Transport
for NSW

New Richmond Bridge and Traffic Improvements Stage 1 – The Driftway

Addendum review of environmental factors

July
2024

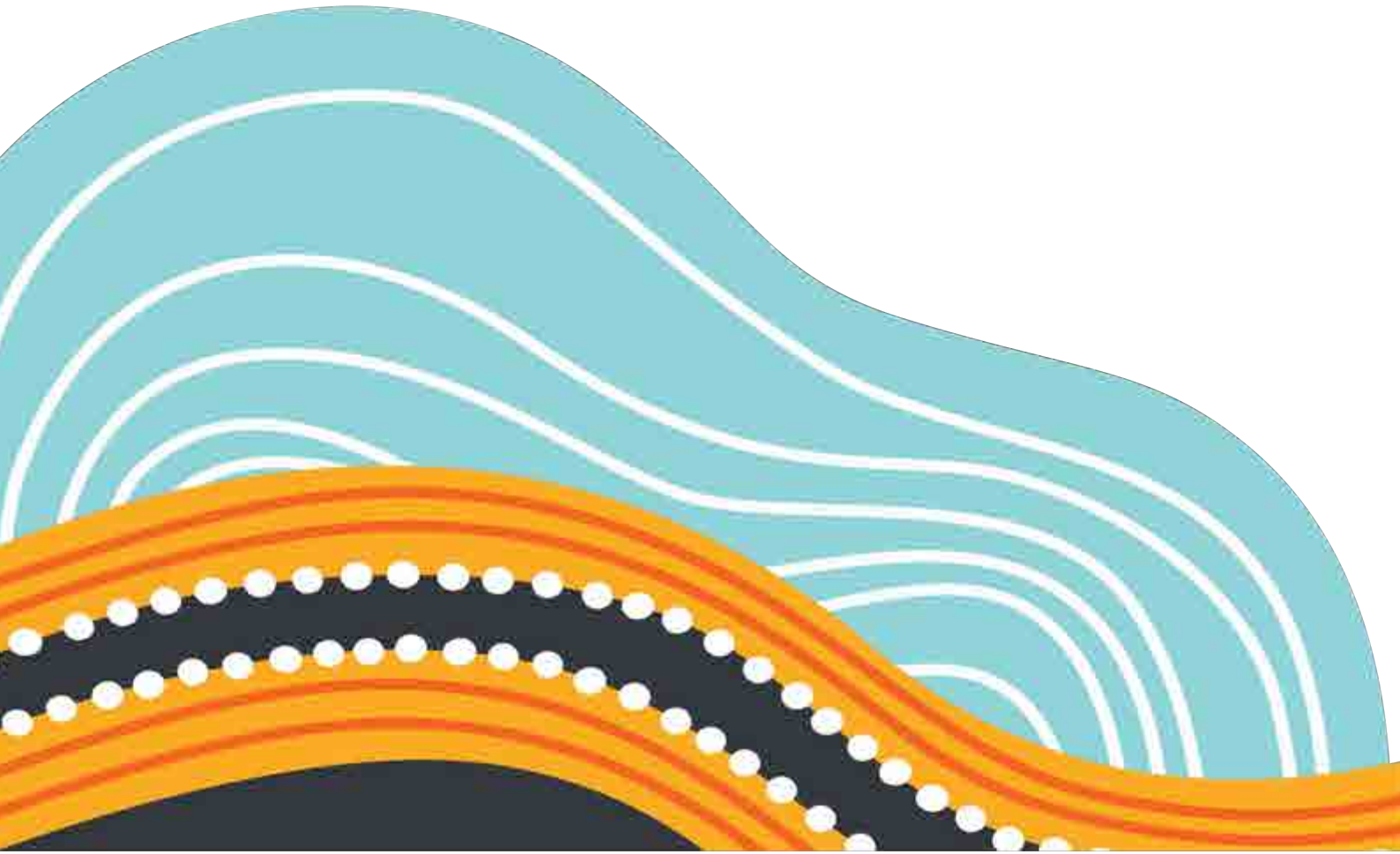
Acknowledgement of Country

Transport for NSW acknowledges the traditional custodians of the land on which we work and live.

We pay our respects to Elders past and present and celebrate the diversity of Aboriginal people and their ongoing cultures and connections to the lands and waters of NSW.

Many of the transport routes we use today – from rail lines, to roads, to water crossings – follow the traditional Songlines, trade routes and ceremonial paths in Country that our nation's First Peoples followed for tens of thousands of years.

Transport for NSW is committed to honouring Aboriginal peoples' cultural and spiritual connections to the land, waters and seas and their rich contribution to society.



Prepared by Mott MacDonald and Transport for NSW.

Executive summary

The proposed modifications

Transport for NSW (Transport) has proposed to upgrade approximately 3.6 kilometres of The Driftway between Londonderry Road and Blacktown Road as part of the New Richmond Bridge and traffic improvements – Stage 1 The Driftway (the Project). The Project is located in the suburbs of Richmond, Londonderry and South Windsor, NSW. Transport prepared The *New Richmond Bridge and traffic improvement – Stage 1 The Driftway Review of Environmental Factors (REF)* (Transport 2021) in November of 2021, referred to in this addendum REF as the "Project REF", as part of its requirements to assess environmental impacts under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The Project REF was placed on public display from 15 November till 10 December 2021. A submissions report dated March 2022 was prepared to respond to submissions raised and the Project was determined to proceed in March 2022.

Transport for NSW developed the detailed design, following the determination of Project REF. The detailed design process identified proposed modifications to meet design standards and Project objectives. These are listed below:

- The implementation of an additional southbound lane on the Londonderry Road roundabout, adjusted tie-ins related to this component extend approximately 50m to the west and 100m to the north and south direction beyond the Project REF boundary.
- Adjustment to the ancillary facility layout to avoid flood prone areas, this component extends beyond the Project REF Boundary.
- Changes to the road network surrounding the Hawkesbury Waste Management Facility (HWMF) including the introduction of a 50m auxiliary left turn lane and adjustments to the posted speed, within the Project REF boundary.
- Shortening of the maintenance access track from the Driftway to avoid the need to cross over a tributary of Rickabys Creek and inclusion of an additional maintenance access track from Blacktown Road.
- Design optimisation of lane markings, barriers, swales, batters, and driveway tie-ins throughout the length of the Project REF. Some driveway tie-ins extend beyond the Project REF boundary.

Need for the proposed modifications

Section 2.1 of the Project REF addresses the strategic need for the Project. The proposed modifications described in this addendum REF (AREF) are consistent with the broad strategic needs of the Project. The proposed upgrades to The Driftway, as detailed in the Project REF, forms Stage 1 of the New Richmond Bridge and traffic improvements to facilitate the bypass of Richmond town centre.

The need to modify the Project was due to components of the Project being refined during the detailed design phase, which included resolution of:

- safety components to comply with Austroads Guidelines
- access requirements for private properties
- facilitation of evacuation routes for surrounding communities during flooding and compliance with the requirements of the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvements Program.

Specific details of the proposed modifications and the need for each modification is detailed in Section 2 of this AREF.

Proposal objectives

The objective of the proposed modifications is to align the Stage 1 of the New Richmond Bridge and traffic improvements with Austroads Guidelines and compliance Hawkesbury Nepean Valley Flood Evacuation Road Resilience Improvements Program while optimising the design.

The strategic objectives of the proposed modifications are consistent with the objectives of the overall Project, which are:

- To improve travel times, journey time reliability and cater for future demand for private, public, active and freight transport between North Richmond, Richmond and the connecting arterial road network
- To improve connectivity between Bells Line of Road and Sydney's arterial road network
- To reduce the frequency and severity of crashes on key road corridors between Richmond and North Richmond
- To improve flood resilience
- To support economic development, improved liveability, and Council's long-term vision for the town centres of Richmond and North Richmond.

Options considered

For each specific design component that required optimisation, alternatives were considered before selecting the proposed modifications as the preferred design. The design modifications were primarily assessed against a do-nothing option, which would leave these designs unchanged from the Project REF. However, the do-nothing alternatives would not meet the need for improvements to private property access and improved safety outcomes compared with the proposed modification.

Eight of the design modifications were assessed against other design options before the preferred option was selected. The final design option was chosen due to alignment with the project objectives, while minimising environment impacts. Further detail on the options considered for the proposed modifications is available in Section 2.3.

Statutory and planning framework

The proposed modifications are categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. Under section 2.109 of SEPP (Transport and Infrastructure), the proposed modifications are permissible without consent. The proposed modifications are not State significant infrastructure or State significant development. The proposed modifications can be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) (NSW). Consent from local councils is not required.

This AREF fulfils obligation under Section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

The proposed modifications are not likely to have a significant impact on matters of national environmental significance listed under EPBC Act and as such no referral under the EPBC Act is required.

Community and stakeholder consultation

Consultation on the Project was carried out with key agencies, stakeholders and the community. Following the public display of the Project REF, various submissions were made and responded to within the submissions report (Transport for NSW, 2022). A total of six submissions were received by Transport for NSW during public display. An additional three submissions were received outside of the public exhibition period. Transport has continued community and key stakeholder communication post this period including Hawkesbury City Council, Penrith City Council, Western Sydney University and affected residents. Consultation with stakeholders has been used to inform the refinement of the detailed design. Components of stakeholder consultation have been incorporated wherever safety and environmental constraints allow.

Environmental impacts

The proposed modifications would have some impacts during construction and longer-term impacts during operation. These impacts and proposed management methods and safeguards are described further in Chapter 6 of this AREF. The main environmental impacts for the proposed modifications are summarised below.

Biodiversity

The proposed modifications will result in additional impacts to 0.216 hectares of native vegetation that has been assessed as comprising threatened ecological communities and habitat for threatened species listed under the *Biodiversity Conservation Act 2016* and the *Environmental Protection Biodiversity Conservation Act 1999.* An assessment of significance has been undertaken which determined the combined impact of the Project and the proposed modifications would not result in a significant impact. All impacts are to be offset in accordance with *Transport for NSW Guideline for Biodiversity Offsets* (Roads and Maritime, 2016). In addition, safeguards from the Project REF and Submissions report will mitigate the impacts anticipated from the proposed modifications.

Noise and Vibration

The proposed modifications will increase the number of receivers impacted by noise and vibration during construction. The level of impacts experienced at each noise catchment during construction is not predicted to change. The existing safeguard, NV1 from the Project REF, to prepare a Construction Noise Vibration Plan (CVNP) will inform mitigation measures to manage these impacts. The proposed modifications also required the inclusion of an additional safeguard, NV9, to mitigate potential vibration impact on the heritage listed Londonderry Cemetery through a structural assessment to understand the sites vulnerability to vibration.

The proposed modifications are likely to decrease the number of receivers affected by noise during operation from 37 to 31 receivers which is attributed to changes in the road conditions (speed limit, surface, etc.). The distribution of receivers across the proposed modifications area is similar compared to the distribution found in the Project REF. In line with NSW EPA's Road Noise Policy, at-receiver mitigation options will be used to minimise these impacts.

Traffic

The proposed modifications would improve the safety of The Driftway and connecting intersections and provide safe access to private properties. There would be a potential impact to traffic flow associated with the relocation of the existing southbound in-lane bus stop on Londonderry Road. This impact is considered minor due to the limited number of services occurring on the route during peak traffic times.

The proposed modifications are anticipated to require additional vehicle movements for construction deliveries. The increase in traffic impacts are considered negligible.

The proposed modifications are not anticipated to have a significant impact to construction traffic.

Justification and conclusion

The proposed modifications reflect the optimisation of design features during the detailed design process. The design modifications facilitate compliance with the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program, improve the safety of the road network, adhere to Austroads Guidelines, and improve the accessibility of the road from private properties along the Project alignment. The design modifications have been assessed against the do-nothing alternative and other design options before their finalisation to align with the Project objectives and needs.

While there are some environmental impacts associated with the construction and operation of the proposed modifications as described in Chapter 6, they are minor and are adequately mitigated through proposed safeguards. The benefits of the proposed modifications are considered to outweigh the potential negative impacts and risks.

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1. Introduction

1.1 Background

Transport for NSW (Transport) has proposed to upgrade approximately 3.6 kilometres of The Driftway between Londonderry Road and Blacktown Road as part of the New Richmond Bridge and traffic improvements – Stage 1 The Driftway (the Project).

The Project is located in the suburbs of Richmond, Londonderry and South Windsor. As part of Transport's obligation to assess environmental impacts under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), The New Richmond Bridge and traffic improvement – Stage 1 The Driftway Review of Environmental Factors (REF) (Transport 2021) was prepared in November of 2021, referred to in this AREF as the "Project REF". The Project REF was placed on public display from 15 November till 10 December 2021. A submissions report dated March 2022 was prepared to respond to comments raised by the public. The Project REF was determined to proceed by Transport in April 2022. This AREF assesses the environmental impacts of modifications that have occurred during the detailed design process.

1.2 Proposed modifications overview

Transport proposes to modify the Project to include:

- An additional southbound lane on the Londonderry Road roundabout, this involves:
  - additional tie-ins of approximately 100m to the north and south and 50m to the west of the project REF Boundary.
  - A bus stop on the southbound lane of Londonderry Road south of the Londonderry roundabout has been relocated approximately 28m further south, with the inclusion of an in-lane bus stop. This is within the project REF boundary.
- Adjustment to the ancillary facility layout to avoid flood prone areas, extending beyond the Project REF boundary.
- Changes to the road network surrounding the Hawkesbury Waste Management Facility (HWMF), within the Project REF boundary:
  - Introduction of a 50m long deceleration and left turn lane into the HWMF
  - Changes to the posted speed approaching the HWMF from 80km/h to 60km/h between the Blacktown Road roundabout approximately 100m west of the HWMF
- Adjustments to the maintenance access track allowing access to utilities and the Driftway road bridge across a tributary of Rickabys Creek, this involves:
  - Shortening of the maintenance access track from the Driftway to avoid the need to cross over the creek
  - Inclusion of an additional maintenance access track from Blacktown Road to access the eastern bank of the creek, this component extends beyond the Project REF boundary.
- Design optimisations throughout the length of the Project REF and Addendum REF area:
  - Minor re-alignment of lane markings to improve safety along The Driftway, within the Project REF boundary
  - Provision of safety barriers throughout The Driftway, within the Project REF boundary
  - Realignment of swales and amendments to the batter, where possible, within the Project REF boundary
  - Batters along the northern verge of The Driftway have been flattened, within the Project REF boundary
  - Modification of driveway tie-ins along Londonderry Road and The Driftway, in some locations modifications extend beyond the Project REF Boundary.

Further detail on the proposed modifications is discussed in Section 3.1. The location of the proposed modifications is presented in Figure 1-1.

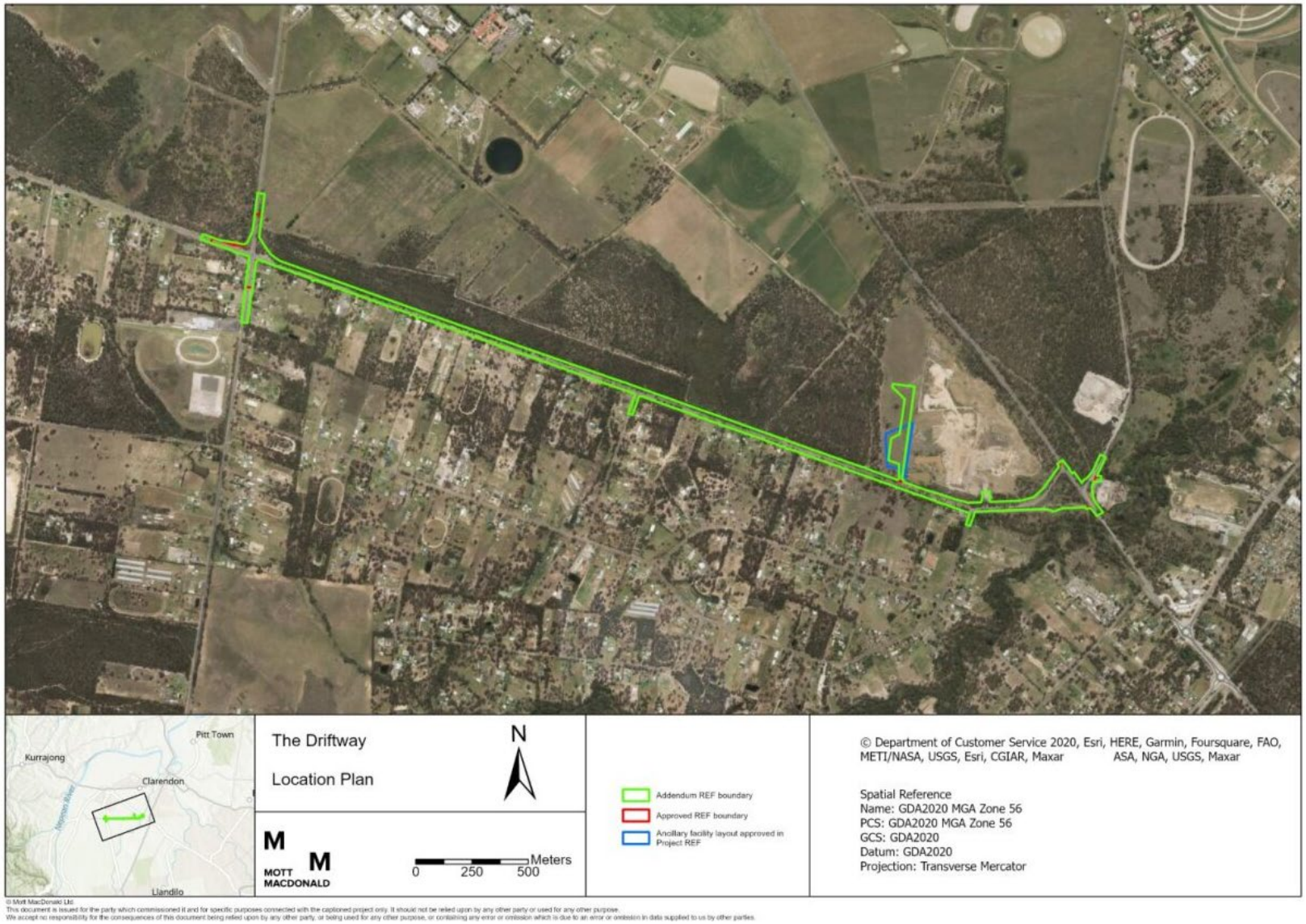

Figure 1-1 Location of the proposed modifications

1.3 Purpose of the report

This AREF has been prepared by Mott MacDonald, on behalf of Transport. For the purposes of these works, Transport is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This AREF is to be read in conjunction with the Project REF and the submissions report. The purpose of this AREF is to describe the proposed modifications, to document & assess the likely impacts on the environment and to detail mitigation & management measures to be implemented.

The description of the proposed modification and assessment of associated environmental impacts has been undertaken in context of section 171 of the Environmental Planning and Assessment Regulation 2021, *Is an EIS Required? Best Practice Guidelines for Part 5.1 of the Environmental Planning and Assessment Act 1979* (Guidelines for Division 5.1 Assessments) (DPE, 2022), *Roads and Road Related Facilities EIS Guideline* (DUAP, 1996), the *Biodiversity Conservation Act 2016* (BC Act), the *Fisheries Management Act 1994* (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

In doing so, the AREF helps to fulfil the requirements of:

- Section 5.5 of the EP&A Act including that Transport examine and take into account the fullest extent possible, all matters affecting or likely to affect the environment by reason of the activity.

The findings of the AREF would be considered when assessing:

- Whether the proposed modifications are likely to result in a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured
- The potential for the proposed modifications to significantly impact any other matters of national environmental significance or Commonwealth land and therefore the need to make a referral to the Australian Department of Climate Change, Energy, the Environment and Water for a decision by the Australian Government Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

Section 2 of the Project REF addresses the strategic need, the objectives and the options considered for the Project. The proposed modifications described in this AREF are consistent with the need and objectives of the Project.

2.1 Strategic need for the proposed modifications

Section 2.1 of the Project REF addresses the strategic need for the Project. The proposed modifications described in this AREF are consistent with the broad strategic needs of the Project. The need to modify the Project was due to components of the Project being refined during the detailed design phase, which included:

- building resilience into the operation of flood evacuation routes identified within the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program, primarily Londonderry Road.
- resolving detailed access requirements for private properties
- resolving safety components associated with design refinement to comply with Austroads Guidelines

The specific design modifications required during the detailed design phase are summarised in Table 2-1. Descriptions of the modifications and relevant design criteria are further detailed in Chapter 1.

Table 2-1 Identified design modifications and the need behind their inclusion in the detailed design

Design Change	Need
Additional southbound lane on the Londonderry Road roundabout	Post concept design the need for an additional southbound lane was identified to support the objectives Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program (Transport for NSW, December 2022). This design change increases the resilience of the Londonderry Road flood evacuation route.
Additional tie in works on Londonderry Road and the Driftway as a result of the additional southbound lane on the Londonderry Road roundabout	The addition of second southbound lane on the Londonderry Road requires tie ins to be extended along Londonderry Road to meet the requirements of Austroads Guidelines for a for a single lane road connecting with a dual lane roundabout.
Relocation of the southbound lane bus stop located south of the Londonderry Road roundabout further south by 28m.	This is required to facilitate the inclusion of the additional lane and allow for the merging of two lanes into one before meeting the bus stop.
Adjustments to the ancillary facility layout, increasing in size from 1.9 ha to 2 ha	During detailed design the ancillary facility location was found to be on land mapped as having a high flooding potential. Consultation with Western Sydney University identified a new layout that would avoid these areas. As the new ancillary facility layout was designed to avoid flooding it is not uniform in shape. Therefore, an additional area is proposed to enable flexibility for construction storage and activities within the laydown area.
Introduction of a 50m deceleration and left turn lane into Hawkesbury Waste HWMF.	The turning lane is required to improve road safety by providing a safe space for drivers to decelerate when entering the HWMF and to create separation of turning traffic from through traffic.
Changes to the posted speed approaching the HWMF from 80km/h to 60km/h between the turning lane and the Blacktown Road roundabout	This is required to improve safety of drivers entering and exiting the HWMF and for a compliant safe intersection sight distance at Reynolds Road.
Shortening of the maintenance access track from the Driftway to avoid the need to cross over a tributary of Rickabys Creek and inclusion of an additional maintenance access track from Blacktown Road.	Maintenance access is required to the abutments of the road bridge either side of the Rickaby's Creek tributary and services in this area. The concept design did not provide detail in this area so the detailed design had to develop a solution to ensure maintenance access is provided.

Design Change	Need
Minor re-alignment of lane markings to improve safety along The Driftway	Improve safety by adjusting Driftway lane alignment to create greater separation between oncoming lanes at the Luxford Road intersection.
Provision of safety barriers throughout The Driftway	This is required to protect motorists from colliding with hazards such as storm water culverts and power poles where other mitigations have not been able to be implemented such as flatter batter slopes.
Realignment of swales and amendments to the batter, where possible	Similar to the above, swales and batter slopes have been flattened to minimise hazards on the southern side of The Driftway. This has happened in locations where other mitigation have not been able to be implemented such as safety barriers.
Modification of driveway tie-ins along Londonderry Road and The Driftway, including a new access driveway to the Turtle Landscape Supplies business on Racecourse Road. In addition, the AREF boundary has been extended by 2 meter around driveways to allow for the safe movement of construction vehicles	New driveways tie-ins are required to facilitate safe access to the upgrade road in locations where they were not previously identified, or the detailed design has created greater level changes requiring a tie-in to be designed and constructed. The inclusion of a 2m buffer zone at the end of driveway tie-ins will enable flexibility for the construction contractor to provide safe and ongoing access from private properties during the construction phase and allow for the manoeuvring of construction vehicles.

2.2 Project objectives and development criteria

Section 2.4 of the Project REF addresses the Project objectives and development criteria, which are:

- To improve travel times, journey time reliability and cater for future demand for private, public, active and freight transport between North Richmond, Richmond and the connecting arterial road network
- To improve connectivity between Bells Line of road and Sydney's arterial road network
- To reduce the frequency and severity of crashes on key road corridors between Richmond and North Richmond
- To improve flood resilience
- To support economic development, improved liveability, and Council's long-term vision for the town centres of Richmond and North Richmond

The proposed modifications remain consistent with these objectives of the Project REF and further assist in achieving the objectives to improve flood resilience through the enhancement of southbound evacuation along the Londonderry Road evacuation route and reduce the frequency and severity of crashes on key road corridors through the provision of additional road safety features.

2.3 Alternatives and options considered

2.3.1 Methodology for selection of preferred option

For each necessary design change, options were assessed by Transport before selecting the proposed modifications for the final design. Each of the options were assessed against their alignment with the strategic need of the Project and the broad objectives of the modifications to improve road safety, accessibility of the Driftway, and flood resilience in accordance with the Hawkesbury-Nepean Valley Flood Risk Management Strategy and the subsequent Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program. The minimisation of environmental impacts was also considered in the determination of preferred options for each design change. The proposed modifications were all assessed against a do-nothing option which would involve maintaining the design component in line with the Project REF and the concept design.

2.3.2 Identified options and selection of preferred options

A full assessment of the need for the design modifications, the options considered, and the preferred option justifications are detailed in Appendix D of this AREF. In all cases, the do-nothing option was assessed and deemed to not be preferred as discussed above, it would not achieve the design objectives.

A summary of the design options assessed are discussed below in Table 2-2.

Table 2-2 Eight of the eleven design modifications with the options used to determine the preferred design.

Proposed Modification	Design Change	Option 1	Option 2	Option 3
An additional southbound lane on the Londonderry Road roundabout	Additional southbound lane on the Londonderry Road roundabout	Do nothing option – Maintaining the lane configuration of the Londonderry Road roundabout as per concept design and Project REF.	Include an additional southbound lane on the Londonderry Road roundabout. This was the preferred option as it meets the objectives of the Hawkesbury-Nepean Flood Evacuation Road Resilience Program by allowing two lanes of evacuation traffic.	No third option
	Additional tie in works on Londonderry Road and the Driftway including the relocation of a southbound bus stop	Do nothing option – Maintain the driveway adjustments as per the concept design and Project REF. This would not enable an appropriate connection to the existing road network.	Tie-in works for additional areas was the preferred option, as it meets the Austroads Guidelines for transitioning two laned intersections to one lane.	No third option.
Adjustments to the ancillary facility layout	Adjustments to the ancillary facility layout, increasing in size from 1.9 ha to 2 ha	Do nothing option – Maintain the proposed ancillary facility as per the concept design REF. This layout would be vulnerable to flooding.	Adjust the layout of the proposed facility to avoid flooding impacts. This was the preferred option as it addresses the areas of high flooding potential identified during the detailed design.	No third option.
Adjustments to the maintenance access track allowing access to utilities and the Driftway road bridge	Shortening of the maintenance access track from the Driftway and inclusion of an additional maintenance access track from Blacktown Road.	Constructing the bridge for the access track was ruled out early due to the interaction with the tributary of Rickabys Creek, increased construction complexity, and project costs.	Only providing maintenance access from The Driftway with no bridge. However, this would have removed all access to the eastern side of Rickabys Creek tributary and would not enable maintenance activities to occur for the bridge and utilities.	Provide multiple entries, one from The Driftway west of Rickabys Creek tributary and one on Blacktown Rd. This would require an additional maintenance access track to be constructed. This option would simplify construction and reduce the interaction with Rickabys Creek. However, this option would remove additional vegetation but minimise impacts to the watercourse. This is considered the preferred option as it will reduce construction complexity and potential impacts to the watercourse.
Design optimisations throughout the length of the Project REF and Addendum REF area	Minor re-alignment of lane markings along the Driftway at the Luxford Road intersection	Do nothing option – leave Luxford Road intersection as per the concept design and Project REF.	Shift the whole intersection alignment to the north to improve lane alignment and reduce potential for vehicles to drift across the centre lane. However, this had the potential for additional impact on native vegetation with the	Amend the centreline of The Driftway at the Luxford Road intersection to reduce potential for vehicle to drift across the centre lane. This was the

Proposed Modification	Design Change	Option 1	Option 2	Option 3
			work extending beyond the northern edge Project REF boundary.	preferred option as it only required the adjustment of line markings and didn't require additional impacts on vegetation.
	Provision of safety barriers throughout The Driftway	Do nothing option – maintain safety barrier design as per concept design and Project REF.	Implementing safety barriers along the Driftway was the preferred option as it provided extra safety measures where other design measures could not be implemented to mitigate potential risks to motorists.	No third option.
	Realignment of swales and amendments to the batter along the Driftway	Do nothing option – maintain swales and batter alignment as per the concept design and Project REF.	Realign the swales and amending the batters where possible is the preferred option as it would optimise safety and minimise impacts to utilities.	No third option
	Refinement of batter design along the northern verge of The Driftway	The inclusion of steeper batters with barriers along the entirety of the northern verge with a smaller clear zone were considered. This was not progressed due to the high cost associated with this option and visual impact associated to the safety barriers.	The inclusion of a flatter batter, where possible. This was considered the preferred option as it complied with Austroads standard clear zone requirements and avoided impacts to native vegetation and corresponding ecological values.	No third option
	Modification of driveway tie-ins along Londonderry Road and The Driftway,	Do nothing option – maintain driveway tie-in design as per the concept design and Project REF.	Redesigning the driveway tie-ins by extending by 2m around driveways including the addition of an access driveway to the Turtle Landscape Supplies business was the preferred option as it allows the safe entry and access to private properties	No third option

3. Description of the proposed modifications

3.1 The proposed modifications

Transport for NSW proposes to modify New Richmond Bridge and traffic improvements Stage 1 – The Driftway through the addition of lanes and further modification of existing lane design. The location of the proposed modifications are shown in Figure 3-1 to Figure 3-3. In addition, the detailed design plans are included in Appendix H.

Key features of the proposed modifications would include:

- An additional southbound lane on the Londonderry Road roundabout, which includes
  - additional tie-ins of approximately 100m to the north and south and 50m to the west of the project REF Boundary.
  - A bus stop on the southbound lane of Londonderry Road south of the Londonderry roundabout has been relocated approximately 28m further south, with the inclusion of an in-lane bus stop.
- Adjustment to the ancillary facility layout to avoid flood prone areas
- An additional materials stockpile area within the Project REF boundary
- Changes to the road network surrounding the Hawkesbury Waste Management Facility (HWMF)
  - Introduction of a 50m long auxiliary left turn lane into the HWMF
  - Changes to the posted speed approaching the HWMF from 80km/h to 60km/h between the Blacktown Road roundabout approximately 100m west of the HWMF
- Adjustments to the maintenance access track the allowing access to utilities and the Driftway road bridge across a tributary of Rickabys Creek.
  - Shortening of the maintenance access track from the Driftway to avoid the need to cross over a tributary of Rickabys Creek
  - Inclusion of an additional maintenance access track from Blacktown Road to access the eastern bank of the creek, this component extends beyond the Project REF boundary.
- Design optimisations throughout the length of the Project REF and Addendum REF area:
  - Minor re-alignment of lane markings to improve safety along The Driftway
  - Provision of safety barriers throughout The Driftway
  - Realignment of swales and refinements to the batter design, where possible
  - Batters along the northern verge of The Driftway have been flattened
  - Modification of driveway tie-ins along Londonderry Road and The Driftway, in some locations modifications extend beyond the Project REF Boundary.

Specific details in relation to each proposed modification are discussed in more detail below.

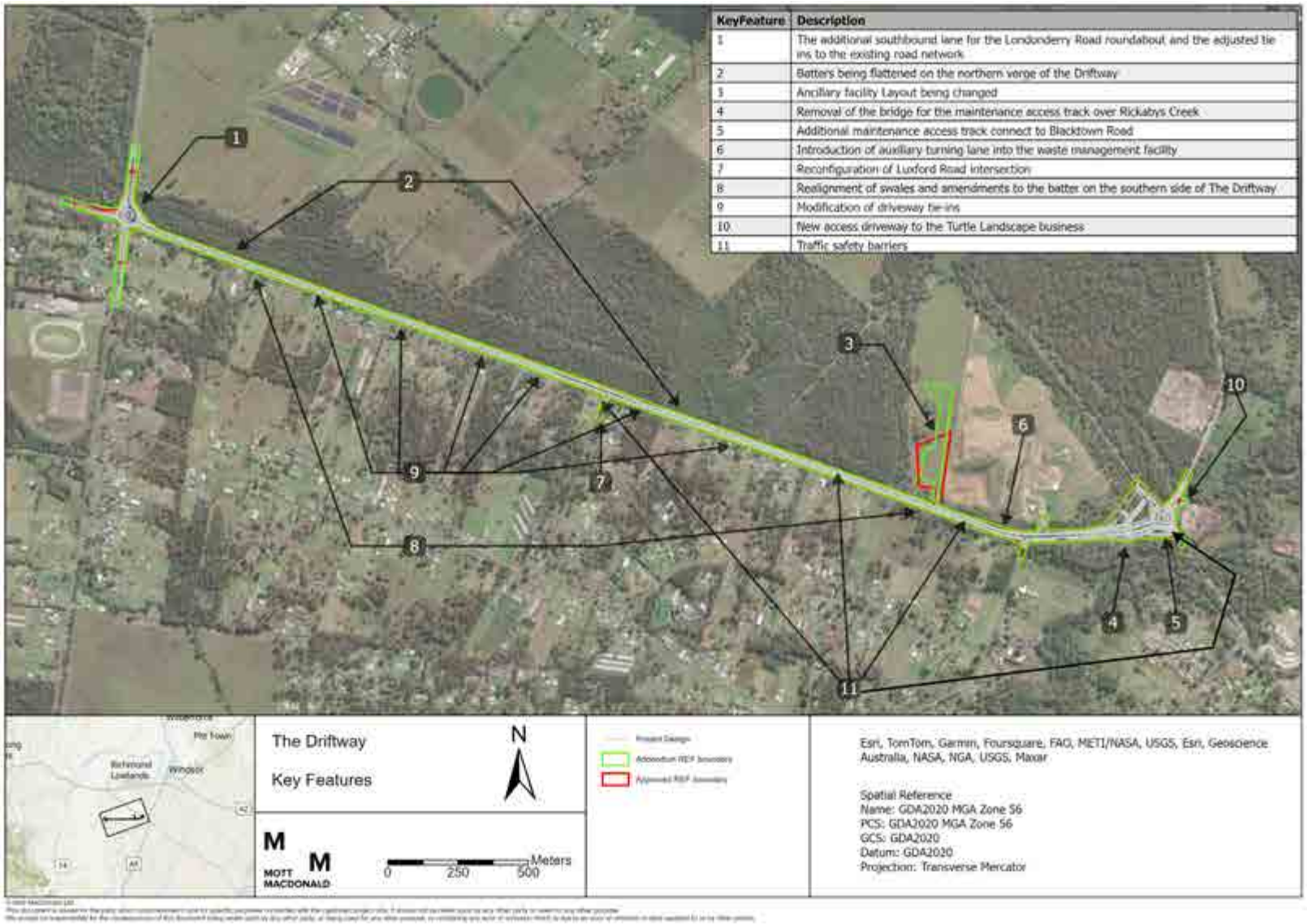

Figure 3-1: Key features of the proposed modifications

Figure 3-2 Western extent of proposed modifications

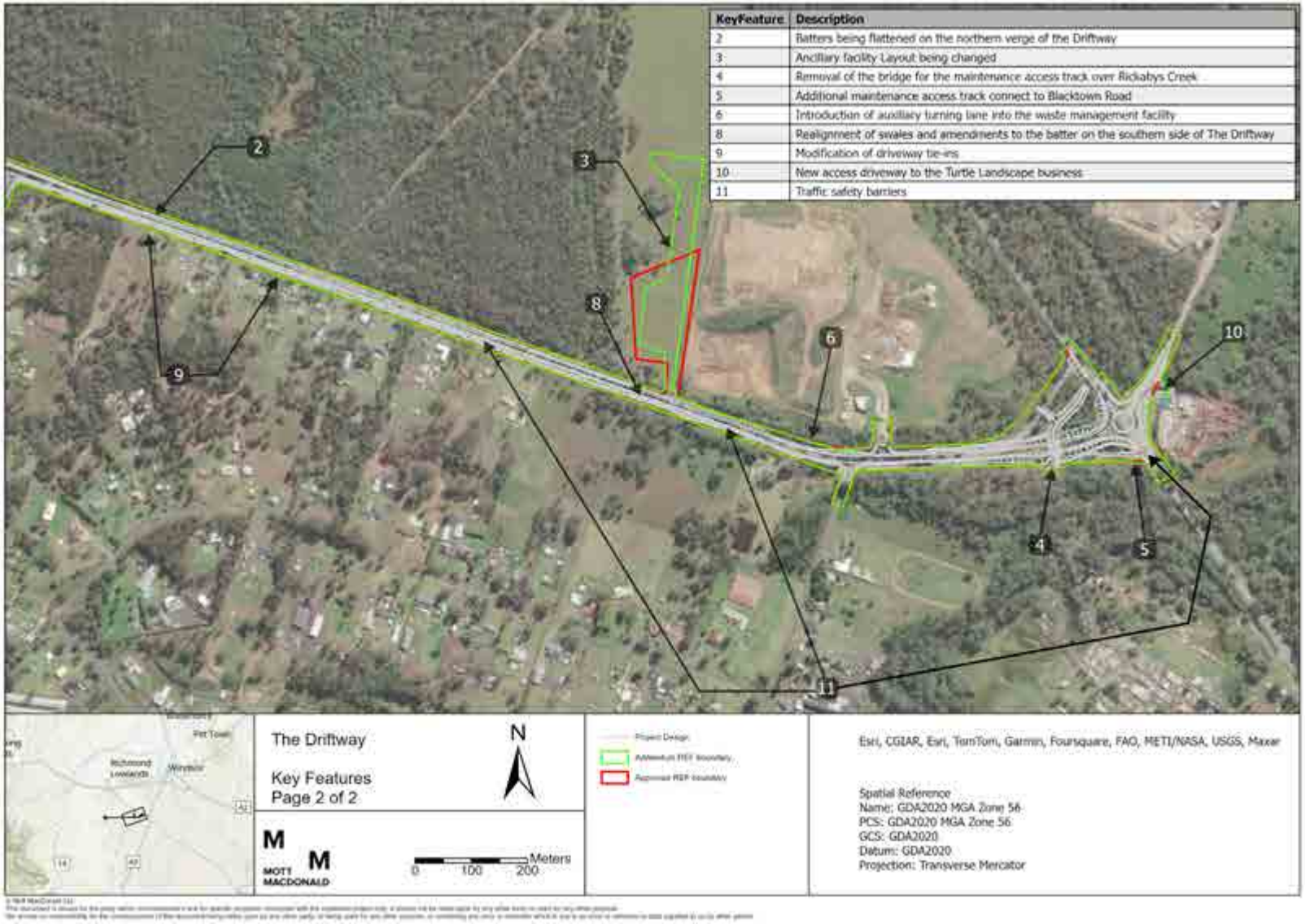

Figure 3-3 Eastern extent of proposed modifications

3.1.1 Londonderry Road Roundabout

The requirement for an additional southbound lane on the Londonderry Road roundabout was identified in the *Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program* (Transport for NSW, December 2022). The inclusion of the additional lane is required to facilitate a flood evacuation route for the surrounding communities connecting other road improvement projects identified in the program. The inclusion of this additional lane requires additional tie-in works to create new connections to the existing roads on the northern and southern sides of Londonderry Road and the western side of the Driftway to maintain compliance with Austroads guidelines. Additionally, a bus stop on the southbound lane of Londonderry Road, on the southern side of the roundabout, has been relocated 28m further south, this is required to facilitate the inclusion of the additional lane. The bus stop has been changed from having a pullout stop to an in-lane stop. The additional southbound lane on the roundabout will remain within the area assessed in the Project REF. However, the adjusted tie in works extend beyond the existing Project REF boundary by approximately 50m to the west and 100m to the south and north. These modifications are presented in Figure 3-4.

3.1.2 Ancillary Facilities

The layout of the ancillary facility has been modified to avoid areas mapped as having high flood potential. The new layout of the facility has proposed to increase the impact area by 0.1 ha from 1.9 ha to 2 ha compared to the Project REF. As the resulting shape of the proposed site is less uniform, the size has been increased to enable flexibility for construction laydown areas while maintaining avoidance of flood prone areas. This is presented in Figure 3-7.

3.1.3 Hawkesbury Waste Management Facility Road Network

A 50m long auxiliary turning lane for access into the HWMF has been introduced on the eastbound side of the Driftway. This will provide a lane for drivers turning left into the HWMF that is separate from the continuing eastbound traffic. In addition, the posted speed limits approaching the HWMF have been reduced from 80km/h to 60km/h between the Blacktown Road roundabout and approximately 100m west of the HWMF. This is presented in Figure 3-5.

3.1.4 Blacktown Road Maintenance Access Track

To avoid the need to cross over a tributary of Rickabys Creek, the maintenance access track from the Driftway has been shortened. To maintain access to the to eastern side of the tributary for road bridge and utility maintenance, an additional access track from Blacktown Road has been included. This is presented in Figure 3-6.

3.1.5 Driftway Design Optimisation

The design of lane markings, barriers, swales, batters, and driveway tie-ins have been optimised throughout the length of the Project REF and Addendum REF boundary. These changes are further discussed below and presented in Figure 3-1 to Figure 3-3.

Lane marking

The intersection of Luxford Road and The Driftway has been reconfigured to improve safety and reduce the risk of head on collisions. The centreline of the intersection has been amended with the inclusion of a greater painted median to reduce the opportunity for vehicles to drift across the centreline. This is only a change to line marking and is within the previously assessed roadway.

Refinement of batter slopes

Batters along the northern verge of The Driftway have been flattened to decrease the required clear zone and improve road safety. This has also improved the constructability of batters. The adjustments to batters on the northern verge of the Driftway are confined within the Project REF boundary.

Along the southern verge of The Driftway batters have also been adjusted to improve safety, this is primarily located around specific safety hazards such as culvert head walls and drainage swales. The amended batters allow sufficient room for safety barriers to be installed.

Drainage swales

Drainage swales along the southern verge of The Driftway have been amended from the concept design to minimise the potential for swales to be hazards for drivers. Amendments of swales include a reduction of the steepness of slopes and lengthening the swale bed width.

Safety barriers

Barriers have been provided along the Driftway to protect vehicles from impact potential hazards such as culverts, power poles and trees along the side of the road.

Driveway tie-ins

The detailed design process has identified additional driveways on The Driftway requiring tie-ins to the new road, including the Turtle Landscapes Supplies driveway on Racecourse Rd. In addition, the Addendum REF Boundary has been extended by two metres around driveways to enable a working area when constructing driveway tie-in.

Figure 3-4 Key design features of the Londonderry Road Intersection

Figure 3-5 Key design features in proximity of the Hawkesbury Waste Management Facility

Figure 3-6 Key design features of the Blacktown Road Intersection

3.2 Design

3.2.1 Design criteria

The proposed modifications are consistent with the broad design criteria as presented in Section 3.2.1 of the Project REF. However, during the detailed design phase the design criteria for some specific design features have changed, these modifications are presented in Table 3-1. The changes were required to facilitate the inclusion of the modifications listed in Section 3.1.

Table 3-1 Design Criteria Requirements

Design features	Modified Criteria	Project Criteria
Posted speed	The Driftway CH3280 – CH3880: proposed posted speed of 60 km/h.	The Driftway posted speed of 80 km/h
Design Vehicle	Inclusion of: • 19m Prime mover and semitrailer • Car B85 • 8.8m Service Vehicle	• 26 m B-Double • 12.5 m single unit truck or bus
Check Vehicle	Inclusion of • 26 B-Double	• PBS Level 3A (36.2 m A-double) • 19 m semi-trailer
Batter Slopes	• 1V:6H batter and a 7.5 m clear zone. A 1 m offset from the toe of batter • 1V:4H batter and a 9 m clear zone. A 1 m offset from the toe of batter. • A 1V:2H batter in specific locations to stay within the Project REF boundary	Embankment on realigned section of The Driftway • Fill batter: 2:1 • Cut batter: 2:1 Embankment on existing section of The Driftway • Fill batter: 2:1 on northern verge, 6:1 on southern verge adjacent to properties

3.2.2 Engineering Constraints

There were several engineering constraints that were not fully resolved during the Concept Design phase, these were:

- Alignment with Austroads Guidelines for the design of roads to ensure safety and function of the impacted roads
- Compliance with the Hawkesbury-Nepean Flood Evacuation Program and the minimisation of flood risks to the ancillary facility
- Minimisation of property, road user, and utility impacts

The detailed design phase has further developed these constraints, resulting in the final design modifications and additional tie-in works.

3.3 Construction activities

Section 3.3 of the REF provides the probable construction activities, an indicative construction plan and methodology associated with the Project. The construction of the proposed modifications is not expected to change the construction strategy or activities determined in the Project REF.

The actual work method may vary from the description provided in this section due to the identification of additional constraints before work starts, ongoing detailed design refinements, feedback from community & stakeholder consultation and contractor requirements and limitations.

3.3.1 Work methodology

The work methodology for the proposed modifications is consistent to the methodologies presented in Section 3.3.1 of the Project REF. The proposed modifications would be constructed using conventional methods used on other road projects. Construction activities for the proposed modifications would be guided by the Construction Environmental Management Plan (CEMP) to ensure construction work is carried out to Transport's specifications. Detailed work methodologies for the proposed modifications would be identified by the construction contractor.

3.3.2 Construction hours and duration

Section 3.3.3 of the Project REF provides an indicative timing of the construction phases and states the proposed hours of construction would be in accordance with the *Transport for NSW Construction Noise and Vibration Guideline* (2016). The proposed modification will not require an amendment to the construction duration or hours.

3.3.3 Plant and equipment

A range of plant and equipment would be used during construction of the proposed modifications. Section 3.3.4 of the Project REF provides an indicative list of the plant and equipment needed to construct the Project. The proposed modifications have not changed this list. The final equipment and plant requirements would be determined by the construction contractor prior to construction.

3.3.4 Earthworks

During detailed design the estimate of earthworks needed for construction of the Project has changed from that presented in Section 3.3.5 of the Project REF. Table 3-2 presents a comparison of the Project REF and AREF estimates.

Table 3-2 Comparison of earthwork estimates

Earthwork	Project REF	Addendum REF
Cut	15,000 m3	30,323 m3 (est 48,000t)
Fill	41,000 m3	46,807 m3 (est 75,000t)

The change in estimated earthwork quantities relate to modification of the road level to optimise pavement design. The increase road area associated with the additional lane and increase tie-ins has also contributed to the change in earthwork quantities. The excavation quantities expected does not require an Environmental Protection Licence (EPL) under the *Protection of the Environment Operations Act 1997* (POEO Act) on its own, as it does not meet the material extraction threshold of 50,000 tonnes specified in Schedule 1, Section 35(3)(a)(i) of the Act. However, if the cumulative totals of extracted materials and 'processed' materials on site exceed the 50,000 tonnes, an EPL will likely be required.

These estimates may change depending on the actual quality of material, the depth to bedrock, and the suitability of the material for re-use in construction. Earthwork's quantities are to be confirmed before construction.

3.3.5 Traffic management and access

The proposed modifications have not changed the traffic management of the Project from what is described in Section 3.3.7 of the Project REF, which would be constructed in accordance with the Traffic Management Plan (TMP). The proposed modifications are anticipated to cause a minor increase in the amount of materials required to be delivered and removed from site due to the increased size of the Project. However, this would result in a negligible increase in traffic due to the scale of modifications compared to the rest of the Project. This remains consistent with the conclusions of the Project REF, which found the increase to traffic from

construction of the Project not to be a significant impact in comparison to existing traffic volumes. Existing safeguards from the Project REF and Submission Report are considered adequate to manage impacts.

The detailed design phase identified that an increased number of driveways along Londonderry Road and The Driftway would require modification to accommodate the revised road levels. To ensure safe and ongoing access throughout construction of the Project, temporary road plates may be installed over excavated areas.

3.4 Ancillary facility

A temporary ancillary site would be required during construction of the Project for various activities including material and equipment/plant storage and laydown, vehicle and equipment refueling, site offices, construction workforce parking and amenities.

The location of the ancillary facility identified in the Project REF is proposed to be modified to avoid flooding as the original location of areas mapped as having high flood potential. The proposed modifications would increase the size of the site from 1.9ha to 2ha and alter the ancillary facility layout to reduce the risk of flooding during the construction phase. The modified layout has also been designed with the goal to maintain flexibility for construction contractors to determine laydown areas required for construction given the less uniform shape of the proposed modification. In addition, negotiations were held between Western Sydney University and Transport on the lease of the Ancillary facility which informed the revised shape shown in Figure 3-7.

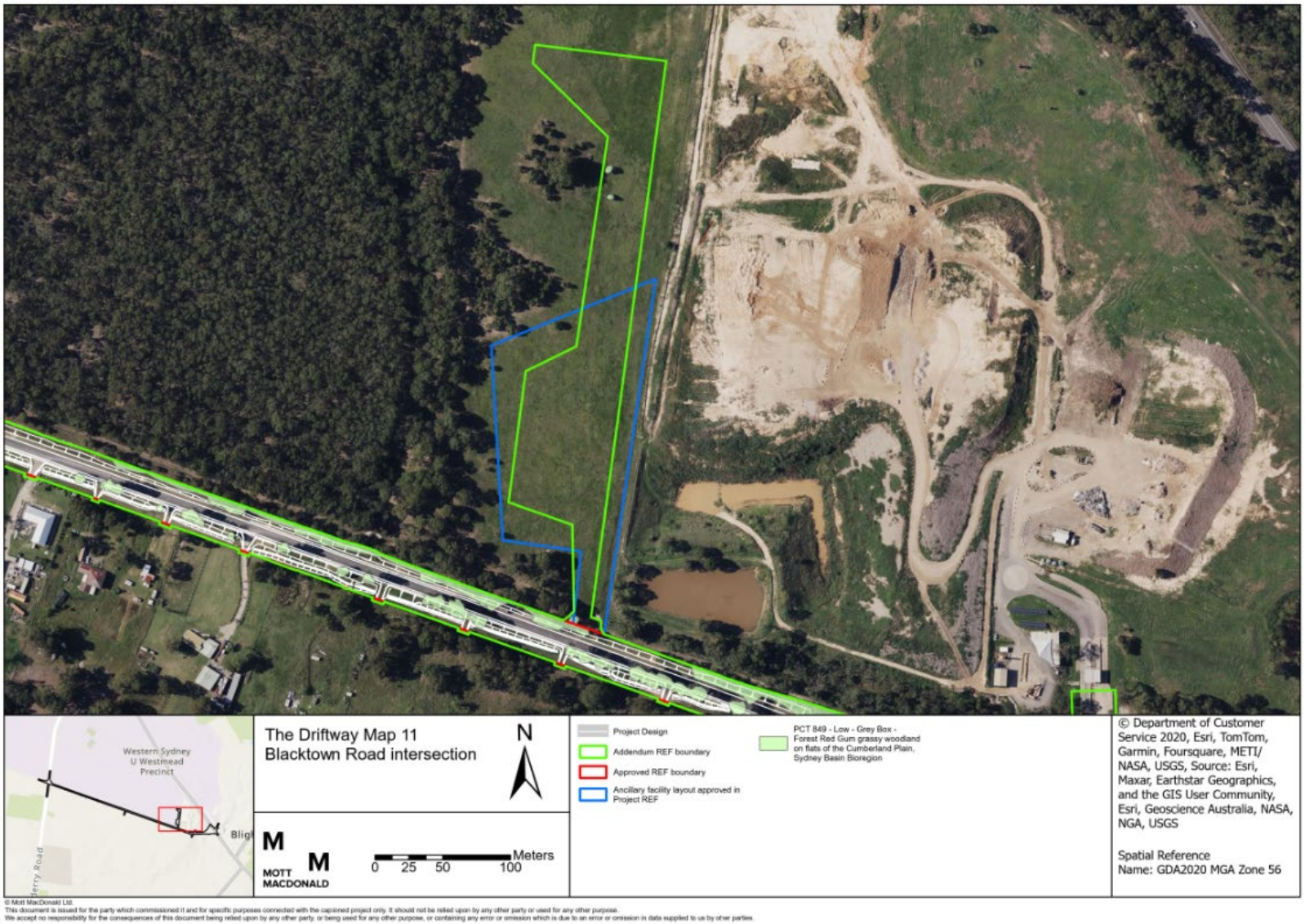

Figure 3-7 Ancillary facility location and PCT 849 communities

3.5 Public utility adjustment

The approach to public utility adjustments and utility requirements of the ancillary facility is consistent with the approach described in the Project REF. For more details, refer to Section 3.5 of the Project REF.

3.6 Property acquisition

Table 3-3 provides a summary of the additional property acquisition required to accommodate the Proposed Modifications. This is the partial acquisition of 0.01 ha of lot 2 DP52477, located on the southeast corner of the Londonderry roundabout, see Figure 3-8. This partial acquisition is required to provide space for a new southbound lane on the roundabout. In addition, the amended area of the proposed ancillary facility requires the lease to be adjusted to consider the change in area and size of the site.

The acquisitions identified in the Project REF are still required for the Proposal and have not been adjusted since the Project REF. All acquisitions would be conducted in accordance with the Transport for NSW *Land Acquisition Guide (2014)*, and compensation based on the requirements of the *Land Acquisition (Just Terms) Compensation Act* 1991. Final acquisition areas would be confirmed before construction in consultation with landowners.

Table 3-3: Additional or amended property acquisition requirements for the proposed modifications

Description	*Total area (ha)*	*Acquisition type*	*Current owner*	*Lot and DP*	*Land use zone (LEP)*
Land required for the road corridor (Londonderry Road roundabout)	0.01	Partial	Private Property	Lot2/DP524577	RU4: Primary Production Small Lots
Land required for the temporary ancillary facility	2	Lease	State of NSW (Western Sydney University	Lot 32/DP1270808	SP1 Special Activities (Education, Agriculture, Research Station)

Consistent with the Project REF, specific designs in six locations have been prepared during detailed design to enable existing driveways to tie-in with the new road level. This would require temporary access to private property for maneuvering of construction plant during construction. The AREF boundary has been revised to accommodate these areas this can be seen around the driveway areas in Figure 3-8.

Figure 3-8 Additional Acquisition Areas to enable the proposed modification.

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

Since the publication of the Project REF all State Environmental Planning Polices (SEPP) in NSW were consolidated from 45 individual polices to 11. This occurred on the 1st of March 2022. This AREF refers to the consolidated SEPPs.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

Chapter 2 (Infrastructure) of SEPP (Transport and Infrastructure) aims to facilitate the effective delivery of infrastructure across the State. Section 2.109 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent.

As the proposed modifications are for an existing assessment for a road project to be carried out on by Transport for NSW, the modification can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The Project and the proposed Modifications are not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Consultation, including consultation as required by ISEPP (where applicable), is discussed in section 5 of this AREF.

State Environmental Planning Policy (Biodiversity and Conservation) 2021

Chapter 8 (Sydney Drinking Water Catchment) of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 relates to the use of land within the Sydney drinking water catchment. Section 8.11 of the SEPP requires consideration of whether or not an activity to which Division 5.1 of the EP&A Act applies would have a neutral or beneficial effect on water quality before carrying out the activity. The Proposed modification is not located within a Sydney Drinking Water Catchment, therefore assessment under this section of the SEPP is not required.

Local Environmental Plans

The proposal is located primarily within the Hawkesbury LGA with a small portion located within the Penrith LGA. The Driftway generally forms the border between the Hawkesbury to the north (and including The Driftway) and the Penrith to the south. The land zoning in and around the proposal area is shown on Figure 4-1, zoning is regulated by both the Hawkesbury Local Environmental Plan 2012 (LEP) and the Penrith LEP 2010.

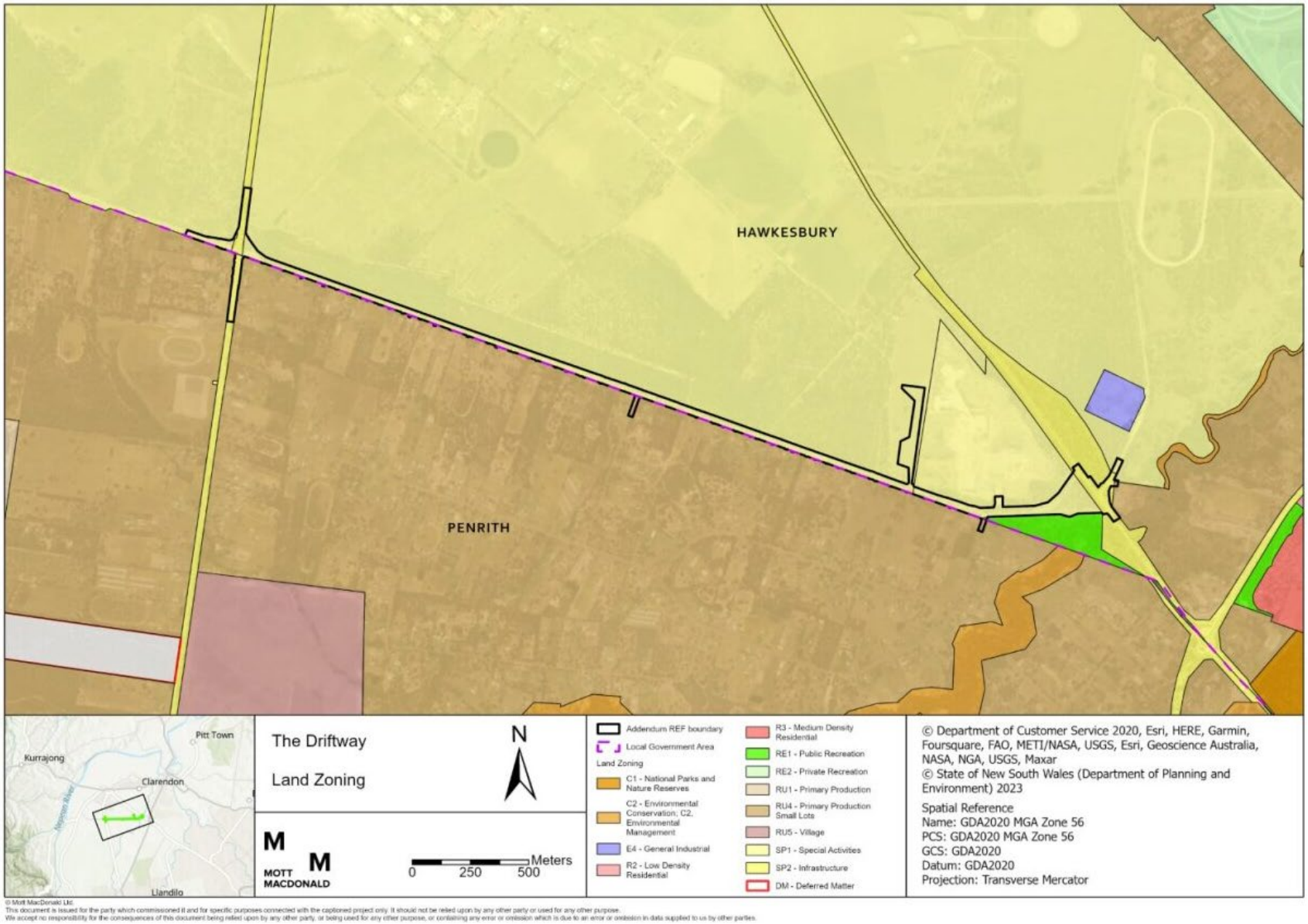

Figure 4-1 Land zoning map

4.2 Other relevant NSW legislation

4.2.1 Roads Act 1993

Under Section 138(1) of the *Roads Act 1993*, consent from the road authority is required for carrying out various activities in, on and over public roads. Under Section 72(1)(b) of the Act, Transport may carry out road work on a road that is not classified if it necessary to do so, in connection with carrying out road work on an adjoining classified road. The Driftway is not a classified road and adjoins to Londonderry Road and Blacktown Road which are classified roads. Consent from the road authority is therefore not required for the Project or the proposed modifications.

4.2.2 Biodiversity Conservation Act 2016

The NSW *Biodiversity Conservation Act 2016* (BC Act) sets out the environmental impact assessment framework for threatened species, threatened ecological communities (TEC) and Areas of Outstanding Biodiversity Value (AOBV) for Division 5.1 activities and other types of development. Under Section 7.2 of the BC Act, a development or activity is likely to significantly affect threatened species if:

- The test of significance, pursuant to Section 7.3 of the BC Act, determines that a significant impact is likely
- The development or activity exceeds the biodiversity offset scheme threshold if the offset scheme applies to the proposed development (this part does not apply to Part 5 activities)
- The development or activity is carried out in an AOBV.

An addendum Biodiversity Assessment Report (BAR) has been prepared to assess the impact of the proposed modifications on biodiversity values and is summarised in Section 6.1. The Project and the additional proposed modifications was assessed holistically and was not considered likely to significantly affect threatened species, ecological communities or their habitats and is not carried out in an AOBV, therefore a Biodiversity Development Assessment Report (BDAR) is not required.

4.2.3 Heritage Act 1997

The *Heritage Act 1977* (Heritage Act) aims to provide for the identification, registration and conservation of items of State heritage significance.

A search of the State Heritage Inventory was undertaken which located one locally listed heritage item, Londonderry Cemetery, approximately 170m from the southern extent of the project boundary. The Project and the proposed modifications have potential to impact this item during construction through vibration of construction plant. An additional mitigation measure has been proposed, Safeguard NV9, requiring a structural assessment of the Londonderry Cemetery to determine vibration vulnerability and provided restrictions on vibratory plant if required. This assessment must occur prior to any works in the area.

4.2.4 Land Acquisition (Just Terms Compensation) Act 1991

Property acquisition requirements for the proposed modifications are detailed in Section 3.6 of this AREF. Property acquisition would be carried out in accordance with the *Land Acquisition (Just Terms Compensation) Act 1991,* which aims to guarantee just compensation terms for land that is acquired by an authority of the State.

4.2.5 Water Management Act 2000

The *Water Management Act 2000* (WM Act) provides for the protection and management of water resources in NSW. It controls the extraction of water, how water can be used, the construction of work such as dams and weirs, and the carrying out of activities on or near water sources. Section 4.24 of the Project REF discusses the Projects exemptions for approvals under Section 89 to 91 of the WM act for water use approvals, water management work approvals (including flood work) and activity approvals. These exemptions apply to the proposed modification and no approvals under the WM Act are required.

4.2.6 Waste Avoidance and Resource Recovery Act 2001

The NSW *Waste Avoidance and Resource Recovery Act 2001* (WARR Act) promotes the waste hierarchy to avoid resource consumption and implement resource recovery in the form of material reuse and recycling in preference to waste disposal. The WARR Act acknowledges that certain materials present either human or environmental risk, requiring classification, treatment and disposal of in accordance with specific waste management provisions.

Waste generated during construction of the proposed modifications would be managed in accordance with the Project's CEMP and waste hierarchy and where required, disposed of in accordance its waste classification and relevant legislation and guidelines.

4.2.7 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) is the primary legislation managing Aboriginal cultural heritage in NSW. Items of Aboriginal cultural heritage (Aboriginal objects) or Aboriginal places (declared under section 84) are protected and regulated under the NPW Act. Aboriginal objects are protected under section 86 of the Act and it is an offence to 'harm' an Aboriginal object. However, under Section 90(1) of the Act, the Chief Executive may issue an Aboriginal Heritage Impact Permit (AHIP) for an activity which would harm an Aboriginal object.

The Project REF did not identify any potential impacts on Aboriginal cultural heritage and provided standard safeguards to manage unexpected finds.

Further assessment of the proposed modifications was completed in accordance with Stage one of the Transport for NSW *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI). There has been no additional impact from the proposed modifications thus the environmental safeguards from the Project REF would be sufficient in managing potential impacts on Aboriginal items. The full assessment is presented in Section 6.5.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed *'actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land'*. These are considered in Appendix D and Section 6 of the AREF.

The assessment of the proposed modifications impact on matters of national environmental significance and the environment of Commonwealth land found that there would be no change to the significance assessments of the determined activity and therefore would be unlikely to cause a significant impact on matters of national environmental significance or the environment of Commonwealth land. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

4.4 Confirmation of statutory position

The proposed modifications are categorised as development for the purpose of a road and is being carried out by or on behalf of a public authority. Under section 2.109 of SEPP (Transport and Infrastructure) the proposed modifications are permissible without consent. The proposed modifications are not State Significant Infrastructure (SSI) or State Significant Development (SSD). The proposed modifications can be assessed under Division 5.1 of the EP&A Act. Consent from Council is not required.

5. Consultation

5.1 Consultation strategy

Consultation on the Project was carried out with key agencies, stakeholders and the community. Following the public display of the Project REF, various submissions were made and responded to within the submissions report (Transport for NSW, 2022). A total of six submissions were received by Transport during public display. An additional three submissions were received outside of the public exhibition period. Transport has continued consultation with community and key stakeholder post this period. Consultation with the community has continued to occur in accordance with Section 5.2 of the Project REF.

5.2 Consultation outcomes

The proposed modification has been informed by consultation wherever safety and environmental constraints allow. Table 5.1 presents a summary of the specific consultation that has occurred in relation to the proposed modification.

Table 5-1 Consultation in relation to the proposed modification

Consultation activity	Topic of consultation	Outcome
Meeting on 6/11/2023 with Hawkesbury Council and Penrith City Council	Transport sought information from Hawkesbury Council and Penrith City Council in relation to the legality of driveways throughout the Driftway. Transport informed Council that tie-ins to the new road will only be provided for legal driveways.	Legal driveways were identified, and the detailed design was updated to provided tie-ins to all legal driveways throughout the Driftway.
Meeting on 30/1/2024 with Hawkesbury City Council	Transport met with Hawkesbury City Council to discuss access to the HWMF. Transport provided two options for a U-turn bay for small vehicles for depot access.	Council confirmed that the option to include a U-turn within HWMF property was the preferred option.
Meeting on 14/02/2024 with Hawkesbury City Council	Hawkesbury Council asked to extend the footpath on the northern side of the Driftway from Blacktown Road up to the bridge and HWMF. Transport informed Council that there is no active transport requirement on The Driftway.	Transport will not provide a footpath on the on northern side from Blacktown Road up to the bridge. However, a footpath will be provided for the same extent on the southern side of the Driftway.
Meeting on 24/05/2024 with Hawkesbury City Council	Meeting to resolve the maintenance issue of 2:1 batter of The Driftway. Transport presented the batter maintenance strategy.	Council accepted the 2:1 batter on the Driftway and the proposed maintenance measures.

5.3 Ongoing or future consultation

The Project would ensure ongoing consultation occurs with the community and stakeholders by providing community updates, continued meetings and briefings with Hawkesbury Council, Penrith City Council, Western Sydney University and the community, providing updates to the Project's website and maintaining the phone line and email address.

6. Environmental assessment

This section of the AREF provides a detailed description of the potential environmental impacts associated with the construction and operation of the proposed modifications of the New Richmond Bridge and traffic improvements – Stage 1 The Driftway project. All aspects of the environment potentially impacted upon by the proposed modifications are considered. This includes consideration of the Roads and Related Facilities EIS Guideline (DUAP, 1996) and Is an EIS required? (DUAP, 1999) G and the factors specified in section 171 of the Environmental Planning and Assessment Regulation 2021. The factors specified in section 171(2) of the Environmental Planning and Assessment Regulation 2021 are considered in Appendix A.

The environmental factors that have potential to experience a change in impact as a result of the proposed modifications are assessed in greater detail below and include:

- Biodiversity
- Flooding, drainage, and surface water
- Traffic, transport, and access
- Noise and vibration
- Aboriginal heritage

To support the assessment of the proposed modifications, an Operational Traffic Noise Assessment Report (Mott MacDonald, 2023a), Addendum Biodiversity Assessment Report (Addendum BAR) (Mott MacDonald, 2023b) and Stage 1 PACHCI (Mott MacDonald, 2023c) have been prepared. Other assessments are compiled within the AREF chapters using information from the detailed design process and publicly accessible databases.

Table 6-1 provides a summary of the additional impacts identified for each proposed modifications and the consistency between the results of assessments undertaken for the Project REF and the Addendum REF.

Other environmental factors which are not expected to experience a change in impact as a result of the proposed modifications have been discussed in Table 6-12. Site-specific safeguards and management from the project REF, submissions report and this AREF is provided in Section 7.

Table 6-1 Summary of the additional impacts identified because of the proposed modifications and the consistency between the Project REF and Addendum REF assessments

Proposed Modifications		Consistency with Project REF	Assessment Required (Note: Aboriginal cultural heritage has been re-assessed for all proposed modifications)
Londonderry Road Roundabout	Additional southbound lane on the roundabout	• Within the Project REF boundary • Additional impacts to traffic conditions have been identified	• Flooding, drainage, and surface water • Traffic, transport, and access • Noise and vibration
	Tie-in works on Londonderry Road associated with the additional southbound lane	• Extends beyond the Project REF boundary • Additional vegetation clearing required	• Biodiversity • Flooding, drainage, and surface water • Traffic, transport, and access • Noise and vibration
	Relocation of the bus stop on Londonderry Road 28m further south of the roundabout and adjustment to an in-lane bus stop	• Within the Project REF boundary • Identified impacts are consistent with existing assessment	
Hawkesbury Waste Management Facility	Introduction of auxiliary turning lane into the HWMF on the eastbound side of the Driftway	• Within the Project REF boundary • Additional impacts to traffic conditions have been identified	• Traffic, transport, and access • Noise and vibration
	Adjustments to the posted speed approaching the HWMF from the Blacktown Road roundabout from 80km/h to 60km/h	• Within the Project REF boundary • Additional impacts to traffic conditions have been identified	• Traffic, transport, and access • Noise and vibration
Throughout the Addendum REF boundary	Realignment of the lane markings	• Within the Project REF boundary • Identified impacts are consistent with existing assessment	
	Introduction of traffic safety barriers along the Driftway at the location of safety hazards e.g. culverts	• Within the Project REF boundary • Identified impacts are consistent with existing assessment • Improved traffic safety outcomes	

Proposed Modifications		Consistency with Project REF	Assessment Required (Note: Aboriginal cultural heritage has been re-assessed for all proposed modifications)
	Realignment of swales and amendments to the batter on the South side of the Driftway	• Within the Project REF boundary • Improved traffic safety outcomes • Improved flooding, drainage, and surface water outcomes	• Flooding, drainage, and surface water
	Flattening of batters along the northern verge of the Driftway	• Within the Project REF boundary • Further vegetation clearing is required	• Biodiversity
	Modifications to drive way tie-ins along Londonderry Road and the Driftway, including new driveway access at the Turlte Landscape Supplies business on Racecourse Road	• Extends beyond the Project REF boundary • Further vegetation clearing may be required • Additional impacts to traffic conditions have been identified • Additional impacts to flooding, drainage, and surface water have been identified	• Biodiversity • Flooding, drainage, and surface water • Traffic, transport, and access • Noise and vibration
Maintenance track	Shortening of the maintenance access track from the Driftway and introduction of an additional maintenance access track from Blacktown Road to access the eastern bank of the creek	• Extends beyond the Project REF boundary • Additional impacts to traffic, transport, and access conditions have been identified • Improved biodiversity outcomes • Improved flooding, drainage, and surface water outcomes	• Biodiversity • Flooding, drainage, and surface water • Traffic, transport, and access • Noise and vibration
Ancillary facilities	Adjustments to the layout of the ancillary facility, increasing in size by 0.1ha	• Extends beyond the Project REF boundary • Additional impacts to biodiversity have been identified • Improved flooding, drainage, and surface water outcomes	• Biodiversity • Flooding, drainage, and surface water

6.1 Biodiversity

The proposed modifications have extended the area of works beyond the previously assessed boundary in the Project REF. Therefore, an Addendum Biodiversity Assessment Report (BAR) has been prepared to assess the impacts to the additional areas and the cumulative impact of these areas and the Project REF on biodiversity values. The Addendum BAR was prepared in accordance with assessment requirements outlined in the BC Act and EPBC Act. This report is presented in Appendix E
Addendum Biodiversity Assessment Report.

For the purposes of the biodiversity assessment in this AREF and the need to assess the impact of the entire project cumulatively against the BC Act and EPBC Act, this section identifies the existing assessment within the Project REF and provides a summary of the assessment from the Addendum BAR. It should also be noted the Addendum BAR has been prepared in a manner that aims to provide consistency between the Project BAR including applying vegetation condition and potential of vegetation to provide threatened species habitat.

6.1.1 Methodology

Below presents a summary of the methodology undertaken to complete the Addendum BAR.

Desktop Assessment

Existing information on the flora and fauna within the AREF Boundary and the locality, including relevant threatened biota, was obtained from relevant databases and ecological assessments undertaken within the proposal area. All database searches were carried out within a 10 km radius of the AREF Boundary.

The following database searches were performed on the 8/12/2023:

- BioNet – Atlas of NSW Wildlife: http://www.bionet.nsw.gov.au
- NSW DPIE BioNet Vegetation Classification: http://www.environment.nsw.gov.au/NSWVCA20PRapp/LoginPR.aspx
- NSW Threatened Biodiversity Data Collection http://www.bionet.nsw.gov.au
- DAWE Protected Matters Search Tool (PMST): http://www.environment.gov.au/epbc/protected-matterssearch-tool
- Atlas of Living Australia: http://www.ala.org.au/

In addition, the following sources of data were checked for any updates from the Project BAR:

- State Vegetation Type Mapping 2023 Department of Planning and Environment (DPE)
- Area of Outstanding Biodiversity Value register available on the NSW DPIE website: https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/areas-ofoutstanding-biodiversity-value
- National Flying-fox monitoring viewer. http://www.environment.gov.au/webgisframework/apps/ffc-wide/ffc-wide.jsf
- The Commonwealth Bureau of Meteorology's Atlas of Groundwater Dependent Ecosystems (GDE): http://www.bom.gov.au/water/groundwater/gde/map.shtml
- NSW DPI Weed Wise: http://weeds.dpi.nsw.gov.au

A review of the Project BAR was also undertaken.

Field Assessments

Diurnal field surveys were conducted on 1 June 2023 and 6 October 2023, led by Mott MacDonald's ecologist Chris Allen, to verify the vegetation within the area of the proposed modifications in accordance with the vegetation zones identified within the Section 6.1. of the Project REF. The assessment conducted involved:

- Ground truthing of Plant Community Types (PCTs) using the random meander survey technique to validate vegetation identified in the desktop assessment

- Assessment of threatened species habitat
- Opportunistic flora and fauna surveys

The June 1st field survey was undertaken during warm weather conditions for June, with a maximum temperature of 21°C and 0.2 mm of rainfall recorded at the Richmond RAAF base. The October 6th field survey was undertaken during cool weather conditions for October, with a maximum temperature of 23.4°C and no rainfall recorded at the Richmond RAAF base.

6.1.2 Existing environment

Section 6.1.2 of the Project REF presents the existing environment in relation to Biodiversity. The existing environment has not had any significant change prior to the preparation of this AREF. For the purpose of this AREF, a brief summary of Section 6.1.2 of the Project REF is provided below to provide context for the impact assessment. In addition, details of the biodiversity values within the AREF boundary have also been identified.

Regional context

The Driftway is located within the Cumberland sub-region of the Sydney Basin Bioregion that is part of the Hawkesbury-Nepean Terrace Gravels Mitchell region. (National Parks and Wildlife Services, 2002). The land to the south of the study area is predominantly cleared, consisting mainly of roadside vegetation, paddocks and small scattered bushland remnants. To the north of the study area are large patches of remnant bushland, part of which lie within the recently approved Western Sydney University biodiversity stewardship site that would conserve this site in perpetuity.

Plant Community Types

The Project REF identified the presence of five Plant Community Types (PCT) in varying condition and were separated into sevent specific vegetation zones. Each of these PCT's constitute NSW BC Act listed threatened ecological communities (TECs). The Addendum BAR validated all vegetation within the AREF boundary in accordance with the vegetation zones identified in the Project BAR. No additional PCTs were identified, and no new vegetation zones were created as the vegetation surveyed was found in a similar condition to that previously surveyed for the Project BAR. The PCTs and their associated vegetation zones and TECs are presented in Table 6-2.

Table 6-2 PCT and the associated BC Act and EPBC Act listed threatened ecological communities

Veg. zone	Plant community type (PCT)	Broad condition class	BC Act	EPBC Act	Area of impact Project REF (ha)	Area of impact Addendum REF (ha)[1]	Total impact area (ha)
1	724: Broad-leaved Ironbark – Grey Box – Melaleuca decora grassy open forest on clay/gravel soils of the Cumberland Plain, Sydney Basin Bioregion	Low	Shale Gravel Transition Forest in the Sydney Basin Bioregion EEC	-	0.51[2]	0.001[3]	0.511
2	725: Broad-leaved Ironbark – Melaleuca decora shrubby open forest on clay soils of the Cumberland Plain, Sydney Basin Bioregion	Low	Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion EEC	-	0.20	0.000	0.200
3	835: Forest Red Gum – Rough-barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin Bioregion	Low	River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions EEC	-	0.37	0.066	0.436
4	849: Grey Box – Forest Red Gum grassy woodland on flats of the Cumberland Plain, Sydney Basin Bioregion	Moderate	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	-	0.45	0.077	0.527
5		Low	Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC	-	2.96	0.050	3.01
6	883: Hard-leaved Scribbly Gum – Parramatta Red Gum heathy woodland of the Cumberland Plain, Sydney Basin Bioregion	Moderate	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion VEC	Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion EEC	0.08	0.000	0.080
7		Low	Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion VEC	-	1.09	0.022	1.112
Total					5.66	0.216	5.876

[1] Includes areas within the Project REF Boundary that were validated during the Addendum REF Survey
[2] Impacts presented to two decimal places as this is how impacts are presented in Project BAR
[3] Impacts presented to three decimal places as Addendum REF impact to PCT 724 is 0.001 ha and should be captured.

Threatened Species Fauna

The updated data base searches for the threated fauna species identified new records for threatened fauna species within 10km of the proposed modifications. Despite their recency, all species were the same as those identified during the Project REF. This was a total of 71 species which included 18 mammals, 49 birds, two frogs and two invertebrates. Figure 6-1 presents the location of threatened species records since 8 June 2021.

A likelihood of occurrence assessment was undertaken and it was found 15 species were likely to utilise the vegetation within the proposed modifications for habitat. The likelihood of occurrence assessment was revised based of the updated data base search and field survey. The revised data did not change the conclusion of the previous assessment, this was primarily due to the habitat containing the appropriate vegetation for identified species to utilise.

Evidence of one threatened fauna species, the Cumberland Plain Land Snail (*Meridolum corneoviren*) listed as endangered under the NSW BC Act, was identified in the survey for the Project BAR and identified in the extended areas of the AREF during additional field surveys. Empty shells of the Cumberland Land Snail were identified under roadside refuse and leaf litter in low condition PCT 849. All PCTs within the proposed modifications are considered to provide habitat for the Cumberland Plain Land Snail.

Threatened Species Flora

Three additional threatened flora species, *Grevillea parviflora subsp. Parviflora*, *Hibbertia fumana*, *Hibbertia sp. Bankstown* were recorded within the 10km radius since the Project BAR was completed.

A likelihood of occurrence assessment was undertaken to inform the ABAR and found 8 species with a moderate likelihood of occurring. During field surveys previously completed for the Project REF, one threatened flora species listed as vulnerable under the NSW BC Act, *Dillwynia tenuifolia,* was identified within the Project REF impact area. The species was surveyed extensively during the Project BAR with the extent of its occurrence defined. This species was found in a dense cluster in PCT 835 and in low condition patches of PCT 724 and PCT 849. The species is generally sparser in PCT 724 and PCT 883.

Matters of National Environmental Significance

The Project REF identified 0.08 hectares PCT 883 in moderate condition, met the EPBC Act listing criteria for the Commonwealths listed TEC: Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion Endangered Ecological Community. It should be noted the proposed modifications would not extend into this area and therefore no additional impact is expected on this TEC.

Two threatened flora species listed as Vulnerable under the EPBC Act are considered moderately likely to occur within the study area: *Pultenaea parviflora* and *Acacia pubescens*. Potential habitat occurs in PCT 724, PCT 725 and PCT 883 for *Pultenaea parviflora* and PCT 724, PCT 725, PCT 849 and PCT 883 for *Acacia pubescens*.

Three threatened fauna species listed under the EPBC Act are considered moderately likely to use the study area to forage: Swift Parrot listed as Critically Endangered, Grey-headed Flying-fox and the Large-eared Pied Bat both listed as Vulnerable.

No EPBC Act listed migratory species recorded in the EPBC Act Protected Matters Search (10 km radius of the study area) were considered moderately or highly likely to use the study area. The study area is not recognised as important habitat for migratory birds.

Three listed Weeds of National Significance (WONs) were identified within the study area: *Asparagus aethiopicus* (Ground Asparagus), *Lantana camara* (Lantana), and *Rubus fruticosus* (Blackberry).

Groundwater dependent ecosystems

Four of the PCTs (724, 725, 835 and 849) are considered to have a high likelihood of being groundwater dependent ecosystems (GDE). These PCTs are likely to be an opportunistic facultative GDE. Facultative GDEs are dependent on the subsurface presence of groundwater (often accessed via the capillary fringe – subsurface water just above the water table) in some locations but not in others, particularly where an alternative source of water, such as rainfall, cannot be accessed to maintain ecological function (Kuginis et al., 2012). Figure 6-2 present mapping from GDE Atlas which indicated high to moderate potential for terrestrial GDEs to be located within the AREF boundary. The mapping does not indicate any potential for aquatic or terrestrial GDEs to be present.

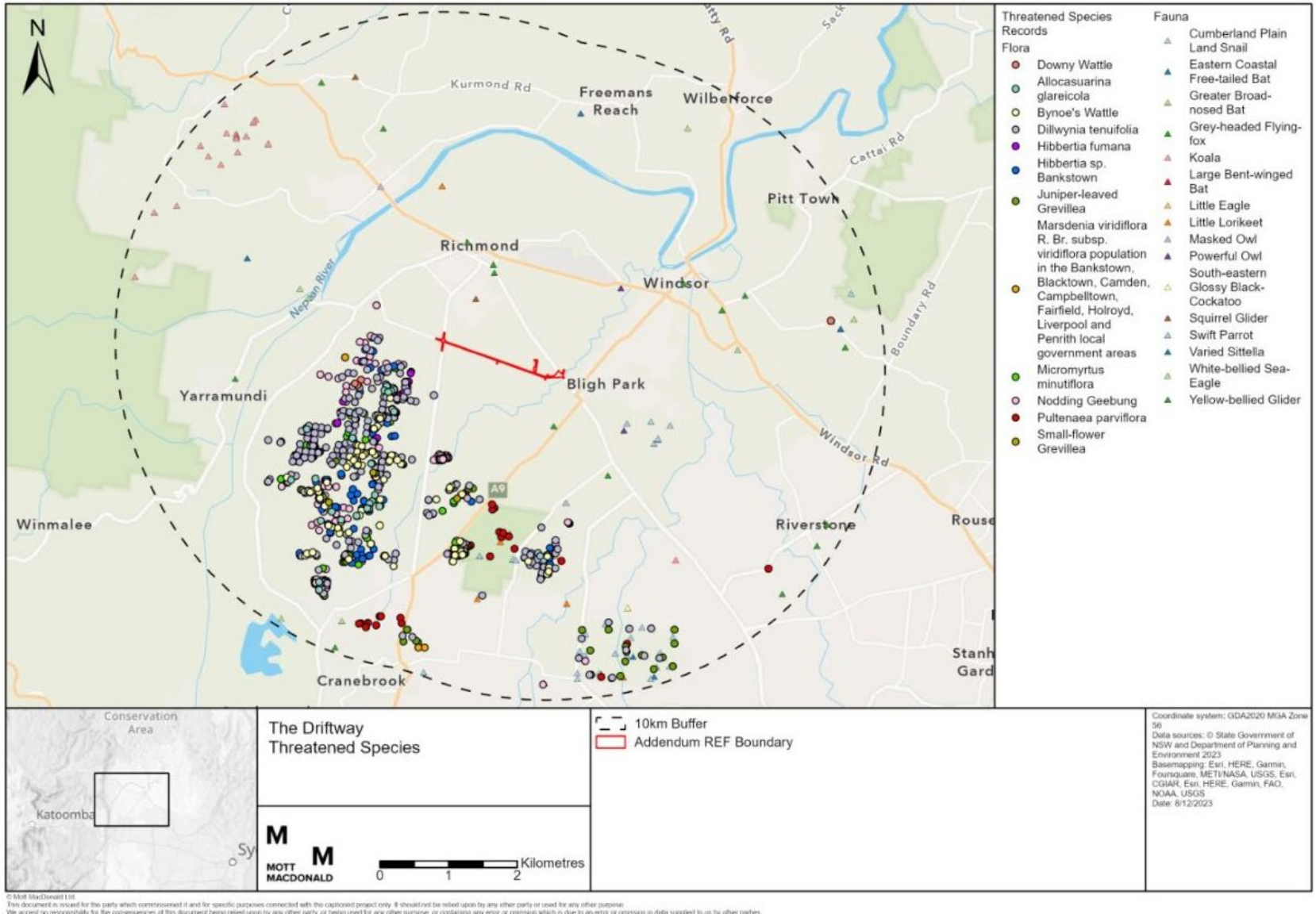

Figure 6-1 Threatened species records since the 8th June 2021

Figure 6-2 Groundwater dependent ecosystems (Red boxes indicate additional areas of impact associated with the additional areas of the AREF, Orange polygon indicates the approximate location of the Project REF)

6.1.3 Potential impacts

Construction

Vegetation Impacts

The proposed modifications would directly impact a further 0.216 hectares of native vegetation. Direct impacts to NSW BC Act and EPBC Act listed TECs are provided in the previous Table 6-2, as well as impacts associated with the Project REF and cumulative total of impacts.

Threatened Fauna Species

The removal of native vegetation would directly result in a loss of habitat/potential habitat for threatened fauna species listed in Table 6-3

Table 6-3 Direct impacts to NSW BC Act and EPBC Act listed fauna

Species	BC Act	EPBC Act	Impact (ha)
Threatened bird species			
Dusky Woodswallow	V	-	0.216 ha foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the development footprint, including PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. No breeding habitat was identified.
Little Lorikeet	V	-	
Swift Parrot	E	CE	
Little Eagle	V	-	
Varied Sittella	V	-	
Threatened nectarivore/frugivore bat species			
Grey-headed Flying-fox	V	V	0.216 ha foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the development footprint, including PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. Non-native vegetation and native plantings within the development footprint may also provide habitat for the Grey-headed Flying Fox. The nearest camp is approximately 4km to the west of the Project. No roosting camps are present within the Project REF and AREF boundary.
Threatened Insectivorous bats (cave-roosting)			
Large Bent-winged Bat	V	V	0.216 ha foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the development footprint, including PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883. Culverts are available for roosting.
Little Bent-winged Bat	V	-	
Eastern False Pipistrelle	V	-	
Yellow-bellied Sheath tail-bat	V	-	
Eastern Coastal Free-tailed Bat	V	-	
Southern Myotis	V	-	
Large-eared Pied bat	V	V	
Greater Broad-nosed Bat	V	-	
Threatened invertebrates			
Cumberland Plain Land Snail	E	-	0.216 ha foraging habitat including mature and native tree species. Impact has been calculated by the area of associated PCTs within the development footprint, including PCT 724, PCT 725, PCT 835, PCT 849 and PCT 883.

Threatened Flora Species

The Project REF determined that it would have impacts on populations of *Dillwynia tenuifolia* within the Project boundary. During the Project REF assessment process the entirety of the *Dilwynia tenuifolia* area of occupancy was identified and mapped, this is presented in Figure 6-3. The identification of the area of occupancy was informed by targeted field surveys within the REF boundary and outside of it to ground truth the known extent

of the population as reported in the biodiversity stewardship site assessment report (BSSAR) (Niche Environment and Heritage, 2021).

The proposed modifications are located in areas outside of the identified area of occupancy, see Figure 6-3. In addition, no *Dillwynia tenuifolia* were identified within the area of the proposed modifications during the Addendum BAR field survey. As such it has been assessed that there are no additional impacts on *Dillwynia tenuifolia* as a result of the proposed modifications.

Figure 6-3 Occurrence of *Dilwynia Tenuifolia*

Aquatic Impacts

The additional areas impacted by the proposed modifications are not located within waterfront land as defined by the *Water Management Act 2000*, within 40m of the top of the bank of a watercourse. The proposed modifications have provided more detail to the design at the tributary of Rickaby's Creek but it has not adjusted the impact area or proposed construction methodology in this location. The Project REF assessed that the Project is unlikely to directly impact aquatic habitats subject to the implementation of safeguards and mitigation measures As such no additional consideration of aquatic impacts to biodiversity is considered. Section 6.2.2 of this AREF discusses the potential for impacts to receiving water quality.

Indirect Impacts

The Project has potential to generate indirect impacts during construction such as lighting, fauna injury or mortality, spread of weed species and noise and vibration. The proposed modifications do not adjust the potential impact of these indirect impacts from that presented in Section 6.1.3 of the Project REF. Safeguards from the Project REF and Submissions Report are considered adequate to mitigate the potential of these impacts.

Operation

The proposed modifications are not anticipated to produce any additional impacts to biodiversity from what was assessed in Section 6.1.3 of the Project REF. These impacts are associated with potential edge effect, noise and vibration, and aquatic impacts that are not anticipated to worsen as a result of the proposed modifications. Safeguards from The Project REF and Submissions Report are considered adequate to mitigate the potential of these impacts.

Conclusion on significance of impacts

Test of Significance in accordance with Section 7.3 of the BC Act have been prepared within the Addendum BAR for the following TECs and threatened species:

- *Cumberland Plain Woodland in the Sydney Basin Bioregion*
- *Shale Gravel Transition Forest in the Sydney Basin Bioregion*
- *Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion*
- *River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*
- *Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion*
- *Dillwynia tenuifolia*
- *Pultenaea parviflora*
- *Acacia pubescens* (Downy Wattle)
- *Grevillea juniperina subsp. juniperina* (Juniper-leaf Grevillea)
- *Dusky Woodswallow (Artamus cyanopterus cyanopterus)*
- *Little Eagle (Hieraaetus morphnoides)*
- Little Lorikeet *(Glossopsitta pusilla)*
- Swift Parrot *(Lathamus discolor)*
- Varied Sittella *(Daphoenositta chrysoptera)*
- Grey-headed Flying-fox (*Pteropus poliocephalus)*
- Large Bent-winged Bat *(Miniopterus orianae oceanensis)*
- Little Bent-wing Bat *(Miniopterus australis)*
- Eastern False Pipistrelle *(Falsistrellus tasmaniensis)*
- Yellow-bellied Sheathtail-bat *(Saccolaimus flaviventris)*
- Eastern Coastal Free-tailed Bat *(Micronomus norfolkensis)*
- Southern Myotis *(Myotis macropus)*
- Large-eared Pied Bat *(Chalinolobus dwyeri)*
- Greater Broad-nosed Bat *(Scoteanax rueppellii)*
- Cumberland Plain Land Snail *(Meridolum corneovirens)*

The tests assessed the cumulative impact of the Project and proposed modifications impact on biodiversity values.

It was assessed that the Project and the proposed modifications are not likely to significantly impact threatened species, populations or ecological communities or their habitats, within the meaning of the BC Act or FM Act and therefore a Species Impact Statement is not required.

Assessments of Significance have been completed in accordance with the *EPBC Act Policy Statement 1.1 Significant Impact Guidelines* (Department of Environment, 2013) within the Addendum BAR for the following TECs and threatened species:

- *Castlereagh Scribbly Gum and Agnes Banks Woodlands of the Sydney Basin Bioregion (Endangered)*
- *Pultenaea parviflora*
- *Acacia pubescens* (Downy Wattle)
- Swift Parrot *(Lathamus discolor)*
- Grey-headed Flying-fox (*Pteropus poliocephalus)*
- Large-eared Pied Bat *(Chalinolobus dwyeri)*

The cumulative impact of the Project and proposed modifications impact on biodiversity values were assessed. The determined Project REF and the proposed modifications would not likely significantly impact threatened species, populations, ecological communities or migratory species, within the meaning of the EPBC Act when assessed separately and cumulatively.

6.1.4 Safeguards and management measures

There is no additional impact from the proposed modifications that require the environmental safeguards from the Project REF and Submissions Report to be amended or supplemented. It is considered that existing safeguards would be sufficient in managing potential impacts. Specifically, B1 requires the preparation of Flora and Fauna Management Plan which would be the primary document for managing impacts during construction. The existing safeguards from the Project REF are detailed in Table 7-1.

As a result of the Biosecurity (Fire Ant) Emergency Order that was put in place in January 2024 for the whole state of NSW, an additional preventative safeguard has been put in place to mitigate the risk of Fire Ant invasion and spread in the Project area. This emergency order provides guidance on the use and procurement of equipment and construction materials that would be required for the scope of works outlined in the AREF. Therefore, any procurement and import of sensitive construction materials must align with guidance outlined in *the Biosecurity (Fire Ant) Emergency Order (No 1) 2024 under the Biosecurity Act 2015* (DPI, 2024) and Transport requirements.

6.1.5 Biodiversity offsets

Transport for NSW Guideline for Biodiversity Offsets (Roads and Maritime, 2016) was used to consider biodiversity offsets to compensate for impacts to threatened biodiversity resulting from the proposal. The assessment identified that the proposal is not likely to have a significant impact on threatened biodiversity listed under the NSW BC Act or the EPBC Act. Therefore, no like-for-like offsets for MNES are required. The offset requirements in accordance with the Transport for NSW offset guidelines is presented in Table 6-4.

Table 6-4 Offset Requirements

Impact type	Impact ha			Offset Ratio	Previous Offset Requirement	Revised Offset Requirement
	Project	Addendum	Total			
Loss of NSW listed critically endangered ecological communities (CEEC)	0.45	0.077	0.527	Offset at a ratio of 4:1 where the offset sites are in moderate to good condition Offset at a ratio of 8:1 where the offset sites are in poor condition including rehabilitation sites	1.8 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in moderate to good condition (ratio of 4:1) Or 3.2 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in poor condition (ratio of 8:1)	2.108 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in moderate to good condition (ratio of 4:1) Or 4.216 hectares of Cumberland Plain Woodland in the Sydney Basin Bioregion CEEC in poor condition (ratio of 8:1)
Loss of threatened fauna species	5.21	0.139	5.349	Offset area of habitat lost at a ratio of 3:1	15.63 hectares of Cumberland Plain Land Snail habitat (ratio of 3:1) 15.63 hectares of ecosystem credit species habitat	16.047 hectares of Cumberland Plain Land Snail habitat (ratio of 3:1) 16.047 hectares of ecosystem credit species habitat
Loss of threatened flora species	1.3	0	1.3	Offset individuals lost at a ratio of 3:1	3.9 hectares of *Dillwynia tenuifolia* habitat. Under the BAM, offsets are calculated by area rather than number of individuals for this species.	3.9 hectares of *Dillwynia tenuifolia* habitat

6.2 Flooding, drainage and surface water

6.2.1 Existing Environment

Section 6.2.2 of the Project REF presents the existing environment in relation to flooding, drainage and surface water. The existing environment has not had any substantial change prior to the preparation of this AREF. Therefore, a brief summary of Section 6.2.2 of the Project REF is provided below to provide context for the impact assessment.

The Driftway is located within the Hawkesbury-Nepean Floodplain, a large valley that covers around 500 square kilometres and has the highest flood exposure in NSW. The Driftway is very flat which has resulted in construction of a network of drainage channels and catch drains that are aimed at draining the area following rainfall events. This includes a large, engineered channel that has been constructed by Penrith City Council along the northern side of The Driftway between its intersection with Londonderry and Reynolds Roads. Due to the very flat landscape, runoff typically ponds in shallow depressions or catch drains for an extended period of time. Runoff intercepted by the catch drains is conveyed to the northern side channel of The Driftway via a series of small diameter pipes and culverts.

The Driftway is located on land that is subject to flooding as a result of backwater flooding from the Hawkesbury River and local catchment flooding from rain falling directly over the Rickabys Creek catchment. Rickabys Creek is a minor tributary of the Hawkesbury River and has a catchment area of about 90 square kilometres where it crosses Blacktown Road a short distance to the south of its intersection with The Driftway. The eastern end of The Driftway is subject to flooding events. Backwater flooding from the Hawkesbury River can inundate the eastern end of The Driftway near its intersection with Blacktown Road by several metres, with the existing two-lane road subject to flooding for a period of several days.

6.2.2 Potential impacts

The Project REF performed hydraulic modeling of local catchment drainage and discharge graphs to inform the flooding, drainage and surface water impacts of the project. This modeling was used to inform the detailed design.

Construction Impacts

Section 6.2.3 of the Project REF presents potential impacts on drainage and surface water during construction. The proposed modifications have increased the area of works, primarily along Londonderry Road and around driveways along Londonderry and The Driftway. This has increased the area of construction activities required for the Project, including vegetation clearing and earthworks. These construction activities have potential to impact receiving waters through the transportation of sediment and gross pollutants. The additional impact associated with the increased areas of construction is not considered to change the significance of the impact associated with the transportation of sediment and gross pollutants. Existing safeguards within the Project REF and Submissions Report are considered adequate to manage impacts on flooding, drainage and surface water during construction. In addition to the mitigation measures listed above, a preliminary Erosion Sediment Control Plan (ESCP) has been prepared to manage water and sediment transportation during construction. This would be progressively updated during construction.

Flood impacts are not anticipated to change during construction as the existing flood regime would remain until drainage infrastructure has been constructed and is manages flood water flows. Existing safeguards within the Project REF and Submission Report are considered adequate to address these impacts. Once drainage is constructed flood impacts would be similar to what is discussed in operational impacts below.

It should be noted that during the detailed design phase the ancillary facility from the Project REF was modified for a number of reasons, including to avoid flood prone land. Figure 6-4 presents the modified location and the mapped Probable Maximum Flood (PMF). Therefore, the relocated ancillary facility is not anticipated to be impacted by flooding during construction.

Figure 6-4 Flood modelling in proximity to the ancillary facility

Operational Impacts

The detailed design has optimised the drainage design presented in the Project REF. Flood models have been prepared to assess the impact of the detailed design against the existing environment. A MUSIC model has been prepared to model water quality impacts of the Project and a TUFLOW model was prepared to assess flooding impacts of the proposal. Below presents this discussion.

Water quality

The minor drainage system comprises of a below ground pit and pipe network in conjunction with grass lined swales, which collects stormwater runoff from the proposed road alignment to control nuisance flooding and enable effective stormwater management for the proposed road alignment.

The major drainage system incorporates overland flow routes through the proposed road hardstand and landscaped areas to cater for minor system failures. The system aims to capture runoff from the proposed road alignment and direct this to the Rickabys Creek tributary at the eastern extent of the Project. Pit spacing has been provided to manage the flow width requirements and pipes have been sized to convey the 10% AEP storm event.

Table 6-5 presents a comparison of the results from the MUSIC Model completed for the concept and detailed design. It was found that under operational conditions both the concept and detailed design would result in overall reductions in the pollutant load discharging to the receiving drainage lines.

Table 6-5 Comparison between Detailed Design and Concept Design MUSIC Models

Pollutants	Detailed Design reduction from existing	Concept Design reduction from existing	Change in reduction of pollutants
Gross Pollutants	90.9%	88%	Increased by 2.9%
Total Suspended Solids	78.3%	78%	Increased by 0.3%
Total Phosphorus	45.8%	51%	Decreased by 5.2%
Total Nitrogen	19.5%	18%	Increased by 1.5%

This reduction is primarily related to the provision of grass lined swales along the full length of the southern side of The Driftway together with the maintaining the existing grass lined channel between Londonderry Road and Reynolds Road along the northern side of the road alignment. The utilisation of grass lined swales is considered to provide an effective means of treatment of runoff from the road carriageway before runoff is discharged into the receiving watercourses.

It should be noted that detailed design has resulted in a decrease in the anticipated reduction in total phosphorus entering receiving waters. This is attributed to the MSUIC model for the detailed design including more detail on the existing catchment and partially accredited to the detailed design having a minor increase in impervious surfaces. This decrease in the anticipated reduction in total phosphorus is still an improvement on the existing water quality.

Flooding

As discussed in Section 6.2.1 The Driftway is located on flood effected land. On completion of the detailed design revised flood models were prepared to understand the impact of the Project on flooding in the locality. The flood model compared the existing condition against the design. The modeling found the Project improves the resilience of The Driftway and safety to more frequent storms up to the 10% AEP event by reducing overtopping of the carriageway. The consequence of the upgrade is considered to be negligible in the context of the surrounding land-use, the relative changes in flood depths and hazard, and the rarity of the 1% AEP storm, particularly as the upgraded road has improved resilience to more frequent storms that are more likely to be

experienced during the lifetime of the road. The proposed upgrade is also beneficial to habitable properties on the south side of the carriageway by reducing flood water levels.

The most heavily flood impacted locations are a portion of The Driftway directly west of Luxford Road intersection and the eastern end of The Driftway at the Blacktown Road intersection.

Figure 6-5 presents a comparison at the Luxford Road intersection between the existing conditions and the Project conditions during the Probable Maximum Flood (PMF). The figure presents a slight decrease in flood depths to specific locations south of Driftway during the PMF but still presents widespread flooding in the locality. Figure 6-6 presents flood extents and depths during a 10%AEP event with the Project. The figure shows all buildings south of The Driftway free from flood impacts.

There is a small box culvert adjacent to Luxford Road where flood water is predicted to inundate the eastbound carriageway only, with the westbound lane remaining flood-free. This is a notable improvement compared to the existing condition where a 10% AEP storm may inundate an 85m length of The Driftway. In addition, the modeling found that increasing the size of this culvert would have detrimental impact on properties on the southern side of The Driftway as the additional flow could not be contained within the existing natural drainage channel, increasing the depth of inundation at several inhabited properties.

Figure 6-7 presents a comparison at the Blacktown Road intersection between the existing conditions and the Project conditions during PMF. The figure shows that The Driftway and Blacktown Road is less flood affected than the existing condition.

In addition, the Londonderry Road intersection is flood affected. Figure 6-8 presents comparison at the intersection between the existing conditions and the Project conditions during PMF. The figure shows that The Driftway and Londonderry Road is less flood affected than the existing condition. In addition, residential properties on the south eastern corner of the intersection previously flood affected are less affected than existing conditions.

6.2.3 Safeguards and management methods

There are no additional impacts from the proposed modifications, thus the environmental safeguards from the Project REF and Submission Report would be sufficient in managing potential impacts during construction. Specifically, SW4 requires a flood management plan to be prepared prior to construction, SW1 requires a Soil and Water Management plan to implemented as part of the Project CEMP and SW3 requires the completion of ESCP which was produced during the detailed design process.

Safeguard SW5 from the Submission report provides specific measures to be included within the detailed design, the completion of floor level survey and improved drainage to avoid impacts to private properties. The floor level survey was incorporated into the revised flood model and the modeling found that the Project would not worsen flood risk to existing properties on the southern side of The Driftway. There are no operational safeguards presented in the Project REF or Submissions Report and no additional safeguards are required.

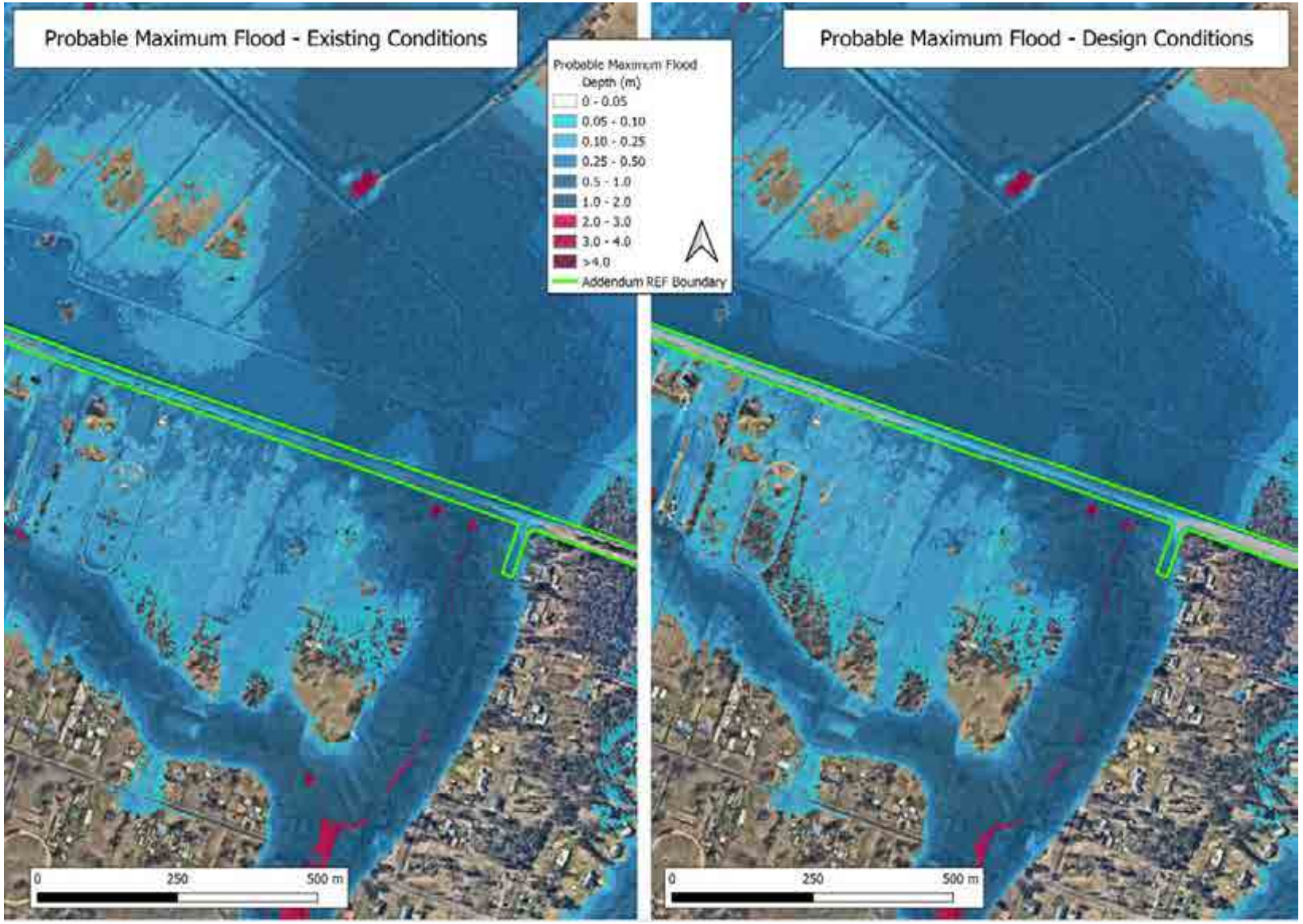

Figure 6-5 Probable Maximum Flood existing compared to design at Luxford Road intersection

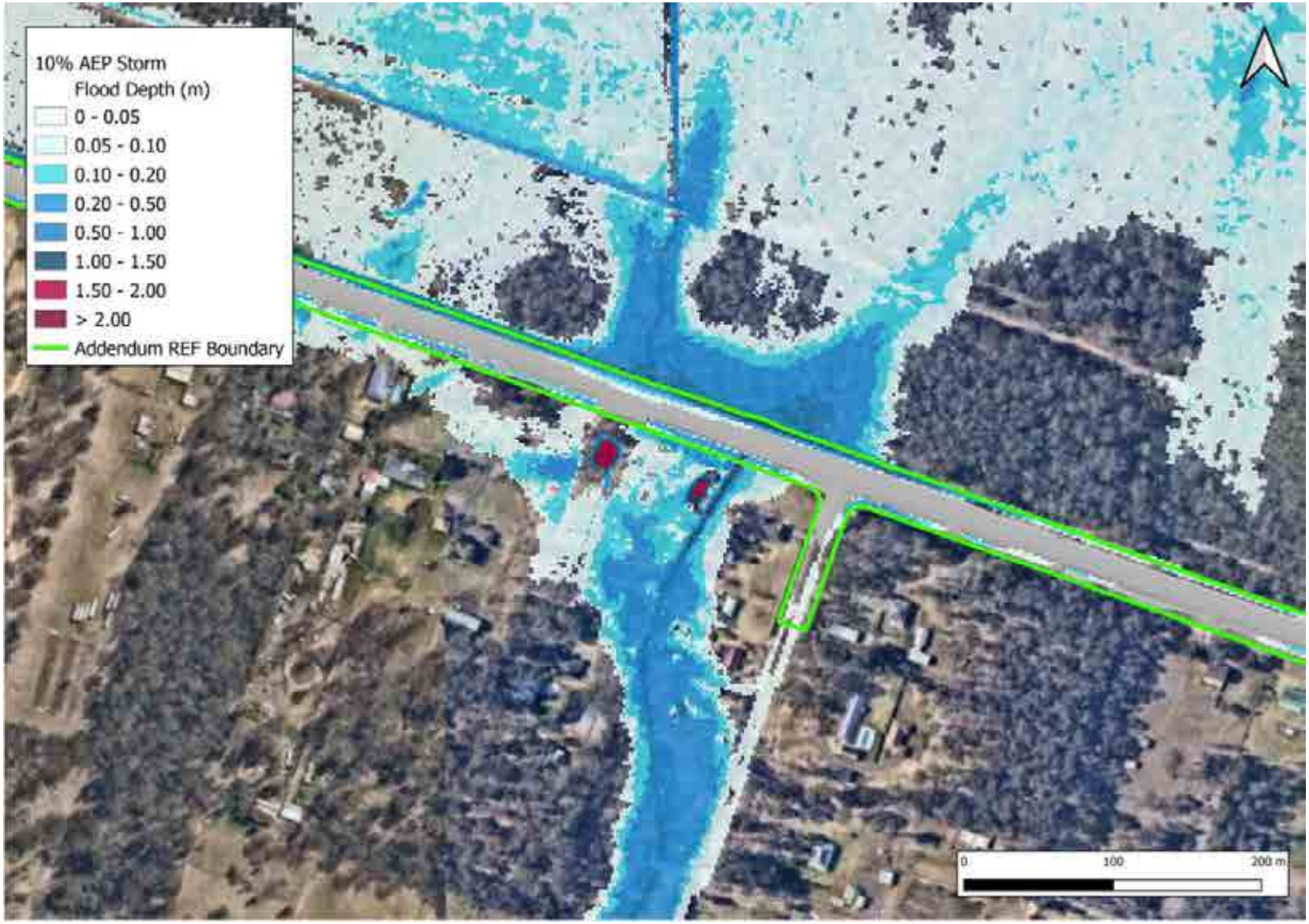

Figure 6-6 10% AEP Flood extents and depths Luxford Road intersection

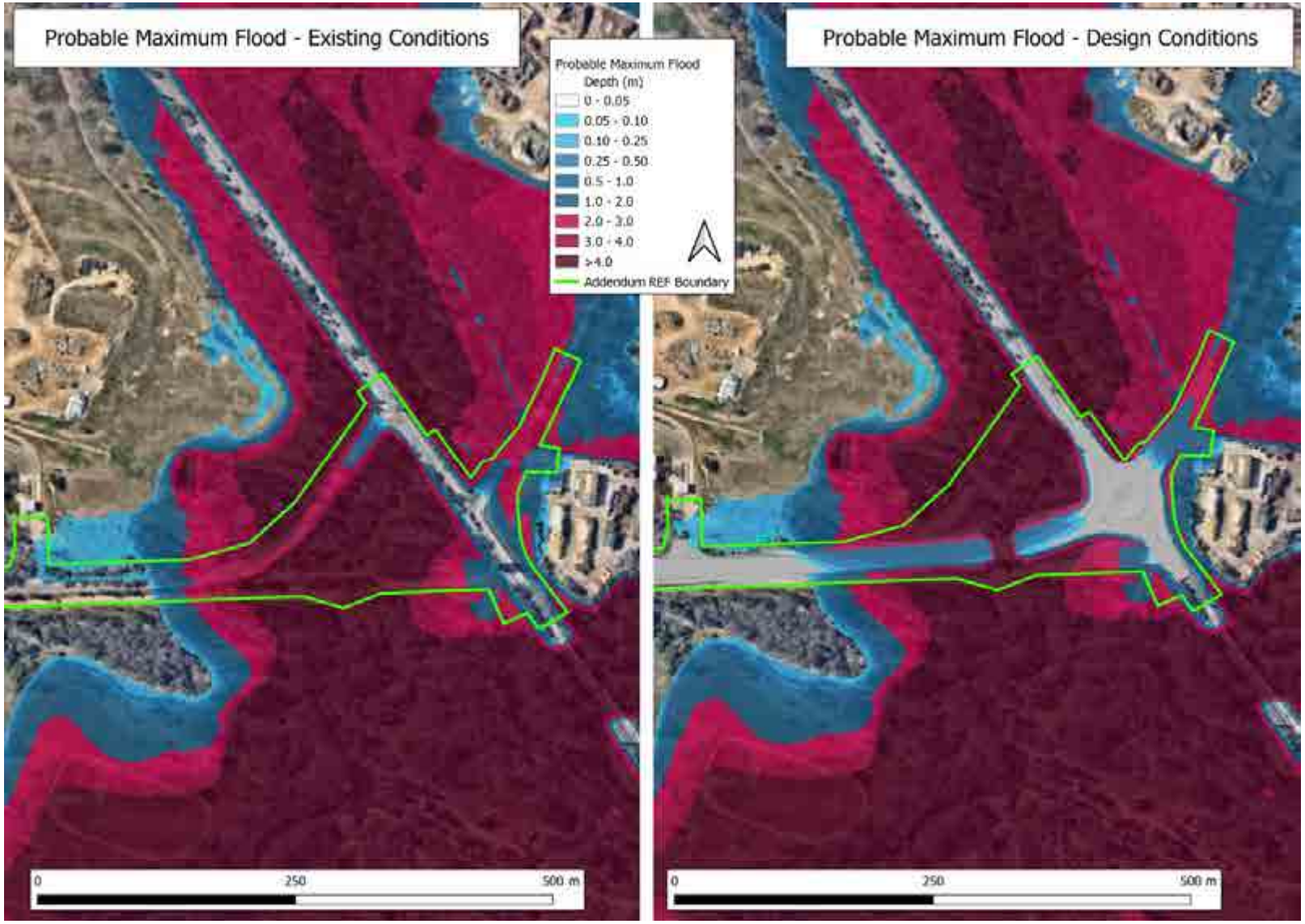

Figure 6-7 Probable Maximum Flood existing compared to design at Blacktown Road intersection

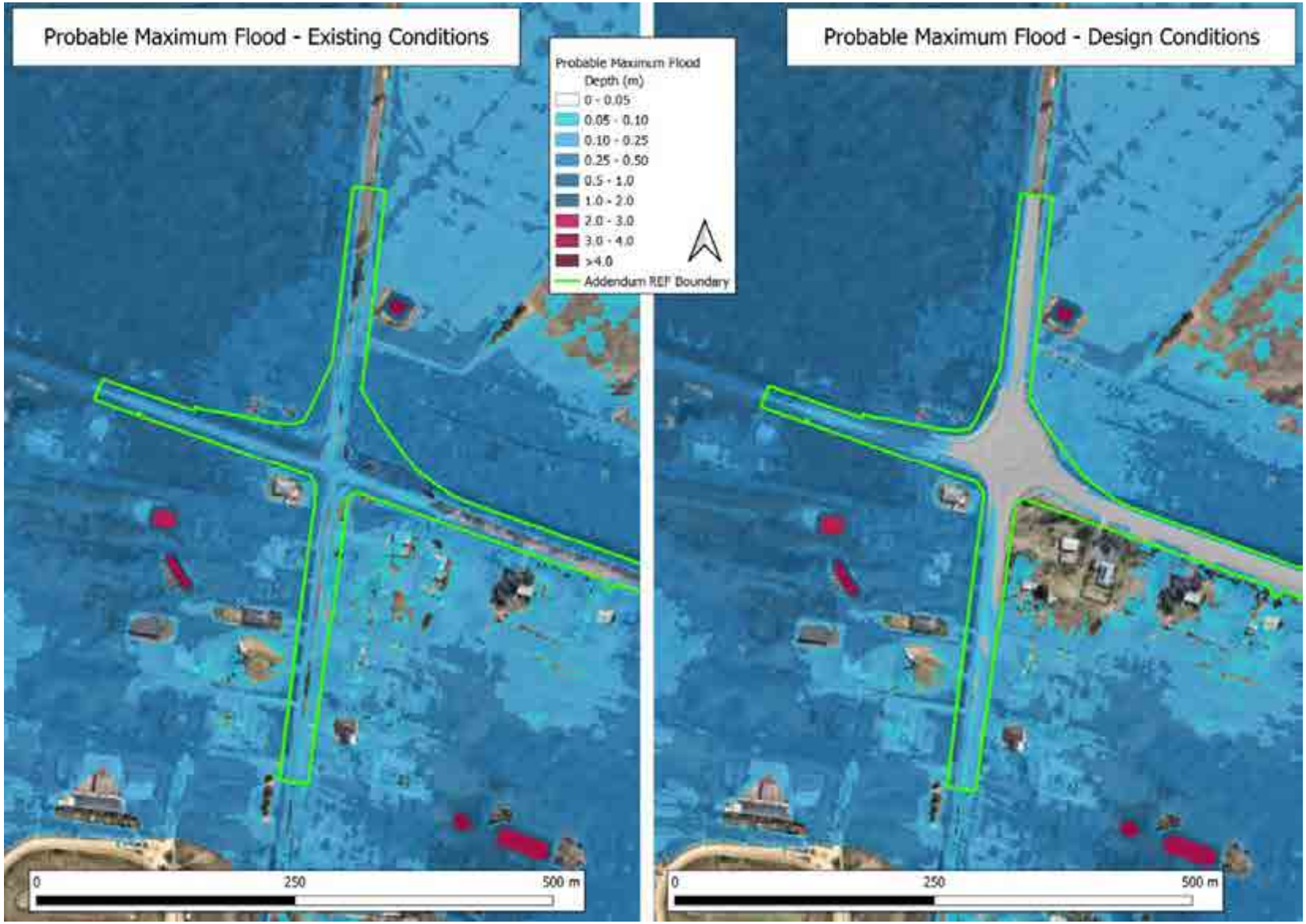

Figure 6-8 Probable Maximum Flood existing compared to design at Londonderry Road intersection

6.3 Traffic, transport and access

6.3.1 Existing Environment

Section 6.3.2 of the Project REF presents the existing environment in relation to traffic, transport and access. The existing environment has not had any substantial change prior to the preparation of this AREF. Therefore, a brief summary of Section 6.3.2 of the Project REF is provided below to provide context for the impact assessment.

The Driftway is a local road within the Hawkesbury LGA connecting Blacktown Road at the eastern extent with Castlereagh Road at the western extent. The Driftway has an undivided carriageway with one travel lane in each direction (eastbound and westbound) and is generally signposted as 80 kilometres per hour (80 km/hr). The Project is proposing to upgrade a 3.6 km Section of The Driftway between Londonderry Road and Blacktown Road. The following intersections are located within the AREF Boundary:

- Driftway and Londonderry Road intersection is a four-way intersection controlled by stop signs
- A give way T-junction intersection between The Driftway and Blacktown Road
- A give way T-junction intersection between Blacktown Road and Racecourse Road
- A give way T-junction intersection between The Driftway and Reynolds Road
- A give way T-junction intersection between The Driftway and Luxford Road

Londonderry and Blacktown Road are classified roads. The Driftway is not a classified road.

Traffic data from June 2021 found that The Driftway currently carries over 200 – 300 vehicles in each direction during the morning and afternoon peak. Londonderry Road currently has higher traffic volumes with about 700 – 750 vehicles per hour during peak periods. Blacktown Road experiences even higher traffic volumes than The Driftway and Londonderry Roads, with about 1,200 – 1,600 per hour in both directions combined during peak periods.

Intersections are currently performing well for traffic entering The Driftway from Blacktown Road and Londonderry Road at peak times. While traffic from The Driftway trying to get onto Blacktown road experiences long delays, average of 113 seconds in the morning peak and 41 seconds during the evening peak. Traffic from The Driftway trying to get on to Londonderry Road have shorter waits during peaks between 20-56 seconds.

Injury crash clusters and safety issues have been identified along The Driftway. Many of these crashes relate to conflicts between through and right-turning traffic at key intersections such as The Driftway with Blacktown Road and Londonderry Road. 39 crashes have occurred between 2015 and 2020, with one fatal crash occurring in 2017.

Several public bus routes operate along the surrounding road network, however there are no routes along The Driftway. There are no dedicated pedestrian pathways along The Driftway, Londonderry Road or Blacktown Road in the vicinity of the proposal. The only bicycle path in proximity of the AREF is located on Blacktown Road.

6.3.2 Potential impacts

Construction Impacts

Section 6.3.3 of the Project REF presents potential impacts on traffic during construction. The proposed modifications are anticipated to cause a minor increase in the amount of materials required to be delivered due to the increased size of the Project, however this would result in a negligible increase in traffic due to the scale of modifications compared to the rest of the Project. This negligible impact is considered consistent with the conclusions of the Project REF which found the increased traffic from construction activities not to be a significant impact in comparison to existing traffic volumes.

Existing safeguards from the Project REF and Submission Report are considered adequate to manage construction impacts of the proposed modifications on traffic.

During the detailed design phase, it was identified that an increased number of driveways along Londonderry Road and The Driftway would require modification to accommodate the revised road levels. This would cause

more access impacts to specific residents than was identified with the Project REF. However, existing mitigation measure TT2 from the Submission Report would ensure that access to properties is maintained during construction.

Operational Impacts

Section 6.3.3 of the Project REF presents the operational impact of the Project on traffic, these impacts are only associated with intersection performance. The proposed modifications are a result of the detailed design which optimised aspects of the concept design and as such is considered to primarily have a positive impact on operational traffic. However, for the purposes of this assessment the impacts form the Project REF will be summarised below and Table 6-6 will present assessment of the road design optimisations and the impact of each change.

Traffic modelling for the future year 2026 indicates that additional demand would cause The Driftway /Blacktown Road and Londonderry Road / The Driftway intersections to be at capacity without the improvement to the intersections. However, the model shows improvements during the morning peak periods with the intersection of Londonderry Road / The Driftway intersection from Level of Service[1] (LoS) C to LoS B as a result of the Project and The Driftway /Blacktown Road intersection from LoS F to LoS C. Similar results were recorded for the afternoon peak. Improvements are a result of upgrading the intersection to a roundabout, allowing traffic from The Driftway to turn onto Blacktown and Londonderry Road more easily. The modeling in relation to the year 2036 presented similar improvements of intersection performance, with the Londonderry Road / The Driftway from LoS E to LoS C as a result of the Project and The Driftway /Blacktown Road intersection from LoS F to LoS E.

Table 6-6 presents how specific design optimisations have changed operational impacts from those assessed in the Project REF. All design optimisations have a positive impact on operational traffic apart from the bus stop south of the Londonderry roundabout now being an in-lane bus stop instead of designated off lane bus stop. This is anticipated to have minor temporary negative impact on traffic flow when compared against the Project REF. The bus stop services the 677 bus route which only has nine services a day during the week and six during the weekend, therefore traffic is only anticipated to be briefly impeded and create a significant impact to traffic in the locality. This is similar to the existing traffic arrangement, as such no safeguards are required to address this impact.

Table 6-6 Design optimisation and change in operational impacts

Design optimisation	*Change in operational impact*	*Justification*
Additional southbound lane on the Londonderry Road roundabout	Yes positive – improved performance by improving ease of traffic flows at the Londonderry Road and The Driftway intersection.	The additional southbound lane on the roundabout is anticipated to further reduce delays to traffic at the intersection by: • increasing ease of eastbound traffic to enter The Driftway from Londonderry Road • increasing ease traffic from The Driftway entering Londonderry Road.
Relocation of the southbound lane bus stop located south of the Londonderry Road roundabout further south by 28m.	Yes negative – minor temporary impact on traffic flow compared to the Project REF	The bus stop would now be in-lane causing temporary obstruction of through traffic. The bus stop services the 677 bus route which only has nine services a day during the week and six during the weekend.
Introduction of an auxiliary turning lane into the HWMF	Yes positive – improved safety for traffic on The Driftway	The auxiliary turning lane removes decelerating vehicles from The Driftway, removing impediments to through traffic creating a safer road arrangement.

[1] Level of Service (LoS) is a measure of the performance (LoS A to F) of intersections based on the delay experienced by vehicles passing through the intersection. As intersections become more congested, the delay increases, reducing the intersection LoS towards F.

[illegible]	[illegible]	[illegible]
Changes to the posted speed approaching the HWMF from 80 km/h to 60 km/h	Yes positive – improved safety for traffic on The Driftway	The reduction to 60 km/s between Blacktown Road and the HWMF provides a compliant safe intersection sight distance. This also addresses Council's request to improve access to the facility.
Minor re-alignment of lane markings along The Driftway at the Luxford Road intersection	Yes positive – improved safety for traffic on The Driftway	The Road Safety Audit identified the need to create clear separation between eastbound and westbound traffic at this intersection. To achieve this the centreline has been amended to create separation between eastbound and westbound traffic.
Modification of driveway tie-ins along Londonderry Road and the Driftway	Yes positive – improved safety for traffic entering The Driftway from private properties.	The modified driveway tie-ins allow safe access to residential and commercial properties to be entered and exited by improving vehicle sight lines.

6.3.3 Safeguards and management methods

The additional negative impacts from the proposed modifications are expected to be minor during the construction and operational phases, thus the environmental safeguards from the Project REF would be sufficient in managing potential impacts. Specifically, TT1 requires the preparation of Traffic Management Plan (TMP) which would be the primary document for managing traffic impacts during construction. There are no safeguards provided for operational impacts in the Project REF and this is consistent for impacts associated with the AREF.

6.4 Noise and vibration

An Operational Traffic Noise Assessment (OTNA) was prepared to validate the Project REF noise and vibration assessment, develop an operational noise model utilising the detailed road design, identify operational impacts to receivers and identify receivers eligible for mitigation of impacts. The assessment also assessed construction vibration impacts. The OTNA Report is provided in Appendix F
Operational Traffic Noise Assessment Report. A technical assessment of construction noise impacts was not prepared as existing mitigation measures from the Project REF are adequate to mitigate and manage potential impacts of the proposed modifications.

6.4.1 Methodology

An operational noise model was prepared using the CoRTN algorithm implemented in SoundPLAN 8.2. The noise model considered multiple factors, including local terrain, geometrical spreading and shielding from the terrain. A review of the noise and vibration assessment, prepared by SLR Consultancy for the Project REF, was undertaken to assist in the development and validation of the operational noise model used for this assessment.

To remain consistent with the approach taken by the previous Project REF noise and vibration assessment seven Noise Catchment Area's (NCAs) were utilised for modeling and developing assessment criteria, these are depicted in Figure 6-9.

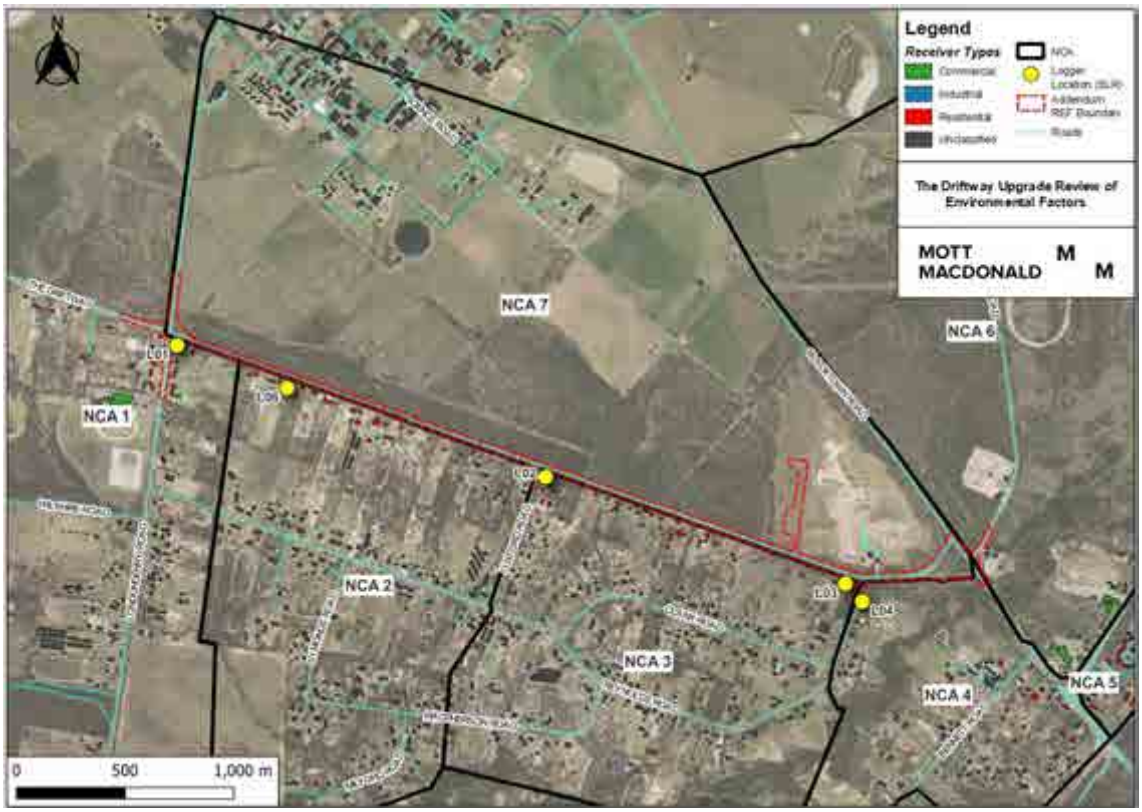

Figure 6-9 Site Layout including Noise Monitoring Location undertaken by SLR Consultancy

The following four noise scenarios were modelled:

- No Build – assessment scenario when the project does not go ahead
- Build – assessment scenario when the project goes ahead
- Build year – an assessment scenario when the project has just been constructed (2026)
- Design year – an assessment scenario typically ten years after the project has been constructed (2036)

Each Scenario was modelled under two time periods:

- Day – 7am to 10 pm as defined by the RNP
- Night – 10 pm to 7 am as defined by the RNP

6.4.2 Existing environment

The existing noise levels in the study area are primarily influenced by road traffic noise from The Driftway, Londonderry Road and Blacktown Road, as well as general environmental noise. The receivers adjacent to the proposal are typically rural residential properties. Although there are notable non-residential receivers in close proximity, these are captured in Table 6 1.

The noise criteria for operational road traffic was derived from the *NSW EPA's Road Noise Policy* (RNP) (DECCW, 2011). Transport for NSW provides guidance on how the RNP is interpreted via the following guidelines through the *Road Noise Criteria Guideline* (RNCG) (Transport, 2022), *Road Noise Mitigation Guideline* (RNMG) (Transport, 2022) and *Road Noise Model Validation Guideline* (RNMVG) (Transport, 2022).

The Project's noise criteria for residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial road corridors is presented inTable 6-8. Table 6-9 presents the noise criteria for non-residential receivers.

Table 6-7 Non-residential receivers within close proximity to the Project

NCA	Non- Residential Receiver	Address
1	Richmond Race Club	308-332 Londonderry Road, Londonderry
	Mechanical Repairs	281-291 Londonderry Road, Londonderry
	K9 Pro – The K9 Professionals	307 Londonderry Road, Londonderry
4	The Junkyard	11 Bennett Road, Londonderry
6	Turtle Landscape Supplies	339 Racecourse Road, South Windsor
7	Hawksbury City Waste Management Facility	1 The Driftway, South Windsor

Table 6-8 Relevant Road traffic noise assessment criteria for residential land uses

Road Category	Type of Project	Assessment criteria	
		Day (7am – 10pm)	Night (10pm – 7am)
Freeway/arterial/sub-arterial roads	Existing residences affected by noise from redevelopment of existing freeway/arterial/sub-arterial road corridors	Leq (15 hours) 60 (external)	Leq (9 hours) 55 (external)
	Existing residences affected by increases in traffic noise of 12 dB(A) or more from a freeway/arterial/ subarterial roads1	Between Leq(15hour) 42-60 (external)	Between Leq(9hour) 42-55 (external)
Local roads	Existing residences affected by noise from redevelopment of existing local roads	Leq(1hour) 55 (external)	Leq(1hour) 50 (external)

Table 6-9 Relevant Road Traffic Noise Assessment Criteria for Non-Residential Land Uses

Existing land use	Assessment criteria		Additional considerations
	Day (7am – 10pm)	Night (10pm – 7am)	
Industrial	LAeq, (1 hour) 70 (external) when in use		Criteria for industrial premise adopted from recommended internal noise level range for 'workshop' as per the guideline AS/NZS2107-2016. The lower value of the range is adopted, and a 10 dB reduction is assumed for an open window.
Commercial	LAeq, (1 hour) 55 (external) when in use		Commercial receivers surrounding the site are represented as 'restaurant' / 'cafeterias' in accordance with AS/NZS2107-2016. Therefore, the maximum design sound level for the occupancy is adopted and a 10 dB reduction is assumed for an open window.

Heritage items are often more susceptible to impacts from vibration than other structures. Londonderry Cemetery is closest heritage site within proximity to the Project. The Londonderry Cemetery is listed as Item 115

on the *Penrith Local Environment Plan 2010.* It is located at 325-331 Londonderry Rd, Londonderry approximately 150m from the edge of the AREF site boundary.

6.4.3 Potential impacts

Construction Noise

The proposed modifications would increase the area of the Project. This would result in more receivers being impacted by construction work on the southern extent of Londonderry Road and the western extent of The Driftway. These additional receivers are located in NCA-1. Additionally, the proposed modifications extend further into properties along The Driftway to allow for the construction of driveway tie-ins. These receivers are located in NCA-2 and NCA-3 were previously identified by the Project REF.

The Project REF found that receivers in NCA-1, NCA-2 and NCA-3 are expected to experience 'highly intrusive' or 'moderately intrusive' impacts during noisy, daytime construction scenarios. The extended area of works associated with the AREF would reduce the distance between receivers in these NCAs and construction activities.

The Project REF identified the following scenarios as most likely to be 'highly intrusive' to receivers:

- site establishment and early works
- intersection/realignment work on Blacktown Road and Londonderry
- road widening and pavement work

The highest impacts are likely to occur when noise intensive equipment such as chainsaws, chippers or concrete saws are being used. This equipment, however, are only required occasionally and are unlikely to be in use for long periods of time.

Construction Vibration

The CVNG provides recommended minimum working distances for various vibration intensive construction plants. At this stage of the project, proposed equipment is not known and should be revisited once a construction schedule has been developed.

An assumption was made that Large Hydraulic Hammers would be the most onerous plant item and as such a minimum safe working distance of 22 metres is necessary to minimise the risk of cosmetic damage in accordance with BS 7385. A minimum safe working buffer was modeled around the perimeter of the AREF. The assessment identified 19 properties within the buffer, three of which were non-residential, at risk of cosmetic damage. This is presented in Figure 6-10 and a full list of properties with buildings effected is presented in Table 6-10.

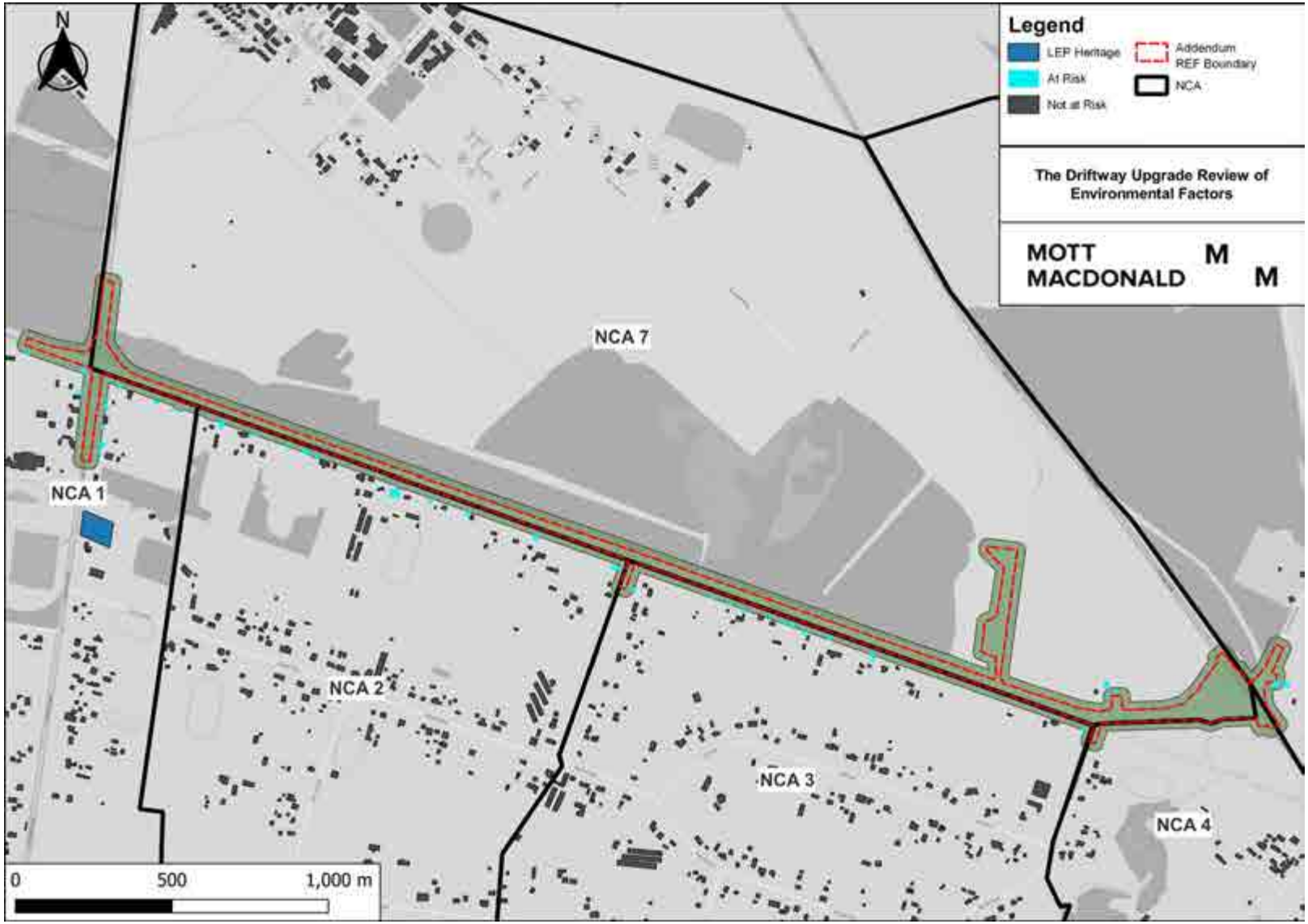

Figure 6-10 Buildings at Risk of Cosmetic Damage and Heritage Site Location

Table 6-10 Distribution of receivers at risk of cosmetic damage

NCA	Address	Buildings Affected	Receiver Type
NCA 1	280-282 Londonderry Road Londonderry	2	Residential
	281-291 Londonderry Road Londonderry	3	Residential
	284-288 Londonderry Road Londonderry	1	Commercial
	301-307 Londonderry Road Londonderry	2	Residential
NCA 2	156-160 The Driftway Londonderry	1	Residential
	180-186 The Driftway Londonderry	1	Residential
	260-266 The Driftway Londonderry	2	Residential
	268-274 The Driftway Londonderry	1	Residential
	276-280 The Driftway Londonderry	1	Residential
	286-290 The Driftway Londonderry	1	Residential
NCA 3	106-114 The Driftway Londonderry	1	Residential
	116-124 The Driftway Londonderry	1	Residential
	2-8 Luxford Road Londonderry	2	Residential
	74-80 The Driftway Londonderry	1	Residential
	8/126 The Driftway Londonderry	1	Residential
	82 The Driftway Londonderry	1	Residential
	98-104 The Driftway Londonderry	3	Residential
NCA 6	339 Racecourse Road South Windsor	2	Industrial
NCA 7	1 The Driftway South Windsor	1	Industrial

Note – Address are derived from SIXMaps sources and should be verified prior to applying treatment.

The CNVG advises that the safe working distances for construction plants are expected to increase for heritage sites. As discussed in Section 6.4.2, the Londonderry Cemetery is heritage listed item approximately 150m from the AREF boundary. The detailed design has extended the work boundary towards the cemetery since the Project REF. As such, it is recommended that specialist advice is sought to determine the structural integrity of the Londonderry Cemetery this would be performed as part of the Noise and Vibration Management Plan (NVMP) and implemented as part of the CEMP. Safeguard NV9, a structural assessment of the Londonderry Cemetery to determine vibration vulnerability, has been included to address potential damage to the site.

Operation

The operational noise impact was found to be consistent with the previous noise and vibration assessment undertaken by SLR Consultancy for the Project REF, with a minor reduction in impacted receivers. Results are discussed below.

The noise model identified 10 receivers eligible for mitigation measures for the 2026 build year and 31 receivers eligible for mitigation for the 2036 design year. These receivers have been identified as eligible due to exceeding one or more of the triggers derived from the noise criteria. Table 6-11 presents the full list of receivers eligible for mitigation for operational impacts based on the 2036 design year.

Table 6-11 Receivers eligible for mitigation for operational impacts

NCA	Address	Buildings experiencing increased noise[1]	Subtotal
NCA 1	280-282 Londonderry Road Londonderry	1	11
	281-291 Londonderry Road Londonderry	2	
	284-288 Londonderry Road Londonderry	1	
	290 Londonderry Road Londonderry	1	
	296 Londonderry Road Londonderry	1	
	300-314 The Driftway Londonderry	1	
	301-307 Londonderry Road Londonderry	1	
	302-306 Londonderry Road Londonderry		
	372-376 Londonderry Road Londonderry	11	
	378-380 The Driftway Londonderry	1	
NCA 2	156-160 The Driftway Londonderry	1	10
	180-186 The Driftway Londonderry	1	
	220-226 The Driftway Londonderry	1	
	228-234 The Driftway Londonderry	1	
	236-242 The Driftway Londonderry	1	
	244 The Driftway Londonderry	1	
	260-266 The Driftway Londonderry	1	
	268-274 The Driftway Londonderry	1	
	276-280 The Driftway Londonderry	1	
	286-290 The Driftway Londonderry	1	
NCA 3	106-114 The Driftway Londonderry	1	10
	116-124 The Driftway Londonderry	2	
	2-8 The Driftway Londonderry	1	
	74-80 The Driftway Londonderry	1	
	8/126 The Driftway Londonderry	1	
	82 The Driftway Londonderry	1	
	90-96 The Driftway Londonderry	1	
	98-104 The Driftway Londonderry	2	
NCA 4	No receivers triggered	-	-
NCA 5	Residential receivers outside the study area	-	-
NCA 6	No receivers triggered	-	-
NCA 7	No receivers triggered	-	-

Note – no residential receivers were trigged for NCA's four, six and seven. NCA five has residential receivers however they were outside the study area and would not be trigged.

The majority of receivers that qualified for mitigation measures exceeded Trigger 1, where the noise level between the Build and No-build scenarios exceeded 2 dB. The main contributor to this increased operational

[1] Worst case is between 2-4 dB(A)

noise levels is due to an anticipated increase in traffic through The Driftway and surrounding road networks as a result of the Project and growth in traffic anticipated by 2036. The proposed modifications including the updates to the road alignment between The Driftway and the additional lane at the Londonderry Road roundabout has resulted in higher traffic noise exceedances in NCA 1 compared to the previous REF assessment.

The Project REF identified 37 receivers qualifying for mitigation measures. These receivers were also located in NCA 1, 2, and 3 with an increase in triggered buildings in NCA 1 and 2. The updated assessment identified a reduced impact on receivers qualifying for mitigation from 37 receivers to 31 receivers. The change in results could be attributed to uncertain variations in the noise model and new changes in the road conditions (speed limit, surface, etc.) from the previously undertaken Project REF. Although the number of receivers identified for mitigation measures are slightly different, the distribution of triggered receivers across the proposed modifications area is similar when compared to the previous assessment.

6.4.4 Safeguards and management measures

Construction Noise

As stipulated in Section 6.4.5 of the project REF standard mitigation measures in accordance with the CNVG must be applied to minimise noise produced by construction and additional mitigation measures are to be implemented based on the exceedance of the appropriate management levels.

Safeguard NV1 requires a Noise and Vibration Management Plan (NVMP) to be prepared and implemented as part of the CEMP. This is to include:

- Identification of nearby sensitive receivers
- Description of work, construction equipment and the hours work would be completed in
- Criteria and mitigation measures for the proposal
- Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures
- Details of how respite would be applied where ongoing high impacts are seen at certain receivers.

The implementation of this safeguard would manage and minimise additional impacts associated with the construction of the proposed modifications.

Construction Vibration

Existing mitigation measures from the Project REF and submissions report are sufficient to mitigate vibration impacts:

- NV1 requires a Noise and Vibration Management Plan (NVMP) to be prepared and implemented as part of the CEMP
- NV7 mandates measures to mitigation impacts to structures within the minimum working distance and considered to exceed the cosmetic damage criteria.

The Operational Noise and Vibration Assessment identifies that the need for an additional structural assessment of the Londonderry Cemetery to determine its vulnerability to vibration impacts should be considered prior to construction based on the finalisation of plant and equipment requirements. If the structural assessment is required, this should be undertaken prior to the commencement of works in the areas. Therefore, an additional safeguard NV9 has been included to consider this assessment as a mitigation measure.

Operational

The AREF noise model identified 31 receivers eligible for mitigation measures in accordance with the RNMG. The RNMG provides a guideline on various options of treatment that can be applied to the Project and at the receiver. The RNP has a preference for treatments being at-site first, then in-corridor and finally at-receiver.

Quieter pavements were considered as an at-site mitigation method. By selecting a quieter pavement, such as Open Grade Asphalt, predicted noise levels for the Project could be reduced by up to 2.5 dB. This mitigation method, however, has unfavorable properties for high-shear portions of the road, including the roundabouts where the Project is expected to have highest noise impact. This mitigation method also has life cycle and

maintenance implications as when worn down Open Grade Asphalt can have worse noise impacts. As such, this option was not investigated further.

Noise barriers were considered as the in-corridor mitigation method. This could be separated into three categories of varying size and cost including noise walls, noise mounds and a combination of noise mound and wall. This mitigation method, however, is only recommended by the RNMG where triggered receivers are considered closely spaced. In addition to this, triggered receivers would require driveway access, which further limits the effectiveness of noise barriers. As such, this option was not investigated further.

The assessment considered all options and concluded that at-receiver to be the most viable due to challenges with the other mitigation measures. As such, Transport has begun liaison on a site by site with property owners on the most appropriate at-site mitigation methods.

6.5 Aboriginal heritage

Section 6.6 of the Project REF presents an assessment of the proposals potential to impact Aboriginal heritage artefacts, features or remains. The assessment found that proposal was unlikely to impact on Aboriginal heritage artefacts, features or remains. Due to the proposed modifications extending beyond the previously assessed area an assessment in accordance with the Stage 1 PACHCI assessment guidelines, as outlined in *the* Road and Maritime Services procedure for Aboriginal cultural heritage consultation and investigation (2011 20-24; 75) has been prepared.

The result of investigations under items 4 and 6-9 are presented below.

6.5.1 Existing environment

Landforms

The Driftway soil landscape is comprised mostly of Berkshire Park soils with a smaller area of Agnes Banks sands northwest of the proposal area. Both soil landscapes are located south and west of the Richmond township. The alluvial Berkshire Park soil landscape is characterised by dissected, gently undulating low rises on the tertiary terraces of the Hawkesbury-Nepean River. Landforms include flat terraces dissected by small drainage channels and narrow drainage lines with exposed areas of underlying geology, due to erosion. These soils are derived from the underlying Tertiary geology and consist of a sandy loam to sandy clay loam with inclusions of silcrete boulders of up to 20 centimetres in size overlying sandy clay and clay. The soils have a high level of wind erosion when cleared and have gully, sheet and rill erosion within the dissected areas. The Agnes Banks sands are an aeolian/alluvial deposit which overlie the Berkshire Park soils at Agnes Banks and at Pitt Town. The soils comprised of deep, acidic and strongly leached sandy soils overlying yellow sandy clays, forming low parallel dunes on flat terrace surfaces. Local relief is approximately seven metres, formed mostly by gradual slopes.

Brief Description of Past Land Use

Land use practices have had a variable impact on the landscape within the study area. Existing road and rail corridors have modified the landscape by creating cuttings and artificial embankments in addition to modifying the course of several waterways. A number of dams and drainage line modifications have been constructed throughout the area, altering the area's hydrology and smaller-scale drainage patterns. Intensive cropping has taken place across the lower river terrace and vegetation clearance has contributed to the erosion of exposed soils along fence lines and infrastructure corridors. Ongoing rural and residential development has also contributed to disturbance.

AHIMS Extensive Search, Maps, and Site Cards

A search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on the 21st of November 2023. This is presented in Figure 6-11 and Figure 6-12.

The previous AHIMS search performed during the Project REF identified Aboriginal archaeological sites which were not present in the updated search undertaken on the 21st of November 2023 for the AREF. In addition, the sites recorded for the Project REF search were located further away than the results returned in the search performed on the 21st of November. The assessment for the AREF has used the results of the search on 21st of November 2023. The 21st of November search identifies no Aboriginal archaeological sites within the AREF boundary and three Aboriginal archaeological sites within 200 metres of AREF boundary. Figure 6-11 presents

the results of the AHIMS search undertaken for the Project REF and the search undertaken on the 21st of November 2023.

Additional maps and site cards can be found in the Appendix G.

Other Relevant Heritage Database Searches

A review of additional heritage databases has been undertaken for the project on the 21st of November 2023. This includes the following:

- Native Title Register search
- Australian Heritage Database search
- State Heritage Inventory search

Details of these database searches are discussed below.

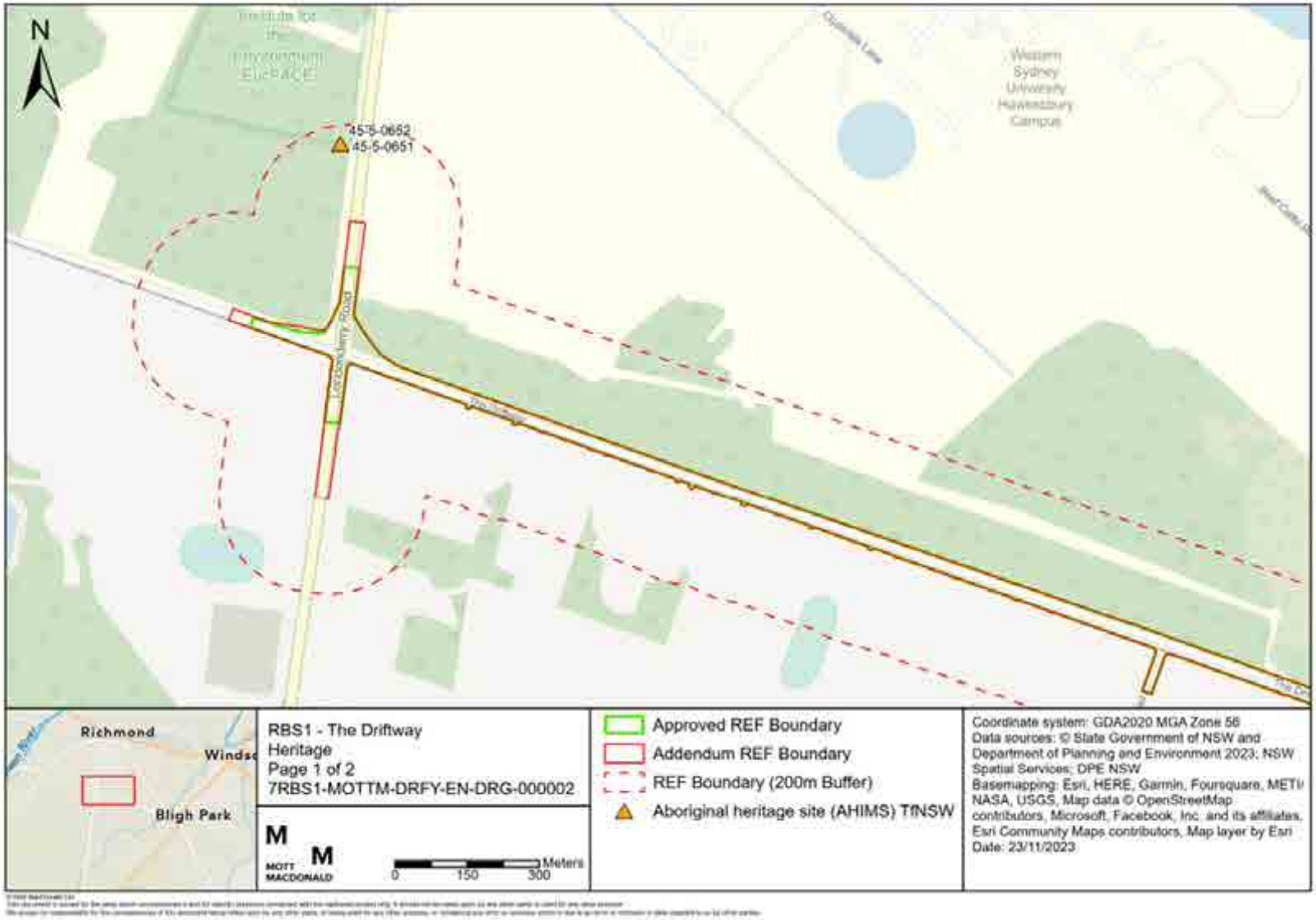

Figure 6-11 AHIMS search results western extent– Note orange triangles present the locations of the previously identified AHIMS results during the project REF. Blue triangles present the location of AHIMS results from the 21st of November 2023 search.

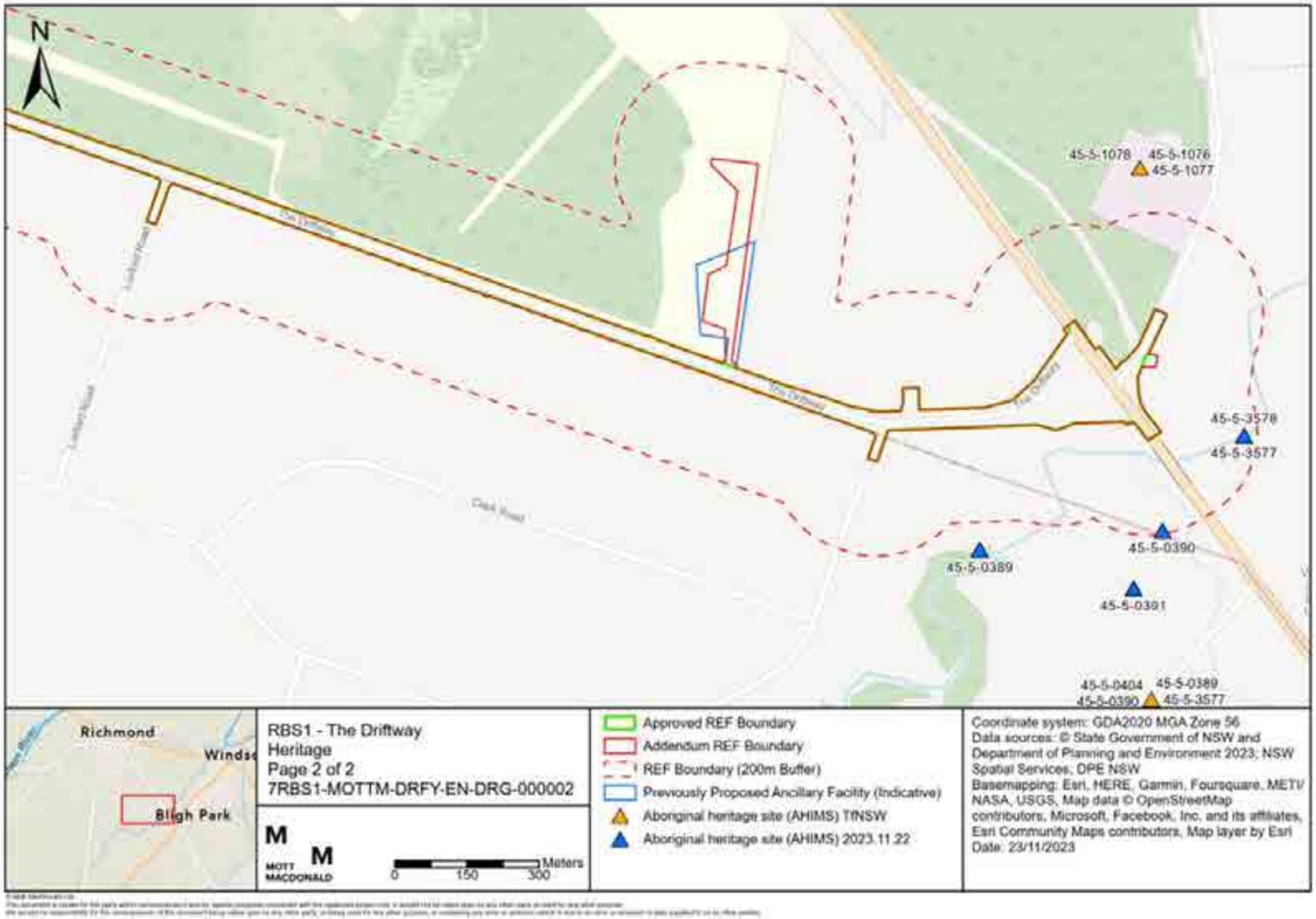

Figure 6-12 AHIMS search results eastern extent

Native Title Register Search

A review of the Native Title Register has identified no additional claims in the Hawkesbury City Council LGA . There are also no active claims in the bordering LGAs of Blacktown, Hawkesbury, Liverpool, or Blue Mountains City Council as of the 21st of November 2023.

Australian Heritage Database Search

A review of the Australian Heritage Database search has identified that the proposed construction impact area borders, and is located within the University of Western Sydney Hawkesbury Native Vegetation registered listing with Natural heritage values.

The potential significance of this item is outlined on the preliminary assessment list for the National Heritage List for 1991.

This listing has been found to have no associated Aboriginal cultural heritage values.

State Heritage Inventory Search

A review of the State Heritage Inventory has identified no items within the construction boundary of the proposed works, however there are three heritage items in the vicinity of the proposed construction impact and laydown areas. These are listed in the Penrith Local Environment Plan 2021 (PLEP 2010):

- Londonderry Cemetery (PLEP No.115)
- Cottage (PLEP No.660)
- Castlereagh Road (PLEP No.261)

NSW State Heritage Inventory listing sheets for these items have been reviewed and they have been found to have no associated Aboriginal cultural heritage values.

Previous Heritage Assessments

Richmond Bridge Duplication and traffic Improvements - Options Assessment Aboriginal Archaeological Report Stage 2 PACHCI (KNC 2021).

The purpose of this assessment was to determine appropriate sites for future roadway planning in the Richmond area, including The Driftway. In total, this assessment identified several sites of varying heritage significance and made recommendations with the aim of minimising harm to Aboriginal Cultural Heritage. However, none of these sites were located inside the boundary of the AREF. The assessment recommended that works proceed, including in the areas surrounding the proposed Driftway upgrades.

Previous Environmental Impact Assessments

New Richmond Bridge and traffic improvements – Stage 1 The Driftway – Review of Environmental Factors (Transport for NSW, 2021)

Previous assessment completed for the Project REF found the construction and operation of the Project was unlikely to impact on Aboriginal heritage items due to their distance from the Project area. All areas of additional impacts in the proposed modifications are directly adjacent to the areas assessed for the Project REF. No specific surface features alluding to Aboriginal occupation were identified.

The Project REF provided and unexpected find protocol to be implemented in the situation that Aboriginal heritage items are uncovered during construction work. If this occurs all works will cease and the steps in the Unexpected Heritage Items (Transport for NSW, 2015) will be followed. This measure will apply to additional areas to impacted by the Proposed Modification.

Evidence of Previous Disturbance

Aerial photography from 1947 to 1961 show that many areas now occupied vegetation had been cleared during that period and the preceding decades. The intersection of The Driftway with Londonderry Road had largely been cleared a significant distance from the road by 1954 and was interspersed with dirt roads and trails. The area also contained several structures near the roadway, adding to the degree of disturbance Figure 6-13.

Figure 6-13 Aerial photography taken 1954 of the intersection of The Driftway and Londonderry Road.

Figure 6-14 presents the area surrounding and just south of the Blacktown Road intersection. The image shows that area has been cleared of most vegetation, up to the banks of Rickaby's Creek. Later developments included a sealed road and bridge over the Rickaby's creek crossing alongside the previous dirt road. The construction of the T-junction intersection of The Driftway with Blacktown Road in its current form also led to further disturbance in this area.

Figure 6-14 Aerial photography taken in 1954 displaying the area that is now the intersection of The Driftway and Blacktown Road.

The southern edge of The Driftway was also utilised as agricultural land before becoming residential, resulting in further disturbance Figure 6-14. In addition, several aerials from this period also reveal the construction of

terraces and trails to the north of The Driftway, indicating moderate to high levels of disturbance in the areas in close proximity to and within in the AREF Boundary, see Figure 6-15.

Figure 6-15 Aerial photography taken in 1961 to the north of The Driftway showing terraced and cleared areas

6.5.2 Potential Impacts

This Stage 1 PACHCI assessment was performed to assess any additional impacts to Aboriginal heritage items as a result of the proposed modifications . As the Project is located on highly disturbed land it is unlikely that construction or operation of the Project including the proposed modifications would have impact on Aboriginal heritage items.

A search of the National, NSW and local heritage databases has identified two natural listings within the construction boundary, which have no associated Aboriginal cultural heritage values. Within a kilometre of the construction boundary, there are three LEP listings recorded in the Penrith LEP 2010 none of which have associated Aboriginal cultural heritage values.

6.5.3 Safeguards and management measures

There has been no additional impact from the proposed modifications thus the environmental safeguards from the Project REF would be sufficient in managing potential impacts on Aboriginal items. Safeguard AH2 requires *The Standard Management Procedure – Unexpected Heritage Item*s (Transport for NSW, 2015) to be followed in the event that an unknown or potential Aboriginal object/s is found during construction.

6.6 Other impacts

Table 6-12 Assessment of Other Impacts

Environmental factor	Existing environment	Potential impacts
Air Quality	Refer to Section 6.9.2 of the project REF.	Construction activities have the potential to increase airborne particulate matter and cause nuisance impact where construction is in proximity to sensitive receivers such as residential dwellings. During operation, an increase in the roadside combustion-related pollutant concentration may occur. The minor increase in construction area due to the proposed modifications would contribute to a negligible increase in air pollution. This would be sufficiently managed by the mitigation measures determined in the Project REF. A full list of environmental safeguards and mitigation measures can be found in Section 7.1.1.
Landscape character and visual impact	Refer to Section 6.8.2 of the project REF.	The proposed modifications would increase the impact to landscape character due to the increased number of trees and vegetation being removed. Additionally, the visual impact would be increased due to the expansion of paved surfaces and the increased number of trees and vegetation being removed. The increased impact is a minor increase of 0.216 ha of additional clearing. This is consistent with the scope of the Project and the environmental safeguards and mitigation measures in the Project REF would be sufficient in managing this impact. A full list of environmental safeguards and mitigation measures can be found in Section 7.1.1

Environmental factor	Existing environment	Potential impacts
Socio-economic, Land use and Property	Refer to Section 6.10.2 of the project REF.	The Project REF was determined to proceed with minor property access adjustments to private properties along The Driftway. The proposed modifications as a result of detailed design has increased the number of driveways being modified. The construction of these may cause changes to local amenities for some residents and local businesses. The construction impact is still considered minor and temporary. Once construction is complete the Driftway as well as its connections would be substantially improved The proposed modifications would require partial property acquisition of 0.01 ha of Lot2/DP524577. This would be done in accordance the Land Acquisition (Just Terms Compensation) Act 1991.
Soil, topography and geology	Refer to Section 6.5.2 of the project REF and Section 4.3 of the Submissions Report.	The proposed modifications do not require extensive new earthworks in addition to those described in the Project REF. New earthworks would be limited to areas of tie in design required to meet Austroads Guidelines. Given the relatively small scope of the proposed modifications, potential impacts on soil and geology are considered to be consistent with those presented in The Project REF. Environmental safeguards consistent with those proposed in The Project REF would suitably mitigate the construction work associated with the proposed modifications. These are detailed in Section 7.1.1 and would be applied through the implementation of the CEMP.
Non-Aboriginal Heritage	Refer to Section 6.7.2 of the project REF.	The proposed modifications requires increased tie-in work on Londonderry Road to accommodate the additional lane in the roundabout. This increase means the AREF boundary is now approximately 170m from Londonderry Cemetery, listed as item 115 under the Penrith LEP. This cemetery has potential to be sensitive to construction vibration impacts as the concrete and stone structure are likely to have cracking that could be exacerbated by construction vibration. The CNVG advises that the safe working distances for construction plant is expected to increase for heritage sites. Therefore as a general precaution it is recommended that specialist advice is sought to determine the structural integrity of the Londonderry Cemetery and determine the safe working distance for construction plant. To mitigate this potential impact safeguard NV9 has been included.

Environmental factor	Existing environment	Potential impacts
Waste management and resource use	Refer to Section 6.11.1 of the project REF.	The proposed modifications would increase the construction area, this would increase the waste being generated and the resources required to complete construction of the Project. This increase would remain consistent with the waste and resource use determined in the Project REF due to the scale of the proposed modifications in comparison to the Project. The Projects Waste Management Plan would sufficiently mitigate any additional impacts. A full list of environmental safeguards and mitigation measures can be found in Section 7.1.1
Hazards and risks	Refer to Section 6.11.1 of the project REF.	Small quantities and inventories of hazardous materials and dangerous goods would be required during construction. As a result, the transportation, use and storage of these materials would occur. A potential to impact to soil and water quality and workforce safety may result from spills or inappropriate and inadequate handling and storage of materials. The Project REF environmental safeguards and mitigation measures would be sufficient in managing any increases in hazardous materials and dangerous goods generated by the proposed modifications. Construction activities that may have potential to increase bushfire risk during construction include mulch stockpiling, hot works such as welding, as well as fuel/chemical storage and plant operation within densely vegetated areas (exhaust fires). The proposed modifications would increase construction activities around densely vegetated areas increasing the risk of Bushfires. The Projects REF environmental safeguards and mitigation measures would be sufficient in managing this increase risk.
Greenhouse gas and climate change	Refer to Section 6.11.1 of the project REF.	During construction greenhouse gas emissions would be produced including: • Carbon dioxide, methane and nitrous oxide generated from liquid fuel use in plant and vehicles (diesel, petrol) • Embedded emissions associated with the manufacture and delivery of construction materials • Methane generated from land filling any carbon-based waste. Given the relatively small scope of the proposed modifications, the increase in greenhouse gases generated are considered to be consistent with those presented in the Project REF.

6.7 Cumulative impacts

Cumulative impacts have the potential to arise from the interaction of individual elements within the proposal and the additive effects of the proposal with other external projects. Transport is required under clause 228(2) of the Environmental Planning and Assessment Regulation 2000, to consider potential cumulative impacts as a result of the proposal.

6.7.1 Potential impacts

The Project REF identified the Hawkesbury Centre of Excellence as a concurrent project in the area that would produce a cumulative impact for the Project. The potential impacts for construction of the Centre of Excellence include the clearing of vegetation, vibration impacts exceeding human comfort criteria during construction, addition of an interim signalised pedestrian crossing on Londonderry Road (approximately 1 km north of the Driftway), and an increase of road users for Londonderry Road. Flooding of the Hawkesbury in 2022 resulted in groundwater being trapped below the land surface of the school site.

Investigations found elevated PFAS levels in the water source, making the site unsuitable for facilities required of an agricultural school, work is currently underway on a revised plan. This change means the projects are unlikely to coincide during construction the phases. However, if construction were to occur simultaneously the traffic impacts along Londonderry Road could be exacerbated and noise and vibration impacts. These potential impacts would be managed and mitigated through the CEMP and TMP.

In addition, the Hawkesbury-Nepean valley Flood Evacuation Road Resilience Program is currently in the concept design phase and the likely impact of this project is unknown. The construction delivery is expected to occur from 2026 – 2030 which is likely to not coincide with the upgrade to The Driftway. However, if construction were to occur simultaneously the traffic impacts along Londonderry Road could be exacerbated due to the close proximity to The Driftway. These impacts would likely be captured by the TMP.

Due to the small scale of the proposed modifications, it is considered that it would not result in additional negative cumulative impacts to those identified within the Project REF and the incorporation of mitigation measures will reduce the likelihood of cumulative impacts occurring. As such the proposed modifications would not need additional environmental safeguards for cumulative impacts.

The Project REF and this AREF represent the consideration of environmental impacts for Stage 1 of the New Richmond Bridge and traffic improvements works. Stage 2 involves the proposed construction of a bridge over the Hawkesbury River between Richmond and North Richmond. These works are separate to Stage 1 and a REF will be prepared to assess potential environmental impacts of Stage 2. It is not anticipated that these projects will have cumulative construction impacts due to the timing of the projects. However, there is potential for cumulative operational impacts associated to connected nature of the road upgrades. The future environmental impact assessment for Stage 2 should consider the operation of the local road network including the upgraded Driftway.

7. Environmental management

7.1 Environmental management plans

A number of safeguards and management measures have been identified to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the proposed modifications. Should the proposed modifications proceed, these management measures would be addressed if required during detailed design and incorporated into The Project Environmental Management Plan (PEMP) and Contractors Environmental Management Plan (CEMP) and applied during the construction and operation of the proposed modifications.

7.1.1 Summary of environmental safeguards and management measures

Environmental safeguards and management measures for the New Richmond Bridge and traffic improvements – Stage 1 The Driftway are summarised in Table 7-1. Additional safeguards and management measures identified in this AREF are included in bold and italicised font. The safeguards and management measures would be incorporated into the detailed design phase of the proposed modifications , the CEMP and the PEMP and implemented during construction and operation of the proposed modifications , should it proceed. These safeguards and management measures would minimise any potential adverse impacts arising from the proposed works on the surrounding environment.

Table 7-1: Summary of safeguards and management measures

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
GEN1	General – minimise environmental impacts during construction	A CEMP would be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • Any requirements associated with statutory approvals • Details of how the project will implement the identified safeguards outlined in the REF • Issue-specific environmental management plans • Roles and responsibilities • Communication requirements • Induction and training requirements • Procedures for monitoring and evaluating environmental performance, and for corrective action • Reporting requirements and record-keeping • Procedures for emergency and incident management • Procedures for audit and review • The endorsed CEMP will be implemented during the undertaking of the activity.	Contractor / Transport project manager	Detailed design / Pre-construction
GEN2	General - notification	All businesses, residential properties and other key stakeholders (schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Transport project manager	Pre-construction
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include: • Threatened species habitat • Adjoining residential areas requiring particular noise management measures.	Contractor / Transport project manager	Detailed design / Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
B1	Removal of vegetation	A Flora and Fauna Management Plan will be prepared in accordance with *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • Pre-clearing survey • Unexpected find procedure • Inductions • Vegetation removal protocols • Exclusion zones.	Contractor	Detailed design / Pre-construction
B2	Removal of vegetation	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Post construction
B3	Removal of vegetation	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Construction
B4	Removal of threatened species habitat and habitat features	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bush rock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Construction / Post-construction
B5	Unexpected finds	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011) if Threatened Ecological Communities (TECs), threatened flora and fauna not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Construction
B6	Induction	All personnel working on site will receive training to ensure awareness of requirements of the Flora and Fauna Management Plan and relevant statutory responsibilities during inductions. Site specific training will be given to personnel when working in the vicinity of areas with identified biodiversity values that are to be protected.	Contractor	Detailed design / Pre-construction
B7	Pre-clearance surveys	Pre-clearance surveys will be undertaken in accordance with *Guide 1: Pre-clearing process of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Pre-construction
B8	Exclusion zones	Exclusion zones will be set up at the limit of clearing the edge of the impact area) in accordance with *Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Construction
B9	Aquatic habitat	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines* (RTA, 2011) and Section 3.3.2 *Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
B10	Fauna injury	Fauna will be managed in accordance with *Guide 9: Fauna handling of the Biodiversity Guidelines* (RTA, 2011).	Contractor	Construction
B11	Weeds and pathogens	Any soil or other materials imported to the site for use in restoration or rehabilitation will be certified free from weeds and pathogens or obtained from sources that demonstrate best practice management to minimise weed and pathogen risks.	Contractor	Construction
B12	Weeds and pathogens	Pathogens will be managed in accordance with *Guide 2: Exclusion zones of the Biodiversity Guidelines: Protection and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Construction
B13	Weeds and pathogens	Weed species will be managed in accordance with *Guide 6: Weed management of the Biodiversity Guidelines: Protecting and Managing Biodiversity on RTA Projects* (RTA, 2011).	Contractor	Construction
B14	***Pests***	***Procurement of construction materials identified as high risk will align with the guidance provided in the Biosecurity (Fire Ant) Emergency Order (No 1) 2024 under the Biosecurity Act 2015 (DPI, 2024).***	***Contractor***	***Pre-construction / Construction***
SW1	Soil erosion and water pollution	A Soil and Water Management Plan (SWMP) will be prepared and implemented as part of the CEMP. The SWMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Pre-construction
SW2	Erosion and sediment	A site-specific Erosion and Sediment Control Plan/s (ESCP) will be prepared and implemented as part of the Soil and Water Management Plan. The Plan will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Contractor	Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
SW3	Contaminants entering receiving environments during construction	Control measures to minimise the risk of water pollution will be included in the ESCP. The following measures will be included to limit sediment and other contaminants entering receiving waterways: • No stockpiles of materials or storage of fuels or chemicals will be located adjacent to the existing culverts • Vehicles and machinery will be properly maintained to minimise the risk of fuel/oil leaks • Routine inspections of all construction vehicles and equipment will be undertaken for evidence of fuel/oil leaks. All fuels, chemicals and hazardous liquids will be stored within an impervious bunded area in accordance with Australian standards and NSW EPA Guidelines • All water discharges will be undertaken in accordance with Transport for NSW's Water Discharge and Re-use Guideline • Emergency spill kits will be kept on-site at all times. All staff will be made aware of the location of the spill kit and be trained in its use • Construction plant, vehicles and equipment will be refuelled offsite, or in designated re-fuelling areas located at a minimum distance of 50 metres from drainage lines or waterways • Groundwater encountered during the construction of the Project will be managed in accordance with the requirements of the *Waste Classification Guidelines* (DECCW 2009) and Transport for NSW's Water Discharge and Re-use Guideline • Stabilised surfaces will be reinstated as quickly as practicable after construction • Material transport from site to surrounding pavement surfaces will be minimised. Soil and water management measures will be identified in consultation with relevant government agencies and Councils and will be consistent with the principles and practices detailed in *Managing Urban Stormwater: Soils and Construction* (2004) (known as the Blue Book).	Contractor	Construction
SW4	Flood management during construction	A Flood Management Plan will be prepared before construction. This plan will include: • Review and coordination with existing local flood plans and evacuation procedures • Flood emergency preparation, response, and recovery • measures which will be implemented during construction • Procedure for daily review of the Bureau of Meteorology website Site protection measures to be implemented before and in the event of flooding.	Contractor	Pre-construction/ Construction
SW5	Increase the depth and duration of inundation on private properties	During detailed design undertake floor level survey on private properties. Improve drainage design to avoid impacts to private properties in accordance with criteria identified in Appendix D.	Design and construction contractor	Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
TT1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport for NSW *Traffic Control at Work Sites* Manual (RTA, 2010) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2008). The TMP will include: • Confirmation of haulage routes • Measures to maintain access to local roads and properties • Site specific traffic control measures (including signage) to manage and regulate traffic movement • Measures to maintain pedestrian and cyclist access • Requirements and methods to consult and inform the local community of impacts on the local road network • Access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • A response plan for any construction traffic incident. Consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.	Contractor	Detailed design / Pre-construction
TT2	Property access during construction	Access to properties will be maintained during construction. Where that is not feasible, temporary alternative access arrangements will be provided following consultation with affected landowners and the relevant local road authority. Any disruptions to property access and traffic will be notified to landowners at least seven days prior in accordance with the relevant community consultation processes outlined in the TMP.	Transport for NSW / Contractor	Construction
TT3	Reduce speeds, traffic delays and disruptions during construction	Road users and local communities will be provided with timely, accurate, relevant and accessible information about changed traffic arrangements and delays owing to construction activities.	Transport for NSW / Contractor	Construction
TT4	Reduce speeds, traffic delays and disruptions during construction	Construction site traffic will be managed to minimise movements during peak periods.	Transport for NSW / Contractor	Construction
TT5	Reduce speeds, traffic delays and disruptions during construction	Clear signage will be provided to direct and guide vehicles not related to the Project during road construction work. This will be supplemented by variable message signs to advise drivers of traffic diversions, speed restrictions or alternative routes.	Transport for NSW / Contractor	Construction
TT6	Impacts to the regional road network	If disruptive work is required (lane closures) would be carried out at night where practicable, to minimise potential impacts on the regional road network.	Transport for NSW / Contractor	Construction
TT7	Parking	Parking will be provided on-site (ancillary site) and not on surrounding local streets.	Transport for NSW / Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
TT8	Site access and egress	All vehicles will enter and exit construction sites in a forward direction, where feasible and reasonable.	Transport for NSW / Contractor	Construction
NV1	Noise and vibration	A Noise and Vibration Management Plan (NVMP) will be prepared and implemented as part of the CEMP. The NVMP will generally follow the approach in the *Interim Construction Noise Guideline* (ICNG) (DECC, 2009) and identify: • Identification of nearby sensitive receivers • Description of work, construction equipment and the hours work would be completed in • Criteria and mitigation measures for the Project • Arrangements for consultation with affected neighbours and sensitive receivers, including notification and complaint handling procedures. Details of how respite would be applied where ongoing high impacts are seen at certain receivers.	Contractor	Detailed design / Pre-construction/ construction
NV2	Noise and vibration	All sensitive receivers (schools, local residents) likely to be affected will be notified at least seven days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The project • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting. How to obtain further information.	Contractor	Detailed design / Pre-construction
NV3	Noise and vibration	Location and activity specific noise and vibration impact assessments should be carried out prior to (as a minimum) activities: • With the potential to result in noise levels above 75 dBA at any receiver • Required outside Standard Construction Hours likely to result in noise levels greater than relevant NMLs • With the potential to exceed relevant criteria for vibration. The assessments should confirm the predicted impacts at the relevant receivers in the vicinity of the activities to aid the selection of appropriate management measures, consistent with the requirements of the CNVG.	Transport for NSW	Pre-construction
NV4	Noise exceedances	Where noise intensive equipment is to be used near sensitive receivers, the work should be scheduled for Standard Construction Hours, where possible. If it is not possible to restrict the work to the daytime, then they should be completed as early as possible in each work shift. Appropriate respite should also be provided to affected receivers in accordance with the CNVG and/or the Project's conditions of determination.	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
NV5	Ancillary sites	Hoarding, or other shielding structures, should be used where receivers are impacted near compounds or fixed work areas with long durations. To provide effective noise mitigation, the barriers should break line-of-sight from the nearest receivers to the work and be of solid construction with minimal gaps.	Contractor	Construction
NV6	Noise and vibration monitoring	Monitoring should be carried out at the start of noise and/or vibration intensive activities to confirm that actual levels are consistent with the predictions and that appropriate mitigation measures from the CNVG have been implemented.	Transport for NSW	Pre-construction / Construction
NV7	Vibration	Where work is within the minimum working distances and considered likely to exceed the cosmetic damage criteria: • Different construction methods with lower source vibration levels should be investigated and implemented, where feasible. Attended vibration measurements should be undertaken at the start of the work to determine actual vibration levels at the item. Work should be ceased if the monitoring indicates vibration levels are likely to, or do, exceed the relevant criteria.	Contractor	Pre-construction
NV8	Building condition surveys	Building condition surveys should be completed before and after the work where buildings or structures are within the minimum working distances and considered likely to exceed the cosmetic damage criteria during the use of vibration intensive equipment.	Transport for NSW / Contractor	Pre-construction / Post-construction
NV9	***Vibration impact to heritage items***	***The need for an additional structural assessment of the Londonderry Cemetery to determine its vulnerability to vibration impacts should be considered prior to construction based on the finalisation of plant and equipment requirements. If the structural assessment is required, this should be undertaken prior to the commencement of works in the area.***	***Contractor***	***Pre-construction***
C1	Soil	Management of impact to soils will be implemented as part of the CEMP. The CEMP will identify all reasonably foreseeable risks relating to soil erosion and water pollution and describe how these risks will be addressed during construction.	Contractor	Detail design / Pre-construction
C2	Soil	A site-specific Erosion and Sediment Control Plan/s will be prepared and implemented as part of the CEMP. The Plan will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Contractor	Detail design / Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
C3	Contaminated land	A Contaminated Land Management Plan (CLMP) would be prepared in accordance with the *Guideline for the Management of Contamination* (Transport for NSW, 2013) and implemented as part of the CEMP. The plan will include, but not be limited to: • Capture and management of any surface runoff contaminated by exposure to the contaminated land • Further investigations required to determine the extent, concentration and type of contamination, as identified in the detailed site investigation (Phase 2) Management of the remediation and subsequent validation of the contaminated land, including any certification required Measures to ensure the safety of site personnel and local communities during construction.	Contractor	Detailed design / Pre-construction
C4	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.	Contractor	Detailed design / Pre-construction
C5	Accidental spill	A site-specific emergency spill plan will be developed and include spill management measures in accordance with the *Transport for NSW Code of Practice for Water Management* (RTA, 1999) and relevant EPA guidelines. The plan will address measures to be implemented in the event of a spill, including initial response and containment, notification of emergency services and relevant authorities (including Transport for NSW and EPA officers).	Contractor	Detailed design / Pre-construction
C6	Contaminated land	In consideration of the confirmed Bonded ACM (fibre cement sheeting and fragments) found within the Project area and the construction activities to be undertaken, an Asbestos Management Plan (AMP) should be implemented inclusive of an 'unexpected finds' protocol within a CEMP to plan for and accommodate confirmed/potential ACM or other waste identified during the construction phase. To fully characterise the soil materials for off-site disposal and / or beneficial re-use within the Project area, further chemical and asbestos characterisation should be undertaken in accordance with *AS4481.1-2005*, NEPM (2013), NSW EPA (2014) and the *Western Australia Department of Health Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated. Sites in Western Australia, 2009* (updated 2021).	Contractor	Pre-construction / Construction
C7	Durability impacts to construction materials	If groundwater is encountered during excavations and / or installation of deep ground structures, such as footings and pilings, further assessment may be considered to determine durability impacts on construction materials (asphalt, steel and concrete) durability.	Contractor	Pre-Construction / Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
AH2	Aboriginal heritage unexpected finds	*The Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / Pre-construction
NH1	Non-Aboriginal heritage unexpected finds	*The Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) will be followed in the event that any unexpected heritage items, archaeological remains or potential relics of Non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contractor	Detailed design / Pre-construction
LV1	Landscape character and visual impact	The landscape and concept design strategies *New Richmond Bridge - Stage 1 The Driftway Urban Design, Landscape Character and Visual Impact Assessment prepared by Tract* (2021) will form the basis of future landscape and detailed design development, providing integrated urban design and practical detail on the application of design principles and objectives identified in the environmental assessment. The Plan will include design treatments for: • Location and identification of existing vegetation and proposed landscaped areas, including species to be used • Built elements including retaining walls, bridges and noise walls • Pedestrian and cyclist elements including footpath location, paving types and pedestrian crossings • Fixtures such as lighting, fencing and signs Details of the staging of landscape works taking account of related environmental controls such as erosion and sedimentation controls and drainage. Procedures for monitoring and maintaining landscaped or rehabilitated areas.	Contractor	Detailed design / Pre-construction
LV2	Removal of vegetation	Avoid impact to prominent trees and vegetation communities where possible Protect threatened species and retained habitat wherever possible. Minimise clearance extent where possible and mark exclusion zones.	Contractor	Pre-construction / Construction
LV3	Removal of vegetation	Revegetation using local provenance material and match community and landscape character. Revegetation efforts should be implemented progressively to limit erosion and sedimentation. Provide screen planting within corridor to limit visibility to the landfill.	Contractor	Construction / Operation

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
LV4	Visual impact of work sites	Project work sites, including construction areas and supporting facilities (such as storage compounds and offices) will be managed to minimise visual impacts, including appropriate fencing or screening (use of shade cloth), storage of equipment, parking, stockpile screening and arrangements for the storage and removal of rubbish and waste materials. Compound and ancillary facilities will be decommissioned, and the sites rehabilitated to their existing condition or as otherwise agreed with the landowner as soon as possible.	Contractor	Construction
LV5	Earthworks	Integrate with adjoining landform through adoption of appropriate grades, avoiding sharp transition in profile where possible. Stabilise/revegetate as works progress to limit erosion and visual impacts through early integration with surrounding vegetation.	Contractor	Detailed design / Construction
AQ1	Air quality impacts during construction	An Air Quality Management Plan (AQMP) will be prepared and implemented as part of the CEMP. The AQMP will include, but not be limited to: • Potential sources of air pollution • Air quality management objectives consistent with any relevant published EPA and/or DPIE (formerly OEH) guidelines • Methods to manage works during strong winds or other adverse weather conditions • A progressive rehabilitation strategy for exposed surfaces An assessment and responsibility delegation of the management of air quality suppression and management measures. A monitoring program to record whether the air quality mitigation, suppression and management measures have been applied and their effectiveness.	Contractor	Detailed design / Pre-construction
AQ2	Dust emissions during construction	Site planning and work practices: • Minimise the extent of disturbed and exposed areas and revegetate finished areas as soon as possible • Minimise the drop heights of materials • Review and, where necessary, modify or suspend activities during dry and windy weather and background air quality conditions • Cover or otherwise regularly stabilise (with water sprays • or binders) stockpiles especially prior to any site shutdown periods • Regularly water haul routes and ensure that all loads are covered Regularly inspect and remove debris from plant and equipment to avoid the tracking of materials on to the adjacent road network. To the extent practical, position ancillary sites and stockpiles away from nearby sensitive receivers.	Contractor	Construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
AQ3	Exhaust emissions from plant and equipment used during construction	Plant and equipment: • Inspect all plant and equipment before it is used on-site • Ensure all vehicles, plant, and equipment operate in a proper and efficient manner Switch off all vehicles, plant and equipment when not in-use. Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	Contactor	Construction
AQ4	Odours and airborne hazardous substances from uncovered contaminated materials	Odour and airborne hazards: Apply odour supressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works. Adhere to relevant requirements for removal and disposal listed in the *Work Health and Safety Act 2011*, and *Work Health and Safety Regulation 2017*.	Contractor	Construction
SE1	Socio-economic	A Communication Plan (CP) will be prepared and implemented as part of the CEMP to help provide timely and accurate information to the community during construction. The CP will include (as a minimum): • Mechanisms to provide details and timing of proposed activities to affected residents, including changed traffic and access conditions • Contact name and number for complaints. How the community enquiry/complaint phone number will be managed. The CP will be prepared in accordance with the *Community Involvement and Communications Resource Manual* (RTA, 2008).	Contractor	Detailed design / Pre-construction
SE2	Partial property acquisition and lease	All partial acquisitions and associated property adjustments will be carried out in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* and *Land acquisition Reform 2016* in consultation with landowners.	Transport for NSW	Pre-construction
W1	Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • Measures to avoid and minimise waste associated with the project • Classification of wastes and management options (re-use, recycle, stockpile, disposal) • Statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • Procedures for storage, transport and disposal • monitoring, record keeping and reporting. The WMP will be prepared taking into account the *Environmental Procedure - Management of Wastes on Transport for NSW Land* (Transport for NSW, 2014) and relevant Transport for NSW Waste Fact Sheets.	Contractor	Detailed design / Pre-construction

No.	Impact	Environmental safeguards and management measures	Responsibility	Timing
U1	Utilities	Prior to the commencement of works: The location of existing utilities and relocation details will be confirmed following consultation with the affected utility owners. If the scope or location of proposed utility relocation works falls outside of the assessed Project scope and footprint, further assessment will be undertaken.	Contractor	Detailed design / Pre-construction
HZ1	Hazards	A Hazard and Risk Management Plan (HRMP) will be prepared and implemented as part of the CEMP. The HRMP will include, but not be limited to: • Details of hazards and risks associated with the activity • Measures to be implemented during construction to minimise these risks • Record keeping arrangements, including information on the materials present on the site, material safety data sheets, and personnel trained and authorised to use such materials • A monitoring program to assess performance in managing the identified risks. Contingency measures to be implemented in the event of unexpected hazards or risks arising, including emergency situations. The HRMP will be prepared in accordance with relevant guidelines and standards, including relevant Safe Work Australia Codes of Practice, and EPA or Office of Environment and Heritage publications.	Contractor	Detailed design / Pre-construction

7.2 Licensing and approvals

All relevant licenses, permits, notifications and approvals needed for The Project and when they need to be obtained are listed in Table 7-2. Additional or changed licenses and approval requirements identified in this AREF are indicated by underlined and/or struck out font.

Table 7-2: Summary of licensing and approval required

Instrument	*Requirement*	*Timing*
Land Acquisition (Just Terms Compensation) Act 1991	The acquisition of land would be required to carry out the proposal and shall be undertaken in accordance with the Land Acquisition (Just Terms Compensation) Act 1991.	At least 90 days prior to acquisition, unless cl 13(2)(a) or (b) or 13(3) apply
Asbestos removal licence (Class B) SafeWork NSW	There is the potential to uncover confirmed Bonded ACM or other waste within the proposal area during construction. A Class B licence is required for removal of more than ten square metres of non-friable asbestos or ACM and asbestos contaminated dust (ACD) associated with the removal of non-friable asbestos or ACM	Pre construction

8. Conclusion

This chapter provides the justification for the proposal taking into account its biophysical, social and economic impacts, the suitability of the site and whether or not the proposal is in the public interest. The proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in Section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

The proposed modifications reflects the Project being refined during the detailed design phase. The detailed design required the resolution of safety components to comply with Austroads Guidelines, detailed access requirements for private properties and enable the safe evacuation of the surrounding communities during flooding and comply with the requirements of the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program.

There are some environmental impacts associated with the proposed modifications, additional vegetation clearing and increased construction areas. However, excluding the vegetation clearing, these impacts are minor, temporary and are adequately addressed through the safeguards listed Table 7-1.

The benefits of the proposed modifications are considered to outweigh the adverse impacts and risks.

8.2 Objects of the EP&A Act

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1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The proposed modifications would improve flood resilience of communities in the area by supporting flood evacuation routes.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	The principles of ecological sustainable development are considered in Section 8.3.
1.3(c) To promote the orderly and economic use and development of land.	Not directly relevant to the proposed modifications.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not directly relevant to the proposed modifications.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	The proposed modifications would result in a minor increase to impacts on biodiversity values due additional clearing of 0.216 ha of native vegetation. Additional offsetting is required to address this impact.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	The proposed modifications would have no heritage Impacts subject to the implementation of safeguards.
1.3(g) To promote good design and amenity of the built environment.	Landscape design has been incorporated into the detailed design to provide planting to soften the appearance of the built environment and integrate with native bushland.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	The proposed modifications have been designed to ensure that the project is beneficial to habitable properties on the south side of The Driftway by reducing flood water levels

1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the project.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	The proposed modifications took into consideration the findings of the Project Submissions Report and incorporated findings where feasible into the detailed design.

8.3 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the project. ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

8.3.1 The precautionary principle

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

The precautionary principle has guided the assessment of environmental impacts for this AREF and the development of mitigation measures. Best available technical information, environmental standards and measures have been used to minimise environmental risks and conservative scenarios have been considered while assessing environmental impact

8.3.2 Intergenerational equity

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

The proposed modifications support the Project, which would increase safety for current and future road users and would provide a flood evacuation route for local communities now ad in the future.

8.3.3 Conservation of biological diversity and ecological integrity

The twin principles of biodiversity conservation and ecological integrity have been a consideration during the design and assessment process with a view to identifying, avoiding, minimising and mitigating impacts. The cumulative impacts of the Project REF and AREF has been assessed as not having significant biodiversity impacts.

8.3.4 Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources that may be affected by the carrying out of a project, including air, water, land and living things.

The value placed on environmental resources within and around the proposal footprint is evident in the extent of environmental investigations, planning and design of impact mitigation measures to prevent adverse environmental impacts. In addition offsets for unavoidable impacts would be delivered in accordance with the Transport for NSW Biodiversity Policy.

8.4 Conclusion

This AREF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. On balance the proposed modifications are considered justified, and the following conclusions are made.

This has included consideration where relevant impacts on threatened species, populations and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the proposed modifications have been avoided or reduced during the design development and options assessment. The proposed modifications as described in the AREF best meets the Project objectives but would still result in 0.216 ha of additional impacts on native vegetation. In addition, the local community would still be impacted during construction with impacts associated to traffic, air quality noise and vibration. Safeguards and management measures as detailed in this AREF would ameliorate or minimise these expected impacts.

However, the proposed modifications are anticipated to improve the flood resilience of the locality and surrounding areas by facilitating aspects of the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program. It would also improve the safety of the road by improving the performance of intersections and access to private properties.

8.4.1 Significance of impact under NSW legislation

The proposed modifications would not result in a change to the findings of the project REF [also refer to the submissions report and any other previous AREFs if relevant] and would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The proposed modifications are subject to assessment under Division 5.1 of the EP&A Act. Consent from Council is not required.

8.4.2 Significance of impact under Australian legislation

The proposed modifications would not likely cause a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the EPBC Act. A referral to the Australian Government Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This addendum review of environmental factors provides a true and fair review of the proposed modifications in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the proposed modifications.

Name: Geraint Breese
Position: Senior Environmental Consultant
Company: Mott MacDonald

Date: 07/03/2023

I have examined this addendum review of environmental factors and accept it on behalf of Transport for NSW.

Name: Tim Green
Position: Technical Director - Environment
Company: Mott MacDonald

Date: 07/03/2023

10. EP&A Regulation publication requirement

Drafting guidance

This section is to be completed by either the Environment and Sustainability Officer or Senior Manager Environment and Sustainability. Complete the REF publication decision checklist located within the document control pages of this template.

Respondent	Yes/No
Does this AREF need to be published under section 171(4) of the EP&A Regulation?	

11. Terms and acronyms used in this addendum REF

Term /acronym	Description
AusLink	Mechanism to facilitate cooperative transport planning and funding by Commonwealth and state and territory jurisdictions
BC Act	*Biodiversity Conservation Act 2016 (NSW).*
CEMP	Construction / Contractor's environmental management plan
EIA	Environmental impact assessment
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994* (NSW)
Heritage Act	*Heritage Act 1977* (NSW)
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LoS	Level of Service. A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.
NES	Matters of national environmental significance under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
NPW Act	National Parks and Wildlife Act 1974 (NSW)
Roads and Maritime	NSW Roads and Maritime was dissolved by the Transport Administration Amendment Bill in August 2019, all function are now managed by Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SEPP (Biodiversity and Conservation)	State Environmental Planning Policy (Biodiversity and Conservation) 2021
SEPP (Planning Systems)	State Environmental Planning Policy (Planning Systems) 2021
SEPP (Precincts – Central River City)	State Environmental Planning Policy (Precincts – Central River City) 2021
SEPP (Precincts – Eastern Harbour City)	State Environmental Planning Policy (Precincts – Eastern Harbour City) 2021
SEPP (Precincts – Regional)	State Environmental Planning Policy (Precincts – Regional) 2021
SEPP (Precincts – Western Parkland City)	State Environmental Planning Policy (Precincts – Western Parkland City) 2021

SEPP (Resilience and Hazards)	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP (Transport and Infrastructure)	State Environmental Planning Policy (Transport and Infrastructure) 2021
TSC Act	*Threatened Species Conservation Act 1995* (NSW)
QA Specifications	Specifications developed by Roads and Maritime Services for use with road work and bridge work contracts let by Transport for NSW.

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Appendix A

Consideration of section 171(2) factors and matters of National Environmental Significance and Commonwealth land

Section 171(2) checklist

In addition to the requirements of the Is an EIS required? (1995/1996) guideline and the *Roads and Related Facilities EIS Guideline* (DUAP, 1996) as detailed in the AREF, the following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the proposed modifications on the natural and built environment.

Factor	Impact
Any environmental impact on a community? Construction of the proposed modifications would result in some addition short-term negative impacts during construction due to the increase in the size of the construction area. Negative impacts include loss off visual amenity, traffic and access disruptions, in addition to potential noise and air emissions impacts. These could impact negatively on the local community as described in this Addendum REF . The primary long-term positive impact of the proposal would include improved safety and reduced travel times and long-term support for economic growth.	Short term, minor, Negative Long term, positive
Any transformation of a locality? Construction of the proposed modifications would result in increase to the area of construction and temporarily increase the impact on the existing locality, predominantly through a negative visual impact, associated with the placement and movement of construction plant and equipment and stockpile areas. In the longer term, the proposed modifications would not result in a substantial transformation of the locality as it comprises widening of the existing road corridor and improved intersection safety.	Short term, minor, Negative Long term, positive
Any environmental impact on the ecosystems of the locality? The proposed modifications will require removal of an additional 0.216 hectares of native vegetation associated with the construction footprint required for the upgrade works. This vegetation clearing would include: • Shale Gravel Transition Forest in the Sydney Basin Bioregion (Endangered BC Act) (PCT 724) – 0.001 hectares • River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions (Endangered) (PCT 835) – 0.066 hectares • Cumberland Plain Woodland in the Sydney Basin Bioregion (Critically Endangered) (PCT 849) – 0.127 hectares • Castlereagh Scribbly Gum Woodland in the Sydney Basin Bioregion (Vulnerable) (PCT 883) – 0.022 hectares The addendum biodiversity assessment identifies that the proposed modifications are not likely to have a significant impact on threatened biodiversity listed under the NSW BC Act and EPBC Act. Separately and cumulatively, the proposed modifications and the Project REF have been assessed as not likely to have a significant impact on threatened biodiversity listed under the NSW BC Act and EPBC Act. No like-for-like offsets for MNES are required. With appropriate safeguards and biodiversity offsets under Transport for NSW Guideline for Biodiversity Offsets (2016) impact would be minimised. Revegetation efforts with endemic species would also reduce direct impacts resulting from clearing activities. The proposed modifications would lead to the long-term negative impact resulting from the direct loss of state listed species and ecological communities. Offsetting and revegetation with endemic species would alleviate some of this loss.	Long term, moderate, negative
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? During construction, the proposed modifications would create a small increase in the construction area, which has the potential to create a reduction in the overall aesthetic quality of the locality due to the equipment associated with construction worksite, dust and noise generation as well as traffic and access disruption.	Short term, minor, Negative

Factor	Impact
The removal of vegetation would impact the visual landscape long term, reducing a small portion of vegetation screening to the landfill site from Blacktown Road. Revegetation efforts would alleviate this impact. No recreational or scientific qualities of the locality are anticipated to be impacted during the construction or operation of the Project.	Short term, minor, negative
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposed modifications will increase the size of the construction area and extend to in approximately 150m of the heritage listed Londonderry Cemetery. There is potential for this cemetery to be impacted by vibration during construction, however safeguards require a Construction Noise and Vibration Management Plan to be prepared which must include consideration of the need for a structural assessment of the cemetery to determine the vulnerability of structures to vibration impacts and mitigate accordingly though the pre-construction and construction processes.	Nil
Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974*)? The proposed modifications will remove marginal foraging habitat for threated fauna, however it is has been assessed in the addendum biodiversity assessment as not having a significant impact on any threated fauna. In addition, revegetation with native plant species is anticipated to provide replacement habitat in the future.	Short term, minor, negative
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? The addendum biodiversity assessment identifies that the Project is not likely to have a significant impact on threatened biodiversity listed under the NSW BC Act and EPBC Act. The assessment assessed the cumulative impact of the Project and the proposed modifications. No like-for-like offsets for MNES are required. With appropriate safeguards and biodiversity offsets under Transport for NSW Guideline for Biodiversity Offsets (2016) impact would be minimised. Revegetation efforts with endemic species would also reduce direct impacts resulting from clearing activities.	Long term, minor, negative
Any long-term effects on the environment? The proposed modifications would have a long term impact on the existing environment by removing an additional 0.216 hectares of native vegetation	Long term, minor, negative
Any degradation of the quality of the environment? The proposed modifications have the potential to degrade the quality of the environment through accidental spills, noise, dust and sediment during construction. Management measures outlined in Section 7.1 would be implemented to mitigate potential impacts. In the long-term, it is anticipated that the proposal would improve the overall quality of the environment through revegetation, improved drainage and reduce flooding of the Driftway and properties on the southern side of the Driftway.	Long term, minor, Negative Long term, moderate, positive
Any risk to the safety of the environment? The proposed modifications are not anticipated to change any potential risk of safety to the environment and safeguards within the Project REF and Submissions Report are considered appropriate to mitigate any impacts	Nil
Any reduction in the range of beneficial uses of the environment? The proposed modifications would not result in a significant reduction in the range of beneficial uses of the environment.	Nil
Any pollution of the environment?	Nil

Factor	Impact
The proposed modifications are not anticipated to change the potential of pollution to the environment to occur and safeguards within the AREF, Project REF and Submissions Report are considered appropriate to mitigate any impacts	
Any environmental problems associated with the disposal of waste? No environmental problems associated with the disposal of waste are expected as a result of the proposed modifications. Waste would be managed as per the safeguards Project REF and Submissions Report.	Nil
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The proposed modifications would not create any significant demand on resources. Reuse of excavated material is expected to minimise demand. All required resources for the Project are considered to be readily available.	Nil
Any cumulative environmental effect with other existing or likely future activities? Due to the small scale of the proposed modifications it is considered that it would not result in additional negative cumulative impacts to those identified within the Project REF.	Nil
Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The Project is not located within a coastal area and would not result in any impact on coastal processes and coastal hazards	Nil
Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1. • Greater Sydney Region Plan • Western City District Plan • Penrith Local Strategic Planning Statement • Hawkesbury Local Strategic Planning Statement	Consistent The addition of the second southbound lane on the roundabout meets objectives of improving flood resilience.
Other relevant environmental factors	In considering the potential impacts of this proposal all relevant environmental factors have been considered, refer to section 6 of this assessment.

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the proposed modifications should be referred to the Australian Government Department of Climate Change, Energy, the Environment and Water.

Under the EPBC Act strategic assessment approval a referral is not required for proposed road actions that may affect nationally listed threatened species, populations, endangered ecological communities and migratory species. Impacts on these matters are assessed in detail as part of this AREF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
Any impact on a World Heritage property? The proposed modifications would not have any impact on a World Heritage property	Nil
Any impact on a National Heritage place? The proposed modifications would not have any impact on a National Heritage place.	Nil
Any impact on a wetland of international importance? There would be no impact to wetlands of international importance by the proposed modifications.	Nil
Any impact on a listed threatened species or communities? The biodiversity assessment determined that the proposal is not likely to have a significant impact on the ecological community or would it have a significant impact on MNES and therefore no like-for-like offsets for MNES are required.	Minor impact
Any impacts on listed migratory species? The proposed modifications would not impact any listed migratory species	Nil
Any impact on a Commonwealth marine area? The proposed modifications would not a Commonwealth marine area	Nil
Do the proposed modifications involve a nuclear action (including uranium mining)? The proposed modifications does not involve a nuclear action.	Nil
Additionally, any impact (direct or indirect) on Commonwealth land? The proposed modification do not involve any impact on Commonwealth land.	Nil

Appendix B
Statutory consultation checklists

SEPP (Transport and Infrastructure)

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Car park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.110
Bus depots	Does the project propose a bus depot?	No		Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.110

Development within the Coastal Zone

Issue	**Description**	**Yes / No** / N/A	**If** 'yes' consult with	**SEPP (Transport and Infrastructure) section**
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Note: See interactive map Coastal management - (nsw.gov.au). Note the coastal vulnerability area has not yet been mapped.

Note: a certified coastal zone management plan is taken to be a certified coastal management program.

Council related infrastructure or services

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
Stormwater	Are the works likely to have a substantial impact on the stormwater management services which are provided by council?	No		Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will strain the capacity of the existing road system in a local government area?	No		Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a substantial impact on the capacity of any part of the system?	No		Section 2.10
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a substantial volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a minor or inconsequential disruption to pedestrian or vehicular flow?	No		Section 2.10
Road and footpath excavation	Will the works involve more than minor or inconsequential excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	Yes	Penrith and Hawkesbury	Section 2.10

Local heritage items

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than minor or inconsequential?	No		Section 2.11

Flood liable land

Development type	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a minor extent?	Yes	Penrith and Hawkesbury	Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance	Yes	State Emergency Services	Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled Floodplain Development Manual: the management of flood liable land published by the New South Wales Government.

Public authorities other than councils

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act?	No	DPE	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	No	DPE	Section 2.15
Aquatic reserves and marine parks	Are the works adjacent to an aquatic reserve or a marine park declared under the *Marine Estate Management Act 2014*?	No	Department of Industry	Section 2.15
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998*?	No	Sydney Harbour Foreshore Authority	Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No	Rural Fire Service	Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky	No	Director of the Siding Spring Observatory	Section 2.15

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
	region is within 200 kilometres of the Siding Spring Observatory)			
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011).	No	Secretary of the Commonwealth Department of Defence	Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No	Mine Subsidence Board	Section 2.15

SEPP (Precincts – Central River City) 2021 and SEPP (Precincts – Western Parkland City) 2021

Development type	Potential impact	Yes / No	If 'yes' consult with the relevant local council(s).	SEPP (Transport and Infrastructure) section
Clearing native vegetation	Do the works involve clearing native vegetation (as defined in the Local Land Services Act 2013) on land that is not subject land (as defined in cl 17 of schedule 7 of the *Threatened Species Conservation Act 1995*)?	No	Department of Planning and Environment	Section 3.24

Appendix C

Neutral or beneficial effect on water quality assessment

Neutral or beneficial effect assessment

Chapter 8 (Sydney Water Drinking Catchment) of SEPP (Biodiversity and Conservation) relates to the use of land within the Sydney drinking water catchment. In accordance with Section 8.11 of the SEPP, Transport for NSW is required to consider whether or not an activity to which Division 5.1 of the EP&A Act applies will have a neutral or beneficial effect on water quality before carrying out the activity.

Factor		Impact
1	**Are there any identifiable potential impacts on water quality?** **What pollutants are likely?** **During construction and/or post construction?**	The proposal could transport pollutants and sediments into adjacent watercourse during construction and operation having an adverse impact on water quality. As part of the concept design development an assessment was undertaken utilising MUSIC, to determine the reduction in pollutant load that would be achieved by the provision of the proposed grass lined swales and existing grass lined channel. From this assessment it was determined that the proposal would lead to a significant overall reduction in gross pollutants (91%) and TSS (78%), as well as a 46% reduction in TP and 19% reduction in TN discharging to receiving waters.
2	**For each pollutant, list the safeguards needed to prevent or mitigate potential impacts on water quality (these may be DPE Water endorsed current recommended practices and/or equally effective other practices)**	An Erosion and Sediment Control Plan (ESCP) has been prepared to manage water quality impacts during construction. As discussed above, the MUSIC model confirmed that proposed grass lined swales and existing grass lined channel will reduce gross pollutants discharging to receiving waters.
3	**Will the safeguards be adequate for the time required? How will they need to be maintained?**	The safeguards for construction have been developed in accordance with the Managing Urban Stormwater 2004. The operational design has been modeled to confirm that proposed grass lined swales and existing grass lined channel will reduce gross pollutants discharging to receiving waters
4	**Will all impacts on water quality be effectively contained on the site by the identified safeguards (above) and not reach any watercourse, waterbody or drainage depression?** **Or will impacts on water quality be transferred outside the site for treatment? How? Why?**	Yes drainage has been designed with specific components to convey flows from a 1% AEP event to a 20% AEP event with consideration of increased rainfall associated with climate change.
5	**Is it likely that a neutral or beneficial effect on water quality will occur? Why?**	Considering the above the Proposal is considered to have neutral effect during construction subject to the effective implementation of the ESCP. The proposal is anticipated to have a beneficial effect during operation as the Proposal is anticipated to reduce gross pollutants discharging into receiving waters.

Appendix D
Design modifications and options considered

Design Change	Need for Change	Options Considered	Preferred Design Option
Inclusion of an additional southbound lane on the Londonderry Road roundabout	The design integrates with the broader Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program. In particular, the adjacent shoulder widening project on Londonderry Road. The concept design did not provide detail for integration with this project	• Option 1 - A do-nothing approach was considered. However, this would not meet the objectives Hawkesbury-Nepean Valley Flood Evacuation Road Resilience Program as two lanes are required through the roundabout to allow two lanes of evacuation traffic. • Option 2 - Include an additional southbound lane on the Londonderry Road roundabout.	Option 2 - The preferred design change is to include an additional southbound lane on the Londonderry Road roundabout. This is required to comply with the requirements of the Hawkesbury Nepean Valley Flood Evacuation Road Resilience Program and to fulfil the Projects safety objectives.
Inclusion of additional areas for tie-ins to the existing road network on Londonderry Road and the western end of The Driftway including the relocation of a southbound bus stop	The additional southbound lane on the Londonderry Road roundabout and the western end of The Driftway would require tie in works to meet the requirements of Austroads Guidelines.	• Option 1 - A do-nothing approach would not enable an appropriate connection to the existing road network. • Option 2 – tie-ins meeting the minimum requirements for going from a two laned intersection into one lane and meet the requirements of the Austroads Guidelines.	Austroads Guidelines requires that additional development length to the north of the additional lane and additional length is required to taper the additional lane back on the south of Londonderry Road. The tie in works at the western end of The Driftway and Londonderry Road are a result of the realignment.
Adjustments to the ancillary facility layout, increasing in size from 1.9 ha to 2 ha	The location of the proposed ancillary facility within the project REF was considered flood liable and included some potential impacts to native vegetation. This change was also informed by the lease agreement between Western Sydney University and Transport for NSW	• Option 1 - A do-nothing approach was considered. However, it would not address the high flooding potential identified during the detailed design process. • Option 2 - Adjust the layout of the proposed ancillary facility to avoid potential flooding impacts	Option 2 - Preferred option was to modify the layout of the ancillary facility to reduce the risk of flooding. The size of the ancillary facility was increased from 1.9 ha to 2 ha to provide flexibility for construction storage within the laydown areas considering the new elongated shape of the area.
Inclusion of an additional materials stockpile are within the Project REF boundary		•	

Design Change	Need for Change	Options Considered	Preferred Design Option
Eastbound deceleration lane to the Hawkesbury Waste Management Facility (HWMF)	During exhibition of the concept design Council requested safety improvements to access the HWMF from The Driftway.	• Option 1 - A do-nothing approach was considered. However, this would not address Council's request. • Option 2 - A roundabout option was considered. However, this would require additional land acquisition and would further impact native vegetation. • Option 3 - Inclusion of an Eastbound deceleration lane on The Driftway to access the HWMF.	Option 2 - Provision of an Eastbound deceleration lane improves safety but was contained within the Project REF boundary.
The posted speed along The Driftway, between Blacktown Road and the HWMF, has been changed from 80km/h to 60km/h.	The proposed posted speed from the concept design would not meet safety requirements for stopping sight distance.	• Option 1 – A do nothing approach was considered that maintained the concept design posted speed of 80km/h for the entire Driftway. This did not meet the safe stopping sight distance requirements. • Option 2 - Lower the posted speed to 60km/h between Blacktown Road and the HWMF.	Option 2 – The preferred option is the reduction to 60 km/s between Blacktown Road and the HWMF, in accordance with the pre-Project REF arrangement, to provide a compliant safe stopping sight distance.
Adjustment to the access track along the southeastern extent of The Driftway, including the addition of access track connection from Blacktown Rd.	The concept design only provides a line on a plan for the maintenance access track crossing over the Rickabys Creek tributary. The detail of this component had to be resolved for the detailed design	• Option 1 - Constructing the bridge for the access track was ruled out early due to the interaction with Rickabys Creek and potential environmental impacts. • Option 2 – Only providing maintenance access from The Driftway with no bridge. This would have not allowed maintenance access to the eastern side of Rickabys Creek • Option 3 – Provide multiple entries, one from The Driftway west of Rickabys Creek and one on Blacktown Rd. This would require an additional maintenance access track to be constructed.	Option 3 was preferred as the crossing over Rickabys Creek would be removed to avoid impacts to the watercourse and reduce construction complexity. To ensure access to the western side of Rickabys Creek is available, the additional maintenance access track and access point on Blacktown Road was proposed.

Design Change	Need for Change	Options Considered	Preferred Design Option
Reconfiguration of Luxford Road intersection	Reconfiguration of the Luxford Road intersection in response to RSA comment about the potential of the current alignment not having sufficient separation between oncoming lanes.	• Option 1 – A do-nothing approach was considered. However, this did not improve safety outcomes of the Driftway. • Option 2 - Shifting the whole intersections alignment to the north. to improve lane alignment and reduce vehicle drift risk However, this had the potential for additional impact on native vegetation on the northern edge of the project boundary • Option 3 - Amend the centreline of The Driftway at the Luxford Road intersection to reduce potential for vehicle drift across the centreline.	Option 3 - Amending the centreline was preferred as this option would not require any additional impacts to native vegetation and improves safety in line with the Project objectives.
Provision safety barriers along the southern extent of The Driftway	The location of utilities and other civil infrastructure, such as swales, along the road corridor requires barriers to improve safety by creating separation from hazards.	• Option 1 – A do-nothing approach was considered. However, this would not achieve the safety objectives of the project. • Option 2 – The preferred option would be the implementation of additional barriers throughout The Driftway.	Option 2 – The detailed design has provided additional barriers along The Driftway to protect motorist from collisions with major culvert headwalls. This is an optimisation of aspects of the concept design and meets the projects objectives of improving road safety and ensuring the safest possible road corridor given the project constraints.

Design Change	Need for Change	Options Considered	Preferred Design Option
Realignment of swales and amendments to the batter on the southern and northern side of The Driftway.	The existing and proposed utilities adjacent to the roadway create hazards for motorists. The Transport concept design did not have detail in this section. As such the design was required to be optimised to address safety issues	• Option 1 - A do-nothing approach was considered. However, the concept design required optimisation to meet the safety objectives of the projects and remove potential hazards from drivers. • Option 2 - The preferred option would be to realign swales and amend batters, where possible.	Option 2 – The preferred option was to realign design of swales and amendments to the batter. As this would optimise aspects of the Transport concept design which required surface water management in this area. The design has been informed by constraints such as: • Utility impacts • Road user safety • Property impacts. This design change would improve road safety by reducing the likelihood of severe crashes and ensures the safest possible road corridor given the Project constraints. This design change would also minimised impacts to utilities.
Refinement batter design along the northern verge of The Driftway	During the concept design phase a design concession in relation to the batter along the northern verge of The Driftway was made due to steepness and clear zone requirements. The detail design looked at additional options to resolve this concession.	• Option 1 – The inclusion of steeper batters with barriers along the entirety of the northern verge with a smaller clear zone were considered. This was not progressed due to not meeting safety requirements and concerns relating to visual impacts. • Option 2 – the inclusion of a flatter batter, where possible, and safety barriers where required to comply with Austroads Guidelines standard clear zone requirements and avoid impacts to native vegetation and corresponding ecological values.	Option 2 – The preferred design option was inclusion of a flatter batter, where possible, to comply with Austroads Guidelines standard clear zone requirements. This meets the design intent of improving road safety and ensuring the safest possible road corridor given the project constraints. In addition, this has also rationalised the constructability of batters and avoided impacts to native vegetation and corresponding ecological values by reducing the need for a large clear zone associated to stepper batter.

Design Change	Need for Change	Options Considered	Preferred Design Option
Modification of driveway tie-ins along Londonderry Road, Blacktown Road and The Driftway including a new access driveway to the Turtle Landscape business.	This is required to ensure safe and ongoing access from private properties along the alignment of the Project.	• Option 1 - Do nothing approach, this was not considered adequate to allow ongoing safe access to and from properties on to the upgrade road network. • Option 2- Redesign driveway tie ins to allow residents and business have safe access to their premises.	Option 2 – Preferred option is to provide driveway tie-ins for private properties adjacent to the Project to allow ongoing safe access to their premises.

Appendix E
Addendum Biodiversity Assessment Report

Appendix F
Operational Traffic Noise Assessment Report

Appendix G
Aboriginal Heritage Stage 1 PACHCI Assessment

Appendix H
New Richmond Bridge and traffic improvements - Stage 1 The Driftway - Detailed Design Plans