NSW Roads and Maritime Services

WOOLGOOLGA TO BALLINA | PACIFIC HIGHWAY UPGRADE

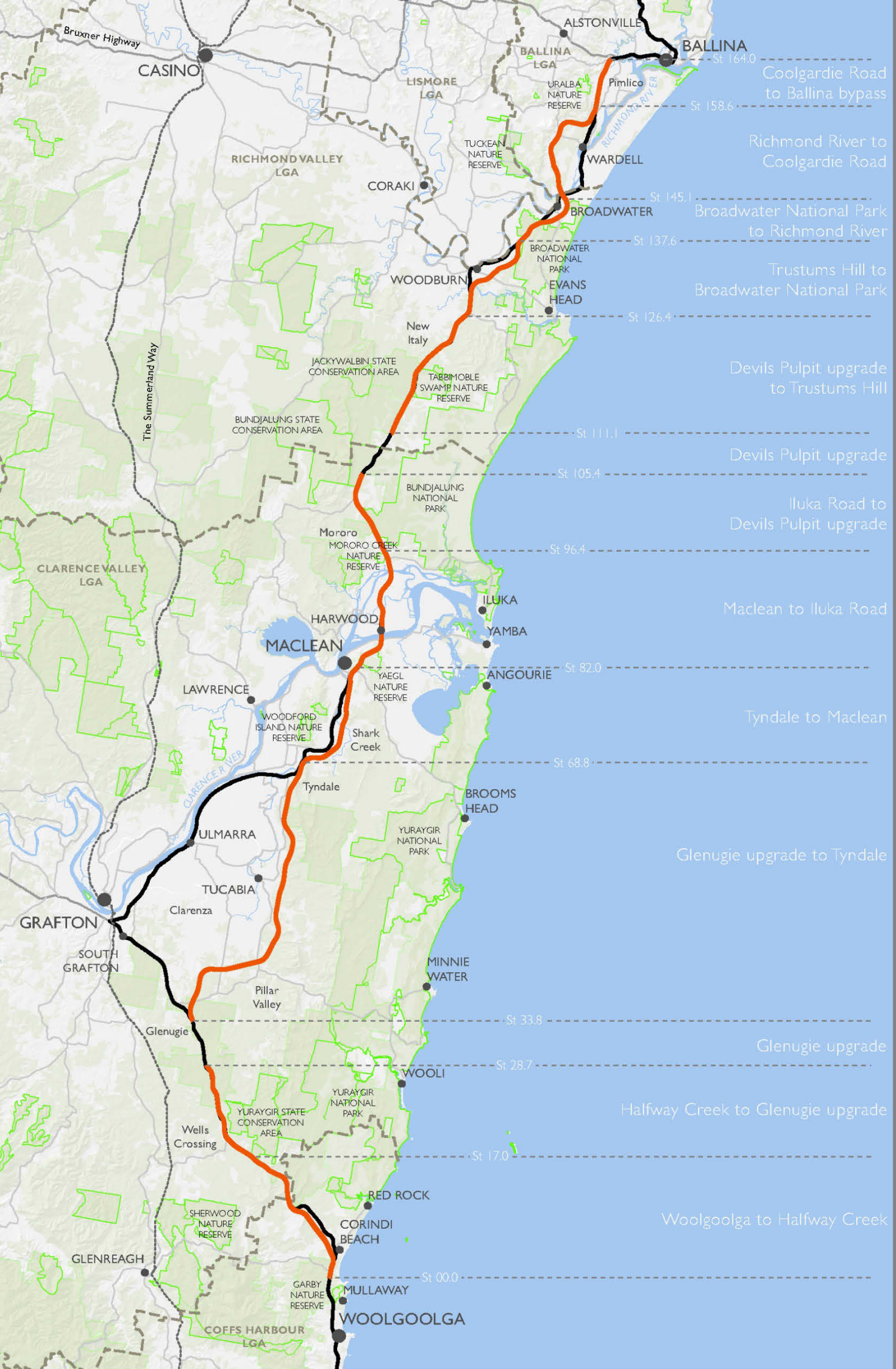
SUBMISSIONS / PREFERRED INFRASTRUCTURE REPORT

Chapter 4

November 2013

Roads and Maritime 13.299

ISBN 978-1-922245-47-2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No further mitigation or management measures are required beyond those in the EIS.

Management and mitigation

This design refinement would not require a change to the proposed mitigation and management measures included in Chapter 19 of the EIS. Based on the above assessment, no additional mitigation measures are required during construction and operation.

4.4.9 Formalisation of Koala Drive, Townsend

Location

Koala Drive is located around 1.5 kilometres north of Townsend, adjacent and to the west of Yaegl Nature Reserve within Section 5 of the project. Section 5 would be upgraded to motorway standard, following an initial upgrade of part of the project to arterial standard. The entire length of Section 5 would be a duplication of the existing highway.

EIS design

The EIS design consists of:

- Koala Drive passing under the project at station 83.1. This would provide a connection either side of the highway and access to Farlows Lane to the north-west of the highway.
- Twin highway bridges (30 metres long) across Koala Drive. This bridge crossing and underpass would provide a 30-metre combined access and fauna crossing, enabling vehicle access and fauna connectivity to adjoining areas of Yaegl Nature Reserve.

The EIS design is shown in Figure 4-23.

Proposed design refinement

The design refinement shown in Figure 4-23 consists of:

- Realignment of Koala Drive along a 100-metre length to the east of the project at station 83.1. To the west of the highway, a 250-metre realignment would tie Koala Drive into Farlows Lane.
- An access track four metres wide.
- A highway overpass that would continue to function as a combined access and fauna crossing.
- Extension of the project boundary west of the highway due to an increase in fill embankment.
- A cutting, around 200 metres long and 80 metres wide, immediately adjacent to the western cut batter of the highway between station 83.0 and 83.2. The cutting would be benched in two sections to a 14-metre depth.
- A retaining wall, which may be required on the western boundary of the project, separating the road reserve from an adjoining property at station 83.2. The requirement for the retaining wall would be confirmed in detailed design.

Reason for design refinement

The design refinement provides a formalised access track for Koala Drive to maintain access for the Yaegl Nature Reserve and agricultural properties.

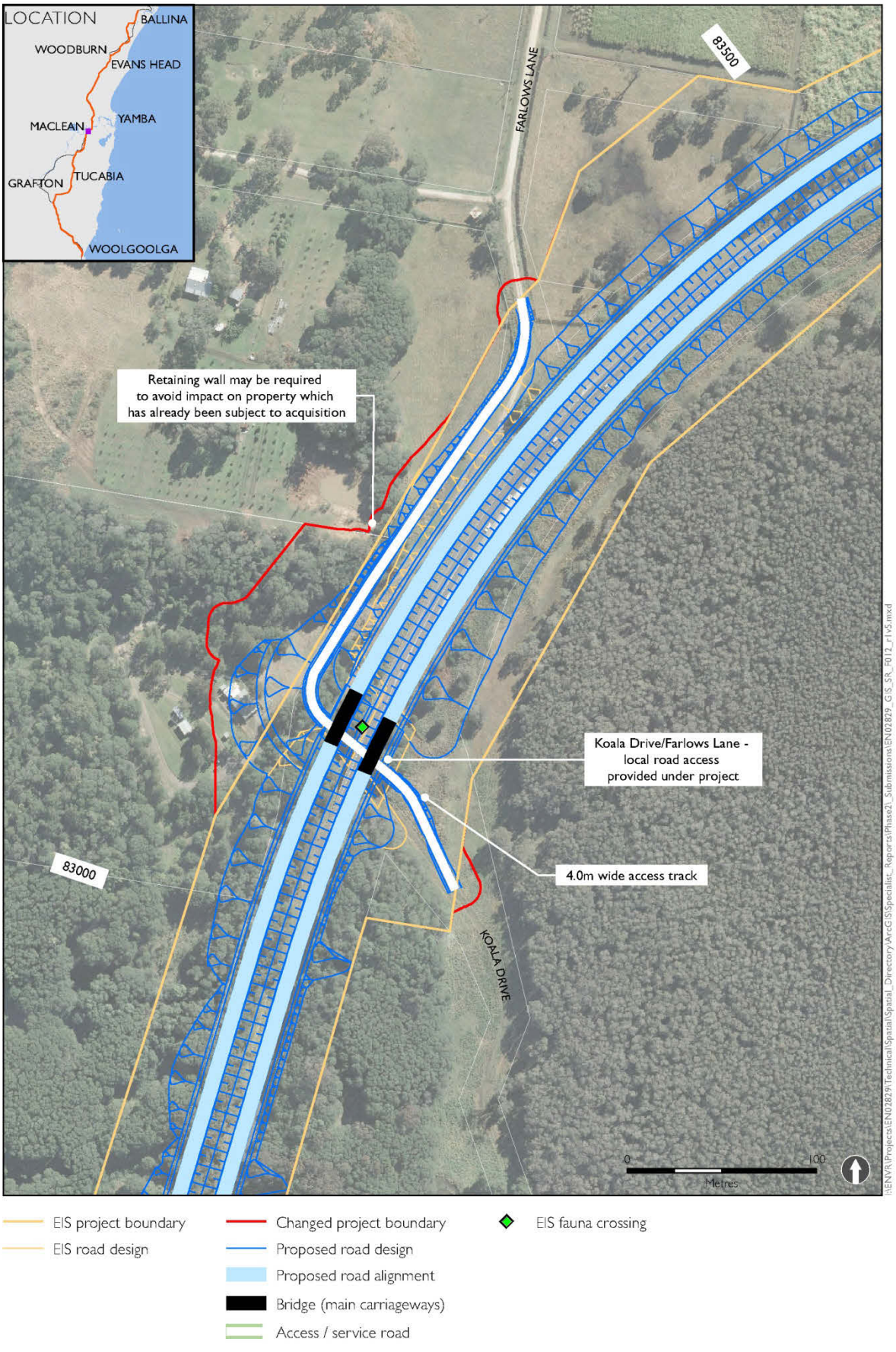

Figure 4-23: Revised design to the Koala Drive access

Consultation

Consultation regarding design refinements formed part of the EIS public display process between December 2012 and February 2013. Members of the project team attended community information sessions to discuss the EIS including the proposal to formalise Koala Drive. The main community information sessions where the design refinement was presented for discussion were:

- Townsend Baptist Church, Townsend: 17 January 2013.
- Maclean Civic Hall, Maclean: 18 January 2013.
- Grafton Community Hall, Grafton: 18 January 2013.

The project team attended a stakeholder meeting relevant to the design refinement at Clarence Valley Council on 12 December 2012. A staffed display was also held at Maclean Civic Hall on 9 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

Consultation with property owners and the local community identified that changes to Koala Drive access were required, and so the design refinement has been informed by this feedback.

Environmental assessment

Hydrology and flooding

Koala Drive is just outside the Clarence River 100-year ARI floodplain. No further hydrology impacts on flooding, duration or velocity have been identified. The hydrological impacts of this design refinement would be consistent with the impacts outlined in Chapter 8 of the EIS and no further mitigation or management measures are required beyond those in the EIS.

Soils, sediments and water

Koala Drive is located south-west of Yaegl Nature Reserve, adjacent to and in 50 metres from an area of SEPP 14 Wetland (No. 220a). James Creek flows through the wetland, which extends into Yaegl Nature Reserve (mainly consisting of an estuarine back swamp). The alteration to the existing access track along Koala Drive would not extend into the SEPP 14 wetland area, and no additional impacts are anticipated.

The additional excavation required at Koala Drive would potentially generate erosion and sedimentation impacts during construction and operation. Similar to other earthworks activities required during construction of the highway, work at this cutting would be managed by a Construction Environmental Management Plan, as identified in Section 9.4 of the EIS. Around six temporary water quality basins proposed in the EIS would be within 100–200 metres of Koala Drive, due to its proximity to the nature reserve. The design refinement would not alter the proposed location of these temporary water quality basins.

As the whole of Section 5 has a high probability of acid sulfate soils, an acid sulfate soil management plan would continue to be required to address potential impacts.

To manage potential impacts from erosion and sedimentation, the project includes water quality ponds. Drainage would continue to be conveyed towards the nearest permanent water quality basins, located around 200 metres north of Koala Drive.

Excavation to the west of the project would be within 3.6 metres of the local groundwater table. The cutting would be categorised as Type B. This cutting type has a low to moderate potential impact where the design level is estimated to be above the local groundwater table. As stated in section 9.3 of the EIS, the excavation may create some seepage but groundwater quality is unlikely to be impacted. The controls included in section 9.4 propose groundwater monitoring pre-construction to identify if additional controls are required.

No further mitigation or management measures are required beyond those in the EIS.

Biodiversity

Yaegl Nature Reserve and its surrounds function as an important corridor for fauna movement. Adjacent to Koala Drive, the nature reserve's vegetation communities include the swamp mahogany swamp forest. This area includes the threatened ecological community (TEC) Swamp Oak Floodplain Forest (TSC Act).

The design refinement would result in a minor additional impact on vegetation habitat (0.1 hectares). However, the impact on Swamp Sclerophyll Forest would reduce by 0.02 hectares (refer to Table 3 2 in Appendix J). Additional impacts would be limited to a small area of Dry Sclerophyll Forest dominated by Tallowwood (*Eucalyptus microcorys*). The dry sclerophyll forest is dominated by a mixed canopy including Tallowwood (*Eucalyptus microcorys*) with a disturbed understorey and high weed density – this is mainly Lantana (*Lantana camara*) – along edge-affected habitat.

The design refinement would be located in an area identified as a wildlife roadkill black spot, associated with movements of fauna across the highway between either side of the reserve. The fauna are mostly common species such as Swamp Wallaby and Red-necked Wallaby, which frequent the reserve. While existing vegetation in the area indicates potential koala habitat, there are no records of koala at this location.

The design refinement would alter the current suitability of this underpass location to act as an effective fauna movement corridor, and further design refinement is required to reduce the size of the cut or vehicle access.

A large cutting is required to the west of the highway and is likely to alter the approach and exit from the underpass on the western side, thus reducing its effectiveness for fauna. However, the cutting would be an improvement in terms of fauna connectivity over the smaller cutting proposed in the EIS design, and remains critical given the known wildlife roadkill hotspot at this point of the highway.

No further mitigation or management measures are required beyond those in the EIS.

Urban design, landscape character and visual

The landscape character of the area is mainly rural-residential, with large areas of forestry, nature reserve and agricultural land immediately adjacent to Koala Drive. The highway adjacent to Koala Drive is a feature of the landscape. The nearest residence is 180 metres to the north-west.

The upgrade of the highway adjacent to Yaegl Nature Reserve and its associated wetlands requires a series of low embankments, mainly within the road reserve of the existing highway. The landscape type includes forest, open woodland, pasture and crops. Section 11.3.2 of the EIS assesses the visual impacts from the upgrade at this location as moderate–low.

The design refinement would be undertaken within the area assessed in the EIS and on Roads and Maritime property. However, there would be a change in the local character of the landscape to the west of the nature reserve along the 200-metre long cutting.

A retaining wall may also be required at the boundary between the proposed road reserve and an adjoining private property immediately to the north of Koala Drive. This would be a small feature and, if required, would not create additional impacts. Its potential visual impact would be assessed during detailed design if necessary.

The construction would be visible from the highway and from only one residence, so overall impacts on visual amenity would continue to be moderate–low.

Therefore, no further mitigation or management measures are required beyond those in the EIS.

Aboriginal heritage

Aboriginal heritage was assessed by field survey and sample test excavation. A site inspection by project archaeologists on 14 February 2013 did not identify any new impacts that could result from construction and operation of the design refinement. The Registered Aboriginal Parties consulted prior to the site inspection and in attendance during fieldwork were:

- Yaegl Local Aboriginal Land Council.
- Birrigan-Gargle Local Aboriginal Land Council.
- Yaegl People Native Title Claim.

The design refinement was discussed with Registered Aboriginal Parties at an Aboriginal Focus Group meeting on 6 February 2013 at Grafton Community Centre.

As no new Aboriginal heritage items were identified, impacts from this design refinement would be consistent with the impacts in the EIS, and there would be no additional impacts during construction

and operation. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Historical (non-Aboriginal) heritage

Several local residences are listed in the Clarence Valley Local Environmental Plan (2011) north and south of Koala Drive for their historic heritage. The nearest sites of local heritage significance include the Townsend Residence around 1.85 kilometres to the south, and The Highfield Residence (Item No 13) at James Creek, around 2.8 kilometres to the north.

As no historical heritage items or State Heritage Register items would be impacted by the design refinement, impacts would be consistent with the EIS. No further mitigation or management measures are required beyond those in the EIS.

Traffic and transport

Local access at Koala Drive is available under the existing highway along an unformed track. This track can provide property access under an existing bridge to Yaegl Nature Reserve. To the north-west, Koala Drive leads to Farlows Lane, which extends around 1.6 kilometres to the north to Yamba Road.

While private property access may be temporarily disrupted during construction, this would be short-term and managed as part of a Traffic Control Plan. Additional construction traffic is likely to be required to transport excavated material sourced from the Koala Drive cutting. However, this would be along the existing highway and road formation.

The design refinement would not affect the operation of the project, as it would simply formalise and improve a property access.

No further mitigation or management measures are required beyond those in the EIS.

Noise and vibration

The noise environment at Koala Drive is mainly influenced by road traffic noise from the highway. A noise and vibration assessment reviewed the potential impacts from the design refinement.

The nearest residential receiver is around 180 metres north-west. The noise management level for this receiver is 53 dB(A) during proposed project hours, and 35 dB(A) during out-of-hours work. The EIS identified construction noise would exceed this target noise level, and so a Construction Noise Management Plan was recommended in section 15.5 of the EIS.

The design refinement includes additional areas of excavation. Additional blasting may potentially be required to excavate the 14-metre-deep cutting. This would be managed in line with the mitigation measures included in section 15.4 of the EIS.

The design refinement would involve no change in operational noise impacts.

The assessment finds that construction and operational noise impacts would be consistent with those for the EIS design in Chapter 15 of the EIS and no further mitigation or management measures are required beyond those in the EIS.

Land use and property

Adjacent to Koala Drive are the existing highway and a mix of land uses include conservation areas to the south and east, grazing and cropping to the north and scattered rural residential uses. Further south is the built-up area of Townsend, and to the south-west is Maclean. The Clarence River is around two kilometres to the west of Koala Drive.

Roads and Maritime owns a property to the north-west of the proposed upgrade at station 83.1, which is adjacent to Koala Drive. A further 0.55 hectares of Roads and Maritime land would be required from this property to accommodate the additional cut batter, and a Roads and Maritime depot building would need to be demolished. This would affect the use of the site as a Roads and Maritime depot. Roads and Maritime is currently considering the use of this site as a biodiversity offset property. Apart from the impacts on the Roads and Maritime depot, no additional land use and property impacts have been identified beyond those outlined in the EIS.

A retaining wall to the west of the upgraded highway may be required at station 83.2 to formalise a boundary and retain an embankment. This would be confirmed in detailed design (refer to management measure LU8).

Social and economic

Locally, the socio-economic environment features the highway, agriculture (including sugar cane), the industrial estate at Townsend, Harwood Bridge (which is an important freight route) and the sugar mill at Harwood. The area immediately adjacent to Koala Drive is sparsely populated, with some rural residential land use.

The road cutting to the west of Koala Drive has the potential to impact the amenity of a dwelling around 180 metres to the north-west of the project. Excavation from the cutting is likely to create further construction traffic at the work site. As vehicles would be routed along the project formation and existing highway, no additional noise impacts have been predicted at this dwelling.

No further mitigation or management measures are required beyond those in the EIS.

Management and mitigation

This design refinement includes additional construction activities. The additional mitigation measures recommended for this design refinement are presented in Chapter 5 and Table 4-25.

Table 4-25: Koala Drive – additional mitigation

Issue	ID number	Mitigation measure	Timing	Relevant section
Land use and property: Property acquisition and managing surplus land	LU8	The requirement for a retaining wall structure at station 83.2, between the road reserve and adjoining property, will be confirmed during detailed design.	Pre-construction	5

This design refinement would not require a change to the other proposed mitigation and management measures in Chapter 19 of the EIS.

4.4.10 Cycle access at the interchange at Yamba Road, James Creek

Location

Yamba Road is located in Section 5, just south and adjacent to the Clarence River. Yamba Road provides a local connection through to Yamba and alternative access into Maclean.

Section 5 would include an interchange at Yamba Road, to the south of the existing Harwood Bridge crossing of the Clarence River. This bridge can be crossed by pedestrians and cyclists.

EIS design

The EIS design consists of:

- An interchange south of Yamba Road providing access to Yamba and Maclean and access to the upgraded highway for southbound motorists. Signposting and crossing points for cyclists would be provided at this interchange.
- A high-level highway bridge crossing the Clarence River to the east of Harwood Bridge.
- Cycle access on the upgraded highway shoulders, including bridges. A connection between the existing shared-user path on Harwood Bridge and the proposed bridge is included in the project boundary.

The EIS design is shown in Figure 4-24.

Proposed design refinement

The design refinement shown in Figure 4-24 consists of:

- A new two-way cycle path to the south of Yamba Road and west of the existing highway. This would provide a dedicated pedestrian and cyclist access. To the west of the existing highway, south of Yamba Road at station 85.9, the cycle path would tie in to the existing path on Harwood Bridge (station 86.0).
- Cycle access to the northbound carriageway, adjacent to the interchange's western roundabout.
- Cycle access from the southbound carriageway, with a connection under the project providing a link to Harwood Bridge.
- Cycle access on the proposed highway bridge along the 2.5-metre outside shoulders.
- A cycleway connection to the east of the project to provide access either side of the project via a path under the first span of the proposed bridge, at station 85.9. A further connection between this crossing and Yamba Road would provide cycle access to the Harwood Bridge path.

The design would be further discussed with stakeholders during detailed design.

Reason for design refinement

The design refinement would provide formalised cycle access from the interchange at Yamba Road to the existing Harwood Bridge crossing of the Clarence River. This would improve cycle and, potentially, pedestrian access from Yamba Road to Harwood. The cycle access would provide formal crossing points under the interchange to provide safe access.

The design refinement also responds to Bicycle NSW's submission, by providing a future link between the project and the NSW Coastline Cycleway. The layout would be refined further during detailed design in consultation with stakeholders.

Consultation

Consultation with the community at Yamba, Harwood and with Clarence Valley Council in January and February 2013 raised the issue of shared user access to the interchange at Yamba Road, and the existing path across Harwood Bridge. Members of the project team attended community information sessions to discuss the EIS including cycle access at the interchange. The main community information session where the design refinement was presented for discussion was at Harwood Hall on 15 January 2013.

The project team attended a stakeholder meeting relevant to the design refinement at Clarence Valley Council on 12 December 2012. A staffed display was also held at Harwood Community Hall on 11 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

Feedback included a request to improve local access for pedestrians and cyclists in the Yamba/Harwood area, and to provide a connection across the interchange and the Clarence River. The design refinement responds to this feedback.

Environmental assessment

Hydrology and flooding

The design refinement location is just south of the main arm of the Clarence River. The loss of flood storage from construction of the embankments for the highway was included in the flood model prepared for the Clarence River. The model predicted no change to flood levels, duration or velocity from including a shared user path within the interchange design, due to the minor design alteration.

The overall impact of this design refinement is consistent with the impacts outlined in the EIS. Therefore, no additional impacts are anticipated during construction and operation and no further mitigation or management measures are required.

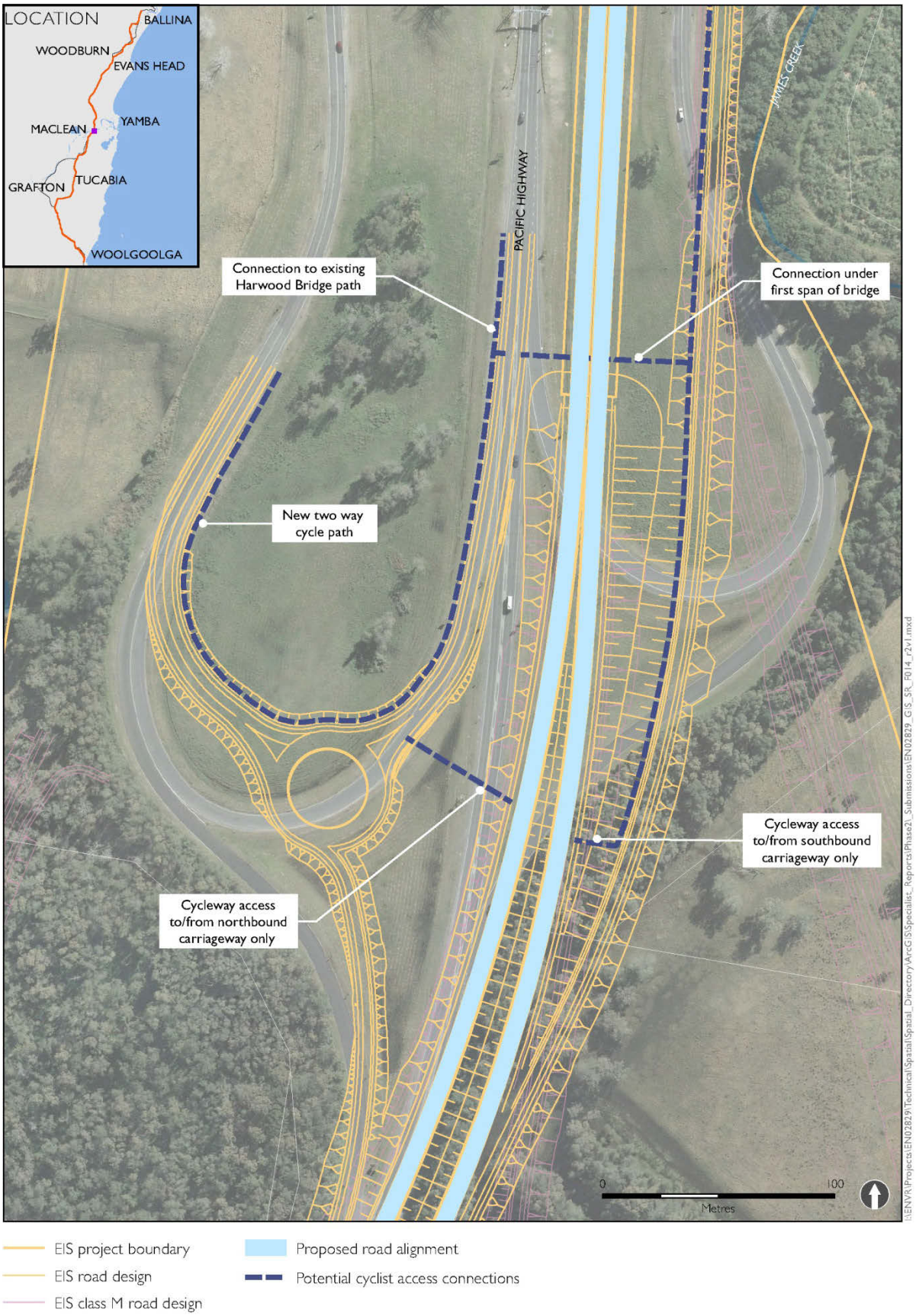

Figure 4-24: Potential design for cycle access south of Yamba Road

Soils, sediments and water

As Section 5 is located in an area with a high probability of acid sulfate soils, the erosion and sedimentation controls outlined in section 9.4 of the EIS would be required. Construction would be located close to the south bank of the Clarence River, and the Construction Environmental Management Plan in section 9.4 of the EIS includes appropriate measures to minimise water quality impacts.

A soft soil site up to 10 metres deep, described in section 6.2.3 of the EIS as SS-04, is located immediately south of Yamba Road, between station 84.9 and 86.0. To construct the project, these soils would need to be treated, involving substantial work to prepare the ground. The actual soft soil treatment method to be used would be confirmed closer to the time of construction and would depend on the time available, engineering design, and site based constraints. As this soft soil site has already been identified, no new impacts are anticipated under the design refinement. The potential soft soil treatment required at the site would be confirmed during detailed design.

The cycle access paths south of Yamba Road would be a small feature of the overall interchange. Construction would be within the project boundary assessed in the EIS. Therefore, the overall impacts of this design refinement would be consistent with the impacts outlined in the EIS. No additional impacts are anticipated during construction and operation and no further mitigation or management measures are required beyond those in the EIS.

Biodiversity

The majority of the cycle access paths would be located within existing cleared areas and would be constructed wholly within the area assessed in the EIS. No additional vegetation would be cleared for the design refinement.

Therefore, the biodiversity impacts of the design refinement would be consistent with the impacts outlined in the EIS. No additional impacts are anticipated during construction and operation and there would be no additional impacts on Commonwealth or State listed threatened species. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Urban design, landscape character and visual

As stated in section 11.3.3 in the EIS, the visual impact of the bridge crossing of the Clarence River would be high, although the cycle access path would form only a small component of the overall construction of the interchange. Therefore, there would be no new urban design or landscape character impacts from the design refinement.

The visual impacts of this design refinement would be consistent with the impacts outlined in the EIS and there would be no changes in visual impact beyond those already assessed. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Aboriginal heritage

As stated in section 12.2 in the EIS, the area adjacent to Yamba Road has low–moderate sensitivity for Aboriginal heritage, as it includes land adjacent to the Clarence River, which was an important resource for Aboriginal people.

The design refinement would be within the area assessed in the EIS. There are no known Aboriginal heritage items in this area, and no impacts on Aboriginal heritage have been identified. Therefore, the overall Aboriginal heritage impacts of this design refinement would be consistent with the impacts outlined in the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Historical (non-Aboriginal) heritage

No State Heritage Register listed items would be directly or indirectly affected by the design refinement.

The cycle access path would, however, be located adjacent to Harwood Bridge (not listed), and two historic residences listed in the Clarence Valley Local Environmental Plan 2011 (Highfield Residence, Item No 13, and the James Creek Residence, Item No 14). The cycle access path would also be located on the opposite side of the river to the Harwood Heritage Conservation Area. This area

includes a large area of the town of Harwood, and its listing would not be directly affected by the construction and operation of the shared user path.

Overall, the addition of the cycle access path would not change the impact of the bridge on the heritage items within the area, and the overall impacts of this design refinement would be consistent with the impacts outlined in Chapter 13 of the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Traffic and transport

The design refinement would provide a cycling connection between Harwood Bridge and the project. This would benefit pedestrians and cyclists crossing the Clarence River, providing a connection either side of the river between Yamba and Harwood.

There would be no additional traffic and transport issues resulting from the design refinement. The cycle access path would be signposted and constructed in accordance with appropriate guidelines. Two dedicated connections beneath the existing and upgraded highway would provide safe and separated access for pedestrians and cyclists.

The overall impacts of this design refinement would be consistent with the impacts outlined in Chapter 14 of the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Noise and vibration

The cycle access path would not generate new noise or vibration sources beyond those already assessed in Chapter 15 of the EIS. No noise impacts have been identified from the operation of the shared user path.

The overall impacts of this design refinement would be consistent with the impacts outlined in Chapter 15 of the EIS, and no additional impacts are anticipated during construction and operation. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Land use and property

Land use within the area of the design refinement is mainly transport corridor, forestry with some rural and agricultural areas located near the built-up areas of Yamba, Harwood and the Clarence River. No additional land uses or properties would be impacted by the design refinement as the shared user path would be within the EIS project boundary.

The overall impacts of this design refinement would be consistent with the assessment outlined in section 16.3 of the EIS, and no additional impacts are anticipated during construction and operation. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Social and economic

Locally, the socio-economic environment features the highway, agriculture (including sugar cane), the community at Yamba, Harwood Bridge (which is part of an important freight route) and the sugar mill at Harwood. The area immediately adjacent to Yamba Road is sparsely populated, with some rural residential land use. However, Yamba is located eight kilometres to the east and the northern extent of Maclean is around three kilometres away to the south-west.

The design refinement would provide a connection for cyclists accessing Harwood Bridge and the proposed highway crossing of the Clarence River. This improved access would provide further connectivity and access either side of the upgrade for cyclists, particularly for Yamba residents seeking access across the interchange and to Harwood via the existing bridge. The design refinement would also provide a potential connection with the proposed NSW Coastline Cycleway.

The overall impacts of this design refinement would be consistent with the assessment outlined in the EIS, and no additional impacts are anticipated during construction and operation. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Management and mitigation

This design refinement would implement EIS management measure T&T18: “Connectivity between the shared user path from Harwood Bridge to Yamba Road would be reviewed to refine pedestrian and cyclist access” is still applicable in the project and has been retained in Chapter 5.

This design refinement would not require a change to the other proposed mitigation and management measures included in Chapter 19 of the EIS. Based on the above assessment, no additional mitigation measures are required during construction and operation.

4.4.11 Access at Carrols Lane, Chatsworth Island

Location

Carrols Lane is located at the northern end of Section 5, around 750 metres south of the North Arm of the Clarence River. Section 5 would be around 14.4 kilometres long, extending from Maclean to Iluka Road at Mororo. It would be upgraded to motorway standard, following an initial upgrade of part of the project to arterial standard. The entire length of Section 5 would be a duplication of the existing highway alignment.

EIS design

The EIS design consists of:

- An overpass of the highway to connect Carrols Lane both side of the highway at station 93.3 under the ultimate motorway upgrade and connect to a proposed service road.
- An access road to the east of the project to provide a connection between Carrols Lane and Fischers Lane. Under the initial upgrade to arterial standard, this access road would provide a left-in, left-out intersection with the southbound highway carriageway. The intersection would be removed under the ultimate motorway upgrade.
- An intersection between the northbound highway carriageway and Carrols Lane to provide a left-in, left-out access as part of the initial arterial upgrade. This would be removed as part of the ultimate motorway upgrade.
- A service road for access between Chatsworth Road (south), Carrols Lane and Chatsworth Road (north) (under the ultimate motorway upgrade).

The EIS design is shown in Figure 4-25.

Proposed design refinement

The design refinement shown in Figure 4-25 consists of:

- An at-grade intersection at Carrols Lane, with left-in, left-out and U-turn facilities at station 93.3 as part of the initial arterial upgrade. This intersection would be removed in the ultimate motorway upgrade.
- Relocating the Carrols Lane overpass 500 metres north to the existing intersection between the highway and Fischers Lane at station 93.8. This would provide a connection between Chatsworth Road (west) and Fischers Lane (east). The overpass structure would be around 70 metres long, and tie in to a realigned section of Chatsworth Road.
- A 600-metre access road providing access to local roads and properties on Carrols Lane and Fischers Lane (station 93.3 to station 93.9). This would be constructed to the east of the highway.
- A 200-metre access road immediately west of the highway, providing a connection between Chatsworth Road and the upgraded highway (station 93.7 to station 93.8). This access road would provide access onto the most western existing bridge of the North Arm. The intersection of the access road with the upgraded highway would be removed in the ultimate motorway upgrade.
- A 300-metre access road under the Fischers Lane overpass to provide a connection between the access road to the west of Chatsworth Road and the existing highway.
- A service road for access between Chatsworth Road (south) and Carrols Lane under the ultimate motorway upgrade.

The design would be further developed in consultation with property owners and the cane industry (as part of the Cane Farm Strategy (refer to section 3.5)).

Reason for design refinement

The design refinement would formalise access to the project in the upgrade to arterial standard. The overpass at Carrols Lane would be replaced by an alternate at-grade access with left-in, left-out and U-turn facilities. This intersection would be closed in the upgrade to motorway standard.

The overpass relocation would improve accessibility for road users travelling between Fischers Lane and Chatsworth Road.

By relocating the overpass, areas of soft soils recently identified during a geotechnical site investigation would also be avoided. While some soft soil treatment may still be required, the design refinement would improve the constructability of the Carrols Lane section of the project by minimising the potential extent of soft soil treatment.

Consultation

Members of the Roads and Maritime project team attended community information sessions to discuss the project. The main community information session to discuss the EIS and present the design refinement was at Harwood Hall on 15 January 2013.

The project team attended a stakeholder meeting relevant to the design refinement at Clarence Valley Council on 12 December 2012. A staffed display was also held at Harwood Community Hall on 11 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

Following this consultation, access either side of the project was reviewed to provide an alternate and improved connection between Carrols Lane, Fischers Lane and Chatsworth Road.

All property owners were directly consulted about the design refinement and the changed impacts on their properties. The design refinement was also discussed with the cane industry to identify benefits and impacts of the changed access from cane farms to the Harwood Sugar Mill.

Environmental assessment

Hydrology and flooding

As stated in section 8.4.12 in the EIS, Carrols Lane is susceptible to flooding as it is located on the Clarence River floodplain in the north of Chatsworth Island, around 700 metres to the south of the southern bank of the northern arm of the Clarence River.

The EIS discussed flood immunity along the existing highway in section 8.2.5 of the EIS. This description of the hydrology of the area in which the design refinement is proposed indicated a section of Chatsworth Island may overtop during a three-to-four-year (ARI) flood event. As part of the overall project assessed in the EIS, the level of the project would be raised to provide immunity against a 20-year (ARI) flood event. The access road built to provide a connection between Carrols Lane and Fischers Lane would continue to have a flood immunity for a 10-year (ARI) flood event, as described in Table 5-3 of the EIS.

The flood relief structures to be provided as part of the overall project would continue to provide cross-drainage within the Chatsworth Island floodplain (station 87.5 to 94.3). The type of structures to be installed would include box culverts, bridges or a combination of these. These structures would act as cross-drainage features conveying floodwaters from one side of the upgraded highway to the other. Drainage would be designed to cater for a 20-year ARI flood event across the Clarence River floodplain. The design refinement would not change the intended level of flood immunity proposed as part of the overall project.

Although the design refinement footprint of the local access roads either side of the highway north of Carrols Lane would be different from the layout shown in Figure 5-49 of the EIS, the overall project would be similar to the design assessed in the EIS. Therefore, the design refinement is not anticipated to change the predicted flooding, duration or velocity of assessed impacts for the Clarence River, as described in section 8.4.12 of the EIS. The overall impacts would be consistent with the impacts outlined in section 8.3 of the EIS and no mitigation or management measures are required beyond those identified in the EIS.

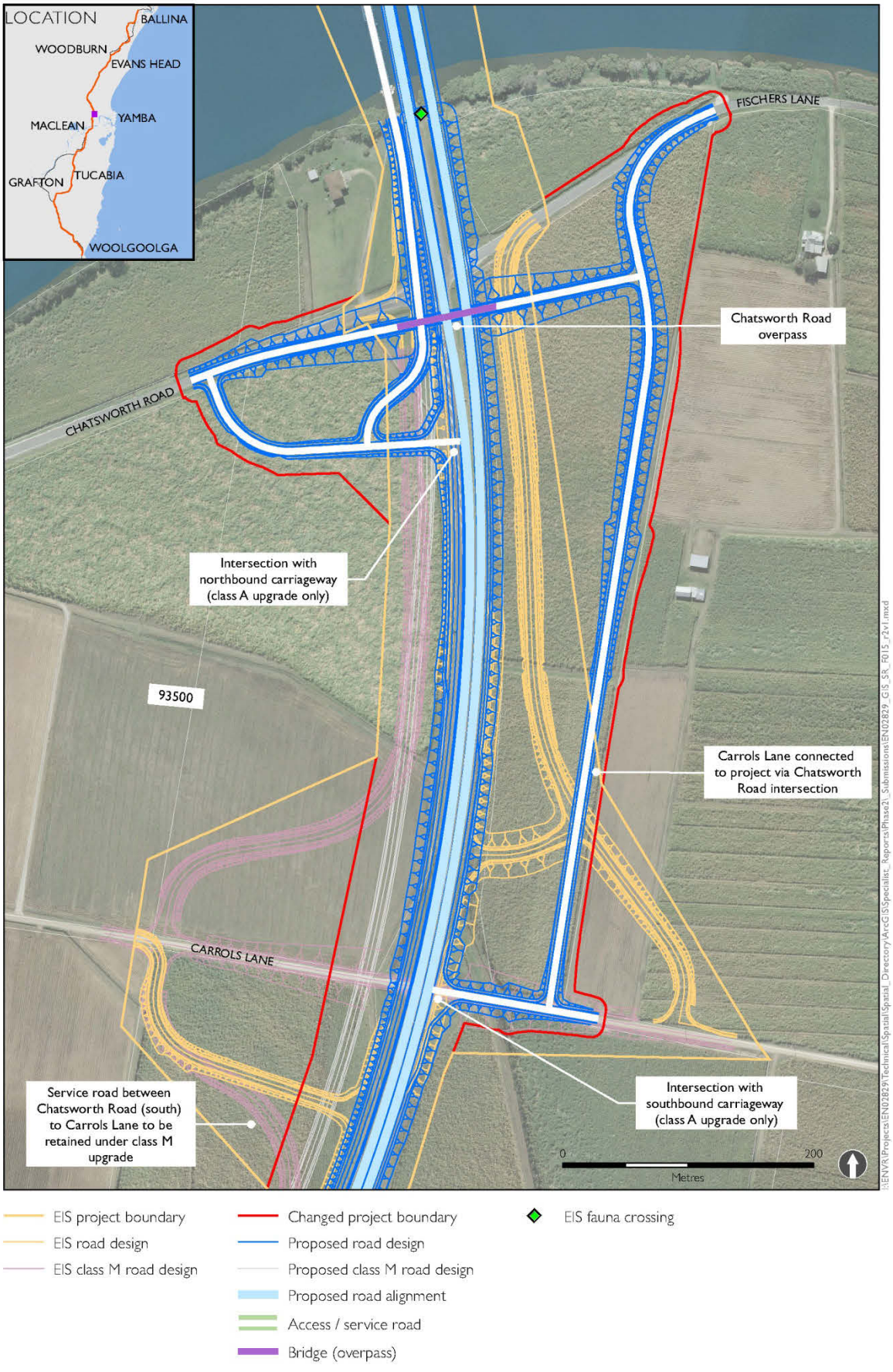

Figure 4-25: Revised design at Carrols Lane

Soils, sediments and water

As Section 5 is located in an area with a high probability of acid sulfate soils, the erosion and sedimentation controls outlined in section 9.4 of the EIS would be required. Construction would be located close to the northern arm of the Clarence River, and the Construction Environmental Management Plan in section 9.4 of the EIS already includes appropriate measures to minimise water quality impacts.

In the EIS, an area south of Carrols Lane was identified as a soft soil site (SS-07) between station 92.4 and 93.3 with a depth up to 12 metres. By relocating the overpass 500 metres north, major areas of soft soils would be avoided, thereby reducing the extent of soft soil treatment at this location.

In section 9.3 of the EIS, impact on the Clarence River was highlighted as a potential issue to be considered during construction and operation of the upgraded highway. To manage potential impacts, a permanent water quality basin was proposed in the EIS, and is shown in Figure 5-49 of the EIS to the east of the upgraded highway around 550 metres north of Carrols Lane, at station 93.9. This basin would capture surface water drainage running of the highway before it can enter the North Arm of the Clarence River. Three temporary basins are also proposed north of Carrols Lane, to capture sediment-laden runoff during construction. The design refinement would not alter these basins, which would continue to be features of the project.

The impacts of this design refinement would be consistent with the impacts outlined in section 9.3 of the EIS, and no additional impacts are anticipated during construction and operation. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Biodiversity

The area impacted by the upgraded highway at Carrols Lane has been cleared of vegetation and is currently used as cropping land for sugarcane and open pasture.

No EECs or threatened flora would be impacted by the EIS design or the design refinement. There would be no additional impacts on Commonwealth or State listed threatened species.

As the area either side of Carrols Lane and to the south of Fischers Lane and Chatsworth Road (station 93.3 to station 94.0) are not vegetated, no new biodiversity impacts have been identified. Therefore, the impacts of this design refinement would be consistent with the impacts outlined in section 10.3 of the EIS. Therefore, no further mitigation or management measures are required.

Urban design, landscape character and visual

The overpass at Fischers Lane would require a similar sized fill embankment to that in the EIS design. The design refinement would reduce the access road extents required to the west and east of the upgraded highway. However, the access road between Carrols Lane and Fischers Lane would extend further east than shown in Figure 5-49 of the EIS.

While the location of the proposed overpass would move 500 metres further north under the design refinement, the visual impact assessment included in section 11.3.2 of the EIS would not alter substantially. The area is sparsely populated and the design refinement is relatively minor when assessed in the context of the overall upgrade at this location.

At viewpoint 33 (refer to Chapter 11 of the EIS), the magnitude of the view would be reduced from moderate to low, as the overpass would no longer be in view from a small number of dwellings to the east and west of Carrols Lane. Sensitivity to the view would continue to be low to moderate because of the small number of local residents and repeated view from local streets. Overall, the visual impact at viewpoint 33 would continue to be moderate to low.

At viewpoint 34 (refer to section 3.7 in Working paper – Urban design, landscape character and visual impact assessment), the magnitude of the view would increase from low to moderate–high, as the overpass and access roads would be relocated closer to dwellings on Chatsworth Road around 500 metres to the west of the Fischers Lane overpass. Sensitivity at viewpoint 34 would change from low to moderate to high because of the low number of local residents and repeated view from local streets. The overall visual impact at this viewpoint would change from low to moderate as shown in Table 4-26 and Figure 4-26. However, no further mitigation or management measures are required beyond those in the EIS.

Table 4-26: Viewpoint 34, Fischers Lane, Iluka (foreground view)

Magnitude	Sensitivity	Impact
Moderate–high	Low–moderate	Moderate
The design refinement is located on a low embankment within the existing road corridor, when seen from a middle distance vantage point. Views of the proposed overpass are generally screened by riparian vegetation located adjacent to the Clarence River. Access roads are also proposed to provide a local road connection either side or adjacent to the upgraded highway.	The changed view would be repeatedly visible from a low number of local dwellings and local streets.	

Updated viewpoint 34, showing view toward new overpass location

Figure 4-26: Revised viewpoint 34 at Carrols Lane

Aboriginal heritage

As stated in section 12.2 in the EIS, the area adjacent to Carrols Lane has low–moderate sensitivity for Aboriginal heritage, as it includes land adjacent to the North Arm of the Clarence River, which was an important resource for Aboriginal people.

Aboriginal heritage was assessed by field survey and sample test excavation. A site inspection by project archaeologists on 14 February 2013 did not identify any new impacts that could result from construction and operation of the design refinement. The Registered Aboriginal Parties consulted prior to the site inspection and in attendance during fieldwork were:

- Yaegl Local Aboriginal Land Council.
- Birrigan-Gargle Local Aboriginal Land Council.
- Yaegl People Native Title Claim.

The design refinement was discussed with Registered Aboriginal Parties at an Aboriginal Focus Group meeting on 6 February 2013 at Grafton Community Centre. As no new Aboriginal heritage items were identified, impacts from this design refinement would be consistent with the impacts in the EIS. Therefore, no additional impacts are anticipated during construction and operation and no further mitigation or management measures are required beyond those in the EIS.

Historical (non-Aboriginal) heritage

The area surrounding Carrols Lane has limited historical (non-Aboriginal) heritage. The nearest heritage item (item 11) shown in Chapter 13 of the EIS is located around 6.5 kilometres south of Carrols Lane.

No historical heritage items or State heritage items would be directly or indirectly impacted by this design refinement. The overall impacts of this design refinement would be consistent with the impacts outlined in section 13.3 of the EIS. No additional impacts are anticipated during construction and operation and no further mitigation or management measures are required beyond those in the EIS.

Traffic and transport

Carrols Lane has an intersection with the existing highway at station 93.0, and is likely to be used by low levels of agricultural and local traffic accessing nearby fields and properties. The existing highway crosses the North Arm of the Clarence River via Mororo Bridge.

Under the design refinement, the overpass at Carrols Lane would be replaced by an alternate at-grade access with left-in, left-out and U-turn facilities. While access to Carrols Lane, Fischers Lane and Chatsworth Road would be different from the EIS layout shown in Figure 5-49 of the EIS, the relocated overpass would continue to provide vehicular access either side of the project and to the existing highway. All intersections would continue to be closed when the arterial road is upgraded to motorway standard.

For road users on Carrols Lane (east of the alignment) seeking access to Chatsworth Road, travel times may be marginally impacted as the overpass at Fischers Lane is to be relocated 500 metres further north, requiring an alternate access road to be parallel with and around 100–150 metres east of the project. Road users on Carrols Lane (west of the alignment) would obtain access to Chatsworth Road via the local road network, rather than the western service road, provided in the EIS.

However, for road users on Fischers Lane and Chatsworth Road, access either side of the project would be 500 metres nearer than shown in the EIS. Therefore, the overall impacts of the design refinement on local access, traffic routes and travel times would be similar to the description in section 14.3 of the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Noise and vibration

The noise environment at Carrols Lane is mainly influenced by road traffic noise from the existing highway, and agricultural activities on nearby properties.

The overpass would be relocated closer to and within around 100 metres of the nearest dwelling (R1464). This dwelling is adjacent to the south bank of the North Arm of the Clarence River at station 93.9, and so would be 650 metres closer to the overpass location. Table 4-27 shows the construction noise levels estimated at this dwelling.

Table 4-27: EIS construction noise predictions for access at Carrols Lane

Noise management level and construction activity, nearest to residential receiver R1464	Noise level (dBA)
Proposed hours (standard and extended working hours) NML	53
Out of hours NML	35
Enabling works	37
Clearing	65
Earthworks	70
Paving	68
Ancillary sites	46
Bridges/piling	74
Highest construction LA max	82

Construction noise is likely to be more audible at this dwelling under the design refinement than from the EIS design. Construction noise would continue to exceed the noise management level of 53 dB(A) during extended hours of work, as described in Appendix E (Construction results table) of Working paper – Noise and vibration.

A Construction Noise Management Plan would continue to be required as described in section 15.4 of the EIS, and the nominated contractor would be required to notify residents should construction of the overpass be required outside of approved working hours.

As the alignment of the proposed dual carriageway would not change under the design refinement, no new operational noise sources and impacts were identified. Road traffic noise from the project would be the dominant noise source for the dwelling described above (Receiver R1464). This dwelling would still require operational noise mitigation and this would be confirmed during detailed design.

As the design refinement would not generate new noise or vibration sources beyond those already assessed, the assessed impacts are considered consistent with the impacts outlined in section 15.3 of the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Land use and property

Land use within the area of the design refinements is mainly transport corridor, agriculture and rural-residential located between Harwood to the south and the North Arm of the Clarence River.

The design refinement would change the project boundary, reducing the area of primary agricultural land required by around 0. 44 hectares (the impacted area would decrease from around 14.4 hectares to 13.96 hectares). There would be a greater impact on two properties, mainly to the east of the project between station 93.3 and 93.8, and a reduced impact on three properties, mainly to the west of the project between station 93.2 and 93.4.

The land use and property impacts of the refinement at Carrols Lane are shown in Table 4-28.

Table 4-28: Property impact schedule for Carrols Lane

Property lot and DP	Land use	EIS		Design refinement		Change in impact area
		Impact area (ha)	% of property affected	Impact area (ha)	% of property affected	
Lot 8 DP 1013578	Cropping	0.1	0.5	0.15	0.9	0.05
Lot 63 DP 751373	Cropping	1.4	6.1	0.01	0.1	-1.39
Lot 3, DP 243978	Cropping	4.2	61.1	2.4	35.2	-1.8
Lot 4 DP 243978	Cropping	0.5	4.7	0.1	0.7	-0.4
Lot 11 DP 1118364	Cropping	8.2	45.9	11.3	63.1	3.1
TOTAL		**14.4**		**13.96**		**-0.44**

No new land uses, properties or landowners would be affected by the design refinement. For further information refer to Appendix C of Working paper – Land use and property.

No further mitigation or management measures are required beyond those in the EIS.

Social and economic

Locally, the socio-economic environment features the highway, agriculture (including sugar cane), Harwood Bridge and the Mororo Bridge, which is part of an important freight route. The area immediately adjacent to Carrols Lane and Chatsworth Island is sparsely populated, with some rural residential land use. The nearest built-up area is Chatsworth, located around two kilometres to the south-west of Carrols Lane.

The design refinement would improve access to the area surrounding Carrols lane. It would include a connection for road users travelling across the project and the existing highway.

There are no highway-based businesses located adjacent to Carrols Lane so none would be directly affected by the design refinement. While cropping land would be affected, the design refinement would impact less land than the EIS design, as described in section 16.3 of the EIS. There would be no new impacts on agribusinesses.

Construction of the relocated overpass has the potential to further impact the amenity of a dwelling located around 100 metres north-west of Fischers Lane. Importation of fill materials and potential piling activities are likely to create further construction traffic, noise and potentially vibration at the work site. However, vehicles would be routed along the existing highway, and a Construction Environmental Management Plan would continue to be required. No additional socio-economic impacts are predicted beyond those assessed in section 17.3 of the EIS. Therefore, no further mitigation or management measures are required beyond those in the EIS.

Management and mitigation

This design refinement would not require a change to the proposed mitigation and management measures included in Chapter 19 of the EIS. Based on the above assessment, no additional mitigation measures are required during construction and operation.

4.4.12 Cutting at Mororo Road, Mororo

Location

Mororo Road is a local road to the west of the highway at station 98.3, located in Section 6 of the project. The entire length of Section 6 would be a duplication of the existing highway alignment.

EIS design

The EIS design consists of:

- A four-lane dual carriageway highway (two lanes in each direction) between station 97.4 and 98.9 following the alignment of the existing highway. The upgraded highway would be located on fill embankment and in road cuttings with minimal excavation required.
- A design level that generally follows the existing level of the highway.
- A left-in, left-out, right-out turn intersection at Mororo Road under the initial arterial upgrade. A formalised bus turning bay would be provided to the north of the intersection. This would be removed under the ultimate motorway upgrade.
- An intersection between Mororo Road and the western service road under the ultimate motorway upgrade.

The EIS design is shown in Figure 4-27.

Proposed design refinement

The design refinement shown in Figure 4-27 consists of:

- An alteration of the vertical alignment of the upgrade between stations 97.4 and 98.9, to deepen the road cutting with excavation either side of the project. The design level would range from around 10 metres to 30 metres AHD.
- Deeper cut batters that would extend the project boundary to the west.
- An alteration to Mororo Road to provide access to the project.
- The design for the ultimate motorway upgrade as described in the EIS design.
- Changes to the project boundary of around 50–100 metres to the west, along a 650-metre stretch of the upgraded highway. The eastern cutting would remain within the project boundary assessed in the EIS.

Reason for design refinement

In section 6, there is a deficit of embankment material, which would require additional fill material to be imported to the site. It is possible that this would be imported from Section 3 of the project, where there is a large surplus. This would be a haul distance in excess of 28 kilometres. As well as resulting in increased cost of haulage, there would be social and traffic impacts, with haulage trucks needing to use the highway, passing through townships on the existing highway, including Ulmarra and Harwood.

The increase in material generated by the embankment cutting would minimise haul movements from Section 3, reduce construction traffic, improve haulage efficiencies across the project, and potentially reduce costs.

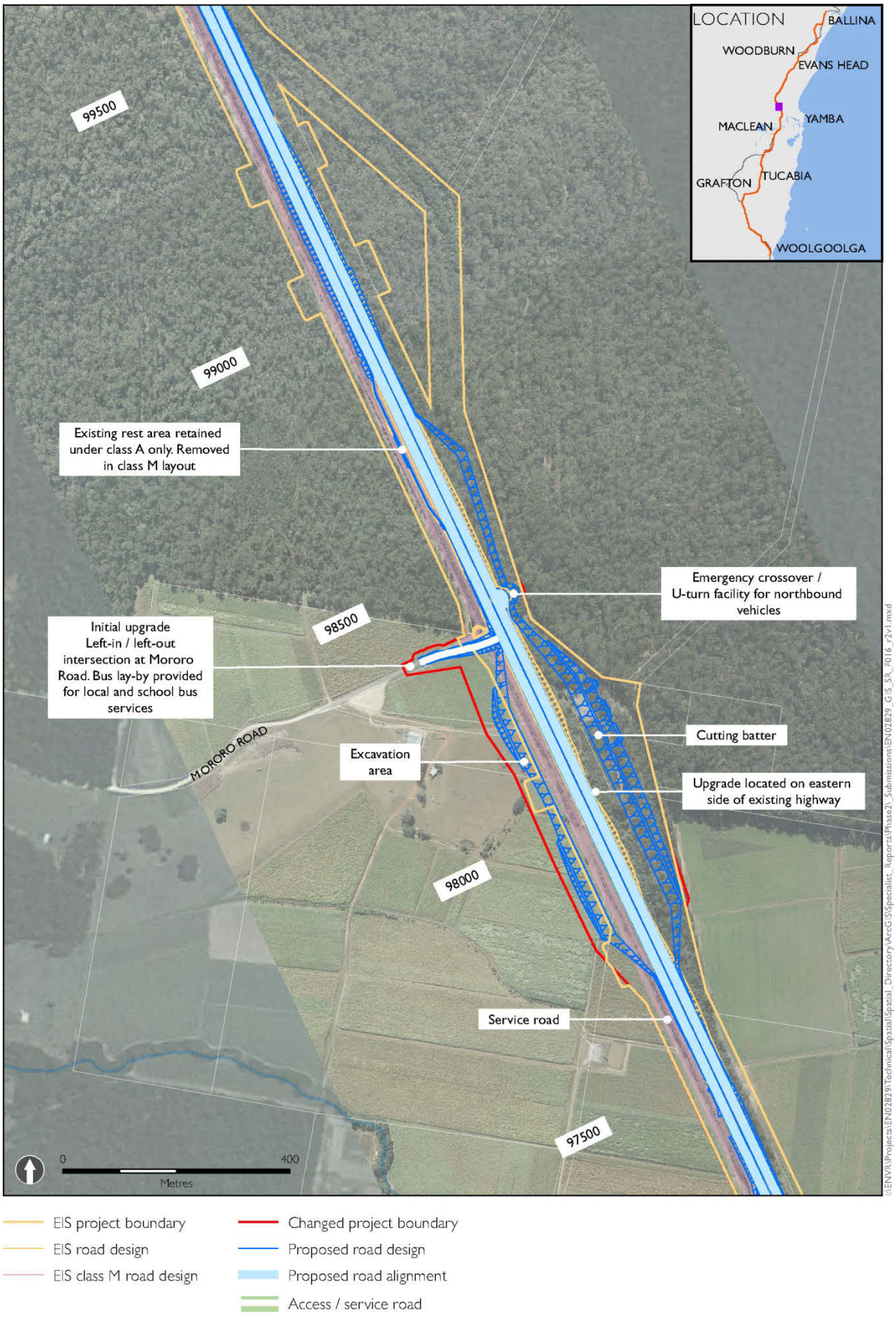

Figure 4-27: Revised design at Mororo Road

Consultation

Consultation with the community and with Clarence Valley Council in January and February 2013 raised the issue of shared user access to the interchange at Yamba Road, and the existing path across Harwood Bridge. Members of the project team attended community information sessions to discuss the proposal to modify the interchange design. The main community information sessions where the EIS was discussed and the design refinement presented were:

- Harwood Hall, River Street Harwood on 15 January 2013.
- Woodburn Memorial Hall, River Street, Woodburn: 17 January 2013

The project team attended a stakeholder meeting relevant to the design refinement at Clarence Valley Council on 12 December 2012. A staffed display was also held at Harwood Community Hall on 11 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

Roads and Maritime also advised the affected landowner identified in the EIS of an increased property impact from the design refinement.

Environmental assessment

Hydrology and flooding

Mororo Creek is the nearest watercourse to the site. Although the project would extend further to the west, the additional cutting would be mainly to the east, only slightly within the 100-year ARI floodplain. As no additional impermeable surfaces would be constructed, no additional impacts on flooding, duration or velocity have been predicted.

The impacts of this design refinement would be consistent with the impacts included in the EIS. Therefore, no additional impacts have been identified during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

As stated in section 9.2.1 of the EIS, Section 6 has no known occurrence of acid sulfate soils. In addition, the design refinement would be located on elevated terrain where acid sulfate soils would not be expected. There are no known areas of environmental concerns in the area, so contamination impacts are not anticipated.

As stated in section 9.3.1 of the EIS, erosion and sedimentation could result during earthworks activities. To mitigate this potential impact, a temporary sedimentation basin is proposed in the EIS around station 98.1. To accommodate the cutting in the design refinement, this temporary basin may need to be resized or relocated between 10–15 metres north and west of the location shown in Figure 6-26 of the EIS. No new impacts are anticipated.

During operation, a permanent water quality basin is proposed to the southwest of the excavation area at station 97.7 to capture road runoff, as shown in Figure 5-51 of the EIS. The design refinement would not impact this basin, which would continue to be a feature of the project.

As stated in section 9.2.3 of the EIS, the local groundwater table is likely to be greater than five metres in depth in this section. At Mororo Road, the cutting was classed as a Type A cutting in the EIS, in which the design profile is predicted to be below the level of the groundwater table. When considered in terms of the design refinement, the cutting would continue to be Type A.

Due to the depth of the cutting proposed, there is the potential for groundwater to be impacted at a depth of five to 10 metres. Potential impacts could include localised drawdown of the groundwater table around the cutting site, and impacts on groundwater flows to local creeks. However, as Mororo Creek is more than 100 metres from the cutting, new impacts are unlikely.

During excavation of the site, engineered mitigation measures would be required to divert groundwater away from the site. This mitigation measure was included in section 9.4 of the EIS.

No mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

The design refinement involves widening the cutting in the current road reserve situated between the existing highway and the boundary of Bundjalung National Park on the eastern side of the project corridor. The cutting on the western side of the project would also be widened. This is located on sugarcane land with minimal value for flora and fauna and no conservation significant biota.

The design refinement in this location would result in a broader footprint impacting a larger area (around 4.0 hectares) of remnant and regenerating vegetation than the EIS design (refer Table 4-29). The vegetation to be impacted consists of both remnant and regrowth dry open sclerophyll forest, commonly recorded in this location and no communities listed under the EPBC Act or TSC Act. No threatened plant species were identified from the field surveys. The condition of the habitat in this location varies from poor to moderate and exhibits a high weed density particularly along edge areas of the old and existing highway.

Table 4-29 Comparison of impacts at the cutting at Mororo Road

BioMetric vegetation types	EIS design (ha)	Design refinement (ha)	Change in vegetation loss (ha)
Blackbutt – bloodwood dry heathy open forest on sandstones of the northern North Coast	1.2	2.7	+1.5
Grey Gum – Grey Ironbark open forest of the Clarence lowlands of the North Coast	1.7	0.8	-0.9
Spotted Gum – Grey Ironbark – Pink Bloodwood open forest of the Clarence Valley lowlands of the North Coast	2.8	6.2	+3.4
TOTAL	**5.7**	**9.7**	**+4.0**

There is moderate potential for threatened fauna to occur in the area including forest-dwelling species such as large forest owls, microchiropteran bats, Squirrel Glider, and Brush-tailed Phascogale. These species may be impacted through the loss of foraging habitat as there is a lack of mature habitat including hollow-bearing trees (which were not found during the survey). The impact area does not contain any prominent habitat features or plant species that would not otherwise exist within the adjoining forest system or indeed are better represented outside the design refinement area. The vegetation that would be removed would provide limited foraging habitat for a small range of fauna, though the potential for this vegetation to be used as significant nesting/roosting sites is limited by the absence of hollow-bearing trees or other significant habitat features within the cleared areas.

Connectivity for fauna

An important east–west regional wildlife corridor occurs to the north of this location linking Bundjalung National Park on the east across the existing highway to Mororo State Forest and continuing west and north. The design refinement would be located at the southern end and mostly outside of this large corridor. From south of station 98.5, the land on the western side of the cutting is cleared farm land (refer Figure 4-27). For this reason no fauna connectivity structures have been located here and the design refinement would not impact on fauna connectivity structures or fauna connectivity in general, given the lack of habitat on the western side. There is a dedicated underpass to the north of the design refinement at station 99.7 to connect Mororo State Forest with Bundjalung National Park within the identified regional corridor.

The design refinement would have a minimal impact on fauna connectivity and regional and local wildlife corridors and would not change the location of proposed fauna crossing structures.

Koala habitat

Potential koala habitat in this location is associated with the Grey Gum – Grey Ironbark open forest habitat and determined by the presence of Small-fruited Grey Gum (*Eucalyptus propinqua*) listed as a secondary food tree species for the North Coast region (DECC, 2008). The design refinement would have a reduced impact on this vegetation type of 0.9 hectares from the EIS design. A dedicated search for koalas or use of the habitat by koalas was conducted but no evidence of koalas was found.

Higher quality habitat for koalas was noted to the east and north-east of the road reserve within Bundjalung National Park. The area to be impacted is considered to have low value for koalas.

No mitigation or management measures are required beyond those identified in the EIS.

Urban design, landscape character and visual

The area around Mororo is sparsely populated, so there are very few visual receivers near the location of the proposed cutting to the east of Mororo Road. One dwelling is located around 150–200 metres to the west, and a further dwelling is located around 500 metres to the south-west of the site. Isolated dwellings are located 500 metres to 1.5 kilometres further to the west and south-west. Mororo State Forest is located immediately to the north of Mororo Road, and Bundjalung National Park is located to the east and south-east.

The additional excavation at Mororo Road requires a substantial cutting to be made in a cropped area to the west of the project and in an area of dry open forest to the east. The proposed cutting would remove stands of roadside vegetation. To the east, the cutting would be screened by the project.

As there are few residents within 500 metres of the site, the EIS did not include a viewpoint at this location. Although the impact would be substantial at the cutting site, vegetation on the eastern side of the cutting would be retained, so visual impacts would be limited to the working area and to passing vehicles. The nearest residential receiver, around 200 metres to the west of the site, would have some views towards the cutting site. During construction, there may be a temporary impact on their visual amenity. The site would be reinstated and landscaped in line with recommendations included in section 11.4 of the EIS and no further mitigation or management measures are required.

Aboriginal heritage

The area has moderate sensitivity for Aboriginal heritage, as it includes crests and slopes adjacent to swampy areas.

The Registered Aboriginal Parties consulted prior to the site inspection and in attendance during fieldwork were:

- Yaegl Local Aboriginal Land Council.
- Birrigan-Gargle Local Aboriginal Land Council.
- Yaegl People Native Title Claim.

The design refinement was discussed with Registered Aboriginal Parties at an Aboriginal Focus Group meeting on 6 February 2013 at Grafton Community Centre.

Aboriginal heritage was assessed by field survey with a site inspection carried out by project archaeologists on 14 February 2013. While no new Aboriginal issues were identified, part of the site includes two low-level ridges that were inaccessible because sugar cane covered the survey area. Although the area is disturbed, to mitigate potential impacts this area is recommended for survey by a registered Aboriginal heritage consultant prior to construction.

As no new Aboriginal heritage items were identified, impacts remain consistent with the EIS. There would be no additional impacts during construction and operation. However, an additional mitigation measure is described below and included in Chapter 5.

Historical (non-Aboriginal) heritage

A Historical (non-Aboriginal) heritage item is located adjacent to Mororo Road. This is Item No 33 (High Conservation Value Old Growth Forest), listed on the State Heritage Register. No other historic heritage items or areas including buildings or historic features of interest are located near Mororo.

At this location, the EIS design would directly impact on 0.06 hectares of High Conservation Value Old Growth Forest. Due to the design refinement, this impact would increase to 0.20 hectares. However, while the change in design footprint increases the forest area to be cleared, the EIS Statement of Heritage Impact (SoHI) assumed removal of all High Conservation Value Old Growth Forest within the project boundary (amounting to 2.14 hectares). For this reason, there is no additional change to the impact on this item from that identified in the EIS and no mitigation or management measures are required beyond those identified in the EIS.

Traffic and transport

As part of the initial upgrade to arterial standard, Chapter 5 of the EIS describes Mororo Road as having a left-in, left-out, right-out intersection. This intersection with the proposed highway would be removed in the upgrade of the highway from arterial to motorway standard. The design refinement would not alter the access changes described in Table 5-8 of the EIS for Mororo Road.

While access to Mororo Road may be temporarily disrupted during construction, the disruption would be temporary and managed by a Traffic Control Plan. Additional construction traffic is likely to be required to transport excavated material sourced from the Mororo cutting. However, this would be along the existing highway and road formation. During operation, access to Mororo Road would be retained. Under the motorway standard upgrade, Mororo Road would connect to the service road, and from there to the highway.

The requirement for a Construction Traffic Management Plan is presented in section 14.4 of the EIS, and this would be used to manage the construction activities at Mororo Road. No additional mitigation or management measures are required.

Noise and vibration

The noise environment at Mororo Road is mainly influenced by road traffic noise from the highway. The design refinement would not impact on the estimated operational road noise levels.

The design refinement at Mororo Road includes additional areas of excavation. Blasting may potentially be required to excavate the cutting. The construction noise assessment found there is potential for construction noise levels and overpressure criteria to be exceeded at the nearest residential receiver, 200 metres west of the main excavation area (R1529), as shown in Table 4-30. Where the criteria are exceeded, these are shown in bold.

Table 4-30: Vibration predictions (PPV) for the closest receiver to the Mororo Road cutting

Sensitive receiver	Separation distance (metres)	Overpressure according to charge size in kg / dB					
		1	5	10	15	20	25
R1529	200	114	121	124	126	127	128

Overpressure criteria are likely to be exceeded at this sensitive receiver, even when the smallest blasting charges are used. Further assessment and consultation with the landowner is recommended during detailed design. Refer to Chapter 5 for mitigation details.

As no bridge sites would be located immediately adjacent to Mororo Road, vibration from piling is unlikely to be an issue at the nearest receiver. As the closest sensitive receiver is around 200 metres away, vibration is predicted to be considerably below structural damage and human comfort criteria.

As the alignment of the upgraded highway would not change from the design assessed in section 15.3 of the EIS, no new operational noise impacts have been identified. The nearest residential receiver was not identified for mitigation as operational noise levels resulting from the proposed upgrade would be similar to noise levels from the operation of the existing highway.

As the EIS recommends that a detailed blast assessment and consultation exercise be carried out prior to blasting at all potential locations, no new mitigation measures are required. Blasting would continue to be managed as per the mitigation measures included in section 15.4 of the EIS.

No mitigation or management measures are required beyond those identified in the EIS.

Land use and property

The design refinement would widen the proposed project boundary to the west of the Mororo Road cutting by 2.5 hectares, impacting further land used for grazing and cropping within one property 50 metres west. The impacted area would increase from around 0.78 hectares to 3.28 hectares (between stations 97.7 to 98.4). This property was identified as impacted in section 16.3 of the EIS. No new land

uses, properties or landowners would be affected by the design refinement. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Social and economic

Locally, the socio-economic environment features the highway, agriculture (including cropping and grazing) and timber production from Mororo State Forest. The area immediately adjacent to Mororo Road is sparsely populated, with some rural residential and conservation land use, including Bundjalung National Park.

The cutting to the south and east of Mororo Road has the potential to impact the amenity of a dwelling around 150–200 metres west of the upgraded highway. Excavation from the cutting is likely to create further construction traffic, noise and, potentially, vibration at the work site. Vehicles would be routed along the project formation and existing highway, so no additional impacts are anticipated. However, a blast management plan would be required to consider potential impacts on the amenity of the nearest dwelling. Work within the cuttings is likely to be part screened from nearby receivers, due to the excavation depth, which may provide noise benefits.

No mitigation or management measures are required beyond those identified in the EIS.

Management and mitigation

The additional mitigation measure recommended for this design refinement is presented in Chapter 5 and Table 4-31.

Table 4-31: Mororo Road – additional mitigation

Issue	ID number	Mitigation measure	Timing	Relevant section
Aboriginal heritage: Mororo Road cutting site	AH46	Before construction at Mororo Road, between station 97.45 and 98.9, a field inspection of the area to be cleared and excavated will be undertaken by an Aboriginal heritage consultant with Registered Aboriginal Parties.	Pre-construction	6

This design refinement would not require a change to the other proposed mitigation and management measures in Chapter 19 of the EIS.

4.4.13 Access at Swan Bay New Italy Road, New Italy

Location

Swan Bay New Italy Road is located in Section 7 of the project. The entire length of Section 7 would be a duplication of the existing highway alignment. Swan Bay New Italy Road is a local road that provides access to New Italy and the New Italy museum.

EIS design

The EIS design consists of:

- A left-in, right-in, left-out and right-out intersection at Swan Bay New Italy Road and the upgraded highway at station 121.1. This would be removed under the ultimate motorway upgrade.
- A 55-metre overpass from Swan Bay New Italy Road to the eastern service road.
- Formalising access to the existing car park facilities at the front of the New Italy Museum Complex.
- Relocating the memorial/flagpole to the European founders of the New Italy Settlement adjacent to the main building, to accommodate the improved intersection access.

The EIS design is shown in Figure 4-28.

Proposed design refinement

The design refinement shown in Figure 4-28 consists of:

- Retaining and upgrading the southerly and northerly access points from the highway to the New Italy Museum under the initial upgrade of the highway to arterial standard.
- Two half left-in intersections to access Swan Bay New Italy Road, 200 metres either side of the existing intersection.
- A left-in auxiliary lane and slip road to the south to enable traffic from the northbound carriageway to enter Swan Bay New Italy Road. The access road to the north would also provide access to the northbound highway carriageway via a left-out only intersection.
- A half seagull median right turn at the existing intersection to enable traffic from Swan Bay New Italy Road to access the southbound carriageway to travel south.
- A median right-turn lane in the form of a half seagull intersection to enable southbound vehicles to access Swan Bay New Italy Road.
- An overpass at station 121.5 to connect Swan Bay New Italy Road to the eastern service road. The median turn lanes would be removed to prevent access to Swan Bay New Italy Road from the southbound carriageway. The left-in and left-out only intersections would remain as part of the motorway upgrade. This would provide direct access to the New Italy Settlement and Swan Bay New Italy Road for the northbound carriageway only.
- Access to the New Italy Museum and Swan Bay New Italy Road for southbound traffic via the interchanges at Trustums Hill Road, Woodburn from the north and Iluka Road, Woombah heading south, as described in section 5.2.7 of the EIS.
- Formalising the car park facilities in front of the New Italy Museum to include around 50 standard car parking spaces. A parking area for trailers and large non-commercial vehicles would be provided with a six-metre wide shoulder.
- A future service road to the west of the upgrade as part of the ultimate motorway upgrade to access Swan Bay New Italy Road.

Reason for design refinement

During the EIS display, consultation was undertaken with the operators of the New Italy Museum, where access to the upgraded highway was highlighted as important in maintaining the viability of the museum. The museum also raised issues relating to directional signage, access, car parking, heritage impacts and improved amenity.

The design refinement responds to these concerns by:

- Providing improved intersection access to the New Italy Museum under an arterial upgrade.
- Providing the opportunity to consider direct highway access to the New Italy Museum in a motorway upgrade.
- Avoiding direct heritage impacts on the memorial located near the entrance to the New Italy Museum.

Consultation

Members of the project team attended community information sessions to discuss the design refinement. The main information session where the design refinement was presented for discussion was at New Italy Museum on 19 January 2013.

At this information session, the project team presented the design refinement to the community. Support was expressed for formalised car parking, improved access, visitor amenity and avoiding direct impacts on the memorial which is important to the heritage of the New Italy community. Concern was raised about direct access to the New Italy Museum under an upgrade to motorway standard.

The design refinement responds to this feedback by providing an alternate intersection design in an arterial upgrade, and a potential opportunity for direct access to the northbound carriageway in a motorway upgrade.

A staffed display was also held at Woodburn Memorial Hall on 11 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

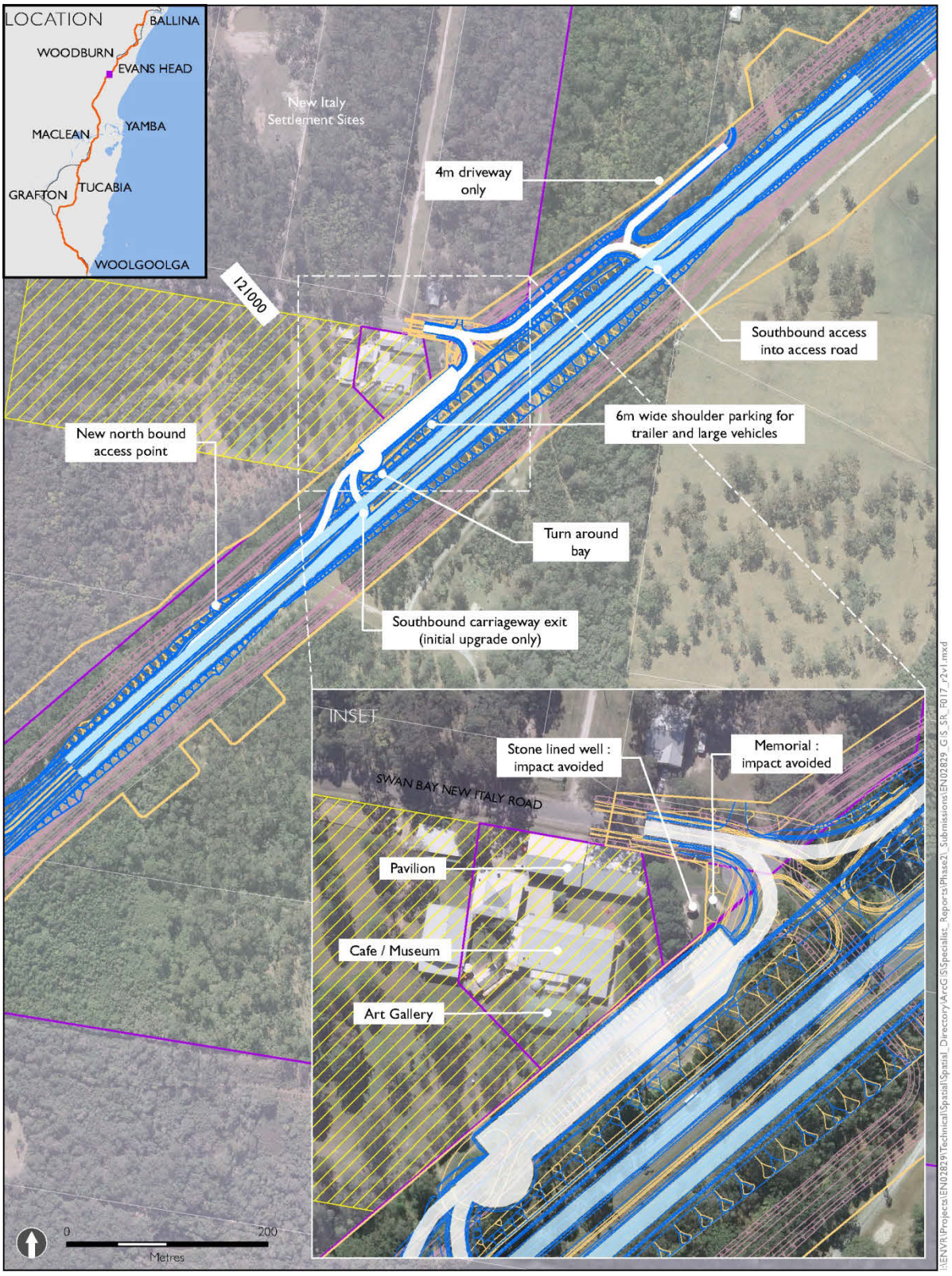

Figure 4-28: Revised design at Swan Bay New Italy Road

Environmental assessment

Hydrology and flooding

Swan Bay New Italy Road is not located in a hydrologic sensitive area due to its elevation and distance from watercourses. Tabbimoble and Oakey creeks are the watercourses nearest to Swan Bay New Italy Road. Their catchments are predominantly forested, with waterways flowing through State forests and nature reserves. The catchments include some cleared areas used for agriculture, grazing and rural residential land uses, typically found in the lower parts of the catchment and closer to the highway. As the Tabbimoble Floodway is around six kilometres to the south of Swan Bay New Italy Road, and Oakey Creek is over one kilometre to the north, Swan Bay New Italy Road is not highly flood prone.

The design refinement is within the area assessed in the EIS, and is located on an area of the existing highway with 100-year flood immunity. The highway formation assessed in section 8.3 of the EIS included assessment of an alteration to Swan Bay New Italy Road. A hydrological review of the design refinement, however, suggests there would be no noticeable change to flood levels, duration or velocity from construction at this location. This is because the difference in design is not sufficient to measurably increase or decrease hydrological impacts.

Therefore, the overall impacts of this design refinement would be consistent with the impacts outlined in section 8.3 of the EIS and no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

As stated in section 9.2.1 of the EIS, most of Section 7 is mapped with no known acid sulfate soils. However, as described in section 9.3 of the EIS, earthwork activities have the potential to create sediment-laden runoff that could impact local watercourses. For this reason, erosion and sedimentation controls were recommended during construction (refer to section 9.4 of the EIS).

There are no identified potential areas of contamination or sensitive receiving environments such as watercourses located in close proximity to Swan Bay New Italy Road. As the design refinement is within the existing EIS project boundary, impacts would be consistent with the assessment outlined in the EIS. No mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

The design refinement area is surrounded by dry open forest, agricultural land and cleared areas. The design refinement would be confined to the EIS clearing boundary and within already cleared areas. The only impacts (within the EIS clearing boundary) would be to a narrow linear strip of vegetation between the highway and an adjacent service road to the west, within the assessed project boundary. As a result there would be no additional impacts on vegetation, fauna habitat or threatened ecological communities beyond what was assessed in the EIS.

The narrow strip of vegetation that would be impacted is along the road reserve and is currently impacted by edge effects and fragmentation. As such, it provides limited value for threatened flora and fauna particularly in comparison to surrounding areas of habitat to the east and west away from the highway.

Indirect impacts from the design refinement on adjoining vegetation and potential threatened fauna species would be associated with weed invasion, altered light levels and noise. These effects would penetrate further into the retained habitat, mostly over an area of 600 metres (station 125.9 to 126.5). Increased edge effects would also degrade the composition and structure of remaining vegetation. The habitat in this location is dominated by wet sclerophyll forest (Red Mahogany open forest of the coastal lowlands on the North Coast).

While there would be a direct loss of this habitat (including food, shelter and breeding resources), impacts would be lessened as the design refinement duplicate the existing highway and the edge-affected habitats are expected to have only marginal habitat value for threatened fauna particularly for wide-ranging and highly mobile species such as Grey-headed Flying-fox and Swift Parrot, Little Lorikeet and threatened microchiropteran bats. These species are capable of accessing resources over large areas and would not be dependent on habitats along the existing edge of the highway.

The design refinement would see a similar impact on vegetation in terms of size (0.8 hectares) and location. The impacts on threatened fauna are not expected to change from the EIS and the assessment of significance on these species is not altered by this design refinement.

An important population of threatened Weeping Paperbark (*Melaleuca irbyana*) (vulnerable species TSC Act) was identified in the EIS to the south of this location; the design refinement would not impact on the population.

Connectivity for fauna

In general, given the design in this location is a duplication of the existing highway, there is limited opportunity for fauna connectivity. Much of the habitat on the western side of the highway has been cleared for hobby farming with the exception of a patch between station 125.6 and 125.9. This vegetation extends to the east and west of the highway and may provide a local wildlife corridor. There is a 60-metre-wide mown strip adjacent to the highway. Fauna that get across the highway would also have to cross this clearing. The proposed new service road would be placed in this mown strip and therefore would not involve vegetation clearing, but would result in a further barrier for fauna crossing at this location.

No further mitigation or management measures are required for this design refinement.

Urban design, landscape character and visual

The landscape is dominated by large areas of State forest, vegetation, agricultural and rural residential areas.

The area is sparsely populated and screened by adjacent forest, so the number of visual receivers near to Swan Bay New Italy Road is limited.

While the design refinement includes formalised parking for cars, trailers and large non-commercial vehicles, the extent of the change would not create new urban design issues beyond those already identified in section 11.4 of the EIS. The design refinement would avoid direct impacts on the memorial and flagpole. Relocation is no longer required as recommended in section 13.4 of the EIS. Also, as the design refinement would be within the existing project boundary, urban design impacts would be consistent with the impacts outlined in section 11.3 of the EIS.

Overall, there would be no noticeable change in impacts to urban design, landscape character and visual amenity. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Aboriginal heritage

The area immediately adjacent to Swan Bay New Italy Road has been disturbed by European settlement. The EIS did not record any Aboriginal heritage items nearby.

The Aboriginal heritage assessment outlined in the EIS included a site inspection of the New Italy area. As the design refinement can be accommodated in the existing EIS project boundary, further survey is not required.

As no new impacts on Aboriginal heritage were identified, impacts are considered to be consistent with the assessment outlined in Chapter 12 of the EIS. No mitigation or management measures are required beyond those identified in the EIS.

Historical (non-Aboriginal) heritage

The New Italy Museum Complex is located around 10 kilometres south of Woodburn on the existing highway. It is a monument to early settlers to the area, and a State registered site important to the local and regional history of NSW.

Under the design refinement, the design of the intersection of Swan Bay New Italy Road and the proposed highway upgrade would be modified to improve the vertical alignment of the intersection and reduce the impact on a historic heritage item in the New Italy Settlement (Museum Complex, State Heritage Register 1648, Richmond Valley Local Environmental Plan 2012, ID I148).

The upgrade of the highway to arterial standard would maintain visitor access to the New Italy Museum Complex from both northbound and southbound directions. Formal car parking in marked bays would be provided for cars, trailers and larger non-commercial vehicles. The layout of the

western corner of the intersection at Swan Bay Road would avoid direct impact on the memorial and would not require its relocation as per the EIS design.

The following provides a summary of the impacts on the New Italy Settlement from the design refinement:

- New Italy Settlement (Museum Complex): The design refinement would improve visitor amenity by providing better access and formalised car parking. No new impacts would result from the design refinement. The impact assessment is consistent with the impact summary outlined in Table 13-3 of the EIS.
- Memorial and Stone-Lined Well: The design refinement would improve visitor amenity by providing better access and formalised car parking, and would avoid direct impact on the memorial and flagpole. Therefore the requirement for archival recording, removal and reinstatement of the memorial/flagpole would no longer be required; indirect impacts would continue to be as described in section 13.4 of the EIS.
- Cypress Road Stone-Lined Well: The overall project would impact the curtilage of the site; however, there would be no direct or indirect impact on any known heritage features. The design refinement would not increase impacts as the well is located outside the design refinement area.
- Roder's Stone-Lined Well and Orchard: The overall project would create direct and indirect impacts. The initial upgrade would result in the removal of the stone-lined well, and possibly physical damage to the mango orchard if machinery enters or disturbs the ground surface close to the orchard, or if materials blow or spill onto the site. A salvage excavation prior to the demolition of the well may realise the site's research potential. Vibration during construction is not expected to damage the mango orchard. The mango orchard would be removed to construct the motorway service road. The design refinement would not increase impacts as the well and orchard are located outside the proposed design refinement area.
- New Italy Village Area: The project would impact on the curtilage of several lots that fall within the Historic New Italy Village Area. However, it would not impact on any known physical remains and would not affect the heritage significance of the sites. The design refinement would not increase impacts as it can be accommodated within the area assessed in the EIS.

No mitigation or management measures are required beyond those identified in the EIS. However, management measures HH30 to HH32 in the EIS have been deleted, as archival recording and removal and reinstatement of the memorial/flagpole is not required as they are no longer directly impacted by the project.

Traffic and transport

Swan Bay New Italy Road is a local road with direct access to and from the highway. It is lightly trafficked and provides direct access to the New Italy Museum, which is an important visitor attraction, providing a historic point of interest directly off the highway.

Access to the highway from Swan Bay New Italy Road would be maintained as part of the upgrade to arterial standard. However, the upgrade to motorway standard would remove immediate access from the southbound highway carriageway to the museum complex altogether. Access to the museum complex from the southbound carriageway would be via the interchange at Woodburn, or the interchange at Iluka Road and then the western service road. The motorway standard would maintain direct access to the museum complex from the northbound carriageway through auxiliary slip lanes to enter and exit the car park.

The design refinement is anticipated to provide a benefit to visitors to the New Italy Museum by providing formalised access and car parking bays.

Consultation with the New Italy Museum would be ongoing during detailed design, as recommended in section 17.4 of the EIS. As no new impacts are anticipated, and the design refinement provides alternate access to and from the museum, no additional mitigation measures are required.

Noise and vibration

The noise environment adjacent to Swan Bay New Italy Road is likely to be dominated by road traffic noise from the highway, local road traffic and some agricultural activities.

As the design refinement would be located within the existing project boundary and the intersection layout would be similar to the EIS design, impacts would be consistent with the noise impacts described in section 15.3 of the EIS and no additional receivers would be affected by the design refinement. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Land use and property

Land use adjacent to Swan Bay New Italy Road is dominated by the highway, forestry, agricultural activities and the commercial/community activities taking place in the New Italy Museum Complex.

The design refinement would reduce property acquisition at New Italy, as a small area of land (0.1 hectare) at station 121.1 would no longer be required. As no new land uses, properties or landowners would be impacted by the design refinement, the impacts are considered consistent with those in section 16.3 of the EIS. No mitigation or management measures are required beyond those identified in the EIS.

Social and economic

The socio-economic environment adjacent to Swan Bay New Italy Road features the highway, agricultural land, forestry, rural-residential land uses and the New Italy Museum Complex. The New Italy Museum is an important local and regional attraction, providing highway-based facilities for road users, visitors to the area and the nearby community. Its features include a museum, Italian pavilion, glass art gallery, workshop, gift shop/café, and a community function hall. Parking and picnic areas are also provided. The facility also provides a venue for community events.

The design refinement would improve access for visitors to the New Italy Museum from both northbound and southbound directions in the upgrade to arterial standard. Improved car parking and a turnaround facility for trailers and larger vehicles (non-commercial) would also be provided, enhancing the facilities available within the site.

However, in the upgrade to motorway standard, removal of direct access from the highway to the New Italy Museum from the southbound carriageway could result in reduced visitor numbers, amenity and accessibility. This would affect the social significance of the site, as there may be less opportunity for continued celebration of the first immigrant community to the area.

In section 13.4 of the EIS, mitigation measure HH29 recommended signage be installed at both the interchange at Woodburn and Iluka Road to direct visitors to the New Italy Museum via the service road.

The EIS recommended further consultation with the New Italy Museum during detailed design (refer to mitigation measure SE8 in section 17.4 of the EIS) to explore design opportunities to assist in the maintenance of access to the museum in the upgrade of the highway to motorway standard. No mitigation or management measures are required beyond those identified in the EIS.

Management and mitigation

One change to the mitigation measures included in section 13.4 of the EIS is required as the design refinement would avoid direct impact on the memorial/flagpole and indirect impacts on the Stone-Lined Well. Therefore, there is no requirement for archival recording or removal and reinstatement of the memorial/flagpole. As such, EIS management measures HH30-HH32 have been deleted (refer to Appendix H).

This design refinement would not require a change to other proposed mitigation and management measures in Chapter 19 of the EIS.

4.4.14 Borrow site at Lang Hill, north of Woodburn

Location

Lang Hill is located in Section 8 of the project. The project would pass adjacent to Lang Hill, north of Woodburn between stations 134.6 and 134.9.

EIS design

The EIS design at Lang Hill consists of:

- A borrow site located between station 134.7 and 134.9.
- The provision of around 530,000 cubic metres of material for road construction.
- A borrow site up to 25 metres deep, with 2:1 batters, and extending around 550 metres to the north and west of the project.

The EIS design is shown in Figure 4-29.

Proposed design refinement

Figure 4-29 shows the design refinement at this location. The use of Lang Hill as a borrow site was reviewed to reduce the extent of cutting and impact on the site, reducing the material excavated by around one-third. The refined area of the borrow site would be located around 250 metres to the north of the project (for further details, refer to the Lang Hill Environmental Work Method Statement (Appendix G of this report)).

The design refinement includes:

- A reduction in the quantity of material sourced from the site to 300,000 cubic metres.
- A reduction in the maximum depth of excavation from the borrow site from 25 metres to between around 13–17 metres.
- Excavation of the site from east to west. The site would be excavated in a number of 'cells'.
- A haul route four metres wide on the eastern extent of the site, from the excavation site to the project corridor.
- A stockpile of topsoil and vegetation from the site in ancillary facility Section 8 site 3. The stockpile would be appropriately bunded.
- Sedimentation fencing between the excavation area and the unnamed waterway to the west.
- Aboriginal heritage exclusion fencing on the southern side of the excavation area, western side of the haul road and northern side of the project for the extent of the property and around the southern corner of the property (south of the alignment, adjacent to ancillary facility Section 8 site 3.
- A sedimentation basin east of Lang Hill to drain surface and groundwater runoff from the excavated area.
- Crushing and screening plant on site for the duration of the excavation.
- Restoration of the site, using available surplus project material to mimic the existing landform, landscaping with indigenous species, and fencing of the unnamed waterway to allow natural regeneration.

The borrow site would be operational for 12 months during project construction hours, as material is extracted via ripping and blasting for the construction of Section 8 of the project.

Reason for design refinement

Excavated earth and rock fill would be taken from borrow sites across the project to provide construction material. One borrow site is a Roads and Maritime owned site known as Lang Hill. Discussions at Aboriginal Focus Group meetings in 2012 requested impacts at the Lang Hill site be reduced as the site is of Aboriginal heritage importance (containing an Aboriginal artefact scatter known as Gittoes Jali). The design refinement responds to this feedback, with a reduced impact area and reduced extraction, with only 300,000 cubic metres of earthworks extracted, compared to 530,000 cubic metres in the EIS design. However, avoidance of the site was not possible due to the earthwork requirements in section 8 of the project. In maintaining the use of the site, this would reduce the requirement to source earthworks from commercial quarries and transport the material to the project, and reduce the associated cost and amenity issues.

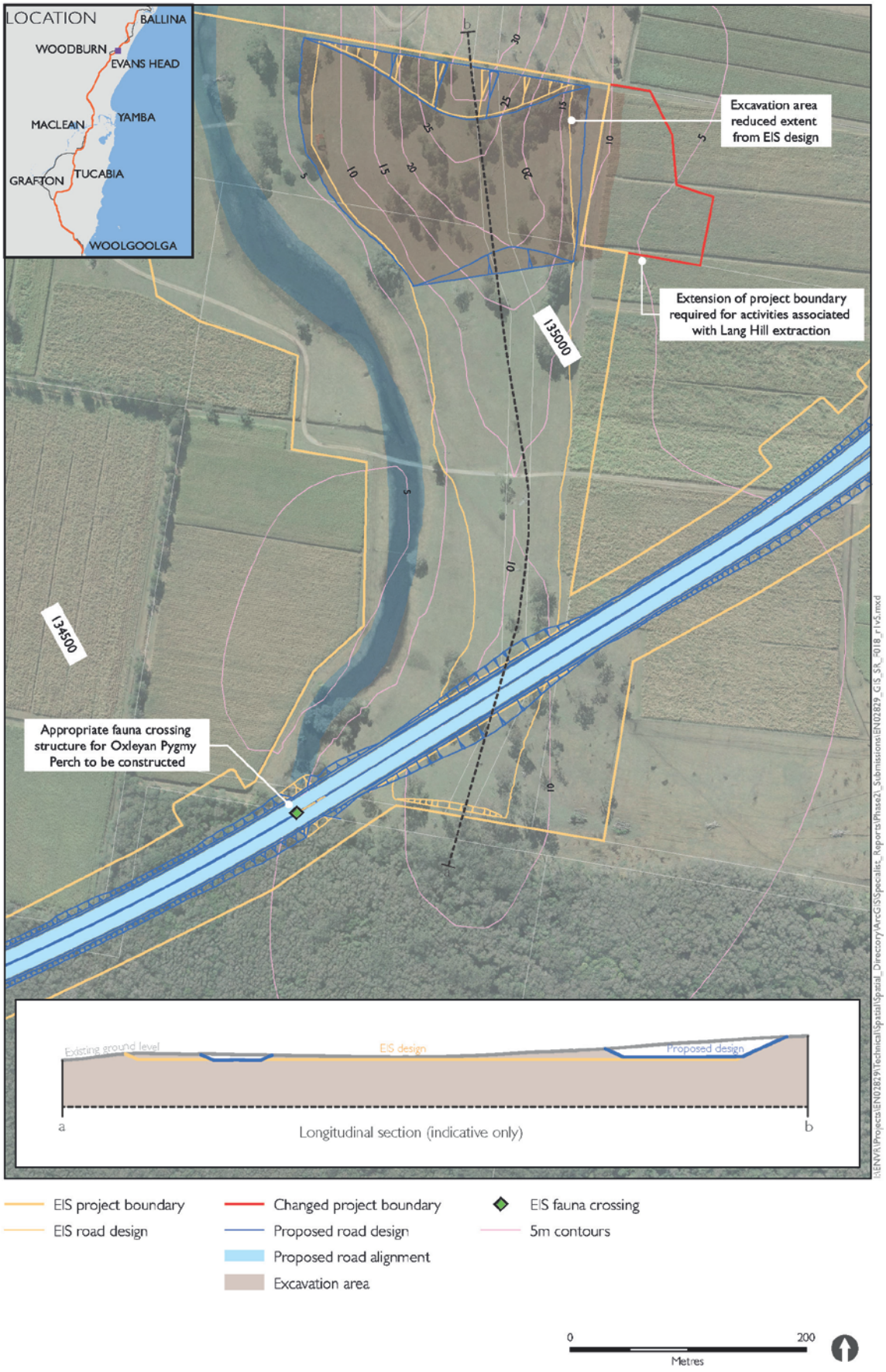

Figure 4-29: Revised borrow site at Lang Hill

Consultation

Members of the Roads and Maritime project team attended community information sessions to discuss the proposal to modify the design at Lang Hill. The main information session where the EIS was discussed and the design refinement presented was at Woodburn Memorial Hall on 17 January 2013. A staffed display was also held at Woodburn Memorial Hall on 11 February 2013. Members of the project team were available to meet with the community and answer questions about the project.

Consultation also included detailed discussions with Aboriginal stakeholders at focus group meetings, and directly impacted or adjoining landowners. Following consultation with the Jali Local Aboriginal Land Council, Bandjalang People #2 Native Title Claimants, and Burabi Aboriginal Corporation, the proposed excavation at Lang Hill was reviewed. The objective was to identify if impacts on artefacts of Aboriginal significance could be reduced. Discussions at Aboriginal Focus Group meetings in 2012 requested impacts be minimised where practicable, by reducing the extent and depth of cutting.

The design refinement responds to discussions with Registered Aboriginal Parties (RAPs), and was presented at a further Aboriginal Focus Group meeting on 7 February 2013, at Wardell Hall, Wardell. At this meeting, three options were presented to Registered Aboriginal Parties:

- The EIS design was presented as a base case. This comprised use of the overall Lang Hill site west of the alignment as a borrow site, with mitigation including extensive archaeological salvage excavations and potential provision for a keeping place for salvaged artefact scatters.
- Option one was presented with the project alignment as per the EIS design, no borrow site, and mitigation limited to some archaeological salvage of stone artefacts.
- Option two included a reduced borrow site cutting within the northern part of the site only (this area has a lower density of artefacts). The project alignment would be maintained as per the EIS design. Mitigation would include extensive archaeological salvage excavations, providing the Aboriginal community ownership of the parcels of land where the borrow site is located, and potential provision for a keeping place.

Those in attendance at this Aboriginal Focus Group meeting were in favour of option one only.

However, after consideration, Roads and Maritime selected option two as the preferred option. This is because:

- There is a need to obtain material for the project. Lang Hill is an important borrow site, with the provision of fill material a significant issue for the project south of the Richmond River as the highway needs to be raised above the floodplain.
- Option two would avoid most of the significant archaeology of the site by reducing the quantity of excavation when compared to the EIS design, and so would address much of the feedback from Registered Aboriginal Parties.

Environmental assessment

Hydrology and flooding

The EIS design provides a bank of 20 culverts to provide cross-drainage, and accommodate an unnamed watercourse south of Lang Hill. Additional drainage structures have been provided for smaller waterways south and north of Lang Hill. The design refinement would not alter any of these structures. The design refinement would not impact the predicted flood level, duration or velocity of floodwaters that could impact Lang Hill or its surroundings during a flood.

The impacts of this design refinement would be consistent with the impacts in the EIS. Therefore, no additional impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

There is an unnamed waterway to the west of the site. This unnamed waterway connects to the Richmond River to the north-west and to the Broadwater National Park to the south-east. The unnamed waterway, near where the project alignment crosses, is in good condition. Further north on site, towards the excavation area, the condition of the creek is considered poor, being impacted by uncontrolled access by cattle, leading to heavy trampling, siltation and potential pollution from cattle dung.

There would be no direct impacts on the waterway located on the western portion of the Lang Hill site from the project or from the use of the site as a borrow site. The borrow site would also not affect any hydrological changes or create barriers to fish movement that could impact on the Oxleyan Pygmy Perch.

The borrow site could result in indirect (surface water quality) impacts on the adjacent waterway which is potential Oxleyan Pygmy Perch habitat. The reduction in the borrow site would reduce the risk of impacts on this waterway and the potential habitat. However, the borrow site would still have a high potential of affecting surface water quality (such as suspended solids and pH) through soil erosion. This could adversely affect Oxleyan Pygmy Perch through reduced egg development, and reduced growth of aquatic plants that are used by this fish species for cover and food supply.

Overall, the design refinement would result in a reduced risk relative to the EIS design as only around a third of the land area would be disturbed for excavation. Mitigation measures identified in the EIS are still applicable (refer to mitigation measure SSW6). In sensitive receiving environments (such as the waterway at Lang Hill), 90 percentile basins would be considered during detailed design (refer to section 5.7 of the Working paper – Water quality).

Lang Hill was identified in section 9.3 of the EIS as a Type A cutting as it would intersect the local groundwater table. The design refinement includes a reduction in the cut profile of the borrow site at Lang Hill. The refined cut profile would still intersect the shallow local groundwater table resulting in seepage and potential changes to the local groundwater table in the immediate vicinity of the borrow site. The maximum excavation extent would be to a design level of around 4.5 metres AHD (Australian Height Datum). However, the borrow site would not intersect the regional groundwater table, which is around two metres AHD. The potential for groundwater seepage would be considered in more detail during detailed design, following the analysis of existing groundwater wells from the area and when detail of the excavation is determined.

Intersecting the groundwater table could result in groundwater flow being directed away from the waterway to the west of the site. However, the excavation of the site would not be below the level of the stream bed (4.5 metres versus 1.5 metres), and groundwater flows would not be directed away from the waterway. There are not expected to be any impacts on the recharge of the waterway as a result of decreased groundwater flows.

As the site is identified as a Type A cutting, groundwater would be monitored to ensure there is no impact on the watertable that may affect the flow or condition of the adjacent waterway or surrounding groundwater-dependent ecosystems (refer to section 9.4 of the EIS).

No mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

The design refinement at Lang Hill would remove small isolated remnant open forest comprising scattered low number of trees and a completely modified and grazed understorey. The disturbed remnant is dominated by Grey Gum (*Eucalyptus propinqua*), Pink Bloodwood (*Corymbia intermedia*) and Northern Grey Ironbark (*E.siderophloia*). The habitat provides some value for wide-ranging fauna species that are not dependent on habitat connectivity. There are some larger, mature trees that would provide temporary refuge or food and shelter for nectarivores such as the Grey-headed Flying-fox or wide ranging nectarivores and insectivores such as lorikeets and insectivorous bats. The habitat may also be used by species that have adapted to hunting in modified landscapes, such as the Masked Owl. The direct and indirect impacts on terrestrial flora and fauna species would not change between the EIS design and this design refinement.

The design refinement would have no impacts on threatened ecological communities or threatened flora species in this location.

By reducing the area of the borrow site from the design in the EIS, the new design would restrict ground disturbance works to the northern end of the site (Figure 4-29). This would be a significant reduction in area and minimise the potential impact on known habitat for Oxleyan Pygmy Perch to the west of the site.

Aquatic habitat

The portion of the waterway adjacent to the Lang Hill borrow site is considered unlikely habitat or only very marginal for the Oxleyan Pygmy Perch, despite the known presence of the species further

upstream (where crossed by the project). This is because the waterway adjacent to the borrow site has been heavily modified by a long history of unrestricted cattle access into the water and removal of riparian vegetation. This has resulted in poor water quality and a complete lack of riparian vegetation. The borrow site of Lang Hill would be to the east of the creek line and adjacent to the unlikely habitat (for the Oxleyan Pygmy Perch). At its nearest location, the borrow site would be between 50 to 60 metres east of the waterway and buffered by a wide flat area of cleared pasture land. Access to the site would be from the east only, with material haulage not undertaken across the existing waterway crossings to further minimise potential impacts on fish habitat.

There would be no direct impacts on potential habitat of the Oxleyan Pygmy Perch as a result of the use of the borrow site at Lang Hill. Potential impacts on the waterway would be associated with indirect impacts including noise and surface runoff. Surface runoff would be managed by excavating east to west, so that the site would never drain towards the waterway. The site would drain towards a sedimentation basin to the east (refer to the Lang Hill Environmental Work Method Statement (Appendix G of this report).

As mentioned above, it is not anticipated that the borrow site would interrupt any recharge of the waterway by groundwater.

The project (on the main highway alignment), would have a suitable crossing of the waterway, upstream of the Lang Hill borrow site at station 134.6, in consultation with DPI (Fisheries).

Additional management measures are required for this design refinement. These are included in Table 4-37 and in Chapter 5.

Urban design, landscape character and visual

This assessment addresses mitigation measure UD11 identified in the EIS.

Lang Hill is located in a mostly cleared agricultural area, which contains a scattering of mature trees. There are a limited number of rural residential properties in the area, and few visual receivers. The site is around 600 metres east of the highway, around three kilometres north-east of Woodburn.

Although the design refinement would reduce the excavation area, the cut would continue to have a high impact on the landscape character and visual appearance of the surrounding area. Around five isolated dwellings are located within 500 metres of the site so visual impacts would be limited to a small number of visual receivers and passing road traffic. The cut would remove the majority of the mature trees on the site and modify the landscape by removing the hillside. As described in section 11.4 of the EIS, the excavation area would be rehabilitated according to the landscape management plan developed in detailed design, to provide a final appearance that blends with the adjacent landforms. (Refer to the urban design principles identified in the Working paper – Urban design, landscape character and visual impact, and to the revised management measure UD11 in chapter 5.)

The undisturbed area between the project alignment and the excavation area would assist in maintaining the landscape character and visual amenity of the area.

Aboriginal heritage

The aim of the design refinement is to reduce significant impact on an Aboriginal artefact scatter (Gittoes Jali). The GIttoes Jali site has a high level of significance at a regional and possibly State level. It has moderate–high social significance to the stakeholders as a well-occupied site in which a range of activities were undertaken. It has high scientific and historical significance due to its lack of physical disturbance, the wide range and types of occupational evidence found at the site, its rarity in the region and therefore its high research potential. The site also has high education potential for the stakeholders due to its other scientific values and is only recently known to local traditional owners.

The design refinement would still impact the heritage values of the site as identified in the EIS, however, this would be reduced due to the reduced area of impact on the Gittoes Jali site. Impact on the site would be reduced to around 35 per cent of the area identified in the EIS (a reduction from an impact on 95 per cent of the site. The design refinement would reduce impacts on the denser concentrations of stone artefacts (by 84 per cent), and avoid all of the more significant Aboriginal features of the site (including the blue rock, the artefact cache, the paint wells, the ground rock and the potential scarred tree). These features would all have been impacted by the design in the EIS (refer to Chapter 12 of the EIS).

The design refinement would allow 77 per cent of all the recorded artefacts to be avoided, in comparison to less than one per cent when assessed against the design in the EIS. In terms of the area of impact on the site, the design refinement would impact around 8000 square metres (m^2) (plus around 5000 m^2 for the project alignment). This is a reduction from 79,800 m^2 that would be impacted under the EIS design.

Mitigation measures, including salvage, would provide for the collection and analysis of artefacts in the area of the site and their reburial or storage in consultation with stakeholders. Management measure AH21 has been revised due to the changed impact on Gittoes Jali.

Historical (non-Aboriginal) heritage

No historic heritage items listed on the State Heritage Register or Richmond Valley Local Environmental Plan (2012) are located near the proposed cutting at Lang Hill. As the reduced cutting would be located within the EIS project boundary, the impacts of the design refinement would be consistent with the impacts and mitigation measures in the EIS. No additional impacts have been identified and no mitigation or management measures are required beyond those identified in the EIS.

Traffic and transport

The reduction in the excavation amount would result in a reduction in around 7500 truck movements. Haulage of material would not be permissible across the existing crossings over the unnamed waterway adjacent to the site. The haul road would go from the excavation area, along the eastern boundary of the property and to the stockpile site or directly to the project formation.

Because there would be no impacts additional to those identified in the EIS, no additional management measures are required.

Noise and vibration

The design refinement at Lang Hill was assessed to identify the potential for further construction noise and vibration impacts on sensitive receivers. Two water reservoirs to the north of the site were identified in submissions to the EIS, with concern about vibration impacts; therefore, the vibration impacts on these reservoirs were also assessed.

It is assumed the site would operate continuously for up to 12 months, with the earthworks required for the construction of Section 8. The site would be operational only during the proposed construction hours. Excavation techniques would include ripping, hard ripping and blasting; and the materials would require processing. Haulage to and from the borrow site would be along the Section 8 corridor. A haul road would be established along the eastern boundary of the property between the project corridor and the borrow site. Once the material has been extracted, the site would be backfilled with surplus material generated by the construction of the project.

The construction activities and associated plant to be used at the Lang Hill site are presented in Table 4-32 with the associated sound power levels.

Table 4-32: Lang Hill activities and associated plant

Activity	Plant	Sound power level (LAeq dB(A))
Excavation	1 x 30 t excavator 2 x 20 t dozer 1 x backhoe 2 x front end loader 4 x 25 t product truck	103 103 110 114 108
Ripping	2 x scraper 1 x grader 1 x 30 t excavator 2 x front end loader 4 x 25 t product truck	108 114 103 114 108

Activity	Plant	Sound power level (LAeq dB(A))
Hard ripping and blasting	2 x excavator with rock breaker 1x drilling rig 1 x excavator with hydraulic hammer 2 x front end loader 4 x 25 t product truck	117 112 122 114 108
Materials processing	1 x portable crushing plant 1 x portable screening plant	118 115
Demobilisation and backfill	1 x 30 t excavator 2 x 20 t dozer 1 x backhoe 2 x front end loader 4 x 25 t product truck	103 103 110 114 108

Sensitive receivers and noise management levels

There are five noise-sensitive residential receivers within 600 metres of the Lang Hill borrow site. These receivers are further than 600 metres from the highway alignment so were not assessed in the EIS. In addition, there are two water reservoirs to the north of the site. The sensitive receivers surrounding Lang Hill are listed in Table 4-33 and shown in Figure 4-30.

Table 4-33: Lang Hill sensitive receivers

Receiver ID	Receiver type	Distance from site boundary
LH1	Residential (owned by Roads and Maritime)	150 metres west
LH2	Residential (owned by Roads and Maritime)	170 metres west
LH3	Residential	250 metres north
LH4	Residential	350 metres north
LH5	Residential	390 metres north
LH6	Commercial (water reservoir)	200 metres north

The relevant noise management levels (NML) for these receivers is 57 dB(A). This has been determined from the noise monitoring and modelling undertaken for the EIS. For further details refer to Working paper – Noise and vibration.

The noise assessment was undertaken using the same methodology as described in the EIS. The plant for each activity was modelled as per the methodology outlined in Working paper - Noise and vibration (section 3.2.3, Part A).

Noise modelling

The results of the modelling show the predicted operational LAeq,15min for each activity, taking into account potential worst case operating areas and time corrections for operating durations. The results for each activity are presented in Table 4-34. Exceedances of the NML are in bold.

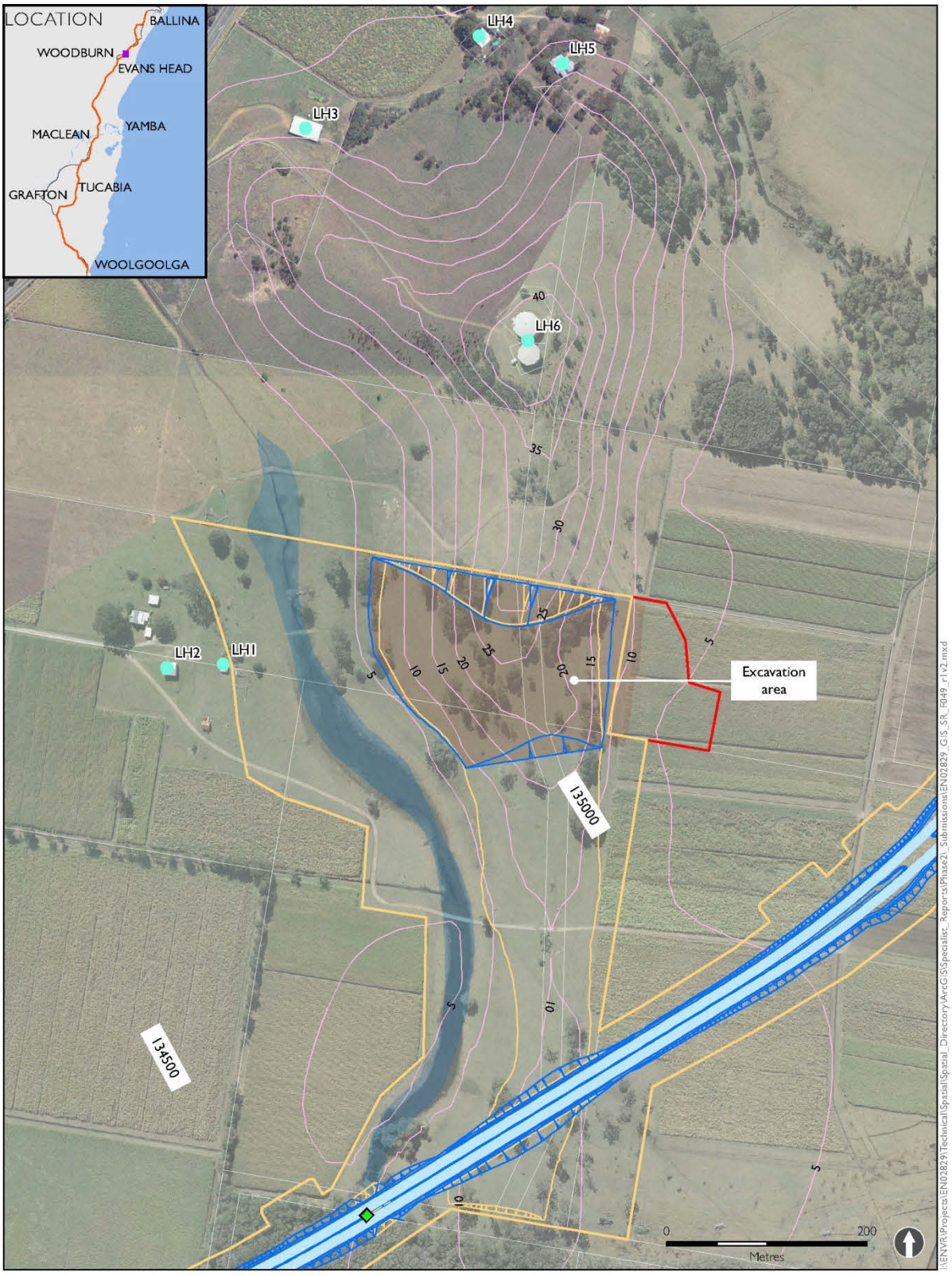

Figure 4-30: Receiver locations in proximity to Lang Hill

Table 4-34: Lang Hill noise modelling results

Receiver	NML	Predicted $L_{Aeq,15min}$, dB(A)				
		Mobilisation and excavation	Ripping	Hard ripping	Materials processing	Demobilisation and backfill
LH1	57 dB(A)	58	58	60	60	58
LH2		56	56	58	58	56
LH3		52	52	54	54	52
LH4		38	38	40	40	38
LH5		36	36	38	38	36

Table 4-34 shows that there would be no exceedances of the highly noise-affected criterion (75 dB(A)).

Potential exceedances are only estimated at the two closest receivers, LH1 and LH2. The predicted noise levels from hard ripping and materials processing would potentially exceed the project NML by up to 3 dB(A) at LH1 and by 2 dB(A) at LH2. This level of exceedance is considered to be minor given that the assessment is considered to be worst case.

The cumulative impact of simultaneous activities occurring would result in an increase in the stated noise levels up to 3 dB(A) for two activities occurring simultaneously (assumed to be the likely scenario). This would result in higher exceedances at LH1 and LH2, but no exceedance of the highly noise affected criterion is predicted.

Noise impacts from the use of the haul route to the east of the borrow site would be minimal. At the closest receiver (LH1), noise impacts are predicted to be 37 dB(A), well under the noise management level.

Vibration impacts

Vibration impacts from the use of the borrow site would result from rock hammering and blasting.

For vibration impacts from rock hammering, receivers greater than 30 metres away have a minimal risk of any form of structural damage or impact on human comfort. As the receivers (including the water reservoirs) are located greater than 30 metres from the closest site boundary, the risk of damage or impact would be minimal. As the exact locations for blasting at the Lang Hill borrow site are unknown, the location of blasting has been assumed at the shortest separation distance to surrounding receivers.

The assessment has used the generic predictions for blasting induced overpressure and vibration presented in Working paper – Noise and vibration (section 3.3.3 of Part A).

Where a blast location is predicted to have an impact on a receiver, a detailed blasting assessment would be undertaken prior to the start of works so that specific site geology can be taken into account. This would consider the impacts on surrounding structures, including sensitive receivers, water towers and underground water pipelines.

Table 4-35 and Table 4-36 present vibration and overpressure predictions as a result of different charges at the closest receivers to the Lang Hill site. Receivers are separated into commercial and residential as the criteria for each is different, with the overpressure and vibration limit marginally higher for non-habitable receivers (criteria are presented in Working paper – Noise and vibration, section 2.4.3 of Part A). The overpressure predictions are based on neutral meteorological conditions. Where conditions are conducive to noise propagation, predictions have the potential to increase by up to 20 dB(A). Exceedances of the criteria are in bold.

Table 4-35: Overpressure levels

Receiver	Receiver type	Separation distance, metres	Overpressure according to charge / dB					
			1	5	10	15	20	25
LH1	Residential	150	111	118	121	122	123	124
LH2	Residential	170	109	116	119	121	122	123
LH3	Residential	250	104	111	114	116	117	118
LH4	Residential	350	100	107	110	112	113	114
LH5	Residential	390	99	106	109	110	111	112
LH6	Commercial	200	107	114	117	119	120	121

Table 4-36: Vibration levels

Receiver	Receiver type	Separation distance / metres	Vibration according to charge (Peak Particle Velocity- PPV) / dB					
			1	5	10	15	20	25
LH1	Residential	150	0.38	1.36	2.37	3.28	4.13	4.94
LH2	Residential	170	0.31	1.12	1.94	2.69	3.38	4.04
LH3	Residential	250	0.17	0.60	1.05	1.45	1.82	2.18
LH4	Residential	350	0.10	0.35	0.31	0.85	1.06	1.27
LH5	Residential	390	0.08	0.30	0.51	0.71	0.90	1.07
LH6	Commercial	200	0.24	0.86	1.50	2.07	2.61	3.12

Table 4-35 shows that there is a potential that overpressure criteria would be exceeded at LH1, LH2 and LH3 from charges greater than one kilogram. Table 4-36 indicates that where a charge of less than 25 kilograms is used, there would be low potential to exceed the vibration criteria. This is due to the relatively large separation distances between the blast area and the receiver. Once the blasting methodology for the Lang Hill site is finalised, a detailed blasting assessment would be undertaken to confirm these predictions. Consultation will also be undertaken with receivers.

There are no specific criteria for assessing vibration against water reservoirs (LH6) and they have been assessed against the more sensitive residential criteria. The structural integrity of the reservoirs is also unknown. However, the assessment shows the potential for damage from charges less than 25 kilograms would be minimal. Further investigation would be undertaken at construction stage if blasting is to be undertaken within 200 metres of the reservoirs, in consultation with Rous Water (refer to management measure CNV24).

Land use and property

The proposed excavation area is wholly within the project boundary identified in the EIS. However, around one hectare of additional land east of the site would be required for a sedimentation basin and plant. The land would be included in the project boundary. Additional land to the east between the site and the highway upgrade would also be used as an irrigation area for the release of water from the sedimentation basin. These areas would only be used during construction and would not form part of the operational road boundary. All of this land is owned by Roads and Maritime and has been leased back to farmers for sugarcane production.

The design refinement would affect the use of land adjacent to the project adjacent to the borrow site, but this would be temporary during construction of the project.

The design refinement would not require additional land acquisition for the operation of the road.

Once the excavation of the site is complete, rehabilitation of the site would include the fencing of the unnamed waterway.

No mitigation or management measures are required beyond those identified in the EIS.

Social and economic

Lang Hill is located to the south of Broadwater National Park in a sparsely populated area. The reduced cutting proposed in the design refinement would lessen impacts on the local amenity of residents within the area. In addition, it is anticipated that temporary construction noise, dust and traffic impacts would be over a shorter duration as there would be fewer vehicles travelling to and from the site.

Overall, there would be no additional impacts during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Management and mitigation

One mitigation measure for Aboriginal heritage included in Chapter 19 of the EIS has been revised as a result of this design refinement. Additional measures have also been developed to address biodiversity, visual and noise impacts of the design refinement. These are outlined in Table 4-37. This design refinement would not require changes to any other mitigation and management measure in Chapter 19 of the EIS.

Table 4-37: Lang Hill – revised mitigation

Issue	ID number	Mitigation measure	Timing	Relevant section
Biodiversity: Minimise impacts to Lang Hill	B59	The Lang Hill Environmental Management Work Statement will be further developed and implemented during the use and rehabilitation of the borrow site.	Pre-construction and construction	8
	B60	The creekline on the 'Lang Hill' property will be fenced off from cattle and the vegetation allowed to regenerate to improve the habitat conditions downstream.	Construction and operation	8
Aboriginal heritage: impacts on Gittoes Jali	AH21	For the Gittoes Jali (09-1-0204, 09-1-0205, 09-1-0203) site: • Where possible, impacts on the Gittoes Jali site will be reduced or avoided. Avoided areas will be protected by an exclusion fence as per management measure AH2. If avoidance is not an option, then extensive salvage will be undertaken as per the methodology detailed in the Ancillary facilities and design change CHAR (refer to Appendix D of the Submissions/ Preferred Infrastructure Report). • Any sediment from the site to 0.6 metre depth proposed to be used outside the site will be sieved to remove any cultural material. Paint wells and grinding rock: • Residue analysis will be undertaken to determine if any pigment is found within the wells. This will be undertaken by a suitably qualified consultant. • The location of these paint wells will be accurately plotted and drawn. • If the paint wells cannot be avoided, they will be relocated; this requires consultation with the registered Aboriginal stakeholders. Geomorphology assessment: • A geomorphology assessment will be	Pre-construction and construction	8

Issue	ID number	Mitigation measure	Timing	Relevant section
		undertaken. The assessment will be non-invasive, but could use observations of the machine salvage excavation. Borrow site: • Haul routes from the project formation to the borrow source that limit direct impacts to Aboriginal heritage will be confirmed in consultation with Registered Aboriginal Parties.		
Urban design	UD11	Any backfilling of the Lang Hill and West of Wardell borrow sites will be undertaken with available surplus material from the project. Rehabilitation of the sites will be undertaken in accordance of the landscape strategy (UD3), design principles (UD5) and the intended future land use of the sites.	Construction	8, 10
Construction noise: Blasting (controlled)	CNV24	Should blasting be required within 200 metres of the water reservoirs at the Lang Hill borrow source, a dilapidation or preconstruction condition survey will be undertaken before blasting work commences in consultation with Richmond Valley Council and Rous Water.	Construction	8

4.4.15 Relocation of rest area north of Richmond River

Location

The rest area is located north of Richmond River and south of Old Bagotville Road, Bagotville in Section 10. The rest area design in the EIS was between stations 147.3 and 148.3 and included parking facilities for light and heavy vehicles as well as a heavy vehicle checking station.

EIS design

The EIS rest area design includes areas to accommodate heavy and light vehicles, and a heavy vehicle checking station within the northbound and southbound rest areas to cater for both northbound and southbound traffic. It would cover an area one kilometre long and up to 200 metres wide. The rest area would also provide:

- Parking spaces for trucks to park and use the facilities without the need to manoeuvre on entering and exiting.
- Suitable parking and movement for B-double trucks.
- Entry and exit ramps for northbound and southbound traffic along a modified alignment.
- Car parking areas separate from truck parking areas.
- Toilet and water facilities.
- A picnic area, maps and information signs.

The EIS design is shown in Figure 4-31.

Proposed design refinement

The refined rest area design involves:

- Relocation of the proposed northbound rest area slightly north to stations 147.7 to 148.6.
- Relocation of the proposed southbound rest area to north of Old Bagotville Road between stations 148.8 to 149.9.
- Inclusion of merge and diverge lanes for northbound and southbound traffic.

- Lengthening of the Old Bagotville Road bridge to cater for the southbound merge lane from the rest area.
- Parking for heavy and light vehicles as per the EIS design, within a modified parking arrangement.

The heavy vehicle checking station has been removed from the design.

The relocation of the rest area has allowed the inclusion of a new dedicated fauna landbridge at station 147.6. This landbridge would be around 55 metres in length and could be between 12 and 30 metres in width.

The design refinement is shown in Figure 4-31 to Figure 4-33.

Reason for design refinement

The proposed rest area has been relocated to minimise the width of the road corridor in this location. The reduced width and footprint provide the opportunity to install fauna connectivity structures in the project and improve fauna connectivity across this landscape. The key structure would be the dedicated fauna landbridge at station 147.6, around 55 metres long and could be between 12 and 30 metres wide.

The heavy vehicle checking station has been removed from the design following review of the Pacific Highway heavy vehicle checking station strategy. This would also minimise the footprint of the rest area. According to the *Strategy for Major Heavy Vehicle Rest Areas on Key Rural Freight Routes in Rural NSW*, rest areas for the project need to be located around 50 kilometres apart and situated on or near a crest. As such, from the Mororo Road rest area – to be constructed as part of the Devil's Pulpit upgrade project – the next rest area required would be after Broadwater (at station 145.0) and on or near a crest point north of Richmond River. Roads and Maritime also considered other options for a rest area further north at the west of Wardell borrow site, south of the river at the sand quarry, and along the upgraded highway near Broadwater. These options were not suitable due to identified constraints. Table 4-38 identifies the constraints and issues with these options. Further details on the rest area strategy are provided in Section 3.10 of this report.

Table 4-38 Option comparison for rest area north of the Richmond River

Options	Constraints and issues
West of Wardell borrow site	A rest area in this location would: • Result in a high noise impact due to a number of residences in close proximity. • Require the acquisition of additional (not currently affected) properties. • Be too close to the Ballina truck service site (around 15 km). • Require a longer overbridge at Wardell Road. • Require a redesign of Thurgates Lane.
Sand quarries	A rest area in this location would: • Result in a difference in grade between the merge and diverge lanes and the highway approaching the Richmond River Bridge. • Require an access road to run the full length of the river crossing.
Near Broadwater	A rest area in this location would: • Conflict with Broadwater's function as a 'service town'. • Result in likely noise impacts on Broadwater. • Potentially conflict with operational cane farming. • Be located within flood-prone areas. • Be within 35 km of the Devils Pulpit rest area.

The preferred rest area location would be east of the Eatons borrow site for the northbound rest area and north of Old Bagotville Road for the southbound rest area. This location would reduce the need for vegetation clearing and minimise the area of additional land to be acquired.

For further detail on the general principles applied in siting rest areas on the project, refer to section 3.10.

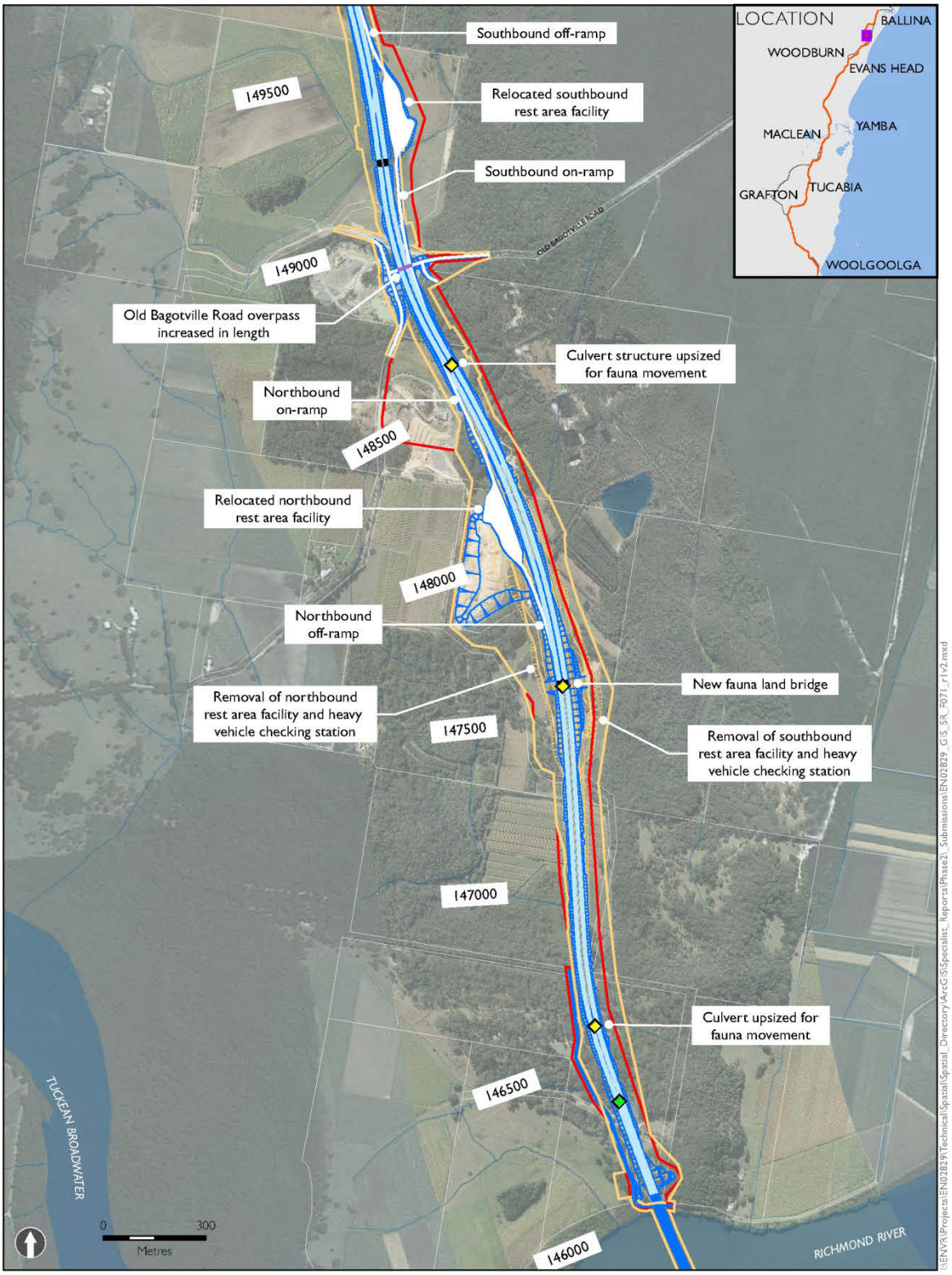

Figure 4-31: Overview of rest areas north of Richmond River

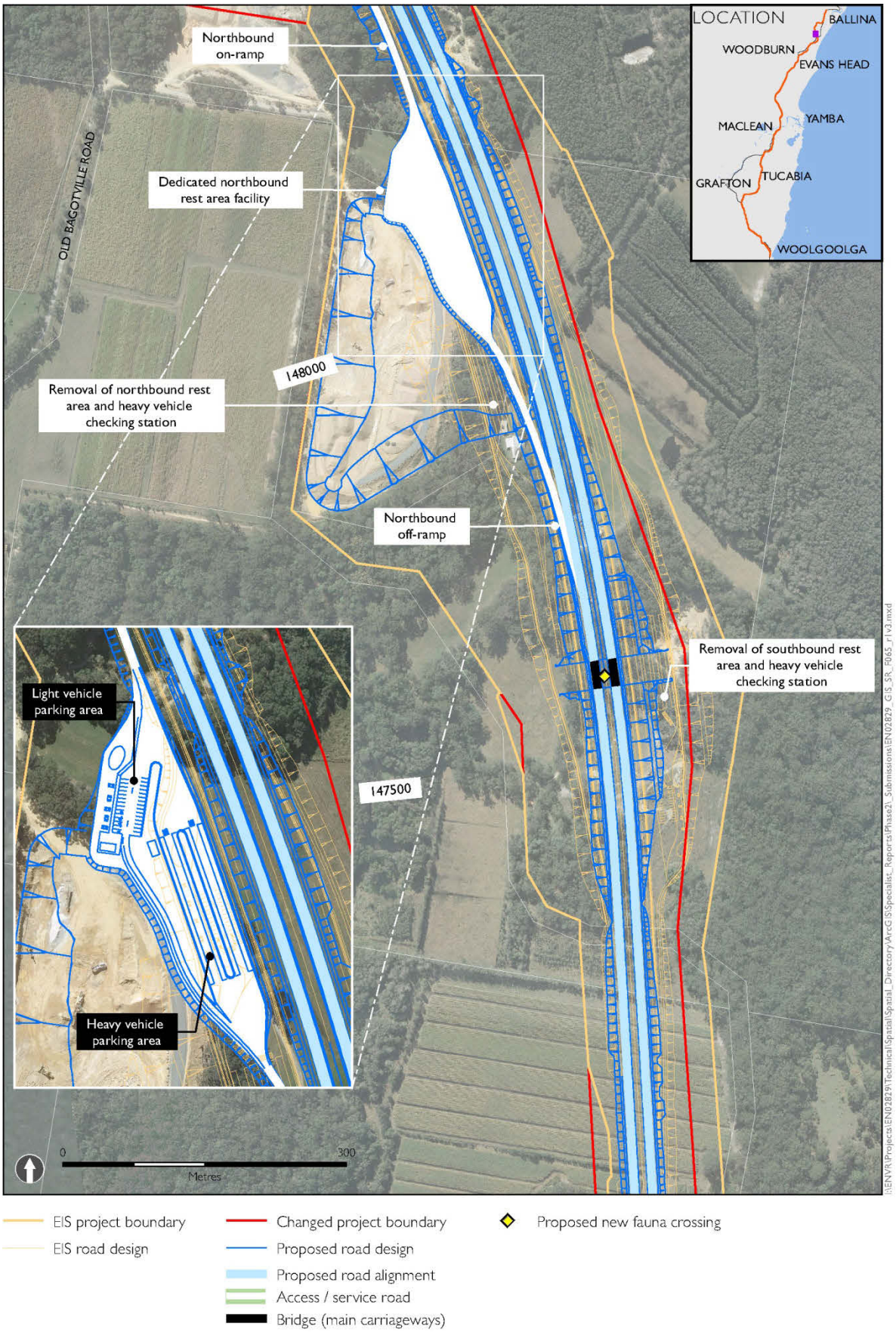

Figure 4-32: Rest area north of Richmond River- northbound rest area

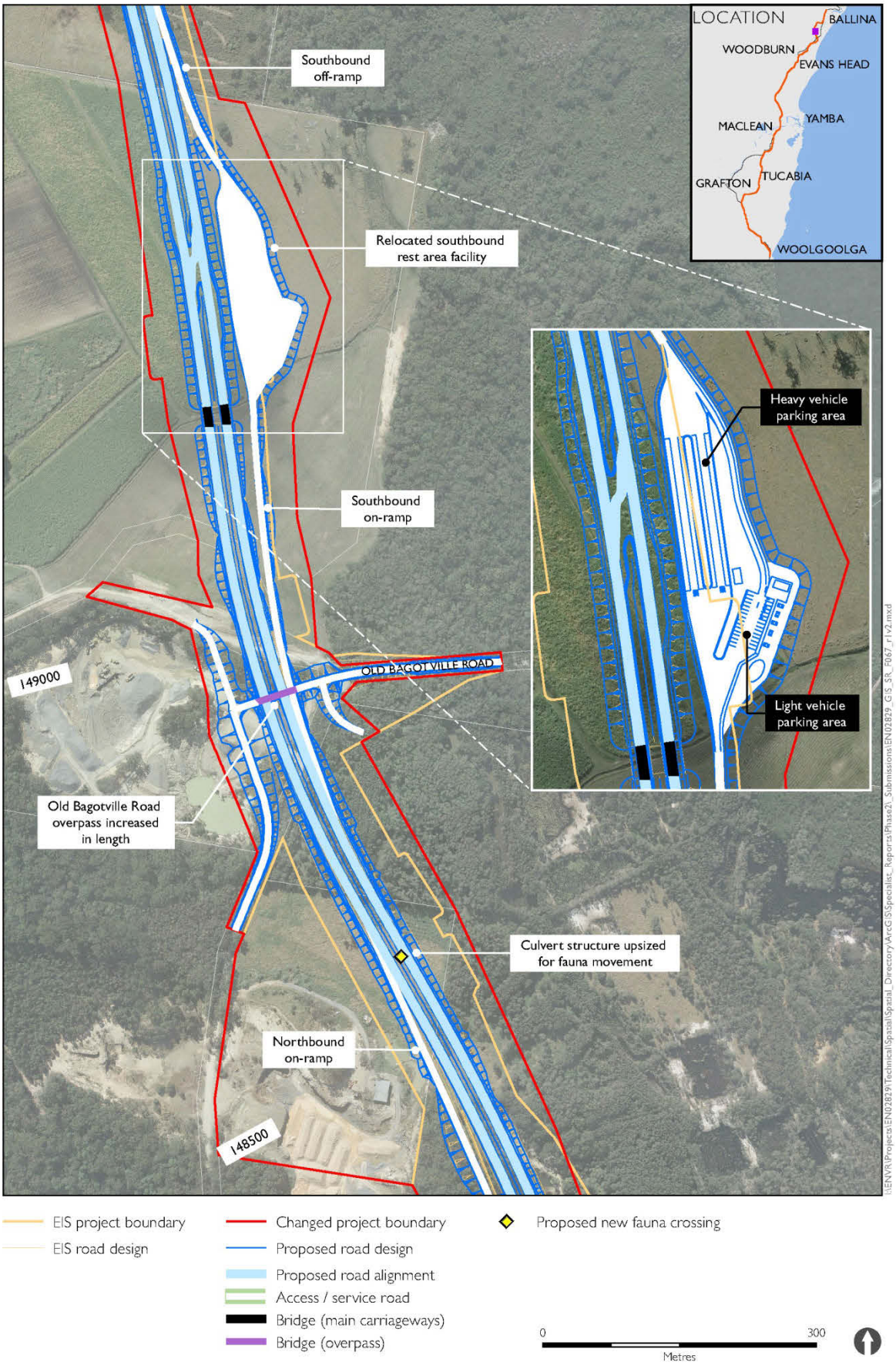

Figure 4-33: Rest area north of Richmond River- southbound rest area

Consultation

Roads and Maritime consulted with property owners regarding this design refinement. Property owner concerns were considered in the final location of the rest area. Concerns raised through consultation included the commercial/agricultural viability and operation of the remaining property, amenity and security issues. As a result, the northbound rest area was moved further south within the existing project boundary. While the southbound rest area would still be on an agricultural property, it would be situated away from the residual property, and would not overly impact on the operation of the residual property.

Environmental assessment

Hydrology and flooding

The southbound rest area would be located adjacent to Bingal Creek, which is around 250 metres north of Old Bagotville Road. This is a small watercourse within the mid-catchment of the Richmond River, which is around four kilometres further south. The highway would cross Bingal Creek on two 18-metre single-span bridges. The southbound entry lane from the rest area would also cross Bingal Creek via another 18-metre single-span bridge. Further hydrology modelling would be undertaken during detailed design to confirm that the bridges meet the relevant flood management objectives as identified in the EIS.

The relocated southbound rest area would not fall within the Richmond River floodplain and would not impact flooding behaviour in the area or be impacted by Richmond River flood events.

The northbound rest area would be relocated slightly north and would not be situated near any waterways. As with the southbound rest area, it would not be within the Richmond River floodplain and would not impact flooding behaviour in the area or be impacted by Richmond River flood events.

The impacts of this design refinement would be consistent with the impacts included in section 8.3 of the EIS. Therefore, no additional impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

Both rest areas would be located on terrain where acid sulfate soils are not expected. There are also no known areas of environmental concern (ground and water contamination), so contamination impacts are not anticipated.

There are key fish habitats in the unnamed tributaries of Bingal Creek at stations 149.3, 150.6 and 153.9.

To manage surface runoff during construction and from the operating highway, sedimentation basins and water quality basins are proposed.

Groundwater quality is unlikely to be impacted by the earthworks and widened corridor required to accommodate the relocated rest areas.

The impacts of this design refinement would be consistent with the impacts described in section 9.3 in the EIS. Therefore, no additional impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

The design refinement for the rest areas at Bagotville would reduce the amount of vegetation and habitat impacted by 6.2 hectares. This is because the design refinement would reduce the footprint of the rest areas in vegetated areas and deliberately site the southbound rest area in a cleared paddock. The vegetation types present in the clearing area are listed in Table 4-39 along with a comparison of the area of impact between the EIS design and the design refinement. In addition, under the design refinement, the area of impact on threatened ecological communities would remain the same or would decrease (refer to Table 4-39 and Figure 4-34).

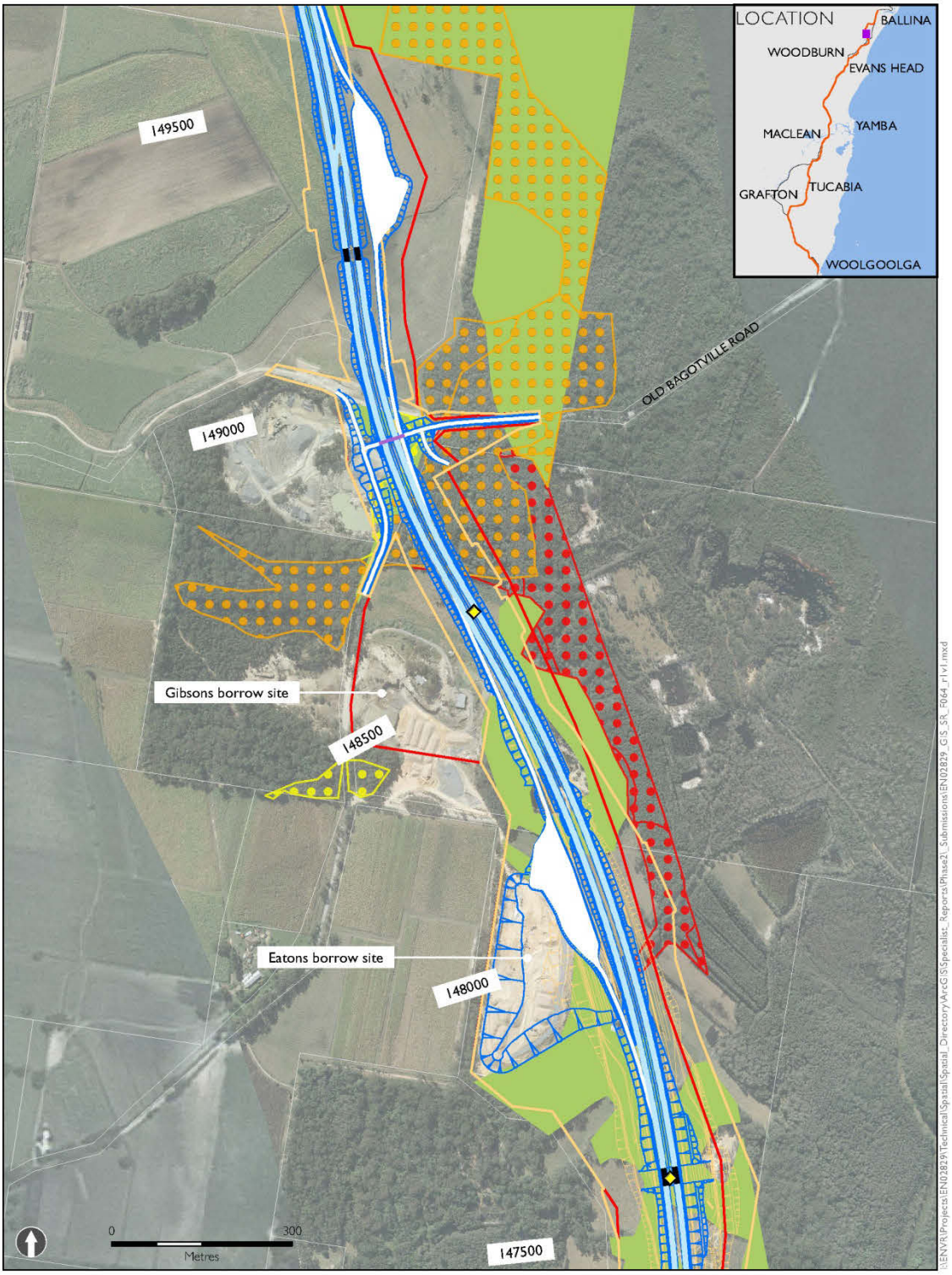

Figure 4-34: Rest area north of Richmond River- biodiversity features

Table 4-39 Comparison of impacts at rest area north of the Richmond River

BioMetric vegetation types	EIS design (ha)	Design refinement (ha)	Change in vegetation loss (ha)
Blackbutt grassy open forest of the lower Clarence Valley of the North Coast	20.2	15.5	-4.7
Coastal floodplain sedgelands, rushlands, and forblands (EEC, Freshwater Wetlands – TSC Act)	**0.5**	**0.2**	**-0.3**
Coastal heath on sands of the North Coast	1.8	1.9	+0.1
Narrow-leaved Red Gum woodlands of the lowlands of the North Coast (EEC, Subtropical Coastal Floodplain Forest – TSC Act)	**0.8**	**0.8**	**0.0**
Paperbark swamp forest of the coastal lowlands of the North Coast (EEC, Swamp Sclerophyll Forest – TSC Act)	**2.3**	**1.5**	**-0.8**
Swamp Mahogany swamp forest of the coastal lowlands of the North Coast (EEC, Swamp Sclerophyll Forest – TSC Act)	**0.1**	**0.1**	**0.0**
Swamp Oak swamp forest of the coastal lowlands of the North Coast (EEC, Swamp Oak Floodplain Forest – TSC Act)	**0.6**	**0.2**	**-0.4**
Tallowwood dry grassy forest of the far northern ranges of the North Coast	0.6	0.5	-0.1
TOTAL	**26.9**	**20.7**	**-6.2**

The reduction in vegetation clearing would include around 0.1 hectare of habitat critical to the survival of koala (DSEWPaC, 2012) and also defined as secondary koala habitat (DECC, 2008). The habitat from the Richmond River to Bagotville and Coolgardie contains an important koala population which is a source population for other koala populations west of this area on the Alstonville plateau and Blackwall Range. The area is important for koala movements.

There would be a small increase (0.1 hectare) in the area of Coastal heath on sand habitat for Long-nosed Potoroo being removed. However, this species could use a diversity of dry sclerophyll forest habitats in this location and is expected to also benefit from the overall reduction in habitat loss.

No threatened flora species have been recorded in the design refinement area.

The net benefit associated with the design refinement is in the shifting of the rest area out of a fauna corridor connecting Wardell heathlands to the west towards Bagotville. This would see a reduction in indirect impacts and benefit species such as koala and Long-nosed Potoroo. To further offset impacts in this area a new dedicated fauna landbridge has been included at station 147.6. This structure was not included in the EIS design and would contribute to the maintenance of wildlife movements in this important area for biodiversity.

No further management measures are required for this design refinement.

Urban design, landscape character and visual

The landscape character of the area is mainly rural-residential, with large areas of forestry, agricultural land, quarries and Wardell Heath located nearby, north and east of Bagotville.

The project in the vicinity of Old Bagotville Road consists of a series of low embankments and cuttings.

The landscape in character precinct 50 has a low–moderate ability to visually absorb change. As described in section 11.3 of the EIS, there would be a minor impact on the local character of the landscape to the west of the Wardell Heath from the relocated rest area. However, the landscape character impact would remain moderate–high as per the EIS. Although requiring additional land, the relocated rest areas would mainly be visible from the newly created transport corridor only, so overall impacts on landscape character and visual amenity are considered to be consistent with the EIS.

The visual impact of the project in the area was assessed from viewpoint 50 (overpass at Old Bagotville Road) and viewpoint 51 (Thurgates Lane). Neither viewpoint would provide direct views

towards the site of the design refinement. The inclusion of the design refinement would not alter the visual impact assessment for these locations, as described in section 11.3 of the EIS. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Aboriginal heritage

The northbound rest area was subject to field survey as part of the EIS investigation. No artefacts or sites were identified in the area and no impacts on Aboriginal heritage are anticipated.

The southbound rest area site was not surveyed due to access and property inundation, but was mostly inspected from the boundary. The rest area would affect two properties to the north of Old Bagotville Road. Lot 2 DP787102 occurs in an area of relatively low Aboriginal heritage potential, with minimal potential for archaeological evidence. No further investigation is required.

Lot 109 DP1137975 occurs in an area of low–moderate Aboriginal heritage potential. Further survey and test excavations (if required) would be undertaken to identify any presence and extent of potential archaeological evidence.

One Indigenous Protected Area (IPA) – Ngunya Jargoon – is adjacent to the project and the relocated southbound rest area. The IPA would not be impacted by the southbound rest area.

At this stage, no known Aboriginal heritage sites or places would be impacted by the design refinement. An additional mitigation measure has been identified (additional survey prior to construction) (refer to management measure AH3 in Chapter 5).

Historical (non-Aboriginal) heritage

There are no historical heritage items on the State Heritage Register or Local Environmental Plan located in the vicinity of the relocated rest areas. The nearest historical heritage is located further north (Meerschaum Vale Brickworks, Wardell), on Wardell Road, but is located over 3.5 kilometres from the relocated rest areas and would not be impacted.

No impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Traffic and transport

The design refinement would retain a northbound and southbound rest area, as proposed in the EIS. These rest areas would be at appropriate distances from the nearest rest areas, in accordance with the rest area strategy for the Pacific Highway (around 47 kilometres for the northbound rest area and around 17 kilometres for the southbound rest area). The rest areas would still cater for both heavy and light vehicles.

The design refinement would not change access or impact on any local road. Access to Old Bagotville Road and Montis Road across the highway would not be changed.

No additional impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Noise and vibration

Rest area noise assessments are undertaken under the Industrial Noise Policy, while the sleep disturbance is taken from the Road Noise Policy. The assessment of noise impacts is undertaken on sensitive receivers up to a distance of 600 metres away from the noise source.

The relocated southbound rest area would be over 600 metres away from any sensitive receivers and, as such, no noise assessment can be undertaken on these properties. However, any noise impacts would be within noise management levels.

The rest area noise assessment undertaken for the EIS identified that the closest sensitive receiver (R1817) would be around 520 metres away from the rest area/heavy vehicle checking station. The assessment identified that noise criteria for intrusive noise from the rest area would be 38 dB(A), with a sleep disturbance criteria of 48 dB(A). Intrusive noise levels at the residence would be around 35 dB(A), while the maximum noise level would be 39 dB(A). Therefore, neither of the predicted noise levels would exceed the appropriate criteria. The relocated northbound rest area would be a similar distance from a residential receiver (R1833), while receiver R1817 would be over 600 metres from the rest area. R1833 was identified in the EIS as requiring noise mitigation as a result of noise impacts

from the project alignment. It is anticipated that noise levels from the rest area at the receiver would be lower than those identified in the EIS for R1817.

No mitigation or management measures are required beyond those identified in the EIS.

Land use and property

The relocated southbound rest area would be located on agricultural (cane-farming) land. In the past few years, part of this property has been opened up to quarrying. The rest area would only impact on the cane-farming portion of the site, increasing the amount of land to be acquired. However, the highway alignment would impact on the quarry site, which would sterilise the use of the quarry. Surrounding the site, other land uses include agricultural land and conservation (Indigenous Protected Area) land.

The southbound rest area could impact on the use of adjoining cane farming. It could potentially alter management practices, particularly through restriction on cane burn-offs or insecticide spraying. However, as the southbound rest area would be situated east of the alignment and the main portion of the property, any impacts on the use of the property would be limited (and based on the distance to the highway alignment, not the rest area).

The northbound rest area would be situated within the existing project boundary. There would be no changes to surrounding land uses, nor any changes to acquisition boundaries.

In addition, this design refinement would reduce the project boundary identified in the EIS. This would reduce impacts on cane farming, rural and vegetated land.

Overall, the design refinement would alter the project boundary and reduce land acquisition by around 6.7 hectares. Four properties already impacted by the project would be subject to additional land acquisition, and four properties already impacted by the project would be subject to reduced land acquisition. Refer to Table 4-40.

Table 4-40: Comparison of property impacts for the rest area north of Richmond River

Property	Land use	EIS		Design refinement		Change in impact area
		Impact area (ha)	% of property affected	Impact area (ha)	% of property affected	
Lot 5, DP 843369	Mining and quarrying Tree and shrub cover Grazing	6.2	12.3	7.1	14.0	0.9
Lot 2 DP 585377	Mining and quarrying Grazing	1.8	26.4	6.93	100	5.13
Lot 2 DP 127944	Grazing Tree and shrub cover	0.6	24.4	0.4	17.7	-0.2
Lot 24 DP 755691	Tree and shrub cover	0.2	0.9	0.51	2.9	0.31
Lot 6 DP 843369	Mining and quarrying Tree and shrub cover Grazing	18.2	39.0	14.5	31	-3.7
Lot 232 DP 755691	Cropping Grazing Tree and shrub cover	5.3	8.2	4.8	7.4	-0.5
Lot 2 DP 787102	Cropping Grazing Tree and shrub cover	6.0	12.9	9.0	19.5	3
Lot 3 DP 619233	Grazing Tree and shrub cover	5.9	100	5.9	100	0

Property	Land use	EIS		Design refinement		Change in impact area
		Impact area (ha)	% of property affected	Impact area (ha)	% of property affected	
Lot 1 DP 787102	Mining and quarrying Tree and shrub cover Cropping	1.7	20.6	1.7	20.6	0
Lot 109 DP 1137975	Grazing Tree and shrub cover	6.0	32.5	6.1	33.5	0.1
Total		52.0		56.9		-4.9

The design refinement would not impact any new land uses or additional properties, and would reduce land use and property impacts by around 5 hectares. No additional impacts are anticipated during construction and operation and no mitigation or management measures are required beyond those identified in the EIS.

Social and economic

The socio-economic environment features agricultural operations and quarry operations. Rural residential land uses and Wardell Heath are also located nearby. The relocated rest areas could result in localised amenity impacts including noise, as discussed above.

The design refinement would not change access to or impact on any social infrastructure.

The rest areas would not have any additional socio-economic impacts from those identified in the EIS. Therefore, the impacts of this design refinement are considered to be consistent with the impacts described and assessed in section 17.3 of the EIS.

No mitigation or management measures are required beyond those identified in the EIS.

Management and mitigation

An additional mitigation measure is recommended for Aboriginal heritage. This additional mitigation measure is presented in Table 4-41 and Chapter 5. This design refinement would not require a change to the other proposed mitigation and management measures in Chapter 19 of the EIS.

Table 4-41: Relocated rest area – revised mitigation

Issue	ID number	Mitigation measure	Timing	Relevant section
General impacts to Aboriginal archaeological sites.	AH3	If any part of the project (such as an ancillary facility) is located in an area which has not been subject to Aboriginal heritage field survey and assessment, an assessment will be undertaken before that part of the project proceeds.	Pre-construction	10

4.4.16 Borrow sites, north of the Richmond River

Location

The two borrow sites, Eatons quarry and Gibsons quarry (hereafter known as Eatons borrow site and Gibsons borrow site), are located in Section 10 of the project between station 147.7 and 148.7. The sites are located around 2.5 kilometres north of the Richmond River and south-west of Wardell.

EIS design

The EIS design included the extent of Eatons borrow site within the project boundary but the site was not identified as a borrow site. The EIS design included a cutting batter on the quarry site, with the remainder of the site identified as an ancillary facility site.

Gibsons borrow site was not included in the EIS and was not within the project boundary.

Proposed design refinement

The design refinement shown in Figure 4-35 includes:

- Eatons borrow site (Lot 3/DP619233) in the project. The site would potentially provide up to 412,000 cubic metres of material. The borrow site extent would be the existing quarry area with an additional extension further east to the project alignment. Material from the borrow site would be hauled along the project alignment for use in project sections 9, 10 and 11. Material from this site is not anticipated to be hauled on local roads.
- Gibsons borrow site (Lot2/DP585377) in the project. The borrow site would potentially provide up to 145,000 cubic metres of material. The borrow site extent would be the existing extent of the quarry area. Material from the borrow site would be hauled along the project alignment for use in project sections 9, 10 and 11. Material from this site is not anticipated to be hauled along local roads.
- Operation of both sites for up to 12 months, with proposed operating hours of:
    - Monday to Friday: 6:00am – 7:00pm.
    - Saturday: 8:00am – 5:00pm.
    - Sunday and public holidays: No operations.
- Extraction of the material from the borrow sites via conventional excavation, ripping or hard ripping. There may be a need to use some form of blasting, but this would only occur where alternative extraction methods are not practical.
- Material processing, such as crushing and screening.
- Site rehabilitation, using available surplus material to re-contour the sites, mimicking the existing landform. The final landform would then be landscaped to a rural setting, using native vegetation to improve fauna connectivity.

Reason for design refinement

The inclusion of these borrow sites within the project would provide up to a 557,000 cubic metres of material that would otherwise be sourced from commercial quarry sites. These sites would reduce the need for importing earthworks materials from commercial sources and would minimise the need to haul imported material through the residential streets of Wardell.

Consultation

Roads and Maritime has undertaken consultation with a number of property owners in vicinity of the sites, but there are few sensitive receivers potentially affected by use of the sites. Receivers in this area would be further consulted once more detail on the use of the sites is developed, prior to construction.

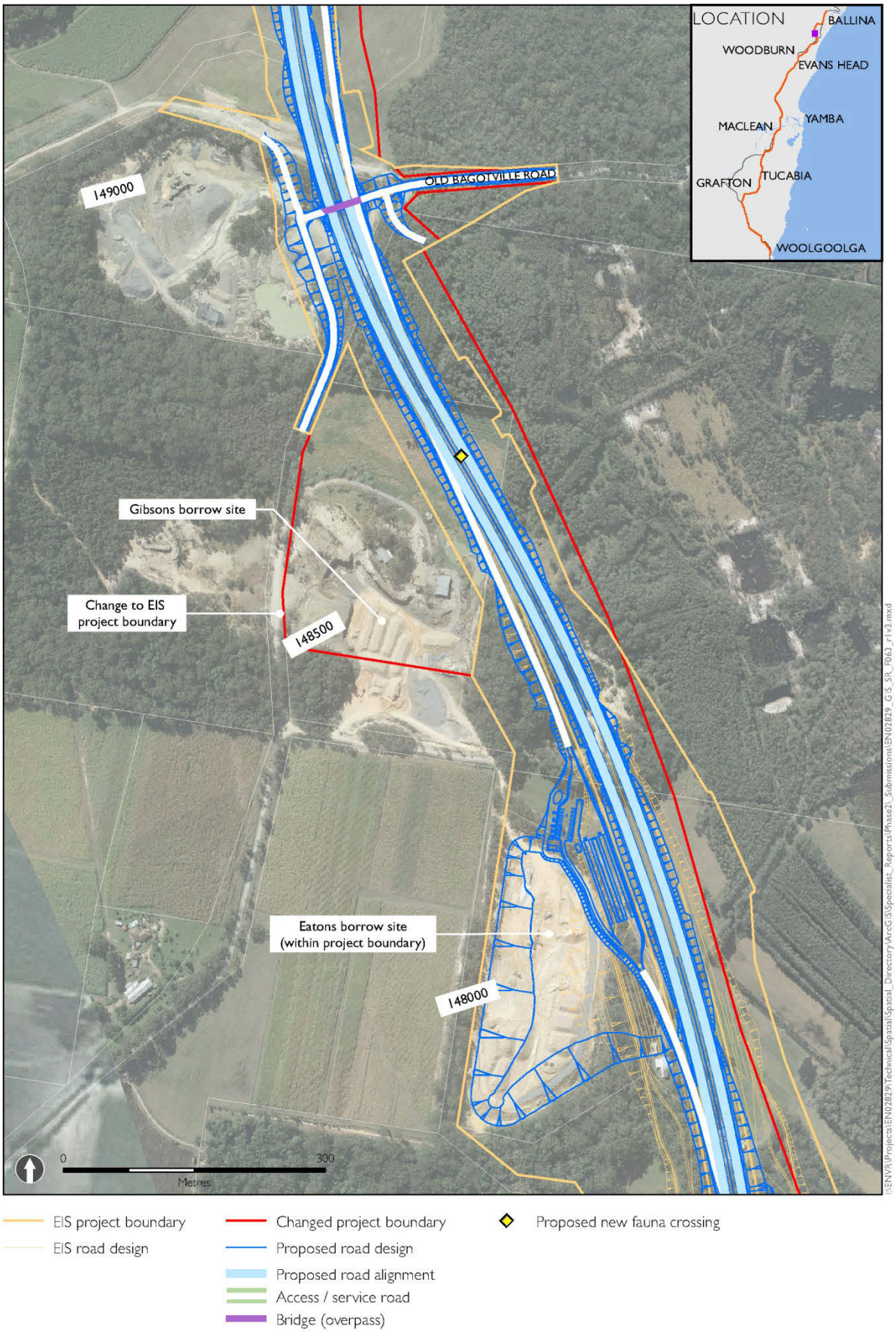

Figure 4-35: Additional borrow sites

Environmental assessment

Hydrology and flooding

The nearest watercourse is Bingal Creek, located around 750 metres north of Gibsons borrow site and one kilometre north of Eatons borrow site. A minor ephemeral creek is located just to the north of Gibsons borrow site. The borrow sites are located outside of the Richmond River floodplain and use of the sites is not expected to change the local flooding behaviour of the area. There would be no impacts additional to those identified in the EIS (Section 8.3) as a result of this design refinement. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

The design refinement is located on elevated terrain where there is no mapping of known or potential acid sulfate soils.

The EIS identified quarries at Old Bagotville Road as being areas of environmental concern. There are potential impacts from the current use of these sites including fuel stores, and workshops (which have potential asbestos structural fabric). Potential contaminants would include total petroleum hydrocarbons (and BTEX), polycyclic aromatic hydrocarbons, metals, and asbestos. The use of these borrow sites could result in the disturbance of contaminated soils and/or underground storage tanks during excavation. This could impact on the quality of groundwater, surface water and soils. Appropriate management measures for potential impacts were included in the EIS.

While there are no major watercourses or sensitive fish habitat close to either borrow site, there is a small creekline to the north of Gibsons borrow site. The increased extraction from the site could increase the risk of water quality impacts on the small creekline and other small drainage lines in the area. However, these sites are existing material quarries and have erosion and sedimentation controls to maintain surface runoff. These erosion and sedimentation controls would be reviewed prior to construction to determine if additional controls are required on the sites.

The borrow sites would be excavated down to an RL of 4.5 (for Gibsons borrow site) and RL of 6.0 for Eatons borrow site. The groundwater levels in this area (collated from existing bore data); vary between RL 6 and RL 10. As such, the borrow sites would be excavated below the local groundwater table and have a high potential impact (the sites are categorised as Type A cuttings). While this could lead to seepage of the groundwater out of the cutting faces and result in localised drawdown of the groundwater table, no impacts on the regional groundwater table are anticipated. Groundwater quality is unlikely to be impacted by further excavation. Controls and monitoring recommended for Type A cuttings would be applicable to these sites. No mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

A biodiversity site survey has been conducted for the two borrow sites. The survey identified that the quarry areas are cleared of vegetation and contain only modified and disturbed areas, including access roads and sedimentation basins.

There is remnant vegetation around the perimeters of the borrow site extraction areas. At Gibsons borrow site, adjoining vegetation would not be impacted. At Eatons borrow site, around 0.8 hectare of disturbed vegetation of the Blackbutt grassy open forest of the lower Clarence Valley of the North Coast would be removed. This is in an area between the disturbed quarry area and the highway design batters. The removal of this vegetation was anticipated in the EIS with this area included within the construction boundary. This vegetation type forms habitat for a wide range of fauna including koala, Long-nosed Potoroo and a range of bird and bat species.

Blackbutt grassy open forest has been identified as habitat critical to the survival of koala (DSEWPaC, 2012) and is also defined as secondary koala habitat according (DECC, 2008). A habitat assessment was undertaken at a site just east of the Eatons borrow site. While the assessment showed that the vegetation is suitable for koala habitat, no koala activity was detected.

On completion of the use of these sites, available surplus material would be backfilled into the borrow sites. The sites would then be rehabilitated with native plants to provide a vegetated link to other areas of vegetation surrounding the borrow sites, including fauna connectivity structures that would be included in the design at this location.

Urban design, landscape character and visual

The project at this location passes through landscape precinct 50 – Bingal Creek – and is adjacent to precinct 49 – Bagotville floodplain. The landscape character of the area is mainly rural, with agricultural activities (in precinct 49), extractive industry activities and forested land (both in precinct 50). Wardell Heath located to the north-east and the Blackwall Ranges to the west dominate the landscape. Precinct 49 has a moderate ability to absorb change due to the undulating landform and enclosed landscape character, while precinct 50 has a low–moderate ability to absorb change.

The project, as assessed in the EIS, would have a moderate to moderate–high impact on the landscape character of the two precincts. The design refinement would not change this rating.

The nearest viewpoint to the two borrow sites is viewpoint number 50 (overpass at Old Bagotville Road). Impacts from the project at this viewpoint location were assessed as moderate.

The design refinement would result in the extraction of materials from areas currently subject to extensive quarrying. At Eatons borrow site, the extent of extraction would be increased further east towards the project alignment. The extent of this area would not be visible except for those travelling the highway but revegetation of the site and the space between the quarry and the travel lanes would reduce this visibility. As the inclusion of the borrow sites would not change the use of the site (during construction), the design refinement would not alter the moderate–high impact of the project on the landscape character.

Due to topography and intervening vegetation to the south of Old Bagotville Road, these two borrow sites would not be visible from viewpoint 50. As such, there would be no change to the visual impact at viewpoint 50 from this design refinement.

Due to the high level of existing disturbance to landform at both borrow sites and little opportunity of viewing the sites, no impacts are anticipated additional to those in the EIS.

Following depletion of the resource at the borrow site, the two sites would be rehabilitated by contouring the excavation area to provide an appearance that conforms to the adjacent landforms (refer to management measure UD12 in chapter 5 of this report). Landscaping on the site would use indigenous species and would seek to establish koala habitat on the sites. This vegetation would connect to the east of the project by a fauna landbridge that would be constructed at station 147.6.

Aboriginal heritage

An Aboriginal assessment including field walkover with Registered Aboriginal Parties (RAPs) was undertaken of the Gibsons borrow site (refer to Addendum CHAR in Appendix D of this report). No heritage sites were identified within the Gibsons borrow site.

The Eatons borrow site was subject to assessment (including field walkover with RAPs) as part of the EIS investigations. No heritage sites were located on the borrow site (refer to section 12.3 of the EIS).

The Aboriginal heritage assessments identified that both borrow sites are of low potential for Aboriginal heritage items due to their disturbed state.

No impacts are anticipated additional to those in the EIS and no further management measures are required.

Historical (non-Aboriginal) heritage

Historical heritage assessments undertaken for the borrow sites were undertaken as part of the EIS (Eatons borrow site) and the design refinements (Gibsons borrow site). Field investigations were undertaken at the same time as the Aboriginal heritage walkovers.

The assessments identified that there are no historical heritage items listed on any local environmental plan or on the State Heritage Register that would be impacted by the design refinement. No historical heritage sites were found in or adjacent to the design refinement area.

No impacts are anticipated additional to those in the EIS and no further management measures are required.

Traffic and transport

It is anticipated that the extraction of material would generate around an additional 18,600 truck movements for the duration of the project. Material excavated from the sites would be hauled north from the borrow sites for use in sections 9, 10 and 11. Haulage of material to sections 10 and 11 would be within the project boundary along the formation north of the design refinement. This is the same approach as that for haulage of material from the West of Wardell borrow site (as per the EIS). To haul material down to Section 9, the project boundary would be used south to the Richmond River and across the proposed bridge (if constructed early in the project). The alternative route would be to haul the material north to Coolgardie Road, then travel south along the existing highway to Section 9. This would avoid the need to haul material through the residential streets of Wardell and there would be no additional impacts on local roads in the area.

The use of these sites would avoid the need to import material to the site from external commercial sources or other project sections, which would require haulage along Old Bagotville Road and through Wardell to access the project formation during construction. The EIS identified that material for Section 10 would need to be hauled from Section 3. This would equate to around 24,600 vehicle trips (170 truck trips per day). The use of these sites would avoid these truck movements and associated impacts on local roads and the existing highway.

As the borrow sites would only be used during construction, and then rehabilitated during the construction of the upgrade, no traffic impacts would occur once the project is operational.

No mitigation or management measures are required beyond those identified in the EIS.

Noise and vibration

Both borrow sites currently operate as chert quarries and so proposed site operations during project construction are likely to be similar and generally within the same extraction area. The construction activities and associated plant to be used at the borrow sites are listed in Table 4-42. The sound power level is included for the purpose of the modelling.

Table 4-42: Activities and associated plant

Activity	Plant	Sound power level (LAeq dB(A))
Excavation	1 x 30 t excavator 2 x 20 t dozer 1 x backhoe 2 x front end loader 4 x 25 t product truck	103 103 110 114 108
Ripping	2 x scraper 1 x grader 1 x 30 t excavator 2 x front end loader 4 x 25 t product truck	108 114 103 114 108
Hard ripping	2 x excavator with rock breaker 2 x front end loader 4 x 25 t product truck	117 114 108
Blasting	Rock hole drilling Rock bolting/hammering:	113 118
Materials processing	1 x portable crushing plant 1 x portable screening plant	118 115
Demobilisation and backfill	1 x 30t excavator 2 x 20 t dozer 1 x backhoe 2 x front end loader 4 x 25 t product truck	103 103 110 114 108

There are two noise-sensitive residential receivers within 600 metres of the borrow sites. One of these receivers (R1833) is within 600 metres of the project and was assessed in the EIS against predicated noise impacts from the project. However, the other receiver (G1) is not within 600 metres of the project and, as such, would not have been assessed in the EIS. These receivers are listed in Table 4-43.

Table 4-43: Sensitive receivers located at Bagotville borrow sites

Receiver ID	Receiver type	Distance and bearing from borrow site boundary
R1833	Residential	360 metres west
G1	Residential	390 metres south-west

Modelling and results

The two borrow sites were assessed separately and cumulatively to consider potential impacts from simultaneous operations. Only daytime hours were assessed, as borrow sites would not operate during night-time hours.

The modelling results are shown in Table 4-44 and Table 4-45 including the noise management level (NML). Table 4-44 and Table 4-45 show that no exceedances of the NMLs are predicted from the operation of a single borrow sites, and there is no exceedance of the highly noise affected criteria of 75 dB(A) at any site.

Table 4-44: Gibsons borrow site noise modelling results

Receiver	NML, dB(A)	Predicted $L_{Aeq,15min}$, dB(A)			
		Excavation	Ripping	Hard ripping	Materials processing
R1833	45	40	40	42	42
G1		31	31	33	33

Exceedance of NML in bold.

Table 4-45: Eatons borrow site noise modelling results

Receiver	NML, dB(A)	Predicted $L_{Aeq,15min}$, dB(A)			
		Excavation	Ripping	Hard ripping	Materials processing
R1833	45	40	40	42	42
G1		38	38	40	40

Exceedance of NML in bold.

However, Table 4-46 shows that with the two borrow sites operating simultaneously, there may be an exceedance of the NML at R1833.

Table 4-46: Cumulative impact of Gibsons and Eatons borrow site operations

Receiver	NML, dB(A)	Maximum predicted $L_{Aeq,15min}$, dB(A)
R1833	45	**51**
G1		44

Exceedance of NML in bold.

However, this assessment assumes all activities at both borrow sites are undertaken simultaneously and does not consider any noise attenuation by the borrow site walls. In practice, it is unlikely that all activities would be undertaken simultaneously at both borrow sites. As a result, general operations at the two borrow sites are likely to be compliant with the NMLs defined for the project.

Potential noise mitigation measures, if required, were identified in the EIS and would be applicable to the operation of these sites. Measures would include proactive site management to reduce the simultaneous operation of all plant at each borrow site and the positioning of plant so it is shielded from receivers.

Vibration impacts

At the two borrow sites, the only potential vibration-generating activity, with the exception of blasting (see below) would result from rock hammering during hard ripping. Table 4-47 lists potential risks from rock hammering, and identifies at what distances an impact is likely to occur.

Table 4-47: Generic vibration impact associated with rock hammering/breaking

Activity	Separation distance from receiver / metres		
	Low risk	Medium risk	High risk
Structural damage	>20	10–20	<10
Human comfort	>40	30–40	<30

As the receivers nearest both borrow sites would be considerably more than 30 metres away, the risk of structural damage or impact on human comfort would be minimal.

Blasting

There is potential for blasting to occur at the two borrow sites, but the exact location for potential blasting has not yet been identified. A generic blasting assessment has been completed to quantify potential risks for the closest receivers, assuming the shortest potential separation distance.

Where a blast location is predicted to have an impact on a receiver, a detailed blasting assessment would be required prior to works starting so that specific site geology can be considered.

Table 4-48 and Table 4-49 provide vibration and overpressure predictions at the sensitive receivers.

Table 4-48: Closest sensitive receiver overpressure prediction

Receiver	Receiver type	Separation distance, metres	Overpressure according to charge / dB					
			1	5	10	15	20	25
R1833	Residential	360	100	107	110	112	113	114
G1	Residential	390	99	106	109	110	111	112

Table 4-49: Closest sensitive receiver vibration prediction

Receiver	Receiver type	Separation distance metres	Vibration according to charge (Peak Particle Velocity- PPV) / dB					
			1	5	10	15	20	25
R1833	Residential	350	0.10	0.35	0.31	0.85	1.06	1.27
G1	Residential	390	0.08	0.30	0.51	0.71	0.90	1.07

Table 4-48 shows that it is unlikely blasting at the two borrow sites would exceed project criteria for overpressure at the two closest receivers where the blast charges are no greater than 25 kilograms.

Table 4-49 shows that where a charge of less than 25 kilograms is used, the potential for vibration criteria to be exceeded would be low.

Although the blasting assessment has shown no exceedances in vibration or overpressure criteria, once the blasting methodology is finalised, further assessment is recommend as described in Section 15.4 of the EIS.

No mitigation or management measures are required beyond those identified in the EIS.

Land use and property

Roads and Maritime has acquired Gibsons borrow site and is in the process of acquiring Eatons borrow site (Eatons borrow site was included in the project boundary in the EIS). The Gibson borrow site, however, is a 6.8 hectare property that Roads and Maritime has acquired for this design refinement.

Both borrow sites are operational commercial quarries. However, the project would be constructed adjacent to the eastern boundary of both sites. There is a risk that the project could result in the sterilisation of the material at these sites (ie that the material on site could not be removed due to obstructions that make the quarry unable to operate). While the project would maintain access to these quarries, the closeness of the highway may place restrictions on operation, particularly in regards to blasting. This could result in the sterilisation of the material. To avoid this business impact, Roads and Maritime will acquire both properties to provide material for the project, thereby using the sites' material reserves productively. Acquisition would also result in less reliance on quarry sites away from the project.

The design refinement would change the long-term land use of these sites from extractive industry to road corridor (those parts that fall under the alignment). The remainder of the sites would be revegetated and become rural land. There would be no impact on the land use of adjoining properties as a result of this design refinement. No mitigation or management measures are required beyond those identified in the EIS.

Social and economic

Extractive industries form an important part of the socio-economic environment of the north coast of NSW. In Ballina Shire, there are six mining operations, comprising 0.2 per cent of businesses in the local government area. In the Bagotville area, there are four quarry sites, of which Eatons and Gibsons are two. These borrow sites, when material has been extracted, would be rehabilitated. This would remove the availability of the material for the region and could result in further shortages of material in the north coast region. The other two quarries near the project would continue to be consulted regarding the potential impacts on operation as a result of the project.

The area is predominantly rural with only two residences within 600 metres of the borrow sites. Use of the borrow sites as material source, with an increased extraction rate, would result in increased truck movements, noise and potentially dust generation. However, as these sites are currently operated as quarries, there is not anticipated to be any significant change to the rural nature of the area from the use of these borrow sites.

No mitigation or management measures are required beyond those identified in the EIS.

Management and mitigation

An additional mitigation measure is recommended for the landscaping of the site. This is presented in Chapter 5 and Table 4-50. This design refinement would not require a change to the other proposed mitigation and management measures in Chapter 19 of the EIS.

Table 4-50: Borrow sites – additional mitigation

Issue	ID number	Mitigation measure	Timing	Relevant section
Visual impact of borrow sites	UD12	Any backfilling of the Eatons and Gibson borrow sites will be undertaken with available surplus material from the project. Landscaping on the site use indigenous species, including those species suitable for Koala. The landscaping will connect to the existing vegetation to the east of the project by a fauna land bridge to be constructed at station 147.6. Rehabilitation of the sites will be undertaken in accordance of the landscape strategy (UD3) and design principles (UD5).	Construction	10

4.4.17 Borrow site west of Wardell (Lumleys Hill)

Location

The west of Wardell borrow site is located in Section 10, on Lumleys Lane (between stations 152.1 and 152.7) near Wardell Road.

EIS design

The EIS design consists of:

- A borrow site located west of Wardell Road between station 152.2 and 152.6.
- An excavation area over three hectares providing around 333,000 cubic metres of material that could be used in road construction.
- An excavation area up to 25 metres deep and extending around 150 metres to the west of the main alignment.

The EIS design is shown in Figure 4-36.

Proposed design refinement

The revised borrow site design would entail:

- Increasing the borrow site extent by around five hectares to a total of 8.4 hectares, incorporating a property to the north.
- Excavation to 20–23 metres, down to an RL of 6 metres.
- Increasing the total amount of material to be won from the site to about 620,000 cubic metres.
- Extracting material by conventional extraction techniques include ripping and hard ripping.
- Modifying an access to an adjoining property around station 152.6.
- Haulage from the site directly to the project corridor, which is adjacent to the site.
- Stockpiling topsoil and vegetation established on the site, adjacent to the excavation area.
- Processing excavated material through the use of crushing and screening plant.
- Rehabilitating the site using available surplus material, and revegetating the site using indigenous species to match the existing rural landscape.

The borrow site would provide material to construct sections 10 and 11 of the project. It would be operational for 12 months, and operate during the proposed construction hours.

It is anticipated that material would be extracted with excavators and bulldozers, without the need for blasting.

The design refinement is shown in Figure 4-36.

Reason for design refinement

The aim of this design refinement is to minimise material haulage through the residential streets of Wardell and along other local roads. This would be achieved by sourcing earthworks material from sites along the alignment.

By increasing the amount of material obtained from the west of Wardell borrow site (which is identified in the EIS), less material would need to be imported through Wardell to the project. Material would be hauled north via the road corridor and/or the realigned Lumley's Lane. Extending the site west of Hillside Lane as a borrow site would provide additional construction materials that could be transported along the project formation.

Consultation

A community information session was held at Wardell Memorial Hall on 15 January 2013. Information sessions and stakeholder meetings were also held with local residents, those adjacent to the borrow site along Hillside Lane and directly affected landowners. Feedback included questions regarding how construction traffic could be minimised through Wardell. The design refinement responds to this issue.

Roads and Maritime has consulted the two residents adjacent to the borrow site in Hillside Lane regarding the proposed change in borrow site extent. Both residents made submissions regarding the project (including potential impacts from the borrow site) to the EIS. The issues raised and Roads and Maritime response are detailed in Chapter 2 of this report.

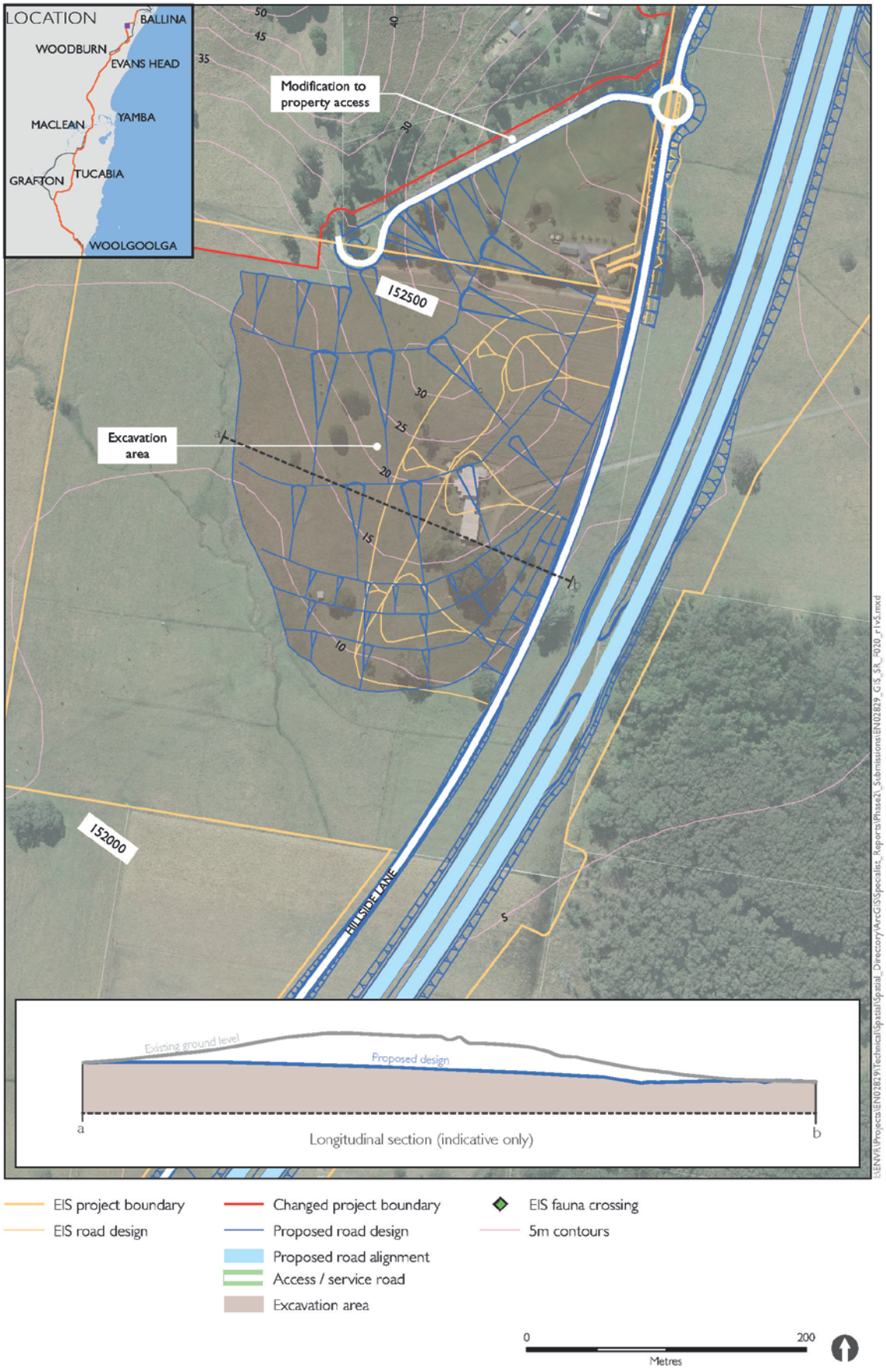

Figure 4-36: Revised excavation design at the borrow source west of Wardell

Environmental assessment

Hydrology and flooding

The nearest watercourse at Bingal Creek is located around 1.5 kilometres to the south-east of the site, west of Wardell Road. Although the project boundary would change, no additional impermeable surfaces would be constructed. Therefore, no additional impacts on flood impact, duration or velocity are predicted. The impacts of this design refinement would be consistent with the impacts outlined in the EIS. Therefore, no mitigation or management measures are required beyond those identified in the EIS.

Soils, sediments and water

The site is located on elevated terrain where acid sulfate soils are not expected. There are no known areas of environmental concern, and contamination impacts are not anticipated.

There are no major watercourses or sensitive fish habitat in close proximity of the site, but an ephemeral drainage line is located on the borrow site, flowing from west to east. Appropriate measures would be implemented during construction, including diversion drains around the site to manage water flows. No additional water quality impacts are anticipated.

The design refinement would more than double the area of land to be disturbed as part of the borrow site. This increase in the borrow site would require additional construction sedimentation basins to capture sediment and surface runoff from the site. The sizing of the basins would be as detailed in the EIS. The basins would be in additional to other basins required for the project alignment.

Groundwater in the area flows to the east. The borrow site is categorised as Type A cutting as it would intersect the groundwater table. This could lead to localised groundwater impacts including seepage of the groundwater table through the cutting. This is likely to be relatively diffuse across the northern face of the cutting, closest to the hill. Seepage may be concentrated along the access road to the north of the cutting, to the west of Hillside Lane. Controls in section 9.4 of the EIS, including ongoing groundwater monitoring during construction, would manage potential impacts. No mitigation or management measures are required beyond those identified in the EIS.

Biodiversity

The design refinement would be on cleared farmland with scattered remnant paddock trees, mostly Stringybark (*Eucalyptus acmenoides*) and the introduced and invasive Camphor Laurel. Of the scattered low-density trees, a single mature tree is hollow-bearing and provides potential roosting habitat for several hollow-dependent threatened fauna species including several threatened microchiropteran bats and a small range of birds such as the Little Lorikeet and Masked Owl. The tree would need to be felled for the borrow site extension.

Associated with the scattering of trees is also a potential food resource for nectivorous fauna in the form of seasonally available blossom. Again, this is of greatest value to wide-ranging and highly mobile species such as the Grey-headed Flying-fox, Little Lorikeet and Swift Parrot.

The design refinement would only have a minimal change in impact from the EIS design. The site is located in cleared land with a lack of permanent freshwater aquatic habitat. As such, no indirect impacts are expected on fauna, and there would be no additional impacts on connectivity for fauna.

No additional management measures are required for this design refinement.

Urban design, landscape character and visual

The landscape character of the area is mainly rural-residential, with agricultural land and forestry dominating the landscape. The nearest dwelling is located around 50 metres to the north of the borrow site. Around ten isolated properties are within around 500 metres of the borrow site, with a cluster located around 450 metres further north. The area west of the excavation site has views towards the project.

The design refinement would involve creating a major cutting west of Wardell Road in an existing rural setting, and this is no different from the design assessed in section 11.3 of the EIS. The area to be excavated includes a rural-residential property with a scattering of mature trees, located on a cleared agricultural site.

The increased excavation would triple the site area impacted, when compared to the EIS design. The site would be visible to receivers located on the eastern side of the Blackwall Ranges. The main visual impacts would be from viewers in the road corridor. However, these impacts would be temporary as the borrow site would be used only during the construction of the project, and then rehabilitated to provide a more natural appearance (refer to management measure UD11 in chapter 5).

Considerable earthworks and removal of scattered trees are required to accommodate the cutting. Although, the number of visual receivers remains unchanged, visual impacts at viewpoint 52 would remain moderate to high as the site is within a scenic agricultural setting.

Aboriginal heritage

The area has moderate sensitivity for Aboriginal heritage, as it includes areas on the crest and slopes of a rise adjacent to low-lying swampy land likely to have been used by Aboriginal people. The site is within the vicinity of the Cooks Hill to Teven Junction culturally significant landscape.

The design refinement was discussed with Registered Aboriginal Parties at an Aboriginal Focus Group meeting on 7 February 2013 at Wardell Hall. Aboriginal heritage was assessed by field survey with a site inspection carried out by project archaeologists on 19 February 2013.

The Registered Aboriginal Parties consulted prior to the site inspection were:

- Jali Local Aboriginal Land Council.
- Burabi Aboriginal Corporation.
- Gubba Gunya Aboriginal Corporation.
- Numbahjing Native Title Claimants.
- Tweed, Byron and Ballina Community Transport Inc.

Those in attendance during fieldwork were:

- Jali Local Aboriginal Land Council.
- Burabi Aboriginal Corporation.

The site inspection and consultation did not identify any new Aboriginal heritage items that could result from the extension of the borrow site. Potential impacts would be consistent with the EIS and no mitigation or management measures are required beyond those identified in the EIS.

Historical (non-Aboriginal) heritage

No historical heritage items listed on any local environmental plan or on the State Heritage Register would be impacted by the design refinement. No additional impacts are anticipated, and the assessment is considered consistent with section 13.3 of the EIS. No mitigation or management measures are required beyond those identified in the EIS.

Traffic and transport

The extension of the borrow site would create an additional 9500 truck movements within the project formation, assuming a vehicle load of 30 cubic metres per truck. Trucks carrying fill material would use the project formation to access areas north and south of the borrow source. Extending the borrow site would have the benefit of reducing the need to transport fill from further south along the highway and local roads.

The EIS described the requirement for a Construction Traffic Management Plan (section 14.4 of the EIS) to manage the traffic construction activities at the borrow site. No mitigation or management measures are required beyond those identified in the EIS.

Noise and vibration

The design refinement at the west of Wardell borrow site was assessed to identify the potential for further construction noise and vibration impacts on sensitive receivers from the extension of the site.

It is assumed the site would operate continuously for up to 12 months, with the earthworks required for the construction of sections 10 and 11. The site would be operational only during the proposed construction hours. Excavation techniques would include ripping and hard ripping and would require

materials processing. Haulage to and from the borrow site would be along the project corridor (which is adjacent to the site) or along the existing highway and local roads (these impacts have been assessed in Working paper – Noise and vibration and no further impacts are anticipated). Once the material has been extracted, the site would be backfilled with surplus material.

The construction activities and associated plant to be used for the borrow site would be similar to those identified for the Lang Hill borrow site. Plant and sound power levels are shown in Table 4-32: The plant for each activity is modelled as per the methodology outlined in Working paper – Noise and vibration (section 3.2.3, Part A).

Sensitive receivers and noise management levels

There are 11 noise-sensitive residential receivers within 600 metres of the west of Wardell borrow site. In addition, there are two water reservoirs to the north of the site. The receivers surrounding the site are listed in Table 4-51 and shown in Figure 4-37.

Table 4-51: West of Wardell sensitive receivers

Receiver ID	Receiver type	Distance from site boundary
R1843	Residential	520 metres south
R1845	Residential	450 metres south
R1848	Residential	430 metres east
R1852	Residential	415 metres east
R1855	Residential	400 metres east
R1858	Residential	225 metres north
R1861	Residential	300 metres north
R1864	Residential	380 metres north
R1865	Residential	300 metres north
R1866	Residential	230 metres north
R1868	Residential	400 metres north
R1871	Residential	550 metres north

For receivers within 600 metres of the upgrade, noise management levels (NML) were set in line with Noise Catchment Areas (NCA), (Working paper – Noise and vibration section 3.2.3 of Part A). The relevant NMLs are identified in Table 4-52:

The noise assessment was undertaken using the same methodology as described in the EIS. The plant for each activity was modelled as per the methodology outlined in Working paper – Noise and vibration (section 3.2.3, Part A).

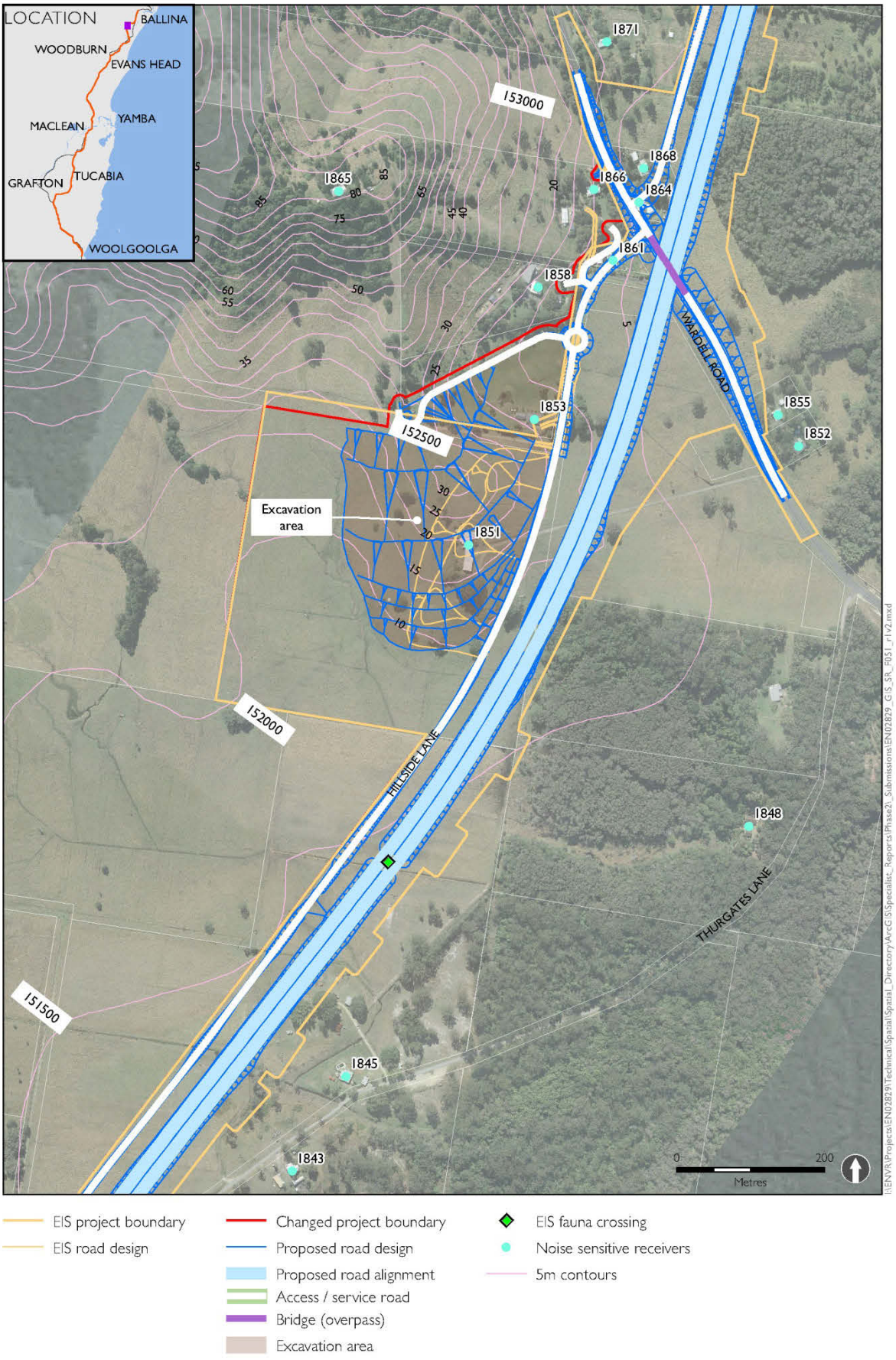

Figure 4-37: West of Wardell borrow source- noise sensitive receivers

Noise modelling

The results of the modelling show the predicted operational $LA_{eq,15min}$ for mobilisation, materials extraction and demobilisation/backfill and take into account the ancillary facility modelling methodology and time corrections for operating durations. The results for each activity are presented in Table 4-52.

Table 4-52: West of Wardell noise modelling results

Receiver	NML	Predicted $L_{Aeq,15min}$, dB(A)		
		Mobilisation	Materials extraction	Demobilisation and backfill
R1843	43	44	**46**	44
R1845	43	44	**45**	44
R1848	53	47	49	47
R1852	43	**46**	**48**	**46**
R1855	43	**46**	**48**	**46**
R1858	43	**44**	**46**	**44**
R1864	43	**52**	**54**	**52**
R1865	45	41	43	41
R1866	43	40	42	40
R1868	43	42	**44**	42
R1871	43	42	**44**	42
R1843	43	44	**46**	44

Table 4-52 shows that exceedances of the NML are estimated at all but three of the sensitive receivers. The exceedance would vary from 1 to 5 dB(A); the highest at R1852 and R1855. However, no exceedances of the 'highly noise affected' criteria are predicted. Where receivers are predicted to be exposed to levels exceeding the adopted NML, management or mitigation measures would be required (such as those detailed in Appendix I of the Noise and Vibration Working Paper). No additional mitigation or management measures are required beyond those identified in the EIS.

Vibration impacts

The only potential vibration impacts at this borrow site would result from rock hammering during hard ripping. No blasting would be required. Rock hammering would pose a minimal risk for receivers greater than 30 metres away in terms of structural damage or impact on human comfort. As all receivers would be further than 30 metres from the closest site boundary, the risk of building damage or human comfort impact would be minimal. No mitigation or management measures are required beyond those identified in the EIS.

Land use and property

The design refinement would extend the project boundary 120 metres further to the north of the area assessed in the EIS. This would require an additional 1.83 hectares of land. The property required for the borrow site is currently being acquired by Roads and Maritime, so no additional private acquisition would be required.

The design refinement would result in impacts on grazing and rural residential properties. However, other than amenity impacts, the design refinement would not impact on the land use of adjoining properties.

No mitigation or management measures are required beyond those identified in the EIS.