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BUILDING OUR FUTURE



Coffs Harbour Bypass

Environmental Impact Statement

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Evaluation and conclusion

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26. Summary of environmental management measures

This chapter collates the environmental management measures for the project that were identified through the impact assessment process. All measures listed in **Table 26-2** will be incorporated into the CEMP and/or the operational framework for the project (as required). This summary of environmental management measures is based on the management measures detailed in **Chapter 8, Traffic and transport** to **Chapter 25, Cumulative impacts**.

Table 26-1 lists the SEARs relevant to environmental mitigation or management measures and where they are addressed in this chapter and the EIS.

Table 26-1 SEARs relevant to summary of environmental measures

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
1.	The EIS must include, but not necessarily be limited to, the following:	
	(I) measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact	Section 26.2

26.1 Environmental management plans

A number of environmental management measures have been identified in order to minimise adverse environmental impacts which could potentially arise as a result of the project. These management measures will be incorporated into the detailed design and applied during the construction and operation of the project.

The main project specific environmental management plan to ensure that appropriate practices are followed during construction is the Construction Environmental Management Plan (CEMP). A CEMP for the project will be prepared in accordance with DPIE's Guideline for the Preparation of Environmental Management Plans (DIPNR, 2004) and will detail how the performance outcomes, commitments, and environmental management measures for the project will be implemented and achieved during all stages of construction. The CEMP will also provide the roles and responsibilities of key construction personnel, describe how environmental risks associated with the project will be managed and be complemented by the various sub-plans included in **Table 26-2**.

The CEMP will be prepared prior to construction of the project and will be reviewed and certified by Roads and Maritime prior to the commencement of any on-site work. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

26.2 Summary of environmental management measures

Environmental management measures detailed in **Chapter 8, Traffic and transport** to **Chapter 25, Cumulative impacts** of this EIS will minimise any potential adverse impacts arising from the proposed work on the surrounding environment. Environmental management measures applicable to the project are summarised in **Table 26-2**.

Table 26-2 Summary of environmental management measures

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Traffic and transport				
Disruption to public transport, including school bus services	TT1	Operational access for public transport services, including school bus services will be maintained as part of the project. The requirements for any temporary changes during construction will be confirmed following further consultation with the school bus operators, CHCC, Kororo Public School and Bishop Druitt College.	Roads and Maritime / Contractor	Detailed design and during construction
Parking and access at Kororo Public School	TT2	Further consultation will be undertaken with Kororo Public School and NSW Department of Education to confirm final parking arrangements and access during construction.	Roads and Maritime / Contractor	Detailed design and during construction
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.	Roads and Maritime	Detailed design
Solitary Rural Fire Service access	TT4	Consultation with Solitary Rural Fire Service will be undertaken during detailed design to ensure the appropriate access requirements are achieved.	Roads and Maritime	Detailed design
Pacific Bay Western Lands access	TT5	Consultation with CHCC and the proponent of the Pacific Bay Western Lands residential development will be undertaken during detailed design to ensure future access arrangements are considered as part of the project.	Roads and Maritime	Detailed design
Pacific Bay Eastern Lands access	TT6	Consultation with CHCC and the proponent of the Pacific Bay Eastern Lands development will be undertaken during detailed design to ensure future access arrangements are considered as part of the project.	Roads and Maritime	Detailed design
Traffic related risks during construction	TT7	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with Traffic Control at Work Sites Manual (Roads and Maritime Services 2018c).	Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<p>The TMP will include:</p> <ul style="list-style-type: none"> • Confirmation of haulage routes • Measures to maintain access to local roads, properties and Kororo Public School • Measures that consider operation of Kororo Public School and Bishop Druitt College • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction traffic incident and consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • Monitoring, review and amendment mechanisms. 		
Access	TT8	Existing accesses to properties will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners.	Contractor	During construction
Road condition reports	TT9	Pre-construction and post-construction road condition reports for local roads will be prepared. Any damage resulting from construction (not normal wear and tear) will be repaired unless alternative arrangements are made CHCC. Copies of road condition reports will be provided to CHCC.	Contractor	Prior to construction and post construction
Permanent removal of parking areas	TT10	<p>Parking demand and use surveys will be undertaken to confirm the extent of temporary and/or permanent impacts at the following locations:</p> <ul style="list-style-type: none"> • Areas associated with the informal school bus stop at the intersection of Coramba Road and Spagnolos Road • Englands Road 	Roads and Maritime	Detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Oz Group Packhouse at Isles Drive <p>The results will be used to determine the need for alternative arrangements, where reasonable and feasible.</p>		
Confirmation of assessed impacts	TT11	A review of operational network performance will be undertaken 12 months from the opening of the project to confirm the operational traffic and transport impacts of the project on the surrounding road network, in particular at interchange locations 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 . Where required, additional mitigation measures will be identified in consultation with CHCC to manage any additional traffic performance impacts.	Roads and Maritime	Operation
Noise and vibration				
Construction noise and vibration management	NV01	<p>A Noise and Vibration Management Plan (NVMP) will be prepared and prepared and implemented as part of the CEMP and in accordance with the Construction Noise and Vibration Guideline (Roads and Maritime Services 2016a) The NVMP plan will identify:</p> <ul style="list-style-type: none"> All potential significant noise and vibration generating activities associated with the activity Measures to be implemented during construction to minimise noise and vibration impacts, such as restrictions on working hours, respite periods, staging, placement and operation of ancillary facilities, temporary noise barriers, haul road maintenance, and controlling the location and use of vibration generating equipment A monitoring program to assess performance against relevant noise and vibration criteria Process for the implementation of respite periods to provide residents with respite from ongoing impact Arrangements for consultation with affected receivers, including notification and complaint handling procedures Contingency measures to be implemented in the event of non-compliance with noise and vibration criteria. 	Contractor	Prior to construction and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Construction and vibration impacts	NV02	Prior to commencing construction, the structural integrity of Old Coast Road Bridge No. 1 and Old Coast Road Bridge No. 2 will be confirmed by a suitably qualified structural engineer. The results from inspection will be documented and used to verify the applicable vibration criteria, construction vehicle restrictions and any feasible and reasonable mitigation measures to be implemented. A copy of the report will be provided to CHCC.	Contractor	Prior to construction
	NV03	Building condition surveys will be conducted for buildings and other structures within 50 m of vibration generating activities before commencement of construction. A copy of the building condition survey report will be provided to the relevant property owner.	Contractor	Prior to construction
	NV04	Where vibration generating activities will be carried out within minimum working distances for cosmetic damage, vibration monitoring will be carried out. Where monitoring indicates cosmetic damage criteria are exceeded, alternative low-vibration work practices will be investigated and implemented.	Contractor	During construction
	NV05	Consultation with the Boambee Equestrian Centre will be carried out during detailed design following further consideration of construction methodologies and further geotechnical conditions to ensure appropriate work practices are implemented to minimise the risk of vibration impacts.	Contractor	Prior to construction
Impacts from out of hours works	NV06	An Out of Hours Work Procedure will be included as part of the NVMP to manage any variations to the standard construction hours. The procedure will follow the approach in Roads and Maritime's Construction Noise and Vibration Guideline (Roads and Maritime Services 2016a) and include, but not be limited to: <ul style="list-style-type: none"> • Scheduling of noise intensive or high noise impact work to evening periods where feasible • Use of alternative plant and equipment and/or construction techniques to minimise noise • Notification and consultation requirements including preparation of a six-month 'look ahead' program for likely out of hours work • Use of temporary noise barriers 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Acoustic sheds will be included around tunnel portals to shield noise from within the tunnel during evening and night periods Respite periods Representative noise monitoring Offers of reasonable and temporary alternative accommodation or an act of good will Use of negotiated agreements. 		
	NV07	At-property operational noise mitigation measures will be implemented during the pre-construction phase of the project, where reasonable and feasible, to assist in reducing noise impacts associated with construction (including out of hours work).	Roads and Maritime / Contractor	Prior to construction
Construction noise impacts from ancillary facilities	NV08	Ancillary facilities will be designed to ensure that primary noise sources are at a maximum distance from residences (where reasonable and feasible), with solid structures (sheds, containers, etc) placed between residences and noise sources (and as close to the noise sources as is practical).	Contractor	During construction
Construction traffic noise impacts	NV09	Management of construction related traffic noise will include the following considerations: <ul style="list-style-type: none"> Scheduling of vehicle movements during less sensitive time periods where possible Training/inductions to address driver behaviour and avoidance of the use of engine compression brakes Vehicle maintenance. 	Contractor	During construction
Blasting	NV10	A Blast Management Strategy will be prepared as part of the NVMP. The strategy will aim to demonstrate that all blasting and associated activities will be carried out in a manner that will not generate unacceptable noise and vibration impacts or pose a significant risk impact to residences and sensitive receivers. The Blast Management Strategy will address: <ul style="list-style-type: none"> Details of blasting to be performed, including location, method and justification of the need to blast 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Identification of any potentially affected noise and vibration sensitive sites and structures • Establishment of appropriate criteria for blast overpressure and ground vibration levels at each category of noise sensitive site • Details of the storage and handling arrangements for explosive materials and the proposed transport of those materials to the construction site • Identification of hazardous situations that may arise from the storage and handling of explosives, the blasting process and recovery of the blast site after detonation of the explosives • Determination of potential noise and vibration and risk impacts from blasting and appropriate best management practices • Community consultation procedures. 		
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.	Roads and Maritime / Contractor	Detailed design
Operational noise impacts	NV12	<p>An operational noise review will be carried out 12 months after the opening of the project to confirm the operational noise impacts. The review will be based on updated traffic surveys at the time (and once traffic flows have stabilised) and will be in accordance with the Roads and Maritime's Noise Mitigation Guideline (Roads and Maritime Services 2015d) and Practice Note viii of ENMM (RTA 2001b). The review will:</p> <ul style="list-style-type: none"> • Assess actual noise performance compared to predicted noise performance • Assess the performance and effectiveness of noise and vibration mitigation measures • Where deficiencies in performance are identified, provide recommendations for additional feasible and reasonable measures. 	Roads and Maritime	Operation
Biodiversity				

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Removal of threatened fauna habitat	FF01	The TSMP (Appendix I, Threatened Species Management Plan) would be reviewed and updated as required during detailed design and prior to operation. The purpose of the review would be to address any detailed design and/or construction refinements and to comply with relevant project approval requirements. The Plan would operate in conjunction with the FFMP.	Contractor	Detailed design and prior to operation
	FF02	The FFMP would be prepared in accordance with Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) and implemented a part of the CEMP. The FFMP would build upon the strategies outlined in the TSMP and identify detailed site-specific and species-specific mitigation measures and management protocols to be implemented before, during and after all construction activities to further avoid or reduce impacts on threatened biodiversity.	Contractor	Prior to construction
	FF03	Native vegetation and fauna habitat removal would be minimised through detailed design where reasonable and feasible. Particular focus would be given to avoiding and minimising the removal of: <ul style="list-style-type: none"> • Hollow bearing trees • Native vegetation in riparian zones • Native vegetation from known fauna connectivity corridors and near proposed fauna crossing structures. 	Contractor	Detailed design
	FF04	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
	FF05	Protection and enhancement of vegetated riparian zones would be undertaken to improve opportunities for fauna movement (including spotted-tailed quoll and pale-vented bush hen).	Contractor	During construction
	FF06	Opportunities for providing roosting habitat for microbats in new bridge structures adjacent areas of known microbat habitat would be investigated where future maintenance issues would not be compromised.	Contractor	Detailed design
	FF07	A Nest Box Management Plan would be prepared and implemented as part of the FFMP in accordance with Guide 8: Nest Boxes of the Biodiversity	Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011). The Plan would include requirements for monitoring and maintenance.		
Removal / clearing of native vegetation (including riparian vegetation)	FF08	Pre-clearing surveys would be undertaken in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	Prior to construction
	FF09	The limits of clearing within the construction footprint would be delineated using appropriate signage and barriers, identified on site construction drawings and communicated to construction staff during induction. Vegetation and habitat features to be retained, such as hollow-bearing trees, would be clearly identified and protected by suitable fencing, signage and/or markings.	Contractor	During construction
	FF10	Vegetation clearing would be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
	FF11	Native vegetation consisting of suitable species from locally indigenous vegetation communities of the study area would be progressively re-established in accordance with Guide 3: Re-establishment of native vegetation of the Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
	FF12	An unexpected species find procedure would be prepared and implemented in accordance with Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
Removal of threatened flora	FF13	A Salvage and Re-establishment Plan for southern swamp orchid individual(s) and rusty plum would 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.	Roads and Maritime	Prior to construction
Fragmentation of identified biodiversity	FF14	Fauna connectivity structures would 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 .	Contractor	Detailed design and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
links and habitat corridors	FF15	Permanent fauna fencing, including specific fencing for koala and giant barred frog areas of known habitat, would be progressively installed as fauna connectivity structures become operational in consultation with a suitably qualified and experienced ecologist.	Contractor	Detailed design and during construction
	FF16	Temporary fauna fencing would be installed if existing fauna fence at the southern end of the project on the Pacific Highway is removed during construction period.	Contractor	During construction
Edge effects on adjacent native vegetation and habitat	FF17	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
Injury and mortality of fauna	FF18	Any fauna encountered during construction would be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011).	Contractor	During construction
	FF19	A native stingless bee rescue protocol would be developed and implemented to guide relocation of any native bee hives within the construction footprint.	Contractor	During construction
Invasion and spread of weeds	FF20	Biosecurity risk and weed species would be managed in accordance with Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) and Guide 7: Pathogen Management (RTA 2011). Specific protocols would be prepared and implemented to manage, Chytrid fungus, Phytophthora and Myrtle Rust.	Contractor	During construction
Noise, light and vibration	FF21	Shading and artificial light impacts on areas of retained native vegetation would be minimised through detailed design where reasonable and feasible.	Contractor	Detailed design
	FF22	Exclusion measures for microbats would be investigated for culverts identified as having high and medium habitat potential in consultation with a suitable qualified and experienced ecologist. Where required, timing for exclusion measures would be undertaken outside of breeding and winter torpor periods.	Contractor	Prior to and during construction
Impacts to aquatic habitat and changed hydrological regimes	FF23	Aquatic habitat would be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA 2011) and Section 3.3.2 Standard	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		precautions and mitigation measures of the Policy and Guidelines for Fish Habitat Conservation and Management Update 2013 (DPI 2013) and with reference to DP Office of Water Guidelines for controlled activities on waterfront land – Riparian corridors (DPI 2018d).		
	FF24	Any machinery used during instream works should be verified as clean and free of potential weeds and pathogens to avoid biosecurity risk.	Contractor	During construction
	FF25	Waterway crossings would be designed and constructed in accordance with DPI Fisheries guideline Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003) and would include maintaining existing nominal flow velocity where possible or at less than 0.3 m/sec to prevent damage to aquatic habitats.	Contractor	Detailed design and during construction
	FF26	Coffer dams would be used during work undertaken within or immediately adjacent to waterways where reasonable and feasible to prevent or minimise increased turbidity. In the event that coffer dams are not reasonable and feasible, silt curtains would be used.	Contractor	During construction
	FF27	Changes to existing hydrological regimes within known and potential coastal petaltail dragonfly habitats would be minimised during detailed design. Bridges and/or culverts would be located and designed to maintain existing hydrological regimes where reasonable and feasible and would consider the potential for scour impacts on downstream habitats.	Contractor	Detailed design
Urban design, landscape and visual amenity				
Landscape and visual impacts	UD01	An urban design and landscape plan will be prepared to support the detailed design of the project. The plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The plan will include: <ul style="list-style-type: none"> Location and identification of existing vegetation and proposed landscaped areas, including species to be used 	Contractor	Detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Built elements including retaining walls, bridges and noise barriers (using mounds as a priority where feasible, walls to supplement where required) • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as lighting, fencing and signs • Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage • Procedures for monitoring and maintaining landscaped or rehabilitated areas • Water sensitive urban design solutions. <p>The plan will be prepared in accordance with Roads and Maritime urban design policy guidelines including:</p> <ul style="list-style-type: none"> • Beyond the Pavement - urban design policy, procedures and design principles (Roads and Maritime Services 2014a) • Landscape design guidelines: Design guideline to improve the quality safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime Services 2017c) • Bridge Aesthetics: Design Guidelines to improve appearance of bridges in NSW (TfNSW Centre for Urban Design 2019) • Tunnel urban design guideline: Design guideline to improve the customer and community experience of road tunnels (Roads and Maritime Services 2017d) • Noise Wall Design Guideline: Design guidelines to improve the appearance of noise walls in NSW (Roads and Maritime Services 2016) • Shotcrete Design Guideline: Design guidelines to avoid, minimise and improve the appearance of shotcrete in NSW (Roads and Maritime Services 2016) • Water sensitive urban design guideline. 		
Water sensitive urban design	UD02	Temporary and permanent drainage infrastructure will be designed to incorporate water sensitive urban design principles where possible in	Contractor	Detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		accordance with Roads and Maritime's Water sensitive urban design guideline (Roads and Maritime 2017). This could include replacing concrete lined longitudinal catch drains with vegetated swales and the operational water quality control measures.		
Construction visual impacts	UD03	Temporary site lighting will be installed and operated in accordance with AS 4282:1997 Control of the Obtrusive Effect of Outdoor Lighting (Standards Australia 1997).	Contractor	During construction
	UD04	Project work sites, including construction areas and supporting facilities (such as ancillary sites) will be managed to minimise visual impacts, including appropriate storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials.	Contractor	During construction
Potential overshadowing	UD05	Where noise walls cause overshadowing, consideration will be given during detailed design to the use of transparent panels within the noise wall design in consultation with potentially affected property owners.	Contractor	Detailed design
Potential glare impacts	UD06	A reflectivity study will be undertaken during detailed design to identify adverse reflective glare from the use of transparent panels in noise walls on road users and adjacent residential properties. An appropriate glazing design will be considered where issues are identified. The reflectivity study will also investigate the potential for glare impacts on road users associated with the morning sun for Shephards Lane and Gatelys Road tunnel.	Contractor	Detailed design
Land use and property				
Future land use	LUP01	Consultation with CHCC will be undertaken during detailed design regarding the West Coffs Investigation Area to ensure appropriate consideration of the project is provided in any future masterplanning.	Roads and Maritime	Detailed design
Property impacts	LUP02	Property acquisition will be carried out in accordance with the Land Acquisition Information Guide (Roads and Maritime, 2014b), Fact sheet: Property acquisition of subsurface lands (Roads and Maritime, 2015g) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .	Roads and Maritime	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Management of residual land	LUP03	Ancillary sites will be rehabilitated to their pre-construction condition (where reasonable and feasible) and managed in accordance with Appendix B – Residual land treatment in Appendix J, Urban design, landscape character and visual impact assessment .	Roads and Maritime / Contractor	During and post construction
Management of utilities adjustment and/or relocation	LUP04	The following strategy for managing utilities will be implemented prior to construction in consultation with the relevant utility providers: <ul style="list-style-type: none"> • Further detailed utility investigations (revised ‘Dial before you Dig’ queries and/or potholing will be carried to confirm location of buried services) • Detailed utility design be undertaken in accordance with the relevant utility providers requirements • Relocation or protection work will be undertaken in a manner that minimises environmental impacts and addresses the relevant utility service providers requirements and construction methods. 	Roads and Maritime / Contractor	Prior to construction
Agriculture				
Partial property acquisition	AG01	Where a property is not subject to a total acquisition, a specialist agricultural consultant will be engaged at the request of affected property owners whose properties are seriously or critically impacted by the project to assist in assessing, but not limited to, considering opportunities for agricultural diversification and/or revised farm management practices.	Roads and Maritime	Prior to construction
Impact on irrigation water source	AG02	Impacted irrigation water sources and/or infrastructure will be restored, replaced, relocated or compensated for in consultation with affected property owners.	Roads and Maritime / Contractor	Prior to construction
Impact on agricultural structures	AG03	Impacted structures, eg packing sheds and cropping structures, etc, will be replaced or reconfigured in consultation with affected property owners where feasible.	Roads and Maritime / Contractor	Prior to construction
Impact on property access	AG04	Internal farm access impacted by the project will be reconfigured in consultation with affected property owners where reasonable and feasible.	Roads and Maritime / Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
	AG05	Existing property accesses will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners with consideration to existing farming practices.	Contractor	Prior to and during construction
Dust impacts	AG06	Real time dust monitoring will be carried out at representative locations of dust sensitive agricultural receivers along the project alignment to allow for the timely management of dust generation on-site and to minimise potential impacts. The representative locations of dust sensitive agricultural receivers will be determined during detailed design and will include the Oz Group Packhouse. Monitoring would be carried out in accordance with the Approved Methods for the sampling and analysis for air pollutants in NSW (DEC 2005) where applicable.	Contractor	Prior to and during construction
Wind and microclimate impacts	AG07	An Automatic Weather Station (AWS) will be established at a representative location to confirm the outcomes of the wind flow and microclimate investigations. The AWS will be established in accordance with the Bureau of Meteorology's Observation Specification No. 2013.1: Guidelines for siting and exposure of meteorological instruments and observing facilities.	Roads and Maritime	Prior to, during and post construction
Managing the spread of Panama disease	AG08	<p>A Panama Disease Control Management Plan will be prepared and implemented during construction in consultation with DPIE (Regions, Industry, Agriculture & Resources) and representatives of the Banana Growers Association of Coffs Harbour & District. The Plan will be prepared in accordance with relevant Queensland's Department of Agriculture and Fisheries guidelines including Panama disease tropical race 4: Biosecurity standards and guidelines (2015) and Panama disease tropical race 4: Decontamination guide (2016).</p> <p>Specific management measures and controls will address the following as a minimum for all existing and former banana plantations within the construction footprint:</p> <ul style="list-style-type: none"> • Cleaning and washdown procedures for construction plant, vehicles and equipment and personnel • Clearing and grubbing practices • Stockpile management procedures for topsoil and other materials 	Roads and Maritime / Contractor	Prior to and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Procedures for the management and/ or disposal of contaminated and/ or potentially contaminated Panama disease soils including its identification as such to prevent accidental spread of the disease by others • Erosion and sediment control requirements • Dust management controls • The movement of construction plant, vehicles and equipment and personnel both within the project and externally, including where construction plant and equipment may have previously worked in other affected areas such as north east Queensland • Revegetation and rehabilitation practices. 		
Socio-economic				
Impacts to residents (including those related to property, amenity, and access impacts)	SE01	<p>Consultation will be undertaken with potentially affected residences prior to the commencement of and during work in accordance with Community Liaison Implementation Plan. The Plan will be based on the draft Community consultation framework in Appendix D and will be implemented prior to construction. The Plan will provide specific information in relation to community involvement during construction and will include, but not be limited to:</p> <ul style="list-style-type: none"> • A map of impacted properties • A register of potential construction impacts and timings • A risk assessment and mitigation plan to minimise impacts on stakeholders • A procedure for managing and responding to enquiries and complaints • Procedures for notifying the community of upcoming work and impacts • Procedures for communicating the details of design and construction. 	Roads and Maritime / Contractor	Prior to and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Minimise loss of passing trade	SE02	A Directional Signage Plan will be developed in accordance with Roads and Maritime signage guidelines to ensure effective and appropriate signposting for key locations along the project. The plan will identify the range of services that Coffs Harbour provides and will be prepared in consultation with CHCC, Coffs Harbour Chamber of Commerce and the NSW Government's Tourist Attraction Signposting Assessment Committee (TASAC).	Roads and Maritime	Prior to operation
Minimising impacts and community values	SE03	Design investigation of the property access road south of the Coramba Road interchange will be undertaken with the aim to avoid potential impacts on the tree planted as a memorial to a family member where feasible.	Contractor	Detailed design
	SE04	Management of the gravestone of Herbert Frazer Simpson at the intersection of the existing Pacific Highway and James Small Drive will be undertaken in accordance with Roads and Maritime's Roadside Tributes Factsheet (Road and Maritime 2016e). Every effort will be made to contact the family, if known, and work with them to develop an appropriate strategy for reinstallation, relocation or removal. If the family is unknown or cannot be contacted, Roads and Maritime would store the gravestone off-site for future recovery if necessary.	Roads and Maritime	Prior to construction
	SE05	Seed collection and salvage of representative species within the planted rainforest impacted by the project near Mackays Road will be undertaken prior to construction where reasonable and feasible. The purpose of the seed collection and salvage is to re-establish a portion of the rainforest within adjacent landscaping associated with project. Where possible, the location would allow for access from the realigned Mackays Road / new local access roads.	Roads and Maritime	Prior to construction
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.	Roads and Maritime	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Aboriginal cultural heritage				
Impacts on known Aboriginal sites or places	AH01	An Aboriginal Heritage Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The plan will be prepared in consultation with the RAPs. The plan will give effect to any management measures contained in the Aboriginal cultural heritage assessment carried out for the project and include: <ul style="list-style-type: none"> • Details of investigations completed or planned to be carried out and any associated approvals required • Mapping of areas of Aboriginal heritage value and identification of protection measures to be applied during construction • Procedures to be implemented if previously unidentified Aboriginal objects, including skeletal remains, are discovered during construction • An induction program for construction personnel on the management of Aboriginal heritage values and cultural awareness. • Opportunities for on-going Aboriginal community engagement in the project. 	Contractor	Prior to construction
	AH02	Before any construction activity (including pre-construction activities of minimal environmental impact), a heritage site map will be prepared identifying Aboriginal sites to be excavated and avoided (for all sites in proximity to the construction footprint) and included in relevant induction training.	Contractor	Prior to construction
	AH03	Archaeological salvage excavation as detailed in Table 15-7 must be carried out in accordance with the methodology specified in Appendix L, Aboriginal cultural heritage assessment report .	Roads and Maritime / Contractor	Prior to construction
	AH04	Where archaeological salvage excavation or surface collection has been nominated for impacted sites, no construction activities (including pre-construction activities of minimal environmental impact) can occur on the land to be investigated until the relevant archaeological excavations at the nominated site have been completed.	Roads and Maritime / Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Unexpected finds of Aboriginal objects	AH05	Roads and Maritime's Unexpected Heritage Items: Heritage Procedure 02 (Roads and Maritime 2015e) will be used in the event of uncovering an unexpected archaeological find during construction.	Contractor	During construction
Unexpected finds of human remains	AH06	In the event that construction activity reveals possible human skeletal material (remains), all work is to halt at that location immediately and the steps outlined in the Roads and Maritime's Unexpected Heritage Item: Heritage Procedure 02 (Roads and Maritime 2015e) will be followed. Identified knowledge holders will be notified within 24 hours of any confirmed discovery of Aboriginal skeletal remains.	Contractor	During construction
Impacts to intangible cultural values associated with impacted cultural sites	AH07	Rehabilitation and revegetation of the construction footprint will occur with local indigenous plant species progressively during construction. The identification of the plant species will be carried out in consultation with the identified knowledge holders and the RAPs. Opportunities will be given to local Aboriginal organisations for involvement and potential engagement in the revegetation process.	Roads and Maritime / Contractor	During construction
	AH08	A booklet (in a format appropriate for local publication) will be prepared by a cultural heritage specialist on the cultural values and historical records of the cultural sites. As part of the process, the visual documentation of the cultural landscape will occur before construction. The report will be full colour and distributed to local libraries and educational institutions. The final content of the booklet will be developed in consultation with identified Aboriginal knowledge holders.	Roads and Maritime	Prior to and during construction
	AH09	Interpretative signage relevant to the cultural sites will be prepared in consultation with identified knowledge holders. Consultation with the knowledge holders will occur in regard to potential locations for the placement of the signage.	Roads and Maritime	During and post construction
Non-Aboriginal cultural heritage				
	NAH01	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on	Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Construction impacts to known non-Aboriginal heritage items		<p>measures and controls to be implemented to avoid and mitigate impacts to Non-Aboriginal heritage. The plan will include:</p> <ul style="list-style-type: none"> • Details of investigations completed or planned to be carried out and any associated approvals required • Mapping of areas of non-Aboriginal heritage value and identification of protection measures to be applied during construction • Procedures to be implemented if previously unidentified non-Aboriginal relics or heritage items are discovered during construction • An induction program for construction personnel on the management of non-Aboriginal heritage values. 		
	NAH02	Consideration will be given to minimising impacts to elevated vantage points across the Coffs Harbour Banana Plantation Landscape during the preparation of the Urban Design and Landscape Plan. This will include, but not be limited to, investigating opportunities to maintain views to, from and within the landscape.	Contractor	Detailed design
	NAH03	Archival recording will be prepared for the Coffs Harbour Banana Plantation Landscape, former Coffs Heights Post Office, the North Coast Railway, the Old Coast Road Bridge No.1, Old Coast Bridge No.2 and the marked tree stumps. The archival records should record the process of development and alterations to heritage values. A program of archival recording should be completed prior to construction. Archival recording will be completed in accordance with How to Prepare Archival Records for Heritage Items (NSW Heritage Office 1998) and Photographic Recording of Heritage Items Using Film or Digital Capture (NSW Heritage Office 2006).	Roads and Maritime / Contractor	Prior to construction
	NAH04	The North Coast Railway, Old Coast Road Bridge No.1 and Old Coast Road Bridge No.2 will be marked on sensitive area maps to identify their heritage values. These areas will be marked as 'no-go' areas which are established at an appropriate distance (ie on the curtilage boundary of the item) to protect the heritage values. Where construction is to occur within 50 m of the North Coast Railway and the timber beam bridges, the use of physical fencing will be considered to further protect the heritage values but allow construction (including access) to proceed unhindered. The use of sensitive area maps and	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		'no go' areas will be incorporated into the induction program as part of the NAHMP.		
Discovery of unexpected non-Aboriginal objects	NAH05	Should any heritage items, archaeological remains or potential relics of non-Aboriginal origin be encountered, then construction work that might affect or damage the material will cease and notification provided in accordance with the Roads and Maritime's Unexpected Heritage Items: Heritage Procedure 02 (Roads and Maritime 2015e). Work will only re-start once the requirements of that Procedure have been satisfied.	Contractor	During construction
Flooding and hydrology				
Impacts on flood behaviour during construction	FH01	<p>A Construction Flood Management Plan (CFMP) will be prepared and implemented before construction to manage the impact of a 5% AEP flood event or greater on the operation of ancillary facilities. The CFMP will form part of the Construction Environmental Management Plan (CEMP). The CFMP should detail:</p> <ul style="list-style-type: none"> • The impacts on hydrology and flooding from the construction phase • Control measures and procedures for construction activities to avoid, minimise or manage potential adverse impacts to construction works in the event of a flood within or adjacent to the project • Management responses for ancillary sites provided in Table 17-5 • Flood monitoring to forecast large rainfall and flood events and notification measures • Emergency response and evacuation procedures in the event of a flood during the construction phase • Suitable evacuation routes and procedures for evacuation of site personnel • A register of all materials stored in work areas prone to flooding • Control measures for stockpiling within the floodplain to minimise loss of material in flood events. • Protocols for equipment and materials that can be removed from the subject area during a flood event where reasonable and feasible 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Consultation and coordination with local residents, CHCC and other relevant stakeholders • Induction of all construction site staff and visitors to familiarise with the emergency response procedures. 		
	FH02	If the detailed construction plan requires staging of additional earthworks within floodplain(s) crossed by the project, revised flood modelling will be carried out as part of the detailed design to determine the potential for changed flooding impacts and any required mitigation and/or management response.	Contractor	During detailed design
Impacts on flood behaviour during construction from temporary waterway crossings	FH03	<p>Temporary waterway crossings will be designed, constructed and maintained in accordance with the following requirements:</p> <ul style="list-style-type: none"> • Low-flow conditions will be maintained • No additional flooding impacts would occur greater than those assessed for the operational phase • Fish passage will be maintained in accordance with the relevant waterway classification and DPIE guideline, Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003) • Material used in temporary waterway crossings will be selected to minimise risk of fine sediment material entering the waterway • Include erosion and sediment controls in accordance with Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom 2004) • Any material used in the temporary creek crossing will be removed following construction and the site rehabilitated to its existing condition where reasonable and feasible. 	Contractor	During construction
Hydrology impacts from creek realignments	FH04	Creek realignments and/or adjustments 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). Revegetation and adequate scour protection will be provided so there are no hydraulic impacts on bed and bank stability, erosion, sedimentation or riparian vegetation in accordance with the Guidelines for instream works on waterfront land (DPI	Contractor	Detailed design and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<p>2012a). Detailed design of waterway realignments and adjustments will be developed in consultation with DPIE (Regions, Industry, Agriculture and Resources) and will consider:</p> <ul style="list-style-type: none"> 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 guideline Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003). 		
	FH05	During the initial establishment and operation period of realigned or adjusted waterways, regular inspections will be carried out to ensure effective design of the realignment. An inspection program will be documented in the Soil and Water Management Plan (SWMP). The inspections will assess implementation and success of the controls and identify any maintenance actions required.	Contractor	During construction
Minimise scour potential	FH06	Scour protection for bridges and culverts will be designed in accordance with DPIE Fisheries guideline, Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (Fairfull & Witheridge 2003) and DPI Office of Water guidelines for controlled activities on waterfront land.	Contractor	During detailed design
Construction impacts on flood evacuation routes	FH07	NSW State Emergency Services will be notified of any partial or total road closures during construction because of the project. The CFMP should detail any impacts on existing flood conditions in relation to flood evacuation routes.	Contractor	During construction
Managing residual flood impacts	FH08	<p>Consultation with CHCC will be carried out during detailed design regarding any residual flood impacts. This will include, but not be limited to:</p> <ul style="list-style-type: none"> A whole of government approach will be investigated which considers the relationship between the project and North Boambee Valley (West) 	Roads and Maritime	During detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<p>URA and what reasonable and feasible options could be implemented to assist in managing potential flood impacts</p> <ul style="list-style-type: none"> • Modifications to the Bennetts Road detention basin. 		
	FH9	Consultation with the proponent of Pacific Bay Eastern Lands development will be carried out during detailed design to develop a reasonable and feasible design solution to mitigate flood impacts on the approved residential areas. Consultation will also consider future proposals that are being investigated.	Roads and Maritime	During detailed design
	FH10	Proposed mitigation measures for the North Boambee Valley catchment as described in Table 17-10 . The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, DPIE (Environment, Energy and Science) and adjacent property owners.	Roads and Maritime / Contractor	During detailed design
	FH11	Proposed mitigation measures for the Coffs Creek catchment as described in Table 17-13 will be investigated during detailed design. The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, DPIE (Environment, Energy and Science) and adjacent property owners.	Roads and Maritime / Contractor	During detailed design
	FH12	Proposed mitigation measures for the Northern creeks catchment as described in Table 17-16 will be investigated during detailed design. The final design solution may involve combinations of the described mitigation options and the design response developed as part of the concept design and will be subject to further flood modelling and consultation with CHCC, DPIE (Environment, Energy and Science) and adjacent property owners.	Roads and Maritime / Contractor	During detailed design
Project impacts on flood evacuation routes	FH13	Consultation with SES and CHCC will be carried out during detailed design if there are any changes to the existing flood evacuation routes or associated roads which may be impacted during operation.	Roads and Maritime	During operation
Soils and contamination				

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Contaminated soil	SC01	<p>Phase 2 contamination investigations will be undertaken in areas of potential contamination identified during the preliminary site investigation (RCA 2016). The investigation will be carried out in accordance with the Roads and Maritime Guideline for the Management of Contamination (2013c). This would include soil sampling from targeted areas including:</p> <ul style="list-style-type: none"> • Banana plantations within proposed cuttings (analysed for arsenic, lead and organochlorin pesticides including DDT, Aldrin and Dieldrin) • Incremental soil sampling along construction footprint at existing Pacific Highway where there is a history of truck accidents to assess potential lead and hydrocarbon contamination • Targeted soil sampling at locations with dumped materials, fill materials and other agricultural uses • Areas of PASS within construction footprint to determine oxidised pH level. 	Roads and Maritime	Prior to construction
Contaminated land disturbance	SC02	<p>A Contaminated Land Management Plan will be prepared and implemented as part of the CEMP for any areas of existing contaminated land or to address land contamination likely to be caused by the activity. The plan will be prepared in accordance with relevant requirements of the Roads and Maritime Guideline for the Management of Contamination (2013c). As a minimum it will address the following matters:</p> <ul style="list-style-type: none"> • Control measures to divert surface runoff away from the contaminated land • Capture and manage of any surface runoff contaminated by exposure to the contaminated land • Further investigations required to determine the extent, concentration and type of contamination, as identified in the Phase 2 contamination investigations • Manage the remediation and subsequent validation any certification land, including any certification required • Measures to ensure the safety of site personnel and local communities during construction 	Contractor	During detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Procedures to identify and manage any unexpected contamination finds during construction. 		
Remediation of contamination	SC03	If site contamination investigations indicate that construction works will impact contaminant that are present on site in concentrations above the intended land use criteria, then a Remedial Action Plan will be developed, and remediation works carried out in consultation with the EPA and in accordance with the Roads and Maritime Contaminated Land Management Guidelines.	Contractor	During detailed design
Soil, surface water and groundwater quality	SC04	A Soil and Water Management Plan (SWMP) will be prepared in accordance with Landcom (Blue Book) Erosion and Sediment Control Principles and Procedures (Landcom 2004) and Erosion and Sediment Management Report: Coffs Harbour Bypass (SEEC 2019) and implemented as part of the CEMP. The plan will identify all reasonably foreseeable risks relating to soil erosion and water pollution associated with carrying out the activity and describe how these risks will be managed and minimised during construction. The plan will include arrangements for managing pollution risks associated with spillage or contamination on the site and adjoining areas.	Contractor	During detailed design
Soil erosion and sedimentation	SC05	<p>A primary Erosion and Sediment Control Plan (ESCP) will be prepared and implemented as part of the SWMP. The plan will identify detailed measures and controls to be applied to minimise erosion and sediment control risks including:</p> <ul style="list-style-type: none"> Runoff, diversion and drainage points Sediment basins and sumps Scour protection Stabilising disturbed areas as soon as possible, check dams, fencing and swales The need for site-specific ESCP to address staged implementation arrangements. <p>The plan will also include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.</p>	Contractor	Prior to and during construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Erosion and sedimentation management	SC06	A suitably qualified and experienced soil conservationist will be engaged during construction of the project to advise and review the implementation and management of erosion and sediment controls.	Contractor	During detailed design and construction
Soil erosion and bank stability risk	SC07	Batters will be designed and constructed to minimise risk or exposure, instability and erosion, and to support long term, ongoing best practice management, in accordance with the Guideline for Batter Stabilisation Using Vegetation (Roads and Maritime 2015b).	Contractor	During detailed design and construction
Spill management during construction	SC08	A site-specific emergency spill response procedure will be developed as part of the SWMP and include spill management measures in accordance with the Roads and Maritime Code of Practice for Water Management and relevant EPA guidelines. The procedure will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities.	Contractor	During detailed design
Disturbance of acid sulfate materials	SC09	An ASS Management Plan will be prepared and implemented as part of the SWMP. The plan will be prepared in accordance with the Guidelines for the Management of Acid Sulfate Materials (RTA 2005).	Contractor	During detailed design
Surface water quality				
Water quality monitoring program	SW01	<p>A water quality monitoring program will be prepared and implemented prior to and during construction and operation to identify whether the project is resulting in adverse impacts on water quality and assess compliance with statutory requirements and project targets. Monitoring would continue for a period of three years following construction, or before if it can be proved that no impact has occurred. The monitoring program will be prepared in accordance with the Roads and Maritime Guideline for Construction Water Quality Monitoring (RTA n.d.) and details provided in Chapter 19, Surface water quality. The monitoring program will include requirements for:</p> <ul style="list-style-type: none"> • Identification of monitoring locations which are representative of the potential impacts • Collection of baseline information prior to construction • Consideration of the identified sensitive environments 	Roads and Maritime	Prior to and during construction and operation

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Water quality objectives to assess potential impacts against Contingency and ameliorative measures in the event that adverse impacts are experienced Reporting of the monitoring results. 		
Water quality impacts from dewatering existing storages	SW02	Dewatering of existing storages (eg dams) will occur overland in vegetated areas or will be used for dust suppression activities and not discharged directly into waterways to minimise release of high levels of nutrients and or contaminants directly into the waterways.	Contractor	During construction
Water quality impacts from dewatering during construction	SW03	Any dewatering activities will be undertaken in accordance with the Roads and Maritime Technical Guideline: Environmental Management of Construction Site Dewatering (RTA 2011b), in a manner that prevents pollution of waters.	Contractor	During construction
Works within or adjacent to waterways	SW04	<p>A detailed Environmental Work Method Statement (EWMS) will be prepared and implemented for all works undertaken within or immediately adjacent to waterways. The EWMS will detail measures to avoid or minimise risks from erosion and sedimentation to water quality and biodiversity. It will be prepared in accordance with relevant guidelines including, but not limited to consideration of:</p> <ul style="list-style-type: none"> Roads and Maritime's Biodiversity Guidelines - Protecting and managing biodiversity on RTA projects DPIE guidelines Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings. 	Contractor	During construction
Managing tannin leachates	SW05	<p>Mulch stockpiles will be managed in accordance with the Roads and Maritime Environmental Direction for the Management of Tannins from Vegetation Mulch (Roads and Maritime 2012b). This would include but not be limited to:</p> <ul style="list-style-type: none"> Planning and staging vegetation processing activities Stockpile location and management to minimise the production and release of tannins Monitoring the stockpiles for the production of tannins Response to tannin production. 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Inspection and maintenance program	SW06	An inspection and maintenance program as part of the SWMP will be implemented during construction to ensure effective implementation of all temporary and permanent soil, erosion and water pollution safeguards. The timing and frequency of inspections will be set out in the SWMP. The inspections will assess implementation and success of the controls, actions required to ensure on-going effective operation, and compliance with any statutory approvals. A register of inspections will be established.	Contractor	During construction
Operational water quality impacts	SW07	Stormwater and road runoff will be directed towards operational water quality treatment structures that will assist in the removal of pollutants from discharge water to protect ecosystem and human health.	Contractor	During detailed design
	SW08	The type and design of the specific stormwater treatment measures will continue to be refined as part of the detailed design process with the aim of achieving the NSW WQOs where reasonable and feasible. This will include review of the proposed stormwater treatment train and consideration of best management practice guidelines including Roads and Maritime's Water sensitive urban design guideline (Roads and Maritime 2017g).	Contractor	During detailed design
Groundwater				
Acid sulfate materials	GW01	Stockpiles containing PASS or ASS treatment areas will be lined and bunded in accordance with the Guidelines for the Management of Acid Sulfate Materials (RTA 2005) to prevent leachate contaminating groundwater.	Contractor	During construction
Management of groundwater interception	GW02	Additional groundwater monitoring standpipes will be included for Type A cuts for alluvial aquifers along the project and in the areas around the major embankments to supplement existing data.	Roads and Maritime	Prior to construction
	GW03	Groundwater captured by cuttings and tunnels will be returned into the aquifer down gradient and within the same catchment from where it was intercepted where reasonable and feasible.	Contractor	During construction
	GW04	Engineering measures for long-term management of groundwater inflow to cuttings and tunnels will be designed and constructed to ensure groundwater is recharged downgradient of the cutting or tunnel from where it is captured and within the same catchment where reasonable and feasible. This will be	Contractor	During detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		facilitated by, but not limited to, absorption trenches, infiltration galleries/pits, sediment basins and grassed swales.		
	GW05	Where groundwater recharge downgradient of the cutting or tunnel is not reasonable and feasible, measures will be designed and implemented that transfer seepage water downstream via water quality basins before being discharged into a downstream drainage channel or creek, within the same catchment.	Contractor	During detailed design and during construction
Prevention of groundwater impacts from cuttings, tunnels and embankments	GW06	Monitoring of groundwater levels and quality will be included in the water quality monitoring program detailed in Chapter 19, Surface water quality .	Roads and Maritime	Prior to and during construction
	GW07	Monitoring of seepage into cuttings will be carried out and evaluated against the predictions of the numerical modelling undertaken during detailed design.	Roads and Maritime / Contractor	Construction
	GW08	Major embankments will be designed to enable distributed flow of surface water to prevent ponding.	Roads and Maritime / Contractor	During detailed design
	GW09	Additional ground truthing and site inspections will be undertaken for potentially impacted groundwater bores/supply wells (including supply well GW068986), springs and agricultural dams within and immediately surrounding the zone of drawdown. The purpose of the ground truthing and site inspections is to confirm predicted impacts and develop make good provisions where required in consultation with affected property owners.	Roads and Maritime	During detailed design
Prevention of potential impacts on groundwater quality	GW10	Sites used for stockpiles, washdown areas, refuelling and chemical storage will be located away from areas of shallow groundwater or appropriately lined and bunded to protect groundwater.	Contractor	Prior to and during construction
Air quality				
Management of construction impacts	AQ01	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will identify: <ul style="list-style-type: none"> Potential sources of air pollution (such as dust, vehicles transporting waste, plant and equipment) during construction 	Contractor	Prior to construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Identification of all dust sensitive receivers, including banana and blueberry farms, residential dwellings, education institutions, health care facilities, places of worship, childcare facilities and open space • Air quality management objectives and criteria consistent with Approved Methods for the Modelling and Assessment of Air Quality Pollutants in NSW (EPA 2017a) • Mitigation and suppression measures to be implemented, such as using soil binders or covering exposed surfaces, provision of vehicle clean down areas, covering of loads, use of water carts and street cleaning, use of dust screens, maintenance of plant in accordance with manufacturer's instructions, spray bars on crushers • Methods to manage or stop works during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces • When the air quality, suppression and management measures need to be applied and who is responsible • A monitoring program to assess the effectiveness of the applied measures • Community notification and complaint handling procedures. 		
Dust generation from building demolition	AQ02	Where buildings and structures are required to be demolished, techniques and practices will be developed to minimise dust generation such as water spraying during demolition as required, and the removal of construction debris along an approved route documented in the AQMP.	Contractor	During construction
Construction vehicle emissions	AQ03	Where practicable, construction vehicles will be fitted with pollution reduction devices and switched off when not in use.	Contractor	During construction
Odour impacts from asphalt batch plants	AQ04	<p>Asphalt batch plants established for the project will include the following measures to minimise odour generation:</p> <ul style="list-style-type: none"> • Bitumen products will be maintained at the minimum temperature possible to minimise odorous emissions • Particulate extraction equipment will be installed, operated and maintained for efficiency in minimising odour impacts 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Filters and burners will be adequately maintained to minimise odour impacts Commission testing will be carried out prior to full operation to ensure that best practice industry standards are met during the operation of the batch plant. 		
Waste				
Waste management	WM01	<p>A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It will also address the importation of recycled materials to site for use in undertaking the project. The WMP will be prepared taking into account the Roads and Maritime Environmental Procedure - Management of Wastes on Roads and Maritime Services Land (2014c).</p> <p>It will include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> Measures to avoid and minimise waste associated with the project Classification of wastes generated by the project and management options Classification of wastes received from off-site for use in the project and management options Identification of any statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions Procedures for storage, transport and disposal Monitoring, record keeping and reporting, including any documentation management obligations arising from resource recovery exemptions. 	Contractor	Prior to construction
Management of excess spoil	WM02	<p>Spoil would be beneficially reused as part of the project before alternative spoil disposal options are pursued. Any excess spoil would be managed using the following order of priorities:</p> <ul style="list-style-type: none"> Review alignment and profile refinements during detailed design 	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> Assess opportunities to reuse excess spoil in works such as landscaping and noise barriers within the construction footprint or in adjacent land (subject to property owner agreement and/or any project approval or POEO Act requirements) Beneficial reuse within the construction footprint for rehabilitation of ancillary sites used for the project (where it is within the requirements of the project approval) Transfer to other nearby Roads and Maritime projects for immediate use, where possible, pending construction of other projects or for use on future projects or routine maintenance Transfer to a Roads and Maritime approved site for reuse on concurrent private/local government projects (with appropriate approvals as required, eg a section 143 notice under section 143(3A) of the POEO Act) Disposal at an approved materials recycling or licensed waste disposal facility. 		
Waste storage	WM03	<p>Prior to construction, suitable areas within the ancillary sites or in other appropriate areas within the construction footprint would be allocated which provide adequate space and access for:</p> <ul style="list-style-type: none"> Separated storage of building materials Separated storage and sorting of construction waste Removal of construction waste for recycling, reuse or disposal Separated storage of known previously contaminated materials and contingency for unknown contaminated materials. 	Contractor	Prior to and during construction
Hazardous materials – risk to human health	WM04	A hazardous materials assessment would be carried out of the buildings to be demolished before demolition to identify presence of hazardous materials and ensure appropriate controls are implemented for the demolition, storage and disposal of materials.	Roads and Maritime / Contractor	During detailed design
Asbestos – risk to human health	WM05	If the hazardous assessment investigations identify asbestos containing materials, an Asbestos Management Plan will be developed and implemented. The plan will include:	Roads and Maritime / Contractor	During detailed design

Environmental issue	ID	Environmental management measures	Responsibility	Timing
		<ul style="list-style-type: none"> • Identification of potential asbestos on site procedures to manage and handle any asbestos, including potential areas where asbestos may be found within soils • Procedures to manage asbestos if encountered during construction • Measures to minimise the total volume of asbestos contaminated material that is generated. These would include separate stockpiling to ensure that asbestos contaminated material is not mixed with clean stockpile material • Procedures for disposal of asbestos in accordance with NSW EPA guidelines, Australian standards and relevant industry codes of practice. 		
Wastewater	WM06	Where reasonable and feasible, water captured within the construction footprint will be prioritised for reuse as construction water or dust suppression.	Contractor	During construction
Operational waste	WM07	All operational waste will be managed in accordance with the Roads and Maritime waste management procedures and Environmental Management System.	Roads and Maritime	Operation
Sustainability				
Sustainability	S01	<p>A SMP will be developed to establish governance structures, processes and systems that ensure integration of all sustainability considerations (vision, commitments, principles, objectives and targets), initiatives, monitoring and reporting during the detailed design and construction phases of the project. The SMP will include commitments detailed in Error! Reference source not found. including but not limited to:</p> <ul style="list-style-type: none"> • Key sustainability management roles and responsibilities • Targets for diverse and inclusive workforce participation and local employment opportunities • An energy efficiency and greenhouse gas emissions strategy • A sustainable procurement strategy • Water savings initiatives • Monitoring and reporting requirements for sustainability initiatives and performance. 	Contractor	During detailed design, construction and operation

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Hazard and risk				
Climate change – risk treatments	HZ01	Hydrological and hydraulic assessments undertaken during detailed design would consider the climate change related flood risks to the project and flood impacts from the project. The assessment would confirm the requirements for any additional management measures. The assessment would be undertaken in accordance with the Practical Considerations of Climate Change – Floodplain Risk Management Guideline (DECC 2007).	Contractor	During detailed design
Emergency access	HZ02	Consultation with emergency services, including the RFS and Fire and Rescue NSW would be undertaken during construction to ensure emergency access is maintained during and after construction.	Contractor	During detailed design and construction
Bushfire risk	HZ03	The CEMP would include a Bushfire Management Plan prepared in accordance with the Planning for Bush Fire Protection 2006 (Rural Fire Service 2006). Measures to be implemented to manage bushfire risk include: <ul style="list-style-type: none"> • Consultation requirements for community notifications in the event of a bushfire • Maintaining equipment in good working order • Ensuring plant and equipment are fitted with appropriate spark arrestors, where practicable • Ensuring site workers are informed of the site rules including designated smoking areas and putting rubbish in designated bins • Obtaining hot work permits and implementing total fire bans as required • Implementing adequate storage and handling requirements for potentially flammable substances in accordance with the relevant guidelines. 	Contractor	Prior to and during construction
Hazardous material storage	HZ04	All fuels, chemicals and other hazardous materials will be stored in a roofed, fire-protected and impervious bunded area at least 50 m from waterways, drainage lines, basins, flood-affected areas or slopes above 10%. Bunding design will comply with relevant Australian Standards and should generally be in accordance with guidelines provided in the EPA Authorised Officers Manual. Appropriate on-site signage will be provided to identify the materials stored.	Contractor	During construction

Environmental issue	ID	Environmental management measures	Responsibility	Timing
Spills and accidents	HZ05	Appropriate spill containment equipment will be provided on-site and located at strategic, accessible locations.	Contractor	During construction
Subsidence	HZ06	A surface settlement monitoring program will be prepared and implemented prior to and during construction to identify whether the project is resulting in adverse subsidence impacts. In the unlikely event that subsidence as a result of the project is deemed to cause building and/or property damage, the damage would be repaired at no cost to the owner.	Contractor	Prior to and during construction
Transportation of dangerous goods	HZ07	Consultation with EPA, SafeWork NSW and FRNSW will continue to confirm if the project would be able to accept any classes of dangerous goods during operation. To support the consultation, an absolute risk assessment will be carried out with the purpose to demonstrate that risks have been reduced so far as is reasonably practical. The absolute risk assessment will also consider appropriate infrastructure design and operational mitigation measures to reduce risk and the consequence of any event occurring.	Roads and Maritime	During detailed design
Cumulative impacts				
Cumulative impacts	CI01	Where relevant, consultation would be undertaken with proponents of other nearby developments to increase the overall awareness of project timeframes and impacts.	Contractor	During construction
	CI02	The CEMP will be updated with any revised or new environmental management measure identified from consultation with proponents of other nearby developments, where required.	Contractor	During construction

CHAPTER

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Chapter 27

Environmental risk analysis

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27. Environmental risk analysis

This chapter explains how environmental issues for the project were identified through an environmental risk analysis process and documents the findings of that process. **Table 27-1** lists the SEARs relevant to environmental risk analysis and where they are addressed.

Table 27-1 SEARs relevant to environmental risk analysis

Ref	Key Issue SEARs	Where addressed
3. Assessment of Key Issues		
2.	For each key issue the Proponent must:	
	(c) identify, describe and quantify (if possible) the impacts associated with the issue, including the likelihood and consequence (including worst case scenario) of the impact (comprehensive risk assessment), and the cumulative impacts	Section 27.2

27.1 Overview

Before lodging the state significant infrastructure application in May 2016, Roads and Maritime reviewed the outcomes of preliminary investigations and community and stakeholder consultation (detailed in **Chapter 7, Consultation**) and identified those environmental issues of most importance for the project through a preliminary environmental risk analysis.

The findings formed the basis of Road and Maritime's application, and helped the Secretary determine the key issues for the project as outlined in the SEARs.

The SEARs were issued by the Secretary of DPIE in June 2016. These SEARs were revised in October 2017 to reflect the decision that the project is a controlled action under the EPBC Act.

The process of environmental risk analysis continued during the preparation of the EIS. The emphasis was on using the detailed information gathered during the assessment process to review the environmental aspects of the project. More specifically, the analysis:

- Identified environmental issues, including key issues in the SEARs, and any other issues
- Examined potential impacts and proposed mitigation measures in relation to the identified issues
- Identified the nature and extent of impacts likely to remain after mitigation measures are applied.

Based on this analysis, an environmental risk category was assigned to each potential impact. This enabled the identification of any matters that might be considered as additional key issues and provided a basis for an appropriately detailed assessment of these additional key issues in this environmental assessment.

The environmental risk categories are described in **Table 27-2**.

Table 27-2 Risk categories

Risk category	Description
Key issue	High or moderate impact (actual and perceived) requiring further investigation to identify specific management and mitigation measures.
Other issue	Moderate or low impact that can be managed effectively with standard and best practice management and mitigation measures

27.2 Risk analysis summary

A summary of the environmental risk analysis is provided in **Table 27-3**. The environmental risk analysis confirms that the key issues identified in the SEARs are all key issues for the project with the exception of cumulative impacts. In addition to issues identified in the SEARs, agricultural impacts have been identified as an additional key issue and discussed in further in **Chapter 13, Agriculture**.

Table 27-3 Environmental risk analysis

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Traffic and transport – Chapter 8				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Temporary disruptions and delays to road users, public transport, pedestrians and cyclists including access to some properties on construction access roads and other local roads identified for access in Chapter 6, Construction • Speed limit restrictions and traffic controls on existing roads adjacent to work sites • Temporary increased traffic volumes on sections of the road network due to increases in construction traffic, particularly from heavy vehicle movements • Permanent removal of some parking areas at Kororo Public School, relocation of the bus interchange, and changes to pedestrian and/or cyclist access • Permanent removal of some parking areas associated with the informal school bus stop at the intersection of Coramba Road and Spagnolos Road, Englands Road and at the Oz Group Packhouse at Isles Drive • Temporary traffic and pedestrian and/or cyclist detours around the construction zone • Changed traffic patterns likely to cause short-term impacts while road users adjust and become familiar with changed traffic patterns • The works between Korora Hill and Sapphire are largely located along the existing Pacific Highway in a tightly constrained corridor. Most construction activities undertaken at this section would need to be 	<p>The following impacts would remain after application of the proposed management measures listed in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Increased traffic volumes on sections of the road network on the existing Pacific Highway south of Englands Road due to some trips being diverted from Hogbin Drive to the Pacific Highway corridor. Traffic is also expected to increase in Englands Road itself between the bypass and the Pacific Highway due to traffic accessing the project through this section. Coramba Road east of the project will have a marginal increase, but not on the western side • While provision for parking demand at the Kororo Public School will be exceeded with replacement parking spaces, there will still be a shortfall in the current number of formal and informal parking spaces available. Further consultation with the school will be undertaken to determine final parking arrangements • Permanent change to parking areas associated with the informal school bus stop at the intersection of Coramba Road and Spagnolos Road, Englands Road and at the Oz Group Packhouse at Isles Drive 	Key Issue	<p>Section 8.3 Section 8.4 Section 8.5</p> <p>Appendix F, Traffic and transport assessment</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	<p>outside the recommended standard construction hours to reduce impacts on existing traffic along the Pacific Highway.</p> <p>Operation:</p> <ul style="list-style-type: none"> • Changes to travel routes for some road users (including pedestrians and cyclists) due to road closures, turn restrictions, and provision of new service roads • Increased traffic volumes on sections of the road network. 	<ul style="list-style-type: none"> • Short-term temporary and permanent changes to property access. 		
Noise and vibration – Chapter 9				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Temporary noise and vibration impacts to sensitive receivers • Construction noise impacts from works during standard and out of hours working timeframes are expected to exceed the noise management levels in most NCAs • Night works are likely to include construction of retaining walls, pavement tie-ins and overlays • Nearby receivers on haulage roads are likely to experience a noise increase • Groundborne noise levels may exceed noise criteria for receivers within 51 m from work site during night-time work, and 41 m during daytime work • Potential that ground vibration and air blast overpressure will adversely impact sensitive receivers during construction, particularly blasting events. 	<p>The following impacts would remain after application of the proposed noise and vibration management plan and the mitigation measures listed in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Temporary noise exceedances from construction on sensitive receivers • Following noise mitigation strategies, a total of 478 noise sensitive receivers would still exceed operation road noise criteria, ten of which are non-residential. At-property noise treatments would mitigate operational noise exceedances, but outdoor areas may still experience noise impacts. 	Key Issue	<p>Section 9.4 Section 9.5</p> <p>Appendix G, Noise and vibration assessment</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	<p>Operation:</p> <ul style="list-style-type: none"> Traffic noise levels ten years after opening (2034) would exceed noise criteria at 1582 sensitive receivers in the study area with no mitigation applied. 			
Biodiversity – Chapter 10				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Clearance of one southern swamp orchid individual Clearance of 57 rusty plum individuals Clearance of 43.37 ha of native vegetation Removal of threatened fauna habitat Temporary displacement of aquatic fauna and impact to riparian vegetation at creek crossings Creek realignments Fragmentation of biodiversity links and habitat corridors Modification and direct loss of habitat and connectivity for MNES as well as potential introduction of diseases/pathogens and general disturbance from noise, vibration and lighting. <p>Operation:</p> <ul style="list-style-type: none"> Introduction or spread of weed species, diseases/pathogens, exposure to vehicle strikes, an increase of light and noise to new areas of vegetation and reduction in habitat values. 	<p>The following impacts would remain after application of the proposed management measures listed in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> Permanent loss of native vegetation, threatened flora habitat for southern swamp orchid and rusty plum and fauna habitat for koala, giant barred frog, and spotted-tail quoll Loss of connectivity and removal of habitat corridors as well as an increased risk of vehicle strikes on threatened species during operation. 	Key issue	<p>Section 10.3 Section 10.4 Section 10.5</p> <p>Appendix H, Biodiversity assessment report</p> <p>Appendix I, Threatened Species Management Plan</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Urban design, landscape and visual amenity – Chapter 11				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Temporary visual impacts associated with construction activities including vegetation clearance, bulk earthworks, cuttings, machinery and plant equipment • Changes to landscape character, with significant impacts surrounding areas where the project differs substantially to the natural topography (ie cuttings and embankments) • Potential light spill impacts during night works. <p>Operation:</p> <ul style="list-style-type: none"> • Impact of built structures (eg tunnels and bridges), cuttings, embankments, and vegetation removal resulting in a change in landscape character, overshadowing, and key viewpoints along the project and for some residents. 	<p>The following impacts would remain after application of the proposed management measures in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Temporary visual amenity impacts associated with construction activities including vegetation removal • Permanent changes to landscape character and key viewpoints due to the construction of a new highway through a predominantly agricultural landscape, including impacts from vegetation clearing as well as new built infrastructure. 	Key issue	<p>Section 11.4 Section 11.5</p> <p>Appendix J, Urban design, landscape character and visual impact assessment</p>
Land use and property – Chapter 12				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Permanent property acquisition (full or partial) on around 151 properties. This includes 59 properties already owned by Roads and Maritime. Around 91 would be partially acquired and around 60 would be fully acquired • Subsurface acquisitions would be required at the tunnel locations. The introduction of a subsurface stratum and tunnel infrastructure has the potential to 	<p>Most of impacts on property and land use would be experienced during the construction phase of the project. Based on the proposed tunnel depth and proposed clearance achieved, no impacts to the surface of the properties and the use of the properties are expected above the tunnels. There would be no residual impacts after the implementation of the proposed management measures in Chapter 26, Summary of environmental management measures.</p>	Key issue	<p>Section 12.4 Section 12.5</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	<p>limit development above the project in some circumstances, which may affect land use.</p> <ul style="list-style-type: none"> • Changes to property access • Changes to zoning purposes <p>There are no adverse impacts anticipated once the project is operational.</p>			
Agriculture – Chapter 13				
No	<p>Construction:</p> <ul style="list-style-type: none"> • Loss of cropping land • Removal of structures required for agriculture, such as packing sheds • Impact to irrigated water supply from water flow movements, groundwater drawdown, and relocation of infrastructure • Impacts from dust on crops and farm operators within 500 m the construction footprint (including the Oz Group Packhouse) • Spread of Panama disease. <p>Operation:</p> <ul style="list-style-type: none"> • Change to operation of farms due to alterations to crops and agricultural infrastructure (packing sheds, water sources, etc). 	<p>The following impacts would remain after application of the proposed management measures in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Six banana farms would be critically impacted and are likely to cease operation in their current capacity. 	Key issue	<p>Section 13.3 Section 13.4</p> <p>Appendix K2, Agricultural assessment</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Socio-economic – Chapter 14				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Property acquisition impacts to private and public land owners may result in changes to the socio-demographic profile (increase in construction workers and reductions in overall population) and community values (some residents may choose to resettle elsewhere and possibly leave community ties behind) Changes to property access and connectivity which would result in residents changing usual travel routes and places which they visit in the local area Relocation and other associated impacts to public utilities and social infrastructure Temporary amenity impacts on nearby businesses and residences Direct impact on around 16 local businesses, notably the waste facilities associated with the Coffs Coast Resource Recovery Park, multiple businesses on Isles Drive and tourist accommodation along the existing Pacific Highway. <p>Operation:</p> <ul style="list-style-type: none"> Short-term business losses in Coffs Harbour from passing trade, long-term neutral impact 	<p>The following impacts would remain after the implementation of management measures outlined in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> Potential reduction of passing trade along the existing Pacific Highway and Coffs Harbour CBD. 	Key Issue	Section 14.3 Section 14.4

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Aboriginal cultural heritage – Chapter 15				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Direct/partial impacts to Aboriginal cultural sites (Roberts Hill Pathway, Gumgali Storyline and Pathway, Sealy Point Pathways, East Boambee Camp and West Korora Living Place) • Direct total and partial impact on 24 Aboriginal archaeological sites of low to moderate significance. <p>There are no adverse impacts anticipated once the project is operational.</p>	<p>The following impacts would remain after application of the proposed management measures in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Direct/partial impact to Aboriginal cultural sites (Roberts Hill Pathway, Gumgali Storyline and Pathway, Sealy Point Pathways, and East Boambee Camp) • Loss of intrinsic Aboriginal cultural value of the impacted sites • Disturbance of artefacts. 	Key issue	<p>Section 15.3 Section 15.4</p> <p>Appendix L, Aboriginal cultural heritage assessment report</p>
Non-Aboriginal cultural heritage – Chapter 16				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Direct physical impact to the Coffs Harbour Banana Plantation Landscape, Former Coffs Heights Post Office, and marked tree stumps • Visual impacts to the North Coast Railway, two timber beam bridges on Old Coast Road. <p>There are no adverse impacts anticipated once the project is operational.</p>	<p>The following impacts would remain after application of the proposed management measures in Chapter 26, Summary of environmental management measures:</p> <ul style="list-style-type: none"> • Total loss of the Coffs Heights Post Office and marked tree stumps • Partial direct physical and visual impacts on Banana Plantation Landscape • Indirect, visual and vibration impacts on Old Coast Road Bridge No.1 and Old Coast Road Bridge No.2 • Indirect, visual impact on views to and from the railway, particularly due to the bridge over North Coast Railway near Shephards Lane. 	Key issue	<p>Section 16.3 Section 16.4</p> <p>Appendix M, Non-Aboriginal heritage assessment</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Flooding and hydrology – Chapter 17				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Potential flooding and drainage risks during construction, including loss of materials and flooding local roads Realignment of Newports Creek around bridge piers Increased localised inundation extents and changes to hazard categories <p>Operation:</p> <ul style="list-style-type: none"> If unmitigated, there would be significant increases in the flood extents and water levels upstream of the project, which could damage properties 	The main areas of impact include Newports Creek floodplain upstream of the project, Coffs Creek downstream of Coramba Road interchange, Pacific Bay Eastern Lands development area and a few residential locations associated with Pine Brush Creek and Sapphire Beach catchments.	Key issue	<p>Section 17.5 Section 17.6 Section 17.7</p> <p>Appendix O, Flooding and hydrology assessment</p>
Soils and contamination – Chapter 18				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Soil erosion, sedimentation, and mobilisation of surface and subsurface contaminants potentially resulting in surface and groundwater water quality impacts Potential exposure and/or disturbance of acid sulfate soils and contaminated soil from pesticides such as Aldrin, Dieldrin, DDT, and railway contaminants such as hydrocarbons, polyaromatic hydrocarbons, heavy metals, asbestos and herbicides Potential for ecological and health impacts due to disturbance of contaminated soils and acid leachate from acid sulfate materials. 	No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26, Summary of environmental management measures.	Key issue	<p>Section 18.3 Section 18.4</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	<p>Operation:</p> <ul style="list-style-type: none"> Contamination of soils due to any spills and leaks of fuel, oils and other hazardous materials from routine traffic along the Pacific Highway or from maintenance activities. 			
Surface water quality – Chapter 19				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Reduced water quality (including increased total suspended solids and turbidity) as a result of erosion, sedimentation and runoff from contaminated land into nearby watercourses Untreated stormwater runoff impacting downstream water quality and sensitive environments such as Solitary Islands Marine Park, Pine Brush Creek wetlands and the Boambee wetlands Movement of sediments during waterway realignments, potentially altering water quality and biotic composition of waterways. Tannin leachates from stockpiled vegetation, which could enter watercourses, resulting in increased acidity, reduced water clarity and light penetration, and increased biological oxygen demand Exposure of potential or actual acid sulfate soils, which could result in the mobilisation of acidic runoff into watercourses. <p>Operation:</p> <ul style="list-style-type: none"> Water quality impacts on sensitive environments such as Solitary Islands Marine Park, Pine Brush Creek wetlands and the Boambee wetlands due to 	<p>Sediment basins would be designed to contain the five-day 90th percentile rainfall event within all sub-catchments that drain into the Solitary Islands Marine Park. However, there would be a number of waterway realignments required within creeks that drain to the identified sensitive receiving environments which may increase the risk of impacting water quality.</p>	Key issue	Section 19.3 Section 19.4

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	<p>changes in hydrology, leading to an increase in erosion, sedimentation and mobilisation of pollutants</p> <ul style="list-style-type: none"> Reduction in water quality for sensitive environments due to proximity to the project and increase in impervious area and stormwater pollution from the project. 			
Groundwater – Chapter 20				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> Changes to groundwater flows, surface flows and connectivity due to lowering groundwater level resulting from cuttings and tunnels being below the groundwater level Runoff and recharge to groundwater systems from construction of large fill embankments. Impact to GDEs, water supply boreholes, agricultural dams and creeks from changes to groundwater levels and through-flow along the project Changes to groundwater quality/properties due to oxidation of acid sulfate materials and exposure to leaching of saline soils <p>Operation:</p> <ul style="list-style-type: none"> Changes in groundwater levels, flow direction and throughput due to redistributed flow paths Changes to groundwater quality from pollution caused by spills and leakages of road user vehicles or during maintenance. 	Following the implementation of proposed management outlined in Chapter 26, Summary of environmental management measures , there remains a potential for chemical spills associated with vehicle crashes. There are unlikely to be any other significant residual impacts.	Key issue	Section 20.4 Section 20.5 Appendix N, Groundwater assessment

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Air quality – Chapter 21				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Generation of dust from construction activities and exposed surfaces impacting on sensitive receivers to the east and south-west of the project causing soiling and amenity impacts as well as potential impacts to crops • Generation of dust causing short-term health effects during dry weather when wind is blowing towards a sensitive receiver • Exhaust emissions from diesel powered construction equipment may impact on local air quality • Potential temporary odour impacts on very close sensitive receptors from asphalt batching plants, asphalt laying, blasting and earthworks stabilisation. <p>Operation:</p> <ul style="list-style-type: none"> • Decrease in regional and local air quality due to vehicle emissions • Increase in local air emission concentrations where previously no road existed • Increases in NO₂, PM_{2.5} and PM₁₀ concentrations may cause impacts to human health, however assessment of health impacts concluded that as concentrations increases are very low, increases are acceptable and would not be measurable within the community. 	<ul style="list-style-type: none"> • The predicted increase in regional NO_x emissions from vehicles is less than 40 per cent of the threshold for new development and represents a very small proportion of total anthropogenic NO_x emissions across NSW. Similarly, there will be very low increases in NO₂, PM_{2.5} and PM₁₀ and increases in concentrations would be found well below the relevant EPA air quality criteria. As such, the regional impacts of the project would be negligible, and undetectable in any ambient air quality measurements at urban background locations. <p>No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26, Summary of environmental management measures.</p> <p>Air quality in the Coffs Harbour CBD would improve through improved traffic flow and redistribution of traffic away from the existing Pacific Highway.</p>	Key issue	<p>Section 21.6 Section 21.7</p> <p>Appendix P, Air quality assessment</p> <p>Appendix Q, Human health risk assessment</p>

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Waste – Chapter 22				
Yes	<p>Construction:</p> <ul style="list-style-type: none"> • Resource use and generation • Disposal of special waste such as asbestos and waste tyres, liquid waste, hazardous waste, and general and restricted solid waste • Potential for excavated material waste to impact surrounding environments as surface water runoff and/or produce dust from stockpiles if not properly dampened • Limited ability to reuse all organic green waste due to potential Panama disease contamination. <p>Operation:</p> <ul style="list-style-type: none"> • Minimal ongoing resource use of water for landscaping and deluge of the tunnels, electricity for street and traffic lights and safety systems in the tunnels, and asphalt, concrete and fuel for maintenance work and powering of a back-up generator • Limited quantity of green and general solids waste generation as well as excess concrete, asphalt and waste for maintenance • Potential contaminated waste from traffic incidents, spills and fuel leaks. 	No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26, Summary of environmental management measures.	Key issue	Section 22.4 Section 22.5

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
Sustainability – Chapter 23				
Yes	Construction <ul style="list-style-type: none"> • Emission of greenhouse gases from construction plant and equipment, embodied emissions of construction materials and construction waste. 	The project will target an ISCA rating of 'Excellent' under Version 1.2 of the tool. Targets and actions were established to nominate sustainability commitments for implementation during the different phases of the project. These targets and actions align with the ISCA credits and the recommended sustainability objectives for the project. No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26 Summary of environmental management measures.	Key issue	Section 23.3 and 23.4
Hazard and risk – Chapter 24				
Yes	Construction: <ul style="list-style-type: none"> • Increased bushfire risk during construction from hot work and accidental ignition from construction equipment, fuels and chemicals • Asbestos risks, associated with identification of asbestos requiring removal • Inappropriate storage, handling and transport of dangerous goods and hazardous materials have the potential to impact the surrounding community and environment if leaks and spills occur • Climate change risks such as extreme weather events, flooding causing erosion and sediment control failure, increased dust generation during drier weather, seasonal water shortages, and increased construction delays due to wet weather 	No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26, Summary of environmental management measures.	Key issue	Section 24.3 Section 24.4

SEARs Key Issue?	Potential adverse impact	Potential residual impacts after implementation of management measures	Risk category of residual impacts	Where discussed in EIS
	Operation: <ul style="list-style-type: none"> Potential impacts from climate change such as increased temperatures, increased severity and frequency of extreme rainfall events, etc. 			
Cumulative impacts – Chapter 25				
No	Construction: <ul style="list-style-type: none"> Cumulative impacts from interactions with other projects being constructed simultaneously, including but not limited to construction traffic, noise and vibration, flooding and hydrology and surface water quality Operation: <ul style="list-style-type: none"> Cumulative impacts from interactions with other projects in the area which would increase traffic flow and population. 	No potential residual impacts are expected to remain after the implementation of proposed management measures in Chapter 26, Summary of environmental management measures.	Other issue	Section 25.3 Section 25.4

CHAPTER

28

Chapter 28

Project justification and conclusion

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28. Project justification and conclusion

This chapter presents a justification of the project and a conclusion to the EIS. The justification considers how the project balances strategic and project needs against the protection of the environment and planning outcomes outlined in the objects of the EP&A Act, including ecologically sustainable development (ESD) and community consultation.

Ref	General SEARs	Where addressed
1. Environmental Impact Assessment Process		
1.	The Environmental Impact Statement (EIS) must be prepared in accordance with Part 3 of Schedule 2 of the <i>Environmental Planning and Assessment Regulation 2000</i> (the Regulation).	Section 28.1.2
2. Environmental Impact Statement		
1.	The EIS must include, but necessarily be limited to, the following: g) a justification for the preferred proposal taking into consideration the objects of the <i>Environmental Planning and Assessment Act 1979</i> .	Section 28.1.2

28.1 Justification

28.1.1 Project justification

The existing Pacific Highway through Coffs Harbour comprises two lanes in each direction with 12 sets of traffic signals and is between the CBD and other major commercial and industrial precincts.

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the entire east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals. In addition, there is a small section of the Pacific Highway at Coolongolook, which is in an urban area with an 80 km/h speed limit, but without traffic signals.

Roads and Maritime has been planning for the project since 2001 as part of the Coffs Harbour Highway Planning Strategy (RTA 2001a). The preferred route for the strategy was announced in 2004 and included the Coffs Harbour Bypass in the south, and the Sapphire to Woolgoolga upgrade in the north. A preliminary concept design for the project was placed on community display in 2008 and the new road corridor was preserved in the Coffs Harbour LEP in 2013. The Sapphire to Woolgoolga upgrade opened to traffic in 2014.

Conflict between pedestrian, passenger and freight traffic through the Coffs Harbour urban centre has resulted in a high crash rate and will continue to be a substantial safety issue as traffic volumes continue to increase.

By providing a bypass of Coffs Harbour the project would address declining transport efficiency, urban congestion and road safety issues caused by the interaction of through and local traffic. The completion of the project will also contribute to providing almost 2000 km of high standard road between Melbourne and just south of Gympie in Queensland.

The rationale for the construction of the project is consistent with the rationale for the broader Pacific Highway upgrade program, which seeks to improve the capacity and quality of the Pacific Highway, improving safety, travel times and reliability. Completion of the project is required to deliver the objectives of the Pacific Highway upgrade program. Not completing the project would mean that only a proportion of the \$4.4 – \$4.7 billion of program-wide benefits estimated in the Pacific Highway Upgrade Program Economic

Appraisal 2011 Update would be captured and could risk the creation of congestion bottlenecks at Coffs Harbour.

The project objectives are listed in **Chapter 3, Strategic justification and project need**. A summary of how the project achieves the project objectives is provided in **Table 28-1**.

Table 28-1 Assessment of the project against the project objectives

Objective	Assessment of the project against the objectives
Provide travel time savings for through and local traffic, and business vehicles/freight	For traffic travelling through Coffs Harbour during the daytime, travel time is expected to be reduced by 10 to 12 minutes in 2024, and by 12 to 20 minutes in 2044. For local traffic, the project would result in improved intersection performance and reduction in delays. For freight, the project would provide a more efficient free-flow freight route past Coffs Harbour, reducing travel times for freight and improving the amenity and environment of the local region.
Provide a road which supports and integrates with the broader transport network	The project would provide a four-lane divided highway to complement the National Land Transport Network and recently upgraded Pacific Highway. The project would also result in improvement to transport efficiency of the existing highway through Coffs Harbour. It would relieve congestion on the wider Coffs Harbour road network and provide an alternative route for some local trips. This improved transport efficiency and the resulting improvements to accessibility to the Coffs Harbour CBD would likely result in wider economic benefits for the Coffs Harbour area.
Provide sufficient road capacity to meet traffic demand on the Pacific Highway	The project would result in additional highway capacity with the provision of four additional traffic lanes (two lanes northbound and two lanes southbound) to a motorway standard. Traffic congestion would be reduced with daytime through traffic travel times reduced by 10 to 12 minutes in 2024, and by 12 to 20 minutes in 2044 as a result of the project.
Provide safer road conditions for all road users on the new and existing road	The project would provide a high standard of road, removing through traffic and some local traffic from the existing road network which would reduce conflicts and improve safety. It is expected that the project would result in 60 per cent lower heavy vehicle volumes travelling through the Coffs Harbour CBD by 2044. Overall, it is expected that the project would have a crash rate of 12.5 per 100 mvkt, which is consistent with the expectations of new highways constructed. This is a reduction of the existing crash rates of the Pacific Highway, which is currently 18.3 per 100 mvkt for the section north of Korora Hill, and 39 per 100 mvkt for the section north of Englands Road.

The project has sought to avoid and minimise environmental impacts through the options selection and design process and would continue to do so during detailed design. Appropriate management and mitigation measures have been identified to manage any potential impacts. The views of relevant government stakeholders and the community have been taken into account, with community feedback sought throughout the development of the project from the commencement of investigations in 2001 to the display of this EIS. Despite some unavoidable adverse environmental and social impact (as addressed in the EIS), the project is in the public interest.

28.1.2 Objects of the Environmental Planning & Assessment Act

The objects of the EP&A Act provide a framework within which the justification of the project can be considered. A summary of this assessment is provided in **Table 28-2**.

Table 28-2 Assessment against objects of the EP&A Act

EP&A Act object	Comment
<p>To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.</p>	<p>The project would promote social and economic welfare by addressing declining transport efficiency, urban congestion and road safety issues caused by the interaction of through and local traffic along the existing Pacific Highway in the Coffs Harbour CBD.</p> <p>The project includes mitigation and management measures to minimise short and long-term impacts from flooding including assessment of future climate conditions. Flood impacts to the majority of local and access roads would be unchanged and in a number of instances access would be improved with increased flood immunity. The project provides additional routes and connections above predicted flood levels resulting in potentially more effective flood evacuation procedures.</p> <p>By reducing traffic in the CBD, the air quality and noise environment would be improved in the city.</p> <p>The rationale for the Coffs Harbour Bypass complements the broader Pacific Highway upgrade program, which seeks to improve the capacity and quality of the Pacific Highway, improving safety, travel times and reliability.</p>
<p>To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.</p>	<p>Ecologically sustainable development has been considered in Section 28.1.3. The principles of ecologically sustainable development have been considered with respect to the design development.</p>
<p>To promote the orderly and economic use and development of the land.</p>	<p>The project would provide a high standard of road, removing through traffic and some local traffic from the existing road network which would reduce conflicts and improve safety. Journey times for daytime traffic travelling through Coffs Harbour are expected to be reduced by up to 20 minutes in 2044 as a result of the project.</p> <p>The project would result in improvement to transport efficiency of the existing highway through Coffs Harbour. It would relieve congestion on the wider Coffs Harbour road network and provide an alternative route for some local trips. The project would contribute to an overall improvement in freight efficiency as a result of the broader Pacific Highway upgrade program. This improved transport efficiency and the resulting improvements to accessibility to the Coffs Harbour CBD would likely result in wider economic benefits for the Coffs Harbour area.</p> <p>Following announcement of the preferred route option for the project in 2004, Roads and Maritime undertook design investigations to allow for a boundary of the road corridor to be defined and CHCC to reserve the route in the Coffs Harbour LEP. This outcome provided planning certainty for CHCC and the local community as the project route has been in place since 2004. This has enabled nearby developments to be progressed while acknowledging the location of the future bypass. The project has continued to consider existing and future urban release areas within the Coffs Harbour LGA during development</p>

EP&A Act object	Comment
	of the concept design. The project has ensured that access to these areas is not affected.
To promote the delivery and maintenance of affordable housing.	While delivery and maintenance of affordable housing is not applicable to the project, it is acknowledged that there is potential for large infrastructure projects, such as the Coffs Harbour Bypass, to negatively impact rental availability and cost during construction.
To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	<p>A range of corridor options have been considered for the project since planning began in 2001. This assessment selected the Inner Corridor as the preferred corridor as, among other benefits, it would have significantly fewer biodiversity impacts compared to the other corridor options located on the coastal range.</p> <p>Following selection of the preferred route in 2004 the alignment was refined following consideration of environmental sensitivities and constraints of the Coffs Harbour LGA. Through this process, adverse impacts have been avoided or minimised to the greatest extent possible.</p> <p>Following display of the 2018 concept design, design investigations carried out in early 2019 resulted in concept design that included tunnels through the three major ridges. This has resulted in avoiding and/or minimising impacts on wildlife corridors (including identified koala corridors) and reducing direct impacts on koala habitat.</p> <p>However, the project would still result in impacts on biodiversity values during construction and operation. A range of management and mitigation measures are proposed to address potential environmental impacts including biodiversity offsets.</p>
To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	<p>A number of environmental impacts have been avoided or minimised throughout the development of the project. The initial planning for the project saw several alternate routes and options abandoned due to potential environmental impacts or risks. This included the Far Western Corridor and CHCC Preferred Corridor because of the potential environmental impacts of these options including impacts on threatened species, wildlife corridors and significant impacts upon a landscape of Aboriginal cultural heritage importance.</p> <p>Route option development for the project has taken into consideration Aboriginal cultural heritage impacts (refer to Chapter 4, Project development and alternatives). The design has been refined to reduce impacts on items of Aboriginal cultural heritage significance including sites. The inclusion of tunnels through the Roberts Hill and Shephards Lane ridges has resulted in a reduction of potential impacts on the Roberts Hill and Sealy Point Pathways and these cultural pathways would not be severed. Management measures have been proposed to mitigate other impacts to Aboriginal heritage, as outlined in Chapter 15, Aboriginal cultural heritage.</p> <p>Impacts to non-Aboriginal heritage as a result of the project are not anticipated to be significant, and management measures identified in Chapter 16, Non-Aboriginal cultural heritage would be implemented to minimise or avoid impacts to heritage items.</p>

EP&A Act object	Comment
To promote good design and amenity of the built environment.	<p>Conflict between pedestrian, passenger and freight traffic through the Coffs Harbour CBD has resulted in a reduction in the amenity of local areas. As demand and congestion increase, amenity would be further reduced because of noise impacts and severance. The project would provide a high standard of road, removing through traffic and some local traffic from the existing road network, which would reduce conflicts. This reduction of traffic travelling through the Coffs Harbour CBD would also reduce congestion and improve amenity in this area.</p> <p>An urban design and landscape strategy has been prepared for the project which aims to integrate the design with the surrounding topography, landscape and urban setting through revegetation and preservation of the existing landscape. The inclusion of tunnels in the design helps to minimise disturbance and provides continuous landscape and environmental corridors above the project. Opportunities to preserve the existing landscape character have been identified through selection and structuring of planting. The design has focused on the visual integration of tunnel portals, cutting and embankment structures to sympathetically integrate these with the surrounding landscape. More detail regarding the urban design and landscape strategy that has guided design development is included in Chapter 11, Urban design, landscape and visual impact.</p>
To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	<p>The construction and maintenance of buildings is not directly applicable to the project as no buildings would be constructed. The impact of the project has been assessed having regard to air quality, noise and vibration impacts and from a hazard and risk perspective. Construction of the project would be undertaken in accordance with best practice construction techniques and implementing standard mitigation measures to mitigate potential impacts.</p>
To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	<p>Consultation has been undertaken with CHCC and State government agencies throughout the development of the project and the preparation of the EIS. All levels of government have been encouraged to be actively involved in, and to contribute to, the development of the project and this EIS through historical and continuing consultation activities.</p>
To provide increased opportunity for community participation in environmental planning and assessment.	<p>The project development process has involved extensive consultation with relevant stakeholders and the community since planning began in 2001. Selection of the preferred route option and development of the concept design has involved a range of consultation activities, which are detailed in Chapter 7, Consultation. The plan for ongoing community consultation is detailed in Appendix D, Draft Community consultation framework.</p>

28.1.3 Ecologically sustainable development

ESD is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project.

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

Precautionary principle

The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle was considered during route options development (refer to **Chapter 4, Project development and alternatives**). Significant environmental impacts on biodiversity and Aboriginal cultural heritage have been avoided or minimised throughout the development of the project. The initial planning for the project saw several alternate routes and options abandoned due to potential risks or environmental impacts which would not support the principles of ecologically sustainable development. This included the Far Western Corridor and CHCC Preferred Corridor because of the potential environmental impacts on threatened species, wildlife corridors and significant impacts upon a landscape of Aboriginal cultural heritage importance.

The precautionary principle continued to guide the assessment of environmental impacts for this EIS and the development of mitigation measures. This EIS details the evaluation of environmental impacts associated with the project. The EIS was prepared using a conservative approach, which included assessing the worst-case impacts and scenarios. It has been carried out using the best available technical information and has adopted best practice environmental standards, goals and measures to minimise environmental risks. The environmental assessment has been carried out in collaboration with stakeholders and relevant statutory and agency requirements.

The threat of serious or irreversible environmental damage is one of the essential preconditions to the engagement of the precautionary principle. Potential environmental risks associated with the project were identified and considered to complete detailed technical assessments as part of the EIS (refer to **Chapter 27, Environmental risk analysis** for more detail). Safeguards and management measures have been developed to manage and reduce impacts identified in these assessments (refer to **Chapter 26, Summary of environmental management measures** for more detail).

Additionally, impacts on biodiversity have been minimised as far as possible through refinement of the alignment. A Biodiversity Offsets Strategy will be implemented in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) to offset the impacts. A summary of the credits required for the project is provided in **Chapter 10, Biodiversity**. All residual impacts of the project will be offset by these credits.

The noise and vibration impact assessment has used worst-case construction and operation scenarios and assumptions as the basis of the impact assessment, and proposed mitigation has been recommended based on these findings. Additionally, the noise and vibration assessment has considered the existing future urban release areas for Coffs Harbour. Mitigation to reduce the number of sensitive receivers predicted to experience operational noise exceedances includes low noise pavement, noise mounds and noise walls. For those predicted to still experience operational noise exceedances after the application of these mitigation treatments, at-property treatment will be considered. More detail is provided in **Chapter 9, Noise and vibration**.

Inter-generational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations.

For road projects, the environmental aspects most relevant are socio-economic, biodiversity, water and air quality, waste and resources and cumulative impacts. These are discussed further in **Table 28-3**.

Table 28-3 Inter-generational equity considerations

Aspect	Comment
Socio-economic	<p>The project has been designed with future road traffic needs in mind, taking into consideration future population growth in the region. Without the project, current and future generations would be exposed to greater traffic congestion, a reduction in road safety and reduced accessibility. Removal of traffic, especially heavy vehicles, from the centre of Coffs Harbour is expected to generate new business opportunities within Coffs Harbour due to improved access and improved amenity.</p>
Biodiversity	<p>Impacts to biodiversity have been avoided and reduced as far as possible; however, the project would still impact biodiversity values including clearing of native vegetation (including endangered ecological communities), loss of connectivity and modification of habitat.</p> <p>A range of management and mitigation measures are proposed to address potential environmental impacts including biodiversity offsets.</p> <p>The project includes tunnels through the three major ridges which assists with retaining native vegetation and fauna movement corridors. Fauna crossing structures and culverts have also been included in the design to reduce impacts on habitat connectivity. This has resulted in avoiding and/or minimising impacts on wildlife corridors (including identified koala corridors) and reducing direct impacts on koala habitat.</p>
Water quality	<p>An assessment of potential impacts to water quality, including groundwater that would be intercepted, has been carried out for the project.</p> <p>Provision of the proposed water quality treatment measures would be expected to maintain existing water quality overall. The project commits to the implementation of effective water quality treatment. This means that the project would not have a significant impact on the water quality objectives.</p>
Air quality	<p>The project will provide free-flow conditions along the bypass, and the reduction of through motorists from the existing Pacific Highway.</p> <p>The assessment of potential air quality impacts for the project has identified the project would result in reductions in pollutant concentrations along the existing Pacific Highway and increase pollutant concentrations along the bypass. However, estimated concentrations of NO₂, PM₁₀ and PM_{2.5} due to the operation of the project were found to be well below the relevant NSW EPA air quality criteria.</p>
Waste and resources	<p>Whilst the project aimed to obtain a balance between the cut and fill requirements of the project, it is impossible to avoid the requirement to import material for the construction of the project while meeting operational design standards, principles and objectives.</p> <p>A Waste Management Plan has been proposed to manage the production of waste through the construction phase to minimise impact of future generational access to waste disposal sites.</p>
Cumulative impacts	<p>Potential cumulative impacts during construction and operation of the project have been assessed. The assessment identified there is potential for short-term minor cumulative impacts if other projects in the vicinity are under construction at the same time, however these are unlikely to be significant. There are likely to be operational cumulative impacts associated with biodiversity, heritage, and landscape and visual, however these are not</p>

Aspect	Comment
	anticipated to be significant. There would also be cumulative long-term benefits associated with improvements to the highway environment, consistent with other upgraded sections of the Pacific Highway.

If the project was not carried out, the motorist, cyclist and pedestrian casualty rate would continue to be more than three times higher than expected of a road of this class, which would continue to impact current generations as well as future generations. The proportion of heavy vehicles and through-traffic travelling through Coffs Harbour is predicted to increase, which will adversely affect road safety and amenity within Coffs Harbour into the future. This congestion may continue to adversely impact on businesses in the CBD.

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the entire east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals. In addition, there is a small section of the Pacific Highway at Coolongolook, which is in an urban area with an 80 km/h speed limit, but without traffic signals. The project would ensure these road benefits were realised by current and future generations across the region, by tying into other Pacific Highway upgrades.

While some negative environmental and social impacts have been identified, management measures to mitigate any potential longer term adverse impacts have been considered and included in **Chapter 26, Summary of environmental management measures**. The implementation of these measures would ensure the principle of inter-generational equity is met, by reducing or avoiding impacts to the health, diversity and productivity of the environment as much as possible, for the benefit of future generations.

Conservation of biological diversity and ecological integrity

Conservation of biological diversity and ecological integrity has been a fundamental consideration of design development. As described in **Chapter 4, Project development and alternatives**, initial corridor identification considered biodiversity constraints, and the preferred corridor was taken forward as it had a relatively low impact on biodiversity compared to other options. The preferred route passes through largely cleared lands and any adverse effects on wildlife corridors have been mitigated.

Throughout the refinement of the concept design, a number of elements have been included to further avoid and minimise impacts to biodiversity including:

- Major ridges that provide existing fauna corridors at Roberts Hill and Gatelys Road have been retained by including tunnels as part of the design and existing native vegetation on the ridges would be retained. A tunnel at Shephards Lane would also provide opportunistic fauna movement, although the existing banana plantation would be retained
- Refinement of drainage design to allow bridge structures to cross tributaries of Newports Creek to protect giant barred frog habitat
- Bridge crossings rather than culverts for higher order streams, such as Pine Brush Creek and Newports Creek, to minimise impacts to fish passage
- Bridge design has considered placement of piers and alignment of bridge spans to minimise impacts to existing channel morphology, aquatic habitat and riparian vegetation
- Design options for the Kororo Public School bus interchange to avoid direct impacts to the adjacent Nature Reserve
- Ancillary sites located in areas to avoid threatened flora and fauna habitat.

A biodiversity assessment was carried out in accordance with the FBA (OEH 2014b) to identify potential adverse impacts on biodiversity (refer to **Chapter 10, Biodiversity** and **Appendix H, Biodiversity**

assessment report). This assessment identifies potential impacts on biodiversity and provides a range of mitigation measures to further avoid and minimise potential impacts.

Where impacts would be unavoidable, a range of management and mitigation measures have been identified with the emphasis on conserving biodiversity values locally where practicable. These measures include provision of fauna connectivity infrastructure, such as dedicated underpasses and glider poles, implementation of management plans to address key biodiversity risks and, where possible, positioning of the operational fencing close to the edge of the road formation which maximises bushland connectivity.

A biodiversity offsets strategy will be implemented in accordance with the NSW Biodiversity Offsets Policy for Major Projects (OEH 2014a) to offset the impacts. This offset strategy requires the purchase and retention of biodiversity credits calculated in accordance with the FBA (OEH 2014b).

Improved valuation, pricing and incentive mechanisms of environmental resources

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things. Environmental factors should be included in the valuation of assets and services, such as:

- Polluter pays, that is, those who generate pollution and waste should bear the cost of containment, avoidance or abatement
- The users of goods and services should pay prices based on the full life cycle of costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste
- Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, that enable those best placed to maximise benefits or minimise costs to develop their own solutions and responses to environmental problems.

This EIS contains a number of mitigation and management measures aimed at minimising pollution and waste during project development and offsetting biodiversity impacts. These include biodiversity offsets, as detailed further in **Chapter 10, Biodiversity**. **Chapter 23, Sustainability** considers the whole of life costs associated with the project including transport of material to site, on-going maintenance and eventual decommissioning. Management and mitigation measures to minimise resource use, pollution, waste generation and waste disposal requirements have also been identified (refer to **Chapter 26, Summary of environmental management measures**). The inclusion of mitigation measures would increase the capital and operating costs of the project, which indicates environmental resources have been given appropriate valuation.

28.2 Conclusion

This environmental assessment has addressed the key issues identified in the SEARs issued under Part 5.1 of the EP&A Act and the relevant provisions of Schedule 2 of the Environmental Planning and Assessment Regulation 2000. A checklist showing where the SEARs are addressed in this environmental assessment is provided in **Appendix A, SEARs requirements and checklist**, and the assessment has addressed the key issues identified in the SEARs.

A number of potential environmental impacts from the project have been avoided or minimised during the assessment of alternatives for the project as a whole (refer to **Chapter 4, Project development and alternatives**) and during the development of the concept design for the project.

The project as described in **Chapter 5, Project description** meets the project objectives but would still result in some impacts due to noise and vibration, temporary disruptions to traffic flow and access during construction, surface water diversions and engineering controls, the removal of vegetation including some

endangered ecological communities, impacts on items and places of Aboriginal heritage significance, socio-economic impacts including business impacts and changes to access and property acquisition.

The project has applied the NSW FBA to quantify the impact of threatened species, populations and communities and developed a Biodiversity Offset Strategy to address the requirements of the *Threatened Species Conservation Act 1995*. A summary of the credits required for the project is provided in **Chapter 10, Biodiversity**. All residual impacts associated with biodiversity will be offset in accordance with the NSW FBA.

Environmental management measures detailed in this EIS would mitigate or minimise expected impacts. A summary of environmental management measures is provided in **Chapter 26, Summary of environmental management measures**.

The project is considered appropriate and justified as the negative impacts are outweighed by the longer term positive impacts, of providing improved road safety and travel times for all road users in a region that is expected to experience population growth in coming years, and realising the overall benefit of the Pacific Highway upgrade program.

CHAPTER

29

Chapter 29

Project synthesis

Chapter 26

Chapter 27

Chapter 28

Chapter 29

Chapter 30

29. Project synthesis

This project synthesis provides a summary of the EIS for the project in response to the SEARs issued by Department of Planning, Industry and Environment (DPIE) and detailed in **Table 29-1**.

Table 29-1 SEARs relating to the project synthesis

Ref	General SEARs	Where addressed
2. Environmental Impact Statement		
	The EIS must include, but not necessarily be limited to, the following:	
	(p) a chapter that synthesises the environmental impact assessment and provides:	
	<ul style="list-style-type: none"> • A succinct but full description of the project for which approval is sought; 	Section 29.1 Section 29.2
	<ul style="list-style-type: none"> • A description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project; 	Section 29.3
	<ul style="list-style-type: none"> • A compilation of the impacts of the project that have not been avoided; 	Section 29.4
	<ul style="list-style-type: none"> • A compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts; 	Section 29.4
	<ul style="list-style-type: none"> • A compilation of the outcome(s) the proponent will achieve; and 	Section 29.5
	<ul style="list-style-type: none"> • The reasons justifying carrying out the project as proposed, having regard to the biophysical, economic, social considerations, including ecologically sustainable development and cumulative impacts. 	Section 29.6

29.1 Overview of the project

29.1.1 Pacific Highway upgrade program

The upgrade of the Pacific Highway is one of the largest road infrastructure projects in NSW. It connects Sydney and Brisbane and is a major contributor to Australia's economic activity. The Australian and NSW governments have been jointly upgrading the Pacific Highway to provide a four-lane divided road from Hexham to Queensland. Upgrading started in 1996 and 2020 has been identified as the targeted completion. By the end of 2020, 95 per cent of the Pacific Highway north and south of Coffs Harbour will be upgraded to 110 km/h design speed with a posted speed limit of 100 or 110 km/h.

The project supports the Pacific Highway upgrade program objectives and is consistent with the rationale for the broader program, which seeks to improve the capacity and quality of the Pacific Highway by improving safety, travel times and reliability. Completion of the project is required to deliver the objectives of the Pacific Highway upgrade program.

Not completing the bypass would mean that only a proportion of the \$4.4 – \$4.7 billion of program-wide benefits estimated in the Pacific Highway Upgrade Program Economic Appraisal 2011 Update would be captured and could worsen the existing congestion bottlenecks at Coffs Harbour.

29.1.2 The completed project

Alignment

The main project alignment would generally provide:

- Two lanes in each direction, with each lane being 3.5 m wide
- Typical median width of about 12 m between edge lines (minimum five metres and maximum 20 m) including a wire rope barrier to divide the carriageways
- Nearside shoulder width of 2.5 m
- Offside shoulder width of 0.5 m.

The proposed concept design is described below with the project features shown in **Figure 29-1-01** to **Figure 29-1-04** and more detail provided in **Chapter 5, Project description**.

The description below has been divided into three sections as follows:

- South of Englands Road to Roberts Hill
- Roberts Hill to Korora Hill
- Korora Hill to Sapphire.

Dimensions provided would be subject to refinement during detailed design.

South of Englands Road to Roberts Hill

The project would start about 1.1 km south of Englands Road, connecting to the existing four-lane divided highway north of Sawtell Road. The upgrade would generally be located west of the urban fringe between Englands Road and Roberts Hill. The main features of the upgrade in this section are shown in **Figure 29-1-01** to **Figure 29-1-04**, and include:

- Upgrade of the existing highway south of Englands Road
- An interchange at Englands Road providing access between the project and the existing road network at Englands Road, including the existing Pacific Highway, Englands Road and Stadium Drive
- A new one-way local access road located on the west side of the highway, to provide access between properties west of the existing highway, including Lindsay Transport, and the road network via Englands Road. The local access road has been included to improve road safety and separate through and local traffic at this location
- A new four-lane divided highway just west of the urban footprint to the north of Englands Road towards North Boambee Road, generally on fill embankment to keep the project above the floodplain. The fill embankments may include an earth mound to help with managing visual and noise impacts
- Bridges over Newports Creek, North Boambee Road and a tributary of Newports Creek to the north of North Boambee Road
- The project is located about 200 m west of the Bishop Druitt College as it crosses North Boambee Road
- The project would be located to the west of Highlander Drive and The Lakes Estate, just to the north of North Boambee Road
- The project would cross Roberts Hill via twin tunnels. The tunnels would retain the existing ridgeline and be about 190 m long and about 35 to 40 m below the crest of Roberts Hill. One tunnel would be provided for each carriageway, separated by a rock pillar. Both the northbound and southbound

tunnels would be about 17.9 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety

- The median between carriageways would be wider than the rest of alignment on approaches to the Roberts Hill tunnel. The additional median width would accommodate the rock pillar between the twin tunnels and an emergency cross over bay about 700 m south of the Roberts Hill tunnel.

Roberts Hill to Korora Hill

The project would generally be located at the base of the escarpment surrounding Coffs Harbour between Roberts Hill and Korora Hill. The project would cross two major ridges in this section, including Shephards Lane ridge and Gatelys Road ridge. The main features of the project in this section are shown in **Figure 29-1-01** to **Figure 29-1-04**, and include:

- An interchange at Coramba Road providing access between the project and the existing road network at Coramba Road
- South of Coramba Road, the project would be located east of the existing flood detention basin which is next to Bennetts Road
- North of Coramba Road, the project would be located west of the existing flood detention basin which is next to Spagnolos Road and Roselands Estate
- Further north, the alignment would be located in a series of cut and fill embankments as it heads towards Shephards Lane and the North Coast Railway. This section of the project includes a climb of about 3.5 per cent over around 1700 m. The fill embankments would typically include an earth mound to help with managing noise and visual impacts
- Shephards Lane would pass over the project
- A bridge would be provided over the North Coast Railway and the local access road immediately north of the existing rail line
- The project would cross Shephards Lane ridge via twin tunnels. The tunnels would be about 360 m long and about 60 m below the crest of Shephards Lane ridge. One tunnel would be provided for each carriageway, separated by a rock pillar. The northbound tunnel would be about 16.8 m wide providing sufficient width for three traffic lanes (two general traffic lanes and an acceleration lane from the Coramba Road interchange) and sight distance widening for road safety. The southbound tunnel would be about 16.8 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety
- The alignment would then pass through the Mackays Road valley and head towards the Gatelys Road ridge. The project would generally be in fill through this section. The fill embankments would typically include an earth mound on the eastern side of the main carriageway to help balance earthworks for the project and help with managing visual and noise impacts
- The project would include an underpass about 500 m north of the Shephards Lane tunnel to provide access to properties located to the west of the project. A new local access road would be provided west of the project to provide access between Mackays Road and the properties located west of the project. Mackays Road would be realigned for about 600 m parallel and east of the project to provide a connection to the underpass
- The project would cross Gatelys Road ridge via twin tunnels. The tunnels would be about 450 m long and about 70 m below the crest of Gatelys Road ridge. One tunnel would be provided for each carriageway, separated by a rock pillar. The northbound tunnel would be about 16.8 m wide providing sufficient width for two traffic lanes and sight distance widening for road safety. The southbound tunnel would be about 16.8 m wide providing sufficient width for three traffic lanes (two general traffic lanes and an acceleration lane from the Coramba Road interchange) and sight distance widening for road safety

- The southern approach to Gatelys Road tunnel would be on a climb of about two per cent over 300 m. The northern approach to Gatelys Road ridge would be on a climb of about 3.4 per cent over 700 m
- The median would be wider than the rest of alignment from south of the Shephards Lane tunnel to north of the Gatelys Road tunnel. The additional median width would accommodate the rock pillar between the twin tunnels at Shephards Lane ridge and at Gatelys Road ridge
- Emergency cross over bays would be provided on either side of the Shephards Lane and Gatelys Road tunnels
- The alignment would then pass through the West Korora Road valley, passing over West Korora Road, towards Korora Hill. The project would generally be in fill through this section
- A cutting, about 30 m deep, would be needed through Korora Hill, just south of Bruxner Park Road.

Korora Hill to Sapphire

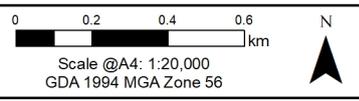
The project would generally comprise an upgrade of the existing Pacific Highway between Korora Hill and Sapphire. The upgrade would be located to the west of the existing Pacific Highway and there would be a two-lane service road on the eastern side of the project. The main features of the project in this section are shown in **Figure 29-1-01** to **Figure 29-1-04** and include:

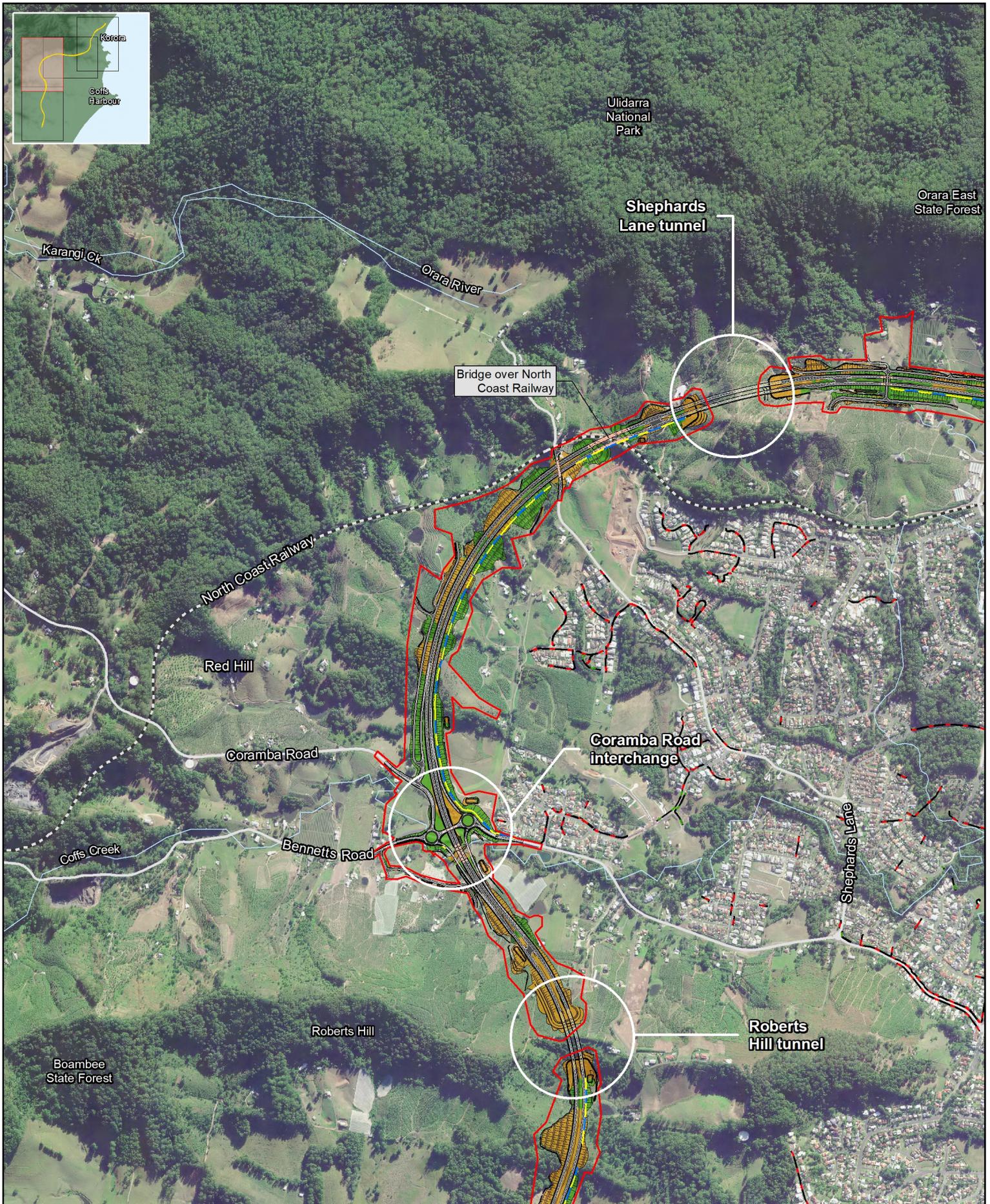
- An interchange at Korora Hill providing access between the project and the existing road network at Korora Hill, including the existing Pacific Highway, James Small Drive and Bruxner Park Road
- An upgrade of the existing highway between Korora Hill and Sapphire
- New bridges over Pine Brush Creek
- A new service road, located east of the project, connecting Solitary Islands Way with James Small Drive and the existing Pacific Highway near Bruxner Park Road
- The existing school bus interchange located near Kororo Nature Reserve would be relocated to just south of Kororo Public School with access provided via James Small Drive
- Luke Bowen footbridge would be replaced with a new pedestrian bridge over the project around 200 m north of the existing bridge. The new bridge would retain the name Luke Bowen footbridge
- A new local access road would be provided west of the project between Old Coast Road and Seaview Close. An underpass below the project would be provided near Fernleigh Avenue to connect the new local access road to the new service road.



- Legend**
- Construction footprint
 - Pavement
 - Bridge
 - North Coast Railway
 - Watercourse
 - Earthworks cut
 - Earthworks Fill
 - Noise protection barriers
 - Existing cycleway
 - Existing Footpath

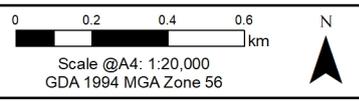
Coffs Harbour Bypass
 Project features
 Figure 29-01-01

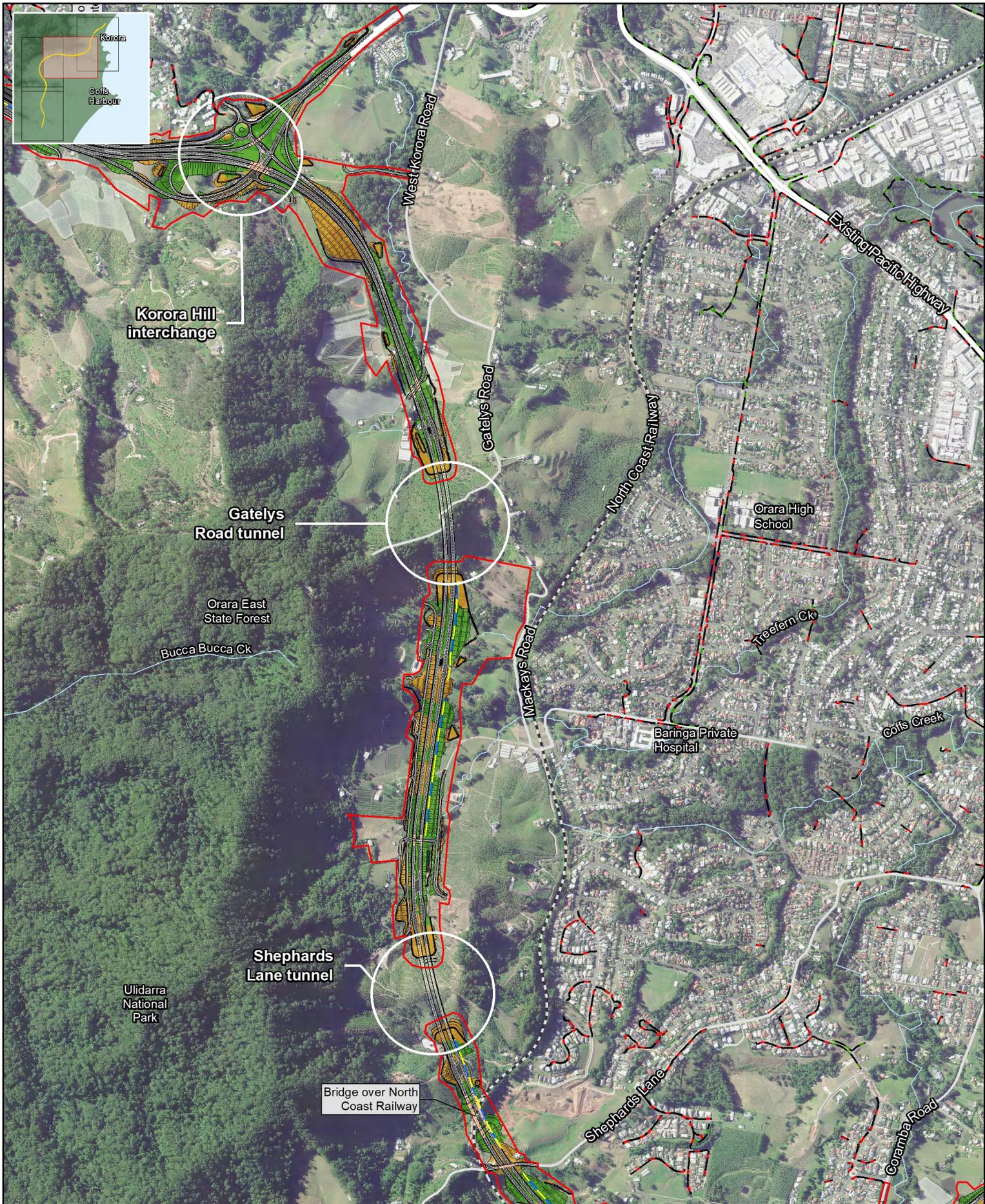




- Legend**
- Construction footprint
 - Earthworks cut
 - Pavement
 - Earthworks Fill
 - Bridge
 - Noise protection barriers
 - North Coast Railway
 - Existing cycleway
 - Watercourse
 - Existing Footpath

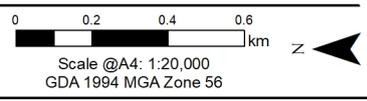
Coffs Harbour Bypass
 Project features
 Figure 29-01-02





- Legend**
- Construction footprint
 - Earthworks cut
 - Pavement
 - Earthworks Fill
 - Bridge
 - Noise protection barriers
 - North Coast Railway
 - Existing cycleway
 - Watercourse
 - Existing Footpath

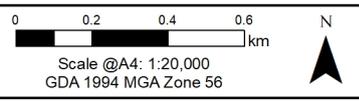
Coffs Harbour Bypass
 Project features
 Figure 29-01-03





- Legend**
- Construction footprint
 - Earthworks cut
 - Pavement
 - Earthworks Fill
 - Bridge
 - Noise protection barriers
 - North Coast Railway
 - Existing cycleway
 - Watercourse
 - Existing Footpath

Coffs Harbour Bypass
 Project features
 Figure 29-01-04



29.2 Construction of the project

The project would likely be built using conventional methods used on most highway projects. These methods may be modified during the detailed design or construction stages to address site-specific environmental or engineering constraints. Refer to **Chapter 6, Construction** for more information and details relating to construction methodology.

The activities listed in **Table 29-2** provide sufficient detail to allow an assessment of the likely nature and extent of environmental impacts during construction. These activities are indicative and would be refined by the construction contractor based on the site constraints and in accordance with any conditions of approval.

Table 29-2 Typical construction activities

Component	Typical activities
Pre-construction and site establishment	<ul style="list-style-type: none"> • Property acquisition and adjustments, including property access changes • Detailed investigations and survey work including investigative drilling, contamination investigations and excavations • Site establishment work including condition surveys, establishment of temporary ancillary facilities and establishment of temporary traffic management arrangements including construction of minor access roads • Progressive installation of environmental controls including temporary or permanent fencing, signage, erosion and sediment control measures and drainage controls including temporary creek crossings • Minor clearing and removal of vegetation (non-threatened species) • Relocation and/or protection of utilities.
Site preparation and bulk earthworks	<ul style="list-style-type: none"> • Clear, grubbing and mulching of vegetation for re-use in landscaping activities, where possible • Stripping topsoil and stockpiling it for reuse in landscaping • Excavation of cuttings, including crushing and screening of excavated material, stockpiling and haulage of material to fill embankment locations • Construction of fill embankments and earth mounds, including foundation drainage, benching and stabilising cut and fill batter slopes • Drilling of blast holes • Establishment of crushing plant(s).
Drainage and structures	<ul style="list-style-type: none"> • Installation of cross-drainage, including culverts and inlet and outlet work, such as channel diversions and scour protection • Installation of longitudinal and vertical drainage in cuttings and embankments • Construction of diversion and catch drains along the formation and sedimentation control basins or swales (where required) • Construction of subsurface drainage, retaining walls and fauna connectivity structures.
Bridge work	<ul style="list-style-type: none"> • Preparation of bridge work areas including temporary piling pads, access platforms • Installation of rock caissons or cofferdams or temporary access roads across waterways • Installation and construction of bridge foundations (driven or bored piles, pile caps and footings), bridge abutments and piers and bridge superstructure including deck and road surface work (cast in situ or precast bridge elements) • Construction of scour protection and noise walls on bridges (where required).
Tunnel work	<ul style="list-style-type: none"> • Establishment of portal sites in preparation for tunnel excavation, including provision of temporary tunnel services

Component	Typical activities
	<ul style="list-style-type: none"> Excavation of tunnel portals, cross passages and tunnel tubes, using drilling and blasting equipment for hard rock including installation of temporary and permanent support measures Finishing works in tunnel and provision of permanent tunnel services Commissioning tunnel plant and equipment.
Demolition	<ul style="list-style-type: none"> Demolition of bridges (Luke Bowen footbridge and northbound carriageway bridge over Pine Brush Creek), buildings and structures/sheds, etc on acquired properties.
Road work and road surfacing	<ul style="list-style-type: none"> Construction of temporary local traffic management diversions Construction of base and select layers of materials Construction of road surface layers and drainage, including kerb and gutter (where required) Construction of concrete barriers, wire rope fencing and guardrails and installation of traffic lights, road markings, signposting, roadside furniture and lighting Progressive landscaping, revegetation of batters and tree planting.
Finishing work	<ul style="list-style-type: none"> Removal of temporary environmental controls Site clean-up and demobilisation, including rehabilitation of ancillary sites and construction access roads (where required) Finalisation of landscaping and revegetation.

29.2.1 Construction ancillary facilities

A range of construction related facilities would be required to build the project. These ancillary facilities would include elements such as compounds, batching plants and stockpile areas.

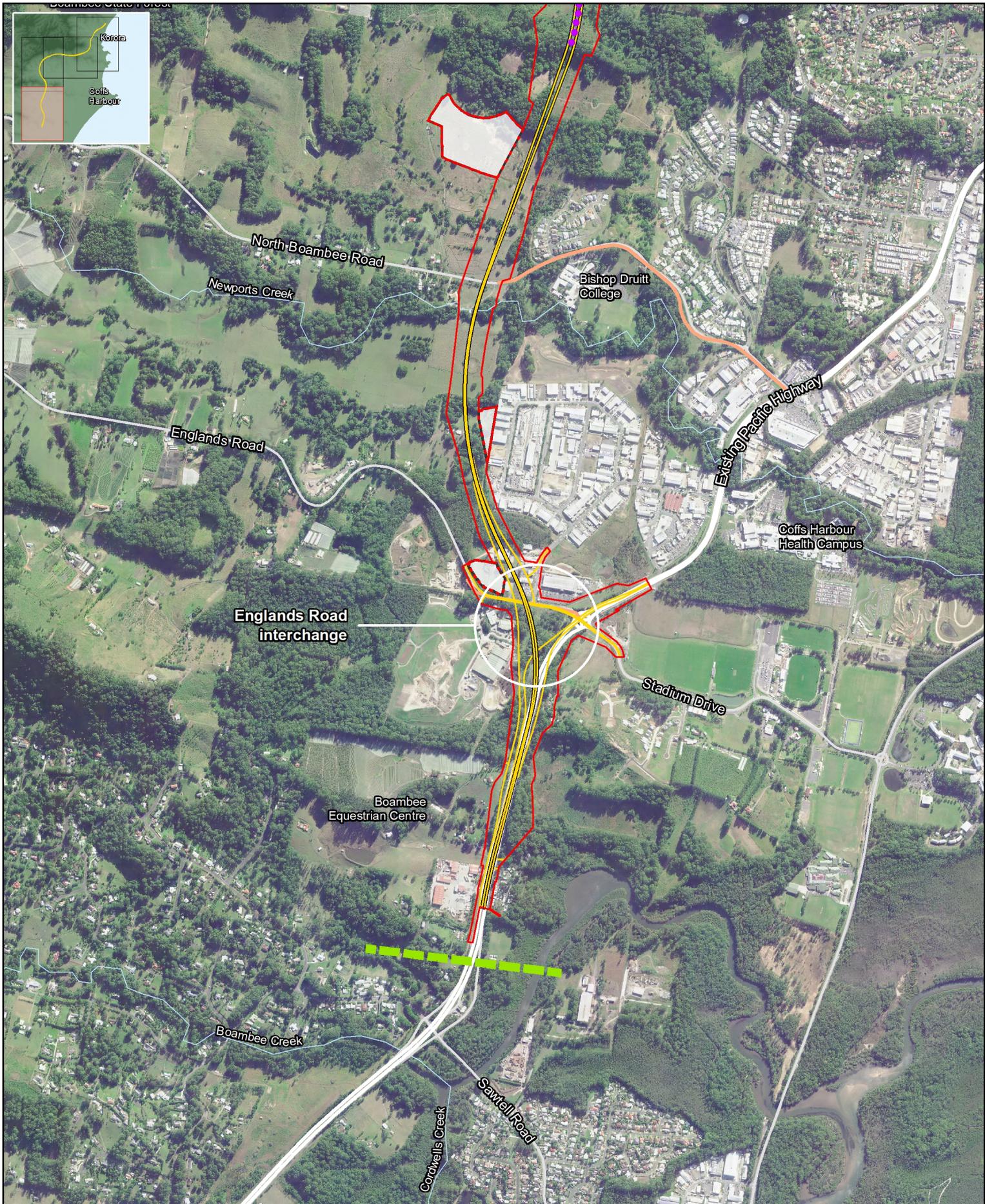
The location of the potential ancillary sites may be revised during detailed design and construction. The final use, locations and layout of ancillary facilities will be determined by the construction contractor. Initial site work in these areas would involve site clearing, installing appropriate environmental controls and providing hardstand areas for storage, parking and access roads.

Site compounds would be located within ancillary sites and would include offices, workforce facilities (such as parking, lunchrooms and toilets), workshops and storage areas for plant and construction materials. Site compounds may be co-located with batch plants and sited near major construction activities to minimise construction traffic. All site compounds would be fenced for security and safety purposes.

One or more concrete and asphalt batching plants may be required to supply concrete for constructing drainage and structures and asphalt for road pavements. It is highly desirable that crushing plants be located in the vicinity of concrete or asphalt batching plants and this would be taken into consideration when choosing the relevant locations for the facilities.

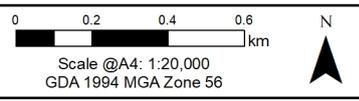
Crushing plants would be required to produce aggregates for concrete and/or asphalt in addition to materials for drainage and the select fill material layers. The crushing plants would be located near cuttings and/or tunnel portals to reduce traffic movements to the crushing and processing area. The crushing plant area would also be expected to include areas for the stockpiling of material. The location of the crushing plant would be determined by the construction staging (if any) and the associated mass haul balance, access, environmental and amenity issues.

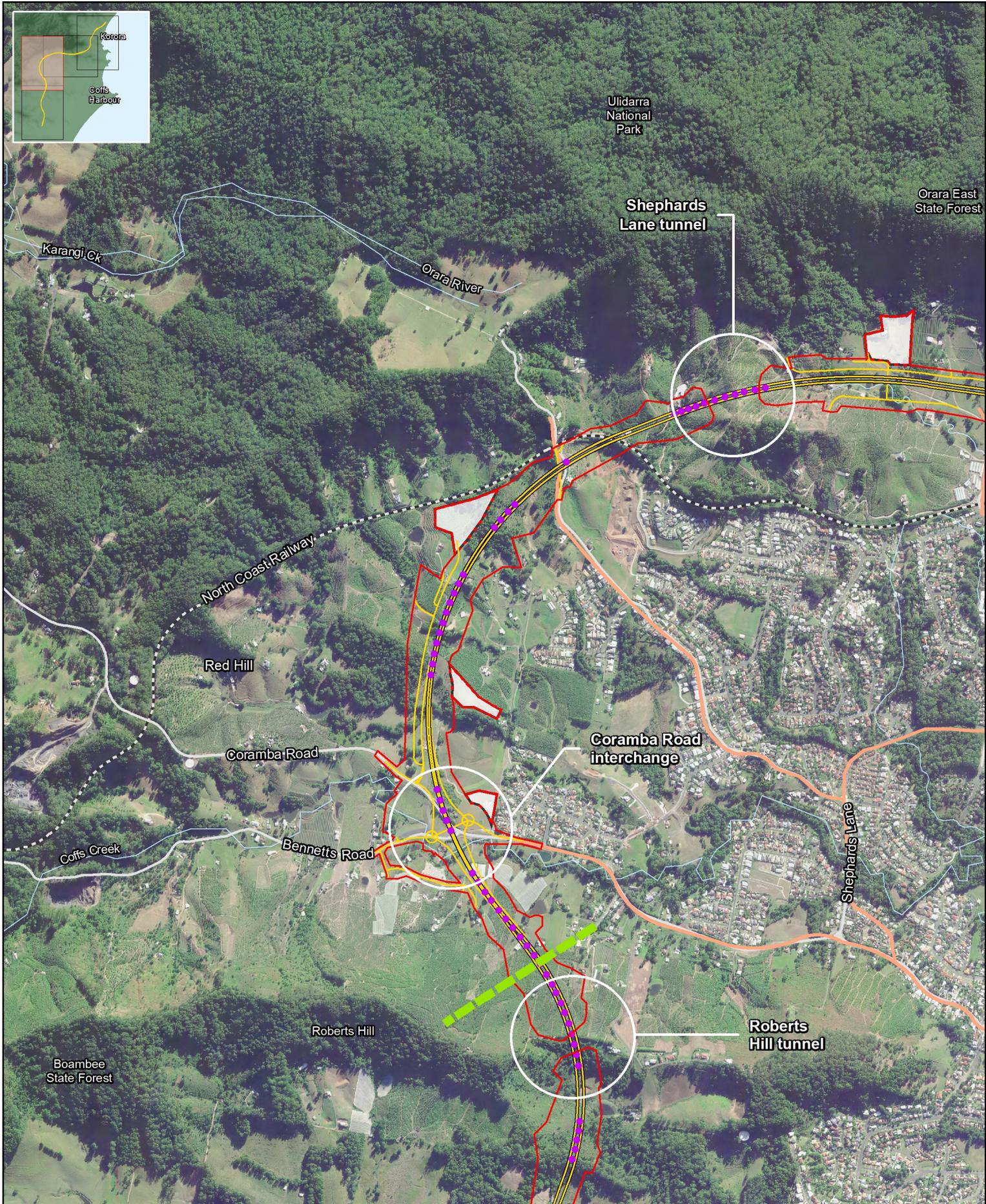
Stockpile areas would also be required to temporarily store general fill material, spoil and mulch and topsoil. Temporary stockpile areas would be located within the ancillary facilities shown in **Figure 29-2-01** to **Figure 29-2-04** as well as other appropriate areas within or adjacent to the construction footprint. Temporary stockpiles located on private land would only be undertaken with landholder permission. Potential ancillary facilities are shown in **Figure 29-2**.



- Legend**
- Construction footprint
 - Ancillary sites
 - Construction zone
 - North Coast Railway
 - Potential construction access
 - Watercourse
 - Potential controlled blasting sites

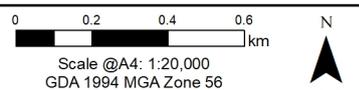
Coffs Harbour Bypass
 Ancillary sites and construction zones
 Figure 29-2-01

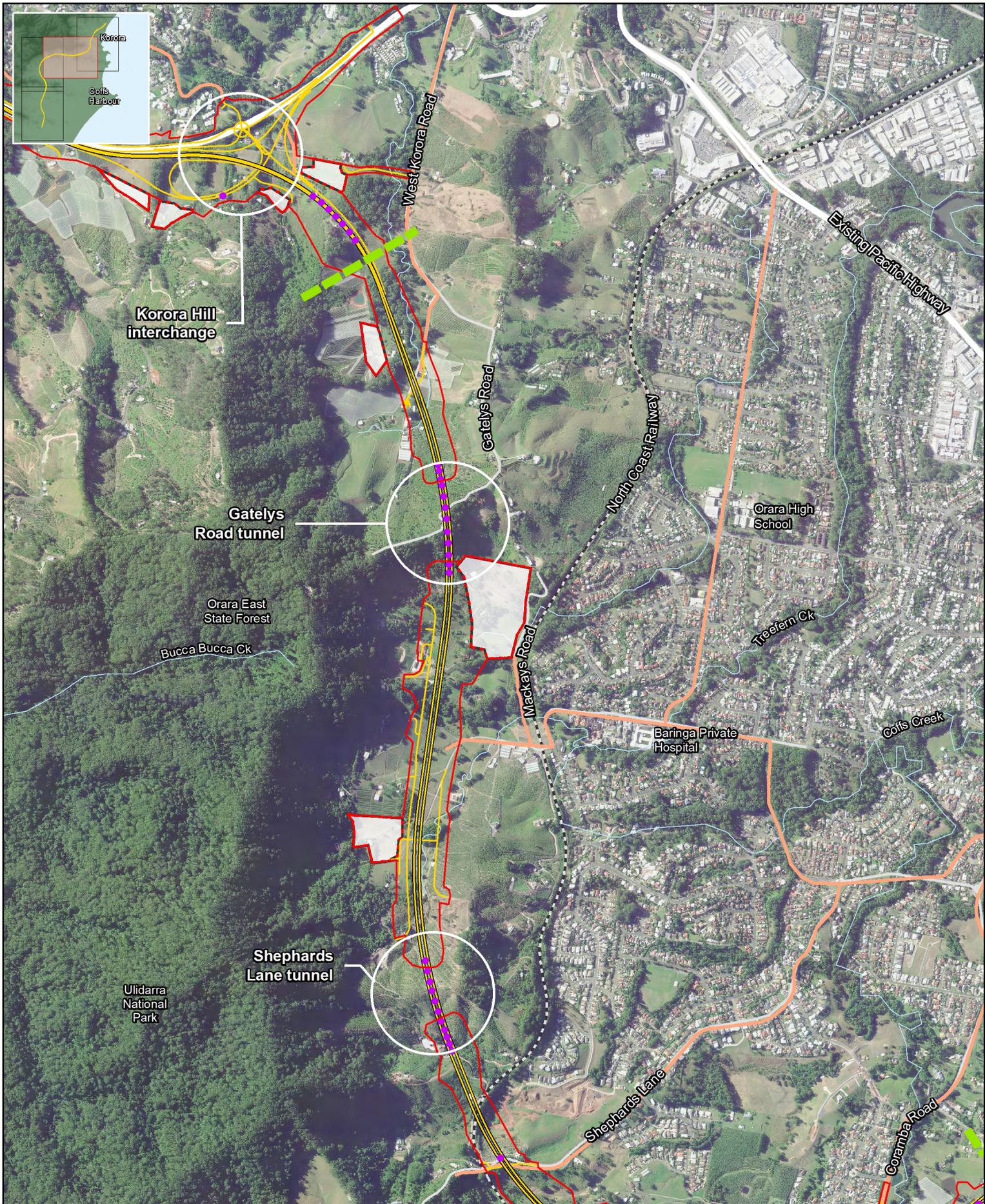




- Legend**
- Construction footprint
 - North Coast Railway
 - Watercourse
 - Construction zone
 - Ancillary sites
 - Potential construction access
 - Potential controlled blasting sites

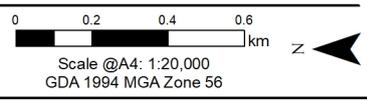
Coffs Harbour Bypass
 Ancillary sites and construction zones
 Figure 29-2-02





- Legend**
- Construction footprint
 - Ancillary sites
 - North Coast Railway
 - Watercourse
 - Construction zone
 - Potential construction access
 - Potential controlled blasting sites

Coffs Harbour Bypass
 Ancillary sites and construction zones
 Figure 29-2-03





- Legend**
- Construction footprint
 - Construction zone
 - Ancillary sites
 - North Coast Railway
 - Watercourse
 - Potential construction access
 - Potential controlled blasting sites

Coffs Harbour Bypass
 Ancillary sites and construction zones
 Figure 29-2-04

0 0.2 0.4 0.6 km

Scale @A4: 1:20,000
 GDA 1994 MGA Zone 56

N

29.2.2 Construction staging

There is potential for the construction phase of the project to be staged to allow certain activities to start as soon as possible following project approval and before the main construction work, ie enabling work.

Potential activities carried out as beneficial enabling work for the project could include construction of various bridge structures, commencing earthworks with the cuttings south of Roberts Hill and processing material, preparatory work for tunnels, permanent waterway crossings and the relocation of Luke Bowen footbridge and the Kororo Public School bus interchange and parking to separate these facilities from the main construction work.

In addition to the enabling work described above, there remains the potential that the section of the project between Korora Hill and Sapphire may be built in stages to maximise the use of the existing dual carriageway highway. An initial stage may include rationalising individual property accesses to the existing highway and closing median breaks.

The decision on possible staging of the Korora Hill to Sapphire section and enabling work would be made following project approval and during the pre-construction stage. The decision would be made with reference to project conditions of approval, funding availability and other engineering considerations.

If a decision is made to stage the relevant works, a staging report would be prepared and would include, but not be limited to:

- A description of the proposed staging requirements
- Identification of how the project conditions of approval would be addressed across and between the proposed construction stages of the project
- Identification of any additional environmental management measures that would be implemented (if required) as a result of the staging of the project's enabling work and the Korora Hill to Sapphire works.

29.3 Project uncertainties

The design of the project would continue to be refined during the detailed design phase and would be guided by the key principles developed during the concept design and EIS phase. Some flexibility has been provided in the concept design to:

- Allow for refinement during detailed design to consider alternative construction techniques
- Allow for refinement in response to submissions received following the exhibition of this EIS
- Minimise environmental impacts
- Respond to improved technologies or materials
- Improve value for money.

The final design may therefore vary from the concept design described in **Chapter 5, Project description**. Any changes to the project would be reviewed for consistency with the assessment contained in the EIS including relevant mitigation measures, environmental performance outcomes and any future conditions of approval. If design refinements are not consistent, approval would be sought from the Minister for Planning for any such modifications in accordance with the requirements of Division 5.2 of the EP&A Act.

Areas where further work would be carried out during detailed design to optimise the design outcomes and construction methodology include:

- Design of the alignment, interchanges, intersections, bridges (including final bridge type and length), batter slope specifications, local road network upgrades, property access roads, emergency crossover access

- Design of the Kororo Public School bus interchange
- Design of the impacted school bus stop at the intersection of Coramba Road and Spagnolos Road
- Drainage line and waterway realignments and/or adjustments and longitudinal and cross-drain design
- Consultation and proposals for relocation or protection of utilities
- Earthworks balance calculations Construction methodology, including staging and programming.

Table 29-4 outlines key project components that have been identified as requiring further resolution during detailed design, construction and/or operation of the project and references where these uncertainties are further described in this EIS.

Table 29-4 Resolution of project uncertainties

Project uncertainties	Proposed resolution	Timing	Where discussed
The location and layout of construction ancillary facilities, including entry and exit arrangements	<p>The location and layout of construction ancillary facilities will be confirmed as part of detailed construction planning, following engagement of the design and construction contractor.</p> <p>The construction ancillary facilities will be established and operated in accordance with the terms of the project approval.</p>	Detailed design	Chapter 6, Construction
The final suite of noise mitigation options for road traffic noise that will be adopted and implemented	<p>The operational road traffic noise model will be updated to identify predicted noise levels at the completion of detailed design.</p> <p>A reasonable and feasible assessment will then be undertaken in accordance with the Roads and Maritime Noise Mitigation Guideline (Roads and Maritime Services, 2015d) to determine the final noise mitigation options for the project (which may include noise barriers, noise walls, at-property treatments, or a combination of these).</p> <p>Ongoing community and stakeholder consultation to assist with informing and determining appropriate additional noise mitigation will be undertaken.</p>	Detailed design	Chapter 9, Noise and vibration
Tunnel design, structure and emergency facilities	<p>Tunnel design, structure and emergency facilities will be refined and confirmed in the detailed design stage.</p> <p>Design elements to be refined include final support measures as well as emergency systems such as road tunnel fire safety system.</p>	Detailed design	Chapter 5, Project description
Cuttings and fill embankments	<p>Cuttings and fill embankments would generally be at a slope of 2H:1V, equating to a one metre vertical rise for every two-metre horizontal run. Batter slope design would be refined during detailed design based on additional environmental, engineering and property constraints. All slopes would be revegetated to the edge of the indicative road corridor or existing landforms, where reasonable and feasible, to integrate the project with the surrounding landscape.</p> <p>Where cut batters are located in hard rock or where 2H:1V slopes are not feasible, and it is not reasonable and feasible to revegetate the cut batter, these would be left as natural stone where stable. If shotcrete is required for batter stability, the colour, consistency and texture would be sensitive to the existing landform and character.</p>	Detailed design	Chapter 5, Project description

Project uncertainties	Proposed resolution	Timing	Where discussed
Property access and acquisition	The project would change existing access arrangements for a number of properties. Property access would be reinstated where existing access is affected by the project. This would be subject to further refinement during the detailed design stage and in consultation with affected property owners.	Detailed design	Chapter 5, Project description Chapter 12, Land use and property
The final suite of mitigation options for flooding that will be adopted and implemented	Further flood modelling will be carried out based on the detailed design to determine the level of predicted impacts. This will inform detailed design development to ensure appropriate mitigation measures are put in place for areas where higher flooding is predicted. In particular, to mitigate impacts on the proposed residential development at Pacific Bay Eastern Lands development area and a few residential locations associated with Pine Brush Creek and Sapphire Beach catchments. A number of mitigation options are proposed to address the residual flood impacts and will be confirmed in consultation with CHCC and other relevant stakeholders prior to construction.	Detailed design	Chapter 17, Flooding and hydrology
The final suite of operational water quality treatments that will be adopted and implemented	The type and design of the specific stormwater treatment measures would continue to be refined and modelled as part of detailed design with the aim of further reducing the potential surface water quality impacts and to work towards meeting the NSW WQOs. This would include review of the proposed stormwater treatment train (individual devices connected in series to improve overall treatment performance) and consideration of best management practice guidelines including Roads and Maritime's Water sensitive urban design guideline (Roads and Maritime 2017g).	Detailed design	Chapter 19, Surface water quality
The final suite of engineering measures for long-term management of groundwater inflow that will be adopted and implemented	Additional ground truthing, geotechnical investigations and groundwater monitoring will be carried out to supplement existing information, in particular at cuts and tunnel sections where additional baseline groundwater level information may improve modelling predictions, from alluvial deposits close to Type A cuts and tunnels, and where potential springs and supply wells have been identified as being impacted. In combination with additional groundwater information obtained from the investigations, further numerical modelling may be undertaken to improve certainty around the predictions and outcomes. Revisions to the modelling would also be based on the detailed design and additional hydrogeological data to supplement	Detailed design	Chapter 20, Groundwater

Project uncertainties	Proposed resolution	Timing	Where discussed
	the current conceptual understanding of the groundwater system. The revised modelling will then allow confirmation of the final suite of engineering measures for long-term management of groundwater inflow to cuttings and tunnels.		
Utilities	Depending on the utility service being relocated, work may be required to occur outside the construction footprint to meet the utility service provider requirements. For example, telecommunication service providers typically require that any optic fibre adjustment be from ‘node to node’ in nominated pits with splicing not preferred and/or feasible. However, it is expected that the utility work would be carried out in existing disturbed areas within or next to existing road/local access corridors. A strategy for managing utilities will be developed during detailed design and will include further detailed utility investigations and design, on-going consultation and methods for relocation works. These methods will be in accordance with environmental management measures, utility provider’s requirements and construction methods.	Detailed design and construction	Chapter 5, Project description Chapter 12, Land use and property

29.4 Summary of project impacts and management measures

This section provides a summary of the impacts of the project. These impacts are discussed in detail in **Chapter 8, Traffic and transport** through to **Chapter 25, Cumulative impacts** of this EIS. Many potential impacts have been avoided through the earlier design and project development process which included input from key stakeholders. The initial planning for the project saw several alternate routes and options abandoned due to potential environmental impacts or risks. This included the Far Western Corridor, CHCC Preferred Corridor due to their potential environmental impacts and risks associated with Sherwood Nature Reserve, threatened species, wildlife corridors and significant impacts upon a landscape of Aboriginal cultural heritage importance.

A number of potential environmental impacts have been avoided or minimised as part of the more recent design development and investigation. These include:

- New bridge structure for Newports Creek to help manage potential impacts on the giant barred frog and reconfiguration of culverts and bridges north of North Boambee Road to address flooding issues and minimise hydrological changes that may affect the coastal petaltail dragonfly
- Use of tunnels to cross Roberts Hill, Shephards Lane ridge and Gatelys Road ridge to avoid and/or minimise impacts on wildlife corridors (including identified koala corridors), reduce direct impacts on koala habitat, minimise impacts to landscape character and visual amenity, reduce impacts to agricultural properties, and reduce impacts on items of Aboriginal cultural heritage significance including sites, areas of potential archaeological deposits and cultural pathways
- Cut and fill batters have been designed to be 2H:1V where possible to minimise the need for geotechnical treatments, eg shotcrete and rock bolting, and improve the visual amenity and landscaping potential of the project
- Inclusion of around 7.5 km of new noise barriers, low noise pavement for the full length of the project and lower carriageway gradients to minimise operational noise impacts of the project
- Locating the proposed service road on the alignment of the south bound carriageway of the existing Pacific Highway as it crosses Pine Brush Creek to reduce potential environmental impacts at this location.

Further refinement of the design including consideration of community issues through the EIS exhibition process may further reduce and, if possible, avoid impacts. Potential impacts would also be further avoided and minimised, where possible, through the implementation of the mitigation measures complying with the performance outcomes identified in **Section 29.5**.

The EIS has assessed the potential environmental impacts that may occur as a result of the project and recommends measures to manage these impacts (see **Chapter 26, Summary of environmental management measures**). An environmental risk analysis has been carried out following the assessment of likely impacts of the project to determine potential residual impacts, ie the impacts remaining after the identified management and mitigation measures are applied. This analysis is included in **Chapter 27, Environmental risk analysis**. **Table 29-3** provides a summary of potential residual impacts of the project and the associated mitigation measures.

Table 29-3 Summary of key project impacts and management measures

Summary of key impact	Construction / operation	Management measure
Traffic and transport (refer to Chapter 8)		
Increased travel times due to potential detours during construction.	Construction	Construction staging and temporary work will be implemented to minimise conflicts with the existing road network and maximise spatial separation between work areas and travel lanes.
Changes to property access.	Construction	Existing accesses to properties will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with affected property owners.
Increased traffic volumes on sections of the road network.	Construction and operation	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP to manage construction impacts.
Noise and vibration (refer to Chapter 9)		
Noise and vibration (including potential blasting) impacts to sensitive receivers.	Construction	<p>A Noise and Vibration Management Plan (NVMP) will be prepared for the project. The NVMP will include measures to be implemented during construction to minimise noise and vibration impacts.</p> <p>The NVMP will incorporate a Blast Management Strategy. The Strategy will aim to demonstrate that all blasting and associated activities will be carried out in a manner that will not generate unacceptable noise and vibration impacts or pose a significant risk impact to residences and sensitive receivers.</p> <p>Any variations to the standard construction hours will be carried out in accordance with an Out of Hours Work Procedure which will include work practices and management measures to manage any potential impacts and keep the affected local community informed.</p>
Increased road traffic noise for sensitive receivers near the project.	Operation	<p>Low noise pavement has been included for the full length of the project.</p> <p>Additional 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.</p> <p>An operational noise review will be carried out 12 months after the opening of the project to confirm the operational noise impacts. Where deficiencies in performance are identified, the review will provide recommendations for additional feasible and reasonable measures.</p>

Summary of key impact	Construction / operation	Management measure
Biodiversity (refer to Chapter 10)		
Clearing of vegetation at the commencement of construction, including native vegetation.	Operation	A Biodiversity Offsets Strategy will be prepared and implemented, and clearing is to be minimised where reasonable and feasible.
Removal of threatened flora and fauna habitat.	Construction	<p>Prior to construction, the Threatened Species Management Plan (TSMP) will be reviewed and implemented. The TSMP provides a framework for the management of threatened flora and fauna likely to be impacted by the project including mitigation goals and actions, management measures, timing and responsibilities, monitoring requirements and contingency measures. The TSMP will be reviewed and updated during detailed design and will inform the development of a Flora and Fauna Management Plan, prior to construction.</p> <p>Removal of habitat will be minimised through detailed design with consideration of hollow bearing trees, native vegetation in areas including, riparian zones, connectivity corridors and proposed fauna crossing structures.</p> <p>A Salvage and Re-establishment Plan will be developed for the translocation and re-establishment of the southern swamp orchid and rusty plum.</p> <p>Additional mitigation measures will be implemented to minimise impact to giant barred frog including bridging areas of known habitat, pre-clearing surveys prior to earthworks and installation of frog-proof fences.</p>
Fragmentation of biodiversity links and habitat corridors.	Operation	Fauna connectivity structures would be designed and constructed to facilitate safe fauna passage across the project. These connectivity structures would include dedicated overpass and underpass structures as well as combined underpass structures. These structures and the road corridor would be designed to include fauna fencing to encourage movement of target species towards the structures and exclude native fauna from the road infrastructure.

Summary of key impact	Construction / operation	Management measure
Urban design and visual amenity (refer to Chapter 11)		
<p>Change in landscape character due to the built structure and vegetation clearance.</p> <p>Adverse impact. Including potential overshadowing and glare impacts, on visual amenity for existing residences, visitors and road users.</p>	Construction and operation	<p>An Urban Design and Landscape Plan will be prepared to support the detailed design of the project. The Plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the environmental assessment. The plan will be prepared in accordance with Roads and Maritime urban design policy and guidelines including:</p> <ul style="list-style-type: none"> • Beyond the Pavement - urban design policy, procedures and design principles (Roads and Maritime Services 2014a) • Landscape design guidelines: Design guideline to improve the quality safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime Services 2017c) • Bridge Aesthetics: Design Guidelines to improve appearance of bridges in NSW (TfNSW Centre for Urban Design 2019) • Tunnel urban design guideline: Design guideline to improve the customer and community experience of road tunnels (Roads and Maritime Services 2017f) • Noise Wall Design Guideline: Design guidelines to improve the appearance of noise walls in NSW (Roads and Maritime Services 2016c) • Shotcrete Design Guideline: Design guidelines to avoid, minimise and improve the appearance of shotcrete in NSW (Roads and Maritime Services 2016d). <p>During detailed design, further consideration will be given to transparent noise walls to reduce the impacts of overshadowing of landowners. A reflective study will be undertaken to identify any adverse reflective glare from the use of transparent noise walls on road users and adjacent residential properties.</p>
Land use and property (refer to Chapter 12)		
Property acquisition impacts to private and public land holders.	Construction	Land acquisition will continue to be carried out in accordance with the Land Acquisition Information Guide (Roads and Maritime 2014b), Fact sheet: Property acquisition of subsurface lands (Roads and Maritime 2015g) and the <i>Land Acquisition (Just Terms Compensation) Act 1991</i> .

Summary of key impact	Construction / operation	Management measure
Utilities	Construction	Detailed consultation and proposals for relocation or protection of utilities impacted by the project will be carried out during detailed design in consultation with respective utility providers. Where relocation or adjustment of utilities is required, these will be planned to minimise disruptions and impacts on surrounding properties.
Agriculture (refer to Chapter 13)		
Agricultural property acquisition	Construction and operation	Where a property is not subject to a total acquisition, a specialist agricultural consultant will be engaged at the request of affected property owners whose properties are seriously or critically impacted by the project to assist in assessing, but not limited to, opportunities for agricultural diversification and/or revised farm management practices.
Impacts on agricultural structures, water sources, access	Construction and operation	Impacts such as affected water sources, structures (eg packing sheds) as well as internal and external access impacts will be restored, replaced, relocated or compensated in consultation with affected property owners where feasible.
Temporary dust impacts to agricultural receivers	Construction	Real time dust monitoring will be carried out to allow for timely management of dust generation on-site and minimise potential impacts.
Panama disease	Construction	A Panama Disease Control Management Plan will be prepared and implemented during construction in consultation with DPI Agriculture and representatives of the Banana Growers Association of Coffs Harbour & District. The plan will be developed to manage risks associated with potentially infected plant material during and following clearing and grubbing, movement of the pathogen in soils and water due to erosion and sedimentation during construction and movement of the pathogen via contaminated construction equipment, vehicles and personnel entering and leaving the construction footprint.
Socio-economic (refer to Chapter 14)		
Impacts to residents (including those related to property, amenity, and access impacts)	Construction	Consultation will be carried out with potentially affected residences prior to the start of, and during work, in accordance with the Community Liaison Implementation Plan. The Plan will be based on the draft Community consultation framework and will be implemented prior to construction. The Plan will provide specific information in relation to community involvement during construction.

Summary of key impact	Construction / operation	Management measure
Reduction in passing trade	Operation	A Directional Signage Plan will be developed in accordance with Roads and Maritime signage guidelines to ensure effective and appropriate signposting for key locations along the project. The Plan will identify the range of services that Coffs Harbour provides.
Impacts to local businesses at Coffs Coast Resource Recovery Park	Construction	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.
Aboriginal cultural heritage (refer to Chapter 15)		
Impact on identified sites of Aboriginal cultural heritage significance.	Construction	An Aboriginal Heritage Management Plan will be prepared and implemented in consultation with the RAPs and will include details of investigations carried out and required, construction management procedures, induction procedures and opportunities for ongoing Aboriginal community engagement. Archaeological salvage excavation will be carried out where impacts cannot be avoided. Salvaged objects will be transferred in accordance with a Care Agreement or similar agreement to the Aboriginal community.
Impacts to intangible cultural values associated with Roberts Hill Pathway, the Gumgali Storyline and Pathway, Sealy Point Pathways, East Boambee Camp and West Korora Living Place.	Construction and operation	Rehabilitation and revegetation of the construction footprint will occur with local Indigenous plant species progressively during construction. The identification of the plant species will be carried out in consultation with the identified knowledge holders and the RAPs. A booklet (in a format appropriate for local publication) will be prepared by a cultural heritage specialist on the cultural values and historical records relating to the cultural landscape that each site forms a part of. The final content of the booklet will be developed in consultation with identified Aboriginal knowledge holders. Interpretative signage relevant to the cultural sites will be prepared in consultation with identified Aboriginal knowledge holders.

Summary of key impact	Construction / operation	Management measure
Non-Aboriginal cultural heritage (refer to Chapter 16)		
Direct and indirect impacts to the Coffs Harbour Banana Plantation Landscape, marked tree stumps, the North Coast Railway, Old Coast Road timber beam bridges and the former Coffs Heights Post Office.	Construction	A Non-Aboriginal Heritage Management Plan (NAHMP) will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to avoid and mitigate impacts to non-Aboriginal heritage. Archival recording will be prepared for the Coffs Harbour Banana Plantation Landscape, former Coffs Heights Post Office, the North Coast Railway, Old Coast Road timber bridges (Old Coast Road Bridge No.1 and No. 2) and marked tree stumps. A program of archival recording will be completed prior to construction.
Vibration impacts on Old Coast Road timber beam bridges.	Construction	A detailed inspection of the structural integrity of the bridges will be carried out by a suitably qualified structural engineer before the start of construction. Following the inspection, if the bridges are considered to be sensitive, options for mitigation will be considered during detailed design.
Flooding and hydrology (refer to Chapter 17)		
Impacts on flood behaviour during construction.	Construction	A Construction Flood Management Plan (CFMP) will be prepared and implemented before construction to manage the impact of a 5% AEP flood event or greater on the operation of ancillary facilities. Ancillary facilities located within potential flood hazard areas will be designed, established and operated to minimise flooding impacts.
Creek realignments	Construction	Creek realignments will be designed in a manner that the final diversion mimics to the greatest extent possible the characteristics of the waterway that is being diverted. During the initial establishment and operation period of realigned waterways, regular inspections would be carried out to ensure effective design of the realignment.
Potential flooding impacts on residences.	Operation	Consultation with CHCC and the proponent of Pacific Bay Eastern Lands development will be carried out during detailed design and construction regarding flooding impacts on residences and local roads. Where required, detailed floor level surveys will be carried out to determine any potential incremental damages to buildings and appropriate mitigation measures will be developed in consultation with the property owner.

Summary of key impact	Construction / operation	Management measure
Soils and contamination (refer to Chapter 18)		
Contaminated soil	Construction	A detailed site contamination investigation (Phase 2) will be carried out in areas of potential contamination. This would include targeted sampling in areas such as banana plantations, unlicensed tips and soil, surface water and groundwater quality fill material. A Contaminated Land Management Plan will be prepared and implemented as part of the CEMP for any areas of existing contaminated land or to address land contamination likely to be caused by the construction activity.
Soil, surface water and groundwater quality	Construction	A Soil and Water Management Plan (SWMP) will be prepared in accordance with Landcom (Blue Book) Erosion and Sediment Control Principles and Procedures (Landcom 2004) and Erosion and Sediment Management Report: Coffs Harbour Bypass (SEEC 2019) and implemented as part of the CEMP.
Soil erosion and sedimentation	Construction	Site specific Erosion and Sediment Control Plans will be prepared and implemented as part of the SWMP.
Acid sulfate soils	Construction	An ASS Management Plan will be implemented as part of the SWMP in accordance with the Guidelines for the Management of Acid Sulfate Materials (RTA 2005).
Surface water quality (refer to Chapter 19)		
Water quality of adjacent waterways and sensitive environments	Construction	Sediment basins will be designed to contain the five-day 90th percentile rainfall event within all sub-catchments that drain into the Solitary Islands Marine Park. All other sub-catchments will include sediment basins designed for five-day 85th percentile rainfall event. A water quality monitoring program will be prepared and implemented prior to, and during, construction to identify whether the project is resulting in adverse impacts on water quality and assess compliance with statutory requirements and project targets. Monitoring will continue for a period of three years following construction, or before if it can be proved that no impact has occurred. A detailed Environmental Work Method Statement (EWMS) will be prepared and implemented for all work carried out within, or immediately adjacent to, waterways. The EWMS will detail measures to avoid or minimise risks from erosion and sedimentation to water quality and biodiversity.

Summary of key impact	Construction / operation	Management measure
Operational water quality impacts	Operation	Stormwater and road runoff will be directed towards operational water quality treatment measures that will assist in the removal of pollutants from discharge water to protect ecosystem and human health. Grass swales will be the primary stormwater treatment measure. The proposed treatment structures will be designed to accommodate a spill volume of up to 40,000 L which would contain a major accidental spill, capturing hydrocarbons that may be released into sensitive receiving environments, causing impacts to ecosystem and human health.
Groundwater (refer to Chapter 20)		
Impacts on quality of groundwater	Construction	Monitoring of groundwater levels and quality will be included in the water quality monitoring program.
Impacts from cuttings, tunnels and embankments on groundwater level, flow and quantity	Operation	Monitoring of seepage into cuttings will be carried out and evaluated against the predictions of the numerical modelling done during detailed design. Major embankments will be designed to enable distributed flow of surface water to prevent ponding. Additional ground truthing and site inspections will be completed for potentially impacted groundwater bores/supply wells, springs and agricultural dams within and immediately surrounding the zone of drawdown.
Air quality (refer to Chapter 21)		
Impacts on sensitive receptors during construction, dust generation from building demolition, emissions from construction vehicles.	Construction	An Air Quality Management Plan will be prepared and implemented as part of the CEMP. The plan will identify potential sources of air pollution, identification of all dust sensitive receivers, air quality objectives, mitigation and suppression methods (including during strong winds and adverse weather conditions) and community notification procedures.
Odour impacts from asphalt batch plants	Construction	Asphalt batch plants established for the project will be maintained at the minimum temperature possible to minimise odorous emissions. Particulate extraction equipment will be installed, operated and maintained for efficiency in minimising odour impacts and filters and burners will be adequately maintained to minimise odour impacts. Commission testing will be carried out prior to full operation to ensure that best practice industry standards are met during the operation of the batch plant.

Summary of key impact	Construction / operation	Management measure
Waste (refer to Chapter 22)		
Waste management and storage, including operational waste and wastewater	Construction	A Waste Management Plan will be prepared and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented to support minimising the amount of waste produced and appropriately handle and dispose of unavoidable waste. It will also address the importation of recycled materials to site for use in constructing the project.
Hazardous building materials	Construction	A hazardous materials assessment of the buildings to be demolished would be carried out before demolition to identify the presence of hazardous materials and ensure appropriate controls are implemented. If the assessment identifies asbestos containing materials, an Asbestos Management Plan will be developed and implemented.
Sustainability (refer to Chapter 23)		
Sustainability	Construction	A Sustainability Management Plan will be developed to establish governance structures, processes and systems that ensure integration of all sustainability considerations (vision, commitments, principles, objectives and targets), initiatives, monitoring and reporting during the detailed design and construction phases of the project.
Hazard and risk (refer to Chapter 24)		
Bushfire risk	Construction	The CEMP will include a Bushfire Management Plan prepared in accordance with the Planning for Bush Fire Protection 2006 (Rural Fire Service 2006) which would detail consultation requirements, methods for ensuring plant and equipment are fitted with spark arrestors, requirements for hot work permits and implementation for appropriate storage and handling requirements for potentially flammable substances.

29.4.1 Environmental management plan framework

The implementation of environmental management measures during detailed design, construction and operation of the project would minimise any potential adverse impacts arising from the proposed work on the surrounding environment. The management measures related to construction would be captured in a CEMP and associated sub-plans. The plan would provide a framework for establishing how these measures would be implemented and who would be responsible for their implementation.

The plan would be prepared prior to construction of the project and would be reviewed and certified by Roads and Maritime prior to the start of any on-site work. The construction environmental management plan would be a working document, subject to ongoing change and updated as necessary to respond to specific requirements.

Sub-plans to be prepared for the project include but may not be limited to:

- Traffic Management Plan
- Noise and Vibration Management Plan
- Flora and Fauna Management Plan
- Threatened Species Management Plan
- Urban Design and Landscape Plan
- Panama Disease Control Management Plan
- Aboriginal Heritage Management Plan
- Non-Aboriginal Heritage Management Plan
- Construction Flood Management Plan
- Soil and Water Management Plan
- Erosion and Sediment Control Plan
- Acid Sulfate Soils Management Plan
- Asbestos Management Plan
- Air Quality Management Plan
- Waste Management Plan
- Sustainability Management Plan
- Bushfire Management Plan.

During operation, the project's environmental performance would be managed under Roads and Maritime's existing Environmental Management System (EMS) for asset maintenance prepared in accordance with the AS/NZS ISO 14000 Environmental Management System series. This EMS has been developed to be consistent with the broad environmental objectives and policies set out in the Roads and Maritime's Corporate EMS. Roads and Maritime are committed to managing its impacts on the environment and carrying out its activities so as to avoid, minimise or mitigate environmental impacts. Accordingly, any project-specific operational environmental management practices and procedures will be incorporated into the existing EMS.

29.5 Desired performance outcomes

The project design has been prepared in consideration of the 'desired performance outcomes' provided in the SEARs. **Table 29-4** outlines how each performance outcome will be achieved by the project.

Table 29-4 Design performance outcomes and project outcome

Desired performance outcome	Project outcome
<p>Consultation The project is developed with meaningful and effective engagement during project design and preparation of the EIS.</p>	<ul style="list-style-type: none"> Community and stakeholders are regularly engaged during development and delivery of the project and have informed the design process Complaints are responded to in a timely and appropriate manner so that concerns are managed effectively and promptly.
<p>Traffic and transport Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.</p>	<ul style="list-style-type: none"> Free-flowing dual carriageway conditions are provided Road safety is improved by removing through traffic and some local traffic from the existing road network Travel time is improved for through and local traffic Transport efficiency of the existing Pacific Highway through Coffs Harbour is improved Freight efficiency for heavy vehicles is improved.
<p>Noise and vibration – amenity Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and wellbeing of the community.</p>	<ul style="list-style-type: none"> Mitigation measures will be implemented in accordance with the relevant criteria from the Construction Noise and Vibration Guideline (Roads and Maritime, 2016a) and Noise Criteria Guideline (Roads and Maritime, 2015c) Road traffic noise is minimised at nearby sensitive receivers Operational noise mitigation measures are implemented early during the construction phase Construction noise and vibration including out of hours work is effectively managed in accordance with relevant guidelines, and the affected community is informed and consulted.
<p>Noise and vibration – structural Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on the structural integrity of buildings and items including Aboriginal places and environmental heritage. Increases in noise emissions and vibration affecting environmental heritage as defined in the <i>Heritage</i></p>	<ul style="list-style-type: none"> Old Coast Road timber beam bridges are not damaged by construction vibration Minimum working distances for sensitive receivers complied with during construction for both human comfort and cosmetic damage Blasting is managed in accordance with relevant standards and guidelines and the affected community and property owners are consulted.

Desired performance outcome	Project outcome
<p>Act 1977 during operation of the project are effectively managed.</p>	
<p>Biodiversity The project design considers all feasible measures to avoid and minimise impacts on terrestrial and aquatic biodiversity.</p> <p>The delivery of offsets and/or supplementary measures required for the project is assured and which are equivalent to any remaining impacts from its construction and operation.</p>	<ul style="list-style-type: none"> • The removal of native vegetation is minimised, particularly in threatened ecological communities, areas of known fauna connectivity, riparian zones and hollow bearing trees • Native vegetation is re-established via the implementation of the Landscape and Urban Design Strategy with reference to Guide 3: Re-establishment of native vegetation of the Roads and Maritime Biodiversity Guidelines • Residual biodiversity impacts are offset in accordance with the FBA • Fauna connectivity structures and exclusion fencing are constructed and used by the target fauna species with low activity or absence of pest animals • Creek realignments use natural channel design principles and revegetation to restore aquatic and riparian habitats • Fish passage is maintained for all Class 1, 2 and 3 waterways crossed by the project • Artificial microbat roosting sites and nest boxes are used by the target fauna species.
<p>Urban design The project design complements the visual amenity, character and quality of the surrounding environment.</p> <p>The project contributes to the accessibility and connectivity of communities.</p>	<ul style="list-style-type: none"> • The project is a flowing road alignment that is responsive to, and integrated with, the landscape • The road reserve is well vegetated with natural species • The constructed project is simplified and unobtrusive, with consistent road elements. The driving experience is enjoyable and interesting for road users.
<p>Visual amenity The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.</p>	<ul style="list-style-type: none"> • Visual impacts are minimised using design solutions such as revegetation, integration of cut slopes and sensitive design of infrastructure elements.
<p>Socio-economic, land use and property The project minimises adverse social and economic impacts and capitalises on opportunities potentially available to affected communities.</p> <p>The project minimises impacts to property and business and achieves appropriate integration with</p>	<ul style="list-style-type: none"> • Construction of the project has minimised property acquisitions and severances • Construction of the project has avoided direct and indirect impacts on agricultural properties • Impacts on the agricultural industry has been minimised

Desired performance outcome	Project outcome
<p>adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.</p> <p>Effective engagement is undertaken with stakeholders during project design and delivery.</p>	<ul style="list-style-type: none"> • Businesses experience minimal disturbance during construction and operation of the project, with ongoing community engagement and stakeholder involvement.
<p>Heritage</p> <p>The design, construction and operation of the project facilitates, to the greatest extent possible, the long-term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places.</p> <p>The design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.</p>	<ul style="list-style-type: none"> • Archival recording is provided for all items of heritage significance impacted by the project • Aboriginal archaeological sites of moderate or high significance undergo salvage and location of salvaged objects are determined in consultation with the Aboriginal community • Impacts on cultural pathways are avoided where possible, and minimised where impacts are unavoidable • Interpretive signage is incorporated at culturally significant locations in consultation with knowledge holders.
<p>Soils</p> <p>The environmental values of land, including soils, subsoils and landforms, are protected.</p> <p>Risks arising from the disturbance and excavation of land and disposal of soil are minimised, including disturbance to acid sulfate soils and site contamination.</p>	<ul style="list-style-type: none"> • An erosion and sediment control plan is prepared and implemented prior to construction commencing and updated regularly during the construction period to suit specific site characteristics. • Construction is undertaken in accordance with the Soil and Water Management Plan and Contaminated Land Management Plan and as result any contaminated sites and contamination is managed in accordance with EPA requirements.
<p>Water quality</p> <p>The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact including estuarine and marine waters (if applicable).</p>	<ul style="list-style-type: none"> • Operational water quality treatment measures are incorporated into the design to minimise impacts on sensitive receiving environments. • All temporary and permanent soil, erosion and water quality safeguards are inspected and maintained during construction to ensure effective implementation. Inspections assess success of the controls, actions required to ensure on-going effective operation, and compliance with any statutory approvals.

Desired performance outcome	Project outcome
<p>Water – hydrology Long term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised.</p> <p>The environmental values of nearby, connected and affected water sources, groundwater and dependent ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved).</p> <p>Sustainable use of water resources.</p>	<ul style="list-style-type: none"> • During construction, treated water is reused as construction water or dust suppression • Changes to environmental water availability and flows are minimised, and impacts on natural hydrological attributes, including creeks, waterways and groundwater sources are minimised. • Waterway realignments are designed to maintain a similar hydrologic and geomorphic manner as the existing conditions, and the design addresses the requirements of DPIE.
<p>Flooding The project minimises adverse impacts on existing flooding characteristics.</p> <p>Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards or dam failure.</p>	<ul style="list-style-type: none"> • Flooding associated impacts during construction are minimised and/or managed through the implementation of the Construction Flood Management Plan • The project reduces flood extents and peak water levels downstream of the project in accordance with the floodplain management objectives.
<p>Air quality The project is designed, constructed and operated in a manner that minimises air quality impacts (including nuisance dust and odour) to minimise risks to human health and the environment to the greatest extent practicable.</p>	<ul style="list-style-type: none"> • Dust, odour and other emissions during construction are effectively managed through the implementation of the Air Quality Management Plan • Operation of the project does not result in any exceedances of the relevant air quality.
<p>Waste All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values</p>	<ul style="list-style-type: none"> • Earthworks spoil is reused within the construction footprint to minimise waste where possible • Off-site waste and re-use is managed in accordance with relevant EPA resource recovery exemptions and requirements.
<p>Sustainability The project reduces the NSW Government’s operating costs and ensures the effective and efficient use of resources. Conservation of natural resources is maximised.</p>	<ul style="list-style-type: none"> • The project achieves an “Excellent” rating for both Design and As-Built under the Infrastructure Sustainability Council of Australia IS ratings scheme.
<p>Hazards and risk The project avoids, to the greatest extent possible, risk to public safety. The project is designed, constructed and operated to be resilient to the future impacts of climate change.</p>	<ul style="list-style-type: none"> • Construction and operational risks, such as bushfire risk, subsidence and handling of dangerous goods are effectively managed.

29.6 Project justification

29.6.1 Overview

The existing Pacific Highway through Coffs Harbour comprises two lanes in each direction with 12 sets of traffic signals and is between the CBD and other major commercial and industrial precincts.

Following the completion of NorthConnex and the Pacific Highway duplication by 2020, Coffs Harbour and Hexham/Heatherbrae will be the only two locations on the entire east coast corridor linking Brisbane, Sydney, Canberra and Melbourne where the route is an urban road with traffic signals. In addition, there is a small section of the Pacific Highway at Coolongolook, which is in an urban area with an 80 km/h speed limit, but without traffic signals.

Chapter 3, Strategic justification and project need and **Chapter 28, Project justification and conclusion** provide further detail.

29.6.2 Biophysical, economic and social considerations

Conflict between pedestrian, passenger and freight traffic through the Coffs Harbour CBD has resulted in a high crash rate and will continue to be a substantial safety issue as traffic volumes continue to increase.

By providing a bypass of Coffs Harbour, the project would address declining transport efficiency, urban congestion and road safety issues caused by the interaction of through and local traffic. The completion of the project will also contribute to providing almost 2000 km of high standard road between Melbourne and just south of Gympie in Queensland.

The rationale for the construction of the Coffs Harbour Bypass is consistent with the rationale for the broader Pacific Highway upgrade program, which seeks to improve the capacity and quality of the Pacific Highway, improving safety, travel times and reliability. Completion of the Coffs Harbour Bypass is required to deliver the objectives of the Pacific Highway upgrade program. Not completing the bypass would mean that only a proportion of the \$4.4 – \$4.7 billion of program-wide benefits estimated in the Pacific Highway Upgrade Program Economic Appraisal 2011 Update would be captured and could risk the creation of congestion bottlenecks at Coffs Harbour.

There were 259 crashes for the period from January 2014 to December 2018 on the Pacific Highway at Coffs Harbour between south of the Englands Road roundabout and the dual carriageway highway at Sapphire. This casualty crash rate is more than three times higher than expected of a road of this class. This higher than average crash rate demonstrates the safety issues caused by congestion and the conflict between pedestrian, passenger and freight traffic through the Coffs Harbour CBD. The stop-start nature of the Pacific Highway through Coffs Harbour results in significant safety risks for the transport industry and other road users due to the mix of through and local traffic.

It is recognised that there will be negative environmental and social impacts resulting from the construction and operation of the project and these are documented in the impact assessments of **Chapter 8, Traffic and transport** to **Chapter 24, Hazard and risk**, with **Chapter 25, Cumulative impacts** considering the cumulative impacts. Some of the key impacts are associated with biodiversity including the clearance of vegetation including threatened flora and fauna habitat, fragmentation of habitat corridors and biodiversity links and potential impact on the water quality of sensitive receivers. There will be impacts on both Aboriginal and non-Aboriginal cultural heritage, some of which will be unavoidable. The amenity values for people living and working in the area will be impacted in relation to noise, air quality including dust, visual impact and inconvenience from altered road and access arrangements during construction. People may also experience direct impacts associated with their property or business being acquired, permanent and changes to access arrangements. For farmers there may need to be changes to their business practices and there may be impacts from altered flood behaviour on residences or local roads.

While some negative environmental and social impacts have been identified, management measures to mitigate any potential longer-term adverse impacts have been considered and included in **Chapter 26, Summary of environmental management measures**.

The following consequences are anticipated if the project is deferred:

- Worsening traffic congestion within Coffs Harbour would lead to greater delays and further deterioration of travel time reliability for both local and longer distance trips, affecting passenger and freight transport tasks
- The motorist, cyclist and pedestrian casualty rate would remain more than three times higher than expected of a road of this class
- Forecast growth in the freight task, particularly on the key Melbourne, Sydney and Brisbane freight network will lead to greater levels of congestion on the Pacific Highway at Coffs Harbour. The proportion of heavy vehicles and through traffic travelling through Coffs Harbour is likely to increase, adversely affecting road safety and amenity within the Coffs Harbour city centre
- Not addressing the current situation would also mean only a proportion of the program-wide benefits estimated for the Pacific Highway upgrade program would be captured and could risk the creation of congestion bottlenecks at Coffs Harbour would continue
- Opportunities for economic growth and development within Coffs Harbour will continue to be constrained by the existing highway.

29.6.3 Sustainable development

Development that improves the total quality of life, both now and in the future, is known as Environmental Sustainable Design (ESD). These principles improve quality of life in a way that maintains the ecological processes on which life depends and have been an integral consideration throughout the development of the project.

Sustainable development requires the effective integration of economic and environmental considerations in decision-making processes.

The four main principles supporting the achievement of ESD are:

- **Precautionary principle:** The precautionary principle deals with reconciling scientific uncertainty about environmental impacts with certainty in decision-making. This was applied from the early consideration of options to eliminate options that would have resulted in significant impact to biodiversity and a landscape of Aboriginal cultural heritage importance, as well as options that had lower benefits. The EIS has taken the precautionary principle with regards to assessing noise and vibration impacts as a result of the project by considering the worst case with regards to impacts from construction and operation of the project
- **Inter-generational equity:** Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations. The project would ensure road benefits including, decreased casualties and travel time, and increased connectivity are realised by current and future generations across the region. If the project was not carried out, the motorist, cyclist and pedestrian casualty rate would continue to increase, as will proportions of heavy vehicles and through traffic travelling through Coffs Harbour. These impacts would continue to affect current generations and future generations as it will adversely affect road safety and amenity within Coffs Harbour into the future. Any long and short term negative impacts associated with the project would be mitigated by the management measures outlined in **Table 29-3** and discussed further in **Chapter 26, Summary of environmental management measures**. The implementation of these measures would ensure, the principle of inter-generational equity is met, by reducing or avoiding impacts to the health, diversity and productivity of the environment as much as possible, for the benefit of future generations

- **Conservation of biological diversity and ecological integrity:** This has been a fundamental consideration of design development. The initial corridor identification considered biodiversity constraints, and the preferred corridor was taken forward as it had a relatively low impact on biodiversity compared to other options. The preferred corridor passes through largely cleared lands and any adverse effects on wildlife corridors were anticipated to be mitigated. The concept design has been refined to include three tunnels through the major ridges, which would have less impacts on biodiversity through retaining wildlife corridors
- **Improved valuation and pricing of environmental resources:** The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a project, including air, water, land and living things. This EIS contains a number of mitigation and management measures aimed at minimising pollution and waste during project development, and offsetting biodiversity impacts.

29.6.4 Cumulative impacts

Potential cumulative impacts during construction and operation of the project have been assessed in **Chapter 25, Cumulative impacts**. Consideration of projects being simultaneously constructed has considered a number of approved and proposed developments consisting a mix of residential, social and health instructed projects as well as future land use assumptions and predicted population and employment growth.

There are likely to be operational cumulative impacts associated with biodiversity, heritage, and landscape and visual, however these are not anticipated to be significant. There would also be cumulative long-term benefits associated with improvements to the highway environment, consistent with other upgraded sections of the Pacific Highway.

To manage these cumulative impacts, consultation would be carried out with relevant stakeholders and other nearby developments to increase the overall awareness of project timeframes and impacts. Following consultation, the CEMP will be updated with any revised or new environmental management measures identified.

29.6.5 Conclusion

Construction of the project would address the declining transport efficiency and current congestion and road safety issues experienced along the existing Pacific Highway through the Coffs Harbour CBD by providing an alternate option of travel. Together with the broader collection of work in the Pacific Highway upgrade program, road users will experience almost 2000 km of high standard road between Melbourne to just south of Gympie in Queensland.

The project is consistent with the rationale for the broader Pacific Highway program and would improve the capacity and quality of the Pacific Highway, improving safety, travel times and reliability. If the project was not completed, only a proportion of the \$4.4 – \$4.7 billion of program-wide benefits estimated in the Pacific Highway Upgrade Program Economic Appraisal 2011 Update would be captured and congestion bottlenecks at Coffs Harbour would continue.

The project is considered appropriate and justified as the negative impacts are outweighed by the long-term benefits of improved road safety and travel times for all road users in a region that is expected to experience population growth in coming years and realising the overall benefit of the Pacific Highway upgrade program.

The preferred option and concept design for the project was identified and refined through an extensive assessment and review process which started in 2001 as part of the Coffs Harbour Highway Planning Strategy. The preferred option and concept design best meets the project objectives, has been thoroughly evaluated against the key performance criteria of function, environment and socio-economic considerations and ultimately provides value for money.

The project is in accordance with a number of Australian Government and State strategic planning documents including but not limited to NSW Government Premier's Priorities (NSW Government 2018b), NSW State Infrastructure Strategy (Infrastructure NSW 2018), Future Transport Strategy 2056 (TfNSW, 2018a) and The White Paper, AusLink: Building Our National Transport Future (Department of Transport and Regional Services, 2004).

The EIS has assessed the potential environmental impacts and identified that the project will impact on a range of sensitive receivers, including nearby property owners and flora and fauna. Although many potential impacts have been avoided through the earlier design and project development, some residual impacts are still applicable. However, a range of mitigation measures will be implemented to manage these environmental impacts and ensure that the project complies with relevant policy and guidelines.

CHAPTER

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References

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30. References

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