7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the proposal and during construction and operation of the proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1 Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
General					
GEN01	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport 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 proposal 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	Prior to construction / detailed design	N/A

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN02	General - notification	All businesses, residential properties and other key stakeholders (eg schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Transport project manager	Prior to construction	N/A
GEN03	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the proposal. 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: • Areas of Aboriginal heritage sensitivity • Threatened species habitat • Adjoining residential areas requiring particular noise management measures	Contractor / Transport project manager	Prior to construction / detailed design	N/A
Biodiversity					
BI01	Biodiversity	A Flora and Fauna Management Plan will be prepared in accordance with Transport's *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • Plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • Requirements set out in the *Landscape Guideline* (RMS, 2008) • Pre-clearing survey requirements • Procedures for unexpected threatened species finds and fauna handling • Procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013) • Protocols to manage weeds and pathogens.	Transport/ Contractor	Detailed design Prior to construction	Section 4.8 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BI02	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Native vegetation and habitat removal will be minimised through detailed design.	Contractor	Detailed design	Appendix D
BI03	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Further consideration for the placement of ancillary facilities (including drainage and sediment basins) currently positioned in native vegetation and high value areas will be considered during the detailed design stage.	Transport/ Contractor	Detailed design	Appendix D
BI04	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Pre-clearing 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	Construction	Appendix D
BI05	Removal of native	Vegetation and habitat removal will be undertaken in accordance with Guide 4: Clearing of vegetation and removal of bushrock of the Biodiversity	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	vegetation, threatened species habitat, habitat features and threatened plants	Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).			
BI06	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	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	Construction	Appendix D
BI07	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	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, not assessed in the biodiversity assessment, are identified in the proposal site.	Contractor	Construction	Appendix D
BI08	Removal of native vegetation, threatened	Habitat removal will be minimised through detailed design.	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	species habitat, habitat features and threatened plants				
BI09	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Fauna will be managed in accordance with Guide 9: Fauna handling of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Construction	Appendix D
BI10	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	Habitat will be replaced or re-instated in accordance with Guide 5: Re-use of woody debris and bushrock and Guide 8: Nest boxes of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011). Modified limbs salvaged from removed vegetation in the subject land would be preferenced over nest boxes for artificial hollow construction.	Contractor	Construction	Appendix D
BI11	Removal of native vegetation, threatened species habitat,	Vegetation removal will be minimised around mapped Purple Copper Butterfly habitat.	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	habitat features and threatened plants				
BI12	Removal of native vegetation, threatened species habitat, habitat features and threatened plants	A Purple Copper Butterfly management plan will be developed within the Flora and Fauna Management Sub-plan which will include measures to minimise impacts to the species including consideration of construction activity timing/scheduling to minimise mortality in areas of mapped habitat and a monitoring strategy to detect efficacy of management measures.	Transport/ Contractor	Construction	Appendix D
BI13	Aquatic impacts	Aquatic habitat will be protected in accordance with Guide 10: Aquatic habitats and riparian zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011) and Section 3.3.2 Standard precautions and mitigation measures of the Policy and guidelines for fish habitat conservation and management Update 2013 (DPI, 2013).	Contractor	Construction	Appendix D
BI14	Aquatic impacts	Creek works and bridges would be designed in accordance with the *Policy and Guidelines for Fish Friendly Waterway Crossings* (DPI, 2003)	Contractor	Construction	Appendix D
BI15	Aquatic impacts	Instream works would be undertaken during periods of low flow where possible. Where not possible, any creek diversions would require a permit from DPI (Fisheries).	Contractor	Construction	Appendix D
BI16	Aquatic impacts	A Construction Soil and Water Management Plan (CSWMP) would be developed as a subplan to the CEMP and will outline measures to manage water quality impacts associated with construction work.	Transport/ Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BI17	Aquatic impacts	A surface water quality monitoring program will be developed in accordance with the *Guidelines for Construction Water Quality Monitoring* (RTA, 2003) as part of the Soil and Water management Sub-plan of the CEMP. The program will monitor surface water prior to construction, during construction and during operation.	Transport/ Contractor	Construction Operation	Appendix D
BI18	Groundwater dependent ecosystems	Interruptions to water flows associated with groundwater dependent ecosystems will be minimised through detailed design.	Contractor	Detailed design	Appendix D
BI19	Changes to hydrology	Changes to existing surface water flows will be minimised through detailed design.	Contractor	Detailed design	Appendix D
BI20	Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA, 2011). This will include retrofitting culverts with fauna friendly design features suitable for target species.	Contractor	Construction	Appendix D
BI21	Fragmentation of identified habitat corridors	Any connectivity measures implemented will be installed under the supervision of an experienced ecologist and maintained during proposal operation.	Transport	Operation	Appendix D
BI22	Fragmentation of identified habitat corridors	Revegetation of unused pavement beneath the bridge at Jenolan Caves Road would be investigated as a potential option to increase fauna connectivity in this area. This would need to consider risk of road strike and feasibility of fauna fencing at this intersection.	Contractor	Detailed design	Appendix D
BI23	Fragmentation of identified habitat corridors	Riparian zone under the twin bridges at River Lett would be revegetated, where feasible, to ensure habitat connectivity is retained.	Contractor	Detailed design	Appendix D
BI24	Indirect impacts on native	Exclusion zones will be set up at the limit of clearing in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	vegetation and habitat				
BI25	Invasion and spread of weeds	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	Appendix D
BI26	Invasion and spread of pests	Pest species will be managed within the construction footprint.	Contractor	Construction	Appendix D
BI27	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with Guide 2: Exclusion zones of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects (RTA, 2011).	Contractor	Construction	Appendix D
BI28	Noise, light and vibration	Works in proximity to cuvert 2 and 3 would be undertaken at night to minimise impacts to roosting microbats	Contractor	Construction	Appendix D
BI29	Noise, light and vibration	Permanent shading and artificial light impacts will be minimised through detailed design.	Contractor	Detailed design Construction	Appendix D
BI30	Noise, light and vibration	Construction lighting impacts would be minimised as follows: • Lighting would only be used as necessary to conduct construction activities at night. Lights would be turned off when not needed • Adaptive light controls to manage light timing, intensity and colour would be installed • Only the object or area intended would be lit where feasible • Lights would be kept close to the ground, directed and shielded to avoid light spill • The lowest intensity lighting appropriate for the task would be used	Contractor	Construction	Appendix D

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Use non-reflective, dark-coloured surfaces where possible • Use lights with reduced or filtered blue, violet and ultra-violet wavelengths where possible.			
BI31	Impacts to habitat in human made structures	A Microbat Management Plan would be prepared as a part of the Fauna and Flora Management Sub-Plan to manage impacts to microbats. It would include pre-clearance checks of culverts, monitoring of microbats during noisy works and stop works procedures.	Contractor	Construction	Appendix D
BI32	Impacts to habitat in human made structures	Permanent roost habitat for cave-dwelling microbats should be considered for inclusion in the design of new bridges and culvert structures. This may include pre-casting roosting chambers on the underside of bridges or in the roof of culverts, and/or retrofitting/modifying standard structures to make them more suitable for microbats i.e. leaving grab holes and section joins unsealed, scabbling of concrete surfaces to make structures more suitable, particularly in recesses and potential roosting sites.	Transport/ Contractor	Detailed design Construction	Appendix D
BI33	Impacts to habitat in human made structures	Access to Culvert 2 and 3 would be restricted during construction to minimise impacts to roosting microbats. If access to either culvert is required, consultation with an ecologist would be undertaken and/or an ecologist would supervise activities/access.	Contractor	Construction	Appendix D
BI34	Vehicle strike	Fauna fencing would be installed at targeted locations along the highway to minimise vehicle strike where reasonable and feasible. Fauna fencing would be designed to minimise impacts to threatened fauna species and species subject to vehicle strike. Locations selected would consider connectivity requirements of fauna and proposed structures. A monitoring strategy would be developed to detect efficacy of fauna fencing and maintenance requirements would be detailed as part of the Flora and Fauna Management Sub-plan of the CEMP.	Transport/ Contractor	Detailed design Construction Operation	Appendix D
Traffic and transport					

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT01	Construction traffic	A Traffic Management Plan (TMP) will be preparedfor the construction phase of the proposal. This will adhere to Traffic Control at Worksites, Technical Manual, Issue No. 6, Transport, September 2020 and QA Specification G10 Traffic Management (Transport, August 2020). This will include details on: • Measures to maintain access to properties and local roads • Site specific traffic control measures to manage and regulate traffic movement • Requirement and methods to consult and inform the local community of impacts on the local road network • Measures to maintain pedestrian and cyclist access • Access to ancillary sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads • A response plan for any construction road traffic incident • Consideration of other developments which 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	Prior to and during construction	Appendix E
TT02	Construction traffic staging	Traffic management plans would be prepared for the construction area and progressively updated as the works progress. The plans would be prepared and implemented by suitably qualified personnel	Contractor	Prior to and during construction	Appendix E
TT03	Construction traffic staging	Schedule partial road closures to maintain 2 lanes at all times except for blasting periods. Full road closures would be required for short periods of time (approximately 15 minutes) however this would be conducted at non-peak times.	Contractor	Prior to and during construction	Appendix E
TT04	Consultation	Undertake consultation with local and regional bus companies prior to and during construction	Contractor	Prior to and during construction	Appendix E

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
TT05	Consultation	Undertake consultation with emergency services prior to and during construction to confirm any diversions during construction and any operational road network changes	Contractor	Prior to and during construction	Appendix E
TT06	Consultation	Undertake consultation with property owners and occupiers regarding changes to access arrangements	Contractor	Prior to and during construction	Appendix E
TT07	Consultation	Undertake consultation with local councils regarding potential impacts to parking during the construction period.	Contractor	Prior to and during construction	Appendix E
TT08	Operational traffic management	Review incident management plan in the event the highway may be temporarily closed due to scheduled maintenance or accident	Transport	Operation	Appendix E
TT09	Operational traffic management	Consult with residents who may be affected by the temporary closure of the highway closed due to scheduled maintenance or accident.	Transport	Operation	Appendix E
Noise and vibration					
NV01	Construction noise and vibration management plan	A Construction Noise and Vibration Management Plan should be prepared before any work begins which would include: • Identification of nearby sensitive receivers • Description of works, construction equipment and hours work would be completed in • Criteria for the proposal and relevant licence and approval conditions • Requirements for noise and vibration monitoring • Details of how community consultation would be completed • Procedures for handling complaints • Details on how respite would be applied where ongoing high impacts are seen at certain receivers.	Contractor	Prior to construction	Appendix F

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NV02	Construction noise and vibration assessments	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 in greater than the relevant Noise Management Levels • 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.	Contractor	Prior to construction	Appendix F
NV03	Construction noise exceedances	The assessment has identified that 'highly intrusive' impacts are likely at the nearest receivers when noise intensive equipment such as concrete saws or rockbreakers are in use, especially during evening and night-time periods. 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 proposal's conditions of approval.	Contractor	Construction	Appendix F
NV04	Compounds noise	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	Appendix F
NV05	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.	Contractor	Construction	Appendix F
NV06	Construction traffic	The potential impacts from construction traffic should be reviewed at a later stage when more information is available.	Contractor	Prior to construction	Appendix F
NV07	Vibration work within	Where work is within the minimum working distances and considered likely to exceed the cosmetic damage criteria:	Contractor	Construction	Appendix F

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	minimum working distance	• 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.			
NV08	Vibration work within minimum working distance	Certain receivers in the study area are within the human comfort minimum working distance and occupants of affected buildings may be able to perceive vibration impacts when vibration intensive equipment is in use. The potential human comfort impacts and requirement for vibration intensive work should be reviewed as the proposal progresses.	Contractor	Prior to construction	Appendix F
NV09	Vibration impacts on structures	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 and/or blasting activities.	Contractor	Prior to construction	Appendix F
NV10	Blasting	The following is recommended to be considered to manage impacts during blasting: • A blast management plan should be prepared prior to the start of blasting • Trial blasts should be undertaken when blasting is proposed to occur within the minimum working distances • Monitoring of overpressure and vibration levels should be undertaken at the potentially most affected receivers for each blast • Notification of all potential affected receivers should occur at least 24 hours prior to blasting.	Contractor	Prior to construction	Appendix F
NV11	Blasting	A Flyrock Management Plan would be developed to manage the potential impacts of flyrock during blasting. This would be developed in consultation with technical specialists. Management measures to be considered would include:	Contractor	Prior to construction	Appendix F

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Implementing a minimum clearance distance of 500 metres to non-construction personnel • Temporary evacuation of residents within a 150 metre radius of each planned blast • Timing of blasting to minimise disruption to local residents • Use of blast mats and soil cover.			
NV12	Operational road traffic noise mitigation measures	As proposals progress through the early design stages, road design features will be evaluated to minimise road traffic noise where necessary. This would include: • Adjustments to vertical and horizontal alignments • Road gradient modifications • Traffic management • Cost effective use of won proposal spoil to provide landscape mounds where there is suitable site footprint.	Contractor	Detailed design	Appendix F
NV13	Operational road traffic noise mitigation measures	Where it is determined that receivers would still have residual exceedances of the Noise Criteria Guideline criteria, site specific 'additional noise mitigation measures would be required. For receivers that qualify for consideration of additional noise mitigation, potential noise mitigation measures are to be considered in the following order of preference: • At-source mitigation such as quieter road pavement surfaces • In-corridor mitigation such as noise mounds and noise barriers • At-receiver mitigation including at-property treatments.	Contractor	Prior to construction	Appendix F
Aboriginal heritage					
AH01	Aboriginal heritage management	An Aboriginal Heritage Management Plan (AHMP) will be developed in consultation with the RAPs to document standard procedures for:	Contractor / Transport	Prior to construction	Section 4.9 of QA G36 Environment Protection

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with RMS (2015) Standard Management Procedures Unexpected Heritage Items • Detailed site salvage strategy • Management and curation of salvaged Aboriginal objects • Detailed locations and installations procedures for fencing and protective coverings • Details of permissible activities and permissible vehicle access inside protected Aboriginal areas • Heritage components of induction package for construction workers and supervisors • Any other heritage matters addressed in the Conditions of Approval for the proposal			
AH02	Minimise impacts to Aboriginal heritage sites	Detailed design will investigate opportunities to minimise impacts to: • Forty Bends contact site • 45-4-1111 (GWH 42) • GWH RS01	Contractor	Detailed design	Appendix G
AH03	Retention of sites located under elevated structures	The feasibility of retaining portions of sites that are located under elevated structures (bridges) over River Lett and on River Lett Hill will be investigated as part of the detailed design process, including the following sites: • 45-4-1097 (GWH 07) • 45-4-1072 (GWH 09) • Robsons Site • GWH 20-2	Contractor	Detailed design	Appendix G
AH04	Aboriginal cultural	Across the proposal, the following interpretation elements have been considered for design integration: • Public works of art	Contractor	Detailed design	Appendix G

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	values interpretation	• Interpretive signage • Bridges • Earthworks • Plantings • Noise walls.			
AH05	Impacts to Aboriginal heritage during construction	Construction works will be closely confined to the minimum possible area required for construction activities. Haulage and other access roads will be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 m of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.	Contractor	Detailed design	Appendix G
AH06	Impacts to Aboriginal heritage during construction	Temporary fencing will be placed on the boundary of the following Aboriginal heritage sites: • GWHAS01 • GWH 20-3 • GWH 20-2 • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1072 (GWH 9) • 45-4-1071 (GWH 8) • Site • South Bowenfels Rural Fire Brigade Site • Magpie Hollow Road site • 45-4-1111 (GWH 42)	Contractor	Prior to construction	Appendix G
AH07	Community collection	Salvage collection is warranted at those Aboriginal sites in the construction footprint where stone artefacts have been recorded on the surface. Salvage collection is to record MGA coordinates of each artefact by GPS and relevant	Contractor	Prior to construction	Appendix G

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		artefact attributes consistent with the broader archaeological salvage analysis. The results of salvage collection should be collated in an Aboriginal Site Salvage Report (ASSR). Salvage collection will be undertaken by a suitably qualified archaeologist. Sites requiring salvage collection include: • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1075 (GWH 12) • 45-4-1074 (GWH 11) • GWH 20-3			
AH08	Salvage excavation	Salvage excavation will be carried out by a suitably qualified archaeologist (refer to Section 1.6 of the Code of Practice) to define the western limit of artefact distribution in accordance with the requirements outlined in Section 10.2 of Appendix G for the following sites: • GWH 20-2 • 45-4-1103 (GWH 31) • 45-4-1097 (GWH 7) • 45-4-1072 (GWH 9) • 45-4-1071 (GWH 8) • Site • South Bowenfels Rural Fire Brigade Site • Magpie Hollow Road site.	Contractor	Pre-construction	Appendix G
AH09	Aboriginal heritage sites	An Aboriginal Heritage Impact Permit (AHIP) will be required under Section 90 of the NP&W Act before any known Aboriginal heritage sites are impacted.	Transport	Prior to construction	Section 4.9 of QA G36 Environment Protection
AH09	Aboriginal heritage sites	Aboriginal site information recording forms (ASIRF) are to be completed for each site and submitted to OEH to be updates on AHIMS.	Transport	Prior to construction	Appendix G

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH10	Unexpected finds	*The Standard Management Procedure - Unexpected Heritage Items* (Roads and Maritime, 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 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	Prior to construction Construction	Appendix G
Non-Aboriginal heritage					
NH01	Discovery of historical heritage materials features or deposits	If at any time during the construction of the proposal, historical heritage materials, features and/or deposits are located, the Transport Standard Management Procedure: Unexpected Heritage Items (unexpected finds protocol) (Transport for NSW 2019) will be implemented The works will not re-commence until the requirements of the procedure have been satisfied	Contractor	Construction	Appendix H
NH02	Discovery of human remains	In the event that construction activities reveal possible human skeletal material (human remains), the Transport Standard Management Procedure Unexpected Heritage Items (unexpected finds protocol) (Transport for NSW 2019) will be implemented. These guidelines have been developed in consultation with Heritage NSW and are consistent with the requirements of the Skeletal Remains: Guidelines for Management of Human Skeletal Remains under the Heritage Act (NSW Heritage Office 1998)	Contractor	Construction	Appendix H
NH03	Inadvertent impacts by contractors during construction	Historical heritage awareness training will be provided for contractors prior to the commencement of construction works to ensure understanding of known and potential heritage items that may be impacted or otherwise encountered during the proposed works This training will include specific mention of the procedure required in the event unexpected heritage finds or human remains are encountered	Contractor	Construction	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
NH04	Direct impacts to heritage fabric/within an item's heritage curtilage	Design consideration should be given to the heritage item and proposed works with critical assessment of the necessity of the proposed impacts: • Road culvert and retaining wall at Emoh (LEP A027) • Bowenfels Presbyterian Cemetery (LEP A030) If the impacts cannot be mitigated through design, additional justification will be required to inform the item's Statement of Heritage Impact	Contractor	Detailed design	Appendix H
NH05	Direct impacts to heritage fabric	An archival recording of the heritage item would be carried out, in accordance with the guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Council of NSW 2006) at the following sites: • Billesdene Grange (LEP I023) • Section of Coxs River Road (unlisted) • Lyndoch Orchard (LEP I019) • Bridge over the River Lett (unlisted) • Historical bullock track and creek crossing (unlisted) • Road culvert and retaining wall at Emoh (LEP A027) Dependant on the nature and complexity of the heritage item and the potential impact of the proposed works, the archival recording may also include additional primary or archival research, and additional digital data capture methods such as 3D scanning	Contractor	Prior to construction	Appendix H
NH06	Proposed works within the curtilage of an SHR listed heritage item	Options to reduce the construction footprint within the SHR curtilage should be considered at the following items: • Hartley Historic Village (SHR 00992/LEP I043) • Fernhill (SHR 00225/LEP I043) An archival recording of the heritage item would be carried out, in accordance with the guidelines Photographic Recording of Heritage Items Using Film or Digital Capture (Heritage Council of NSW, 2006). The appropriate heritage permits must be obtained prior to construction This will be an approval under either Section 60 or subsection 57(2) of the Heritage Act	Contractor	Detailed design	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Either application will require the approval of the NSW Heritage Council or its delegate			
NH07	Changes to, or exacerbation of existing, water runoff and drainage in proximity to a heritage item	An assessment of existing drainage and water runoff on the item should be completed for the following items: • House (LEP I021) • Meads Farm (LEP I020) Options to mitigate drainage or runoff issues through the installation of drainage infrastructure or other modifications should be explored prior to or during detailed design.	Contractor	Detailed design	Appendix H
NH08	Direct impact to heritage fabric with unknown impacts	Structural assessment by a heritage structural engineer in order to determine the structural capability of the causeway, the probable impacts from the road construction and required compaction, and any additional management or mitigation measures at Billesdene Grange (LEP I023). Archaeological investigation of the area of impact should be completed in order to fully understand the structure and enable a comprehensive archival recording to be produced.	Contractor	Prior to construction	Appendix H
NH09	Removal of old, rare, or otherwise significant trees or vegetation	The remnant orchard trees at Lyndoch Orchard (LEP I019) should be examined by a qualified arborist and assessed for significance and horticultural value Any rare, old, or otherwise significant examples or varieties should have potential for propagation or preservation considered	Transport	Prior to construction	Appendix H
NH10	Construction (cut or fill) of large road cuttings, embankments or batter slopes	Attempts should be made, where possible, to blend new batter slopes and embankments with existing topography near: • Rosedale (LEP I024) • Meads Farm (LEP I020) • Old Roman Catholic Cemetery (LEP A015) • Hartley Historic Village (SHR 00992/LEP I043)	Contractor	Prior to construction and construction	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Fernhill (SHR 00225/LEP I043) Where the construction requires vegetation removal, embankment design should aim to be of an obtuse angle such that revegetation or new landscape planting is possible			
NH11	Removal of visually significant vegetation or areas of existing mature trees	Wherever possible, areas where vegetation removal is required should attempt to revegetate or landscape the area, with plantings to match the existing landscape (trees replacing trees, grasses replacing grasses) at the following items: • Rosedale (LEP I024) • Billesdene Grange (LEP I023) • Harp of Erin (LEP I028) • Meads Farm (LEP I020) • Old Roman Catholic Cemetery (LEP A015) • Fernhill (SHR 00225/LEP I043) • Old Catholic Cemetery (LEP A029) Landscaping of new works elements should not introduce plantings of tall height species if they did not previously exist in that location. This should aid in maintaining an open landscape where suitable and screening vegetation where it currently exists	Contractor	Construction	Appendix H
NH12	Structures not expected to be sensitive to vibration impacts, but need this to be confirmed prior to construction	A dilapidation survey should be confirmed for the following items, with consideration to the proposed works and expected construction plant to be used in their proximity, in order to confirm whether they would be sensitive to vibration impacts during construction: • Billesdene Grange (LEP I023) • Log Cabin Farmhouse Village Shop (unlisted) • House (LEP I021) • Lyndoch Orchard (LEP I019) • Old Roman Catholic Cemetery (LEP A015)	Contractor	Prior to construction	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• St John the Evangelist's Anglican Church (LEP I029) • Stone and Timber Cottage (LEP I045) • Bowenfels National School Site (SHR 00761/LEPI054)			
NH13	Structures considered to be sensitive to vibration impacts during construction	A dilapidation report should be prepared for each of the following sensitive heritage item to assess, on a case-by-case basis, whether the fabric would be sensitive to vibration impacts during construction or operation: • Rosedale (LEP I024) • Nioka (LEP I025) • Harp of Erin (LEP I028) • House (LEP I021) • Meads Farm (LEP I020) • Hartley Historic Village (SHR 00992/LEP I043) • Bridge over the River Lett (unlisted) • Fernhill (SHR 00225/LEP I043) • Emoh (Emu Store/Corderoy's Store) (LEP I051) • Road culvert and retaining wall at Emoh (LEP A027) • Umera (Bowenfels Inn, Tricks House) (LEP I052) • Ben Avon (former Royal Hotel) (LEP I053) • Old Catholic Cemetery (LEP A029) • Somerset House (LEP I057) • Parsonage Farm (LEP I058) • Presbyterian Church and Sessions Hall (LEP I059) • Bowenfels Presbyterian Cemetery (LEP A030) • Caldwells House (LEP I061) Vibration monitoring would be carried out on sensitive heritage items for at least the period of construction	Contractor	Prior to construction	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		Monitoring should continue at least 12 months after the completion of works to determine if ongoing impacts are occurring i.e. identify any operational damage attributable to the proposal Surfacing and construction methods in proximity to sensitive heritage items should be in accordance with the Transport criteria for construction adjacent to sensitive heritage buildings The dilapidation report for each cemetery should involve archival recording/photographs showing the present state of monuments, followed by an assessment of any tilting of headstones or cracking of slabs that may be attributable to roadworks			
NH14	Vibration impacts during construction	Where a heritage item is deemed sensitive to vibration impacts, the more stringent German Standard guideline values (DIN 4150) should be followed when assessing minimum safe distances and determining allowable plant and its maximum vibration level This may require a greater safety buffer to be maintained between the heritage item a particular vibration-intensive construction equipment	Contractor	Construction	Appendix H
NH15	Ground disturbance in an area of low archaeological potential	Application for a s139 exception and test excavation or monitoring of ground disturbance works by an appropriately qualified archaeologist are required at the following locations: • Harp of Erin (LEP I028) • Hartley Historic Village (SHR 00992/LEP I043) • Archaeological potential on unidentified Lot (unlisted) Test excavation prior to, or monitoring during ground disturbance works in this area under a s139 exception.	Contractor	Prior to construction	Appendix H
NH16	Ground disturbance in an area of moderate archaeological potential	Test excavation under a s140 permit - an Excavation Permit under Section 139(4) of the Heritage Act is required at the following sites: • Hartley Historic Site (SHR 00992/LEP I043) • Ben Avon (LEP I053) • Former Bowenfels Lockup (unlisted) • Bowenfels Presbyterian Cemetery (LEP A030)	Contractor	Prior to construction	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		For works within the SHR curtilage, the excavations would require approval under s60 of the Heritage Act instead Where test excavations are proposed, an archaeological research design and methodology must be prepared in accordance with Archaeological Assessments: Archaeological Assessment Guidelines (NSW Heritage Office 1996a)			
NH17	Disturbance of an area of high archaeological potential	As the causeway at Billesdene Grange (LEP I023) is considered to be an archaeological 'work' it does not trigger the requirement for a s140 permit Archaeological investigation should be completed under appropriately qualified supervision to expose, investigate and record the causeway fabric A detailed archival recording of the causeway and Billesdene Grange frontage to the Great Western Highway should be completed prior to works	Contractor	Prior to construction	Appendix H
NH18	Disturbance of an area with the potential for human remains	An archaeological assessment should be completed of the site Archaeological potential on unidentified Lot, including a detailed survey of the lot and area of potential in order to assess the landform and identify any surface features, and remote sensing of an appropriate method Based on the results of the survey and remote sensing, an archaeological research design should be prepared for management of the site and. It should include further research to try and ascertain the potential identity of the deceased and may subsequently include genealogical research to locate any of their descendants If the archaeological assessment identifies potential features, complete a test excavation. If the results are inconclusive then the area to be impacted should be monitored during the removal of topsoil by an appropriately qualified archaeologist. This work would require a s139 exception and should be completed with the support of a physical anthropologist in case potential human remains are identified.	Contractor	Prior to construction	Appendix H
NH19	Properties unable to be accessed	Further assessment in the detailed design phase will be completed at the following locations in order to physically inspect these items and amend the desktop assessment of the items presented in this report: • Billesdene Grange (LEP I023) • House (LEP I021)	Contractor	Detailed design	Appendix H

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Meads Farm (LEP I020) • Lyndoch Orchard (LEP I019) • Archaeological potential on unidentified Lot (unlisted) • Fernhill (SHR 00225/LEP I043) • Emoh (I051) • Umera (LEP I052)			
Soils and surface water					
SW01	Erosion and sedimentation of soils / Surface water quality	A Construction Soil and Water Management Plan (CSWMP) would be developed as a subplan to the CEMP and will outline measures to manage water quality impacts associated with construction work. The CWSMP will provide: • An Erosion and Sediment Control Plan (ESCP) including measures to mitigate erosion and sediment transport both within the construction footprint and offsite including requirements for the preparation of erosion and sediment control plans for all progressive stages of construction and the implementation of erosion and sediment control measures including the use of sediment basins. • Erosion and sediment control measures which would be implemented and maintained in accordance with *Managing Urban Stormwater – Soils and Construction, Volume 1* (Landcom, 2004) and *Volume 2D* (DECC, 2008). • Measures to manage stockpiles including locations, separation of waste types, sediment controls and stabilisation. • Measures to manage waste including classification and handling of spoil. • Measures to manage tannin leachates. • Measures to manage accidental spills including requirement to maintain materials such as spill kits, an emergency response procedures and regular visual water quality checks when working near waterways.	Contractor	Prior to construction Construction	Appendix I

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Controls for sensitive receiving environments which may include but not be limited to designation of 'no go' zone for construction plant and equipment (where application).			
SW02	Erosion and sedimentation of soils / Surface water quality	A soil conservation specialist will be engaged for the duration of construction of the proposal to provide advice on the planning an implementation of erosion and sediment control including review of the Construction Soil and Water Management Plan and Erosion and Sediment Control Plan.	Transport Contractor	Prior to construction Construction	Appendix I
SW03	Neutral or Beneficial Effect (NorBE) assessment for water quality	A further NorBE assessment will be undertaken during detailed design.	Contractor	Detailed design	Appendix I
SW04	Water reuse	A water reuse strategy will be developed as part of the CEMP for both construction and operation to reduce reliance on potable water. Any water from sediment basins will be checked to ensure compliance with *ANZG (2018) Water Quality Guidelines* for proper reuse.	Contractor	Detailed design Prior to construction Construction	Appendix I
SW05	Water balance	A water balance assessment may need to be undertaken at the design stages to determine if there is any impact on the quantity of surface runoff that is currently received at various private farm dams located at the downstream end (within approximately 500 meters) of the proposed road corridor. Any increases or decreases would need to be quantified based on an average yearly runoff yield assessment at each of the affected farm dams.	Transport	Detailed design	Appendix I
SW06	Surface water quality impacts	A surface water quality monitoring program will be developed in accordance with the *Guidelines for Construction Water Quality Monitoring* (RTA, 2003). The program will monitor surface water prior to construction, during construction and during operation.	Transport Contractor	Prior to construction Construction Operation	Appendix I

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW07	Surface water quality impacts	An Acid Sulfate Rock Management Plan (ASRMP) would be prepared to provide information on the mitigation and management of acid sulfate rock disturbed as part of the construction works.	Contractor	Detailed design Prior to Construction Construction	Appendix I
Groundwater					
GW01	Evaluation of hydraulic conductivity test data	Once groundwater monitoring bores associated with the current geotechnical drilling program have been installed and slug tested, the hydraulic conductivity assumptions adopted for the Groundwater report (Appendix J) will be reviewed in light of the test data. If test data shows hydraulic conductivity to deviate significantly from the assumed values in this report, then re-assessment of potential groundwater impacts and groundwater inflow rates will be required. A hydrogeologist will review the hydraulic conductivity test data once available and determine whether re-assessment of potential groundwater impacts/groundwater inflow rates with revised hydraulic conductivity assumptions is required.	Transport	Prior to construction	Appendix J
GW02	Groundwater monitoring program	Groundwater monitoring will be undertaken to acquire appropriate baseline data and to provide a basis by which the proposal impact on groundwater can be monitored. This would include: • Reviewing groundwater level measurement by data logger at all 26 scheduled proposal monitoring bores (currently in process of being installed as part of geotechnical investigations) • Prior to commencement of construction, a groundwater quality sampling round should be undertaken at the 26 scheduled proposal groundwater monitoring bores. The analytes should comprise field parameters, major ions (chloride, sulphate, sodium, potassium, magnesium, calcium, carbonate and bicarbonate) and dissolved heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, zinc, iron and manganese).	Transport	Prior to construction	Appendix J

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GW03	Construction groundwater monitoring	During the construction phase, the following groundwater monitoring should occur: • Continuation of groundwater level measurement by data logger at all 26 scheduled proposal monitoring bores. The data should be downloaded and reviewed quarterly. • Quarterly groundwater quality sampling rounds at select (locations and quantity to be confirmed at end of baseline period, prior to construction) proposal monitoring bores. The tested analytes should be the same as those outlined in Section 6.3.1 of Appendix J. The data should be reviewed after each sampling round.	Contractor	Construction	Appendix J
GW04	Operational groundwater monitoring	During the operational phase the following groundwater monitoring should occur: • Continuation of groundwater level measurement by data logger at all 26 scheduled proposal monitoring bores. The data should be downloaded and reviewed quarterly. • Quarterly groundwater quality sampling rounds as per the construction period monitoring regime. The data should be reviewed after each sampling round. After one a year the data should be reviewed, and a decision made as to whether monitoring should continue.	Transport	Construction	Appendix J
Hydrology and flooding					
HF01	Operational flooding impacts	All cross-drainage structures including culverts and bridges would be constructed to cater for the 100 year ARI local and regional storm events to minimise upstream afflux.	Contractor	Detailed design	Appendix K
HF02	Operational flooding impacts	During detailed design, the height of the proposed road embankment adjacent to Boxes Creek would be reviewed or alternative designs considered to eliminate or reduce potential PMF impact.	Contractor	Detailed design	Appendix K
HF03	Operational flooding impacts	Additional flood modelling would be undertaken during detailed design. If residual risk of embankment stress remains adjacent to Boxes Creek, a dam	Contractor	Detailed design	Appendix K

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		safety check would be undertaken and further mitigation such as a debris catch upstream would be considered.			
HF04	Operational flooding impacts	An eastwards shift of the Kelly Street service road will be considered during detailed design to mitigate potential flooding impacts at this location.	Contractor	Detailed design	Appendix K
Landscape character and visual impact					
LV01	Landscape character and visual impact	An Urban Design Plan will be prepared to support the final detailed proposal design and implemented as part of the CEMP. The Urban Design Plan will present an integrated urban design for the proposal, providing 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 and bridges • fixtures such as seating, 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. The Urban Design Plan will be prepared in accordance with relevant guidelines, including: • Beyond the Pavement (Transport for NSW, 2020b) • Landscape and design guideline (Roads and Maritime Services, 2018) • Bridge Aesthetics (Transport for NSW, 2019).	Transport / Contactor	Detailed design Prior to construction	Appendix L

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
LV02	Landscape character and visual impact	Detailed design of the proposal will consider, where feasible and reasonable: • Opportunities to reduce the construction footprint • Minimising the number of ancillary facilities required • Using visually recessive materials to minimise the visual dominance of the road • Investigating opportunities to reduce the bulk of structures • Minimising vegetation clearing and maximising revegetation and planting opportunities, particularly in high sensitivity areas where screening is required • Ensuring residual land is developed to complement the existing landform • Opportunities to incorporate pedestrian and cycle connections.	Transport/ Contractor	Detailed design	Appendix L
LV03	Landscape character and visual impact	Landscape planting and maintenance will be in accordance with the Lithgow City Council Weed List and include indigenous species endemic to the area. Locally collected seeds or bioregionally-sourced indigenous seeds and plants will be used where feasible.	Transport/ Contractor	Detailed design Construction	Appendix L
LV04	Lighting	The design of temporary and permanent lighting will be carried out in accordance with AS 1158.1-1986 and will avoid unnecessary light spill on adjacent residents or sensitive receivers.	Transport/ Contractor	Detailed design Construction	Appendix L
LV05	Landscape character and visual impact	During construction, the following measures will be implemented: • Provide suitable barriers to screen views from adjacent areas during construction • Return temporary works areas, such as ancillary facilities, to at least their pre-construction condition progressively throughout the works, where feasible, or once construction is complete • Identify, protect and retain existing trees located within the ancillary facility areas	Transport/ Contractor	Construction	Appendix L

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Temporary lighting should be screened or diverted to reduce unnecessary light spill.			
Socio-economic					
SE01	Community consultation	A Community Communication Strategy (CCS) will be prepared for the proposal to facilitate communication with the local and regional communities including relevant Government agencies, Councils, adjoining landowners and businesses, residents, motorists and other relevant stakeholders that may be affected by the proposal. The strategy will: • Identify people or organisations to be consulted during the delivery of the proposal • Set out procedures and mechanisms for the regular distribution of information about the proposal • Outline mechanisms to keep relevant stakeholders updated on construction activities, schedules and milestones • Outline avenues for the community to provide feedback (including a 24-hour, toll free proposal information and complaints line) or to register complaints and through which Transport will respond to community feedback • Outline a process to resolve complaints and issues raised.	Transport/ Contractor	Prior to construction and construction	Appendix M
SE02	Business impacts	Access will be maintained to local businesses near to construction works. Where temporary access changes are proposed, these will be agreed with the affected business owner.	Contractor	During construction	Appendix M
SE03	Business impacts	Signage would be provided to key business locations such as Little Hartley and Hartley Historic Village during construction.	Contractor	During construction	Appendix M
SE04	Business impacts	Ongoing consultation will be undertaken with local business owners at Little Hartley, Hartley Historic Village, Hartley and South Bowenfels that may be impacted during construction in accordance with Community Communication Strategy.	Contractor	During construction	Appendix M

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE05	Emergency vehicle access	Access for emergency vehicles will be maintained at all times during construction. Any site-specific requirements will be determined in consultation with the relevant emergency services agency (e.g. for South Bowenfels Rural Fire Brigade and Lithgow Hospital).	Contractor	During construction	Appendix M
SE06	Local access changes	Local communities and road users will be notified about access changes prior to implementation.	Contractor	During construction	Appendix M
Property and land use					
PL01	Leased land	Areas of land leased for the purposes of construction will be reinstated at the end of the lease to at least equivalent standard in consultation with the landowner.	Contractor	Construction	N/A
PL02	Property	All partial and full acquisitions and associated property adjustments will be carried out in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* and the *Transport for NSW Land Acquisition Information Guide* in consultation with landowners. This will include the provision of monetary compensation determined in accordance with the provisions of the Act.	Transport	Prior to construction	Appendix M
PL03	Property	Property adjustments for the proposal will be completed in consultation with property owners.	Transport/ Contractor	Prior to construction / during construction	Appendix M
PL04	Property	Existing property access will be maintained during construction. Where this is not feasible or reasonable, temporary alternative access arrangements will be provided following consultation with the affected property owners.	Transport/ Contractor	During construction	Appendix M
Contamination					
CN01	Detailed site investigation	A Detailed Site Investigation (DSI) is being undertaken prior to construction to better understand the nature and extent of contamination in accordance with the NEPM (2013) and other guidelines made or endorsed by the NSW EPA.	Contractor	Prior to construction	Appendix N

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
CN02	Management of low risk contamination	Where site investigation data confirms that contamination is likely to have a very low, low or moderate impact potential, the site would then be managed in accordance with Construction Environmental Management Framework.	Contractor	Prior to construction	Appendix N
CN03	Remediation Action Plan	If identified as required following detailed site investigations, a Remedial Action Plan (RAP) would be developed for identified risk areas within the construction footprint. Each RAP would detail the remediation works required to mitigate risks from contamination throughout and following completion of construction. The RAP would be prepared in accordance with relevant NSW EPA guidelines and where applicable, detail remediation methodologies in accordance with Australian Standards and other relevant government guidelines and codes of practice.	Contractor	Prior to construction	Appendix N
CN04	Site audit statement	If identified as required following detailed site investigations, an accredited Site Auditor would review and approve the RAP and remediation activities and will develop a Site Audit Statement (SAS) and Site Audit Report (SAR) upon completion of remediation.	Contractor	Prior to construction	Appendix N
CN05	Residual contamination following construction	Ongoing management and monitoring measures would be documented in an appropriate form, for example an environmental management plan, and implemented for any areas where minor, residual contamination remains following construction.	Contractor	Construction	Appendix N
Air quality					
AQ01	Air quality management	Develop and implement an Air Quality Management Plan (AQMP) as part of the Construction Environmental management Plan (CEMP). In addition to detailing how the measures above should be implemented, the AQMP should also identify: • Potential sources of air pollution (including odours and dust) during construction. • Air quality management objectives consistent with any relevant published guidelines.	Construction contractor	Prior to and during construction	Appendix O

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		• Methods to manage works during strong winds or other adverse weather conditions. • A progressive rehabilitation strategy for exposed surfaces. • When the air quality, suppression and management measures need to be applied, who is responsible, and how effectiveness will be assessed. • A monitoring program to record whether the air quality mitigation, suppression and management measures have been applied; and assess the effectiveness of the applied measures.			
AQ02	Dust emissions during construction	Minimise the extent of disturbed and exposed areas, and revegetate finished areas as soon as possible	Construction contractor	During construction	Appendix O
AQ03	Dust emissions during construction	Minimise the drop heights of materials	Construction contractor	During construction	Appendix O
AQ04	Dust emissions during construction	Review and where necessary modify or suspend activities during dry and windy weather and background air quality conditions.	Construction contractor	During construction	Appendix O
AQ05	Dust emissions during construction	Cover or otherwise regularly stabilise (with water sprays or binders) stockpiles	Construction contractor	During construction	Appendix O
AQ06	Dust emissions during construction	Regularly water haul routes and ensure that all loads are covered	Construction contractor	During construction	Appendix O

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AQ07	Dust emissions during construction	Regularly inspect and remove debris from plant and equipment to avoid the tracking of materials on to the adjacent road network	Construction contractor	During construction	Appendix O
AQ08	Dust emissions during construction	To the extent practical, position ancillary sites and stockpiles away from nearby sensitive receivers	Construction contractor	Prior to construction	Appendix O
AQ09	Exhaust emissions from plant and equipment used during construction	Inspect all plant and equipment before it is used on-site	Construction contractor	Prior to and during construction	Appendix O
AQ10	Exhaust emissions from plant and equipment used during construction	Ensure all vehicles, plant, and equipment operate in a proper and efficient manner.	Construction contractor	During construction	Appendix O
AQ11	Exhaust emissions from plant and equipment used during construction	Switch off all vehicles, plant and equipment when not in-use	Construction contractor	During construction	Appendix O
AQ12	Exhaust emissions	Avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	Construction contractor	During construction	Appendix O

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
	from plant and equipment used during construction				
AQ13	Odours and airborne hazardous substances from uncovered contaminated materials	Apply odour supressing agents to materials as necessary to minimise related impacts should any contaminated or hazardous materials be uncovered during the works	Construction contractor	During construction	Appendix O
AQ14	Odours and airborne hazardous substances from uncovered contaminated materials	Adhere to relevant requirements for removal and disposal listed in the Work Health and Safety Act 2011, and Work Health and Safety Regulation 2017.	Construction contractor	During construction	Appendix O
AQ15	Emissions to air and visual impacts from blasting activities	Prior to firing, review and confirm that the blast would not likely result in any dust or fume-related impacts. This should include a review of whether meteorological conditions (ie inversions, wind speeds and directions, stability, time of day, cloud cover, temperature and humidity are suitable	Construction contractor	During construction	Appendix O
AQ16	Emissions to air and visual impacts from blasting activities	Where possible, avoid blasting during early morning and late afternoon when meteorological conditions are typically least favourable in terms of the potential for blast-related impacts	Construction contractor	During construction	Appendix O

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
Bushfire					
BF01	Emergency access during construction	In the event of a fire, emergency services will be able to gain access via existing Great Western Highway or tracks used for construction activities. Access and egress to/from private properties in bushfire prone areas adjoining the construction corridor will be maintained, with advice on any access changes provided to RFS in advance of the bushfire season.	Construction contractor	Construction	Appendix P
BF02	Hot works	Works that have potential to generate sparks or heat and ignite fires will be subject to the contractor's hot works safety management procedures. Hot works will not be undertaken on total fire ban days except where permission has been given by the RFS. Construction equipment and contractor's vehicles will carry fire extinguishers or knap sacks to help extinguish any small fires that may be ignited by construction activities.	Construction contractor	Construction	Appendix P
BF03	Hazardous materials storage	Storage of hazardous and flammable materials should follow environmental protection guidance and be located in areas with low radiant heat exposure in the event of a bushfire. Any hazardous fuel storage areas should be free of vegetation or any other combustible materials that could contribute to a fire ignition.	Construction contractor	Construction	Appendix P
BF04	Emergency management	On site bushfire emergency management arrangements will be addressed through the construction contractor's site emergency management plan. This plan will specify notifications to emergency services in case of fire, emergency assembly areas and evacuation procedures. If a fire is ignited and cannot be safely contained using fire extinguishers or other materials at hand, construction crews will dial 000 and seek emergency service assistance.	Construction contractor	Construction	Appendix P
BF05	Operational bushfire risks	Grass within the highway corridor should be inspected and maintained at the commencement of the fire season (and through the fire season, if required) to reduce fuel loading and the potential for fire ignition and to create a low bushfire fuel zone in the immediate vicinity of the road. Woody vegetation in the vicinity of the road should also be actively managed to remove dead plants. Roadside trees should be inspected for stability and safety following any fire event to minimise the risk posed to road users.	Transport	Operation	Appendix P

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
BF06	Operational access	Design would incorporate the need for safe emergency vehicle access at all times.	Transport	Operation	Appendix P
BF07	Fire weather signage	Roadside signage should be erected at either end of the proposal that informs road users of the daily fire weather forecast (i.e. the daily Fire Danger Rating). On days of highly elevated fire danger (extreme or catastrophic fire danger), additional advice should be posted that advises road users to reconsider the need for travel.	Transport	Operation	Appendix P
BF08	Road closures	During active fire events in the landscape surrounding the proposal, emergency services should consider temporary road closures to all but emergency service vehicles.	Transport	Operation	Appendix P
Waste					
WM01	Waste management	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 (reuse, 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 (Roads and Maritime Services, 2014) and relevant Transport for NSW Waste Fact Sheets.	Contractor	Prior to construction	Environmental Procedure - Management of Wastes on Transport Land (Roads and Maritime Services, 2014)
WM02	Waste management	All wastes will be managed and disposed of in accordance with the Protection of the Environment Operations Act 1997 and the Protection of the Contractor Construction Environment Operations (Waste) Regulation 2014	Contractor	Construction	N/A
WM03	Waste disposal	Excavated material would be assessed for reuse as backfill material as part of the proposal. If material is unable to be used as backfill material it would be	Contractor	Construction	Appendix N

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		appropriately tested and classified against the NSW EPA Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA, 2014) and Addendum 1 (NSW EPA, 2016) prior to being disposed of off-site.			
WM04	Green waste	Where possible and suitable for use, cleared vegetation will be used as mulch or coarse woody debris for site erosion and sedimentation controls or rehabilitation.	Contractor	Construction	N/A
WM05	Fill material	Any required additional fill material will be sourced from appropriately licensed facilities and/or other construction projects wherever possible. Additional fill material will be sourced and verified as suitable for use in accordance with relevant EPA and Transport guidelines.	Contractor	Construction	N/A
Sustainability, greenhouse gas and climate change					
GH01	Greenhouse gas emissions	Undertaking detailed modelling to ensure that cut and fill balances are managed to minimise any unnecessary movements of material;	Contractor	Detailed design	Appendix Q
GH02	Greenhouse gas emissions	Review opportunities to specify biofuel use on construction plant and equipment based on site for long periods;	Contractor	Detailed design	Appendix Q
GH03	Greenhouse gas emissions	Review opportunities to use alternative materials in construction, such as fly ash as a supplementary cementitious material (to replace traditional Portland cement) and reclaimed aggregate;	Contractor	Detailed design and construction	Appendix Q
GH04	Greenhouse gas emissions	Specify high recycled content in steel use (where technically possible and cost effective).	Contractor	Detailed design	Appendix Q
GH05	Flooding	Findings of the CCRA will be used to inform further design considerations, mitigation measures and management plans regarding flooding in and around the proposal alignment.	Contractor	Detailed design	Appendix Q
GH06	Bushfire risk	Findings of the CCRA will be used to inform bushfire risk management measures and management plans.	Contractor	Detailed design	Appendix Q

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GH07	Climate projections	Adopt consideration of climate projections, flooding and bushfire risks when developing the detailed design and material consideration	Contractor	Detailed design	Appendix Q
Cumulative					
CU01	Cumulative impacts	Ongoing coordination and consultation will be undertaken with nearby projects as required.	Transport/ Contractor	Prior to and during construction	N/A
CU02	Cumulative impacts	The CEMP will be revised to consider potential cumulative impacts from surrounding development activities as they become known.	Contractor	Construction	N/A
CU03	Cumulative impacts	Opportunities for further design refinements would be considered during detailed design to reduce potential impacts where feasible.	Contractor	Detailed design	N/A
CU04	Dust, exhaust and other emissions during construction	To the extent practical, plan the construction of the various segments of the proposal to avoid situations where sensitive receivers may be affected by emissions to air from multiple work areas.	Contractor	Prior to construction and construction	Appendix O