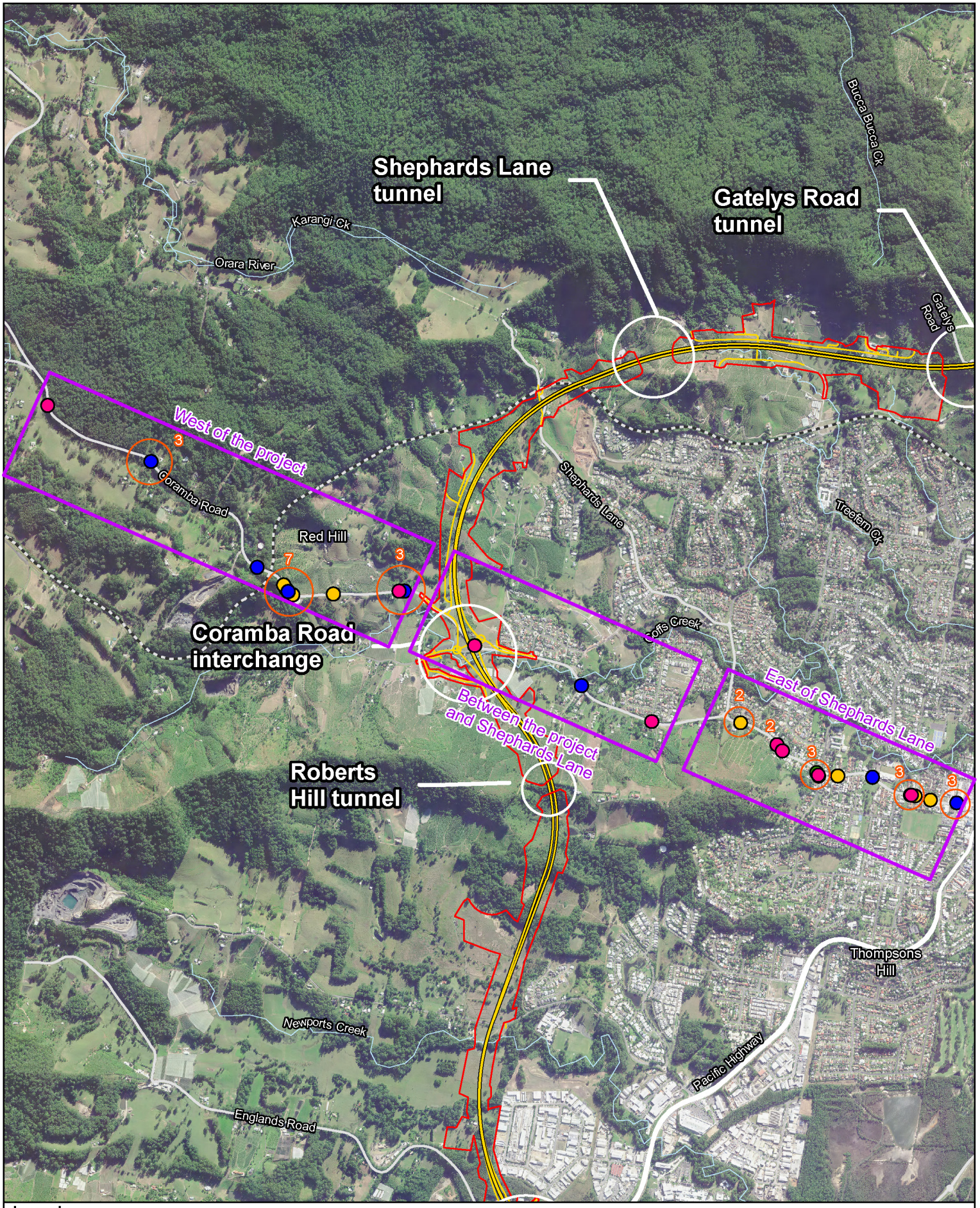
Kororo Public School bus interchange and Luke Bowen footbridge:

- The proposed design changes of the Kororo Public School bus interchange would separate bus and private vehicle movements, including for parking. This separation between users would improve the operational safety of the facility when compared to the EIS design
- The proposed design changes of the Kororo Public School bus interchange would relocate access to the interchange from James Small Drive to the service road. This design change minimises the need for buses to use James Small Drive, therefore reducing the risk of bus-to-passenger vehicle conflicts to occur on James Small Drive when compared to the EIS design
- The amended design at the Kororo Public School bus interchange would include provision of a pedestrian underpass to allow grade separated access to the school from the new car park. This would separate vulnerable road users from bus and car movements removing the risk of vehicle/pedestrian conflict at this location
- The proposed design changes incorporate the formalisation and provision of 24 off-street car park spaces provided on the western property access road near the existing Solitary RFS shed. By providing a sealed and line-marked car park, vehicle manoeuvres are more predictable as they enter/exit the parking area and each individual space. This minimises the risk of vehicle to vehicle low speed collisions in this area.

Coramba Road:

- West of the project, 16 crashes were recorded for the five year period between 2014 and 2018 (see **Figure 5.2-3**). The resulting crash rate for this section of Coramba Road is 40.4 crashes per 100 million vehicle kilometres travelled (mkvt). The proposed design changes are anticipated to result in negligible difference in daily volumes along this portion of Coramba Road. As such, when compared to the EIS and the existing situation, it is expected there would be no change in the predicted number of crashes
- Between the project and Shephards Lane, a total of three crashes were recorded for the five year period between 2014 and 2018. Of these, one of those crashes is within the construction footprint at the intersection of Bennetts Road and Coramba Road, which would be upgraded as part of the project
- The proposed design changes are anticipated to result in a localised increase in traffic volumes on Coramba Road of 500 vehicles per day (compared with the EIS). Given the low crash history in this section of Coramba Road, the existing crash rate at this location is 12.6 crashes per 100mvkt. The predicted increase in demands therefore result in less than 0.1 increase to the anticipated number of crashes on Coramba Road between Shephards Lane and the project
- East of Shephards Lane, a total of 16 crashes were recorded for the five year period between 2014 and 2018. Within this section of Coramba Road, daily traffic demands are predicted to increase by 100 and 200 vehicles per day at the 2024 and 2044 design years respectively. Given the existing crash rate on this section of Coramba Road, the minor increase in demands results in less than 0.1 increase at 2044 as compared to the EIS.

Based on the existing crash rates on Coramba Road, the analysis demonstrates less than a 0.1 increase in the number of crashes on Coramba Road is anticipated as a result of the proposed design changes and the associated shifts in traffic demand. As shown, the predicted localised increase in traffic volumes on Coramba Road to the east of the project, does not result in a significant increase in the predicted number of crashes, given the increased traffic volumes occur on the section of Coramba Road with a low crash history.



Coffs Harbour Bypass
Crash locations – Coramba Road (2014-2018) Source: Centre for Road Safety, NSW Government
Figure 5.2-3

Public transport

The proposed design changes for the Coramba Road bus stop and the Kororo Public School bus interchange are expected to improve the school bus facilities when compared with the EIS design.

The proposed design changes to the bus stop on Coramba Road near Spagnolos Road would:

- Increase the capacity of the bus stop to enable four buses to stop at one time, to meet the expected peak demand for buses using the Coramba Road bus stop.

The proposed design changes to the Kororo Public School bus interchange would:

- Provide access to the bus interchange from the service road instead of James Small Drive, avoiding the need for buses to travel on the narrower James Small Drive to access the bus interchange
- Provide greater separation between buses and passenger vehicles using the bus interchange
- Allow all buses to line up nose-to-tail at one location when students are interchanging. The EIS design had the bus set down and layover areas separated into two different locations. This design change minimises walking distance for students when interchanging and minimises the risk of students 'cutting' through the staff car park to reach their bus. This therefore reduces the likelihood of pedestrian-vehicle collisions within the facility
- Physically restrict students accessing the bus interchange area directly from the kiss and drop zone via the internal car park road network. By installing a separating fence between these two facilities, students are instead directed to travel via the grade-separated underpass and follow the designated footpath to reach the bus interchange. By restricting this direct pedestrian access and instead directing users to separated facilities off-road, the risk of students being struck by vehicles is limited
- Reduce the impact to travel time for buses compared with the EIS because of access now being provided via the service road rather than James Small Drive.

All other potential impacts on public transport operation described in the EIS are not altered as a result of the proposed design changes and remain consistent with the amended design.

Pedestrian and cyclists

The proposed design changes would result in the following changes to the local pedestrian and cycle network, when compared with the EIS design:

- Introduction of a formalised shared path linking Spagnolos Road to the proposed Coramba Road bus stop
- Improved safety for pedestrians and cyclists crossing the Pacific Highway at Charlesworth Bay Road with the introduction of traffic lights at this intersection and subsequent signalised and protected crosswalks
- Reduced travel distance from the Luke Bowen footbridge to the entrance of the Kororo Public School
- Improved connectivity between the Luke Bowen footbridge, Kororo Public School and the bus interchange
- Improved pedestrian connectivity and safety from Old Coast Road to Kororo Public School, through provision of an off-road footpath along the length of the local access road located on the west side of the project to the Luke Bowen footbridge

- Provide grade-separated access from the bus interchange car park to Kororo Public School through the provision of an underpass. However, it is noted that based on the current design, the use of stairs may inhibit access for parents with prams. Consultation with Kororo Public School in relation to this would continue through the detailed design phase.
- Off-road shared pathways are to be provided at the proposed roundabout at the Englands Road and Korora Hill interchanges for cyclists. Refuge areas would be provided on roundabout approaches, to ensure cyclists are only required to cross one to two lanes of traffic at a time. The location of the crossing points on approach to the intersections would ensure vehicle speeds are minimised (as compared to the high speeds on the project) as drivers would either be turning into or out of the roundabout.

The design changes proposed as part of the amended design for pedestrians and cyclists are anticipated to increase the safety of these vulnerable road users and improve network connectivity.

Property access

Consistent with the EIS design, existing property accesses impacted by the project would be reinstated in consultation with affected landowners.

In addition to property accesses, the location of the Solitary RFS shed on Old Coast Road would be affected by the proposed design changes, as the existing shed would be directly impacted to accommodate the additional car park spaces and the new footbridge location. Consultation with RFS Mid North Coast Team about the design changes and impact to the existing shed has been ongoing since the exhibition of EIS, as noted in **Chapter 4, Consultation**. During this consultation, a location near Korora Hill interchange for a new shed and facilities on TfNSW owned property has been identified (within construction ancillary facility site 3B, see **Figure 3-1-05**). The new shed and facilities are proposed to be constructed as part of the project as described in **Chapter 2, Design changes**. TfNSW will continue to consult with RFS Mid North Coast Team to confirm any additional requirements.

Parking

The proposed design changes are consistent with the EIS with respect to impacts to informal on-street parking at the Englands Road and Coramba Road interchanges, and the existing parking available at the Oz Group Packhouse at Isles Drive.

The proposed design change to the Englands Road interchange would result in an additional 0.03 hectares of land from the car park of the Oz Group Packhouse (37/51 Isles Drive), bringing the total directly impacted area to 0.54 hectares (about 21 per cent of the total lot area, compared to 20 per cent in the EIS). TfNSW will carry out further consultation with Oz Group Packhouse about the extent of temporary and/or permanent parking impacts during detailed design. Property adjustments, including parking arrangements, will be determined through further consultation with the property owner as part of the property acquisition process.

As part of the proposed design changes, the parking arrangements near the Kororo Public School have changed as follows:

- The bus interchange would include capacity for 30 staff car park spaces, compared to 52 in the EIS design
- Eighteen short term parking bays would be provided at the kiss and drop zone within the bus interchange, accessed via the service road. The kiss-and-drop zone would be separated from the bus bays via a narrow raised-median. No short term parking bays (kiss and drop zone) were provided within the bus interchange for the EIS design

- Two parking spaces close to the Kororo Public School entry on the service road for persons with disability
- About 19 parallel parking bays along the service road, compared to 66 in the EIS design
- Twenty-four off-street car park spaces would be provided on the property access road located on the western side of the project, near the existing Solitary RFS shed. No off-street car park spaces were provided in the EIS design, however it was estimated there was enough space for about 40 informal on-street parking spaces on the local access road in the EIS design.

The above equates to a total formal parking supply of 93 car park spaces close to the Kororo Public School, where 18 car park spaces are high turnover off-street parking bays (kiss and drop zone) and 24 are provided on the western side of the highway.

Based on the survey of current parking demand at Kororo Public School, the parking arrangements for the amended design would mean there is a five-space shortfall of the existing parking demand of 98 spaces. The EIS design included provision for 158 car park spaces, which exceeds the existing parking demand.

TfNSW will continue to consult with the NSW Department of Education, School Infrastructure NSW and Kororo Public School about the final design of the bus interchange and parking arrangements for the school, during development of the detailed design.

5.2.5 Revised environmental management measures

The management measures presented within the EIS to address traffic and transport impacts have been reviewed in consideration of the identified design and construction changes. Minor amendments have been made to the mitigation measures and are presented as strikethrough for deletions and italicised for new text in **Table 5.2-11.** Other mitigation measures presented in the EIS are still considered to be relevant and accurate and are provided in **Chapter 6, Revised environmental management measures** for completeness.

Table 5.2-11 Proposed amendments to management measures from the EIS

Impact	ID No.	Environmental management measure	Responsibility	Timing
~~Use of James Small Drive during operation~~	~~TT3~~	~~Traffic management improvement opportunities for James Small Drive, including but not limited to restrictions to on-street parking and installation of traffic barriers, will be further evaluated and finalised during detailed design and in consultation with CHCC, Kororo Public School, Coffs Harbour Montessori Preschool, NSW Department of Education and the adjacent community.~~	~~TfNSW~~	~~Detailed design~~
Solitary Rural Fire Service	TT3	Consultation with the ~~Solitary~~ Rural Fire Service *Mid North Coast Team* will be undertaken	TfNSW	Detailed design *and*

Impact	ID No.	Environmental management measure	Responsibility	Timing
relocation and access		during detailed design *and prior to construction to confirm the requirements for relocating their services and* to ensure the appropriate access ~~requirements are~~ *is* achieved.		*prior to construction*
Confirmation of assessed impacts	TT11	A review of operational network performance will be undertaken within 12 months ~~from~~ *after* the ~~opening~~ *completion* of the project to confirm the operational traffic and transport impacts of the project on the surrounding road network, in particular at interchange locations, *Isles Drive* and Coramba Road. The assessment will be based on updated traffic surveys at the time and the methodology used will be comparable with that used in Appendix F, Traffic and transport assessment *and Appendix A, Supplementary traffic and transport assessment of the Amendment Report.* Where required, additional mitigation measures will be identified in consultation with CHCC to manage any additional traffic performance impacts.	TfNSW	Operation
Parking and access at Kororo Public School	*TT15*	*The new Luke Bowen footbridge will be constructed prior to the removal of the existing bridge where reasonable and feasible with any disruptions to access occurring outside of school terms and in consultation with Kororo Public School and School Infrastructure NSW.*	*TfNSW/ Contractor*	*During construction*

5.3 Noise and vibration

5.3.1 Assessment methodology and approach

A noise and vibration assessment was prepared as part of the EIS (Chapter 9, Noise and vibration). The updated noise and vibration assessment is detailed in **Appendix B, Updated noise and vibration assessment** and has been prepared in accordance with the SEARs to assess the potential impacts of the project, including the design and construction changes.

Following exhibition of the EIS, changes to the construction noise assessment methodology and approach include:

- Additional construction scenarios for drainage, finishing and demolition works have been assessed to detail the typical construction noise impacts in addition to the worst-case construction noise impacts included for the EIS
- There has been an amendment to the application of air blast overpressure and groundborne vibration criteria at some noise catchment areas following a review of the expected number of blasts and the duration of blasting operations periods at each blasting location
- The source noise levels algorithm used for the construction noise assessment was changed for the assessment of road works, earthworks and ancillary sites to provide a more conservative assessment of potential construction noise impacts and to provide consistency in the assessment of all construction scenarios.

Changes to the operational noise assessment methodology and approach include:

- Local roads with low traffic volumes that were previously considered in the EIS assessment are now excluded in the noise model for the amended design. These roads have been excluded in response to community concerns about the effect of considering the contribution of local roads on noise levels at sensitive receivers. This change also led to a change in the modelled existing environment.

Changes to inputs to the operational noise model include:

- Update to the predicted traffic volumes on main roads, based on the updated traffic model outputs for the amended design described in **Section 5.2, Traffic and transport**
- Update to the design terrain model incorporating the design changes described in **Chapter 2, Design changes.**

This change in methodology is consistent with all relevant NSW noise and vibration guidelines and the Interim Construction Noise Guideline (DECCW 2009).

5.3.2 Existing environment

The existing noise environment is described in Chapter 9, Noise and vibration of the EIS. There have been several revisions to the existing environment as a result of further review, submissions from the community and stakeholders and changes to the modelling approach described in **Section 5.3.1**

These changes include:

- A total of 2332 residential receivers were considered in the noise model for the project, an increase from 2295[1] in the EIS. This increase is largely because of the assessment including the future residential areas approved in the master plan for the Pacific Bay Eastern Lands development
- The status of 18 dwellings in the Sunset Ridge development have changed from proposed dwellings to existing dwellings
- The classification of a small percentage of sensitive receivers has changed after a detailed check of property addresses. A number of receivers were incorrectly marked as residential properties and have been changed to sheds and other structures, and a number of sheds and other structures have changed to residential properties
- The building footprint for receivers in NCA03 and NCA06 have moved slightly in plan position. This change has been made to align the modelled building envelope with more accurate digital terrain survey and aerial imagery that has become available since the exhibition of the EIS
- Additional sensitive receivers were added for the Pacific Bay Eastern Lands development to include future residential areas included in the approved master plan. In addition, the buildings in the approved Pacific Bay Eastern Lands development close to the existing Pacific Highway were revised to be two storey[2] buildings to be consistent with the approved subdivision. Properties in the approved Pacific Bay Eastern Lands development were assumed to be one-storey in the assessment carried out for the EIS. Other areas covered by the masterplan have also been included with relevant heights based on the assumption of three metre high storeys.

In addition, a development application (DA) for a new residential development at 65A-65C Stadium Drive, Coffs Harbour was approved on 27 March 2020. The development is located partially within the study area of the project in NCA03.

Based on the predicted operational noise assessment discussed in the following sections, low noise pavement and a five metre noise barrier are considered feasible noise mitigation measures to reduce traffic noise impacts for receivers in NCA03. The nearest residential noise sensitive receiver to the proposed development at 65A-65C Stadium Drive that has been considered for at-property treatment is part of the Elements Estate subdivision. This receiver will be located at least 400 metres closer to the Pacific Highway relative to the location of the proposed development.

It is therefore unlikely for these future noise sensitive receivers to require consideration of additional noise mitigation due to the project. Also, considering the approved DA location, the noise contribution from the project would be lower relative to the noise contribution from the nearest existing traffic noise source (Stadium Drive). As such, the development has not been considered in the updated construction and operational noise assessments as part of the **Appendix B, Updated noise and vibration assessment**. Notwithstanding, further consideration for assessment would be undertaken during in detailed design.

Searches for other recently approved DAs within 600 metres of the project were also undertaken for the period following exhibition of EIS up until 14 May 2020. Based on that search, no additional

[1] The number of residential receivers was incorrectly reported as 2265 in Chapter 9, Noise and vibration of the EIS. Appendix G, Noise and vibration assessment of the EIS reported 2295 residential receivers. This correction is noted in Chapter 5, Clarifications, corrections and further information of the response to Submissions Report

[2] This correction is noted in Chapter 5, Clarifications, corrections and further information of the response to Submissions Report

sensitive receivers have been considered as part of the updated construction and operational noise assessments. See **Appendix B, Updated noise and vibration assessment** for further information.

5.3.3 Construction noise and vibration impacts

Construction noise and vibration impacts have been predicted based on the indicative construction activities and durations described in the EIS, the changes to the construction noise assessment identified in Section 5.3.1 and the construction changes described in **Chapter 3, Construction updates.** The construction changes relevant to the updated construction noise and vibration assessment include:

- Construction footprint for the amended design
- New ancillary sites 1A, 1J, 3A and 3F
- Revised ancillary sites 1C and 3D
- New construction accesses from Buchanans Road and Gatelys Road
- New temporary access during construction along Russ Hammond Close
- Additional construction scenario assessment to include:
  - Modified earthworks activity for night-time and evening out of hours works (Activity ID5)
  - Demolition (Activity ID14)
  - Drainage and structures (Activity ID8)
  - Finishing works (Activity ID18)
  - Utility works and relocation (Activity ID2).
- Additional blasting locations and updated assessment using the air blast overpressure and vibration assessment criteria.

Predicted construction noise levels

Predicted construction noise levels are based on the worst affected receiver(s) for the noise catchment area (NCA) and provide a comparison of the applicable noise management level for each NCA. The assessment is representative of the worst case 15-minute periods of construction activity and does not necessarily reflect the noise impact at sensitive receivers for an extended period of time. However, most construction activities (aside from fixed sites such as ancillary sites) would be intermittent and would generally tend to move within the construction footprint. Therefore the noise impacts experienced at any sensitive receiver would be far less.

The revised construction footprint, ancillary sites, and construction activities have been assessed to determine predicted construction noise for the amended design for standard construction working hours and out of hours work (refer to **Appendix B, Updated noise and vibration assessment**).

The number of receivers exceeding noise management levels (NML) and sleep disturbance criteria for roadworks for the amended design is provided in **Table 5.3-1**. The equivalent numbers from the EIS design are shown beneath in brackets. The period with the highest total number of exceedances would be the outside of standard hours night period, as detailed in **Table 5.3-1**. Refer to **Appendix B, Updated noise and vibration assessment** for further detail. The total number of exceedances would increase for the amended design compared to the EIS. This change in the total number of potential exceedances is largely because of the change in methodology outlined in **Section 5.3.1**, where a more conservative approach has been adopted for determining potential construction noise levels.

Construction activities during out of standard hours are predicted to exceed the noise management level at most NCAs for residential noise sensitive receivers with the exception of NCA04 (commercial/industrial) and NCA05 (hospital, place of worship and child care facility) where there are no residential receivers.

The NCAs with the greatest number of exceedances during out of hours work (NCAs with more than 100 noise sensitive receivers exceeding the night-time out of hours criterion) are NCA03 (unbuilt residential), NCA06 (unbuilt residential), NCA13 (residential), NCA14 (residential), NCA16 (residential), NCA18 (residential), NCA24 (residential), NCA25 (residential), NCA26 (residential) and NCA28 (residential).

Non-residential noise sensitive receivers which would experience construction noise exceedances during standard construction hours include education facilities (Bishop Druitt College and Kororo Public School), child care facilities (Petit Early Learning Journey Coffs Harbour and Cow & Koala Professional Child Care), and places of worship (The Foursquare Church Australia).

Consistent with the EIS, construction noise impacts and exceedance of NMLs are expected across the project. The greatest number of NML exceedances are expected from activities involving larger work areas within the construction footprint such as earthworks and roadworks.

Table 5.3-1 Predicted construction noise exceedances for roadworks

NCA all receiver types	Number of receivers exceeding NMLs and sleep disturbance criteria (roadworks)						
	All hours Highly noise affected >75dB(A) (EIS)	Standard hours	Outside of standard hours			Sleep disturbance	
		Daytime (EIS)	Daytime (EIS)	Evening (EIS)	Night (EIS)	Night	
						Screening criterion RBL+15 (EIS)	Awakening criterion >65 dB(A) (EIS)
NCA01	0 (0)	6 (0)	10 (0)	27 (7)	27 (27)	27 (27)	10 (24)
NCA02	0 (0)	7 (5)	14 (7)	13 (11)	13 (12)	13 (12)	5 (6)
NCA03	0 (0)	40 (9)	128 (57)	154 (80)	210 (142)	101 (127)	0 (17)
NCA04	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NCA05	0 (0)	1 (0)	1 (0)	1 (0)	0 (0)	0 (0)	0 (0)
NCA06	0 (0)	166 (107)	248 (140)	269 (169)	270 (185)	184 (188)	0 (21)
NCA07	0 (0)	5 (2)	5 (3)	5 (3)	5 (3)	5 (3)	1 (0)

NCA all receiver types	Number of receivers exceeding NMLs and sleep disturbance criteria (roadworks)						
	All hours Highly noise affected >75dB(A) (EIS)	Standard hours	Outside of standard hours			Sleep disturbance	
		Daytime (EIS)	Daytime (EIS)	Evening (EIS)	Night (EIS)	Night	
						Screening criterion RBL+15 (EIS)	Awakening criterion >65 dB(A) (EIS)
NCA08	0 (0)	7 (7)	7 (7)	7 (7)	7 (7)	7 (7)	0 (0)
NCA09	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
NCA10	0 (0)	4 (2)	4 (3)	4 (5)	4 (5)	4 (3)	0 (0)
NCA11	0 (0)	24 (1)	36 (7)	37 (32)	37 (35)	33 (25)	0 (0)
NCA12	0 (0)	39 (19)	39 (34)	39 (39)	39 (39)	39 (39)	4 (13)
NCA13	0 (0)	131 (44)	131 (109)	131 (131)	131 (131)	131 (131)	3 (21)
NCA14	0 (0)	110 (15)	110 (85)	110 (109)	110 (109)	103 (102)	0 (0)
NCA15	0 (0)	14 (7)	16 (12)	16 (14)	16 (14)	15 (13)	0 (1)
NCA16	0 (0)	99 (43)	168 (64)	198 (103)	198 (103)	105 (106)	3 (29)
NCA17	0 (0)	3 (3)	3 (3)	3 (3)	3 (3)	3 (3)	0 (3)
NCA18	0 (0)	173 (10)	208 (58)	217 (157)	217 (164)	123 (130)	1 (2)
NCA19	0 (0)	11 (11)	11 (11)	11 (11)	11 (11)	11 (11)	1 (3)
NCA20	0 (0)	7 (5)	7 (8)	7 (8)	7 (8)	7 (8)	0 (2)
NCA21	0 (0)	0 (0)	2 (0)	20 (2)	34 (33)	26 (34)	4 (14)

NCA all receiver types	Number of receivers exceeding NMLs and sleep disturbance criteria (roadworks)						
	All hours Highly noise affected >75dB(A) (EIS)	Standard hours	Outside of standard hours			Sleep disturbance	
		Daytime (EIS)	Daytime (EIS)	Evening (EIS)	Night (EIS)	Night	
						Screening criterion RBL+15 (EIS)	Awakening criterion >65 dB(A) (EIS)
NCA22	0 (0)	0 (0)	0 (0)	58 (0)	112 (14)	66 (11)	0 (6)
NCA23	0 (0)	7 (5)	10 (8)	10 (10)	10 (10)	9 (9)	1 (3)
NCA24	0 (0)	29 (9)	43 (26)	109 (58)	140 (103)	56 (71)	0 (21)
NCA25	0 (0)	34 (6)	77 (29)	182 (100)	249 (159)	112 (120)	6 (34)
NCA26	0 (0)	44 (25)	64 (27)	158 (67)	202 (176)	118 (123)	9 (43)
NCA27	0 (0)	1 (0)	6 (2)	34 (12)	59 (52)	25 (35)	2 (9)
NCA28	0 (0)	2 (1)	20 (5)	95 (39)	139 (115)	69 (127)	20 (85)
NCA29	0 (0)	2 (1)	7 (3)	11 (9)	11 (12)	11 (12)	2 (8)
TOTAL	**0 (0)**	**966 (337)**	**1375 (708)**	**1926 (1186)**	**2261 (1673)**	**1403 (1477)**	**72 (365)**

Construction traffic noise

The additional construction access roads have been assessed to determine the construction traffic noise impacts. The assessment has been based on the methodology detailed in the EIS for the two new access roads identified in **Chapter 3, Construction updates**, ie Buchanans Road and Gatelys Road. **Table 5.3-2** shows a summary, for the revised construction access roads only, of the results of the assessment of the average existing traffic volumes and expected peak daily construction traffic volumes over the duration of construction activities. While exceedances have been identified, several environmental management measures have been identified to manage construction noise including at-property treatments being implemented during the pre-construction and early construction phases of the project, where reasonable and feasible (refer to **Chapter 6, Revised environmental management measures**).

Table 5.3-2 Construction traffic noise assessment for Buchanans Road and Gatelys Road

Road name	Daytime			Night time		
	Noise level increase (dB)	Relative increase screening criterion exceeded?	Min distance from the road at which daytime RNP criterion is met (m)	Noise level increase (dB)	Relative increase screening criterion exceeded?	Min distance from the road at which daytime RNP criterion is met (m)
Buchanans Road	6.0	Yes	N/A[2]	3.1	Yes[3]	N/A[1]
Gatelys Road	4.8	Yes	N/A[2]	0.9	No	N/A[2]

[1] Relative increase screening criteria not exceeded therefore overall assessment of noise impact not required in accordance with the Construction Noise and Vibration Guideline (CNVG).
[2] Predicted traffic noise level is below the Road Noise Policy (RNP) criteria for sub arterial roads due to very low traffic volumes
[3] While exceedances have been identified, sensitive receivers in this area would be subject to operational noise treatment which would be implemented before construction starts, in line with management measures NV11.

During construction, access to Korora School Road from the existing Pacific Highway would be closed and a temporary connection would be provided via Russ Hammond Close to provide access to Kororo Public School and residential access to existing properties on Korora School Road. The temporary access via Russ Hammond Close could be in place for up to 18 months and would not be used for construction traffic.

This temporary access road has been assessed to determine the change in traffic noise impacts during this arrangement and the assessment has been based on the methodology detailed in the EIS for construction traffic. **Table 5.3-3** shows a summary of the assessment for average existing traffic volumes and the expected peak daily traffic volumes while the temporary access diversion is in place. The predicted noise level increase due to the temporary connection does not exceed the screening criteria and therefore, an overall assessment of noise impact is not required in accordance with the Construction Noise and Vibration Guideline.

Table 5.3-3 Construction traffic noise assessment for temporary access via Russ Hammond Close

Road name	Daytime			Night time		
	Noise level increase (dB)	Relative increase screening criterion exceeded?	Min distance from the road at which daytime RNP criterion is met (m)	Noise level increase (dB)	Relative increase screening criterion exceeded?	Min distance from the road at which daytime RNP criterion is met (m)
Russ Hammond Close	1.0	No	N/A[1]	0.3	No	N/A[1]

1 Relative increase screening criteria not exceeded therefore overall assessment of noise impact not required in accordance with CNVG

Construction vibration

Potential construction vibration impacts for the amended design would be consistent with those presented in the EIS.

Blasting

Air blast overpressure and ground vibration were estimated using the same methods described in the EIS. A review of construction timeframes for different blasting activities has led to a revision of the air blast overpressure and groundborne vibration assessment criteria (refer to **Appendix B, Updated noise and vibration assessment**). The criteria used for the assessment depend on the expected type of blasting operations at each blasting location. The two types of blasting operations considered are:

- Operations lasting longer than 12 months or more than 20 blasts
- Operations lasting for less than 12 months or less than 20 blasts.

The following NCAs have been considered as having blasting which would last longer than 12 months or more than 20 blasts:

- NCA10 and NCA11 – Roberts Hill tunnel
- NCA16 and NCA17 – Shephards Lane tunnel
- NCA18 and NCA19 – Gatelys Road tunnel
- NCA20 and NCA23 – Cut 20.

At all other NCAs it is considered unlikely operations would be longer than 12 months or involve greater than 20 blasts.

Indicative potential maximum blast size (maximum instantaneous charge, MIC) was determined for the nearest sensitive receiver in each of the NCAs where blasting is proposed. The results for the amended design are provided in **Table 5.3-4.** For comparison, the EIS results are shown in brackets below the amended design results where the blasting activities for the amended design are consistent with the EIS. For NCAs where new blasting locations are proposed or where there are several new sensitive receivers which have been added since the EIS exhibition, the EIS results are not reproduced.

In general, there is a reduction to the MIC predictions for the air blast overpressure criteria across most NCAs. The MIC prediction results for the ground vibration criteria are similar when comparing the amended design to the EIS design. These limits are indicative only and would need to be confirmed by the construction contractor(s). Further, community consultation would form part of construction noise and vibration management plan (CNVMP) to agree any restrictions on construction methodology.

The impacts are compliant with the CVNG and the Australian Standard (AS2187.2 – 2006 Explosives – Storage and use Part 2: Use of explosives) and the British Standard (BS 7385-2 (Evaluation and measurement for vibration in buildings. Guide to damage levels from ground borne vibration)).

Table 5.3-4 Indicative maximum instantaneous charge (MIC) limits for air blast overpressure and groundborne vibration

Cutting ID	NCA	Type	Distance (m)	Air blast overpressure		Ground vibration	
				Overpressure criterion (dBL)	MIC (kg)	Peak particle velocity (mm/s)	MIC (kg)
C1	NCA02[2]	Residential	41	120	<1	10	5
C2	NCA03[2]	Residential[3]	27	120	<1	10	2
C2	NCA03[2]	Residential	295	120	67	10	234
C2	NCA04[2]	Commercial	214	125	84	25	386
C3	NCA07[2]	Residential	36	120	<1	10	3
C3	NCA07[2]	Residential	228	120	31	10	140
C3	NCA05[2]	Industrial	221	125	93	25	412
C3	NCA05[2]	Commercial	80	125	4	25	54
C4	NCA06	Residential[3]	110 (100)	120	3	10 (5)	32 (12)
C4	NCA06	Residential	546	120	424	10	800
C5	NCA10[1]	Residential[4]	97	115	<1	5	11
C5	NCA10[1]	Residential	232	115	10	5	61
C6	NCA11[1]	Residential[4]	90	120	2	10	22
C6	NCA11	Commercial	345 (333)	125	352 (318)	25	1004 (938)
C7	NCA12[1]	Residential[4]	32	120	<1	10	3
C7	NCA12[1]	Residential	73	120	1	10	14
C7	NCA13	Childcare facility	500 (494)	120	326 (314)	10 (5)	671 (275)
C8	NCA12[1]	Residential	139	120	7	10	52
C9	NCA14[1]	Residential	190	120	18	10	97
C10	NCA15	Residential	57 (76)	120	<1 (1)	10 (5)	9 (7)
C11	NCA14[1]	Residential	137	120	7	10	50
C12	NCA16[1]	Residential[3]	33	115	<1	5	1

Cutting ID	NCA	Type	Distance (m)	Air blast overpressure		Ground vibration	
				Overpressure criterion (dBL)	MIC (kg)	Peak particle velocity (mm/s)	MIC (kg)
C12	NCA16[1]	Residential	55	115	<1	5	3
C13	NCA16[1]	Residential	133	115	2	5	20
C14	NCA16[1]	Residential	173	115	4	5	34
C15	NCA17[1]	Residential	84	115	<1	5	8
C17	NCA18[2]	Residential	98	115	<1	5	11
C18	NCA19	Residential	241 (240)	115 (120)	11 (36)	5	66 (65)
C19	NCA19[1]	Residential	157	115	3	5	28
C20	NCA20[1]	Residential	128	115	2	5	18
C20	NCA21[1]	Commercial	412	125	600	25	1432
C20a	NCA23	Commercial	379 (380)	125	467 (471)	25	1212 (1219)
C20a	NCA23[1]	Residential	37	115	<1	5	2
C23	NCA28[2]	Residential	15	120	<1	10	<1

[1] Most affected noise sensitive receiver updated since EIS reporting due to updated blasting location
[2] New blasting locations added since EIS reporting
[3] Most sensitive receivers identified are not built yet but part of an approved DA subdivision
[4] TfNSW owned property.

5.3.4 Operational noise impacts

The operational noise impacts for the amended design have been assessed in conjunction with the revised traffic volumes that are forecast to use the bypass (refer to **Section 5.2, Traffic and transport**) and the changes to the operational noise modelling outlined in **Section 5.3.1**. The following key changes in traffic volumes affect the predicted operational noise levels:

- Traffic using the bypass between Englands Road interchange and Coramba Road interchange is predicted to increase by about five per cent for the amended design in the year 2034 (compared with the forecasts for the EIS design)
- Traffic using the bypass between Coramba Road interchange and Korora Hill interchange is predicted to increase by about two per cent for the amended design in the year 2034 (compared with the forecasts for the EIS design).

A total of 1401 receivers qualify for consideration of mitigation in the amended design, before the use of low noise pavements and noise barriers. A breakdown of the number of receivers that qualify for each NCA is provided in **Table 5.3-5**.

Table 5.3-5 Number of noise sensitive receivers that exceed 2034 operational noise criteria with no noise mitigation in place, qualifying for consideration of noise mitigation

NCA	Receiver type	NCG* eligibility triggers			Total number of exceedances of NCG	Total number receivers that qualify for consideration of noise mitigation as per the NMG^
		Cumulative limit	Acute	>+2dB and >NCG		
NCA01	Residential	18	16	5	27	18
NCA02	Residential	9	9	12	13	13
NCA02	Active recreation	0	0	1	1	1
NCA03	Residential	77	41	89	162	115
NCA03	Hospital	1	0	0	1	1
NCA03	Active recreation	0	0	0	0	0
NCA04	N/A[1]	0	0	0	0	0
NCA05	Hospital	1	0	1	1	1
NCA05	Place of worship	1	0	1	1	1
NCA05	Childcare facility	1	0	1	1	1
NCA06	Residential	261	11	315	315	315
NCA06	School	1	1	1	1	1
NCA06	Place of worship	0	0	1	1	1
NCA07	Residential	5	1	5	5	5
NCA08	Residential	7	4	7	7	7
NCA08	School	1	1	1	1	1
NCA10	Residential	4	1	4	4	4

NCA	Receiver type	NCG* eligibility triggers			Total number of exceedances of NCG	Total number receivers that qualify for consideration of noise mitigation as per the NMG^
		Cumulative limit	Acute	>+2dB and >NCG		
NCA11	Residential	3	0	9	22	9
NCA12	Residential	17	5	26	28	26
NCA13	Residential	13	1	90	100	90
NCA13	Childcare facility	1	0	1	1	1
NCA14	Residential	100	0	110	110	110
NCA15	Residential	14	4	15	15	15
NCA16	Residential	128	8	193	193	193
NCA17	Residential	3	1	3	3	3
NCA18	Residential	169	5	213	213	213
NCA19	Residential	11	7	11	11	11
NCA20	Residential	6	3	7	7	7
NCA21	Residential	3	3	1	13	4
NCA21	Active recreation	0	0	0	0	0
NCA22	Residential	15	1	2	69	15
NCA22	Active recreation	0	0	0	0	0
NCA23	Residential	5	3	7	8	7
NCA23	Passive recreation	1	0	1	1	1
NCA24	Residential	26	10	27	55	36

NCA	Receiver type	NCG* eligibility triggers			Total number of exceedances of NCG	Total number receivers that qualify for consideration of noise mitigation as per the NMG^
		Cumulative limit	Acute	>+2dB and >NCG		
NCA25	Residential	5	5	7	29	10
NCA26	Residential	40	40	45	67	61
NCA26	School	2	2	2	2	2
NCA27	Residential	13	13	20	21	20
NCA28	Residential	25	25	72	77	73
NCA29	Residential	4	3	8	5	9
TOTAL					**1591**	**1401**

*Noise Criteria Guideline (NCG)
^Noise Mitigation Guideline (NMG)

Table 5.3-6 provides a comparison of the number of receivers that qualify for consideration of mitigation before the use of low noise pavements and noise barriers for the amended design, against the EIS design. Overall, there is an increase of 85 receivers that qualify for consideration of mitigation with the most significant increases in NCA16, NCA22, NCA24 and NCA28. The main reasons for changes in the operational noise impacts compared with the EIS include:

- Minor changes to the horizontal and vertical alignment of the concept design within the overall road corridor
- Removal of noise mounds around North Boambee Road
- Changes in the classification of some sensitive receivers, as outlined in **Section 5.3.2**
- Updates to sensitive receiver locations in NCA03 and NCA06
- Local roads with low traffic volumes that were previously considered in the EIS assessment are now excluded in the noise model for the amended design. These roads are:
    - Shephards Lane
    - Roselands Drive
    - Spagnolos Road
    - William Sharp Drive
    - Mackays Road.

Table 5.3-6 Comparison of the number of receivers that qualify for consideration of mitigation before the use of low noise pavements and noise barriers

NCA	Receiver type	Number of receivers qualify for consideration of mitigation as per the NMG		Difference from EIS design to amended design
		EIS design	Amended design	
NCA01	Residential	16	18	2
NCA02	Residential	13	13	0
NCA02	Active recreation	1	1	0
NCA03	Residential	108	115	7
NCA03	Hospital	1	1	0
NCA03	Active recreation	0	0	0
NCA04	N/A	0	0	0
NCA05	Hospital	1	1	0
NCA05	Place of worship	1	1	0
NCA05	Child care facility	1	1	0
NCA06	Residential	317	315	-2
NCA06	School	1	1	0
NCA06	Place of worship	1	1	0
NCA07	Residential	4	5	1
NCA08	Residential	7	7	0
NCA08	School	1	1	0
NCA10	Residential	4	4	0
NCA11	Residential	9	9	0
NCA12	Residential	25	26	1

NCA	Receiver type	Number of receivers qualify for consideration of mitigation as per the NMG		Difference from EIS design to amended design
		EIS design	Amended design	
NCA13	Residential	95	90	-5
NCA13	Child care facility	1	1	0
NCA14	Residential	106	110	4
NCA15	Residential	15	15	0
NCA16	Residential	182	193	11
NCA17	Residential	3	3	0
NCA18	Residential	214	213	-1
NCA19	Residential	11	11	0
NCA20	Residential	8	7	-1
NCA21	Residential	3	4	1
NCA21	Active recreation	0	0	0
NCA22	Residential	0	15	15
NCA22	Active recreation	0	0	0
NCA23	Residential	6	7	1
NCA23	Passive recreation	1	1	0
NCA24	Residential	26	36	10
NCA25	Residential	1	10	9
NCA26	Residential	56	61	5
NCA26	School	2	2	0
NCA27	Residential	14	20	6
NCA28	Residential	56	73	17

NCA	Receiver type	Number of receivers qualify for consideration of mitigation as per the NMG		Difference from EIS design to amended design
		EIS design	Amended design	
NCA29	Residential	5	9	4
TOTAL		1316	1401	85

Noise mitigation measures

The use of low noise pavements and noise barriers has been applied to the project to mitigate noise levels as described in the EIS. The revised noise barrier assessment has resulted in minor adjustments of up to 0.5 metres to the height of the noise barriers (refer to **Appendix B, Updated noise and vibration assessment**). There have been some adjustments to the extent of barriers to integrate them into the design in the location of drainage and bridge structures as shown in **Table 5.3-7**. All barriers were subject to a reasonable and feasible analysis that considered a number of environmental, social, engineering and cost factors. Section 4.8.2 **of Appendix B, Updated noise and vibration assessment** provides further detail on the reasonable and feasible analysis. Consistent with the EIS, low noise pavement (open graded asphalt) is proposed from the southern tie-in to the northern extent of the project, excluding the extent of the tunnels.

Table 5.3-7 Summary of reasonable and feasible noise barriers for the amended design compared to the EIS

Barrier ID	Location	EIS design^		Amended design	
		Height (m)	Length (m)	Height (m)	Length (m)
NCA03	South of Englands Road interchange on the eastern side of the project next to NCA03 and proposed Elements Estate subdivision	5.0	800	5.0	790
NCA06	North of North Boambee Road on the eastern side of the project next to NCA06 and Lakes Estate and Highlands Estate subdivisions	5.0	1880	5.0	1700
NCA13	North of Coramba Road interchange on the eastern side of the project next to NCA13	3.5	1020	4.5	1030
NCA14	At Shephards Lane on the eastern side of the project next to NCA14	4.5	1530	5.0	1440
NCA18	Mackays Road Valley on the southern side of the project next to NCA18	4.5	1100	5.0	1000
NCA25	South of Korora Public School on the eastern side of the project next to NCA25	3.0	540	5.0	610

Barrier ID	Location	EIS design^		Amended design	
		Height (m)	Length (m)	Height (m)	Length (m)
NCA26	North of Korora Public School on the eastern side of the project next to NCA26	5.0	670	5.0	600
NCA28	North of Pine Brush Creek on the eastern side of the project next to NCA28	4.0	970	4.5	960

^The height and length of some noise walls was incorrectly recorded in Table 9-27 of the EIS. The incorrect measurements are as follows; NCA06 length recorded as 1560 metres, NCA14 height recorded as 4.0 metres and length recorded as 1310 metres, NCA18 length recorded as 1110 metres and NCA25 was not listed. The correct lengths were shown in Appendix G, Noise and vibration assessment of the EIS. These corrections are noted in Chapter 5, Clarifications, corrections and further information of the Submissions Report.

The difference in length of the noise barriers in the amended design are generally due to alignment updates and consideration of design features such as overlaps over bridges, basins and retaining walls.

After mitigation is applied, a total of 619 sensitive receivers qualify for at-property treatments in the amended design as shown in **Figure 5.3-1-01** to **Figure 5.3-1-06**. A breakdown of the number of receivers that qualify for each NCA is shown in **Table 5.3-8**.

Table 5.3-8 Number of at-property treatments after low noise pavements and noise barriers

NCA	Receiver type	Number of exceedances of the NCG (with mitigation)			
		0 5dB	5 10dB	>10dB	Total
NCA01	Residential	5	11	2	18
NCA02	Residential	5	4	3	12
NCA02	Active recreation	0	0	0	0
NCA03	Residential	0	0	0	0
NCA03	Hospital	0	0	1	1
NCA03	Active recreation	0	0	0	0
NCA04	N/A[1]	0	0	0	0
NCA05	Hospital	0	0	1	1
NCA05	Place of worship	0	1	0	1
NCA05	Child care facility	0	0	1	1
NCA06	Residential	102	32	0	134

NCA	Receiver type	Number of exceedances of the NCG (with mitigation)			
		0 5dB	5 10dB	>10dB	Total
NCA06	School	0	1	0	1
NCA06	Place of worship	1	0	0	1
NCA07	Residential	0	4	1	5
NCA08	Residential	0	7	0	7
NCA08	School	0	1	0	1
NCA10	Residential	2	1	1	4
NCA11	Residential	1	3	0	4
NCA12	Residential	13	6	4	23
NCA13	Residential	5	2	0	7
NCA13	Child care facility	0	1	0	1
NCA14	Residential	50	4	0	54
NCA15	Residential	2	6	6	14
NCA16	Residential	52	37	20	109
NCA17	Residential	0	2	1	3
NCA18	Residential	79	16	4	99
NCA19	Residential	0	1	10	11
NCA20	Residential	3	3	1	7
NCA21	Residential	1	3	0	4
NCA21	Active recreational	0	0	0	0
NCA22	Residential	9	6	0	15
NCA22	Active recreational	0	0	0	0
NCA23	Residential	4	1	1	6
NCA23	Passive recreation	1	0	0	1
NCA24	Residential	8	21	2	31

NCA	Receiver type	Number of exceedances of the NCG (with mitigation)			
		0 5dB	5 10dB	>10dB	Total
NCA25	Residential	3	0	0	3
NCA26	Residential	8	2	0	10
NCA26	School	0	1	1	2
NCA27	Residential	4	9	0	13
NCA28	Residential	7	2	0	9
NCA29	Residential	3	2	1	6
TOTAL		**368**	**190**	**61**	**619**

[1]Only commercial/industrial receivers located in NCA04

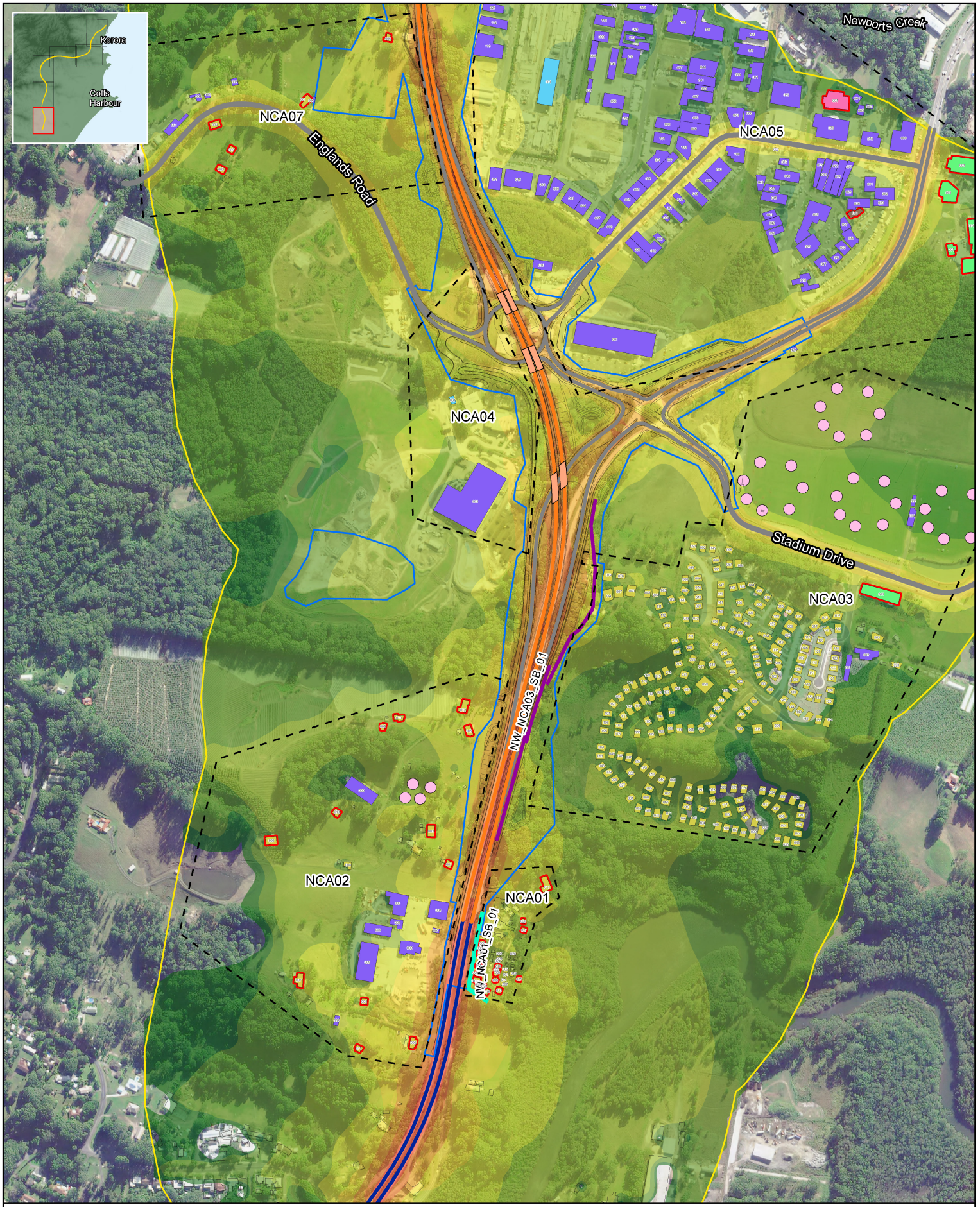
A comparison of the number of receivers that qualify for at-property treatments for the amended design against the EIS design is provided in **Table 5.3-9**. Overall, there is an increase of 141 receivers that qualify for at-property treatments with the most significant increases in NCA06, NCA14, NCA16, NCA18 and NCA22 and the most significant decrease in NCA13.

Table 5.3-9 Comparison of the number of at-property treatments after low noise pavements and noise barriers

NCA	Receiver type	Number of receivers qualify for consideration of mitigation		Difference from EIS design to amended design
		EIS design	Amended design	
NCA01	Residential	15	18	3
NCA02	Residential	12	12	0
NCA02	Active recreation	0	0	0
NCA03	Residential	0	0	0
NCA03	Hospital	1	1	0
NCA03	Active recreation	0	0	0
NCA04	N/A	0	0	0
NCA05	Hospital	1	1	0
NCA05	Place of worship	1	1	0
NCA05	Child care facility	1	1	0
NCA06	Residential	107	134	27

NCA	Receiver type	Number of receivers qualify for consideration of mitigation		Difference from EIS design to amended design
		EIS design	Amended design	
NCA06	School	1	1	0
NCA06	Place of worship	0	1	1
NCA07	Residential	4	5	1
NCA08	Residential	7	7	0
NCA08	School	1	1	0
NCA10	Residential	3	4	1
NCA11	Residential	5	4	-1
NCA12	Residential	17	23	6
NCA13	Residential	30	7	-23
NCA13	Child care facility	1	1	0
NCA14	Residential	13	54	41
NCA15	Residential	14	14	0
NCA16	Residential	93	109	16
NCA17	Residential	3	3	0
NCA18	Residential	62	99	37
NCA19	Residential	11	11	0
NCA20	Residential	8	7	-1
NCA21	Residential	2	4	2
NCA21	Active recreation	0	0	0
NCA22	Residential	0	15	15
NCA22	Active recreation	0	0	0
NCA23	Residential	5	6	1
NCA23	Passive recreation	1	1	0
NCA24	Residential	23	31	8

NCA	Receiver type	Number of receivers qualify for consideration of mitigation		Difference from EIS design to amended design
		EIS design	Amended design	
NCA25	Residential	1	3	2
NCA26	Residential	9	10	1
NCA26	School	2	2	0
NCA27	Residential	10	13	3
NCA28	Residential	9	9	0
NCA29	Residential	5	6	1
TOTAL		478	619	141



Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation
- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

42 45 50 55 60 65 70 75

Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-01

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation
- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

- 42
- 45
- 50
- 55
- 60
- 65
- 70
- 75

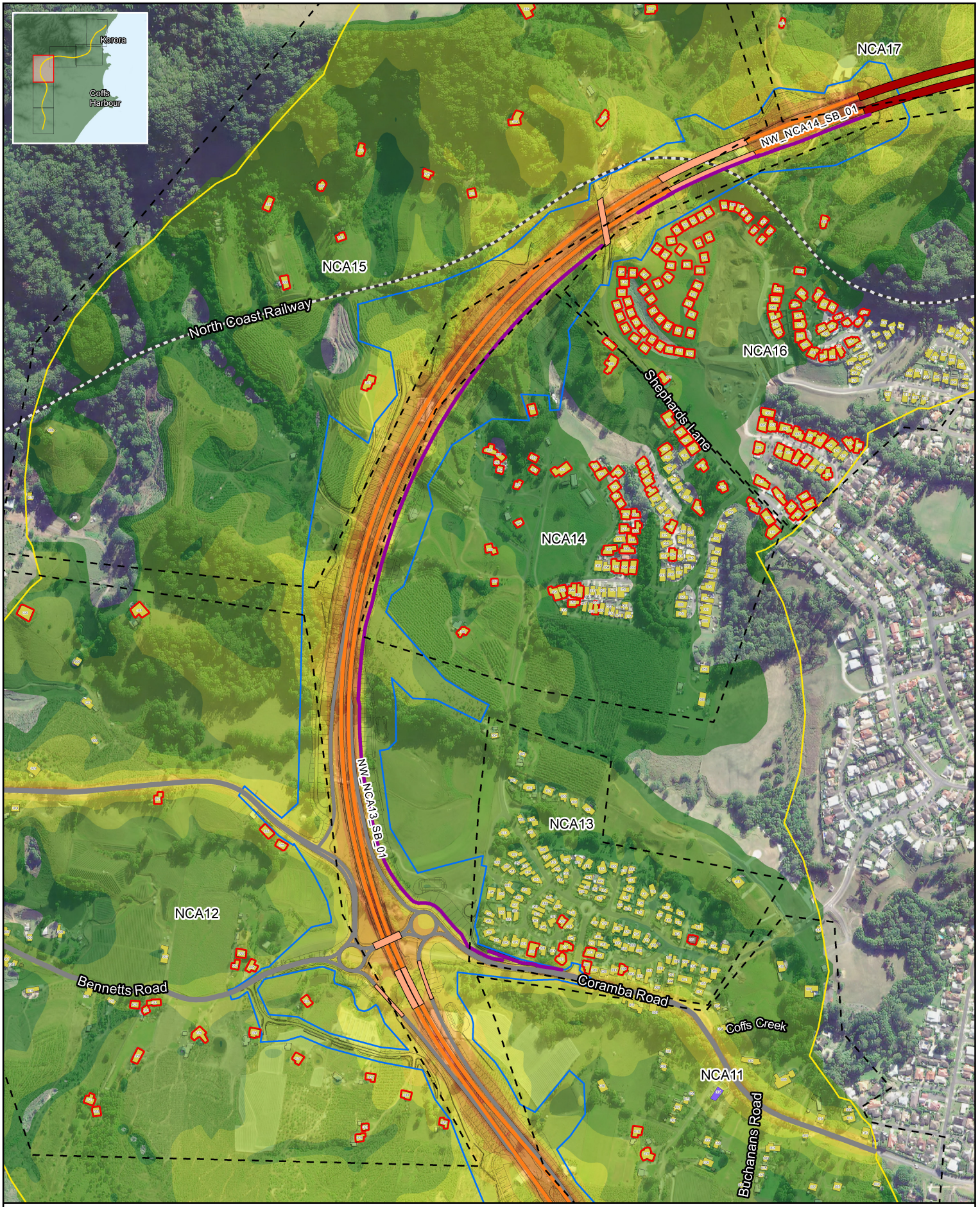
Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-02

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation
- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

- 42
- 45
- 50
- 55
- 60
- 65
- 70
- 75

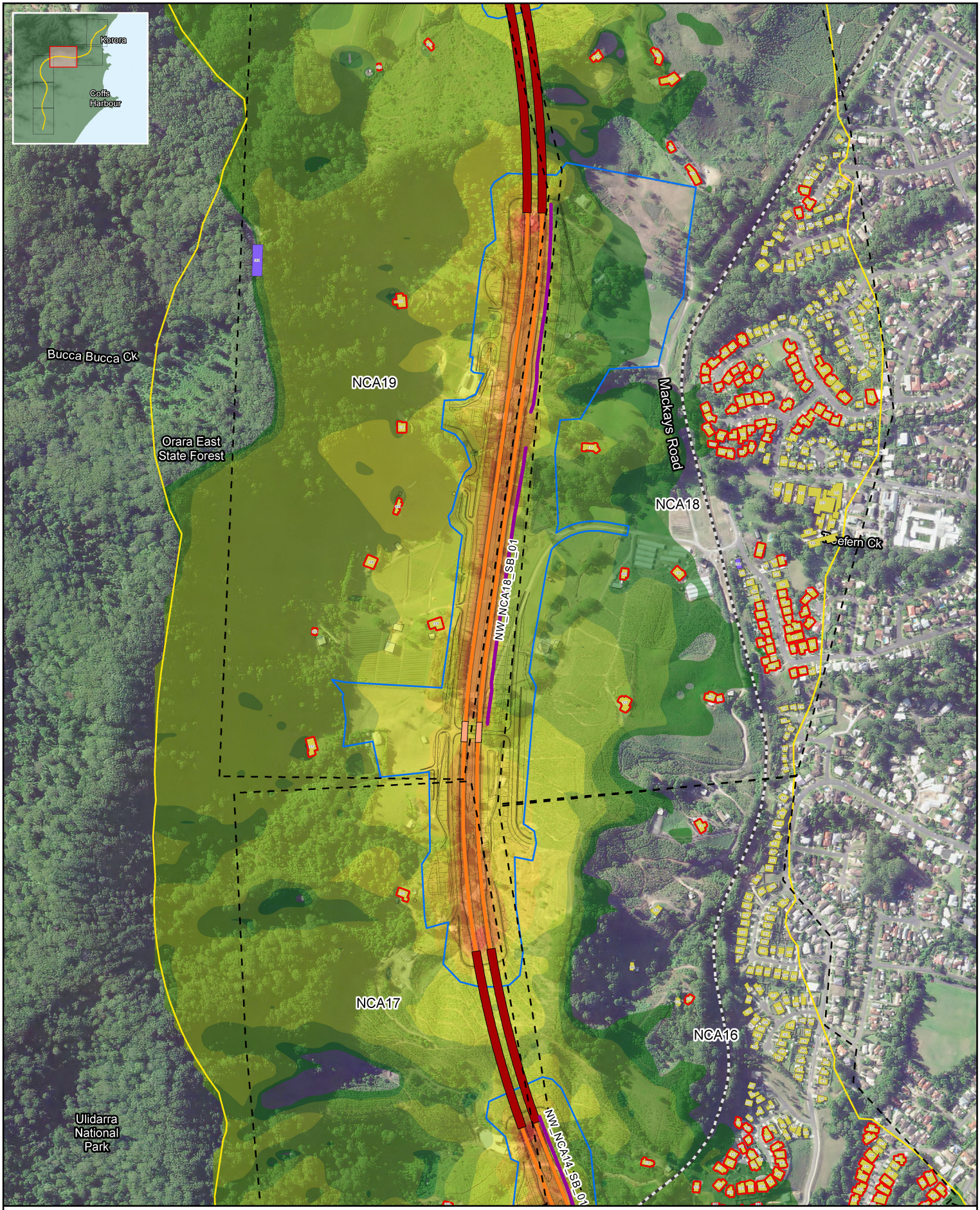
Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-03

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation
- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

42	60
45	65
50	70
55	75

Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-04

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation

- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

42	60
45	65
50	70
55	75

Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-05

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Construction footprint
- Study Area
- NCA
- Above NCG Criteria
- Bridge
- Tunnel

Noise Wall

- New
- Existing, retained
- Relocated, same height
- Relocated, supplement height

Road Surface

- OGA
- DGA
- Concrete

Receiver Classification

- Active Recreation
- Passive Recreation
- Child care facility
- Commercial
- Places of worship
- Hospital
- Industrial
- Residential
- School

2034 Night-time Build, dBA

42 45 50 55 60 65 70 75

Note: Noise contours are not façade corrected

Coffs Harbour Bypass
Noise Contours - Build
Mitigated with Low Noise Pavement and Noise Barriers - Figure 5.3-1-06

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Operational noise impacts of the design changes

The impact to operational noise as a result of the design changes are summarised in **Table 5.3-10**. Changes in impacts are because of a combination of:

- Changes in forecast traffic volumes predicted to use the project
- The exclusion of local roads with low traffic volumes from the noise model for the amended design which effects the contribution of local roads on existing noise levels at sensitive receivers
- The proposed design changes which results in minor changes in the distance between the project (the noise source) and noise sensitive receivers.

Table 5.3-10 Summary of the operational noise impact of the amended design

Design change	Change to operational noise and vibration impact compared to the EIS design
Englands Road interchange (NCA01, NCA02, NCA03, NCA04, NCA05 and NCA07)	The lowering of the main alignment at Englands Road interchange results in a reduction in sound levels and there is a corresponding reduction in the number of sensitive receivers qualifying for mitigation. When low noise pavements and barriers are modelled, the overall number of properties qualifying for at-property treatment remain the same.
North Boambee Valley vertical alignment (NCA06)	There is an increase to the sound levels in this area, with the design changes, including removal of noise mounds at this location contributing to the increase. Other factors which contributed to increased sound levels in this area are: • Forecast traffic volumes increasing by about five per cent over this section of the project • Modification to the location of the sensitive receivers based on updated digital terrain survey and aerial photography.
Coramba Road bus stop (NCA13)	The predicted noise levels for the period where up to four buses are expected to enter, idle and exit the site exceeds the project specific daytime trigger levels of 44 dB(A). It is noted the proposed relocation of the bus stop will largely overlap with the current bus stop location. It is therefore not expected that the current noise impacts from the bus stop operations would change significantly as compared with existing operations. Conversely, it is also expected that the recommended noise wall in this location will reduce the noise impacts as compared to current bus stop operations.
Korora Hill interchange (NCA20, NCA21, NCA22, NCA23 and NCA 24)	There is a minor increase to the number of receivers that qualify for at-property treatments. This is mainly because of the service road and southbound exit ramps moving closer to residences. The extent of the project has also extended further south because of work at the Charlesworth Bay Drive intersection which results in up to four additional receivers qualifying for at-property treatments.

Design change	Change to operational noise and vibration impact compared to the EIS design
Kororo Public School bus interchange and Luke Bowen footbridge (NCA25 and NCA26)	There is an increase to industrial noise impacts for the revised bus interchange compared to the EIS. The amended design results in noise levels that are predicted to exceed the project specific trigger levels of 53 dB(A) at two residential receivers. These do not qualify for consideration of noise mitigation as an outcome of the project's operational noise impact assessment. The increase in noise levels is a result of the revised horizontal and vertical positioning of the bus interchange, as well as considering in the assessment the simultaneous departure of buses. Due to the identified exceedances and that the receivers do not qualify for at-property noise treatment, further investigation will be undertaken during detail design to manage this exceedance. This could include a combination of localised screening and at-property treatment options where reasonable and feasible.

5.3.5 Revised environmental management measures

The management measures presented within the EIS to address noise and vibration impacts have been reviewed in consideration of the identified design and construction changes. Minor amendments have been made to the mitigation measures and are presented as strikethrough for deletions and italicised for new text in **Table 5.3-11**. Other mitigation measures presented in the EIS are still considered to be relevant and accurate and are provided in **Chapter 6, Revised environmental management measures** for completeness.

Table 5.3-11 Proposed amendments to management measures from the EIS

Impact	ID No.	Environmental management measure	Responsibility	Timing
Operational noise impacts	NV11	The operational noise mitigation measures, including noise barriers and/or at-property treatments, will be confirmed during detailed design. ~~The treatments will be provided as early as practicable in the construction program to reduce potential noise impacts associated with construction.~~ *This will also include consideration of industrial noise exceedances associated with the Kororo Public School bus interchange.*	TfNSW/ Contractor	Detailed design

5.4 Biodiversity

5.4.1 Assessment methodology

A biodiversity assessment was prepared as part of the EIS (Chapter 10, Biodiversity). An updated biodiversity assessment report is detailed in **Appendix C, Updated biodiversity assessment report**. This report has been prepared in accordance with the SEARs to assess the potential impacts of the project, including the design and construction changes.

Following exhibition of the EIS, additional field surveys were carried out in response to submissions on the EIS and proposed design and construction changes. These additional surveys have resulted in changes to the description of the existing environment as reported in the EIS. The proposed design and construction changes in combination with existing environment updates have also resulted in revised impacts for the project. These changes in impacts are presented in two parts, as follows:

- Change in impacts because of the proposed design and construction changes, refer to **Section 5.4.3**
- Change in overall impacts because of changes to the existing environment following the January 2020 field investigations and the amended design, refer to **Section 5.4.4**.

The biodiversity impact assessment and calculation of offsets in **Appendix C, Updated biodiversity assessment report** has been completed in accordance with the now repealed NSW *Threatened Species Conservation Act 1995* (TSC Act) and the Framework for Biodiversity Assessment (FBA). The current *Biodiversity Conservation Act 2016* (BC Act) includes transitional arrangements, which permitted projects that had already commenced a biodiversity assessment and approval process to apply the TSC Act.

Appendix C, Updated biodiversity assessment report makes reference to the BC Act when reporting the conservation status of threatened species and ecological communities only. This is because of a requirement in the transitional arrangements that require species conservation listings to follow the BC Act.

Field surveys

In response to submissions on the EIS and the proposed design and construction changes, additional field surveys were carried out in January 2020. These surveys included targeted threatened flora searches, verification of vegetation communities and additional anabat surveys.

Areas targeted included vegetation communities included in Appendix H, Biodiversity Assessment Report of the EIS that were not mapped as either a plant community type (PCT) or urban native/exotic (non-native). Areas of potential re-growth identified from aerial imagery, areas potentially supporting wetland vegetation and new areas because of changes to the construction footprint, were also targeted. Further details of the scope and timing of surveys is provided in **Appendix C, Updated biodiversity assessment report**.

Vegetation and flora surveys

Classification and detailed mapping of native vegetation communities was based on the PCT grouping system described in Keith (2004). This process remains unchanged from the EIS.

In mid-2019, species listed under the schedules of the *Biodiversity Conservation Act 2016* (BC Act) changed with some flora species added. This occurred after the completion of the fieldwork for the EIS. As a result, two flora species, in addition to the 24 candidate threatened flora species reported in

the EIS were targeted in the January 2020 field surveys. The two newly listed flora species of relevance to the project was the listing of scrub turpentine *Rhodamnia rubescens* and native guava *Rhodomyrtus psidioides* as Critically Endangered. Due to the availability of habitat for both species, the presence of records within 10 kilometres of the study area and known records of scrub turpentine within the construction footprint, the two species were identified as having a high likelihood of occurrence within the study area.

Threatened fauna surveys

An additional culvert under the North Coast Railway line was identified during detailed survey in 2019 and was subject to habitat assessment and supplementary anabat surveys in January 2020.

Two timber bridges are located on Old Coast Road near Kororo Nature Reserve. Old Coast Road Bridge No. 1 (the southern bridge) was inspected during the EIS field investigations for roosting microbats. No bats were observed roosting in this bridge and the bridge underwent upgrade maintenance works during the course of the field investigations for the project, decreasing the likelihood of the structure supporting roosting bats. Old Coast Road Bridge No. 2, located further north along Old Coast Road was not inspected during the initial field investigation for roosting microbats.

Due to the potential for microbats to occur at both of the Old Coast Road bridges, additional field investigations were carried out in January 2020 and an anabat unit was deployed at each of the two bridges to determine if either structure was being used by microbat species. These units were deployed for a total of two nights (from 22 January 2020 to 24 January 2020).

Hollow bearing trees were also surveyed as part of the January 2020 fieldwork. The methodology used followed that described in the EIS.

No additional targeted fauna or aquatic surveys were carried out, beyond those described in the EIS. Additional aquatic surveys were not undertaken, as the impacts of the amended design to instream macrophytes and habitat condition are considered to be consistent with the EIS.

5.4.2 Existing environment

Landscape features

The landscape features as described in Chapter 10, Biodiversity of the EIS are still largely applicable to this assessment. An additional regionally significant biodiversity link was identified following the exhibition of the EIS. The additional biodiversity link was identified as a result of a submission made by EESG, DPIE. The link comprises seven regionally significant biodiversity links identified as separate sub-regional corridors which all form part of the Coffs Harbour Koala links in the Northern Rivers Regional Biodiversity Management Plan (DECCW 2010a).

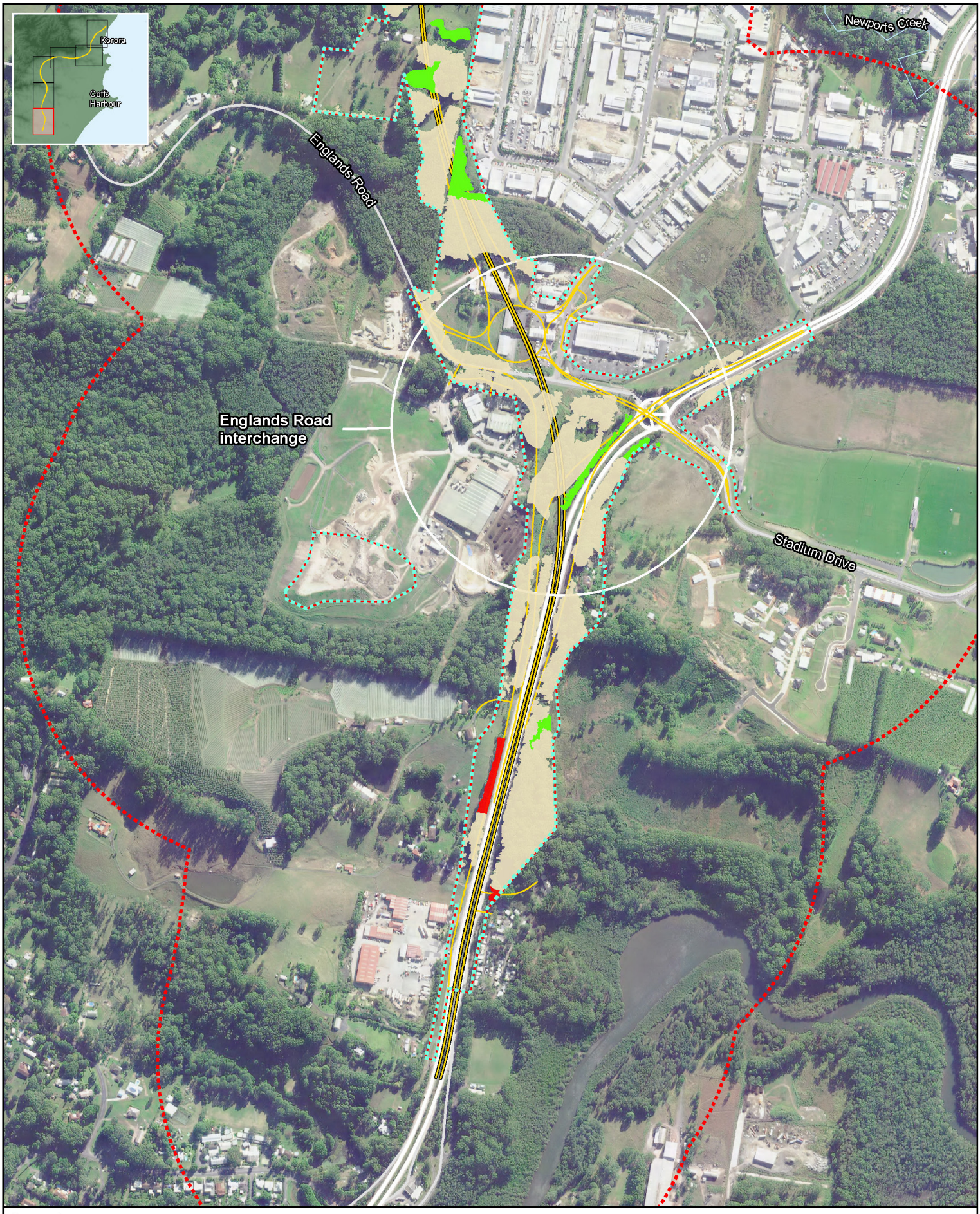
Native vegetation

Updates were made to the PCT mapping throughout the study area[1] based on supplementary vegetation surveys carried out in January 2020. These updates include the mapping of an additional vegetation community, PCT 780 as outlined in **Table 5.4-1**. The supplementary vegetation surveys also detected some changes in the extent of some previously mapped PCTs across the amended design construction footprint. These changes are because of additional field work and data, which

[1] The study area for the amended design consists of the construction footprint and indicative road corridor for the project as well as ridges over the tunnels.

refined mapping of PCTs and changes to vegetation condition (ie reduction of weed cover) since 2016/2017. The extent of these changes is shown in **Figure 5.4-1-01** to **Figure 5.4-1-06**.

The construction footprint supports 48.17 hectares of native vegetation, mainly consisting of isolated patches within a matrix dominated by agricultural, residential and industrial land uses. Vegetation formations identified within the construction footprint for the amended design, are dominated by wet sclerophyll forest with forested wetlands and rainforest vegetation present to a lesser extent. Ten PCTs were identified within the construction footprint, compared to nine PCTs identified within the EIS. These PCTs have been stratified in 21 vegetation zones, compared to 19 vegetation zones identified in the EIS. Detailed figures showing the PCT mapping across the updated construction footprint are provided in **Appendix C, Updated biodiversity assessment report**.



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-01

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Legend

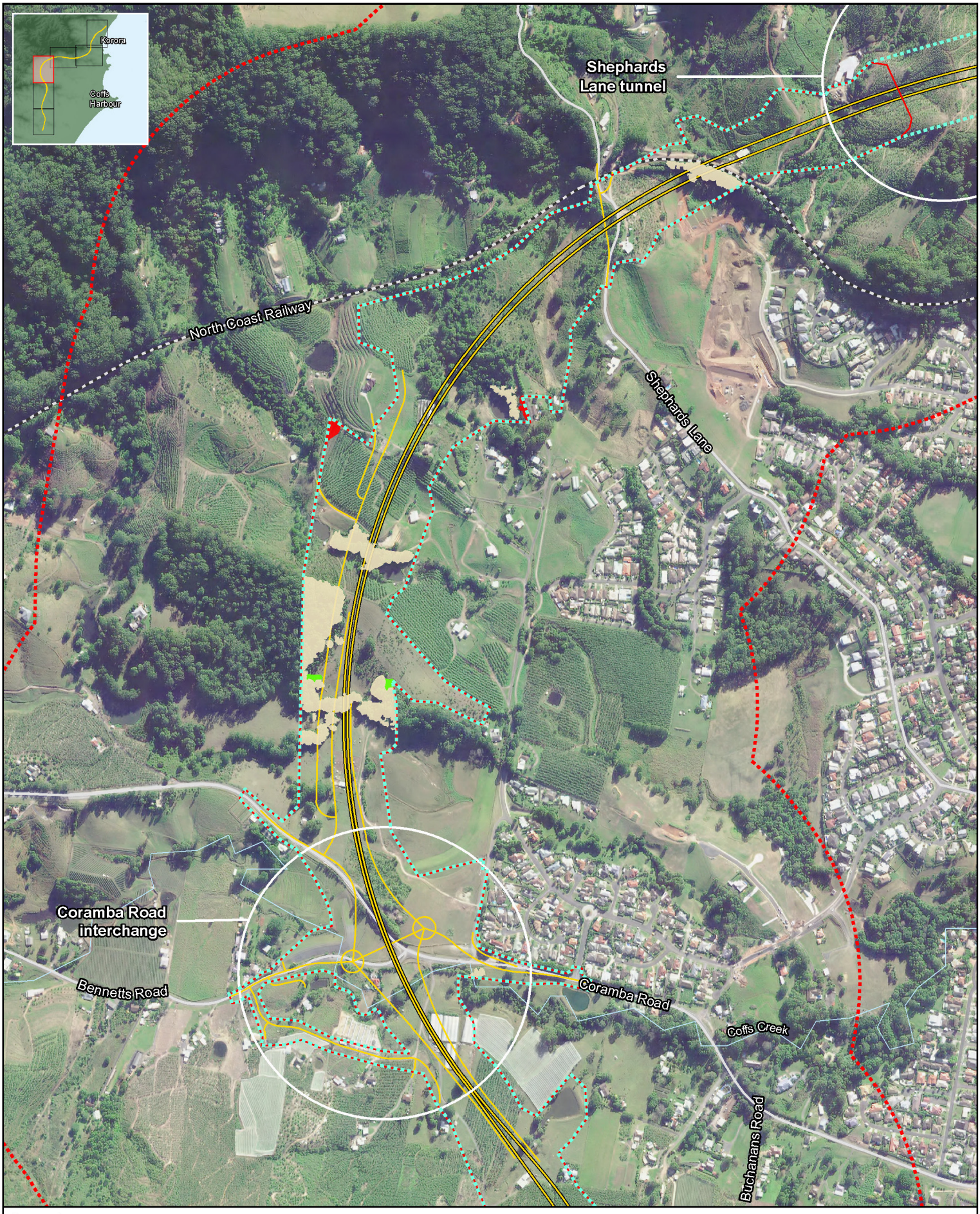
- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-02

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

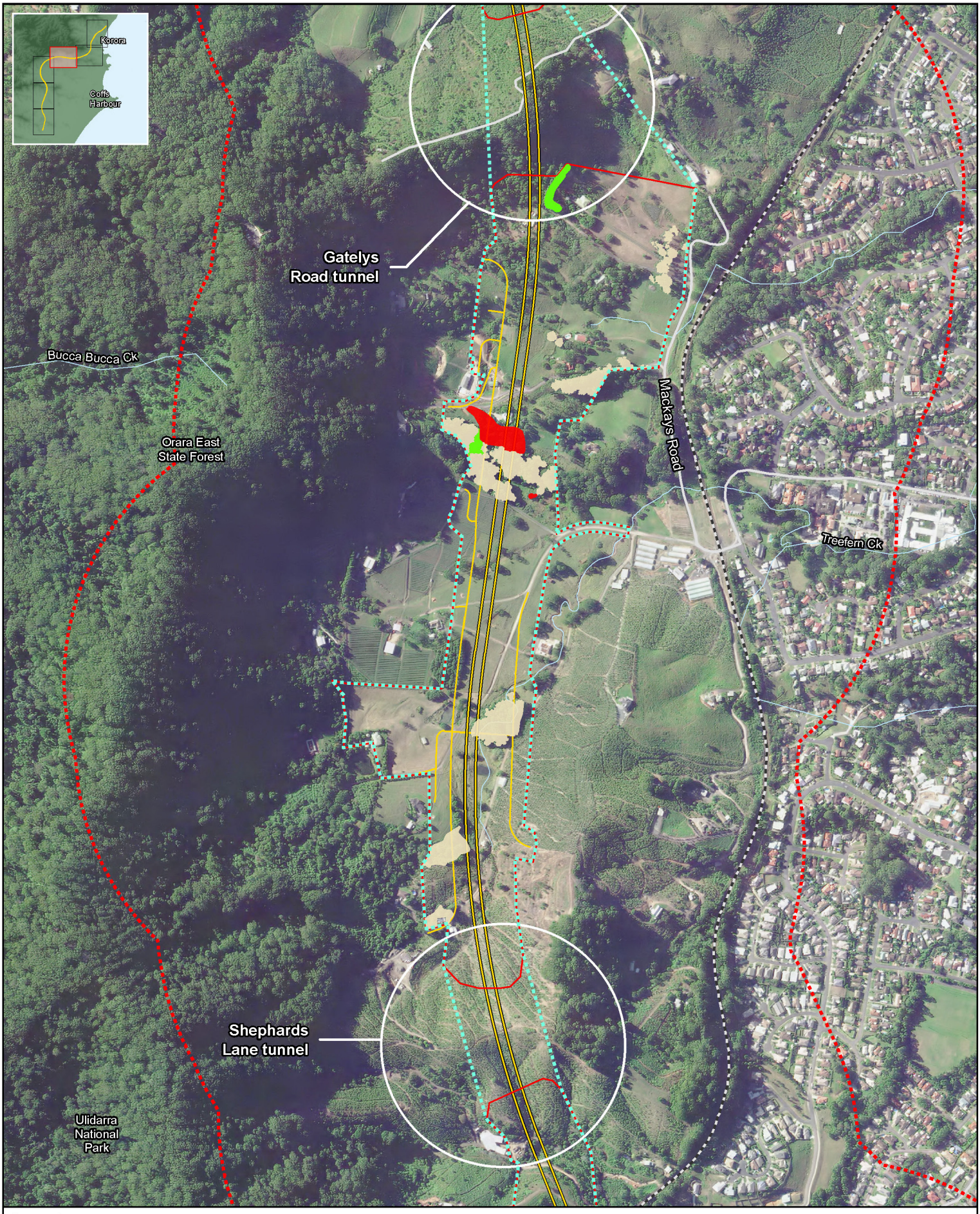
- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-03

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



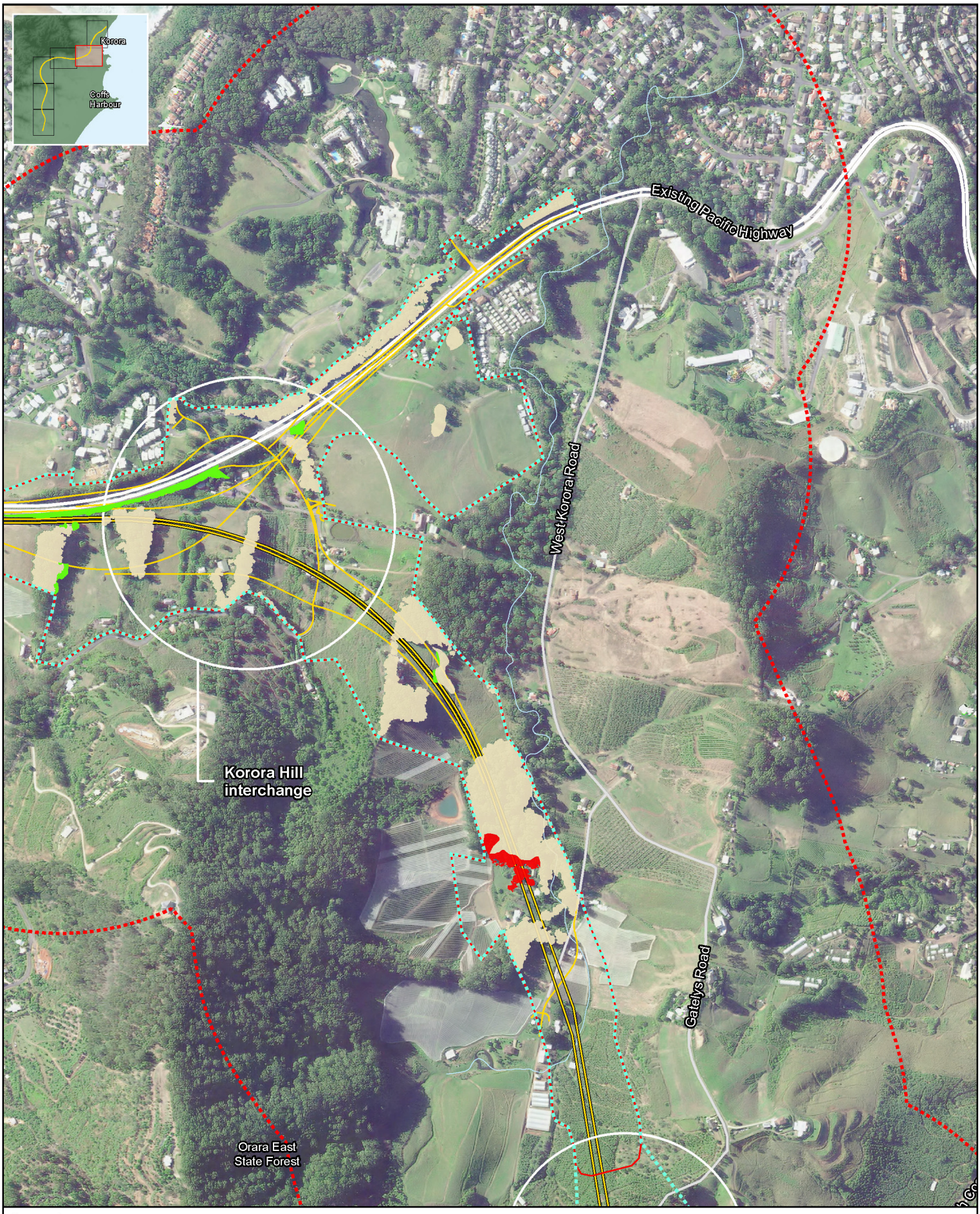
Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-04

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-05

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse
- Amended design PCTs
- PCTs added due to 2020 survey
- PCTs removed due to 2020 survey

Coffs Harbour Bypass
2020 vegetation survey PCTs
Figure 5.4-1-06

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Table 5.4-1 PCT extent in the construction footprint

Vegetation formation	Plant community type (PCT)	Area in construction footprint (ha) EIS	Area in construction footprint (ha) amended design
Rainforest	PCT 670 Black Booyong – Rosewood – Yellow Carabeen subtropical rainforest of the NSW North Coast Bioregion (NR111)	0.51	0.51
Wet Sclerophyll Forest (Shrubby sub-formation)	PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion (NR120)	15.40	17.33
Wet Sclerophyll Forest (Shrubby sub-formation)	PCT 695 Blackbutt – Turpentine –Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion (NR122)	10.48	10.41
Wet Sclerophyll Forest (Shrubby sub-formation)	PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion (NR138)	5.83	6.99
Forested Wetland	PCT 780 Coastal floodplain sedgelands, rushlands and forblands of the North Coast (NR149)	0	0.33
Forested Wetland	PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (NR217)	3.65	4.41
Wet Sclerophyll Forest (Shrubby sub-formation)	PCT 1244 Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast (NR258)	0.94	1.18
Wet Sclerophyll Forest (Grassy sub-formation)	PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the	1.62	1.60

Vegetation formation	Plant community type (PCT)	Area in construction footprint (ha) EIS	Area in construction footprint (ha) amended design
	foothills of the NSW North Coast (NR263)		
Wet Sclerophyll Forest (Shrubby sub-formation)	PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion (NR274)	3.03	3.50
Rainforest	PCT 1302 White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion (NR280)	1.91	1.91
Total		**43.37**	**48.17**

Threatened ecological communities

The EIS identified the presence of two threatened ecological communities (TECs) listed under the BC Act, Swamp Sclerophyll Forest and Lowland Rainforest. **Appendix C, Updated biodiversity assessment report** identified an additional TEC, associated with PCT 780, (Freshwater Wetlands TEC), during additional fieldwork completed in January 2020. The TECs are described in **Table 5.4-2**, with the areas of each TEC assessed in the EIS and as a result of the proposed design changes provided. The locations of the corresponding TECs are shown in **Figure 5.4-2-01** to **Figure 5.4-2-06**.

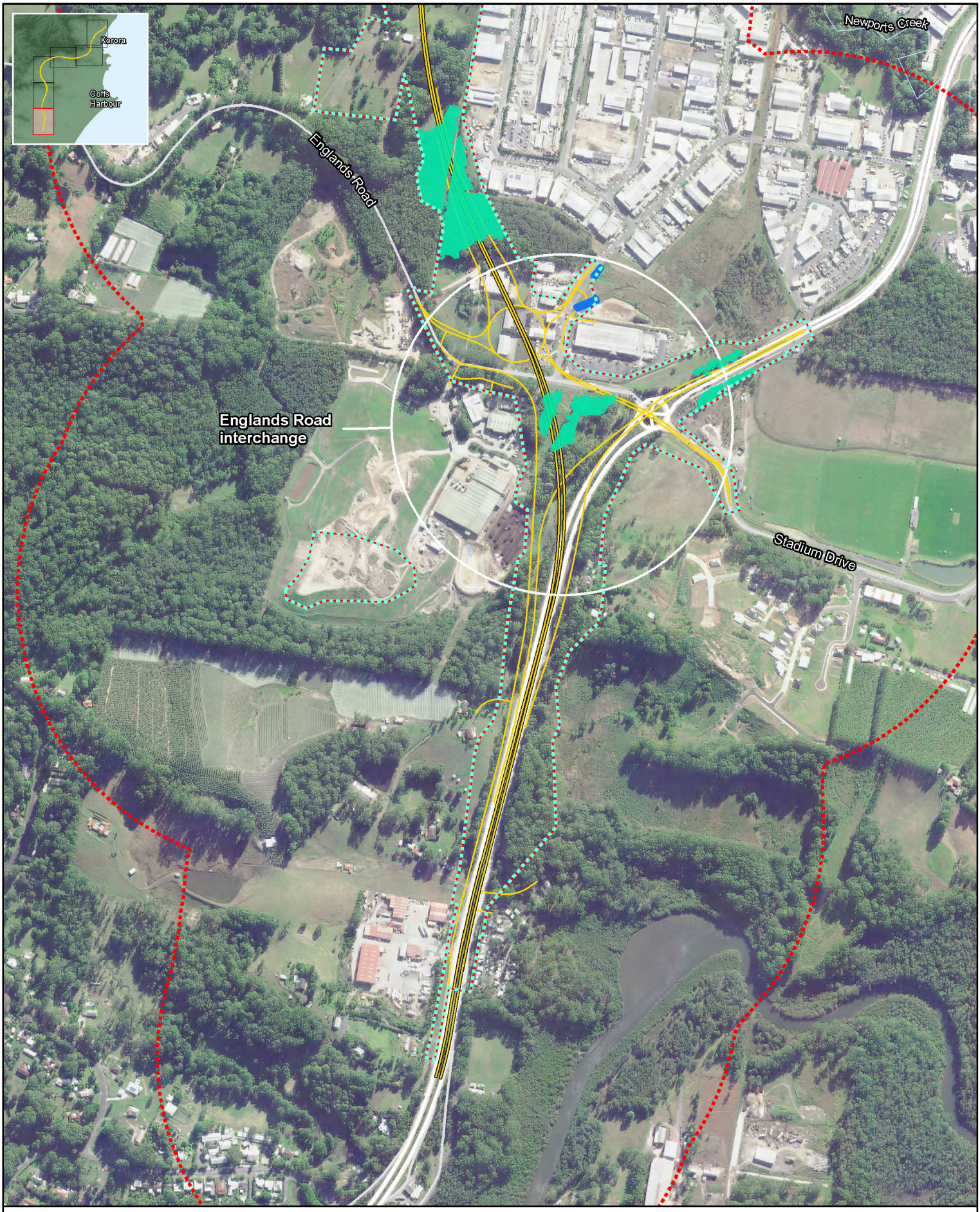
Changes in the areas of Swamp Sclerophyll Forest (PCT 1064) is because of changes to the design and the construction footprint. This resulted in an increased impact to Swamp Sclerophyll Forest. For the additional PCT recorded in the January 2020 surveys, 0.28 hectares of PCT 780 within the construction footprint is considered to conform to the BC Act listed Freshwater Wetlands TEC. The increase in impacts to the Freshwater Wetlands TEC is because of additional survey in January 2020 confirming the presence of PCT 780 within the construction footprint. Of note, the impact to Lowland Rainforest remains consistent with the EIS.

A further 0.05 hectares of PCT 780 occurs within a small dam (around 20 metres by 20 metres with an island/soil mound in the centre of around eight metres by four metres), south of North Boambee Road. This patch of vegetation is not considered to meet the listing criteria under the BC Act as it is considered artificial judging by its circular shape, the soil mound/island in the centre, and its location between North Boambee Road and a property driveway. This patch of PCT 780 is also located over 50 metres away from the nearest watercourse and not located on the floodplain.

Table 5.4-2 Threatened ecological communities within the construction footprint

PCT	TEC scientific name	Conservation status^		Area (ha) – EIS	Area (ha) – Amended Design
		EPBC	BC Act		
PCT 780 Coastal floodplain sedgelands, rushlands, and forblands of the North Coast (NR149)	Freshwater Wetlands on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (Freshwater Wetlands TEC).	-	E3	0	0.28
PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion (NR217)	Swamp Sclerophyll Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Swamp Sclerophyll Forest Endangered Ecological Community (EEC))	–	E3	3.65	4.41
PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion (NR280) PCT 670 Black Booyong – Rosewood – Yellow Carabeen subtropical rainforest of the NSW North Coast Bioregion (NR111)	Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion	-	E3	2.42	2.42
Total				**6.07**	**7.11**

^ Table codes: Endangered ecological communities (E3)



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

Threatened ecological communities

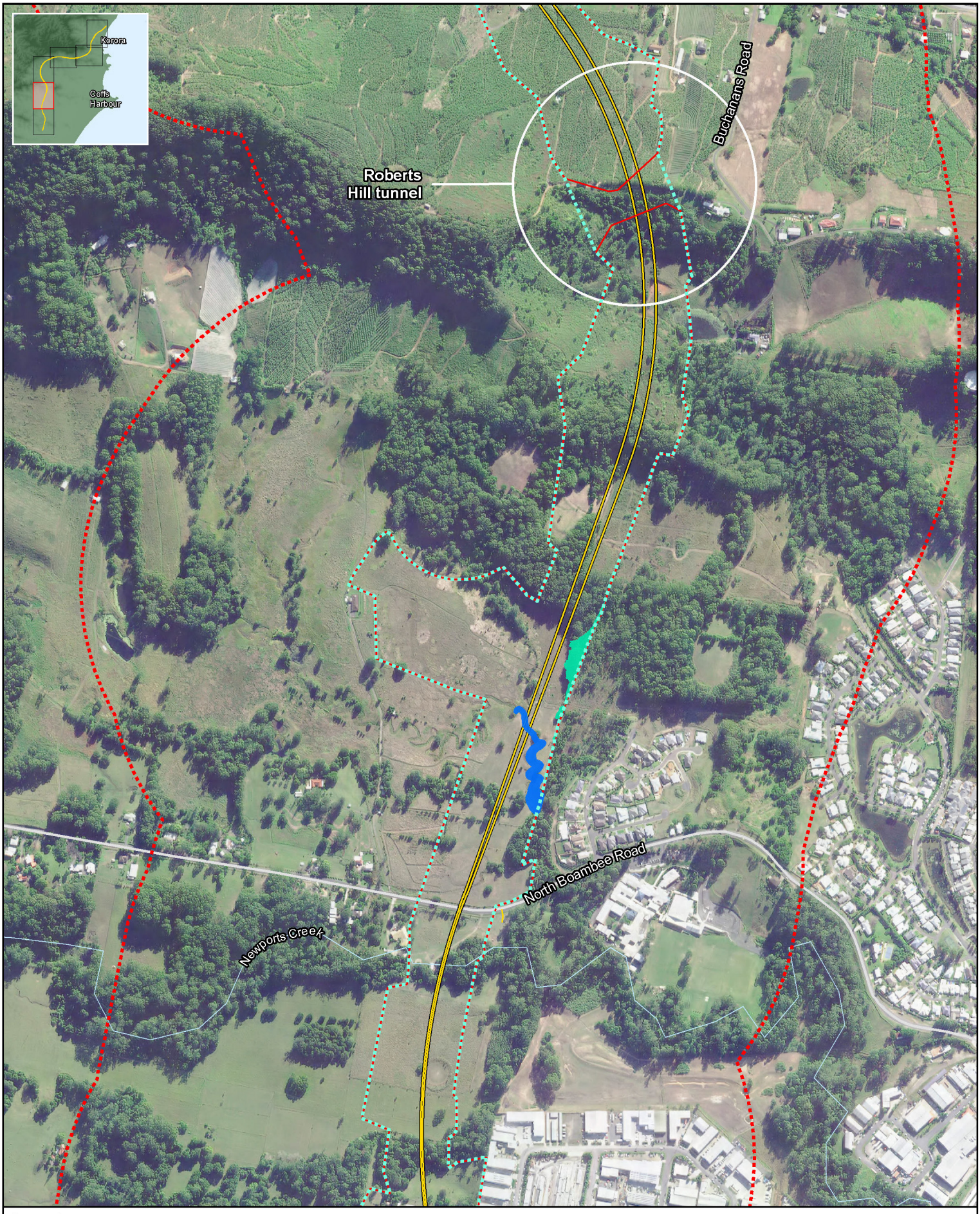
- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-01

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

Threatened ecological communities

- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-02

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

Threatened ecological communities

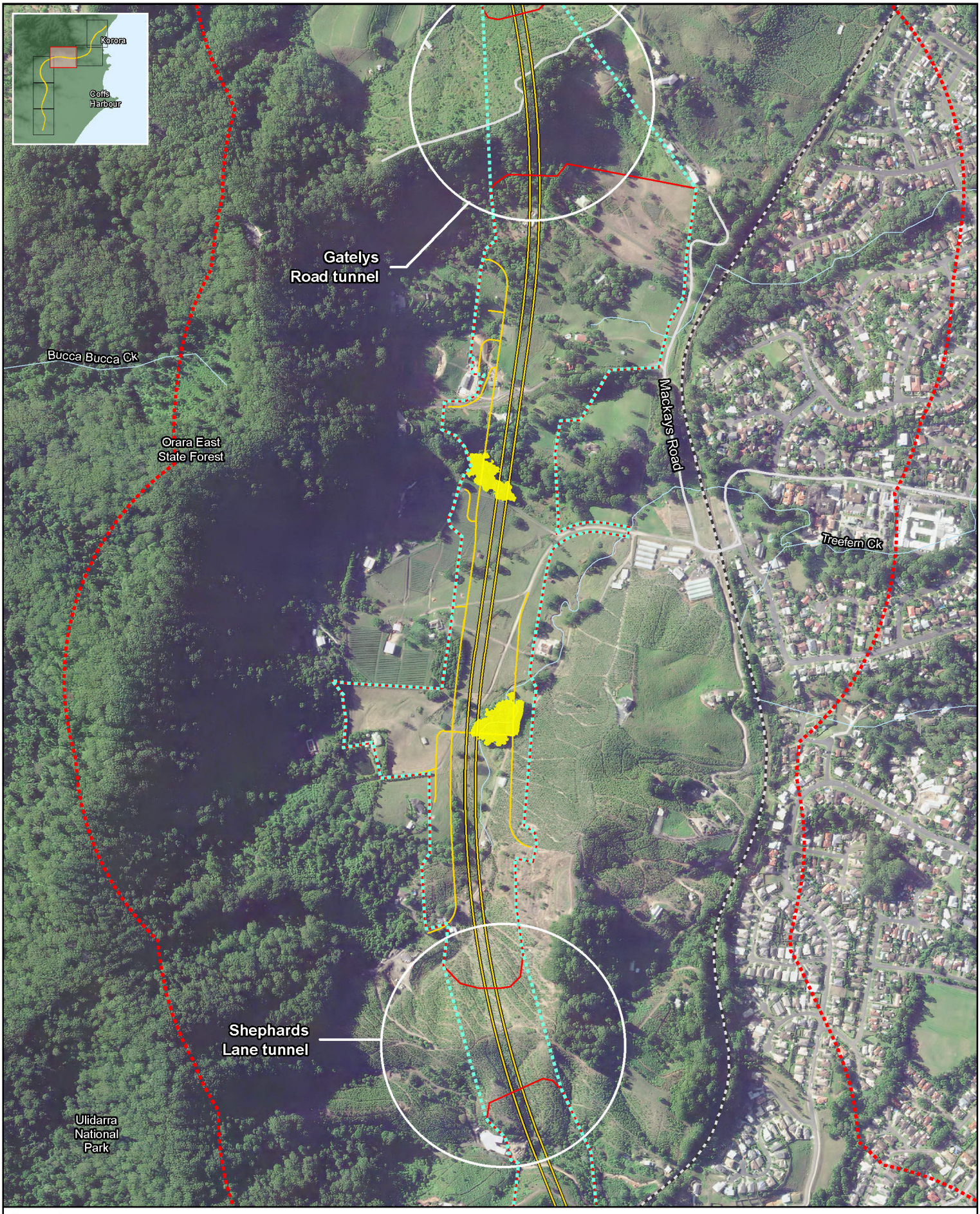
- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-03

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

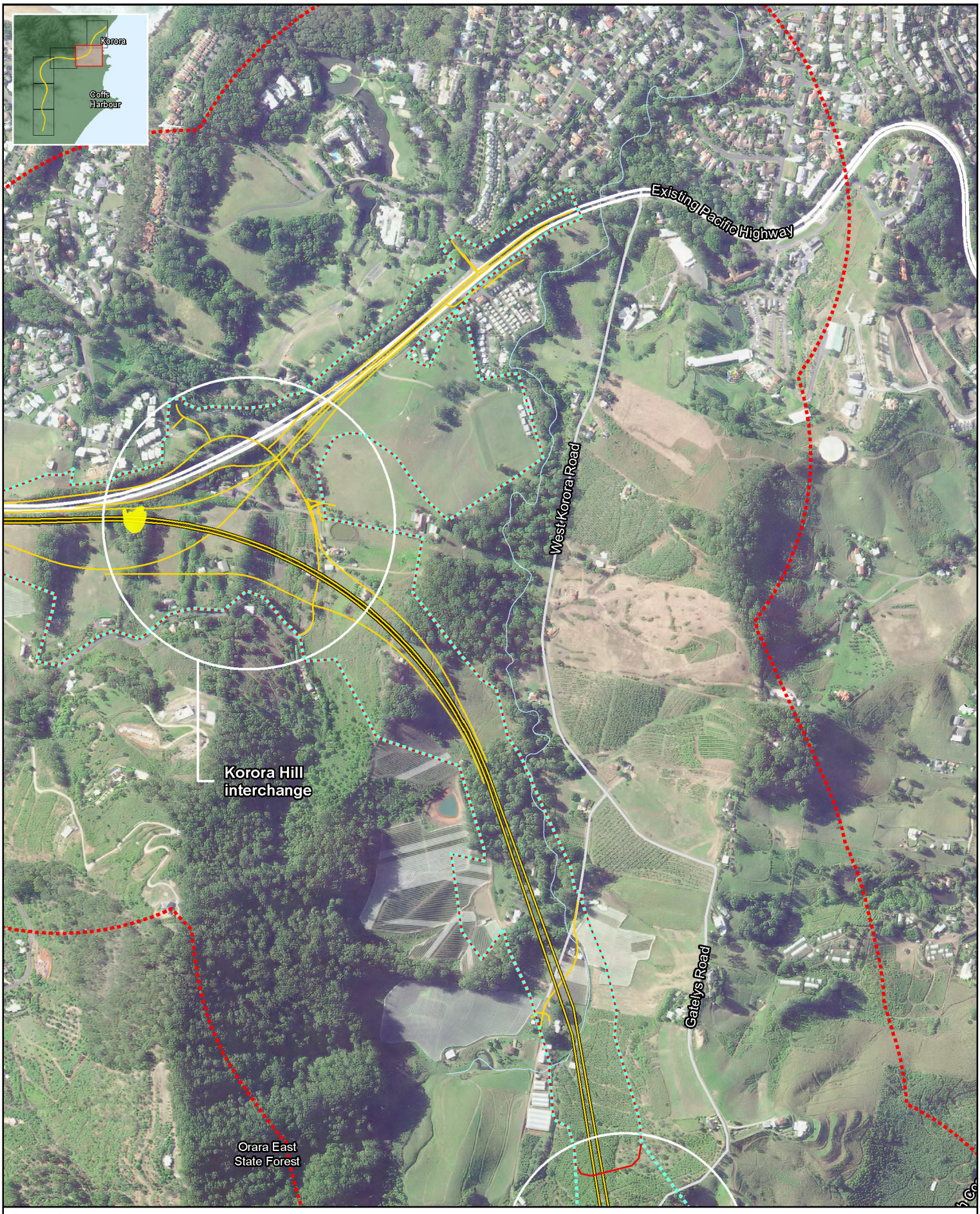
Threatened ecological communities

- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-04

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56



Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

Threatened ecological communities

- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-05

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Construction footprint
- Study area
- Landscape assessment 550m buffer
- Alignment
- North Coast Railway
- Watercourse

Threatened ecological communities

- Freshwater wetlands
- Lowland rainforest
- Swamp sclerophyll forest

Coffs Harbour Bypass
Threatened ecological communities
Figure 5.4-2-06

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Groundwater dependent ecosystems

Assessment of the potential for the study area to support groundwater dependent ecosystems (GDEs) was assessed using the Australian Government's Bureau of Meteorology (BoM) Groundwater Dependent Ecosystems Atlas and Statewide GDE mapping (DPI 2016c). This assessment was outlined in the EIS and remains unchanged. No areas reliant on the surface expression of groundwater are mapped within the study area according to the GDE Atlas or metadata (DPI 2016c).

In the EIS, all nine PCTs located within the study area were identified as 'high probability GDEs from regional studies', based on a search of the GDE Atlas. The additional PCT 780 identified in the recent field surveys was identified as a high probability GDE and is also a groundwater dependent wetland community. PCT 780 occurs along two tributaries of Newports Creek in the southern portion of the study area. The PCT occurs in depressions where water pools and areas of land are either periodically or permanently waterlogged leading to a dominance of water tolerant flora species, compared to the surrounding higher and dryer areas. Areas of PCT 780 present within the vicinity of Englands Road, adjacent to Isles Drive, in the south of the study area are considered to be ground water dependent vegetation, reliant on subsurface presence of groundwater. The Statewide GDE regional studies and mapping identified PCT 780 to be a low probability GDE.

Threatened flora species

Two threatened flora species were directly observed during the targeted flora surveys completed for the EIS and during the additional surveys carried out in January 2020. These included scrub turpentine *Rhodamnia rubescens* and rusty plum *Niemeyera whitei*. Scrub turpentine is listed as critically endangered under the BC Act and rusty plum is listed as vulnerable under the BC Act. Species records relative to each PCT are provided in **Table 5.4-3** and the locations shown mapped in **Figure 5.4-3**.

Rusty plum is a small to medium-sized tree with a fluted trunk. It typically occurs in gullies of warm temperate or littoral rainforests on poor soils below an altitude of 600 metres above sea level. During 2016/2017 targeted flora surveys, a total of 57 individuals were counted and recorded as likely to be impacted by the project during the field investigations, predominantly in the northern extent of the study area in gullies and depressions associated with the riparian corridors of Pine Brush Creek and Jordans Creek. During surveys carried out in January 2020, a further 17 rusty plums were recorded.

Of these 17 newly recorded rusty plum individuals, 13 were juveniles/immature plants appearing to be less than three years old and not present during the EIS field surveys, with the other four individuals likely to have been present during previous surveys, but not detected. Two of these plants are however on the edge of the amended construction footprint and are unlikely to have been within the search area during the previous round of survey in 2016/2017. This species occurred across seven PCTs with most recorded within PCT 695 Blackbutt – Turpentine shrubby open forest of the coastal foothills of the central North Coast.

Scrub turpentine occurs in littoral, warm temperate and subtropical rainforest, and wet sclerophyll forests. The species is a shrub or small tree up to 25 metres with reddish/brown fissured bark (DPIE 2019). A total of 14 individuals were recorded within the study area during the January 2020 surveys and all are likely to be impacted by the project. The species was located across four PCTs with most records within PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion.

A southern swamp orchid individual was previously assumed present within the study area in the EIS through application of the precautionary principle and based on the occurrence of an orchid similar in terms of leaf morphology. When recorded in October 2016 the plant was not in flower, and the plant

was re-visited multiple times through to January 2018 to identify the species in flower. In absence of the observing the orchid in flower, the precautionary principle was applied, and the orchid was assumed to be southern swamp orchid. The plant was visited again in December 2019 and was found to be in the early stages of flowering. The orchid was confirmed not to be southern swamp orchid, but the non-threatened Christmas orchid *Calanthe triplicata*. Confirmation of the genetic identification of the plant as Christmas orchid was also received from the National Herbarium in February 2020.

Native guava was also targeted during January 2020 field surveys. No native guava individuals were recorded.

Table 5.4-3 Summary of threatened flora records and associated PCT

Threatened species	Habitat	Number of records – EIS	Number of records – amended design
Rusty plum	PCT 670 Black Booyong – Rosewood – Yellow Carabeen subtropical rainforest of the North Coast	2	2
	PCT 747 Brush Box –Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	9	20
	PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the North Coast	7	9
	PCT 695 Blackbutt – Turpentine shrubby open forest of the coastal foothills of the central North Coast	23	25
	PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	0	1
	PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	3	4
	PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast	13	13
Sub-total rusty plum		57	74

Threatened species	Habitat	Number of records – EIS	Number of records – amended design
Scrub turpentine	PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the North Coast	0	6
	PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central North Coast	0	3
	PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	0	4
	PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	0	1
Sub-total scrub turpentine		0	14

Legend

- Construction footprint
- Alignment
- North Coast Railway
- Watercourse
- Scrub Turpentine - *Rhodamnia rubescens*
- Rusty Plum - *Niemeyera whitei*

Coffs Harbour Bypass
Threatened flora records
Figure 5.4-3

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

Threatened fauna species

Based on the desktop review carried out as part of the assessment of the proposed design changes, 34 species were identified as candidate threatened fauna requiring targeted surveys in accordance with the Framework for Biodiversity Assessment (FBA) (OEH 2014a) and provisions of the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), compared to 33 species in the EIS. Since the EIS, the white-bellied sea eagle *Haliaeetus leucogaster* was added to the candidate threatened fauna species requiring targeted surveys as a result of submissions. This species was previously surveyed in the EIS, through diurnal bird surveys and searches for stick nests, but was not explicitly listed as a candidate threatened fauna species.

Fourteen threatened terrestrial fauna species were confirmed through field investigations for the study area as summarised in **Table 5.4-4**. The EIS also reported fourteen threatened terrestrial fauna species, however the green-thighed frog *Litoria brevipalmata* was removed and the common planigale *maculata* has been added since the exhibition of the EIS. Areas of known and potential habitat for some species have changed as a result of the proposed design and construction changes.

The green-thighed frog was thought to have been recorded during November 2016 surveys. However, following further consultation with EESG, DPIE, the identification of the individual found was revised to the non-threatened stony-creek frog *Litoria wilcoxii*. As such, the green-thighed frog has been removed from the threatened fauna species within the study area.

In addition, following further consultation with EESG, DPIE since the exhibition of the EIS, the precautionary approach has been applied for common planigale and its presence has been assumed in areas of optimal habitat. Habitat for this species is limited within the study area, as the majority of patches of potential habitat are subject to edge effects and substantial disturbance. Consequently, common planigale habitat has only been mapped where patches of high-quality habitat remain, and where suitable micro-habitats necessary for the life-cycle of the species exist.

High quality habitat within the study area includes rainforest and wetter forest areas with low weed presence, a patchy distribution of ground cover, areas interspersed with hollow logs, bark and deep leaf litter. Within the study area there is little to no surface or exfoliating rock that could be utilised by the common planigale. Mapped habitat is also generally connected to larger areas of protected bushland through riparian corridors.

Threatened species polygons have been prepared for the six species credit fauna species recorded within the study area in accordance with Section 6.5.1.18 of the FBA (**Figure 5.4-4-01** to **Figure 5.4 4-06**).

Table 5.4-4 Threatened fauna species and habitat within the study area

Species name	Habitat within the study area	Known and potential habitat (EIS)	Known and potential habitat (amended design)
Giant barred frog*	• PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion.	Known: 3.20 ha Potential: 4.79 ha	Known: 3.56 ha Potential: 4.79 ha

Species name	Habitat within the study area	Known and potential habitat (EIS)	Known and potential habitat (amended design)
Common planigale*	• PCT 670 Black Booyong – Rosewood – Yellow Carabeen subtropical rainforest of the NSW North Coast Bioregion • PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion • PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion • PCT 1244 Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast	n/a	Known: n/a Potential: 7.94 ha
Koala*	• PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion • PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion • PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion • PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion. • PCT 1244 Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast • PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast • PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion.	Known: 36.70 ha Potential: 43.37 ha	Known: 39.71 ha Potential: 47.84 ha

Species name	Habitat within the study area	Known and potential habitat (EIS)	Known and potential habitat (amended design)
	• PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion.		
Pale-vented bush-hen*	• PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion • Non-native vegetation (farm dam)	Known: 4.95 ha Potential: Up to 50 ha	Known: 4.86 ha Potential: Up to 50 ha
White-bellied sea eagle	• Foraging over site	Known: n/a Potential: Up to 307 ha	Known: n/a Potential: Up to 317 ha
Square-tailed kite	• Foraging over site	Known: n/a Potential: Up to 307 ha	Known: n/a Potential: Up to 317 ha
Olive whistler	• PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion	Known: 10.48 ha Potential: 10.48 ha	Known: 10.41 ha Potential: 10.92 ha
Southern myotis*	• PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coast ranges of the NSW North Coast Bioregion • PCT 695 Blackbutt - Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion • PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion • PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion • PCT 1244 Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast • PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	Known: 15.10 ha Potential: Up to 50 ha	Known: 15.19 ha Potential: Up to 50 ha

Species name	Habitat within the study area	Known and potential habitat (EIS)	Known and potential habitat (amended design)
	• Culverts 8 and 10 and foraging over riparian areas (refer to Section 4.2.4, Threatened species results in **Appendix C, Updated biodiversity assessment report**)		
Little bentwing-bat	• Roosting in Culvert 10 (Culvert 28 was assessed as an unconfirmed roost) • Foraging over site	Known: 1 culvert Potential: Up to 307 ha	Known: 1 culvert Potential: Up to 317 ha
Eastern false pipistrelle	• Foraging over site	Known: n/a Potential: Up to 307 ha	Known: n/a Potential: Up to 317 ha
Greater broad-nosed bat	• Foraging over site	Known: n/a Potential: Up to 307 ha	Known: n/a Potential: Up to 317 ha
Eastern freetail-bat	• Foraging over site	Known: n/a Potential: Up to 307 ha	Known: n/a Potential: Up to 317 ha
Grey-headed flying-fox	• PCT 692 Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion. • PCT 695 Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion. • PCT 747 Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion. • PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion. • PCT 1244 Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast • PCT 1262 Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast.	Known: 43.37 ha Potential: Up to 307 ha	Known: 47.48 ha Potential: Up to 317 ha

Species name	Habitat within the study area	Known and potential habitat (EIS)	Known and potential habitat (amended design)
	• PCT 1285 Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion. • PCT 1302 White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion.		
Coastal petaltail dragonfly*	• PCT 780 Coastal floodplain sedgelands, rushlands, and forblands of the North Coast • PCT 1064 Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Known: 2.50 ha Potential: 3.65 ha	Known: 3.05 ha Potential: 3.05 ha

* Species credit species

Anabat surveys

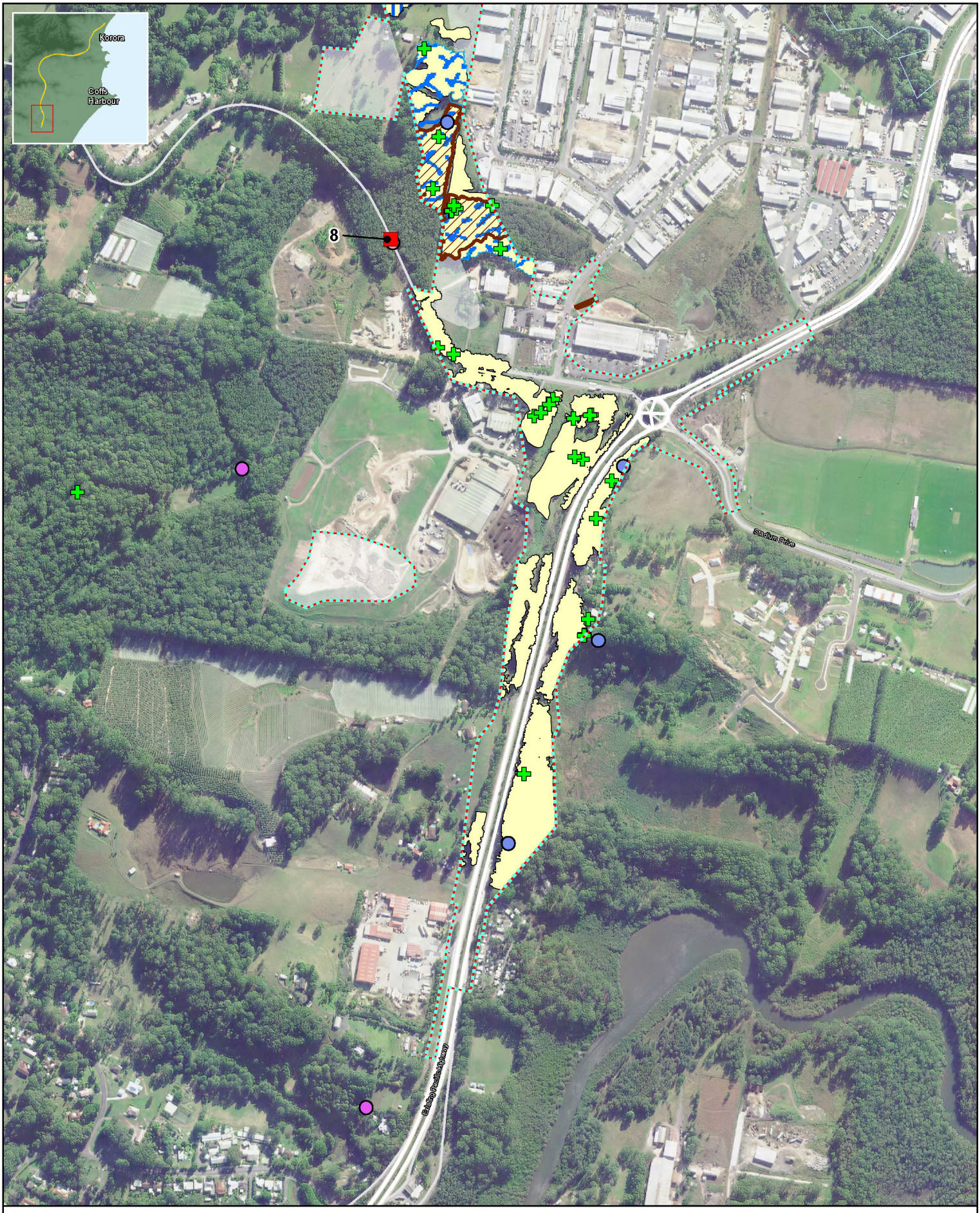
As identified in **Section 5.4.1**, an additional culvert under the North Coast Railway line was identified during detailed topographic survey in 2019 and was subject to habitat assessment and supplementary anabat surveys in January 2020. The culvert was assessed as having low potential as a microbat roost as the culvert was smooth internally with no cracks or gaps to provide habitat for microbats, it was noted as showing signs of being regularly flushed with stormwater, and is flooded with light because of the relatively large diameter opening at each end and its short span distance. No microbat species were recorded on the anabat device deployed at the culvert entrance.

Habitat tree surveys

An additional nine hollow-bearing trees were identified during the January 2020 field surveys. A total of 98 hollow-bearing trees were recorded across all field surveys. The total number of hollow bearing trees potentially impacted by the project has increased by eleven. Two are because of the amended design and the other nine are new hollow bearing trees identified in the January 2020 field surveys. These trees would have been impacted by the project assessed in the EIS.

Matters of national environmental significance

No additional matters of national environmental significance (MNES) were identified in addition to those outlined in the EIS. The southern swamp orchid individual previously assumed to be present within the study area in the EIS, was removed from the assessment following confirmation the orchid was not a southern swamp orchid, but the non-threatened Christmas orchid.



Legend

- Study area
- Construction footprint
- North Coast Railway
- Watercourse
- Hollow bearing tree

Threatened fauna records

- Grey-headed flying-fox
- Koala
- Southern myotis

Threatened species habitat

- Coastal petaltail
- Giant barred frog
- Southern myotis
- Koala

Culverts - potential microbat roost

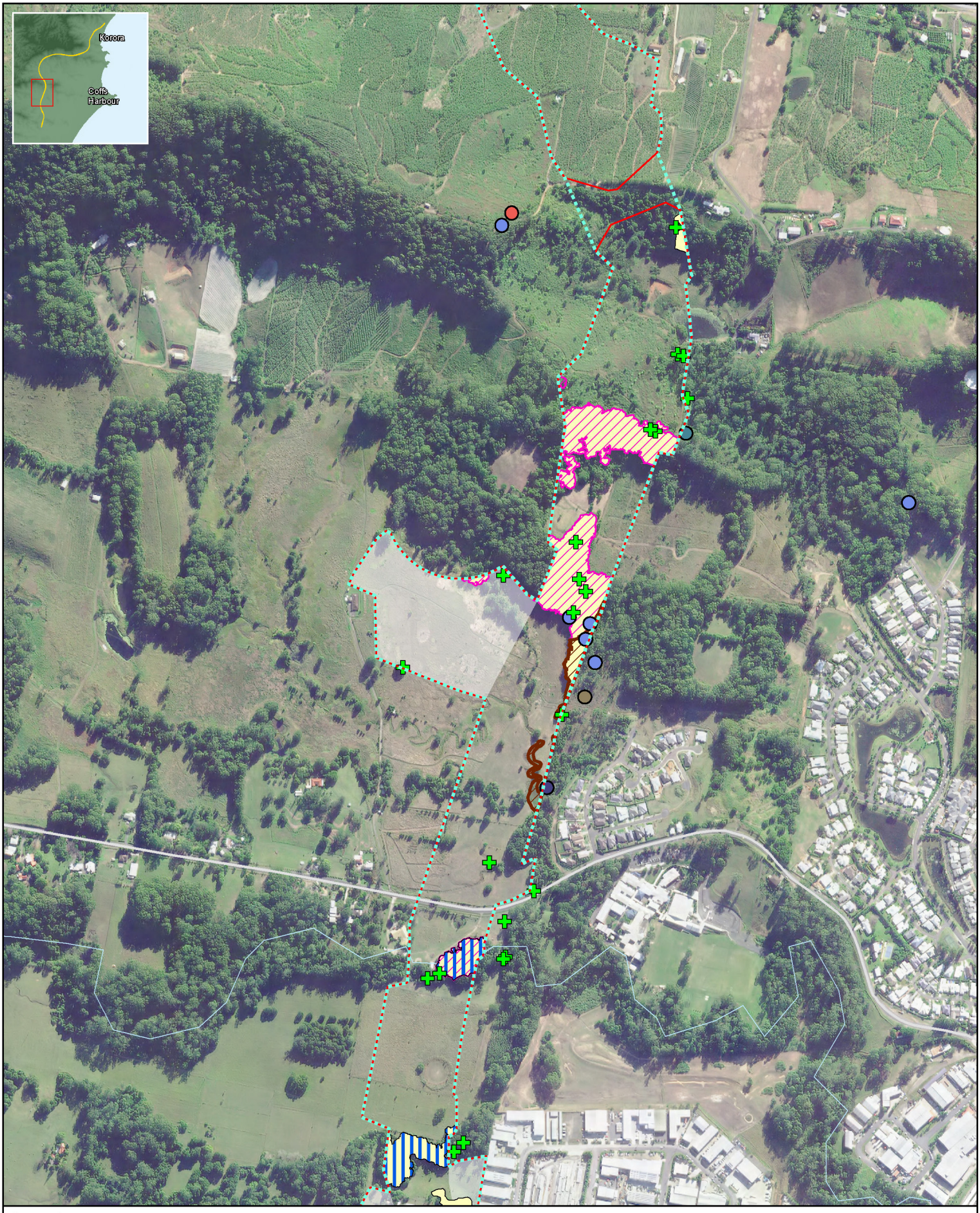
- High

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-01

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Study area
- Construction footprint
- North Coast Railway
- Watercourse
- Hollow bearing tree

Threatened fauna records

- Eastern false pipistrelle
- Greater broad-nosed bat
- Koala
- White-bellied sea-eagle
- Coastal petaltail

Threatened species habitat

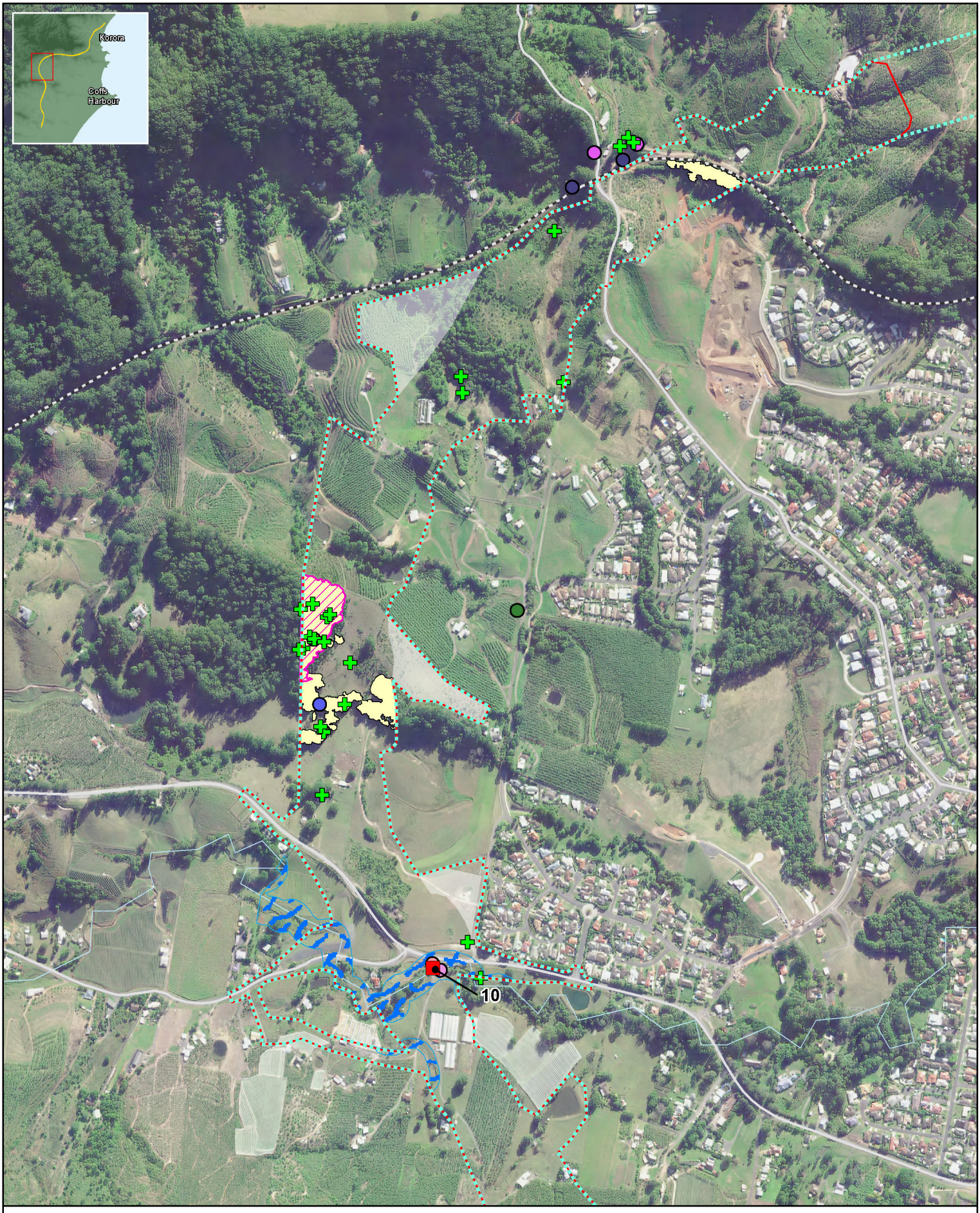
- Common Planigale
- Coastal petaltail
- Giant barred frog
- Koala

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-02

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N



Legend

- Study area
- Construction footprint
- North Coast Railway
- Watercourse
- Hollow bearing tree

Threatened fauna records

- Little bentwing-bat
- Eastern false pipistrelle
- Eastern freetail-bat
- Grey-headed flying-fox
- Southern myotis
- Olive whistler
- Square-tailed kite

Threatened species habitat

- Common Planigale
- Southern myotis
- Koala

Culverts - potential microbat roost

- High

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-03

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

Legend

Study area
Construction footprint
North Coast Railway
Watercourse
Hollow bearing tree

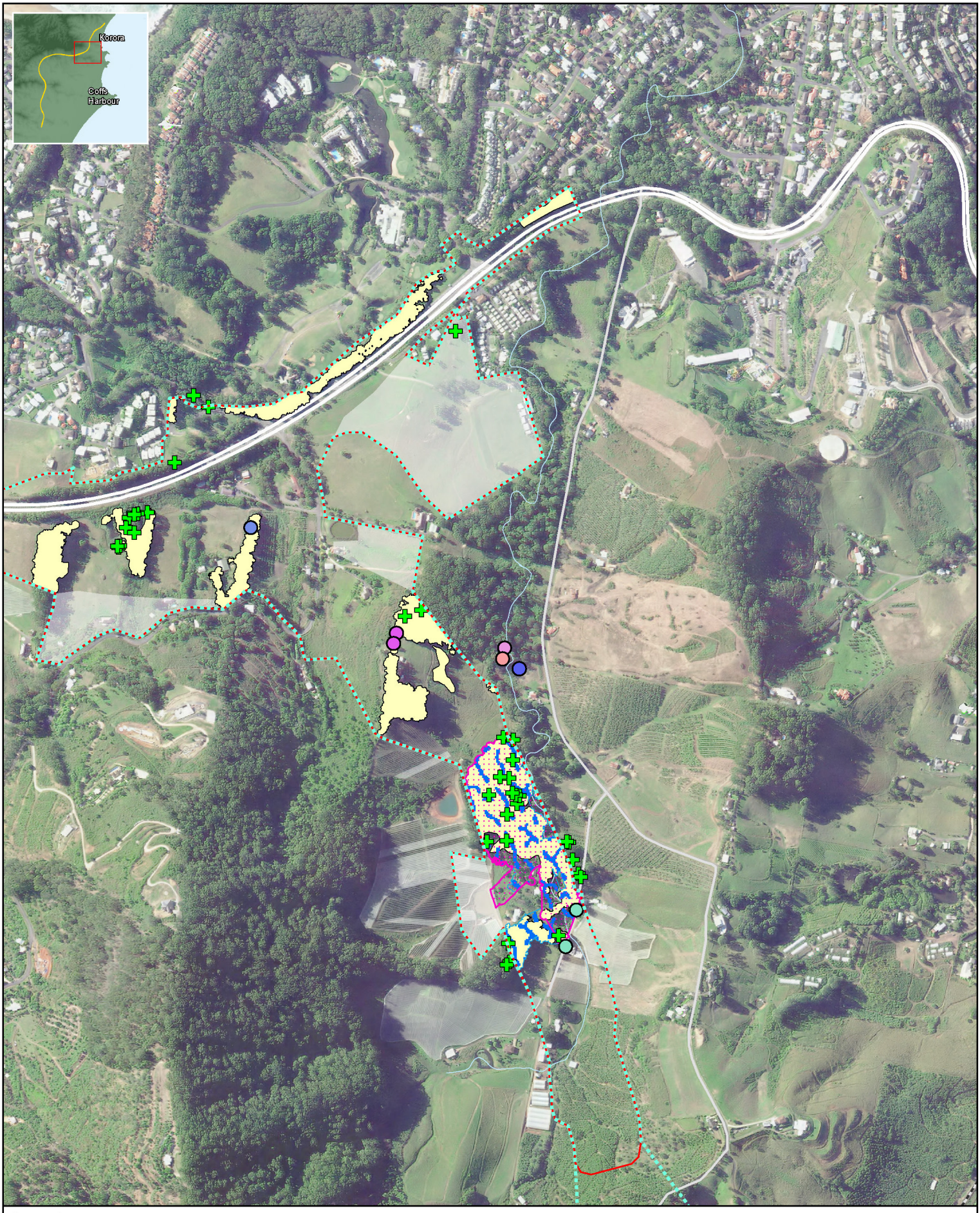
Threatened fauna records
Koala
Pale-vented bush-hen

Threatened species habitat
Common Planigale

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-04

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56



Legend

- Study area
- Construction footprint
- North Coast Railway
- Watercourse
- Hollow bearing tree

Threatened fauna records

- Little bentwing-bat
- Eastern freetail-bat
- Grey-headed flying-fox
- Koala
- Southern myotis
- Pale-vented bush-hen

Threatened species habitat

- Pale-vented bush-hen
- Southern myotis
- Koala

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-05

0 0.1 0.2 0.3 km

N

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

Legend

- Study area
- Construction footprint
- North Coast Railway
- Watercourse
- Hollow bearing tree

Threatened fauna records

- Eastern false pipistrelle
- Grey-headed flying-fox
- Koala
- Southern myotis
- Giant barred frog

Threatened species habitat

- Giant barred frog
- Southern myotis
- Koala

Culverts - potential microbat roost

- High

Coffs Harbour Bypass
Threatened fauna records and species credit habitat polygons
Figure 5.4-4-06

0 0.1 0.2 0.3 km

Scale @A4: 1:10,000
GDA 1994 MGA Zone 56

N

5.4.3 Assessment of potential impacts

This section discusses the potential impacts of the project on biodiversity because of the proposed design and construction changes. It includes a discussion of impacts to the existing environment, MNES and other impacts including aquatic ecology. A description of the overall impacts because of changes to the existing environment following the January 2020 field investigations and the amended design is provided in **Section 5.4.4**.

Potential impacts to existing environment

The following potential impacts are focused only on the impacts from the proposed design and construction changes and not the changes to the existing environment from the results of the fieldwork in January 2020. As a result, PCT 780 which was identified during that fieldwork is not included in this section. For an assessment of the overall impacts of the project, refer to **Section 5.4.4**.

Landscape values

The proposed design and construction changes would not result in a change to impact on landscape values compared to the project outlined in the EIS.

Native vegetation

Specific areas of the proposed design and construction changes would result in increases and decreases in the project footprint. **Table 5.4-5** shows the design and construction changes where there would be a change in impact to PCTs and the change in impact area relative to the impacts identified in the EIS.

Table 5.4-5 Change in impact to PCTs for proposed design and construction changes

Proposed design and construction change	Plant community types			
	692	695	1064	1285
Englands Road interchange	+ 0.15 ha	-	-	-
Korora Hill interchange	+ 0.05 ha	- 0.38 ha	-	+ 0.38 ha
Kororo Public School bus interchange and Luke Bowen footbridge	+ 0.29 ha	+ 0.08 ha	-	-
Pine Brush Creek and Williams Creek realignment	-	-	-	+ 0.08 ha
Construction sediment basins and water quality basins	-	+ 0.06 ha	+ 0.20 ha	-
Total	**+ 0.49 ha**	**- 0.24 ha**	**+ 0.20 ha**	**+ 0.46 ha**

Threatened flora

The proposed design and construction changes would result in an increase in clearing of about 0.24 hectares of rusty plum habitat. The changes as a result of proposed construction and design changes is summarised in **Table 5.4-6**. Of note, the proposed design and construction changes would not result in an increased impact to scrub turpentine habitat compared to the EIS design.

One additional rusty plum individual would be impacted as a result of the proposed design change at Pine Brush Creek and Williams Creek and one because of the proposed Korora Hill interchange design change.

Table 5.4-6 Change in impact to rusty plum habitat for proposed design and construction changes

Proposed design and construction change	Rusty plum habitat	Rusty plum individuals
Korora Hill interchange	-	+ 1
Kororo Public School bus interchange and Luke Bowen footbridge	+ 0.1 ha	-
Pine Brush Creek and Williams Creek realignment	+ 0.08 ha	+ 1
Construction sediment basins and water quality basins	+ 0.06 ha	-
Total	**+ 0.24 ha**	**2**

Threatened fauna

Table 5.4-7 shows the design and construction changes where there would be a change in impact to habitat and the change in impact area relative to the impacts identified in the EIS.

As a result of the proposed design and construction changes, an additional two hollow bearing trees would be cleared – one because of the changes to the North Boambee Valley vertical alignment and the other because of the provision for construction sediment basin at Chainage 16100. The total number of hollow bearing trees potentially impacted by the project has increased by eleven. Two are because of the amended design and the other nine are new hollow bearing trees identified in the January 2020 field surveys. These trees would have been impacted by the project assessed in the EIS.

Table 5.4-7 Change in impact to threatened fauna habitat for proposed design and construction changes

Proposed design and construction change	Threatened fauna habitat			
	Koala	Southern myotis	Giant barred frog	Coastal petaltail
Englands Road interchange	+ 0.28 ha	+ 0.1 ha	-	+ 0.05 ha
Coffs Creek flood mitigation	-	- 0.88 ha	-	-

Proposed design and construction change	Threatened fauna habitat			
	Koala	Southern myotis	Giant barred frog	Coastal petaltail
Korora Hill interchange	+ 0.43 ha	-	-	-
Kororo Public School bus interchange and Luke Bowen footbridge	+ 0.44 ha	+ 0.11 ha	+ 0.13 ha	-
Pine Brush Creek and Williams Creek realignment	+ 0.08 ha	+ 0.08 ha	+ 0.08 ha	-
Construction sediment basins and water quality basins	+ 0.06 ha	+ 0.06 ha	+ 0.06 ha	-
Total	**+ 1.29 ha**	**- 0.53 ha**	**+ 0.27 ha**	**+ 0.05 ha**

Of note, the proposed new and revised ancillary sites contain some threatened species habitat. An additional environmental management measure has been included to ensure threatened species habitat will not be cleared for the purpose of ancillary facilities. Refer to environmental management measure FF14 in **Section 5.4.5**.

Aquatic habitats

As identified in the EIS, no threatened aquatic species, populations or communities were recorded within the study area and they are not considered likely to occur. There is no change to this as a result of the design amendments. Therefore, no additional aquatic surveys were carried out as part of the January 2020 surveys.

Matters of national environmental significance

Table 5.4-8 summarises the additional habitat clearing for the MNES assessed in the EIS as a result of the proposed design and construction changes.

Table 5.4-8 Change in impact to MNES habitat for proposed design and construction changes

Proposed design and construction change	Threatened fauna habitat				
	Koala	Grey headed flying fox	Giant barred frog	Spotted tailed quoll	Regent honeyeater
Englands Road interchange	+ 0.28 ha	+ 0.15 ha	-	+ 0.15 ha	-
Korora Hill interchange	+ 0.43 ha	+ 0.05 ha	-	+ 0.05 ha	-

Proposed design and construction change	Threatened fauna habitat				
	Koala	Grey headed flying fox	Giant barred frog	Spotted tailed quoll	Regent honeyeater
Kororo Public School bus interchange and Luke Bowen footbridge	+ 0.44 ha	+ 0.37 ha	+ 0.13 ha	+ 0.37 ha	-
Pine Brush Creek and Williams Creek realignment	+ 0.08 ha	+ 0.08 ha	+ 0.08 ha	+ 0.08 ha	-
Construction sediment basins and water quality basins	+ 0.06 ha	+ 0.26 ha	+ 0.06 ha	+ 0.26 ha	+ 0.20 ha
Total	**+ 1.29 ha**	**+0.91 ha**	**+ 0.27 ha**	**+ 0.91 ha**	**+ 0.20 ha**

Other impacts

Most 'other impacts' as listed in the EIS would remain unchanged because of the proposed design and construction changes. Only those that would change because of the proposed design and construction changes are listed below.

Aquatic ecology

Aquatic fauna may be temporarily displaced during the construction of permanent waterway crossings and proposed creek realignments including:

- Realignment of about 130 metres of a northern tributary of Newports Creek (north of North Boambee Road) through a bank of culverts. The realignment would include a low flow channel to provide for fish passage, including through one of the culverts beneath the carriageways, which would be designed in accordance with the requirements of DPIE guidelines for fish conservation and management (Fairfull & Witheridge 2003). The alignment of the creek through the culverts (directly beneath the carriageways) would be straightened, and there would be limited opportunity to meander the creek through this section, compared with the EIS which provided more space below bridge BR 05 to enable design of a more natural creek alignment. Scour protection is likely to be needed on the upstream and downstream side of the culverts. The scour protection would be designed and constructed in a way that would accommodate a low flow channel and where possible provide an opportunity to include a meander. The extent of scour protection would be determined during detailed design in accordance with the requirements detailed in Chapter 5, Project description and Chapter 6, Construction of the EIS.
- A new confluence of Pine Brush Creek and Williams Creek would be constructed about 20 metres upstream of the new bridge over Pine Brush Creek (BR 21). The realignment of Williams Creek would extend for about 90 metres upstream of the new confluence and would require construction of a new low flow channel and waterway corridor. The low flow channel would need to meander within the realigned waterway corridor to ensure existing waterway lengths, velocities and

hydraulic grades are maintained. Realignment of Pine Brush Creek would require construction of a new 85 metre channel slightly north of the existing channel. The realignment would generally remain within the extents of the existing riparian corridor and would be located between the new bridge (BR 21) and the existing bridge over Old Coast Road. This proposed design change is described in more detail in **Chapter 2, Design changes**.

Where reasonable and feasible, the creek realignments will be designed to behave in a similar hydrologic and geomorphic manner as existing conditions and will consider the requirements of the Policy and Guidelines for Fish Habitat Conservation and Management (Department of Primary Industries (DPI) 2013) and Guidelines for Instream Works on Waterfront Land (DPI 2012).

Detailed design of waterway realignments and adjustments would be developed in consultation with DPIE (Regions, Industry, Agriculture and Resources) and will consider:

- Investigation of opportunities to reduce or avoid waterway realignments to maintain existing creek alignments including locating piers outside of the waterway
- Retention of existing riparian vegetation where possible, including retention of tree stumps where trees are removed
- Maintaining existing waterway lengths, velocities and hydraulic grades
- Use of soft engineering approaches to scour protection where landscaping is provided over the rock scour
- Maintaining fish passage in accordance with the waterway classification and DPIE (Regions, Industry, Agriculture and Resources) guideline Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003).

There would be no other changes to aquatic ecology as a result of the proposed design changes.

5.4.4 Summary of overall project impacts

As a result of additional field surveys and proposed design and construction changes, the overall impact on biodiversity has increased compared to the project described in the EIS. The following section outlines the changes to the entire length of the project.

Impacts on existing environment

Native vegetation

The project would impact on a total of 48.17 hectares of native vegetation comprising ten PCTs. The EIS reported a total of 43.37 hectares and nine PCTs, however the number of PCTs has increased following analysis of the additional field surveys carried out in January 2020. **Table 5.4-9** outlines the change in impacts to native vegetation compared to the EIS. PCT 780 has been included in the table twice to differentiate between vegetation classified under the BC Act definition and vegetation not.

Table 5.4-9 Impacts to native vegetation compared to the EIS

Plant community type	Condition	Status		% cleared CMA*	Impact area (ha) EIS	Impact area (ha) amended design	Change in impact (ha)
		BC Act	EPBC				
PCT 670 – Black Booyong – Rosewood – Yellow Carabeen subtropical rainforest of the NSW North Coast Bioregion	Moderate/good 82.67	Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion		75%	0.51	0.51	0.00
PCT 692 – Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion	Moderate/good 57.33 – 82.00	n/a	n/a	15%	15.40	17.33	+1.93
PCT 695 – Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion	Moderate/good 46.67 – 89.33	n/a	n/a	5%	10.48	10.41	-0.07
PCT 747 – Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	Moderate/good 79.33 – 82.00	n/a	n/a	30%	5.82	6.99	+1.17
PCT 780 – Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	Moderate/good 23.96 – 28.12	Freshwater Wetlands	n/a	80%	-	0.28	+0.28

Plant community type	Condition	Status		% cleared CMA*	Impact area (ha) EIS	Impact area (ha) amended design	Change in impact (ha)
		BC Act	EPBC				
PCT 780 – Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	Moderate/good 28.12	n/a	n/a	80%	-	0.05	+0.05
PCT 1064 – Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	Moderate/good 72.67 – 87.33	Swamp Sclerophyll Forest	n/a	75%	3.65	4.41	+0.76
PCT 1244 – Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast	Moderate/good 82.67	n/a	n/a	60%	0.94	1.18	+0.24
PCT 1262 – Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	Moderate/good 71.33 – 88.00	n/a	n/a	30%	1.62	1.60	-0.02
PCT 1285 – Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	Moderate/good 76.67 – 76.00	n/a	n/a	55%	3.04	3.50	+0.46
PCT 1302 – White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion	Moderate/good 72.67	Lowland Rainforest in NSW North Coast and Sydney Basin Bioregion	n/a	75%	1.91	1.91	0.00
Total					**43.37**	**48.17**	**+ 4.8**

* % cleared in CMA is the per cent cleared in the catchment management area

Threatened flora

Threatened flora species recorded for the study area would be directly impacted because of the project. This includes 74 rusty plum individuals and 14 scrub turpentine individuals. Direct impacts on threatened flora habitats would occur as a result of the removal of 48.17 hectares of native vegetation which has the potential to support threatened species in the future. However, when assessed at a local scale, impacts on habitat availability for local populations are not considered significant. **Table 5.4-10** provides a comparison of the broad threatened flora habitat types impacted by the project and those remaining within 10 kilometres of the study area.

Table 5.4-10 Impacts to threatened flora habitat

Threatened flora species	Individuals impacted	Key habitat features	Area to be impacted EIS	Area to be impacted amended design	Estimate remaining within 10 km of the study area*	Percentage habitat removed
Rusty plum	74	Wet sclerophyll forest vegetation	37.30 ha	41.01 ha	10,180 ha	0.4%
		Rainforest vegetation	2.43 ha	2.42 ha	1190 ha	0.2%
		Riparian areas^	9.73 ha	9.73 ha	2200 ha	0.4%
Scrub turpentine	14	Wet sclerophyll forest vegetation	37.30 ha	41.01 ha	10,180 ha	0.4%
		Rainforest vegetation	2.43 ha	2.42 ha	1190 ha	0.2%
		Riparian areas^	9.73 ha	9.73 ha	2200 ha	0.4%

* Estimates remaining are based on equivalent vegetated areas mapped by the Coffs Harbour LGA mapping (OEH 2012) with non-equivalent vegetation types excluded where appropriate.

^ Riparian areas are based on mapped vegetation (Biosis Pty Ltd. 2019 and OEH 2012) within 20 metres of either side of watercourses mapped on the 1:25,000 hydro line dataset from the LPI Digital Topographic Database (DTDB). Riparian areas occur within the other two key habitat feature types.

Threatened fauna

The removal of 48.17 hectares of native vegetation would result in the loss of fauna habitat features known to support locally occurring threatened fauna species. This includes the loss of potential breeding habitats in the form of hollow-bearing trees, riparian vegetation, dense forest vegetation and swamps, as well as forage habitat in the form of nectar, blossom and fruit producing trees, accumulated leaf litter and large woody debris and open areas of grasslands not supporting native vegetation.

Although the field surveys for this project identified 14 threatened fauna species within the study area, there is a potential for impacts on habitat used by a wider range of threatened species. As discussed

in **Section 5.4.2**, the green-thighed frog is no longer considered to be impacted by the project, but the presence of common planigale has been assumed.

No other additional threatened fauna species would be impacted, beyond those identified above and in the EIS.

Matters of national environmental significance

MNES that were identified or assessed as having a high likelihood of occurrence in the study area (as listed in Section 10.2.8 of the EIS) include:

- Giant barred frog – endangered
- Koala – vulnerable
- Grey-headed flying-fox – vulnerable
- Regent honeyeater – critically endangered
- Spotted-tailed quoll – endangered.

Impacts to MNES as a result of the project and that have changed since the EIS are summarised in **Table 5.4-11.** A summary of MNES impacts against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoEE 2013) remains unchanged since the EIS. Project impacts to MNES are detailed further in **Appendix C, Updated biodiversity assessment report**.

Table 5.4-11 Changed impacts on MNES identified or assessed as having a high likelihood of occurrence in the study area

Project impacts	MNES impacted
Direct loss of habitat The project would result in a loss of 48.17 ha of native vegetation offering suitable habitat for threatened flora and fauna listed under the EPBC Act. There is the potential for short and long-term impacts to MNES as a result of vegetation clearing including direct loss threatened species and ongoing population declines.	Giant barred frog: 4.79 ha of known and potential habitat. Koala: 47.84 ha of known and potential habitat. Grey-headed flying-fox: 47.84 ha of known and potential foraging habitat. Regent honeyeater (foraging): 4.41 ha of potential foraging habitat. Spotted-tailed quoll: 47.84 ha of potential habitat.

A detailed assessment against the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoEE 2013) is provided in **Appendix C, Updated biodiversity assessment report** and the outcome remains unchanged since the EIS. The project would result in potential significant impacts to koala and giant barred frog before mitigation is applied. This includes the direct loss of habitat. Potential indirect impacts to these species may occur from habitat fragmentation that prevents the movement of individuals. Elements have been included in the design to mitigate these impacts including the provisions of bridges over creeks supporting giant barred frog and movement structures for koala. Other indirect impacts associated with edge effects, primarily light and noise impacts from road operations, are not considered to have a significant impact to koala and giant barred frog.

Other impacts

Most ‘other impacts’ as listed in the EIS would remain unchanged. Only those that would change because of the amended design and additional field survey are listed below.

Aquatic ecology

Impacts to aquatic fauna as a result of the proposed design and construction changes are listed in **Section 5.4.3**. There would be no other changes to impacts to aquatic ecology

Changes to surface water hydrology and quality

The impact assessment completed as part of the EIS identified the most sensitive areas to changes in surface water hydrology are riparian zones associated with the waterways and the area of swamp sclerophyll forest in the North Boambee Valley area. The updated flood modelling completed for the amended design has been reviewed and no additional impacts to sensitive ecological areas have been identified.

Changes to groundwater hydrology

Direct impacts to GDEs because of the project include the removal of 3.58 hectares of ‘High probability GDE – from regional studies’ and 44.59 hectares ‘Low probability GDE – from regional studies’ as per the GDE Atlas (BoM 2018). This is compared to the removal of 0.77 hectares of ‘High probability GDE – from regional studies’ and 42.6 hectares ‘Low probability GDE – from regional studies’ reported in the EIS. This change in impact is because of the additional field surveys and not because of any proposed construction and design changes.

The overall impacts to GDEs as a result of the project would be consistent with the impacts reported in the EIS.

Key threatening processes

A key threatening process (KTP) is defined under the Threatened Species Conservation Act 1995 (TSC Act) and Fisheries Management Act 1994 (FM Act) as an action, activity or proposal that:

- Adversely affects two or more threatened species, populations or ecological communities
- Could cause species, populations or ecological communities that are not currently threatened to become threatened.

Listed KTPs are set out in Schedule 3 of the TSC Act and Schedule 6 of the FM Act.

Similarly, the EPBC Act defines a “threatening process” as a process that threatens, or may threaten, the survival, abundance or evolutionary development of a native species or ecological community. A KTP under the EPBC Act is a threatening process that has been listed by the Minister of the Environment under that Act.

KTPs that have changed compared to the project outlined in the EIS are listed in **Table 5.4-12.** The EIS values are shown in brackets.

Table 5.4-12 Key threatening processes relevant to the amended project

Key threatening process	Status	Comment
Clearing of native vegetation	TSC Act EPBC Act	A total of 48.17 ha (43.37 ha) of native vegetation is proposed to be cleared for the project across ten (nine) PCTs. This total includes 4.41 ha (3.65 ha) of Swamp Sclerophyll Forest (Endangered TSC Act), 2.42 ha (2.42 ha) of Lowland Rainforest (Endangered TSC Act) and 0.28 ha of Freshwater Wetlands (Endangered BC Act).
Clearing of hollow-bearing trees	TSC Act	A total of 98 (87) hollow-bearing trees are proposed to be removed for the project.
Introduction and establishment of exotic rust fungi of the order *Pucciniales pathogenic* on plants of the family *Myrtaceae*	TSC Act	Evidence of myrtle rust was observed on scrub turpentine individuals during field investigation undertaken in January 2020. Road construction activities have the potential to introduce or spread myrtle rust within the study area.

5.4.5 Revised environmental management measures

The management measures presented within the EIS have been reviewed in consideration of the identified design and construction changes to address impacts to biodiversity. Minor amendments have been made to the mitigation measures. New additions are shown in italics and deletions are presented as strikethrough in **Table 5.4-13**.

Additionally, because of the January 2020 surveys and the proposed design and construction changes, the TSMP included as Appendix I to the EIS has been updated (refer to **Appendix D, Updated threatened species management plan**).

Other mitigation measures presented in the EIS are still considered to be relevant and accurate and are provided in **Chapter 6, Revised environmental management measures** for completeness.

Table 5.4-13 Revised environmental management measures

Impact	ID No.	Environmental management measure	Responsibility	Timing
Removal of threatened fauna habitat	FF01	The Threatened Species Management Plan (**~~(Appendix I, Threatened Species Management Plan~~** *Appendix D, Updated threatened species management plan of the Amendment Report)* will be reviewed and updated as required during detailed design and prior to ~~operation~~ *construction*. The purpose of the review will be to address any detailed design and/or construction refinements and to comply with relevant project approval requirements. The Plan will operate in conjunction with the Flora and Fauna Management Plan.	Contractor	Detailed design and prior to ~~operation~~ construction
Removal of threatened flora	FF13	A *Rusty Plum* Salvage and Re-establishment Plan ~~for southern swamp orchid individual(s) and rusty plum~~ will be prepared prior to construction, outlining detailed procedures for the preparation of the re-establishment and receiving sites, plant movement, pre- and post- care of target individuals as well as detailing the objectives, monitoring procedures and contingency measures.	TfNSW	Prior to construction
Removal of threatened species habitat	FF14	*Threatened species habitat will not be cleared for the purposes of ancillary facilities. These areas will be identified, and limits of clearing delineated before*	*Contractor*	*Prior to construction*

Impact	ID No.	Environmental management measure	Responsibility	Timing
		construction in accordance with FF09.		
Fragmentation of identified biodiversity links and habitat corridors	FF15	Fauna connectivity structures will be designed and constructed to facilitate safe fauna passage across the project in accordance with the locations and design principles detailed in ~~**Appendix H, Biodiversity assessment report**~~ *Appendix D, Updated threatened species management plan of the Amendment Report.*	Contractor	Detailed design and during construction

Fauna connectivity measures

There would be no change to the fauna connectivity strategy outlined in the EIS because of the proposed design and construction changes, however there are some changes to the location and dimensions of some connectivity structures which are described below.

Target species

Appendix C, Updated biodiversity assessment report has identified impacts on the following threatened fauna species associated with habitat fragmentation:

- Koala
- Spotted-tailed quoll
- Giant barred frog
- Pale-vented bush hen
- Common planigale.

In addition to threatened species known to be impacted by habitat fragmentation as a result of the project, requirements for fish passage have also been considered during the design development. In accordance with the DPIE guidelines, fish passage would be required on all Class 1, 2 and 3 waterways.

Overview of connectivity structures

A range of fauna connectivity structures for the project were outlined in the EIS. Fauna connectivity structures proposed for the project include:

- **Retained ridgelines over tunnels** which maintain the native vegetation at Roberts Hill and Gatelys Road providing a connection for fauna over the road infrastructure during construction and operation. The ridgeline at Shephards Lane would likely maintain its existing land use providing low value opportunistic fauna crossing
- **Glider poles** provide a connection for fauna over the road infrastructure

- **Dedicated underpass structures** constructed of culverts which pass underneath the road infrastructure, providing a direct connection
- **Combined underpass structures** where culverts or bridge structures contain specific design elements to enhance their attractiveness to the target fauna species. These structures are combined with drainage or road overpass structures, such as drainage culverts, waterway bridges, or road and rail bridge structures.

These structures and the road corridor would be designed to include fauna fencing to encourage movement of the target species towards the structures and exclude native fauna from the road infrastructure. Revegetation works within the road corridor would also be required to connect entry/exit points of the connectivity structures to retained native vegetation and ecological corridors on either side of the alignment.

Changes to fauna connectivity structures are outlined in **Table 5.4-14.** A full list of fauna connectivity structures is included in **Appendix D, Updated threatened species management plan**.

The fauna connectivity structure at site 1 would change compared to the EIS because a new fauna underpass would be built 10 metres north of the existing underpass to accommodate lowering of the vertical alignment of the mainline through Englands Road interchange. Fauna connectivity structures at sites 2 and 6 have changed because of updated flood modelling which is described further is **Section 5.10, Flooding and hydrology.** The fauna connectivity structure at site 16 would change as a result of the proposed Pine Brush Creek and Williams Creek realignment design change.

Table 5.4-14 Changes to fauna connectivity structures

Site No.	Design chainage	Connectivity structure type	Description, indicative dimensions and target species EIS	Description, indicative dimensions and target species amended design
1	10160	Dedicated fauna underpass Glider poles	Extension of existing arch structure under the Pacific Highway (2.8 m high, 5.5 m wide at base, length 83 m). Structure to be retained and extended, with new fauna furniture to be retrofitted and extended through new structure. Target species: koala, spotted-tail quoll, gliders	Existing fauna underpass under the Pacific Highway would be demolished and a new fauna underpass would be built 10 m north of the existing underpass. The new fauna crossing would be built before the existing underpass is demolished. Underpass dimensions to match existing (2.7 m high and 5.5 m wide at base). Length about 80 m. Target species: koala, spotted-tail quoll, common planigale, gliders
2	11100	Combined fauna and drainage underpass	Culvert crossing across unnamed tributary of Newports Creek (Class 2 waterway) (three 3 m wide x 2.7 m high culverts about 75 m long).	Culvert crossing across unnamed tributary of Newports Creek (Class 2 waterway), dimensions changed to five 2.7 m wide x 1.5 m high culverts and one

Site No.	Design chainage	Connectivity structure type	Description, indicative dimensions and target species EIS	Description, indicative dimensions and target species amended design
			Target species: koala, spotted-tail quoll, giant barred frog, fish.	3 m wide x 3 m high culvert and about 90 m long. Target species: koala, spotted-tail quoll, giant barred frog, fish.
6	12400	Combined fauna and drainage underpass	Bridge crossing across unnamed tributary of Newports Creek (Class 2 waterway) (66 m long and x 24 m wide). Target species: koala, spotted-tail quoll, giant barred frog, pale-vented bush hen, fish.	Bridge changed to culvert crossing across unnamed tributary of Newports Creek (Class 2 waterway) (six 2.4 m x 2.4 m culverts about 45 m long). Target species: koala, spotted-tail quoll, giant barred frog, pale-vented bush hen, fish.
16	22450	Combined waterway bridge incorporated fauna underpass	Bridge crossing across Pine Brush Creek (Class 1) (60 m length x 32 m width). Target species: koala, spotted-tail quoll, pale-vented bush hen, giant barred frog.	Bridge length reduced because of the Pine Brush Creek and Williams Creek realignment design change. Bridge crossing across Pine Brush Creek (Class 1) (37 m length x 32 m width). Target species: koala, spotted-tail quoll, pale-vented bush hen, giant barred frog.

5.4.6 Impact and mitigation summary

The identification of impacts on biodiversity and measures to avoid and mitigate these impacts has been completed in accordance with the FBA, the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoEE 2013) and the Environmental Offsets Policy (Department of Sustainability, Environment, Water, Population and Communities 2012). During the development of the design, measures have been taken to avoid and minimise impacts on threatened species and vegetation communities, with additional commitments made during detailed design, construction and operational phases to further minimise impacts. Details on the mitigation measures for threatened species are provided in **Appendix D, Updated threatened species management plan**.

Following the application of measures to avoid and minimise impacts on biodiversity, the impact assessment in this chapter has identified some residual impacts that would require biodiversity offsets. Applying the FBA, residual impacts to State-listed matters include:

- Ten PCTs
- Rusty plum

- Scrub turpentine
- Coastal petaltail dragonfly
- Giant barred frog
- Koala
- Pale-vented bush-hen
- Southern myotis
- Common planigale.

Using the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoEE 2013), significant residual impacts to MNES include:

- Loss of habitat for koala
- Loss of habitat for giant barred frog.

The biodiversity offset requirements for these residual impacts have been calculated in accordance with the requirements of the FBA.

5.4.7 Biodiversity offset requirements

Framework for Biodiversity Assessment

The offset assessment followed the methodology outlined in the FBA (OEH 2014a). Under the FBA, biodiversity offsets are required to address impacts on biodiversity resulting from the project. A summary of credits required for the project is provided in **Table 5.4-15** and **Table 5.4-16**. All residual impacts of the project would be offset in accordance with the FBA.

Due to the listing of scrub turpentine after the introduction of the BC Act, calculation of offset requirements under the FBA cannot be directly undertaken. Offsetting of impacts may be achieved through direct offsets or by undertaking supplementary measures as negotiated by TfNSW and the EESG, DPIE. Supplementary measures would be targeted towards research into matters such as gaining a better understanding of the myrtle rust pathogen and ways to combat its spread, and potentially treating infected plants.

A Biodiversity Offset Strategy (BOS) has been prepared and is included in **Appendix C, Updated biodiversity assessment report**. This BOS identifies the mechanism for delivery of offsets in accordance with the FBA, which has been endorsed by the Australian Government as part of the EPBC Act assessment bilateral agreement. The BOS establishes the process for identifying and securing offsets for the project.

Table 5.4-15 Species credit summary – EIS design compared to amended design

Scientific name	Common name	TS* offset multiplier	EIS		Amended design	
			Loss of habitat (ha) or individuals	Species credits required	Loss of habitat (ha) or individuals	Species credits required
Niemeyera whitei	Rusty plum	1.5	57 individuals	855	74 individuals	1,110

Scientific name	Common name	TS* offset multiplier	EIS		Amended design	
			Loss of habitat (ha) or individuals	Species credits required	Loss of habitat (ha) or individuals	Species credits required
Rhodamnia rubescens	Scrub turpentine	3	n/a	n/a	14 individuals	42 (BAM)
Petalura litorea	Coastal petaltail dragonfly	7.7	2.50	192	3.05	235
Planigale maculata	Common Planigale	2.6	-	-	7.94	206
Mixophyes iteratus	Giant barred frog	7.7	3.28	253	3.56	274
Phascolarctos cinereus	Koala	2.6	36.70	954	39.71	1032
Amaurornis moluccana	Pale-vented bush-hen	1.3	4.95	64	4.86	63
Myotis macropus	Southern myotis	2.2	15.10	332	15.19	334
TOTAL				**2,686**		**3,254**

*Threatened species

Table 5.4-16 Ecosystem credits summary

Veg Zone	PCT	Plant community type name	EIS		Amended design	
			Management zone area (ha)	Ecosystem credits required	Management zone area (ha)	Ecosystem credits required
1	1302	White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion	0.51	35	0.51	34
2	692	Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion	11.27	754	11.93	795
3	692	Blackbutt –Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion	3.39	136	4.15	167
5	695	Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion	6.26	438	6.19	431
6	692	Blackbutt – Tallowwood moist ferny open forest of the coastal ranges of the NSW North Coast Bioregion	0.74	36	1.25	61
8	1244	Sydney Blue Gum open forest on coastal foothills and escarpment of the North Coast	0.94	64	1.18	80
9	747	Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	2.48	149	3.64	217

Veg Zone	PCT	Plant community type name	EIS		Amended design	
			Management zone area (ha)	Ecosystem credits required	Management zone area (ha)	Ecosystem credits required
10	1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	0.89	61	0.97	67
11	1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	1.15	80	1.79	125
12	1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	1.23	79	1.25	80
13	695	Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion	0.15	11	0.38	28
14	695	Blackbutt – Turpentine – Tallowwood shrubby open forest of the coastal foothills of the central NSW North Coast Bioregion	4.07	167	3.84	156
15	1262	Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	0.73	43	0.71	42
16	1064	Paperbark swamp forest of the coastal lowlands of the NSW North Coast Bioregion and Sydney Basin Bioregion	0.38	27	0.4	28
17	1302	White Booyong – Fig subtropical rainforest of the NSW North Coast Bioregion	1.91	109	1.91	108

Veg Zone	PCT	Plant community type name	EIS		Amended design	
			Management zone area (ha)	Ecosystem credits required	Management zone area (ha)	Ecosystem credits required
100	1262	Tallowwood – Small-fruited Grey Gum dry grassy open forest of the foothills of the NSW North Coast	0.89	57	0.89	57
101	1285	Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	1.42	87	1.82	111
102	747	Brush Box – Tallowwood – Sydney Blue Gum tall moist forest of the ranges of the central NSW North Coast Bioregion	3.35	216	3.35	215
103	1285	Turpentine moist open forest of the coastal hills and ranges of the NSW North Coast Bioregion	1.61	97	1.68	101
104	780	Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	-	-	0.28	7
105	780	Coastal floodplain sedgelands, rushlands, and forblands of the North Coast	-	-	0.05	1
TOTAL			**43.37**	**2,646**	**48.17**	**2,911**

* PCT 1302 White Booyong - Fig subtropical rainforest of the NSW North Coast Bioregion has been used as a substitute for PCT 670 Black Booyong – Rosewood – Yellow Barabeen subtropical rainforest of the NSW North Coast Bioregion located in Veg Zone 1. This is due to the unavailability of this vegetation community in the BioBanking Calculator. This PCT has the same benchmark values, the same value for catchment management area per cent cleared and represents the same vegetation formation (Rainforest) and class (Subtropical Rainforest) as PCT 670. As such, the offsetting calculations would result in the same requirement and offsetting options, but with a different baseline PCT.

5.5 Urban design, landscape and visual amenity

5.5.1 Assessment methodology and approach

An urban design, landscape and visual amenity impact assessment was prepared as part of EIS (Chapter 11, Urban design, landscape and visual amenity). The supplementary assessment report is detailed in **Appendix E, Supplementary urban design, landscape character and visual impact assessment** and has been prepared in accordance with the SEARs to assess the potential impacts of the project, including the design and construction changes. The supplementary assessment only includes information that has changed since the EIS.

The methodology used to assess the landscape character impacts for the amended design is consistent with the methodology used for the EIS. The landscape character impact assessment for the amended design has been completed in line with the following steps:

- The changes associated with the amended design have been reviewed against the landscape character zone boundaries
- Where changes occur within a landscape character zone, the magnitude of change and impact assessed for the EIS has been reviewed and updated to reflect the design and construction changes
- The embedded mitigation developed as part of the urban design concepts has been updated to respond to the amended design.

The methodology used to assess visual impacts for the amended design is consistent with the methodology used for the EIS. The visual impact assessment for the amended design has been completed in line with the following steps:

- A visual envelope map for the amended design was generated to illustrate the theoretical area from which the amended design would be visible in the landscape
- The visual envelope map for the amended design was compared against the visual envelope map for the EIS as part of a quantitative analysis
- Where changes occurred to representative viewpoints, a qualitative analysis was carried out to determine whether further assessment was required
- Where changes were considered to be immaterial in the context of the project, such as small scale and localised earthwork changes, further analysis was not deemed necessary as it was not considered to alter the overall level of impact when compared with the impacts identified in the EIS
- Where changes had the potential to alter the overall level of impact for a representative viewpoint, further analysis was carried out.

The viewpoints for which further analysis was carried out are shown in **Table 5.5-1.** Further detail on the analysis is provided in **Appendix E, Supplementary urban design, landscape character and visual impact assessment**.

Table 5.5-1 Viewpoints for which further analysis was carried out

Viewpoint	Proposed design and construction change	Further analysis required
2 – Coachmans Close	Ancillary site 3F	Further analysis undertaken
3 – Luke Bowen footbridge	Kororo Public School bus interchange and Luke Bowen footbridge	Further analysis undertaken
6 – Charlesworth Bay Road	Korora Hill interchange and new ancillary site 3A	Further analysis undertaken
8 – Sealy Lookout	Coffs Creek flood mitigation	Further analysis undertaken
18 – Isles Drive commercial	Englands Road interchange	Further analysis undertaken
20 – Korora lookout	Kororo Public School bus interchange and Luke Bowen footbridge	Further analysis undertaken
21 – Coffs Coast Sports and Leisure	Englands Road interchange	Further analysis undertaken
23 – Fern Tree Place	Kororo Public School bus interchange and Luke Bowen footbridge	New viewpoint – analysis undertaken

5.5.2 Existing environment

Overall, the existing environment is described in Chapter 11, Urban design, landscape and visual amenity of the EIS and is still applicable to this assessment. However, an additional viewpoint, viewpoint 23, has been considered for the visual impact assessment as described below.

Existing views

Chapter 11, Urban design, landscape and visual amenity of the EIS, a total of 22 viewpoints were selected to illustrate the potential visual influence of the project. An additional viewpoint, viewpoint 23, was assessed at Fern Tree Place, to assess the visual impacts from the proposed design change at Kororo Public School bus interchange and Luke Bowen footbridge. The description of the setting, viewer type and sensitivity are shown in **Table 5.5-2.**

Table 5.5-2 Viewpoint 23

Viewpoint	Viewpoint photo	Description of the setting	Viewer type	Sensitivity
23	View from residential properties on Fern Tree Place looking north towards the Pacific highway and Kororo Public School 	The view is dominated by dense, mature vegetation enclosing the properties and limiting views towards the existing highway and Kororo Public School.	Residents	High

5.5.3 Assessment of potential impacts

Construction

Consistent with the EIS, the key construction activities that have the potential to result in landscape and visual impacts for the amended design include:

- Pre-construction and site establishment, including vegetation clearance, site establishment works, fencing and signage, and establishment of site compounds
- Bulk earthworks, including stripping and stockpiling of topsoil, excavation of cuttings and tunnels, drilling, blasting, establishment of crushing plants, haulage of materials from excavation and construction of fill embankments, including benching and stabilisation
- Bridge works, including establishment of batching plants, preparation of bridge works, construction of foundations, abutments, piers, etc.
- Construction of retaining walls and noise walls
- Demolition of bridges (Luke Bowen footbridge and northern carriageway bridge over Pine Brush Creek) and buildings
- Road work and road surfacing.

Landscape character

As outlined in the EIS, construction would be evident across the rural landscape. The EIS assessed the impact on landscape character during construction to be moderate to high. While additional ancillary sites have been proposed as part of the amended design, overall the amended design would not create additional construction impacts on the landscape character. The design changes would not create additional impacts because of the incremental change in construction activity compared to the EIS design and it is anticipated that the overall existing landscape would be retained. Accordingly, there would be no additional landscape impacts, beyond those identified in the EIS.

Visual impact

Consistent with the EIS, construction of the project would result in varying impacts along the length of the corridor (from negligible to high), influenced by the location and duration of the key construction activities. Impacts arising from the key construction activities are heightened where viewpoints are of moderate to high sensitivity and where a considerable change to the existing view is anticipated.

There would be additional vegetation clearing and construction movements close to viewpoints because of the amended design. This would occur during construction for the following design and construction changes:

- New ancillary site 3A and Korora Hill interchange
- New ancillary site 3F
- Kororo Public School bus interchange and Luke Bowen footbridge.

While there would be additional vegetation clearance and construction movements close to receivers because of the amended design, these changes would be minor and would not alter the overall level of impact identified in the EIS. Additionally, threatened species habitat would not be cleared for the purposes of ancillary facilities, as described in environmental management measure FF14. Refer to **Chapter 6, Revised environmental management measures** for further detail.

Further detail on the construction impacts to visual amenity is provided in **Appendix E, Supplementary urban design, landscape character and visual impact assessment.** The supplementary assessment includes viewpoints with proposed embedded mitigation and artistic impressions of the design changes to illustrate how the project has responded to the visual impacts through the use of urban design and landscaping.

Operation

Landscape character

The EIS assessed impact on the landscape character across the different landscape character zones during operation of the project, as identified in Chapter 11, Urban design, landscape and visual amenity of the EIS. The proposed design changes would not create additional impacts on landscape character, beyond those identified in the EIS. Assessment of impacts on landscape character for the amended design is provided in **Appendix E, Supplementary urban design, landscape character and visual impact assessment**.

Visual impact

The visual impact of the amended design from the eight viewpoints identified in **Table 5.5-1** is described in **Table 5.5-3.** Detailed analysis is provided in Section 3.3 of **Appendix E, Supplementary urban design, landscape character and visual impact assessment.**

Consistent with the EIS, some of the viewpoints assessed for the amended design would experience a moderate to high impact and some would experience a high impact because of the removal of existing mature vegetation. These impacts would mostly be mitigated through the landscape planting proposed for the project and would continually reduce over time as vegetation matures.

The amended design would generally result in some changes to the visual impact, but the overall level of visual impact would remain consistent with the EIS. For example, the proposed design change at Englands Road interchange would result in a lowered alignment. This would result in a decrease in visibility towards the project at viewpoints 18 and 21. However the project would still be visible and would still result in a moderate and high-moderate impact on visual amenity from those two viewpoints, consistent with the EIS.

Similarly, the proposed design change for Coffs Creek flood mitigation would result in an increased project footprint being visible from viewpoint 8. However, the project would still result in a high impact on visual amenity from that viewpoint, consistent with the EIS.

Proposed embedded design mitigation at each viewpoint for the amended design is consistent with the EIS. For new viewpoint 23 – Fern Tree Place, the embedded design mitigation includes:

- Planting to screen views towards the Kororo Public School bus interchange and retaining walls, reinstating the mature tree canopy
- Urban corridor planting mix incorporated within the Kororo Public School bus interchange design to assist with filtering views towards the amended design
- Sensitive design of the retaining walls, including a dark pigment and texturing that would assist with the walls receding amongst the vegetation.

The EIS included indicative photomontages with the project and embedded design mitigation in place for representative viewpoints with the potential to be visually affected by some element of the project. These viewpoints were selected to illustrate a range of receiver types, a range of view types, a range of viewing distances and key or protected areas.

Photomontages for the viewpoints potentially affected by the amended design have been updated to show how the visibility of the project would change compared with the EIS design, refer to **Figure 5.5-1** to **Figure 5.5-6.** To illustrate the change in visibility at each viewpoint, an increase in visibility of the project is shaded orange and a decrease in visibility of the project is shaded blue.

In addition to the updated photomontages, a new photomontage has been developed for viewpoint 23 to illustrate the potential changes from the Kororo Public School bus interchange design change and is shown in **Figure 5.5-7** and **Figure 5.5-8.**

The proposed landscaping included within the embedded design mitigation would establish over time, with pioneer species establishing more quickly compared to hardwood species. For the purposes of the photomontages, it is assumed vegetation would reach a suitable level of maturity within about 10 years with tree heights indicatively illustrated to range between five to 15 metres.

Table 5.5-3 Visual impact from viewpoints

Viewpoint	Sensitivity	EIS design		Proposed design or construction change	Amended design	
		Magnitude of change	Impact		Magnitude of change	Impact
2 Coachmans Close	**Moderate**	**High** The project would bring the existing road closer to the residences on Coachmans Close and the increased height of the noise wall would further block views.	**Moderate-High***	Ancillary site 3F	**High** New ancillary site 3F would result in the expansion of the construction footprint with the additional ancillary site located to the south of this view. It is anticipated the vegetation within the ancillary site would be retained where possible, however for the purposes of the assessment, the worst-case scenario of vegetation clearance has been assumed.	**Moderate-High**
3 Luke Bowen footbridge	**Moderate**	**Low** The width of the indicative road corridor would increase to allow for the introduction of the service road and would result in vegetation removal. Luke Bowen footbridge would be replaced and relocated about 225 m to the north.	**Low-Moderate**	Kororo Public School bus interchange and Luke Bowen footbridge	**Low** The amended design would result in the following changes to this viewpoint: • Relocation of the proposed Luke Bowen footbridge closer to its current alignment • The design of Luke Bowen footbridge would consist of an arched structure • Reconfiguration of the Kororo Public School bus interchange with access provided from the service road instead of James Small Drive.	**Low-Moderate**

Viewpoint	Sensitivity	EIS design		Proposed design or construction change	Amended design	
		Magnitude of change	Impact		Magnitude of change	Impact
6 Charlesworth Bay Road	**Moderate**	**High** The removal of existing vegetation would open views towards the project and the Korora Hill interchange. The interchanges would be upgraded to include a roundabout connection to James Small Drive, on and off ramps, a connection to Bruxner Park Road and introduction of four bridge structures. Lighting would be added to the interchange.	**Moderate-High**	Korora Hill interchange and ancillary site 3A	**High** The amended design would result in the following changes to this viewpoint: • Decrease in visibility towards the project as a result of the consolidated Korora Hill interchange and associated alignment works • The expansion of the construction footprint and the addition of construction ancillary site 3A to the north west of the view. It is anticipated the vegetation within the ancillary site would be retained where possible • New signalised intersection at Charlesworth Bay Road.	**Moderate-High**
8 Sealy Lookout	**High**	**High** Removal of existing vegetation, introduction of earthworks for Roberts Hill tunnel approach. Views towards the southern edge of Coramba Road interchange, including lighting columns and introduction of vehicles and infrastructure within the rural edge of Coffs Harbour basin.	**High**	Coffs Creek flood mitigation	**High** The amended design would result in a minor increase in visibility towards the project because of changes to earthworks for the additional flood mitigation.	**High**

Viewpoint	Sensitivity	EIS design		Proposed design or construction change	Amended design	
		Magnitude of change	Impact		Magnitude of change	Impact
18 Isles Drive commercial	**Low**	**Moderate*** Commercial/industrial environment, removal of vegetation would not result in a large-scale change	**Moderate**	Englands Road interchange	**Moderate** The amended design would result in the following changes to this viewpoint: • Lowering of the alignment • The expansion of the construction footprint and introduction of an ancillary site. It is anticipated vegetation within the ancillary site would be retained where possible.	**Moderate**
20 Korora lookout	**High**	**Moderate** The removal of existing vegetation, introduction of Korora Hill interchange entry ramp, service road, a new Luke Bowen footbridge, local access road and associated earthworks for the project would result in a change to the scenic nature of this view. Existing road infrastructure is currently visible from this location.	**High-Moderate**	Kororo Public School bus interchange and Luke Bowen footbridge	**Moderate** The amended design would result in the following changes to this viewpoint: • Expansion of Kororo Public school bus interchange. • Luke Bowen footbridge arch would be visible partially filtered by existing vegetation.	**High - Moderate**

Viewpoint	Sensitivity	EIS design		Proposed design or construction change	Amended design	
		Magnitude of change	Impact		Magnitude of change	Impact
21 Coffs Coast Sports and Leisure	**Moderate**	**Moderate** The widening of the existing Pacific Highway, introduction of entry and exit ramps and a series of bridge structures beyond the sports fields.	**Moderate**	Englands Road interchange	**Moderate** The amended design would result in reduced project footprint to the north of Englands Road interchange.	**Moderate**
23 Fern Tree Place	**High**	Not assessed in EIS	Not assessed	Kororo Public School bus interchange and Luke Bowen footbridge	**Negligible** Vegetation would be removed to the north of this view to facilitate the construction of the bus interchange. It is anticipated that the mature trees and understorey vegetation to the southern edge (immediately adjacent to the residential properties), would be retained, heavily filtering views towards the amended design from this location.	**High**

*Incorrectly reported as high in the EIS.

Figure 5.5-1 Viewpoint 8 showing the change in visibility of the project from the EIS

Figure 5.5-2 Viewpoint 8 showing the amended design with embedded mitigation

Figure 5.5-3 Viewpoint 20 showing the change in visibility of the project from the EIS

Figure 5.5-4 Viewpoint 20 showing the amended design with embedded mitigation

Figure 5.5-5 Viewpoint 21 showing the change in visibility of the project from the EIS

Figure 5.5-6 Viewpoint 21 showing the amended design with embedded mitigation

Figure 5.5-7 Viewpoint 23 showing the extent of the project from the EIS

Figure 5.5-8 Viewpoint 23 showing the amended design with embedded mitigation

Overshadowing

The EIS assessed overshadowing based on the winter solstice (21 June), the day with the shortest amount of daylight during the year. This is considered the worst-case scenario with regards to potential overshadowing impacts and it is anticipated that some of the impacts would be less than the impacts described below. When assessing overshadowing for the proposed design changes at most viewpoints, impacts would be consistent with those stated in the EIS.

Results of the overshadowing assessment for the amended design considered impacts from noise walls, earthworks and structures such as retaining walls and bridges associated with the proposed design changes. Potential changes in overshadowing because of the proposed design changes, compared with the EIS assessment, are outlined below:

- Changes to the horizontal alignment at Englands Road interchange results in the alignment moving slightly west, resulting in overshadowing beyond the construction footprint adjacent to the new water quality basin at Chainage 11250. This would result in a decreased impact compared to the EIS. The proposed design change at Englands Road interchange would also result in the removal of the overshadowing reported in the EIS that extends to the commercial car park
- The proposed design change at North Boambee Valley vertical alignment would result in a slight reduction in overshadowing beyond the construction footprint compared to the EIS. This would be because of the lowering of the alignment, removal of earth mounds and a change in position of noise walls to be closer to the main alignment
- The proposed design change at Kororo Public School bus interchange and Luke Bowen footbridge would result in overshadowing extending from the retaining wall on the eastern edge of the bus interchange to properties situated on Fern Tree Place. However, the extent of overshadowing would be comparable to the existing vegetation retained to the east of the retaining wall. As such, the retaining wall would not introduce overshadowing beyond what is currently experienced because of the existing vegetation.

Further detail on the overshadowing assessment can be found in Appendix B of **Appendix E, Supplementary urban design, landscape character and visual impact assessment**.

Coastal views

Coastal views were reassessed for properties that experience views of the ocean. Impacts arising from the proposed design changes would be largely consistent with impacts associated with the EIS.

Property 102 is located about 350 metres west of the project, opposite the Kororo Public School bus interchange. The property would see a change in coastal views compared to the impacts described in the EIS. The proposed design change at Korora Hill interchange would result in an altered vertical alignment, increasing the height of the project. Note the EIS design resulted in an increase in coastal views for Property 102 when compared with existing views from the property. While the amended design indicates a reduction in coastal views compared with the EIS, when compared with existing coastal views, the amended design would result in coastal views consistent with existing views from the property.

There would be no other change in impact to coastal views as a result of the amended design, beyond those identified above and in the EIS.

Glare and reflection

There would be no changes to the impacts of glare and reflection as a result of the proposed design and construction changes compared to the project outlined in the EIS.

5.5.4 Revised environmental management measures

The management measures presented within the EIS to address urban design, landscape and visual amenity impacts have been reviewed in consideration of the identified design and construction changes. Minor amendments have been made to the management measures and are shown in italics for new text and as strikethrough for deletions in **Table 5.5-4**. Other management measures provided in the EIS are still considered to be suitable for the project and are provided in **Chapter 6, Revised environmental management measures** for completeness.

Table 5.5-4 Revised environmental management measures

Impact	ID No.	Environmental management measure	Responsibility	Timing
Visual impacts at Fern Tree Place	*UD08*	*An arborist will be engaged to determine whether trees within the construction footprint could be trimmed rather than cleared for the construction of the Kororo Public School bus interchange adjacent Fern Tree Close. Any trimming will be carried out by or under direction of the arborist. Retained trees will be protected to ensure construction does not detrimentally affect tree health.*	*Contractor*	*During construction*
	UD09	*Consultation with Fern Tree Place property owners located adjacent to the Kororo Public School bus interchange will be carried out prior to construction to determine whether additional tree planting beyond the indicative road corridor could be undertaken to assist in screening impacts.*	*TfNSW/ Contractor*	*Prior to construction*

5.6 Land use and property

5.6.1 Assessment methodology and approach

A land use and property assessment was prepared as part of the EIS (Chapter 12, Land use and property). The assessment has been updated to assess the potential impacts of the amended design and has been prepared in accordance with the SEARs. Of note, the study area remains the same as that assessed in the EIS. A supplement to Appendix K1 of the EIS has been prepared to document the potential change in property and land use impacts associated with the design and construction changes and is located in **Appendix F, Supplementary property impacts**.

5.6.2 Existing environment

The existing environment is described in Chapter 12, Land use and property of the EIS and is still applicable to this assessment.

5.6.3 Assessment of potential impacts

A summary of the impacts associated with the proposed design and construction changes is provided below. Consistent with the approach in the EIS, this section considers impacts associated with property and land use during construction and operation.

As a result of the proposed design changes, the construction footprint would extend into properties which have previously been acquired by TfNSW. These impacts were previously reported in the EIS and as such, have not been reported. The affected property owners (APOs) which this change relates to are APOs 14, 16, 17, 18, 35, 36, 40, 46, 48, 61, 80, 98 and 101. This includes the land required for the proposed new and revised ancillary sites 1C, 1J and 3D.

Land use

A corridor zoned SP2 Infrastructure was reserved for the project in the Coffs Harbour Local Environment Plan (LEP) 2013. Land within this corridor has been assessed as part of the broader strategic planning process for the Coffs Harbour LEP 2013. For land outside of the SP2 Infrastructure zone, the construction of the project would result in minor impacts to existing land uses as described below. Overall, the proposed design changes would have a negligible impact on land use compared to the EIS.

Residential

A number of dwellings and rural residential properties located within the construction footprint would be impacted.

The proposed design change for the Coffs Creek flood mitigation would result in a decrease of about 1.8 hectares of rural residential land within the construction footprint. Other proposed design changes would result in increases to the area of residential land uses within the footprint. Overall, the proposed design changes would result in a decrease of about 1.2 hectares of residential land uses within the construction footprint of the project compared to the EIS.

Commercial and industrial

The proposed construction changes, namely ancillary sites 1A and 1C, would result in an increase in the area of commercial use land needed for the project. The changes would impact an additional 3.2 hectares of commercial land uses compared to the EIS.

As described in **Chapter 3, Construction updates** ancillary site 1A is located within the Coffs Coast Resource Recovery Park and would require about 2.84 hectares of land to be leased to TfNSW for the purposes of ancillary activities. The impacts to the business are discussed further in **Section 5.8, Socio-economic**.

As discussed in Chapter 12, Land use and property of the EIS, once construction has finished, ancillary sites owned by TfNSW (ie ancillary site 1C) would no longer be required and would be disposed of with no change to current land use. As such, impacts to the existing land use because of ancillary site 1C are considered to be short-term only.

The proposed design change at Englands Road interchange would result in an overall decrease in impacts of about 0.43 hectares to commercial land uses. This is because of the decreased permanent impact to the Coffs Coast Resource Recovery Park. The total permanent impact would be about 2.92 hectares.

Extensive agriculture

The proposed design change at Englands Road interchange would result in an increased impact of about 0.33 hectares to the extensive agriculture land use, compared to the project outlined in the EIS.

The proposed new ancillary site 3A would have an increased impact of about 8.73 hectares to the extensive agriculture land use. This property would be leased from the current owner and would be a temporary impact to the existing land use.

Irrigated plants

The proposed design change for the Coffs Creek flood mitigation would result in an increased impact of about 0.95 hectares to the irrigated plants land use. Additionally, there would be an increased temporary impact of about 0.83 hectares because of the proposed construction sediment basins at Chainage 16650 (0.33 hectares) and Chainage 21800 (0.50 hectares).

Native vegetation

The proposed construction sediment basin at Chainage 16100 would result in an increased temporary impact of about 0.53 hectares to the native vegetation land use. Additionally, there would be an increased impact of about 0.44 hectares to the native vegetation land use because of the proposed design change at Kororo Public School bus interchange and Luke Bowen footbridge.

While there are a number of individual land uses which would be impacted by the project during construction, generally the functions and use of land across the study area would be maintained.

Land use zoning

Most of the construction footprint (194.2 hectares or 64.4 per cent of land) is located within land zoned SP2 Infrastructure. The change in impact to land use zoning when compared to the project outlined in the EIS is shown in **Table 5.6-1**.

Table 5.6-1 Change in impact on land use zoning

LEP Zoning	EIS impact	Amended design impact
E2 Environmental Conservation	The construction footprint would directly impact around 8 ha of land zoned E2 Environmental Conservation.	The proposed design changes would result in an overall decreased impact of about 0.5 ha to the E2 Environmental Conservation zone compared to the EIS, resulting in a 7.5 ha direct impact to land zoned E2 Environmental Conservation. The most significant change is a 0.6 ha decrease in impacts compared to the EIS due to the proposed Korora Hill interchange. The proposed new ancillary site 3A would result in an increase in impacts of about 0.2 ha to the E2 Environmental Conservation zone. This impact would be temporary and would only be used during construction.
IN1 General Industrial	The construction footprint would impact around 3 ha of land zoned IN1 General Industrial.	Proposed new ancillary site 1C would result in an increased temporary impact of 0.1 ha to the IN1 General Industrial zone.
R2 Low Density Residential	The construction footprint would impact about 13 ha of land zoned R2 Low Density Residential. Of this, 7 ha would be used as an ancillary site	The proposed Kororo Public School bus interchange and Luke Bowen footbridge design change would result in an increased impact of about 0.3 ha to land zoned R2 Low Density Residential.
R5 Large Lot Residential	The construction footprint would impact on around 5 ha of land zoned R5 Large Lot Residential, including land required for ancillary sites.	The proposed design change due to the Pine Brush Creek and Williams Creek realignment would result in an increased impact of about 0.1 ha to land zoned R5 Large Lot Residential.
RU2 Rural Landscape	The construction of the project would impact on 53 ha of land zoned RU2 Rural Landscape. This includes ancillary sites totalling of about 6 ha.	The proposed design and construction changes would result in an increased impact of about 0.4 ha to land zoned RU2 Rural Landscape, resulting in a 53.4 ha direct impact to land zoned RU2 Rural Landscape. The largest change would be as a result of the proposed construction sediment control basins. The basins would result in an increase in impacts of 1.54 ha.
B6 Enterprise Corridor	The construction footprint would impact about 0.65 ha of	The proposed design change at Englands Road interchange would result in an increased impact of about 0.05 ha to land

LEP Zoning	EIS impact	Amended design impact
	land zoned B6 Enterprise Corridor.	zoned B6 Enterprise Corridor, resulting in a 0.70 ha direct impact to land zoned B6 Enterprise Corridor.
IN3 Heavy Industrial	The construction footprint would impact about 11.50 ha of land zoned IN3 Heavy Industrial.	Proposed new ancillary site 1A would result in an increased temporary impact of 2.84 ha to the IN3 Heavy Industrial zone.
R1 General Residential	The construction footprint would impact about 0.14 ha of land zoned R1 General Residential.	Proposed new ancillary site 3A would result in an increased temporary impact of 7.7 ha to the R1 General Residential zone.
RE1 Public Recreation	The construction footprint would impact about 1.25 ha of land zoned RE1 Public Recreation.	The proposed design change at Englands Road interchange would result in an increased impact of 0.15 ha to land zoned RE1 Public Recreation, resulting in a 1.4 ha direct impact to land zoned RE1 Public Recreation. The proposed new ancillary site 3F would result in an increase in impacts of about 0.3 ha to the RE1 Public Recreation zone. This impact would be temporary and would only be used during construction.
RE2 Private Recreation	The construction footprint would impact about 2.66 ha of land zoned RE2 Private Recreation.	The proposed design change at Korora Hill interchange would result in an increased impact of 0.3 ha to land zoned RE2 Private Recreation, resulting in a 2.93 ha direct impact to land zoned RE2 Private Recreation. The proposed new ancillary site 3A would result in an increase in impacts of about 0.7 ha to the RE2 Private Recreation. This impact would be temporary and would only be used during construction.

Future development

As identified in the EIS, the project would impact on land included within a number of growth, infill or renewal areas. A summary of the change in impacts when compared to the project outlined in the EIS is shown in **Table 5.6-2**. While there would be an overall increase in impacts, these impacts are considered to be minimal and the project would not result in any significant land take on any one growth, infill or renewal land area.

Table 5.6-2 Impact on growth, infill or renewal areas compared to the EIS.

Growth, infill or renewal area	EIS impact	Impact of proposed design and construction changes	Change in impact
South Coffs Urban Release Area (URA).	About one per cent of land directly impacted. Access to the South Coffs URA, and Elements Estate specifically, would not be impacted by the project.be impacted by the project.	Around 1.6 per cent of land directly impacted. Access to the South Coffs URA, and Elements Estate specifically, would not be impacted by the project.	Increase by 0.6 per cent in impact as a result of the proposed Englands Road interchange design change.
West Coffs Investigation Area	Around 15 per cent of land impacted during construction of the project.	Around 18 per cent of land impacted during construction of the project.	Increase of around three per cent as a result of the proposed basin at Chainage 16100 and the proposed Coffs Creek flood mitigation design change.

Property

As outlined in the EIS, the main property impacts would occur where land is required for the construction of the project. A large portion of the land required is already owned by TfNSW and was acquired in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Information Guide (Roads and Maritime Services 2014a).

Where privately owned land would be required for the project (and has not yet been acquired by TfNSW), discussions are being held with the affected property owners regarding the purchase, lease or licence of the land. All property boundary adjustments would continue to the be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Information Guide (Roads and Maritime Services 2014a).

The majority of acquisitions are subject to ongoing negotiations and impacted areas described below and in the EIS may change as a result of negotiations.

The proposed design and construction changes would result in an overall increased impact to property compared to the project described in the EIS. The proposed new and revised ancillary sites would result in an increased temporary impact to property, however this impact would only be during construction. The impact to properties as a result of the proposed design changes is shown in **Appendix F, Supplementary property impacts**. Of note, no properties additional to those outlined in the EIS would be acquired as a result of the proposed design and construction changes.

The three properties required for the new ancillary sites 1A and 3A, and the construction sediment basin at Chainage 16650 are proposed to be leased by TfNSW and returned to their existing condition following construction unless otherwise agreed by the property owner. As described, these impacts to property would be temporary. The properties to be leased by TfNSW are at APO 4, APO 50 and APO 79.

The amended design would result in an adjustment to the boundary at Mackays Road. This is to allow the conversion of an existing right of carriageway to a public road. The boundary change would not result in any physical changes, rather is to capture the change in ownership to a public road. The intended land use during operation of the project with this boundary adjustment is consistent with the EIS as it would be used to maintain access to properties which are accessed via Mackays Road. Notwithstanding, further consultation would be required with CHCC during detailed design about the application of the local road geometrical standards for Mackays Road provided as part of the EIS submission.

In addition to impacts on residential properties, the proposed design changes would also result in an additional impact to two agricultural properties. This is discussed further in **Section 5.7, Agriculture.**

A number of business and industry properties would be impacted during construction of the project, including the Coffs Coast Resource Recovery Park. The impacts related to business and industry properties are discussed in **Section 5.8, Socio-economic.** Of note, the property impacts to the CHCC owned Coffs Coast Resource Recovery Park would decrease compared to the impacts described in the EIS.

Utilities

The proposed design changes would have no change to the impact on utilities as identified in the EIS.

5.6.4 Summary of potential impacts

A summary of the potential land use and property impacts associated with the amended design is provided below which draws on the above assessment of the proposed design and construction changes and impacts described in Chapter 12, Land use and property of the EIS. Any impacts on wider socio-economic factors are discussed in **Section 5.8, Socio-economic**.

Land use

A corridor zoned SP2 Infrastructure was reserved for the project in the Coffs Harbour LEP. Land within this corridor has been assessed as part of the broader strategic planning process for the Coffs Harbour LEP. For land outside of the SP2 Infrastructure zone, the construction of the project would result in minor impacts to existing land uses. This would include impacts to land uses including residential, commercial and industrial, extensive agriculture, irrigated plants and native vegetation.

While there are a number of individual land uses which would be impacted by the project during construction, generally the functions and use of land across the study area would be maintained.

Land use zoning

Most of the construction footprint (194.2 hectares or 64.4 per cent of land) is located within land zoned SP2 Infrastructure. The project is entirely aligned with the intent of this zone. Any potential impacts as a result of zoning the land SP2 Infrastructure, including land use impacts, would have been assessed as a part of the CHCC's broader planning process for the Coffs Harbour LEP.

Outside of the SP2 Infrastructure zone, only a small area of land within each zone would be impacted by the project. The main impacts to land use zones include:

- RU2 Rural Landscape (around 53 hectares)
- IN3 Heavy Industrial (around 15 hectares)
- R2 Low Density Residential (around 13 hectares)
- E2 Environmental Conservation (around seven hectares).

As described in **Table 5.6-1**, the project would also result in a minor impact to zones R5 Large Lot Residential, IN1 General Industrial, B6 Enterprise Corridor, R1 General Residential, RE1 Public Recreation and RE2 Recreation. The total area of each zone impacted is linear and fragmented across the construction footprint.

Any impacts to land use zoning would be minimal and the loss of these areas would not compromise each zone's objectives. Land within the construction footprint used for ancillary sites during construction would be disposed of by TfNSW once the project is operational without change to zoning.

Future development

The project would impact on land included within a number of growth, infill or renewal areas. Given the linear nature of the project, only a small portion of land within growth, infill or renewal areas would be impacted by the project. The project's impacts are considered to be minimal and would not result in any significant land take on any one growth, infill or renewal area. In several instances, the direct impacts are only required for ancillary sites, and land would be available for future use in line with the future growth, infill or renewal requirements.

Property

A total of 151 properties would be impacted by the project, including 90 partial acquisitions and 61 total acquisitions. Three properties have been identified for temporary lease during construction, two of which are located on properties which will be partially acquired. In addition to impacts on residential properties, the project would also impact several agricultural properties which would need to be partially or fully acquired as part of the project. This is discussed further in **Section 5.7, Agriculture** and Chapter 13, Agriculture of the EIS.

A number of business and industry properties would be impacted during construction of the project including Coffs Coast Resource Recovery Park, Oz Group Packhouse at Isles Drive, Sapphire Motel, Paradise Palms Resort and other privately-owned land. In addition to the properties affected by surface activities, subsurface acquisition would be required around the tunnels.

Property acquisition will be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991* and the Land Acquisition Information Guide (Roads and Maritime Services 2014a).

Utilities

The construction phase of the project would involve the adjustment and/or relocation of utilities including electrical, sewer, water and telecommunications. Where possible, all utility adjustments and/or relocations would be contained within the construction footprint and impacts to land use and property would be minimised.

5.6.5 Revised environmental management measures

The management measures presented within the EIS to address land use and property impacts have been reviewed in consideration of the identified design and construction changes. The management measures provided in the EIS are still considered to be suitable and accurate for the project and are provided in **Chapter 6, Revised environmental management measures** for completeness.

5.7 Agriculture

5.7.1 Assessment methodology and approach

An agriculture assessment was prepared as part of the EIS (Chapter 13, Agriculture). A supplementary agriculture assessment has been prepared in accordance with the SEARs to assess the potential impacts to agriculture associated with the proposed design and construction changes. The supplementary assessment included a review of Appendix K2, Agricultural assessment of the EIS and a qualitative assessment to identify potential changes in impacts associated with the proposed design and construction changes.

5.7.2 Existing environment

The existing environment is described in Chapter 13, Agriculture of the EIS and is still applicable to this assessment.

5.7.3 Assessment of potential impacts

The proposed construction and design changes were reviewed against the impact assessment criteria developed as part of the EIS and detailed below:

- Direct – an assessment of the impacts on properties that fall wholly or partially within the construction footprint
- Indirect – an assessment of potential impacts on properties outside the construction footprint, but within the 500 metre buffer
- Panama disease – consideration of the potential to spread the pathogen and impact on industry
- Microclimate – consideration of the potential to impact the existing microclimate
- Industry – a qualitative assessment of impacts to the blueberry and banana industries.

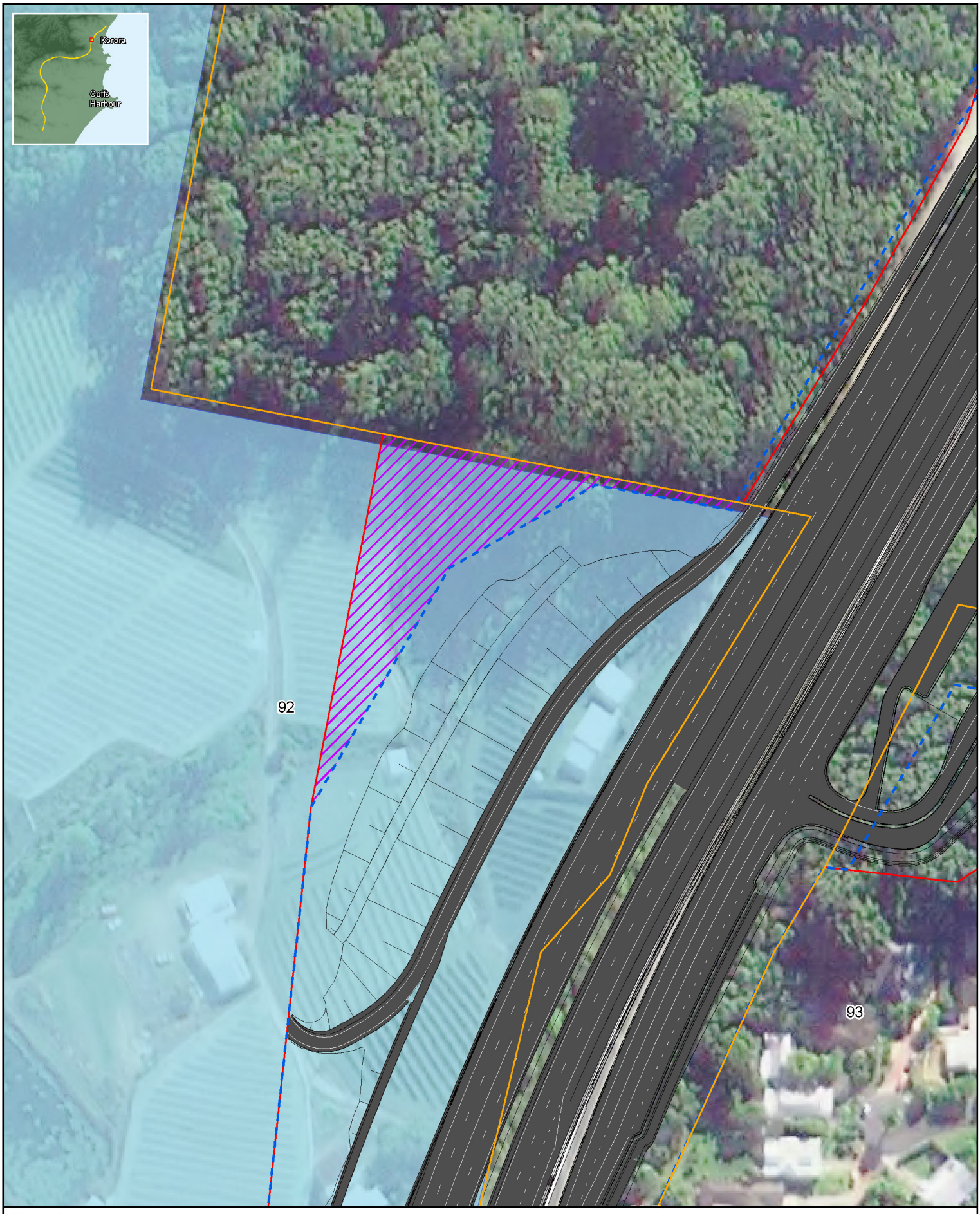
The review identified two additional direct impacts on farms identified in the EIS and one revised indirect impact associated with the Oz Group Packhouse. The assessment of these impacts is detailed below.

The proposed design and construction changes would not result in changes in indirect impacts, Panama disease, microclimate and industry compared to the impacts described in the EIS.

Direct impact assessment

The amended design would result in a change in direct impacts to two farms, APO 92 and APO 29. The change in direct impacts on farms is associated with the proposed construction sediment basin at Chainage 21800 and the Coffs Creek flood mitigation design change.

The proposed construction sediment basin at Chainage 21800 would result in an increase in direct impacts to APO 92, a blueberry farm as detailed in **Table 5.7-1** and shown **Figure 5.7-1.**



Legend

- Construction footprint - EIS
- Construction footprint - Amendment Report
- Area of increase of construction footprint
- Pavement
- North Coast Railway
- Watercourse

Primary crop

- Bananas
- Blueberries
- Cucumbers

Coffs Harbour Bypass

Agricultural impacts on APO 92 because of construction sediment basin at Chainage 21800

Figure 5.7-1

0 0.015 0.03 0.045 km

Scale @A4: 1:1,500

GDA 1994 MGA Zone 56

N

Table 5.7-1 Change in impact on APO 92 compared with the EIS because of proposed construction sediment basin at Chainage 21800

Criteria	Impact level EIS	Impact level amended design	Consistency with EIS	Assessment/comment
Direct land take	14.40%*	17.04%	Minor increase	The proposed construction change would result in an increase of 0.50 ha area required for the project.
	2.75 ha	3.25 ha		
Crop impact	Minor	Minor	Consistent	The proposed construction change would impact an additional area of 0.2 ha of blueberry crop previously identified as being impacted in the EIS. The additional area impacted would unlikely influence the operation of the farm, as such, the overall crop impact would remain consistent with the EIS.
Structures	Serious	Serious	Consistent	The proposed construction change would have an additional impact to a cropping structure and it is likely the structure would need to be modified and/or reconfigured to allow cropping to continue. No other structures would be impacted by the design change at this location. As such, the overall impact to structures would remain consistent with the EIS.
Type of acquisition	Minor	Minor	Consistent	The proposed construction change would result in an increase (slightly wider strip) in land acquired, however these impacts would be consistent with the EIS.
Access	Minor	Minor	Consistent	There would be no additional impacts to access as a result of the proposed construction change.
Irrigation water	Moderate	Moderate	Consistent	There would be no additional impacts to irrigation water from the proposed construction change than that described in the EIS assessment.
Dust	Serious risk of impact	Serious risk of impact	Consistent	While the construction footprint has increased by 0.50 ha, the risk of impact from dust would remain consistent with the risk of impact described in the EIS.
Overall impact	Moderate	Moderate	Consistent	The additional impact from the proposed construction change isn't of a scale that would change the overall impact to the farm.

Criteria	Impact level EIS	Impact level amended design	Consistency with EIS	Assessment/comment
Mitigation measures	-	-	-	No changes are proposed to mitigation measures outlined in the EIS.

*This was incorrectly reported as 9.96 per cent in Sub-appendix K2, Agricultural Assessment in the EIS. This correction is noted in Chapter 5, Clarifications, corrections and further information of the Submissions Report.

The proposed Coffs Creek flood mitigation works design change would result in additional direct impacts to APO 29, a banana, blueberry and cucumber farm, compared to the EIS. The change in impact to APO 29 because of this design change is outlined in **Table 5.7-2** and shown in **Figure 5.7-2.**

Table 5.7-2 Change in impact on APO 29 compared with the EIS because of Coffs Creek flood mitigation works

Criteria	Impact level EIS	Impact level amended design	Consistency with EIS	Assessment/comment
Direct land take	41.9%^ 8.94 ha	46.33% 9.89 ha	Increased impact	The proposed design change would result in an increase of 0.95 ha area required for the project.
Crop impact	Serious	Serious	Consistent	The proposed design change would impact an additional 0.92 ha area of banana crop. While there is an additional area being impacted, it is considered a negligible increase to the overall impact. As such, the overall crop impact would remain consistent with the EIS.
Structures	Serious	Serious	Consistent	There would be no change to impact on structures compared to the EIS.
Type of acquisition	Critical	Critical	Consistent	The proposed design change would result in an increase in land acquired, however the impact level would remain consistent with the EIS.
Access	Moderate	Moderate	Consistent	There would be no change to impact on access compared to the EIS.
Irrigation water	Moderate	Serious	Increased impact	The proposed design change would result in an additional dam being impacted from that described in the EIS. Two dams would be directly impacted and only one dam would be retained. Accordingly, the impact level for the amended design has been revised to serious. However, given the nature of the proposed design change (ie additional flood storage), there could be an opportunity to provide a replacement water source through the provision of a larger basin.
Dust	Serious risk of impact	Serious risk of impact	Consistent	The risk of impact from dust would be consistent with the project described in the EIS.

Criteria	Impact level EIS	Impact level amended design	Consistency with EIS	Assessment/comment
Overall impact	Serious	Serious	Consistent	While the proposed design change has increased the impact to irrigation water, there remains an opportunity to provide a viable replacement water source. Therefore, the overall impact as a result of the proposed design change would remain consistent with the EIS.
Mitigation measures	-	-	-	No change to mitigation measures.

^This was incorrectly reported as 39.01 per cent in Sub-appendix K2, Agricultural Assessment in the EIS. This correction is noted in Chapter 5, Clarifications, corrections and further information of the Submissions Report.

No additional agricultural properties, beyond those outlined in the EIS, would be directly impacted as a result of the proposed design and construction changes.

Indirect impacts

The proposed design change at Englands Road interchange would result in about 0.1 hectares of additional land being needed from the car park of the Oz Group Packhouse. As reported in the EIS, the Oz Group Packhouse is the primary packaging facility for blueberries in the Coffs Harbour region, and also packages raspberries and blackberries. While this is not an agricultural property and has not been assessed as such, it is an important facility for the local area.

The proposed design change would also result in more beneficial access arrangements compared to the EIS design. Vehicles would be able to turn right from Englands Road into Isles Drive, which would improve access to Isles Drive and the Oz Group Packhouse.

Oz Group Packhouse has been consulted regarding the design change at this location (see **Chapter 4, Consultation**). Further consultation would be carried out as part of property acquisition negotiations and implementation of relevant environmental management measures detailed in **Chapter 6, Revised environmental management measures**.

The additional land that would be required as a result of the Englands Road interchange design change would result in a negligible additional impact and access would be maintained at all times to minimise impacts on business operations. More information on the potential business impact is provided in **Section 5.8, Socio-economic.**

5.7.4 Revised environmental management measures

The management measures presented within the EIS to address agricultural impacts have been reviewed in consideration of the identified design and construction changes. The management measures provided in the EIS are still considered to be suitable and accurate for the project and are provided in **Chapter 6, Revised environmental management measures** for completeness.

Legend

- Construction footprint - EIS
- Construction footprint - Amendment Report
- Area of increase of construction footprint
- Pavement
- North Coast Railway
- Watercourse

Primary crop

- Bananas
- Blueberries
- Cucumbers

Coffs Harbour Bypass
Agricultural impacts on APO 29 because of Coffs Creek flood mitigation
Figure 5.7-2

0 0.02 0.04 0.06 km

Scale @A4: 1:2,000
GDA 1994 MGA Zone 56

N

5.8 Socio-economic

5.8.1 Assessment methodology and approach

A socio-economic assessment was prepared as part of the EIS (Chapter 14, Socio-economic). A supplementary socio-economic assessment has been prepared in accordance with the SEARs to assess the potential socio-economic impacts associated with the proposed design and construction changes. The supplementary assessment only includes information that has changed since the EIS and follows the methodology discussed in Section 14.1, Assessment methodology of the EIS.

5.8.2 Existing environment

The existing socio-economic environment is described in Chapter 14, Socio-economic of the EIS. The socio-economic impact assessment (SEIA) study area identified within the EIS is still applicable to this assessment. The EIS core impact area was established for reporting on communities adjacent to the project and is still applicable to this assessment. The demographic and economic data used within the EIS is still considered relevant. While the SEIA study area remains unchanged, in response to CHCC's submission to the EIS, a high-level review of the Boambee East and Toormina areas was carried out to ensure all possible impacts had been captured. This did not highlight any additional impacts beyond what was outlined within the EIS and is summarised in Section 3.1.14 of the Submissions Report.

Since the exhibition of the EIS, West Coffs District Park has been constructed to support residential growth in West Coffs. The West Coffs District Park is located on William Sharp Drive and is a neighbourhood park servicing the local residential community. It is located outside the 500 metre core impact area and the wider SEIA study area. Given the distance from the project, the socio-economic impacts to West Coffs District Park because of the project, including the proposed design and construction changes, would be negligible and are not considered further.

In the EIS, Pacific Bay Resort Golf Course and Elite Training Centre were listed as social infrastructure within the 500 metre core impact area. It was assessed in the EIS that construction might impact on user amenity of this facility, although it was noted the property owner suggested the site may be redeveloped for residential purposes. Since the exhibition of the EIS, the property owner has confirmed that the facility is no longer operational and not accessible to the public. As a result, this site is treated as private land for the purposes of the assessment and any socio-economic impacts associated with past provision of social infrastructure on this site are no longer relevant.

5.8.3 Assessment of potential impacts

The socio-economic impacts associated with the design and construction changes are described below for construction and operation. Only impacts that are additional or different from those documented in the EIS have been outlined. Overall, the proposed design and construction changes would likely result in localised changes to socio-economic impacts and are considered to have minimal variation from the impacts described in the EIS.

Construction impacts

The potential change in socio-economic impacts for amended design during construction are summarised in **Table 5.8-1**.

Table 5.8-1 Potential change in socio-economic impacts for the amended design during construction

Design or construction change	Change to socio economic impact during construction
New and revised ancillary sites	Ancillary site 3D remains within the construction footprint and the proposed changes would not result in any additional or changed socio-economic impacts. *Impact of property acquisition* Changes to property impacts associated with the new or revised ancillary sites are discussed in **Section 5.6, Land use and property.** The majority of new or revised ancillary sites are either located on TfNSW owned land or would be temporarily leased. On this basis, there would not be a change to the socio-economic impacts directly associated with acquisition reported in the EIS. Ancillary site 3F will be acquired from CHCC by TfNSW but noting that the site is in public ownership and the small size of the area acquired (0.88 ha), it is not considered that this acquisition will directly result in any additional socio-economic impacts. However, other socio-economic impacts associated with the leased and acquired ancillary sites (ie site 1A, site 3A and site 3F) are described below. *Amenity* Proposed ancillary site 1A is located about 230 m from the closest sensitive receiver (residential property). There is potential for increased amenity impacts on this sensitive receiver during construction compared to those described in the EIS. However, it is likely that with the implementation of the environmental management measures detailed in **Chapter 6, Revised environmental management measures**, these impacts would be adequately managed. The closest sensitive receivers to proposed ancillary site 1C are about 400 to 450 m to the west. At these distances there would be no changes to amenity impacts compared to those outlined in the EIS. Additionally, the ancillary site is separated from the closest residence by a 100 m vegetated buffer which reduces the perceived impact to amenity. Proposed ancillary site 1J is located adjacent to rural residential land north of the Englands Road interchange. The closest sensitive receiver (residential property) is located immediately adjacent the western boundary near Englands Road. However, given the size of the ancillary site (about 2.6 ha) there are opportunities to maximise the distance to this receiver from primary noise and dust sources within the site, in addition to installing solid structures (eg shed, containers, etc.) to further shield impacts. As such, while there are potential construction amenity impacts associated with the site, the impacts are generally consistent with those described in the EIS and would be adequately managed with environmental management measures detailed in **Chapter 6, Revised environmental management measures**. Proposed ancillary site 3A is located adjacent the Korora Hill interchange on land identified as the Pacific Bay Western Lands in the EIS. This area was noted in the EIS to include social infrastructure, with the Golf Course

Design or construction change	Change to socio economic impact during construction
	and Elite Training Centre as part of the Pacific Bay Resort. In the EIS, this facility was assessed to experience amenity impacts associated with construction noise. Further consultation with the property owner has revealed that this social infrastructure no longer operates, and it is therefore now considered as private land for the purposes of the assessment. As such, the reported amenity impacts would no longer be relevant for this area. Other adjacent receivers could be exposed to amenity impacts as a result of the operation of ancillary site 3A. However, and similar to site 1J, the size of the ancillary site would allow opportunities to maximise distances from primary noise and dust sources to adjacent receivers. As such, it is considered that potential construction amenity impacts associated with proposed ancillary site 3A would be adequately managed with environmental management measures detailed in **Chapter 6, Revised environmental management measures**. Proposed ancillary site 3F is located about 80 m from the closest sensitive receivers (residential property). Given the proposed use of ancillary site 3F (ie secondary site compound and/or stockpile site) and its relatively small site area, it is not anticipated that it would generate construction amenity impacts inconsistent with those described in the EIS. Additionally, environmental management measures detailed in **Chapter 6, Revised environmental management measures** would adequately manage any potential amenity related impacts. Overall, as only a small proportion of the study area would be affected by the changes to amenity impact, the magnitude of the impact is considered to be low, with the sensitivity of receivers considered to be moderate. Therefore, the overall amenity related impacts from the new and revised ancillary sites are assessed as being of low-moderate significance for the duration of construction, consistent with the EIS. *Social infrastructure* Proposed ancillary site 3F is located on land that is used as part of Opal Cove Resort's nine-hole golf course. This site will be permanently acquired by the project. This would result in a total impact of 0.88 ha, an increase of about 0.37 ha. Ancillary site 3F would impact 11.78 per cent of the 7.87 ha lot. Other areas of the golf course, east of Opal Boulevard and south of Pine Brush Creek would remain unaffected. However, they may experience amenity impacts as described in the EIS. Based on the local nature of these impacts, the impacts already identified in the EIS and the informal nature of the current community use, the socio-economic impact of this construction change on social infrastructure would be of low significance for the duration of construction. *Business and industry* Proposed ancillary site 1A would occupy an area of about 2.84 ha within the southern portion of the Coffs Coast Resource Recovery Park (shown in **Figure 5.8-1**). The ancillary site is located within an area no longer

Design or construction change	Change to socio economic impact during construction
	being used as part of landfill operations. Operation of the ancillary site would be negotiated with CHCC as part of any lease agreement and would ensure construction traffic and deliveries would not impact the operation of Coffs Coast Resource Recovery Park. Therefore, the proposed ancillary site 1A would have negligible impact on the business operations. *Access and connectivity* All proposed new and revised ancillary sites would use roads previously described in the EIS for construction access. As such, potential impacts are considered consistent with those described in the EIS and would be managed through the implementation of the TMP during construction. Therefore, impacts of the project to access and connectivity in association with ancillary sites are assessed to be of low significance, consistent with the EIS.
Blasting	*Amenity* Further analysis of the existing ground conditions has indicated the likely need to carry out additional blasting compared to that shown and assessed in the EIS. Additional blast locations are shown in Figure 3.1-1 to Figure 3.1-6 and are generally located: • North and south of Englands Road interchange • South of Shephards Lane tunnel • Between Gatelys Road tunnel and Shephards Lane tunnel • North of Coachmans Close. While additional blasting could increase amenity impacts overall for sensitive receivers, it is anticipated that impacts would be effectively managed through the development and implementation of the Blast Management Strategy for the project. The strategy will aim to ensure all blasting and associated activities will be carried out in a manner that would not generate unacceptable noise and vibration impacts or pose a significant risk impact to residences and sensitive receivers. Refer to **Section 5.3, Noise and vibration** for further consideration of the additional blasting locations. While not necessarily considered a noise sensitive receiver, the Boambee Equestrian Centre, given the nature of its use, would be sensitive to the noise and vibration impacts associated with additional blasting near Englands Road interchange. Based on this, the overall socio-economic impact of this additional blasting is assessed to be of low-moderate significance during construction, consistent with noise amenity impacts assessed in the EIS.
Revised traffic management	*Access and connectivity* As discussed in **Chapter 3, Construction updates**, Buchanans Road and Gatelys Road have been identified as access roads and Russ

Design or construction change	Change to socio economic impact during construction
	Hammond Close would be needed to provide temporary local access during construction. During construction, Buchanans Road is expected to see an increase from 50 vehicles per day to about 200 vehicles per day. Gatelys Road is expected to see an increase from 300 vehicles per day to about 350 vehicles per day. An increase in construction vehicle traffic has the potential to impact on local access and result in conflicts between residents and construction traffic. However, the anticipated increases in traffic during construction for both roads are within the nominal capacity of each road. As such, it is not anticipated that construction traffic would significantly impact the operation of these roads. Russ Hammond Close is anticipated to experience relatively high increases in estimated daily traffic volumes while it is used as temporary traffic diversion as it currently carries a low level of traffic (estimated at about 200 vehicles per day). The total predicted daily traffic volumes on this road with the addition of redistributed school traffic and traffic accessing Korora School Road are expected to be about 370 vehicles per day. The nominal capacity of this road is 300 vehicles per day, which suggests Russ Hammond Close would be operating at capacity during peak construction periods. Noting that any impacts would be local in nature, it is anticipated that use of Buchanans Road, Gatelys Road and Russ Hammond Close and the associated impact on local connectivity and access would be of low significance during construction, consistent with the impacts to access and connectivity during construction described in the EIS. A TMP would be prepared to manage short-term traffic impacts expected during construction. Refer to **Section 5.2, Traffic and transport** for further information. *Amenity* The additional traffic resulting from the proposed design changes on Buchanans Road, Gatelys Road and Russ Hammond Close also has the potential to impact the amenity of local residents and communities, mostly because of traffic noise. The construction traffic would increase potential noise and dust impacts to residential communities and sensitive receivers, such as the Coffs Harbour Montessori Pre-school on James Small Drive (note existing houses would offer some shielding from noise and dust impacts for the pre-school). Amenity impacts during construction could interfere with daily activities and could disrupt the learning environment at schools through interfering with concentration and memory. Construction working hours would be determined in advance of commencement of construction works. Sundays are not included in standard work hours which would allow respite and expected to have less impact to residential users. The TMP would help manage short-term traffic impacts expected during construction. Refer to **Section 5.2, Traffic and transport** for further

Design or construction change	Change to socio economic impact during construction
	information. Amenity impacts including noise and air quality described above would be managed through the implementation of a NVMP and AQMP during construction. Refer to management measures NV01 and AQ01 for further information.
Water quality basins/ construction sediment basins	It should be noted the grouping of the water quality basins and construction sediment basins for the purposes of this supplementary socio-economic assessment is due to the basin installations having comparable associated impacts. *Impact of property acquisitions* The proposed new construction sediment basins would require the acquisition of additional land from two properties (in rural residential and agricultural land use). One would require an additional 0.53 ha (on top of 0.76 ha reported in the EIS) and the other would require an additional 0.50 ha (on top of 2.75 ha reported in the EIS). The land required for the third construction sediment basin would be leased for the duration of construction. The impact would be short-term in nature and would directly impact 2.86 per cent of the total private lot area. This scale of impact to land used for irrigated plants is unlikely to influence the overall operation of the farm, and therefore, the impact is expected to be minimal. As the socio-economic impacts associated with direct property acquisition for construction sediment basins are local in nature, the magnitude is assessed to be low, with sensitivity of receivers moderate. Therefore, the overall socio-economic impacts associated with direct property acquisition for construction sediment basins are assessed to be of moderate-low significance for the duration of construction, consistent with the EIS. The two additional operational water quality basins would not result in any additional direct impacts to property compared to the project described in the EIS, as the properties have previously been acquired by TfNSW. As such, it is assessed that there would be a negligible additional socio-economic impact associated with the proposed basins, compared to the EIS. *Business and industry* As a result of the construction sediment basins, there would be an additional direct business impact compared to the EIS on a blueberry farm adjacent to Kororo Nature Reserve (as shown in **Figure 5.8-1**). While there would be an increase of 0.50 ha being impacted (of which 0.2 ha is blueberry crop) the impacts on this property are generally considered to be consistent with the EIS. Further information about this property impact is outlined in **Section 5.7, Agriculture**. While there would be an additional impact to an agricultural business, the impact would be localised and therefore the magnitude of this additional socio-economic impact and sensitivity of users would be low. Therefore, it is expected that the impact of the additional construction sediment basins

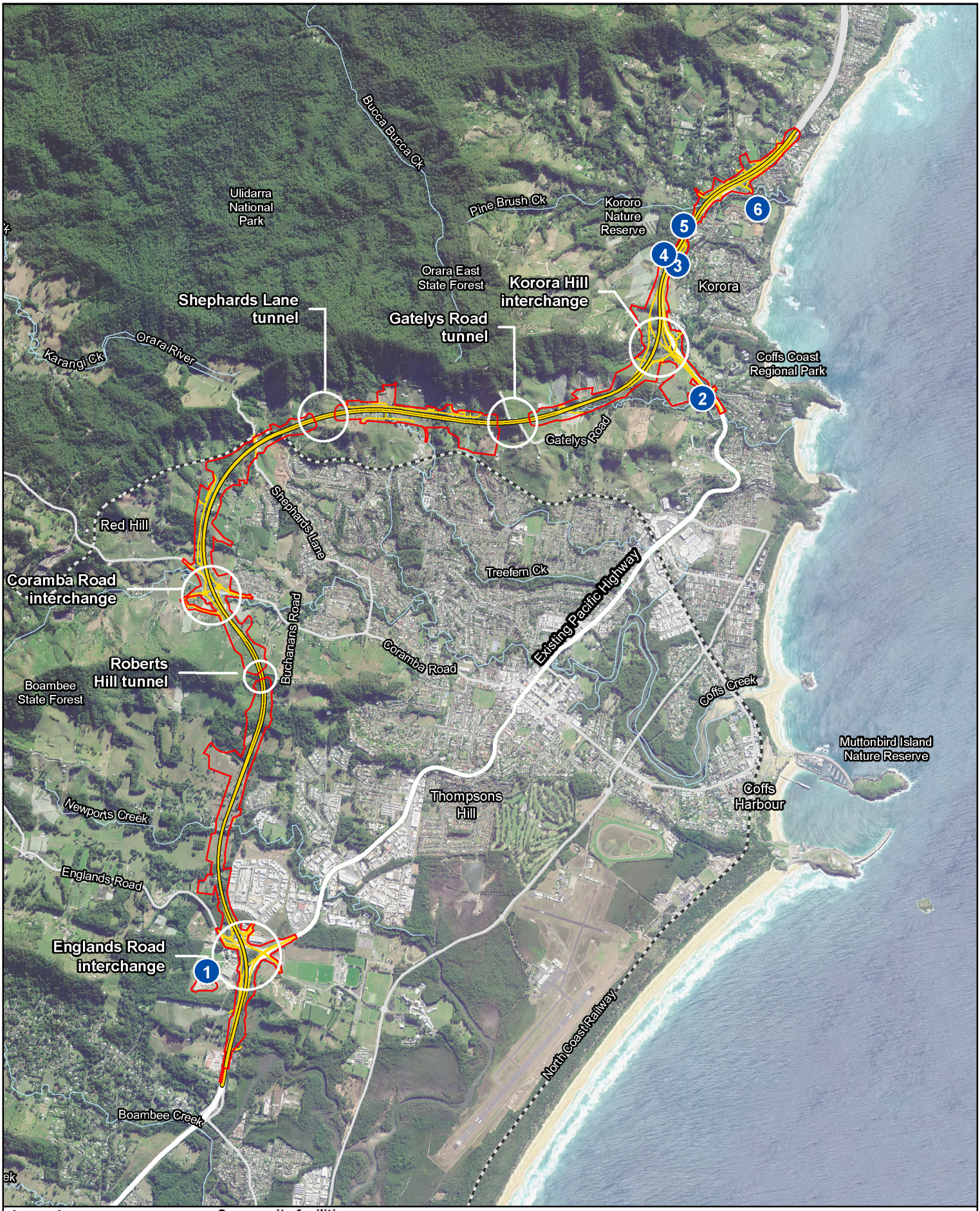
Design or construction change	Change to socio economic impact during construction
	to the overall agricultural industry would be consistent with that documented in the EIS, of moderate-low significance.
Englands Road interchange	*Impact of property acquisitions/business and industry* In the EIS, the project was assessed to have impacts on several businesses within the Coffs Coast Resource Recovery Park during construction (shown in **Figure 5.8-1**). The change to socio-economic impact on each business is outlined below: • Handy Bin Waste Services – the proposed design changes would no longer require the demolition of the eastern end of the main shed, which provides a beneficial change that would ensure operations can continue with minimal alterations. Impacts to the existing car parking would still be required but would be undertaken in consultation with Handy Bin Waste Services to ensure there is minimal disruption to staff and customer access • Coffs Coast Waste Services – the EIS identified direct impacts to an onsite parking area and vehicle maintenance sheds. These impacts would be avoided with the proposed design change, which would be a beneficial change when compared with the EIS • CHCC Community Recycling Centre – the proposed design change would not alter the impacts reported in the EIS. Access to the centre would still be directly impacted during construction, but alternative access would be provided • Biomass solutions – the stockpiling area, car parking areas and access routes would be avoided as a result of the proposed design changes. This would mean the business could continue on site, with minimal alterations to current operations. This would be a beneficial change from the EIS, which reported the required demolition and subsequent impacts on business operations. Overall, the proposed design change results in a significant beneficial reduction in property and business impacts within the Coffs Coast Resource Recovery Park. The EIS reported a direct property impact of 3.35 ha on the Coffs Coast Resource Recovery Park. The proposed design change would reduce the impacts by about 0.43 ha (to 2.92 ha overall). This would result in more functional operations for Coffs Coast Resource Recovery Park and a decrease compared to the impacts described within the EIS. In the EIS, the project was reported to have a direct impact on the CNW Pty Ltd (28B Isles Drive) property, requiring demolition and relocation of this business before start of construction. The proposed design change would reduce impacts by about 0.01 ha (from 0.21 ha in the EIS), and there would be no requirement for demolition of the building on site. Consultation with the business has confirmed that as a result of the design changes, relocation would no longer be expected. While this has

Design or construction change	Change to socio economic impact during construction
	resulted in a beneficial improvement from the EIS, it is anticipated that construction of the project would likely result in amenity impacts during construction (eg noise and dust) which would need to be managed through the implementation of the environmental management measures detailed in **Chapter 6, Revised environmental management measures**. The proposed design change would result in a requirement for about 0.03 ha of additional land from the car park of the Oz Group Packhouse (37/51 Isles Drive), bring the total directly impacted area to 0.54 ha (approximately 21% of the total lot area, compared to 20% in the EIS). This is considered a negligible additional impact from that described in the EIS and access would be maintained at all times to minimise impacts on business operations. The proposed design change would also result in more beneficial access arrangements compared to the EIS design. Vehicles would be able to turn right from Englands Road into Isles Drive, which would improve access to Isles Drive and the Oz Group Packhouse. Overall, there would be some beneficial changes to the socio-economic impact of the project on local business operations during construction. The socio-economic impacts to local businesses would be localised and largely consistent with the EIS, which reported a moderate-low significance.
North Boambee Valley vertical alignment	During construction there would be no additional or changed socio-economic impacts for the North Boambee Valley vertical alignment design change from those described in the EIS.
Coramba Road bus stop	*Access and connectivity* The construction impacts of the bus stop relocation on local connectivity and access (including potential disruption to bus stop users) reported in the EIS would continue to be relevant in the context of the proposed design changes. Consistent with the EIS, these would be temporary, during construction only and of overall low significance.
Coffs Creek flood mitigation	*Impact of property acquisition* Excavation of Bennetts Road detention basin to increase the flood storage capacity is no longer required, resulting in a boundary change which would reduce property impacts by about 1.84 ha to rural residential land. This would result in a reduced impact to the property owner, which may reduce the anxiety and stress associated with property acquisition. As this impact is local in nature, the magnitude of the impact is considered to be low, with the sensitivity of receivers considered to be moderate. Therefore, the overall socio-economic impacts of property acquisition as part of the Coffs Creek flood mitigation design changes are assessed as being of moderate-low significance for the duration of construction, consistent with the EIS.

Design or construction change	Change to socio economic impact during construction
	Business and industry The proposed design change would result in an increase in direct impact of about 0.95 ha to APO 29, a banana, blueberry and cucumber farm. In the EIS it was reported this farm would be seriously impacted by the project. The design change would directly impact on an additional irrigation dam, which would represent an increased impact. However, the overall impact of the project on this property would not be increased by this design change. Overall, the change would not significantly alter the impacts to the agricultural industry as a whole, which remain of moderate-low significance, consistent with the EIS. Further information about this property impact is outlined in **Section 5.7, Agriculture**.
Korora Hill interchange	*Amenity* The amended Korora Hill interchange design would result in work extending to south of the Pacific Highway and Charlesworth Bay Road intersection. This would bring construction related activities closer to the Banana Coast Caravan Park boundary as shown in **Figure 5.8-1** (from 350 m away to immediately adjacent). This extension of work would therefore expose the business and its users to more potential amenity issues associated with construction noise, vibration and dust, when compared to the EIS. Overall, as only a small proportion of the study area would be affected by the changes to amenity impact, the magnitude of the impact is considered to be low, with the sensitivity of receivers considered to be moderate. It is also anticipated that amenity impacts would be managed through the implementation of the environmental management measures detailed in **Chapter 6, Revised environmental management measures**. Therefore, amenity related impacts from the extension of work associated with the Korora Hill interchange is assessed as being of low-moderate significance, consistent with the EIS. *Access and connectivity* The amended Korora Hill interchange design includes an upgrade of the Pacific Highway and Charlesworth Bay Road intersection which was not included as part of the EIS. While local connectivity and access in this area would have been impacted during construction as part of the EIS, the amended design would likely result in an increased duration of impacts. However, the impacts would likely be local in nature, and would be of low significance during construction, consistent with impacts described in the EIS. A TMP would be prepared to manage short-term traffic impacts expected during construction. Refer to **Section 5.2, Traffic and transport** for further discussion.

Design or construction change	Change to socio economic impact during construction
Kororo Public School bus interchange and Luke Bowen footbridge	*Impact of property acquisition* The proposed design changes to the Kororo Public School bus interchange would directly impact on about 0.53 ha of native vegetation, which makes up more than half of the Fern Tree Place community property (shown in **Appendix F, Supplementary property impacts, Figure F-2-07**). This compares to about 0.09 ha impacted in the EIS. The property is owned by the residents of Fern Tree Place and provides privacy between residential properties and the existing Pacific Highway. The property does not have active walking routes or public access. The design change would reduce the quantity of the vegetation which is considered to provide a buffer between residents and the existing Pacific Highway. This would potentially open up views from residential receivers towards construction works, however it is anticipated that the mature trees and understorey vegetation to the southern edge (immediately adjacent to the residential properties), would be retained, heavily filtering views towards the amended design. The close proximity of construction activities to residences in Fern Tree Place also have potential impacts on amenity (eg construction noise). Amenity impacts would be managed through the implementation of the environmental management measures detailed in **Chapter 6, Revised environmental management measures**. The socio-economic impacts associated with this additional direct property impact would be local in nature and therefore the magnitude of impact is assessed to be low. The sensitivity of users would be high, resulting in an overall additional impact of moderate significance. The overall construction impact of property acquisition for the project is assessed to be consistent with the EIS, and of moderate-low significance. The assessment of the additional property acquisition impact is included in **Section 5.6, Land use and property**. Further information on other specific impacts discussed above are outlined in **Section 5.4, Biodiversity** and **Section 5.5, Urban design, landscape and visual amenity**. *Social infrastructure* The EIS reported impacts of the project on access to the existing Solitary RFS shed (shown in **Figure 5.8-1**). As a result of the design change, the existing shed would be impacted and need to be removed to accommodate the additional car parking spaces and the new Luke Bowen footbridge. Consultation with RFS Mid North Coast Team about the design change and impact to the existing shed was carried out following exhibition of the EIS (refer to **Chapter 4, Consultation**). TfNSW will continue to consult with RFS Mid North Coast Team regarding relocating their services to the new location near Korora Hill interchange with provision of a new building to ensure there is no disruption to the existing level of emergency services during construction and operation of the project. As such, it is considered that the scale of this impact does not change the overarching impacts to social infrastructure during

Design or construction change	Change to socio economic impact during construction
	construction reported in the EIS, which are still assessed to be of low significance. Refer to **Section 5.2, Traffic and transport** and environmental management measure TT6 for further information. *Access and connectivity* The construction impacts associated with the new Luke Bowen footbridge on local connectivity and access reported in the EIS would continue to be relevant in the context of the proposed design changes. Consistent with the EIS, these would be temporary, during construction only and of overall low significance. It is anticipated that the new Luke Bowen footbridge would be constructed prior to the removal of the existing bridge where possible with any disruptions to access occurring outside of school terms and in consultation with Kororo Public School and NSW Department of Education. Refer to **Section 5.2, Traffic and transport** and new environmental management measure TT15 for further information.
Pine Brush Creek and Williams Creek realignment	*Impacts of property acquisition* The proposed design change would have an increased impact of about 0.1 ha on a property on Old Coast Road (APO 100). This increase would result in an additional direct impact to a residence, and the property becoming a total acquisition rather than a partial acquisition as described in the EIS. The total acquisition may result in impacts to the property owner, including impacts on way of life, and anxiety and stress associated with relocation. To minimise property acquisition impacts, all property acquisition will be carried out in accordance with the Land Acquisition Information Guide (Roads and Maritime Services 2014a), Fact sheet: Property acquisition of subsurface lands (Roads and Maritime Services 2015c) and the *Land Acquisition (Just Terms Compensation) Act 1991*. Refer to environmental management measure LUP02 in **Chapter 6, Revised environmental management measures**. The application of the above TfNSW property acquisition guidelines includes the appointment of a Personal Manager Acquisitions to assist each of the landowners, residents and commercial tenants affected by acquisition for the project. The Personal Manager Acquisitions would work with the landowners, residents and commercial tenants to offer them assistance and support throughout the process. While the sensitivity of users to the socio-economic impacts associated with this additional direct property impact would be high, the magnitude of impact is assessed to be low because of the local nature of the impacts. This would result in an additional impact of moderate significance. The overall construction impact of property acquisition for the project would be consistent with the EIS, and of moderate-low significance.



Legend

- Construction footprint
- Alignment
- North Coast Railway
- Watercourse

Community facilities

1 - Coffs Coast Resource Recovery Park
2 - Banana Coast Caravan Park
3 - Fern Tree Place Community Lot
4 - Blueberry Farm (APO92)
5 - Solitary RFS shed
6 - Opal Cove Resort Golf Club

Coffs Harbour Bypass
Areas of additional or changed socio-economic impact
Figure 5.8-1

0 0.5 1 1.5 km

Scale @A4: 1:50,000
GDA 1994 MGA Zone 56

N

Operational impacts

There would be minimal operational impacts associated with the proposed construction updates, as these are focused on the construction phase. The operational phase would not result in any additional property acquisition or direct business and industry impacts, other than those described under construction impacts.

Amenity impacts associated with the operation of the proposed design changes would be similar to those described in the EIS and therefore, these have not been assessed further. Amenity related impacts such as noise, vibration and visual changes would be managed with environmental management measures detailed in **Chapter 6, Revised environmental management measures**.

Other changes in socio-economic impacts for the amended design during operation, including access and connectivity and community values are described below in **Table 5.8-2**.

Table 5.8-2 Potential change in operational socio-economic impacts for the amended design

Design change	Change to socio economic impact during operation
Englands Road interchange	*Access and connectivity* A new direct access between Englands Road and Isles Drive would be provided which would maintain all turning movements to the Isles Drive Industrial area and local businesses. This would remove the need for vehicles to travel north to access the industrial area via the existing Pacific Highway/Isles Drive intersection. During operation, this would result in improved access for local businesses and their customers and reduce congestion at the existing Pacific Highway/Isles Drive intersection compared to the EIS. The proposed design change would improve access and travel time to the Oz Group Packhouse (37/51 Isles Drive) located in the southern end of Isles Drive. **Section 5.2, Traffic and transport** provides further information on access impacts.
North Boambee Valley vertical alignment	*Community values* Flood resilient properties and access aligns broadly with the community values. Flood impacts have changed since the EIS as a result of updates to the flood model and indicated increased flooding impacts. This changes the flood resilience in this area. Increased impact to flood levels, as a result of the updated models, are located in areas of vacant, forested or pasture land. This is to minimise flood impacts on properties and land access. The design changes have been proposed to minimise flood impacts (refer to **Appendix H, Updated flooding and hydrology assessment**). The proposed design changes would result in flood impacts which are largely consistent with the impact outlined in the EIS, resulting in similar outcomes for flood resilience and access. As such, the socio-economic impacts on community values would be consistent with the EIS and be of negligible significance.
Coramba Road bus stop	*Access and connectivity* During operation, the new school bus stop and shared user path would provide enhanced public transport facilities and safer access for residents, road users and public transport users. The magnitude of the benefit would be expected to be low as it would be local. The sensitivity of users to the change would be high. Therefore, this additional beneficial impact as a result of the changes to the design would be of moderate significance. However, the

Design change	Change to socio economic impact during operation
	overall socio-economic impact associated with access and connectivity would be consistent with the EIS, and of negligible significance.
Korora Hill interchange	*Community values* The proposed design change would improve operational flood resilience within the James Small Drive area compared to the EIS. This would improve road access in the area due to reduced flooding impacts. This would enhance the socio-economic amenity of residents, and respond to concerns relating to potential flooding impacts, highlighted as a key community value. Noting the importance of flood resilience to the community and CHCC, the magnitude of this additional socio-economic impact would be expected to be moderate and the sensitivity of users to the change would be moderate. Therefore, it is expected that the additional operational socio-economic impacts associated with the Korora Hill interchange flood resilience changes would be beneficial and of moderate significance. However, the overall impact on community values would be consistent with the EIS, and of low significance. *Access and connectivity* The proposed design change would create improved and safer access during operation with the introduction of new traffic lights at the Pacific Highway and Charlesworth Bay Road intersection. This design change would provide enhanced access to the Pacific Bay Resort, the residential area and local businesses and improve local connectivity. The proposed design change would also provide an improved access for the Pacific Bay Western Lands compared to the EIS. The new beneficial impacts as a result of the proposed design change would be moderate in magnitude, and the sensitivity of users to the change would be low. Therefore, this additional beneficial impact as a result of changes to the design would be moderate-low significance for local road users, businesses, and residents. However, the overall socio-economic impact associated with access and connectivity would be consistent with the EIS, and of negligible significance.
Kororo Public School bus interchange and Luke Bowen footbridge	*Access and connectivity* During operation, the proposed design changes would result in improved drop-off facilities compared to the EIS, increasing the size of the 'kiss-and-drop' zone, which would enhance circulation for Kororo Public School students, carers and users of James Small Drive, reduce impact on local roads and provide safe access to an important community facility. The proposed design changes would also provide separation of mode users, which would have a beneficial impact when compared to the EIS design. As a result of the proposed design changes, buses would access the bus interchange via the service road and no longer need to travel along the narrow James Small Drive. This would have beneficial impacts on travel time for buses (both locally and more widely) and safety and congestion of other vehicles along the route. The design changes would provide a pedestrian underpass to allow grade separated access to the school from the new car

Design change	Change to socio economic impact during operation
	park. This would provide safety benefits to pedestrians in the area by providing a dedicated link separate from buses and cars. The design changes would provide a formalised, line-marked off-street car park facility near the existing Solitary RFS shed. This would improve vehicle circulation and safety. The proposed design changes would result in a reduction in private vehicle car parking provision within the bus interchange from the EIS design of 52 car park spaces to a proposed 30 car park spaces (refer to **Section 5.2, Traffic and transport**). Additional private vehicle car parking would be provided near the school, however this would still be less than that proposed within the EIS. The amended design proposes 98 private vehicle car park spaces, which is less than the existing provision of 103 private vehicle car park spaces, and the EIS proposed 158 private vehicle car park spaces. This would have the potential to affect access and connectivity for staff, students and other school users who are private vehicle commuters. The proposed design change would also bring Luke Bowen footbridge closer to the bus interchange and the front entrance of the school when compared to the EIS, which would result in beneficial impacts regarding community access and safety. The beneficial impacts as a result of the proposed design change would be moderate in magnitude, and the sensitivity of users to the change would be moderate. Therefore, this additional beneficial impact as a result of the design changes at Kororo Public School would be of moderate significance. Noting the localised nature of these impacts, overall socio-economic impacts associated with access and connectivity for the project more widely are considered to be consistent with the impacts described in the EIS, and of negligible significance.

5.8.4 Summary of overall impacts

A summary of the potential socio-economic impacts associated with the amended design is provided below which draws on the above assessment of the proposed design and construction changes and impacts described in Chapter 14, Socio-economic of the EIS.

Impact of property acquisition

Socio-economic benefits and impacts would result from construction and operation of the project. As discussed in **Section 5.6, Land use and property** and Chapter 12, Land use and property of the EIS, 151 properties would be impacted by the project.

Socio-demographic profile

The employment of a construction workforce for the project may see an increase in people employed in the construction industry moving into the SEIA study area. Given the spatial distribution and size of the population, it is unlikely the changes as a result of the construction workforce and property acquisition would substantially shift the socio-demographic profile.

Amenity

The community who live close to the construction footprint would potentially be impacted by a range of construction related amenity impacts such as noise, vibration, visual changes and air quality (dust), as well as traffic impacts associated with construction vehicles. Given the project would be constructed through a ‘greenfield’ setting away from the existing Pacific Highway and Coffs Harbour’s

population centres, this would result in a small percentage of the SEIA study area's population experiencing these impacts. Once the project is operational, the community who live close to the project would potentially be impacted by operational amenity related impacts such as noise and visual changes.

Community values

The Coffs Harbour community values its lifestyle, proximity to the coastline, natural environment and ability to travel easily through the local area. While some people may experience impacts during construction of the project which affect their experience of Coffs Harbour and its values, overall it is considered the project would not significantly change the overall community values.

Once operational, the project would provide an improved and more efficient road environment for those who are not travelling to and from Coffs Harbour, by providing a bypass of the CBD, which would provide travel time savings of up to 20 minutes by 2044. The reduction in traffic within the Coffs Harbour CBD may also provide opportunities to foster community values and cohesion through changes to built form and public open space in these areas.

Social infrastructure

The construction of the project would impact a number of social infrastructure facilities, including schools, recreation facilities and the Solitary RFS shed. This would also include access and amenity impacts. Within the broader SEIA study area, a range of social infrastructure facilities may also experience indirect impacts associated with the project's construction. This includes schools, medical facilities and other regional services. These impacts would most likely be related to access and traffic related changes, such as temporary road closures and detours. These may impact on emergency service response times. Overall, the project would improve accessibility and safe access to social infrastructure located in the SEIA study area, particularly those along the Pacific Highway and in the Coffs Harbour CBD. These include the Coffs Harbour Health Campus, Kororo Public School and Coffs Coast Sport and Leisure Park. However, there would be operational amenity impacts for a number of social infrastructure facilities close to the project including Bishop Druitt College, Kororo Public School and Coffs Harbour Montessori Pre-School.

Business and industry

There may be a short-term reduction in passing trade for service stations, food outlets, accommodation providers and tourism operators along the existing Pacific Highway as a result of the construction of the project. However, it is expected impacts would be neutral in the long-term. Coffs Harbour is a major regional destination, located about halfway between Sydney and Brisbane. It is likely many of these businesses would still experience high use as visitors seek out their services, particularly with the improved amenity of the Coffs Harbour CBD.

The construction of the project is not considered likely to significantly impact on the wider agricultural industry in the SEIA study area. As described in Chapter 13, Agriculture of the EIS, six banana farms within Coffs Harbour LGA would be critically impacted and would cease to operate. This is considered to be a minor impact on the overall industry and confined only to the banana industry. Once operational, the project is unlikely to have ongoing impacts on agriculture. However, the operation of the highway may benefit the industry through improved access and movement of produce.

Access and connectivity

During construction, potential disruption may impact commuters, local residents, businesses, heavy vehicle operators, public transport users and active transport users for the duration of construction. In particular, it may result in traffic that could impact on local travel (including travel times) in the short-term. Communities in the SEIA study area may change their usual travel routes or change locations where they visit within the local area during construction. Road users may also change the way they travel through the local area based on real or perceived traffic impacts.

During operation, existing access to all properties (which have not been fully acquired) would be reinstated, with adjustments as required to suit the new road infrastructure. The design of access arrangements to affected properties would be refined during detailed design, subject to consultation with affected property owners.

Public utilities

Disruption to utilities during construction could have a range of impacts on residents, businesses and the wider community. This work would be undertaken in consultation with the relevant authorities and in line with their relevant procedure to minimise disruption of service.

5.8.5 Revised environmental management measures

The management measures presented within the EIS to address socio-economic impacts have been reviewed in consideration of the identified design refinements and construction changes. Minor amendments have been made to the mitigation measures. New additions are shown in italics and deletions are presented as strikethrough in **Table 5.8-3**. Other mitigation measures presented in the EIS are still considered to be relevant and accurate, and have been included **Chapter 6, Revised environmental mitigation measures** for completeness.

Table 5.8-3 Proposed amendments to management measures from the EIS

Impact	ID No.	Environmental management measure	Responsibility	Timing
~~Impacts to local businesses~~	~~SE06~~	~~Consultation with CHCC will be carried out prior to construction regarding impacts to the Coffs Coast Resource Recovery Park and the businesses which operate from the park. Consultation will aim to identify opportunities to reduce the extent of property acquisition, temporary construction impacts and any other associated impacts to facilities which are important to the ongoing operations of the park.~~	~~TfNSW~~	~~Prior to construction~~
Impacts to local businesses	*SE06*	*Ongoing consultation with CHCC will be undertaken to identify opportunities to reduce temporary construction impacts on the operation of Coffs Coast Resource Recovery Park.*	*TfNSW*	*Prior to construction and during construction*