CHAPTER

27

Approach to environmental management

ARTC | INLAND RAIL
An Australian Government Initiative

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27 Approach to environmental management and mitigation

This chapter, together with Chapter 28, provides a synthesis of the environmental impact statement (EIS) for the Narrabri to North Star (N2NS) Phase 2—Moree to Camurra North project (the proposal). This chapter compiles the key potential impacts that have not been avoided, and the measures proposed to avoid, minimise, manage or offset the impacts identified in Chapter 9 to Chapter 25. The chapter also provides the outcomes the proponent is seeking to achieve through the implementation of the mitigation measures.

The Secretary's Environmental Assessment Requirements (SEARs) relevant to environmental management and mitigation, and where they are addressed, are listed in Table 27-1. A full copy of the SEARs is provided in Appendix A: Secretary's Environmental Assessment Requirements.

TABLE 27-1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS FOR ENVIRONMENTAL MANAGEMENT AND MITIGATION

Key Issues and desired performance outcomes	Requirement (specific assessment requirements in addition to the general requirements above)	EIS Reference
2. Environmental Impact Statement	**1** The EIS must include, but not necessarily be limited to, the following:	
	n measures to avoid, minimise or offset impacts must be linked to the impact(s) they treat, so it is clear which measures will be applied to each impact;	Sections 27.1 and 27.6
	o consideration of the interactions between measures proposed to avoid or minimise impact(s), between impacts themselves and between measures and impacts;	Sections 27.1 and 27.5
	2 The EIS must include the following:	
	r A chapter that synthesises the environmental impact statement and provides:	Chapters 27 and 28
	ii a description of any uncertainties that still exist around design, construction methodologies and/or operational methodologies and how these will be resolved in the next stages of the project;	Section 27.2
	iii a compilation of the impacts of the project that have not been avoided;	Sections 27.1 and 27.2
	iv a compilation of the proposed measures associated with each impact to avoid or minimise (through design refinements or ongoing management during construction and operation) or offset these impacts;	Section 27.6
	v a compilation of the outcome(s) and criteria the proponent will achieve and how these will be monitored; and	Section 27.5

27.1 Impacts that have not been able to be avoided

The Australian Rail Track Corporation (ARTC) has adopted the 'avoid, mitigate, offset' approach for the construction and operation of Inland Rail. This strategy aims to minimise adverse environmental, social and economic impacts through ideally avoiding high-risk or high-impact activities. If avoidance cannot be reasonably achieved, impacts would be carefully managed and minimised through the implementation of mitigation measures, as detailed in Chapters 9 through to 27. Where a residual impact remains after mitigation measures have been applied, impacts may require offsets under state and Commonwealth legislation.

A summary of the impacts associated with the construction and operation of N2NS Phase 2 that cannot be reasonably avoided is provided below. These impacts would be further explored during subsequent phases of the proposal, such as detailed design.

Impacts that have not been able to be avoided include:

- Permanent acquisition or leasing of property and changes to land use, which may restrict or sterilise land for agricultural operations. Impacts to utilities, travelling stock routes (TSRs) and access to private and public properties during construction would also likely occur.
- Clearing of native vegetation and impacts to aquatic habitat during bridge demolition and construction would result in a loss of habitat and connectivity for terrestrial and aquatic fauna. Additional interaction between wildlife and trains (train strikes) is also expected given the increased number of rail movements.

- Additional construction vehicle movements on local roads associated with earthworks and transportation of materials may increase road safety risks and contribute to road dilapidation and congestion (along Oak and Morton Street in particular).
- Localised minor increases in flood velocity, duration, extent and hazard would occur in close proximity to the rail corridor, which may impact agricultural land and local buildings. Cumulative hydrological impacts associated with the upgrade of the Newell Highway are also expected.
- Scour protection may extend beyond the rail corridor boundary at some level crossings, requiring further land acquisitions and/or agreements with landowners. Potential mitigation measures have been consulted on with the impacted landowners and site-specific mitigation measures would be developed through further engagement with the landowner at the detailed design stage.
- Plumes (silt) and pollution (hydraulics and concrete) caused by the demolition of the Mehi and Gwydir River bridges would impact surface water quality during construction. Impacts to groundwater quality during piling, excavation works or dewatering may also occur.
- Direct impacts to known listed heritage items, including the Mehi and Gwydir River bridges would occur as a result of the construction of the proposal. Impacts to identified Aboriginal cultural heritage items including surface artefacts and areas of cultural significance, such as the Steel Bridge Camp, would also occur.
- Construction noise and vibration when works are occurring around Moree would impact sensitive residential receivers, particularly around Oak and Morton Streets. Additional noise impacts associated with construction-generated traffic are also expected.
- During operation, rail movements between Moree and Camurra would generate additional noise impacts to local residences when compared with noise impacts associated with current rail movements.
- Increased demand for worker services and accommodation within the town of Moree may have impacts on local residents such as an increase in price and decrease in availability.
- Impacts to visual amenity for residents in Moree and road users along the Newell Highway during construction are expected as a result of vegetation clearing, earthworks, the presence of heavy machinery and laydown areas. Impacts to landscape character and visual amenity for residents (and tourists) in Moree may occur during operation due to changes in the appearance and height of the rail formation.
- Changes to the soil surface as a result of earthwork activities, vegetation clearing and/or creating embankments may result in erosion and sedimentation down-gradient. The disturbance of contaminated or acid sulfate soils (ASS) during construction may also impact surrounding environments if erosion occurs.
- The proposal would require the consumption of renewable and non-renewable resources during construction and operation. Non-recyclable waste would result in material being disposed of in landfill facilities.
- Impacts to local air quality during construction would be expected, due to dust generation, fuel combustion and the operation of construction plant and materials. Impacts to air quality during operation would occur due to additional train movements between Moree and Camurra North. Greenhouse gas (GHG) emissions would be generated during both construction (machinery and vehicles) and operation (train movements).
- Cumulative impacts would occur due to the construction of other major projects in proximity to the proposal.

27.2 Proposal uncertainties

The design for the proposal is currently an initial design for the EIS that is based on the level of available information at the time. Given the current level of design development, there are still some uncertainties relating to technical requirements, how the proposal would be constructed, and how it would operate as part of Inland Rail overall. These details would be resolved as the design of the proposal, and Inland Rail as a whole, progresses.

A summary of the main uncertainties around the design, construction and/or operational methodologies of the proposal, and how these would be managed, is provided in Table 27-2.

TABLE 27-2 PROPOSAL UNCERTAINTIES

Category	Uncertainty	How uncertainties would be resolved
Design	Utilities—impacts on utilities as part of early works or main works to be defined in detail	The location of all utilities, services and other infrastructure, and requirements for access to, diversion, protection and/or support, and the timing of these works would be confirmed prior to construction and during detailed design. This will include (as required), undertaking utilities investigations, including intrusive investigations, and consultation and agreement with service providers. The utilities management framework provides an outline of how utility works would be managed (Appendix D: Utilities management framework).
Design	Preferred construction water supply options	Construction phase water supply options would continue to be explored during detailed design and would include ongoing consultation with water providers to access the availability of already approved allocations, use of water tanks within construction compounds and/or use of farm dams. Alternative water supply options, including recycled water, would also be investigated.
Design	Property acquisition and temporary occupation	Refining the area and location of property acquisition would involve a detailed survey of the proposal site and surrounding properties, and confirmation of the final detailed design and construction methodology to determine temporary land occupation needs.
Design	Culvert numbers, locations and design	Further modelling would be undertaken during detailed design to confirm the exact number, locations and design of culverts including extent of scour protection.
Design	Flood model—base data	Further investigation of topographical datasets and associated refinements of the flood model would be undertaken at the detailed design stage, noting that Moree Plains Shire Council (MPSC) is also in the process of updating the flood model. At detailed design, the model would be refined as necessary in collaboration with Council's flood modellers to ensure consistency in the modelling for the area.
Design	Operational noise mitigation for triggered receivers	Operational noise and vibration assessments would be undertaken to review the potential for operational impacts and guide the approach to identifying feasible and reasonable mitigation measures to be incorporated in the detailed design. This would be informed by further investigations of internal noise levels, building layout and building condition to confirm noise trigger exceedances and required mitigation responses if at property treatment proves to be the most desirable mitigation strategy. Consultation with impacted residents would be undertaken to agree mitigation measures, such as noise barriers or at-property treatments where exceedances of operational noise and vibration criteria are confirmed.
Design	Stock crossing	Stock crossing of the Gwydir River currently takes place to the west of the Newell Highway across an existing sand bank. No change to this location is envisaged. Detailed design would need to allow for ongoing access under the replaced Mehi River bridge, new Gwydir River bridge and through the TSR extending to the north. Other rail crossings have been allowed for at level crossings LX564 and LX3149. It is not anticipated that the proposal will result in any residual impacts to the functionality of the TSR. Detailed design would determine stock movements on the TSR network including arrangements for crossing the railway, roads and rivers.
Design	Contaminated land	Three potential contaminated land sites have been identified in accordance with the ARTC contaminated land register, No information exists on the character of this potential contamination, During detailed design a contaminated land investigation of these three potential sites will be undertaken to understand the nature of contamination and any remedial action required.
Design	Heritage Bridges	Bridge design of the replaced Mehi and Gwydir bridges will require the appointment of a heritage architect to adequately mitigate the heritage impacts associated with the demolition of the two bridges.
Design	Decommissioning of the Camurra hairpin	While the current intent of the proposal is the total decommissioning and removal of the Camurra hairpin, further flood modelling may require the retention of portions of the hairpin to better balance flood impacts, Final resolution of whether the entire hairpin should be removed can only be confirmed during detailed design.
Construction	Haul routes—exact routes and haulage methods	A detailed haulage program would be developed based on the detailed design and final construction methodology, and developed as part of the traffic and transport management sub-plan.
Construction	Compound sites—location,	The final selection of identified compound locations and final layout of construction areas would be confirmed based on the detailed design and final

Category	Uncertainty	How uncertainties would be resolved
	layout and facilities	construction methodology, taking into account the criteria and requirements of the EIS, particularly in relation to flooding.
Construction	Biodiversity—presence of fauna in the proposal site	Pre-clearance surveys would be carried out prior to construction by a suitability qualified ecologist to identify potentially affected fauna. This would include: ▸ inspections of structures that provide potential microbat habitat. If bats are identified roosting in these structures, individuals will be excluded from this habitat. Refer to B-20 in Chapter 10: Biodiversity and section 27.6 of this chapter. ▸ In the event that native aquatic fauna is identified during pre-clearance surveys, the need for developing relocation and salvage protocols would be determined. ▸ development of a species management plan for the five clawed worm skink.
Construction	Noise and vibration impacts based on final construction methodology	Location- and activity-specific construction noise and vibration reviews will be prepared based on a more detailed understanding of the construction methods, including the size and type of construction equipment, duration and timing of works, and detailed reviews of local receivers, as required. The plan would confirm predicted impacts at relevant receivers to assist with the selection of feasible and reasonable management measures, and the required auditing and monitoring requirements. Any activities that could exceed the construction noise management levels and vibration criteria would be identified and managed in accordance with the framework, the CNVMP, and the construction noise and vibration impact statements. Notification of impacts would be undertaken in accordance with the communication management plan for the proposal.
Construction	Potential to encounter contaminated soils	A contamination unexpected finds protocol (UFP) would be prepared and implemented. This would detail the required management response, which may require further investigation. Further investigations would also occur where there is a higher likelihood for contamination to be or where deep excavations are proposed.
Construction	Structural fill material	Final source and volume of required structured fill will be refined during detailed design. Current material balance shows a low shortfall and is likely to be sourced from commercial and licenced quarries in the Moree area. It is unlikely that any borrow sites will be required.
Operation	Train stopping patterns	Train stopping patterns and associated infrastructure requirements would continue to be refined as the design of the other sections of Inland Rail progresses. Train stopping patterns would be developed in consultation with potential users of Inland Rail and key stakeholders, including the agencies responsible for intermodal terminals along the route (such as Moree Plains Shire Council).

27.3 Approach to environmental management

The approach to environmental mitigation and management for the proposal involves:

- Project description—as described in Chapter 7, the proposal incorporates measures to avoid and minimise impacts.
- Mitigation measures—mitigation measures provided in Chapter 9 to 25 are identified as an outcome of the environmental impact assessment and would be supplementary to the design refinements in section 27.3.
- ARTC's environmental management systems (Inland Rail iEMS)—would be used during the construction and operation of Inland Rail, including the proposal. The management systems would provide the framework for tracking the compliance of construction and operation environmental management plans (OEMPs) described below, and any conditions of other approvals, licences or permits.
- Inland Rail NSW Construction Noise and Vibration Management Framework—describes how ARTC proposes to manage construction noise and vibration for Inland Rail in NSW as a whole including management measures, processes and the approach to additional assessment where required.
- Proposal-specific construction environmental management plans (CEMPs) and OEMP would be prepared to guide the approach to environmental management during construction and operation, as described in sections 27.3.1 and 27.3.2. The CEMP and OEMP would:
  - outline the environmental management practices and procedures to be followed
  - document processes for demonstrating compliance with the commitments made in this EIS, the submissions report (to be prepared), and relevant approval conditions

- be prepared in consultation with relevant agencies and in accordance with the *Guideline for the Preparation of Environmental Management Plans* (Department of Infrastructure, Planning and Natural Resources, 2004)
- environmental performance outcomes—establishes the intended outcomes to be achieved by the proposal. The environmental performance outcomes are provided in section 27.5.

27.3.1 Construction environmental management plan (CEMP)

The CEMP would include:

- ARTC's environmental policy, objectives and performance targets for construction
- reference to all relevant statutory and other obligations, including consents, licences, approvals and voluntary agreements required
- management policies, procedures and review processes to assess the implementation of environmental management practices and the environmental performance of the proposal against the objective and targets
- requirements and guidelines for management in accordance with:
  - the conditions of approval for the proposal
  - the mitigation measures specified in this EIS
  - relevant construction management guidelines
- requirements in relation to incorporating environmental protection measures and instructions in all relevant standards operating procedures and emergency response procedures
- roles and responsibilities of all personnel and contractors to be employed onsite
- incident and contingency management procedures
- procedures for complaints handling and ongoing communication with the community
- monitoring and auditing program, as defined by this EIS and the conditions of approval.

The CEMP would address:

- biodiversity, including flora and fauna and biosecurity
- cultural heritage
- soil and water
- waste and contamination
- air quality
- construction noise and vibration
- road and traffic safety.

An outline of the CEMP, including the required sub-plans and a guide to the general construction management measures required in each, is provided in Appendix F.

27.3.2 Operational environmental management plan (OEMP)

An OEMP would be prepared to detail the approach to environmental management during operation, in accordance with the conditions of approval.

The OEMP would include:

- description of activities to be undertaken during operational phase of the proposal
- environmental risk analysis to identify the key environmental performance issues associated with the operational phase
- statutory and other obligations that the proponent is required to fulfil during operation, including approvals, consultations and agreements required from authorities and other stakeholders under key legislation and policies
- description of ARTC's Environmental Management System (Inland Rail iEMS), and the environmental protection licence relevant to the proposal
- overall environmental policies, guidelines and principles to be applied to operation
- roles and responsibilities for relevant employees involved in operation, including relevant environmental training and induction requirements

- incident and contingency management procedures
- details of how environmental performance would be managed and monitored to meet acceptable outcomes, including what actions would be taken to address identified potential adverse environmental impacts.

27.4 Approach to design refinements

The design of the proposal as described in the EIS would be subject to ongoing refinements during detailed design. Refinements may be made to:

- avoid ground conditions or services that present significant construction difficulties in terms of logistics, time and/or cost
- reduce the construction timeframe
- avoid areas of environmental sensitivity identified following approval
- reduce impacts on local residents
- improve the construction or operation of the proposal without increasing the potential environmental impacts.

Such refinements may include, for example:

- changes to the location of construction compounds and construction site access routes
- minor changes to access roads as a result of changes to level crossings
- changes to the location of cross drainage structures
- changes to the level crossing upgrades
- minor changes to the location of key infrastructure, refinement or reorientation of site boundaries
- minor changes in technology or the features of key proposal components.

Refinements would not include significant changes to the proposal.

For design refinements a consistency review would be undertaken to consider whether the refinement:

- would result in any of the conditions of approval not being met
- be consistent with the objectives and operation of the proposal as described in the environmental assessment
- result in a significant change to the approved project
- would result in any potential environmental or social impacts of a greater scale or different nature than that considered by the EIS.

A refinement that does not meet these criteria would be considered a design modification. Approval would be sought from the Minister for Planning for any such modifications in accordance with the requirements of Part 5.2 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act).

27.5 Compilation of performance outcomes

The SEARs identify a number of desired performance outcomes for the proposal. These desired performance outcomes outline the broader objectives to be achieved in the design, construction and operation of the proposal. Based on the outcomes of the environmental impact assessment summarised in Section 27.1 and the implementation of the mitigation measures compiled in section 27.3, environmental performance outcomes have been established for the proposal. These are listed in Table 27-3. Further detailed mitigations are outlined in Section 27.6.

Design development and any design changes would be considered against these environmental performance outcomes.

TABLE 27-3 COMPILATION OF ENVIRONMENTAL PERFORMANCE OUTCOMES

Key issue	SEARs desired performance outcomes	Proposal-specific environmental performance outcomes
1. Flooding and hydrology	The project minimises changes to the existing flood regime's impacts on property, public safety and the environment resulting from alteration of the water flow characteristics of watercourses and overland flow paths. The project includes remedial measures to mitigate adverse water flow impacts or flood safety risks caused by the	- Construction would be undertaken in a manner that minimises the potential for adverse flooding impacts, through staging of works and the implementation of flood mitigation measures. - Structures such as spoil mounds would be designed and located such that flows are not significantly altered.

Key issue	SEARs desired performance outcomes	Proposal-specific environmental performance outcomes
	existing rail infrastructure within the project area. Construction and operation of the project avoids or minimises the risk of, and adverse impacts from, infrastructure flooding, flooding hazards, or dam failure.	▸ The proposal would prevent overtopping of the rail corridor. ▸ The proposal would reduce and not significantly increase the area subject to flooding. ▸ The proposal would not significantly increase velocity or duration of flooding. ▸ The proposal would result in a net reduction in the number of buildings flooded. ▸ Where performance outcomes (POs) are unable to be achieved, compliance would be achieved through modified design or through agreement with affected landowners on impacts to property.
2.Water—hydrology	Long-term impacts on surface water and groundwater hydrology (including drawdown, flow rates and volumes) are minimised. The environmental values of nearby, connected and affected water sources, groundwater and dependant ecological systems including estuarine and marine water (if applicable) are maintained (where values are achieved) or improved and maintained (where values are not achieved). Sustainable use of water resources.	▸ Long-term impacts on surface and groundwater hydrology would be minimised. ▸ The use of water during construction would be minimised and natural resources would not be a primary source of water. ▸ Opportunities to reuse water resources would be considered during the design process. ▸ Impacts on environmental values of nearby, connected and affected water sources would be minimised through appropriate erosion and sediment control.
3. Water—quality	The project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the project to the extent of the project impact.	▸ The proposal would be designed and constructed to minimise changes to water flows in watercourse. ▸ Water would not be discharged that exceeds the *ANZECC Guidelines* (2000) for protection of aquatic ecosystems or water quality trigger values. ▸ Impacts to water quality during construction and operation would be minimised through appropriate erosion and sediment controls, specific controls for in-stream works, and management of high-risk activities such as re-fuelling.
4. Biodiversity	The project design considers measures to avoid and minimise impacts on terrestrial and aquatic biodiversity. Offsets and/or supplementary measures are assured which are equivalent to any residual impacts of project construction and operation.	▸ The proposal has been designed to minimise the surface footprint and impacts on biodiversity. ▸ Biodiversity connectivity would be maintained or improved where possible. ▸ Detailed design would seek to minimise clearing of vegetation. ▸ The biodiversity outcome has been developed consistently with the Biodiversity Assessment Method (BAM) (Office of Environment and Heritage (OEH), 2020). ▸ Offsets would be calculated and provided in accordance with the NSW *Biodiversity Offsets Scheme* (BOS) (Department of Planning, Industry and Environment (DPIE), 2020a).

Key issue	SEARs desired performance outcomes	Proposal-specific environmental performance outcomes
5. Noise and vibration	Construction noise and vibration (including airborne noise, ground-borne noise and blasting) are effectively managed to minimise adverse impacts on acoustic amenity. Increases in noise emissions and vibration affecting nearby properties and other sensitive receivers during operation of the project are effectively managed to protect the amenity and well-being of the community. Increases in noise emissions and vibration affecting environmental heritage as defined in the *Heritage Act 1977* during operation of the project are effectively managed.	▸ The proposal would minimise impacts to the local community by: ▸▸ controlling noise and vibration at the source ▸▸ controlling noise on the source to receiver transmission path ▸▸ implementing feasible and reasonable measures to minimise the noise and vibration impacts of construction and operation activities on local sensitive receivers. ▸ The proposal would minimise impacts to structures by: ▸▸ controlling vibration at the source ▸▸ controlling vibration on the source-to-receiver transmission path ▸▸ implementing feasible and reasonable measures to minimise vibration impacts of construction activities on structures.
6. Heritage	The design, construction and operation of the project facilitates, to the greatest extent practicable, the long-term protection, conservation and management of the heritage and cultural significance of items of environmental heritage and Aboriginal objects and places. The design, construction and operation of the project avoids or minimises impacts, to the greatest extent practicable, on the heritage significance of environmental heritage and Aboriginal objects and places.	▸ The proposal has been designed to minimise the surface footprint. ▸ The detailed design would be sympathetic to the historic significance of the existing rail corridor and the heritage significance of surrounding listed heritage items and, where practicable, avoids and would minimise impacts to heritage. ▸ Where impacts to heritage items cannot be avoided due to structural/load requirements, consideration would be given to the re-use of materials. ▸ Impacts on heritage would be managed in accordance with relevant legislation, including the EP&A Act, the *National Parks and Wildlife Act 1974* (NSW) and relevant guidelines.
7. Economic, land use and agriculture	The project minimises adverse economic impacts and capitalises on opportunities potentially available to affected communities. The project minimises impacts to property and business including agricultural enterprises and accommodation and achieves appropriate integration with adjoining land uses, including maintenance of appropriate access to properties and community facilities, and minimisation of displacement of existing land use activities, dwellings and infrastructure.	▸ The proposal has taken into account and minimised impacts to the local community and businesses. ▸ As part of Inland Rail as a whole, the proposal would provide for the development of an efficient and sustainable route for the transport of freight between Brisbane and Melbourne. ▸ The proposal would provide opportunities for regional economic development, by enabling local and regional businesses to access Inland Rail via regional transport hubs. ▸ Impacts to land use and properties would be minimised. ▸ The proposal would be appropriately integrated with adjoining land uses, and access to private properties would be maintained. ▸ The proposal would be appropriately integrated with local and regional land use planning strategies.
8. Social	The project minimises adverse social impacts and capitalises on opportunities potentially available to affected communities.	▸ The proposal has considered the social impacts of the project and would minimise impacts to the local community and businesses. ▸ Community engagement mechanisms such as training and employment opportunities would continue to be undertaken throughout the proposal.

Key issue	SEARs desired performance outcomes	Proposal-specific environmental performance outcomes
9. Traffic and transport	Network connectivity, safety and efficiency of the transport system in the vicinity of the project are managed to minimise impacts. The safety of transport system customers is maintained. Impacts on network capacity and the level of service are effectively managed. Works are compatible with existing infrastructure and future transport corridors.	▸ The proposal would provide for more efficient and productive freight rail operations. ▸ Impacts to traffic and transport would be minimised and managed. ▸ Motorist, pedestrian and cyclist safety would be maintained or improved, particularly regarding the upgraded public level crossings. ▸ The proposal would contribute to one of the desired outcomes of Inland Rail—to have reduced truck volumes on the road network, improving road safety. ▸ The proposal would be integrated with existing and future local and regional transport infrastructure and planning strategies.
10. Visual amenity	The project minimises adverse impacts on the visual amenity of the built and natural environment (including public open space) and capitalises on opportunities to improve visual amenity.	▸ Screening vegetation to the rail corridor would be retained, where practicable, and would be replaced where agreements with private landowners are established. ▸ The proposal has been designed to have regard to the surrounding landscape and visual environment and this would be continued during the ongoing design phases. ▸ The proposal has incorporated features to minimise the potential visual impacts where visual receptors are concentrated. ▸ The proposal would be visually integrated with its surroundings, given the low rise, linear nature of the infrastructure. ▸ Construction-related impacts to visual amenity would be temporary.
11. Climate change and sustainability	The project reduces the NSW Government's operating costs and ensures the effective and efficient use of resources. Conservation of natural resources is maximised. The project is designed, constructed and operated to be resilient to the future impacts of climate change.	▸ Climate change risks have been considered throughout the design and development process. ▸ The proposal has been designed to maximise climate change resilience while minimising costs, community and environmental impacts. ▸ The proposal would be designed, constructed and operated in accordance with relevant climate change legislation and guidelines. ▸ The design process would continue to target an 'excellent' rating in accordance with the ISCA rating tool. ▸ Sustainability considerations would be integrated throughout the design, construction, and operation phases of the proposal. ▸ The proposal would contribute to one of the desired outcomes of Inland Rail—to reduce more than 750,000 tonnes (t) of carbon, one-third less fuel consumption, and truck volumes in over 20 regional towns.
12. Other issues	An assessment of the following issues must be undertaken in accordance with the commitments in Section 6 of the Scoping Report: ▸ air quality ▸ greenhouse gases and energy ▸ hazards and risk ▸ topography, geology and soils ▸ utilities and services ▸ waste and resource use	▸ The proposal would not result in significant adverse impacts to air quality during construction and operation. ▸ Greenhouse gas (GHG) emissions would be reduced during construction and operation. ▸ The proposal would not adversely affect community safety and, where possible, improve it while limiting exposure to hazards and risks. ▸ The proposal would not significantly alter the topography, geology and soils of the region and does not cause erosion or contamination of land. ▸ The proposal would not adversely impact any utilities or services. ▸ The proposal would maximise opportunities to reduce waste and resource use and would actively seek to maximise re-use of materials.

27.6 Summary of mitigation measures

The key potential impacts requiring mitigation and management during construction and operation are summarised in Table 27-4. These impacts are assessed in detail in Chapters 9 to 25.

TABLE 27-4 SUMMARY OF KEY POTENTIAL IMPACTS

Ref	Impact	Mitigation measures	Timing
Land Use and Property (Chapter 9)			
LU-1	Property acquisition	All property acquisitions/adjustments would be undertaken in consultation with landowners and, where relevant, in accordance with the requirements of the *Land Acquisition (Just Terms Compensation) Act 1991* (NSW) (Land Acquisition Act). In line with the Land Acquisition Act, ARTC would undertake acquisition by agreement, where practicable.	Design and pre-construction
LU-2	Property agreements	Where required, individual property agreements would be developed in consultation with landowners/occupants, with respect to the management of construction on, or immediately adjacent to, private properties. These agreements would detail any required adjustments to fencing, access, farm infrastructure, irrigation assets and relocation of any impacted structures, as required. The agreements would also detail the expected level of rehabilitation of the impacted portion of property when handed back to private landowners, where temporary occupation is required. The consultation may also include: ▸ measures to minimise property impacts, including impacts on agricultural operations ▸ specific requirements to ensure that operations, including the movement of livestock and farm machinery, are able to be maintained as efficiently as possible ▸ measures to manage severance impacts where practicable, including appropriate access solutions and amalgamation opportunities ▸ required adjustments to affected structures.	Design and pre-construction
LU-3	Communication	A communication plan would be prepared to facilitate communication between ARTC, the community and relevant government authorities (including local councils). The communication plan would identify specific people, organisations and government authorities to be consulted before and during works, and set out procedures and mechanisms for the regular distribution of accessible information relevant to the proposal, such as upcoming construction activities, schedules and milestones. Landowners and occupants, in particular, would be consulted in accordance with the communication plan to ensure they are informed about the timing and scope of activities in their area, and any potential property impacts or changes; particularly, in relation to potential impacts to access, services or farm operational arrangements. The communication plan would also set out procedures and mechanisms through which the community can discuss or provide feedback to ARTC, and outline how ARTC would respond to enquiries or feedback from the community to attempt to resolve issues and mediate disputes, where possible and practicable.	Design and pre-construction
LU-4	Consultation	Property owners and occupants, in particular, would be consulted in accordance with the N2NS Phase 2 communication plan, to ensure that owners/occupants are informed about the timing and scope of activities in their area; and any potential property impacts/changes, particularly in relation to potential impacts to access, services, or farm operational arrangements.	Design and pre-construction

Ref	Impact	Mitigation measures	Timing
LU-5	Consultation	Local Land Services (LLS) would be consulted during detailed design to understand how impacts on TSRs would be avoided during construction and operation. Alternative access arrangements would be made, as required, subject to maintaining rail safety.	Design and pre-construction
LU-6	Property access	Access to individual residences, services and businesses, and access for livestock across the rail corridor, would be maintained during construction. Where alternative access arrangements need to be made, these would be developed in consultation with affected landowners/occupants subject to maintaining rail safety.	Pre-construction and construction
LU-7	Property access	Where any legal access to a property is permanently affected and a property has no other legal means of access, alternative access to and from a public road would be provided to an equivalent standard, where feasible and practicable. Where an alternative access is not feasible or practicable, and a property is left with no access to a public road, negotiations would be undertaken with the relevant landowner for acquisition of the property in accordance with the provisions of the Land Acquisition Act. In accordance with the Land Acquisition Act, ARTC's preference is for acquisition by agreement, where practicable.	Design and pre-construction
LU-8	Agricultural impacts	ARTC would consult with adjoining landowners regarding temporary construction impacts on viability and productivity. This may include consideration of: ▸ temporary farm infrastructure to maintain farm management practices ▸ modification of construction activities and footprint ▸ compensation in accordance with NSW legislation.	Design and pre-construction
LU-9	Property impacts	Temporarily affected land for construction purposes would be restored to an agreed condition and returned to affected landowners as soon as practically possible.	Construction
LU-10	Agricultural impacts	Stock fencing would be in accordance with the Inland Rail fencing standards and would be constructed prior to the removal of existing fencing or any works being carried out on the subject land, unless otherwise agreed with the landowner. Where fencing is required, the relevant landowner would be able to select the type of fencing on a like-for-like basis from ARTC's standard fence and gate types, to suit the farm operations. Internal fencing matters would be considered, as appropriate, during the land acquisition process.	Design and pre-construction
LU-11	Agricultural impacts	Access to the construction area for stock, as well as non-construction-related vehicles and people would be restricted via fencing and other measures.	Design and pre-construction
LU-12	Agricultural impacts	Guidance would be provided to agricultural landowners at the commencement of operation regarding the frequency of train movements to assist with safe scheduling of routine agricultural activities.	Design and pre-construction
LU-13	Agricultural impacts	Farm water pipelines, dams and drainage channels would be replaced or reinstated to ensure continuity of stock and domestic water supplies prior to removal of existing impacted infrastructure.	Construction
LU-14	Property impacts	The design and construction planning would continue to be refined to minimise potential impacts on land uses and properties so far as reasonably practicable.	Design and pre-construction
LU-15	Road/rail interface	Appropriate road/rail interface would continue to be assessed on a case-by-case basis for design purposes, with consideration given to current and future usage of the existing asset, its location relative to other crossings in the rail corridor, and the road and rail geometry at the crossing location.	Design and pre-construction

Ref	Impact	Mitigation measures	Timing
LU-16	Utilities	The location of utilities and other infrastructure would be identified prior to construction, to determine requirements for access to, diversion, protection and/or support. Utility and service providers would continue to be consulted during detailed design to identify possible interactions and develop procedures to minimise the potential for service interruptions and impacts on existing land uses.	Design and pre-construction
LU-17	Biosecurity	Consultation would be undertaken with adjoining landowners regarding how biosecurity risks are to be managed. Management outcomes of consultation would be included in the property access agreement.	Pre-construction and construction
LU-18	Biosecurity	The biosecurity (or weed and pest) management sub-plan included in the construction environmental management plan (CEMP) would detail measures to minimise the potential for biosecurity risks during construction.	Design and pre-construction
LU-19	TSRs	Bridge design would allow for sufficient space between the riverbank and the bridge abutment to allow stock movement under the bridges.	Detailed design
LU-20	TSRs	Resolution of stock movements on the TSR networking including arrangements for crossing the railway, roads and rivers.	Detailed design
Biodiversity (Chapter 10)			
B-1	Flora and fauna management plan	A flora and fauna management plan (FFMP) would be prepared prior to construction and implemented as part of the CEMP. The plan would include measures to manage biodiversity and minimise the potential for impacts during construction. The plan would be prepared in accordance with relevant legislation, guidelines and standards. The plan would include, but not be limited to: ▸ locations and requirements for pre-clearing surveys ▸ pre-clearing procedure and clearing protocol ▸ dedicated management actions for the Five-clawed Worm Skink which will be informed by the Species Management Plan that is under development by ARTC with DPE ▸ dedicated management actions for the Braid Fern in the form of a protective buffer between the development footprint and the remaining suitable habitat for the Braid Fern ▸ establishing protocols for the staged clearing of vegetation and safe tree felling and log removal to reduce the risk of fauna mortality ▸ survey for species in potential habitat to identify any additional populations ▸ where practicable, protection of native vegetation to be retained through mapping in sensitive area plans, and physical fencing through the use of star-pickets with high-visibility flagging/bunting and environmental exclusion zone signage ▸ best practice removal and disposal of vegetation including separation and stockpiling of declared weeds, incorporation of recovered habitat features into revegetation, and identification of mulch stockpile locations and structure to avoid tannin leaching ▸ staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by a suitably trained fauna handler though the implementation of the clearing protocol ▸ weed management throughout the lifespan of the proposal to ensure that no increase to weed load occurs as a result of the works ▸ measures to avoid and minimise clearing of hollow-bearing trees where practicable ▸ a waterway crossing design	Design and pre-construction

Ref	Impact	Mitigation measures	Timing
		▸ measures relating to the provision and management of nest boxes, including reuse of hollows and monitoring protocols ▸ an unexpected finds protocol ▸ measures to manage biosecurity risks in accordance with the Biosecurity Act 2015 ▸ measures to reduce the risk of aquatic fauna mortality/injury ▸ stop works arrangements in the immediate area of the threatened species ▸ protocols and procedures for the use of suitably qualified, licensed and experienced fauna handlers/spotter catchers ▸ notification and communication protocol ▸ adaptive management strategy.	
B-2	Riparian vegetation	▸ Compounds would be located more than 50 m away from riparian vegetation to avoid indirect impacts on aquatic habitat. ▸ Works within waterfront land (creek beds and land within 50 m of the highest bank) would be programmed to ensure that they take place during dry periods (i.e. when the watercourses within the proposal site do not have water in them). ▸ Where it is not possible to work in the dry, a sediment or silt screen would be installed around the entire work area, attached to the same bank upstream and downstream of the work site so that it does not impede fish passage. Sediment or silt screens would be inspected daily and maintained to prevent the escape of suspended sediments. ▸ Temporary fencing or bunting to be erected along marked riparian zones and drainage lines to protect significant environmental features.	Design and pre-construction
B-3	Aquatic ecology/fish passage	▸ Detailed design and construction planning would minimise the potential for impacts to fish passage. To ensure that fish passage is maintained, watercourse crossing structures would be designed in accordance with the guideline *Why do fish need to cross the road?* (Fairfull and Witheridge, 2003). ▸ *Fish passage requirements for waterway crossings* (Fairfull and Witheridge, 2003) and the minimum design requirements specified in Table 5.1 of Technical Paper 2: Post-wet Aquatic Ecology Assessment.	Design and pre-construction
B-4	Aquatic habitat	The proposal would be designed to minimise impacts to waterways, riparian vegetation and in-stream flora and habitats including: ▸ adopt a crossing structure hierarchy: bridges preferred to culverts; however, local conditions and constructability impacts would be considered when determining the preferred environmental solution ▸ aim to avoid, then minimise the extent of waterway diversions or realignments, including the re-instatement of large woody debris upstream or downstream of the area of impact ▸ include aquatic fauna salvage of work areas ▸ ancillary facilities associated with replacement or upgrading of infrastructure to be sited in areas already subject to disturbance, or within areas dominated by exotic flora, limiting impacts to riparian vegetation.	Design and pre-construction
B-5	Vegetation and habitat clearing	▸ Prior to commencement of clearing, a detailed pre-clearing check of all areas of potential fauna habitat to be impacted undertaken. ▸ Habitat features to include trees containing hollows and/or nests, logs, bushrock and burrows. ▸ All habitat features to be clearly marked with > 1m spray painted in a highly visual colour (i.e. pink) “H” on all sides of feature. ▸ All features to be mapped using GPS or equivalent portable GIS software.	Pre-construction

Ref	Impact	Mitigation measures	Timing
		▸ Each feature to be flagged with pink flagging tape, with unique identifying number written on tape. ▸ Areas of potential Five-clawed Worm-skink habitat to be mapped. ▸ Report to be prepared including detailed maps of habitat features, and locations to be incorporated into sensitive area plans pre-construction.	
B-6	Vegetation and habitat clearing	▸ Vegetation clearing would be limited to the minimum necessary to construct the proposal and allow for its effective operation. ▸ Disturbance would be minimised, to avoid impacts to native vegetation and habitats so far as practicable. ▸ All practical measures would be taken to avoid removal of HBT during breeding and hibernation season (June to January) to mitigate impacts.	Pre-construction and construction
B-7	Vegetation and habitat clearing	Scheduling of clearing activities would avoid breeding seasons as far as reasonably practical. Clearing activities would avoid winter months to avoid risk of injury to hibernating or torpid reptiles as far as reasonably practical. Where this is not practical and where breeding sites are identified within the corridor during pre-clearance surveys, a suitably qualified person would provide mitigation measures for exclusion zones/relocation requirements relevant to the specific species identified. Ideally, program clearing for late summer/early autumn.	Pre-construction and construction
B-8	Vegetation and habitat clearing	▸ Pre-clearing surveys would be undertaken prior to construction. The surveys, inspections and any subsequent relocation of species, would be undertaken in accordance with the flora and fauna management plan in the CEMP. ▸ Clearing extents/site boundary/limit of works would be consistent with the proposal extents defined in a condition of approval. ▸ The clearing extents/site boundary/limit of works would be clearly defined with flagging or marking tape, signage or other suitable means to delineate no go areas. This delineation and marking process would be incorporated and will align with the project flagging/marking tape process and specifications, to ensure that it aligns with the greater project processes and does not conflict or contradict any of their demarcation. ▸ No stockpiling or storage within dripline of any mature trees. ▸ Where clearing is to occur adjacent to vegetation to be retained, appropriate techniques must be used to prevent unauthorized disturbance.	Pre-construction and construction
B-9	Relocation of habitat features (fallen timber/hollow logs)	Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement where practicable.	Construction
B-10	Noise impacts	CEMP will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as practicable.	Construction
B-11	Light spill impacts	▸ Avoid night works. ▸ Direct lights away from vegetation as far as practicable.	Construction
B-12	Air quality	▸ Regular monitoring of dust generated by construction and operation activities. ▸ Construction would cease if excessive dust or wind conditions observed being blown from site until control measures were implemented. ▸ All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the subject land.	Construction

Ref	Impact	Mitigation measures	Timing
B-13	Erosion and sedimentation	▸ An erosion and sediment control plan would be prepared within the CEMP and/or soil/water management plan in conjunction with the final design and implemented ▸ Spill management procedures would be implemented.	Construction

B-14	Connectivity and fauna passage	▸ Fauna passage opportunities would be included within the flora and fauna management plan where the need to maintain habitat connectivity is identified. Plan to include the following:
		  ▸ Where practical to do so and structures large enough (e.g., under bridges, culverts) incorporate fauna crossing structures including timber logs with connection to adjacent vegetation to account for arboreal fauna movement, and woody ground debris to allow for terrestrial fauna movement, in accordance with NSW RMS guidelines.
		  ▸ In areas of high vegetative connectivity, include installation of fauna fencing (to RMS specifications) to exclude fauna from entering rail corridor, with inclusion of fauna escape devices to allow any fauna within corridor to escape. This may include earthen ramps and/or escape poles from within the corridor.
		▸ Fauna fencing would be designed in accordance with relevant guidelines where impact assessments identify it is required to limit fauna strike and fauna mortality risk and/or maintain habitat connectivity. The placement of fauna fencing would take into account the requirements and responsibilities for maintaining an appropriate clearance zone between adjacent vegetation and fauna fencing to limit opportunities for fauna to jump or climb from adjacent vegetation over the fence into the proposal area.
		  ▸ Security fencing to be used in township areas to incorporate measures to prevent entanglement of flying foxes/gliders where there is adjacent vegetation.
		  ▸ Fencing adjacent to areas of the subject land that are connected to areas of bushland outside the subject land are to include Koala friendly structures to aid traversal of Koala across their range, particularly around the Gwydir and Mehi Rivers.
		▸ Where possible, fauna fencing would refer to Inland Rail standard drawings.
		▸ Fauna fencing and adjacent vegetation clearance zones would be inspected and maintained during operation to retain the fauna fencing integrity.
			Detailed design, pre-construction and construction

B-15	Fauna fencing	Fauna fencing and movement opportunities would be further developed during detailed design. Development of these opportunities would involve:
		▸ assessment of the compatibility of each approach with the general fencing principles at each location and existing land use
		▸ assessment of adjacent habitat and connectivity (including existing adjacent land use)
		▸ consideration of safety requirements for the rail corridor and adjoining properties. e.g. rail corridor fencing has not been proposed across the Macintyre River floodplain to prevent the possibility of debris accumulation in fencing during flood events
		▸ consideration of maintenance constraints that a fauna connectivity or fencing opportunity may introduce
		▸ consideration of the type of fauna crossings that would be best suited to the location:
		  ▸ elevated fauna crossing structures may be required to provide clearance over double-stacked trains (e.g. glider poles)
		  ▸ for higher bridges or viaducts, rope-bridge underpasses may be more practical
			Design and pre-construction

Ref	Impact	Mitigation measures	Timing
		▸ fauna crossing structures may include glider poles, rope-bridge underpasses and fauna furniture within culverts ▸ fauna exclusion fencing to channel fauna towards crossing structures ▸ fish passage measures would be assessed in consultation with NSW DPI Fisheries for implementation monitoring and reporting requirements.	
B-16	Fauna fencing	Vegetation maintenance on the habitat side of the fauna exclusion fencing associated with fauna passages would be undertaken to ensure that species cannot use vegetation to climb onto the exclusion fencing.	Operation
B-17	Flora	Construction areas including compounds, stockpiles, fuel storage areas, laydown areas and staff parking would be located and established outside the tree protection zone as defined in *AS4970-2009 Protection of trees on development sites* (Standards Australia, 2009).	Pre-construction and construction
B-18	Tree clearing and loss of habitat	▸ Clearing to be undertaken as close as is practical following pre-clearing survey so as to minimise chance of missing newly created habitat (such as nests or possum dreys). ▸ Where the pre-clearing survey was completed more than 48 hours before the commencement of clearing, a re-inspection of the work area shall be undertaken by the ecologist/licensed fauna handler to ensure fauna has not moved back into the area. ▸ Where sub optimal or low condition habitat is to be cleared, confirm any potential habitat feature locations with clearing contractor. ▸ Clearing within wooded vegetation, PCTs, TECs and in locations of threatened species identified to be supervised by ecologist/fauna spotter at all times. ▸ Habitat features to be isolated and left overnight to allow for fauna relocation. ▸ A second pre-clearing survey will be undertaken the morning of clearing to ensure no fauna have moved back in the interim. ▸ Habitat features to be cleared following day in the presence of a trained ecological or licensed wildlife handler. ▸ Known and potential habitat trees to be felled with minimal impact – this shall include use of arborists to section and lower hollow sections from trees, or use of excavators with grabs to avoid uncontrolled felling of trees. ▸ All hollows, fissures, logs and rocks to be checked by ecologist/spotter catcher post felling or impacts, and any fauna present caught and safely housed in a well-ventilated area. Habitat features to be moved to allow all hollows to be inspected. ▸ Where practicable, hollows to be inspected by ecologists using torch and/or borescope within deeper fissures. Crowbar to be used to crack open sections of dead limbs and check under bark. ▸ Uninjured fauna to be released in adjacent suitable habitat on day of clearing. ▸ Injured fauna to be euthanised on site by a suitably experienced ecologist in accordance with OEH Code of Practice for Injured, Sick and Orphaned Protected Fauna if severely injured, or taken to vet or wildlife carer for assessment. ▸ Records to be kept of number of hollows, number and species of individuals captured, and outcome of capture to incorporate into monthly environmental reporting.	Pre-construction and construction

Ref	Impact	Mitigation measures	Timing
B-19	Loss of HBTs and trees containing habitat features	▸ HBTs would be retained where possible. ▸ Trees to be removed would be marked and an inventory would be kept of trees and hollows to be removed. ▸ Hollows from cleared hollow bearing trees would be salvaged and reused where possible. Chainsaw hollows and/or nest boxes would be provided to mitigate hollow bearing tree removal. ▸ Trees to be retained would be protected prior to the commencement of construction in accordance with AS4970-2009 Protection of trees on development sites (Standards Australia, 2009).	Pre-construction and construction
B-20	Loss of cave and structure dependent microbat habitat clearing	▸ A protocol for the survey and exclusion of cave-dependent microbats that may be utilising bridge structures is to be developed as part of the FFMP. ▸ Protocol to include identification during pre-clearing survey, followed by inspection day prior to disturbance of habitat (if identified). ▸ Where roosting bats identified, bats to be captured and relocated at or after dusk. Survey to confirm any bats not captured have left roost for the night. ▸ Once bats have left roost, roost habitat to exclude re-entry. Measures such as using shade cloth, geofabric or expanding foam may be suitable to exclude bats. ▸ Survey report to be prepared detailing species, number, and relocation and/or other actions undertaken to discourage occupancy.	Pre-construction and construction
B-21	Injury and mortality	▸ Speed limits would be implemented on access and haul routes to reduce the impact of vehicle strike mortality on native fauna. ▸ Requirements for pre-clearing surveys, including terrestrial and aquatic habitats, breeding habitats (including burrows and hollow bearing trees/logs, existing culverts and structures) would be implemented. ▸ Staged and sequential clearing protocols would be implemented. ▸ Animal handling protocols, including relocation and emergency care would be implemented. ▸ Site induction to be held. ▸ Regular toolbox talks to be held. ▸ At the commencement of the proposal, pre-starts or kick off meetings to be conducted with relevant personnel by ecologist/environmental advisor prior to clearing.	Pre-construction and construction
B-22	Fauna habitat clearing: Five-clawed Worm-skink	▸ Dedicated management actions for the Five-clawed Worm Skink which will be informed by the Species Management Plan that is under development by ARTC with DPE.	Pre-construction and construction
B-23	Flora and fauna/ biodiversity	▸ The siting of temporary construction facilities compounds, stockpiles, mobile fuel storage, laydown areas, temporary access roads and staff parking would be in accordance with the project conditions of approval and sited to minimise the extent of disturbance. ▸ Where activities are to occur outside of the defined proposal limit, consult with regulators to determine any additional assessments, approvals or amendments required to existing approvals.	Pre-construction and construction
B-24	Flora and fauna	The need for translocation options would be discussed with the Department of Planning and Environment (Biodiversity, Conservation and Science Directorate), should these be required.	Design and pre-construction
B-25	Flora	Topsoil stockpiles would be a maximum of 2.5 m in height to avoid heat sterilisation of seed bank.	Pre-construction and construction
B-26	Weeds and pests	A biosecurity (or weed and pest) management plan would be developed as part of the CEMP, which complies with the proposal's conditions of approval, relevant regulatory requirements and guidelines. This plan would include:	Pre-construction and construction

Ref	Impact	Mitigation measures	Timing
		▸ requirements for pre-clearing surveys, including weeds, pest animal presence or risk of presence—map existing extent and severity of weed infestation and to determine weed management requirements ▸ pest animal management, including Cane toad mitigation ▸ site hygiene and waste management to deter pest animals ▸ weed surveillance and treatment during construction and rehabilitation activities ▸ pesticide and herbicide use, documentation and limitations on use i.e. not used in sensitive environmental areas, drainage lines that flow to waterways and aquatic habitats, broadscale use does not result in an increased erosion and sediment risk ▸ vehicle, machinery and imported fill hygiene protocols and documentation ▸ erosion and sediment control risk associated with broadscale weed removal or treatment ▸ any outbreak of priority and/or weeds of national environmental significance within or immediately adjacent to construction areas as a result of construction activity would be managed in accordance with the relevant regulatory requirements.	
B-27	Weeds and pests	▸ Suitability of cleared vegetation for mulching/erosion protection would be assessed on a site-by-site basis. ▸ Any vegetated material containing or with the potential to contain weed seed material would not be used for onsite mulching or erosion protection. ▸ Any mulch generated as part of the proposal would be re-used within appropriate timeframes and manners as specified in the erosion and sediment control plan and the reinstatement and rehabilitation Plan. The erosion and sediment control plan and the reinstatement and rehabilitation plan would clearly specify this as per any relevant applicable conditions of approval, regulatory requirements and industry guidelines.	Pre-construction and construction
B-28	Biosecurity	Priority weeds would be managed in accordance with the *Biosecurity Act 2015*. Weeds of national environmental significance would be managed in accordance with the *Weeds of National Significance Weed Management Guide* (Cooperative Research Centre for Australian Weed Management, 2003). Vegetation would be managed in accordance with the general biosecurity duty to prevent, eliminate or minimise any cross contamination and/or spreading of known weeds.	Pre-construction, construction and post-construction
B-29	Biosecurity	The effectiveness of weed hygiene measures would be monitored as a component of the environmental monitoring procedure for the proposal.	Post-construction
B-30	Biosecurity	Property-specific biosecurity requirements would be agreed with the relevant landowner/operator prior to pre-construction/construction activities occurring on that property. Agreed protocols would be documented in individual property management agreements, to be signed by ARTC and the landowner/operator.	Design and pre-construction

Ref	Impact	Mitigation measures	Timing

B-31	Rehabilitation	A reinstatement and rehabilitation plan would be prepared to guide rehabilitation planning, implementation, monitoring and maintenance of disturbed areas outside the operational footprint (such as compounds and temporary workforce accommodation).
		The reinstatement and rehabilitation plan would include clear objectives for rehabilitation of native vegetation in temporary disturbances areas and would be supported by the urban design and landscape plan. These plans would be based on the Inland Rail Landscape and Rehabilitation Strategy, the Inland Rail Landscape and Rehabilitation Framework and property-specific reinstatement commitments. As a minimum the reinstatement and rehabilitation plan would establish the following:
		▸ timeframes for rehabilitation and/or reinstatement/stabilisation works to be achieved
		▸ details of the actions and responsibilities to progressively rehabilitate, regenerate and/or revegetate areas, consistent with the agreed objectives
		▸ include rehabilitation requirements such as:
		  ▸ milling and removal of bitumen pavement
		  ▸ removal of any decommissioned culverts
		  ▸ tyning and ripping of base and sub-base material
		  ▸ application of soil ameliorants
		  ▸ topsoiling and/or compost blanket
		  ▸ stabilisation and rehabilitation (e.g. planting and or seeding)
		▸ consideration for maintenance or performance issues of rehabilitation e.g. vegetation that does not grow and obscure signals or impact the longevity of rail infrastructure
		▸ procedures, timeframes, measurable performance objectives and responsibilities for monitoring the success of rehabilitation and/or reinstatement/stabilisation areas
		▸ where temporary construction facilities are required, land will be returned to a stable condition that complies with the conditions of applicable landowner agreements and regulatory approvals.
			Construction and post-construction

B-32	Rehabilitation	▸ Pallets of locally endemic species, targeted to the structure and plant community type of the original landscape, would be used as part of rehabilitation. ▸ Plantings would include complex mid-stratum to increase habitat for woodland birds and support small faunal movement. ▸ Rehabilitation would be targeted around any fauna furniture or rail corridor crossing structures—dense mid-stratum of vegetation and connectivity with larger patches to be enhanced. ▸ Rehabilitation would be used to enhance fauna habitat connectivity along movement corridors. ▸ Felled timber and recovered habitat features would be incorporated in rehabilitation to enhance small mammal, reptile and invertebrate habitat. ▸ Installation of nest boxes or assisted hollow augmentation would be considered.	Pre-construction, construction and post-construction
B-33	Offsets	Biodiversity offsets would be finalised in accordance with the BAM calculator as calculated in Appendix D of Technical paper 1: Biodiversity development assessment report.	Design and pre-construction
B-34	Aquatic ecology	Works within the riparian zone would minimise vegetation disturbance as far as practical. Where riparian vegetation is removed, revegetation of disturbed riparian areas would be undertaken using local native species and would include native in-stream macrophytes suited to the ephemeral nature of the watercourses where applicable.	Pre-construction and construction

Ref	Impact	Mitigation measures	Timing
B-35	Aquatic ecology	Works within or adjacent to watercourses would be conducted in accordance with the intent of: ▸ Policy and Guidelines for Fish Habitat Conservation and Management Update 2013 (DPI, 2013) ▸ Guidelines for controlled activities on waterfront land (DPI, 2018) ▸ The salvage and relocation of fish within isolated aquatic environments would be managed in accordance with the Policy and Guidelines for Fish Habitat Conservation and Management Update 2013 (DPI, 2013) ▸ Why do fish need to cross the road? Fish passage requirements for waterway crossings (Fairfull and Witheridge, 2003).	Pre-construction and construction
B-36	Aquatic ecology	Any large debris (snags) would be salvaged and relocated upstream or downstream and aligned so that they point downstream so that water is deflected towards the centre of the stream.	Pre-construction and construction
B-37	Fish passage	Regular inspection and maintenance of instream structures would be undertaken to ensure their functionality is maintained and minimise occurrence of accidental blockage of fish passage.	Design, pre-construction and construction
Traffic and Transport (Chapter 11)			
T-1	Consultation	Stakeholder engagement would be undertaken (including local councils and Transport for NSW (TfNSW)) prior to finalising the detailed design for those aspects of the proposal that impact on the operation of road infrastructure under the management of these stakeholders. Input would be sought from relevant landowners prior to finalising the detailed design of those aspects of the preferred infrastructure that impact on individual property access arrangements. Additional measures identified as an outcome of consultation would be implemented during construction where reasonable and feasible. This would include modifying work areas, activities and construction access arrangements to address traffic flow and access issues identified by key stakeholders, where practicable.	Detailed design and pre-construction
T-2	Community	The community would be notified in advance of any proposed road and pedestrian network changes through signage, the local media and other appropriate forms of communication.	Construction
T-3	Level crossings	Public level crossings would be designed in accordance with relevant guidelines and standards, including *AS 1742.7:2016 Manual of uniform traffic control devices*, *Part 7: Railway crossings* (Standards Australia, 2016), *Guide to Road Design Part 4: Intersections and Crossings* (Austroads, 2021), *Guideline: Lighting for railway crossings* (Roads and Maritime Services, 2013) and ARTC standards, including provision of warning signage, line marking and other relevant controls.	Design and pre-construction
T-4	Level crossings	A public level crossing treatment report would be prepared to document the level crossing process design and assessment process that has been undertaken. The report would be developed in consultation with TfNSW and the relevant councils. The report would provide an assessment of road risks consistent with the guideline *Establishing a Railway Crossing Safety Management Plan* (NSW Roads and Traffic Authority (RTA), 2011). Justification would be provided where no works are proposed on existing level crossings.	Design and pre-construction
T-5	Road/rail interface	Temporary diversions and closures of existing rail and road traffic would be undertaken in consultation with relevant stakeholders, and alternative arrangements would be provided as required.	Construction

Ref	Impact	Mitigation measures	Timing
T-6	Road safety	A traffic, transport and access management plan would be prepared and implemented as part of the CEMP. It would include measures to minimise the potential for impacts on the community and the operation of the surrounding road and transport environment. It would address all the aspects of construction relating to the movement of vehicles, pedestrians and cyclists, and the operation of the surrounding road network, including: ▸ construction site traffic control, parking and access arrangements ▸ construction material, equipment and spoil haulage, including arrangements for oversize vehicles ▸ road pavement and access road condition management ▸ management of impacts on public transport, including school buses, pedestrian and cyclist access, and safety ▸ management of impacts on access for surrounding residents and business owners/operators ▸ arrangements for level crossings during construction ▸ road and driver safety.	Design and pre-construction
T-7	Damage to local roads	▸ A dilapidation survey would be undertaken of the public roads within the proposed haulage routes prior to, and following completion of, construction and would be provided to the relevant road authority. ▸ Pavement condition monitoring would be carried out during works, as required. ▸ Rectification measures would be implemented as needed during and/or following completion of construction to address any damage caused by construction.	Construction
T-8	Oversize vehicles	Permits for oversize vehicles that do not comply with mass, dimension or operating requirements would be determined and permits applied for as required.	Pre-construction and construction
T-9	Road safety	Road safety audits would be undertaken at level crossings in accordance with the Austroads Guidelines (Austroads, 2019) to confirm: ▸ the level of protection is appropriate ▸ the infrastructure is appropriate for the traffic conditions ▸ the crossing is designed to provide suitable stacking and sight distance.	Design and pre-construction
T-10	Emergency vehicle access	Access for emergency vehicles would be maintained along key emergency access routes throughout the construction period, with suitable alternative access arrangements provided where required.	Construction
T-11	Emergency services	A protocol between ARTC and emergency service providers would be developed to define appropriate and coordinated responses and communication in the event of an emergency during operations (e.g. access to real-time information regarding crossing times and access to alternative crossing points).	Operation
T-12	Rail traffic diversions	Diversions of existing rail traffic would be undertaken in consultation with relevant stakeholders, and alternative arrangements would be provided, if required.	Construction
T-13	Consultation	Ongoing consultation with relevant stakeholders would be undertaken to facilitate the efficient delivery of the proposal and to minimise congestion and inconvenience to road users. Stakeholders would include the relevant local council, bus operators, state government departments, emergency services and affected property owners/occupants. The community would be notified in advance of any proposed road and pedestrian network changes through signage, the local media, and other appropriate forms of communication. Where changes to access arrangements are required, ARTC would advise landowners/occupants and consult with them in advance regarding alternative access arrangements.	Detailed design, pre-construction and construction

Ref	Impact	Mitigation measures	Timing
Hydrology and Flooding (Chapter 12)			
HF-1	Obstruction and diversion of overland flows due to: ▸ temporary embankment opening during demolition / reconstruction may pass additional flow downstream ▸ location and level of long-term construction facilities (such as compounds, access tracks and stockpiles) may obstruct and divert flows; and ▸ location and level of temporary works in waterways and overland flow paths during bridge and culvert construction may obstruct and divert flows.	▸ Following development of the construction methodology, critical stages of the works would be identified and tested in the flood model to identify potential construction phase flooding impacts. The tests would simulate the following in the model for a number of construction phase scenarios as required: ▸ key stages of temporary embankment opening during demolition/reconstruction that could pass additional flow downstream ▸ location and level of construction facilities (such as compounds, access tracks and stockpiles) that could obstruct and divert flows ▸ location and level of temporary works in waterways and overland flow paths during bridge and culvert construction that could obstruct and divert flows. ▸ The construction phase flood modelling would be iterated through sufficient scenarios to inform planning of the works such that construction phase flood impacts are identified and managed accordingly. ▸ The construction phase flood modelling would consider potential changes to: ▸ building and property inundation (including floor level surveys and consideration of existing inundation levels) ▸ existing rail line, at rail connections ▸ road flood levels and extent of flooding along roads ▸ overland flow paths and storage effects of construction and operational infrastructure. ▸ The outcomes of the modelling would be used to inform the construction phase flood emergency response plan. ARTC would work with stakeholders including directly impacted landowners, relevant community stakeholders, local governments, state departments and local flood specialists to inform and refine assessments and design.	Detailed design and pre-construction
HF-2	▸ Formation of new flow paths or changes to existing modelled flows during detailed design ▸ Confirmation of velocity QDL exceedances in land adjacent to the rail corridor. ▸ Confirmation of impact on Flood Planning Levels set by other agencies, including Council and TfNSW.	▸ Further refinement of the cross-drainage design would occur at the detailed design stage to reduce exceedances of the currently adopted impact criteria and preserve existing flood patterns and characteristics as far as possible. This may involve some repositioning and reconfiguration of the cross drainage structures in the current design and provision of additional structures. .As part of this refinement, the most appropriate blockage factors to assume in design would be confirmed, and adoption of debris deflectors or other similar measures to manage blockage risks at sensitive locations would be considered. ▸ Sensitivity testing to alternative representations of large culvert banks within the flood model using a two-dimensional modelling approach rather than the current one-dimensional approach would also be undertaken to confirm the best approach to modelling the proposed drainage infrastructure (noting that the current one-dimensional modelling approach is consistent with the current industry standard). ▸ Following refinement of the cross drainage design, where velocity QDL exceedances occur in land adjacent to the corridor that cannot be resolved through infrastructure measures within the corridor, mitigation measures would be negotiated with the affected landowners for the affected land areas would occur. ▸ Additional topographic data would be sourced and the topographic grid in the hydraulic model would be updated to ensure that the best available data is incorporated into the modelling analysis.	Detailed design

Ref	Impact	Mitigation measures	Timing
		▸ The detailed design flood model would be calibrated to recent flood events, including the events that occurred in 2011, 2012 and 2021, to increase confidence in the model's accuracy. ▸ Following calibration, the design event model would be updated to adopt ARR2019 rainfall runoff modelling methodologies for the local catchments around Moree and the flood frequency analysis updated as required to include the latest flow records at the Gravesend stream gauge. ▸ The updated model will be used to assess the proposal's impacts against all aspects of the QDLs, including those that allow minor or negligible impacts to be filtered out (e.g. those attributable to model noise) so that material impacts are focused on for mitigation. The detailed design will identify and quantify QDL exceedances to a high level of detail, and where these cannot be designed out or mitigated, they will be justified by a thorough examination of each exceedance to demonstrate that the associated flood risk does not adversely affect the land use or asset that is subject to the QDL exceedance. ▸ The final afflux outcomes achieved at detailed design would be advised to Council, TfNSW and other agencies so that any required adjustments to their Flood Planning Levels can be made.	
HF-3	▸ Obstruction of floodwater that previously overtopped the rail causing increased flooding on the upstream (eastern) side of the rail corridor. ▸ Passing of floodwater too efficiently through the rail corridor resulting in increased flooding on the downstream (western) side of the rail corridor. ▸ Location of permanent spoil mounds within the floodplain may cause obstruction and diversion of flows with associated adverse impacts on adjacent land and property.	▸ The design of the proposal has aimed to improve the flood immunity and resilience of the rail corridor while preserving existing flood patterns and characteristics as far as possible. The design includes significant numbers of additional cross drainage structures to allow equivalent volumes of floodwater that overtop the existing rail to pass under the rail in a more controlled manner. ▸ All new and upgraded culverts and bridges would be sized and located to ensure that they do not obstruct flow upstream (east) of the rail corridor or pass flow too efficiently through the rail corridor and adversely impact flooding on the downstream (western) side of the rail corridor. The impacts of the proposal on flooding have been balanced upstream and downstream of the rail corridor across the range of events from the 20% AEP to the 1% AEP. Further refinements of the design are required at the detailed design stage to achieve a better balance in areas that are predicted to have most impact from the current design. These include the area around the Camurra Hairpin and land west of the rail corridor in the central floodplain, including the Newell and Carnarvon Highways. ▸ The design approach maintains existing drainage characteristics and minimises impacts on drainage and flooding patterns around the proposal site. This prevents the formation of new flow paths or changes to existing flow paths and therefore reduces potential for erosion and scour during flood events. The culvert designs incorporate long concrete aprons at inlets and outlets, flared wingwalls and extended rock aprons where velocities are high to reduce flow velocity across the culvert and reduce potential scour and disturbance of bed sediments. The bridge designs incorporate abutment scour protection and piers aligned with the main river flow directions to avoid scouring and disturbance of river banks and beds around the bridges. ▸ No spoil mounds are proposed as part of the proposal's permanent works.	Detailed design
HF-4	Cumulative impacts	Consultation and collaboration with TfNSW would occur regarding the cumulative effects of the proposal and the Newell Highway upgrade to gain a better flood impact outcome on properties between the rail corridor and the upgraded highway section, and in the area downstream of the highway upgrade. This may require some repositioning and reconfiguration of the cross drainage structures in the current rail design adjacent to the highway upgrade.	Detailed design

Ref	Impact	Mitigation measures	Timing
HF-5	Location of construction facilities within floodplain causing: ▸ displacement and diversion of floodwater and overland flow causing increased flood level, velocity and duration in adjacent land ▸ scour and erosion of sensitive land causing crop damage and other damages due to changed flooding conditions.	Flood model results would be used to identify areas free from flooding in a 10% AEP event and construction compounds would be located in these areas if required. Where locating construction compounds within the floodplain is unavoidable, flood model results would be used to identify areas where flood depth and velocity are low to ensure that facilities are located in areas of lowest flood risk.	Detailed design and pre-construction
HF-6	Progressive demolition and reconstruction of existing rail embankment resulting in: ▸ temporary openings in rail embankment may cause new flow paths to occur during flood events, increasing flooding downstream of the corridor ▸ associated increase in flood level, velocity and duration, associated damage to land, crops and other assets.	Key stages of embankment works would be analysed using the flood model to determine most sensitive embankment sections and appropriate limits on extents of temporary embankment openings. Likely flood warning times would be identified between rainfall forecast and onset of flooding and, where required, works would be staged so that demolished sections of the embankment can be sufficiently reinstated and stabilised prior to onset of flooding.	Detailed design and pre-construction
HF-7	▸ Temporary works such as cofferdams, working platforms and access tracks in waterways and overland flow paths obstruct flow and displace / divert floodwater. ▸ Associated increase in flood level, velocity and duration, associated damage to land, crops and other assets.	Key stages of temporary works would be analysed using the flood model to determine appropriate limits on extents of temporary works in waterways and flow paths. Likely flood warning times would be identified between rainfall forecast and onset of flooding and, where required, the temporary works would be designed to allow partial removal of key flow obstructions prior to onset of flooding.	Detailed design and pre-construction

Ref	Impact	Mitigation measures	Timing

HF-8	Construction phase flood event resulting in:
	▸ displacement and diversion of floodwater and overland flow causing increased flood level, velocity and duration in adjacent land
	▸ damage or loss of equipment and/or machinery
	▸ injury or death of personnel
	▸ damage or loss of adjacent infrastructure including private buildings.
		Prior to construction, a flood warning system would be established that monitors real time and forecast rainfall data and real time streamflow gauge data. The rainfall and streamflow data would be used to set a number of trigger levels and associated actions in a flood emergency response plan to manage works areas appropriately prior to and during, and after flood events. Typical actions would include the following:
		▸ Prior to flood events:
		  ▸ stabilise and protect disturbed areas and stockpiles
		  ▸ where required, remove flow obstructions from waterways and flow paths and reinstate open sections of embankment
		  ▸ secure/evacuate equipment and machinery
		  ▸ evacuate personnel
		  ▸ issue flood warnings to potentially affected agencies and landowners.
		▸ During flood events:
		  ▸ monitor flood data to anticipate damage
		  ▸ collate reports of damage.
		▸ After flood events:
		  ▸ confirm flooding has receded and access to works areas is safe
		  ▸ inspect work areas for flood damage
		  ▸ undertake inspections of temporary works to assess stability before undertaking repairs or recommencing work
		  ▸ respond to reports of flood damage by neighbouring landowners
		  ▸ where necessary, prepare flood event reports assessing damages to adjacent land, causes and any required compensation and future mitigation works.
		▸ Where feasible, facilities and routes identified as being critical to emergency response operations would be protected from the probable maximum flood level.
		Site shutdown procedures would be developed for work sites and updated regularly as construction progresses and sites change. Site shutdown procedures would be implemented prior to forecast inclement weather and planned site shutdowns in excess of 48 hours.
			Detailed design, pre-construction and construction

HF-9	Flood emergencies	A flood and emergency response plan would be prepared and implemented as part of the CEMP. The plan would include measures, process and responsibilities to minimise the potential impacts of construction activities on flood behaviour as far as practicable. It would also include measures to manage flood risks during construction and address flood recovery during construction. The plan would be developed in consultation with TfNSW, local councils and emergency services.	Construction

HF-10	Climate change
	▸ Climate change has the potential to reduce flood immunity and resilience of the proposal, and increase the flooding impacts of the proposal on adjacent land and assets.
		▸ When and if required, potential future impacts would be addressed by additional works to restore the intended design flood immunity and resilience and offset the impacts by a combination of future upgrade works, including:
		  ▸ increase in rail level
		  ▸ provision of additional scour protection on rail embankments and cross-drainage structures
		  ▸ provision of additional cross drainage structures to provide more flow capacity in flood events.
			Post-construction and operation

Ref	Impact	Mitigation measures	Timing
HF-11	Progressive deterioration of cross-drainage structure condition and capacity	▸ Inspections would be carried out of cross-drainage structures in accordance with ARTC's Structures Inspection Engineering Code of Practice (ETE-09-01) (2019) to identify defects and conditions that may affect waterway and drainage system capacity or indicate increased risk of flooding such as: ▸ scour ▸ blockages due to debris build up ▸ indication of floods overtopping a structure ▸ culvert or drain damage or collapse.	Operation
Surface Water Quality (Chapter 13)			
WQ-1	SWMP	A soil and water management plan (SWMP) would be prepared as part of the CEMP. The plan would be in accordance with best practice, reflected in *Managing Urban Stormwater Soils and Construction (Blue Book)* (Landcom, 2004) and would include: ▸ water quality and soil land conservation objectives for the proposal ▸ a progressive erosion and sediment control plan (ESCP) that allows for staging and site-specific erosion and sediment controls at all work sites in accordance with *Managing Urban Stormwater Soils and Construction (Blue Book)*. Physical controls may include sediment fences and basins, containment bunds, silt traps, turbidity barriers and diversions, dust suppression, and earth compaction around stockpiles and earthworks areas. The controls would aim to: ▸ divert water from upslope areas around the site ▸ reduce erosion from within the site ▸ intercept runoff and capture sediment from site ▸ protect watercourses, drainage lines and drain inlets down-gradient from the site. The SWMP would identify: ▸ monitoring locations at discharge points and selected watercourses where works are being undertaken ▸ monitoring parameters ▸ frequency and duration of monitoring. Any temporary or permanent erosion and sediment controls would be provided for in the proposal Construction Impact Zone (CIZ). Surface controls would be provided to promote ground stability, limit runoff lengths and reduce runoff velocities within the construction areas. Capture, testing and treatment (if required) of water travelling through the site would be undertaken prior to discharge. Requirements would be implemented for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction. Erosion and sediment control plans and the soil and water management plan would be signed off by a Suitably Qualified Person (e.g. Certified Professional in Erosion and Sediment Control (CPESC)) in accordance with regulatory requirements.	Construction
WQ-2	Aquatic and riparian areas	Detailed design would aim to avoid, then minimise, the extent of waterway diversions or realignments by using the existing rail corridor.	Design
WQ-3	EPL requirements	The proposal would be managed in accordance with the water quality management requirements to be specified in the environment protection licence (EPL) for N2NS Phase 2.	Construction

Ref	Impact	Mitigation measures	Timing
WQ-4	Water resources	Sources for construction water requirements (surface water, groundwater, municipal supply) would be confirmed via consultation with relevant stakeholders (including landowners/occupants) prior to construction. Appropriate approvals and agreements would be sought for the extraction of water, if required. Where private water sources are used for construction, monitoring would be undertaken during extraction to ensure volumes and conditions stipulated by licence requirements and/or private landowner agreements are met. Detailed design and construction planning would aim to minimise the use of potable water during construction.	Design and pre-construction
WQ-5	Works in waterways	Construction sequencing and temporary diversions of water during construction would be developed to consider the impact of change on flow regimes and to minimise these changes throughout construction.	Design and pre-construction
WQ-6	Temporary waterway crossings	Temporary waterway crossings would be rehabilitated in accordance with conditions of approval and a reinstatement and rehabilitation plan.	Operation
WQ-7	Water use	Requirements for construction water (volumes, quality, demand curves, approvals requirements and lead times) would be defined during detailed design, e.g. water used for dust suppression would not result in adverse environmental or health impacts.	Construction
WQ-8	Surface water monitoring	A surface water monitoring framework would be developed and implemented to monitor water quality at discharge points and selected watercourses where works are being undertaken. The framework would provide for seasonal variability and include the relevant water quality objectives (WQOs), parameters and criteria identified. The surface water monitoring framework would be developed in consultation with relevant regulators or as specified in project approval conditions or licences.	Pre-construction and construction
WQ-9	Flooding	Permanent drainage structures would be installed in areas where there are significant sections of embankment fill that incorporate cross-drainage structures over floodplain areas	Pre-construction and construction
WQ-10	Contaminants	Laydown areas and storage areas would be located to minimise potential impacts on creeks, rivers, and/or sensitive receptors such as existing groundwater bores or known groundwater dependent ecosystems (GDEs).	Construction
WQ-11	Containment of spills and leaks	Vehicle and plant maintenance activities would be undertaken in suitable areas, with hardstand to minimise risk of discharge of contaminants from site. No refuelling or maintenance of plant would be undertaken within 50 m of a waterway. Specific refuelling and maintenance areas would be set up onsite with bunding to ensure there are no spills, or leaks of oils or fuels, into waterways. Stationary plant (e.g. cranes) would be bunded insitu and double bunding would be carried out during any refuelling process for the plant. All potentially contaminating, contaminated and hazardous substances would be stored in secured, bunded and impervious locations. Storage locations would be isolated from surface water and outside of the extent of the 5% AEP design flood, wherever practicable. Identification and/or reuse of contaminated, hazardous or potentially contaminated material onsite (i.e. soil, ballast) would be subject to a risk assessment and managed in accordance with any relevant applicable legislation and regulations.	Design, pre-construction and construction
WQ12	Spill response	ARTC's existing spill response procedures would be reviewed to determine applicability and suitability during operation. The adopted procedure would include measures to minimise the potential for impacts on the local community and the environment as a result of any leaks and spills.	Operation

Ref	Impact	Mitigation measures	Timing
WQ-13	Irrigation	Any irrigation areas would be designed and operated in accordance with the risk framework and management principles contained in the *National Guidelines on Water Recycling* (Environment Protection and Heritage Council, 2006) and the *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation (DEC), 2004). This would include the following design requirements: ▸ irrigation area/s would be delineated based on the expected rate of irrigation and the drainage characteristics of the receiving soil ▸ the quality of treated water would be determined to prevent accumulation of contaminants, with reference to the relevant guidelines ▸ irrigation area/s would be designed to include capacity to store treated water for the duration of typical wet weather events ▸ the rate of irrigation would be optimised to avoid waterlogging or ponding of reclaimed water ▸ soil and groundwater conditions would be monitored to identify and correct trends in soil salinity or other potential effects of irrigation.	Design and pre-construction
WQ-14	Contaminated soil	Testing and identification of contaminated soil and groundwater would be undertaken to prevent transport of the contaminants into waterways or groundwater.	Design and construction
WQ-15	Rehabilitation	Disturbed areas would be rehabilitated and restored progressively, as soon as possible on completion of works in the area, to promote surface stability and reduce the potential for erosion into waterways.	Post construction
Groundwater (Chapter 14)			
GW-1	Groundwater	A groundwater mitigation and management plan would be prepared as a sub plan, as part of the CEMP. The plan would comply with the proposal conditions and be implemented to monitor the effectiveness of mitigation and management measures applied during the construction phase of the proposal. The groundwater mitigation and management plan would, at a minimum: ▸ be based on baseline studies developed for the proposal ▸ include procedures for the documentation and reporting of results ▸ include requirements for training, inspections, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction. A groundwater monitoring program would be developed and implemented as part of the plan to monitor potential groundwater impacts. The program would define the following: ▸ monitoring parameters ▸ monitoring locations ▸ frequency and duration of monitoring.	Design and pre-construction
GW-2	Groundwater	Further assessment of design concepts would be undertaken at watercourse crossings to minimise embankment loading or compaction of alluvial sediments and mounding of groundwater levels (i.e. use of pilings).	Design and pre-construction
GW-3	Contaminants	Drilling and excavation activities during construction would use drilling fluids and chemicals that are environmentally neutral and biodegradable, where practical.	Construction

Ref	Impact	Mitigation measures	Timing
GW-4	Groundwater quality	Laydown areas and storage areas would be located to minimise potential impacts on creeks, rivers and/or sensitive receptors such as existing groundwater bores or known GDEs. Maintenance activities and refuelling would be carried out further than 50 m from riparian vegetation and waterways, with appropriate measures in place to avoid impacts to groundwater in accordance with relevant regulatory requirements.	Operation
GW-5	Groundwater supply and discharge	In the event that groundwater is required for construction water supply, all water take would be appropriately licensed. Consultation would be undertaken with relevant stakeholders (including landowners/occupants) prior to construction, and appropriate approvals and agreements would be sought for the extraction of water. Monitoring would be undertaken during extraction to ensure volumes stipulated by licence requirements and/or private landowner agreements are not exceeded. Meters would be installed, and groundwater extraction recorded and reported, in accordance with the relevant requirements of the *Non-Urban Metering Policy* (DPIE, 2020b) and clause 21(6) of the Water Management (General) Regulation 2018. No groundwater discharge would be reintroduced to the groundwater system without appropriate testing and conformance to the relevant water quality control criteria.	Design and construction
GW-6	Groundwater table	If excavations unexpectedly intersect the water table, potential impacts would be assessed by a hydrogeologist and adaptive mitigation measures implemented as required.	Construction
GW-7	Groundwater bores	The location of registered bores that may be lost due to construction or operation of the proposal would be confirmed (through physical survey or ground truth) and licensed users would be consulted to determine the appropriate mitigation strategy (e.g. replacement of water supply, if required). Decommissioning of bores would be undertaken in accordance with the *Minimum Construction Requirements for Water Bores in Australia—Edition 3* (National Water Commission, 2012).	Construction
GW-8	Groundwater bores	Where groundwater monitoring identifies the potential for groundwater drawdown in existing bores to exceed the NSW *Aquifer Interference Policy* (DPI, 2012) minimal impact considerations, 'make good' provisions would be triggered for those bores in consultation with the relevant landowners.	Construction and operation
GW-9	Groundwater bore census	A bore census would be undertaken for existing licensed bores within 1 km of the proposal's bore fields, where landowners permit. The census would collect baseline groundwater level data and information on a given bore's typical usage and characteristics (including bore construction, pump depth, yield, water level during pumping and water level outside of pumping periods).	Pre-construction
Cultural Heritage (Chapter 15)			
CH-1	Building salvage strategy	A pre-construction survey would be undertaken to confirm the locations and appropriate demarcation of any previously listed Aboriginal Heritage Information Management System (AHIMS) sites that could not be located during the site survey. Where the proposed works would result in the removal of significant heritage fabric, such as the removal of Mehi River Bridge and Camurra–Gwydir River underbridge, a salvage strategy would be prepared. At a minimum, the salvage strategy would include an assessment of the condition, significance, storage requirements and the potential reuse of each of the elements of the structures. This would be prepared in conjunction with a Heritage Interpretation Strategy to identify the fabric for possible reuse in interpretation or as part of the design of the new bridges.	Detailed design, pre-construction and construction

Ref	Impact	Mitigation measures	Timing
		Any sites with the potential to be impacted would be managed in accordance with the salvage strategy. Any targeted survey would be undertaken with registered Aboriginal parties, in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (Department of Environment, Climate Change and Water (DECCW), 2010).	
CH-2	Bridge designs	Where feasible and reasonable, design elements of the Mehi River Bridge and the Camurra–Gwydir River underbridge would be incorporated into the new bridge designs. This would include the following: ▸ a more sympathetic design that incorporates or references the original design of the steel Pratt truss bridges would be considered to reflect the heritage values of the Mehi River Bridge and Camurra–Gwydir River underbridge ▸ the new bridges would be designed in consultation with suitably qualified heritage consultants and heritage architects.	Detailed design
CH-3	Cultural interpretation	Options for the reuse of original elements of the existing bridges for non-structural elements, or in interpretation near the bridges, would be considered during the detailed design stage in consultation with the local community and MPSC. Landscape design and the rehabilitation of the landscape would incorporate interpretation and tie into landscaping plantings with native plants.	Design and Construction

CH-4	Vibration impacts	To minimise and control any risks to the heritage fabric of Moree Hotel or other heritage items as a result of vibration impacts, the following mitigation measures would be implemented:
		▸ a dilapidation study would be undertaken for heritage items within 50 m of the CIZ prior to works commencing
		▸ a vibrations assessment would be undertaken for items within 50 m of the CIZ as per the:
		  ▸ British Standard BS 7385: Part 2: Evaluation and Measurement for Vibrations in Buildings—Part 2: Guide to Damage Levels from Ground-Borne Vibration
		  ▸ German Standard DIN 4150, Part 3: Structural Vibration in Buildings: Effects on Structures.
		Vibration assessments would take place prior to works commencing, during the construction program and once the proposal is operational.
		If a heritage structure is found to be structurally unsound following inspection, a more conservative cosmetic damage objective (e.g. 2.5 mm/s peak component particle velocity for long-term vibration) would be considered.
		Where vibration monitors would need to be attached to the heritage items, they would not be attached with permanent fixings. They would be removable without causing damage (e.g. with beeswax).
			Pre-construction and construction

CH-5	Vibration impacts	Where any works are found to be causing vibration damage to the heritage fabric, works would cease and the construction methodology would be reviewed, in consultation with a heritage consultant, to mitigate further impacts. A temporary protection plan to outline protection measures required for significant fabric during activities causing potential vibration impacts would be prepared prior to commencement of works.	During construction
CH-6	Photographic archival recording of Mehi and Gwydir River underbridges	A comprehensive photographic archival recording would be undertaken for the removal of Mehi River and Camurra–Gwydir River bridges. This would be done in accordance with the Heritage Division's guidelines set out in *How to Prepare Archival Recording of Heritage Items* (NSW Heritage Office, 1998) and *Photographic Recording of Heritage Items Using Film or Digital Capture* (NSW Heritage Office, 2006).	Detailed design

Ref	Impact	Mitigation measures	Timing
CH-7	Delisting of heritage items	Prior to the demolition of Mehi River Bridge and Camurra–Gwydir River Underbridge, the ARTC's and CRN's s170 Heritage and Conservation Registers would be amended to remove these items from the registers. A s170 notification would be submitted to Heritage NSW prior to any works that would significantly modify and/or remove the Mehi River Bridge and the Camurra–Gwydir River underbridge.	Pre-construction
CH-8	Moree Hotel photographic archival recording	If the dilapidation study and vibrations assessment confirm that the Moree Hotel would be impacted by vibrations caused by the proposed works, an archival recording of the Moree Hotel would be undertaken.	During construction
CH-9	Archaeological management	An unexpected finds procedure would be developed and included in the CEMP. If Aboriginal items or evidence of Aboriginal occupation are identified, including any remains associated with the Steel Bridge Camp, these would be managed in accordance with the unexpected finds procedure. Prior to construction commencing, and once rehabilitation is complete, a smoking ceremony would be undertaken at a suitable location.	Construction
CH-10	Heritage induction	Cultural and historic heritage inductions and awareness training would be provided to all construction staff, contractors and subcontractors to ensure they are aware of their obligations. Cultural heritage awareness training would be provided by an Aboriginal representative at the commencement of substantial works for the proposal. A heritage induction would be carried out prior to works commencing, and continued throughout the works program, with the aim of ensuring that all relevant construction staff, contractors and subcontractors are made aware of their statutory obligations for heritage under the *Heritage Act 1977* (NSW) and best practice as outlined in *The Burra Charter* (ICOMOS, 2013). The heritage induction would seek to ensure that no archaeological remains or heritage fabric are inadvertently impacted during the proposed works.	Construction
CH-11	Building salvage strategy	A pre-construction survey would be undertaken to confirm the locations of any previously listed AHIMS sites that could not be located during the site survey. Where the proposed works would result in the removal of significant heritage fabric, such as the removal of Mehi River Bridge and Camurra–Gwydir River underbridge, a salvage strategy would be prepared prior to the commencement of works in order to identify the significant fabric to be salvaged during demolition. At a minimum, the salvage strategy would include an assessment of the condition, significance, storage requirements and the potential reuse of each of the elements of the structures. This would be prepared in conjunction with a Heritage Interpretation Strategy (as per mitigation measure CH-9) to identify the fabric for possible reuse in interpretation or as part of the design of the new bridges. Any sites with the potential to be impacted would be managed in accordance with the salvage strategy. Any targeted survey would be undertaken with registered Aboriginal parties in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW, 2010).	Detailed design, pre-construction and construction
CH-12	Heritage interpretation strategy	A heritage interpretation strategy would be developed for incorporation into future designs and planning, particularly in the location of Mehi River Bridge and the Camurra–Gwydir River underbridge. Opportunities for interpretive displays in appropriate locations, along accessible portions of the proposed route, would be explored. Any impacts to the existing interpretive footpath on the south side of the river would be rectified following the completion of the works.	Detailed design, pre-construction and construction

Ref	Impact	Mitigation measures	Timing
CH-13	Oral history	An oral history project would be considered in consultation with the local archives, library and history societies in order to record memories and experiences of the railway workers, the local Aboriginal people living in Steel Bridge Camp, and other members of the local community and their interactions with the railway and the Mehi River Bridge and Camurra–Gwydir River underbridge in the 20th century.	Detailed design
CH-14	Consultation with relevant stakeholders	Consultation with the MPSC, ARTC, and the manager of the CRN s170 Heritage and Conservation Register would be undertaken to mitigate and manage major impacts to the Mehi River Bridge and Camurra–Gwydir River underbridge, and the implementation of heritage interpretation.	Pre-construction and construction
Noise and Vibration (Chapter 16)			

NV-1	Construction noise and vibration management	A construction noise and vibration management plan (CNVMP) would be prepared and implemented in accordance with the requirements of the interim construction noise guideline (ICNG) and the Construction Noise and Vibration Management Framework (CNVMF).
		The CNVMP would take into consideration all reasonable and feasible measures for reducing the source noise levels of construction equipment by construction planning and equipment selection, where practicable. Equipment selections would be reviewed with a preference for adopting quieter and non-vibratory plant items near sensitive receivers, where feasible and reasonable.
		The CNVMP would outline measures to reduce the noise impact from construction activities, including:
		▸ noise monitoring in the event of a complaint or to verify noise levels to assess compliance of construction activities against adopted criteria. Monitoring would be in the form of either unattended or operator attended surveys (i.e. for specific periods of construction noise)
		▸ dilapidation surveys: which would be completed prior to any vibration intensive work being carried out at or within the minimum distances set out in Section 5 Technical Paper 10: Construction noise and vibration impact assessment, Volume 4. Minimum working distances would be confirmed prior to carrying out any vibration intensive work onsite.
		▸ Vibration monitoring in accordance with the safe work distances and attended vibration monitoring or vibration trials that would be undertaken. Vibration resulting from construction and received at any structure outside the proposal site would be managed in accordance with:
		  ▸ for structural damage vibration—DIN4150
		  ▸ for human exposure to vibration—*Assessing Vibration: A technical guideline* (AVTG) (DEC, 2006)
		▸ where vibration levels are predicted to exceed the screening criteria, a more detailed assessment of the structure and vibration monitoring would be carried out in accordance with the CNVMF, to ensure vibration levels remain below appropriate limits for that structure.
		▸ a notification process would be included in the community engagement plan (including who to contact in the event of a complaint) to advise of significant works with potential for noise nuisance or vibration at sensitive receivers and surrounding residences/premises.
			Pre-construction

Ref	Impact	Mitigation measures	Timing
NV-2	Construction noise	In addition to ARTC standard noise and vibration mitigation measures and construction controls detailed in *AS 2436:2010—Guide to noise and vibration control on construction, demolition and maintenance sites*, the following measures would be considered and undertaken where practical and feasible: ▸ substitute dump trucks, where feasible and reasonable, for quieter plant items such as 'truck and trailer' style trucks. This would reduce overall scenario noise levels by 3 dB or more ▸ install residential class mufflers on all dump trucks to be used ▸ use reversing 'squawker' alarms instead of conventional reversing alarms ▸ install localised screens for stationary plants ▸ use stationary plant items or work vehicles to create in situ noise screens along the corridor.	Construction

NV-3	Construction vibration	Building condition surveys (dilapidation surveys) would be completed prior to construction where buildings or structures are expected to exceed the structural damage vibration limits given by DIN 4150.3 or are within the minimum vibration working distances for cosmetic damage. Building condition/dilapidation surveys would be undertaken at identified sensitive receivers identified, including heritage buildings (such as the Moree Hotel).
		Validation of these results would be undertaken during the operational phase.
		In addition to ARTC standard noise and vibration mitigation measures and construction controls detailed in *AS 2436:2010—Guide to noise and vibration control on construction, demolition and maintenance sites* (Standards Australia, 2010), the following measures would be considered:
		▸ for vibratory rollers:
		  ▸ use other forms of compaction such as a hand-operated vibratory plate compactor nearest to receivers where there is potential for cosmetic damage
		  ▸ reduce the vibration amplitude setting for the drum of the roller
		  ▸ use a single drum roller only
		  ▸ increase pass-by speed of the roller to reduce energy input into the ground near each receiver
		  ▸ replace large excavators with smaller excavators, or use less intensive excavation measures, such as bobcats and backhoes, when construction works are conducted within the minimum working distances.
			Construction

NV-4	Bridge piling	An assessment of the vibration impacts of the preferred bridge piling method would be undertaken to determine suitability of vibratory piling compared to driven piling and bored piers. The assessment would be focused on selecting a construction methodology that suitably limits noise and vibration impacts to local receiving properties.	Detailed design
NV-5	Out-of-hours work	No construction noise-generating activities would be undertaken in any area south of the Gwydirfield Road level crossing (Chainage 669.900) between 6.00 am and 7.00 am.	Construction

Ref	Impact	Mitigation measures	Timing
NV-6	Operational noise and vibration	Feasible and reasonable mitigation measures would be identified where exceedances of operational noise and vibration criteria are confirmed. Measures would be identified in accordance with the outcome of the operational noise and vibration review and the Inland Rail Noise and Vibration Strategy. These options include: ▸ the introduction of rail dampers ▸ the introduction of noise barriers, where considered practical and feasible to achieve compliance ▸ consideration of at-property treatments once all other mitigation options have been exhausted. Where at-property noise treatments are identified as the preferred mitigation option, these would be developed in consultation with individual property owners.	Detailed design
NV-7	Complaints management	A complaint hotline would be established to enable members of the public to notify ARTC of issues, including the generation of excessive noise and/or vibration. A complaints register would also be maintained and regularly reviewed to determine if alternative work methods could be adopted in response to repetitive, same receiver complaints.	Construction
Social Impact (Chapter 17)			

SI-1	Social	A Social Impact Management Plan (SIMP) would be prepared and include the following:
		▸ targeted management measures, which would be developed for all social impacts assigned a medium or higher risk rating and included in the SIMP
		▸ development of the SIMP would be informed by relevant ARTC and Inland Rail policies and would include the following categories:
		  ▸ community and stakeholder engagement
		  ▸ workforce management
		  ▸ housing and accommodation
		  ▸ local business and industry content
		  ▸ health and community wellbeing.
		▸ a communication strategy, which would be developed to engage with the community and individual landowners to build understanding and ensure preparedness for potential impacts. The strategy would incorporate communication protocols developed in the overall communications and engagement strategy as part of the overall EIS.
		▸ identify specific stakeholders, such as local councils, relevant government departments, Gwydir Valley Irrigators Association, the chamber of commerce, tourism services, community and Aboriginal groups, emergency services, education facilities, health services and any other relevant stakeholders and include them in engagement activities, which would inform them of the proposal and provide strategies to overcoming impacts from the proposal, such as:
		  ▸ flooding
		  ▸ noise
		  ▸ construction hours
		  ▸ dust
		  ▸ traffic
		  ▸ services interruptions
		  ▸ access interruptions.
			Pre-construction

SI-2	Social	Engagement with local schools, such as Moree Secondary College, and training providers, such as the Moree TAFE and the Northern Skills Academy, would be undertaken to promote training opportunities and employment pathways associated with the proposal.	Pre-construction

Ref	Impact	Mitigation measures	Timing
SI-3	Social	Liaison and consultation would be undertaken with MPSC, Moree Chamber of Commerce, and other local industry body networks to develop local employment and procurement opportunities.	Pre-construction
SI-4	Social	Engagement with local Aboriginal stakeholders through ARTC's *Inland Rail Aboriginal Employment Strategy* and the Local Aboriginal Land Council (LALC) would be undertaken to build awareness of Indigenous employment and business opportunities.	Pre-construction
SI-5	Social	Consultation with directly affected landowners would be undertaken to discuss property-specific impacts, including access, property management and operation, and amenity impacts to inform the development of property specific agreements.	Pre-construction
SI-6	Social	Regular communications would be developed for each stage of the construction program that focus on awareness and preparedness for upcoming impacts and would include: ▸ schedule updates and any upcoming milestones or activities that may increase local impacts ▸ changes to the local road network ▸ information on local employment ▸ information on how to provide feedback and complaints, and communication details ▸ strategies to reach vulnerable communities.	Construction
SI-7	Social	Collaboration would be undertaken with relevant organisations, such as the Gwydir Valley Irrigators Association and MPSC, to maintain communications and engagement activities aimed at addressing concerns about possible or perceived flood impacts.	Pre-construction
SI-8	Social	Information would be made available to the community regarding pathways to mental health treatment and wellbeing support tools and contacts for mental health, and community support services such as the Moree Family Support Service.	Construction
SI-9	Social	The principal contractor would consult with community service and health providers, particularly the Moree Health Service, Moree Family Support Service Inc., and the Thiyama-Li Family Violence Service, to access changes in service levels attributed to construction impacts for action by the contractor.	Construction
SI-10	Social	Regular updates would be provided to emergency services of the program and status of upcoming road closures or traffic management measures to ensure sufficient time for network planning.	Construction

SI-11	Workforce	The principal contractor would prepare a project-specific workforce management plan that sets out:
		▸ targets for under-represented and non-traditional demographics including, but not limited to, Indigenous people, women, youth participation and trade-related positions
		▸ strategic initiatives to reach the above-mentioned target, including:
		  ▸ identification of local skills gaps and potential workforce skills and training requirements
		  ▸ how the contractor would use the Inland Rail Skills Academy to achieve its training objectives
		  ▸ workforce management protocols and strategies including induction framework, code of conduct, drugs and alcohol policy, and worker support pathways
		  ▸ consideration of additional mechanisms to address employment barriers based on a needs-threshold, such as implementing flexible working arrangements for certain roles so women can more easily participate in the workforce (school hours)
			Pre-construction

Ref	Impact	Mitigation measures	Timing

		▸ the workforce management plan would include the following commitments:
		  ▸ connecting with participants of pre-construction training opportunities delivered through support of the Inland Rail Skills Academy and local registered training organisations (RTOs)
		  ▸ monthly reporting on cumulative achievements against the targets with accompanying meetings with ARTC to identify challenges and strategies to achieve aspirational targets
		▸ quarterly reports to comply with Australian Industry Participation Plan and DPE reporting commitments.	

SI-12	Accommodation	A workforce housing and accommodation plan would be prepared and implemented by the principal contractor and would include: ▸ proposed workforce housing options ▸ management measures to ensure sufficient supply of short-term accommodation so as to not impact local supply for tourism, seasonal workforce and highway traveller demand ▸ plans for supporting the safe movement of workers to and from the work site daily ▸ consultation with Moree Tourism and local short-term accommodation providers to ensure the construction program is not having a material impact on availability ▸ avoidance of the local rental market to ensure no change in supply, to avoid impacting the local long-term rental market ▸ ongoing monitoring of the housing market and, in particular, the rental market in Moree to ensure that workers can be accommodated without impacting on availability. The plan would be developed in accordance with ARTC's Inland Rail Program Accommodation Principles and would: ▸ prioritise the use of existing facilities in order to minimise amenity impacts to any surrounding sensitive receivers ▸ avoid the use of private rental housing accommodation ▸ consider a target of rooms remaining available to ensure sufficient supply for tourism, seasonal workforce and student demand is met ▸ develop a monitoring and management mechanism for identifying the capacity of local short-term accommodation for use by workers, having regard to forecast for tourism, seasonal workforce and tourism demand ▸ include plans for supporting the safe movement of workers to and from the work site daily. The plan would be developed in consultation with: ▸ MPSC and Moree Tourism to understand average and peak tourist demand patterns and major event schedules ▸ local agricultural bodies to understand demand patterns associated with seasonal agricultural workers ▸ local short-term accommodation providers to understand seasonal peaks and identify constraints.	Construction
SI-13	Community health and wellbeing	The principal contractor would develop a community health and wellbeing plan that includes: ▸ strategies to promote community wellbeing ▸ local support mechanisms ▸ communications and engagement activities to directly support health and wellbeing.	Pre-construction

Ref	Impact	Mitigation measures	Timing
Economic Impact (Chapter 18)			
EI-1	Project employment	ARTC and the principal contractor would engage with local schools and training providers to build knowledge of training opportunities and employment pathways associated with the proposal. The principal contractor would engage with local Aboriginal stakeholders through ARTC's *Inland Rail Aboriginal Employment Strategy* and the LALC to build awareness of Indigenous employment and business opportunities. The principal contractor would prepare a proposal-specific workforce management plan that sets out: ▸ participation goals and targets, including Indigenous, women and youth participation, with consideration of the proportion of the Indigenous population and workforce participation rates ▸ local skills gaps and potential workforce skills requirements with apprenticeship and training participation targets ▸ workforce management protocols and strategies, including induction framework, code of conduct, drugs and alcohol policy, and worker support pathways. The principal contractor would liaise with the N2NS Phase 1 contractor to understand gaps, constraints and opportunities for improvement in the workforce recruitment process. The principal contractor would liaise with the N2NS Phase 1 contractor to identify potential opportunities to provide, where possible, the continuation of employment to maximise worker retention. The principal contractor would leverage local resources such as MPSC, the ARTC's *Inland Rail Aboriginal Employment Strategy* and local community support services to promote employment opportunities and pathways. ARTC and the principal contractor would develop a localised communication and engagement strategy to help all interested community members understand opportunities to gain employment and training through the Inland Rail Skills Academy. The principal contractor would engage with the Moree LALC, MPSC and local Indigenous employment agencies to determine opportunities and strategies for maximising local training and employment opportunities for Indigenous residents. The principal contractor would engage with Moree Secondary College, Moree TAFE, and the Northern Skills Academy to promote current students' training and apprenticeship opportunities. ARTC would continue to facilitate the implementation of Inland Rail Skills Academy training programs for regional residents. ARTC would promote training opportunities to support rail operation and track maintenance.	Pre-construction, construction and operation

Ref	Impact	Mitigation measures	Timing
EI-2	Local business and industry	ARTC and the principal contractor would consult with MPSC, the Moree Chamber of Commerce and local agricultural bodies to identify any potential labour-force constraints in the region. The principal contractor would liaise with the Moree Chamber of Commerce and the LALC to understand the capacity of local and Indigenous business to supply the proposal. The principal contractor would seek an information-sharing agreement with the N2NS Phase 1 contractor to investigate opportunities to provide continuity of service for suppliers. The principal contractor would prepare a local and Indigenous participation plan that identifies: ▸ capacity of local and Indigenous businesses suitable to supply the proposal ▸ methods for preparing suppliers to be ready for potential demand ▸ local and Indigenous procurement targets. ARTC and the principal contractor would promote the Inland Rail information hub and Industry Capability Network (ICN) portal to local businesses in the region. ARTC and the principal contractor would support training and business capacity building programs available as part of Inland Rail Skills Academy. The principal contractor would leverage the Moree Chamber of Commerce and Moree Plains Shire Council to promote supply opportunities ahead of the construction phase. ARTC would maintain a register of local businesses able to supply the project during the operational phase.	Pre-construction, construction and operation
EI-3	Agriculture industry	ARTC would consult with adjoining landowners regarding temporary construction impacts on viability and productivity. This may include consideration of: ▸ temporary farm infrastructure to maintain farm management practices ▸ modification of construction activities and footprint ▸ compensation in accordance with NSW legislation. Stock fencing must be provided in accordance with the Inland Rail fencing standards and be constructed prior to the removal of existing fencing or any works being carried out on the subject land, unless otherwise agreed with the landowners. ARTC would restrict access for stock, as well as non-construction related vehicles and people, to the construction area through fencing and other measures. Temporarily affected land for construction purposes would be restored to an agreed condition and returned to affected landowners as soon as practically possible.	Pre-construction, construction and operation
Visual impact (Chapter 19)			
LV1	Urban design and landscape plan	An urban design and landscape plan (UDLP) would be prepared to provide a consistent approach to design and landscaping. The UDLP would include: ▸ vegetation screening in strategic locations to visually mitigate impacts from new structures and rail operations, including around bridges and locations where the proposal would be visible from sensitive receivers, where the presence of screening does not impact safe rail operations ▸ appropriate species that respond to the existing landscape character setting and environmental conditions ▸ design guidelines to minimise the visual impacts of bridges, with consideration of the existing landscape and visual context and with regard to *Bridge aesthetics: design guidelines to improve the appearance of bridges in NSW* (Roads and Maritime Services, 2012).	Design, pre-construction and construction

Ref	Impact	Mitigation measures	Timing
LV-2	Rehabilitation	A rehabilitation and reinstatement plan (R&RP) would be prepared to guide the approach to rehabilitation following the completion of construction. The R&RP would include and clearly specify: ▸ location of areas subject to rehabilitation and/or reinstatement/stabilisation ▸ details of the actions and responsibilities to progressively rehabilitate, regenerate, and/or revegetate areas, consistent with the agreed objectives.	Design and pre-construction
LV-3	Visual	Detailed design of the Mehi River Bridge would consider alternative designs to improve the appearance of the standard ARTC bridge (e.g. single piers, consideration of various material types, incorporation of any features of the historic bridge (as per mitigation measure CH-1) and use of colours to reduce the visual impact.	Design
LV-4	Visual	If noise walls are proposed, design would consider the visual impact and associated mitigation measures, including strategic landscape planting and urban design of the noise walls. Community consultation would be undertaken to ensure community issues are reflected and to demonstrate that social impacts have been considered and addressed as far as practicable.	Design
V-5	Visual	Screening plantings along the outer edge of the rail corridor in the Grose Walkway area would be included in the landscape design to screen receivers Rx1979, Rx1983 and Rx1989.	Detailed design, post-construction
V-6	Visual	Consultation with the landowner of Rx2095 would be undertaken to determine appropriate landscaping treatments at the property to screen the proposal.	Detailed design, pre-construction
V-7	Visual	A visual impact assessment of sensitive receiver ID Rx2243 would be undertaken to incorporate screening or other mitigations into the design.	Detailed design
LV-8	Stockpiles	All stockpiles would be situated to minimise visual impacts to sensitive receivers where possible and would be limited in height to reduce their visual impact.	Construction
LV-9	Landscape/biodiversity	Opportunities would be sought during detailed design to provide ecological benefits within landscaping by use of local, Indigenous species for plant and seed mixes to maximise and connect habitat types, where possible.	Design and pre-construction
LV-10	Visual	Reinstatement, stabilisation and rehabilitation of disturbed areas would be undertaken progressively, consistent with the reinstatement (or equivalent) and rehabilitation plan, and any relevant and applicable individual property management agreements.	Construction and post-construction
LV-11	Landscape character	The following measures would be considered to minimise visual impacts in rural landscapes: ▸ design of the landscape earthworks and planting to screen the railway and associated structures and features, where practicable ▸ landscape design would seek to enhance the features and qualities that give the landscape its particular characteristic, ensuring the design responds to the natural patterns of the rural landscape ▸ operational maintenance requirements would be an important consideration in retaining and enhancing local landscape character. The design of landscape treatments would ensure that operational maintenance is cost effective and easily managed.	Pre-construction/ detailed design

Ref	Impact	Mitigation measures	Timing
LV-12	Landscape character	The following measures would be considered to minimise visual impacts within ecologically sensitive areas: ▸ ecological links across the landscape, in particular near watercourses, would be improved by joining or re-joining fragmented areas of habitat to encourage the movement of wildlife. This may be aided by fauna fencing to encourage fauna movement through these fauna crossings (such as underpasses) and reduce fauna interacting with the active rail corridor ▸ landscape design and planting would incorporate relevant ecological requirements to benefit the characteristic and visual amenity of local landscapes. Revegetation of locally Indigenous species would match the adjacent/nearby landscape ▸ the selective retention of existing mature trees within the laydown areas would be considered, where practical.	Design, pre-construction and construction
LV-13	Landscaping in Moree	The following measures would be considered to minimise visual impacts within the township of Moree and its local context: ▸ design approach would include sustainability principles (such as multifunctional design, permeable surfacing and sustainable water systems) to build in climate change resilience and deliver social, environmental and economic benefits to the local community where practical ▸ design would address all components in an urban context, including the appearance and careful integration and alignment of new structures, fencing and noise barriers ▸ local community consultation would be undertaken regarding visual impact mitigation (e.g. planting of screening trees on private property and/or community contribution in noise wall painting design) and in the overall improvement of visual amenity ▸ improved visual amenity, connectivity and access to open spaces would be developed during the design This would be undertaken through the restoration of footpaths under the Mehi River Bridge, i.e. the Grose Walkway under the Mehi River Bridge ▸ design would provide enhanced planting and habitat creation to benefit the local community and support health and wellbeing.	Detailed design, pre-construction/ detailed design
LV-14	Construction compounds	Construction compounds would be located, as far as practicable, within already cleared areas and away from sensitive receivers. Compounds would be designed and oriented to minimise visual impacts by locating them away from sensitive receivers, where possible, and/or erecting boundary screening around compounds, where appropriate	Construction
LV-15	Light spill	Lighting of work areas, compounds, and work sites would be oriented to minimise glare and light spill impact on adjacent receivers. Light pollution from signalled crossings would be adequately screened from sensitive receivers. Temporary and permanent lighting would be designed and sited to comply with: ▸ AS 4292-1997 Control of the obtrusive effects of outdoor lighting (Standards Australia, 1997) ▸ Dark Sky Planning Guideline: Protecting the observing conditions at Siding Spring (Department of Planning and Environment, 2016).	Construction and operation
LV-16	Light spill	No night-time construction works are planned. If, however, night-time construction works become a requirement, attenuation measures would be assessed and implemented, such as screening of sensitive receptors or limiting work hours.	Construction

Ref	Impact	Mitigation measures	Timing
LV-17	Consultation	Community consultation would be undertaken to ensure community issues are reflected and to demonstrate that social impacts have been considered and addressed as far as practicable.	Design and pre-construction
LV-18	Monitoring and maintenance of vegetation	Vegetation provided in accordance with the rehabilitation plan would be subject to ongoing monitoring and maintenance in accordance with ARTC's standard operating procedures.	Operation
Soils and contamination (Chapter 20)			

SC-1	Soil management	A soil and water management plan (SWMP) would be prepared and implemented as a sub-plan of the CEMP. The SWMP would include a detailed list of measures that would be implemented during construction to minimise the potential for soil and contamination impacts, including:
		▸ soil/land conservation objectives for the proposal
		▸ management of problem soils (refer Chapter 20: Soils and contamination), such as:
		  ▸ cracking clays (vertosols) that are expected to be encountered directly south of the Macintyre River
		  ▸ saline soils, particularly in potential expression areas such as soil salt stores, artificial restrictions and roads
		▸ specification of the type and location of erosion and sediment controls
		▸ allocation of general site practices and responsibilities
		▸ material management practices
		▸ stockpiling and topsoil management, including prompt stabilisation of spoil mounds (e.g. through mixing of gypsum)
		▸ surface water and erosion control practices that take into account site-specific soil types.
			Pre-construction/ construction

SC-2	Soil structural integrity	Detailed design would include engineering measures to minimise operational risks from dispersive and/or low-strength soils, particularly through foundation and batter design.	Detailed design
SC-3	Erosion management	An erosion and sediment control plan (ESCP) would be prepared and implemented as part of the SWMP, in accordance with *Managing Urban Stormwater Soils and Construction (Blue Book)* (Landcom, 2004). The ESCP would 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. Also refer to the flood mitigation measures.	Pre-construction/ construction
SC-4	Soils	Soil conditions across the study area would be appropriately characterised at a suitable scale in accordance with the SWMP prior to construction, to inform design and environmental management measures. This would include identification of potential/actual ASS, reactive soils, erosive soils, dispersive soils, saline soils, acidic soils, alkaline soils and contaminated soils.	Design and pre-construction
SC-5	Topsoil stripping and stockpiling	Topsoil would be stripped progressively in areas designated for construction, and stockpiled separately onsite for use in rehabilitation and stabilisation works.	Construction

Ref	Impact	Mitigation measures	Timing
SC-6	Management of sediments	Consistent with any specific requirements of the approved SWMP, control measures would be implemented to minimise risks associated with erosion and sedimentation, and entry of materials to drainage lines and waterways. Control measures would include but not necessarily be limited to: ▸ sediment management devices, such as fencing, straw bales or sandbags ▸ measures to divert or capture and filter water prior to discharge, such as drainage channels and sediment basins ▸ scour protection and energy dissipaters at locations of high erosion risk ▸ installation of measures at work entry and exit points to minimise movement of material onto adjoining roads, such as rumble grids or wheel wash bays ▸ appropriate location and storage of construction materials, fuels and chemicals, including bunding, where appropriate. During operation, any maintenance work where soils are exposed, sediment and erosion control devices would be installed in accordance with M*anaging Urban Stormwater: Soils and Construction (Blue Book)* (Landcom, 2004).	Construction and operation
SC-7	Contamination	A contaminated land and hazardous materials management plan would be prepared and implemented as part of the CEMP. The plan would include but not be limited to: ▸ further investigations during detailed design would be required to characterise contamination at the three contaminated sites listed in the ARTC register. Results would be used to further inform CEMP requirements ▸ identify methodology to manage excavation and spoil management with known contaminated sites ▸ capture and management of any surface runoff contaminated by exposure to the contaminated land ▸ measures to ensure the safety of site personnel, environment and local communities during construction ▸ procedures for incident management and managing unexpected contamination finds (an unexpected finds procedure).	Detailed design, pre-construction and construction
SC-8	Contamination	Site investigations would be undertaken by a suitably qualified and experienced consultant as defined in Schedule B9 of the National Environment Protection (Assessment of Site Contamination) Measure 1999 to assess exposure risks to site workers and other receptors as a result of disturbances to areas considered to be at a higher risk of being contaminated. The results of the site investigations would be assessed against the criteria contained within the National Environment Protection (Assessment of Site Contamination) Measure 1999 to determine the need for any remediation.	Design and pre-construction
SC-9	Contamination	If contaminated areas are encountered during construction, appropriate control measures would be implemented to manage the immediate risks of contamination. All other work that may impact on the contaminated area would 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 ARTC Environment Manager and/or the EPA.	Construction
SC-10	Acid sulfate soils	Prior to ground disturbance in high probability acid sulfate areas, testing would be carried out to determine the presence of ASS. If ASS are encountered, they would be managed in accordance with the *Acid Sulfate Soils Assessment Guidelines* (ASSMAC, 1998), and the *Waste Classification Guidelines - Part 4: Acid Sulfate Soils* (NSW EPA, 2014).	Design and pre-construction

Ref	Impact	Mitigation measures	Timing
SC-11	Contamination	All requirements set out in the *ARTC Earthworks Materials Management Framework* (ETC-08-03 Rev 1.3) (ARTC, 2020) would be complied with, including meeting the criteria for earthworks material selection and imported fill.	Design, pre-construction and construction
SC-12	Contamination	The reuse or retention of contaminated or potentially contaminated material onsite (i.e. soil, ballast and timbers) would be subject to a risk assessment.	Design and pre-construction
SC-13	Ongoing management	ARTC would routinely maintain all plant and equipment within the rail corridor to minimise any leaks of fuels and oils. During any maintenance work where soils are exposed, sediment and erosion control devices would be installed in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).	Operation
SC-14	Contaminants and unexpected finds	All staff and contractors working in ground-disturbing works would be provided with induction training in the identification of potential contaminated soil/material, relevant controls and the unexpected finds procedure.	Design and pre-construction
Waste (Chapter 21)			
WM-1	Waste management	A waste management plan would be prepared for the proposal, including: ▸ waste targets for the proposal ▸ estimated waste generation (volumes and types of waste arisings) ▸ waste mitigation and management measures for the waste types and quantities, and also contingencies for any unexpected waste volumes ▸ general protocols and performance objectives for keeping the worksite clean and tidy ▸ processes for monitoring, documenting and reporting waste types, volumes and how these arisings compare to waste targets (e.g. describe waste streams and estimated volumes, temporary waste storage areas and disposal locations onsite and offsite (including stockpiles and landfilling) as well as waste disposal and National Environmental Protection Measures (NEPM) criteria for disposal sites ▸ requirements for waste segregation (e.g. inert—including virgin excavated material, vegetation, building and demolition waste, concrete and asphalt; solid—such as food waste and litter; industrial/regulated—such as asbestos; hazardous—such as flammable liquids; liquid—such as sewage ▸ requirements for secure temporary storage, collection frequency and disposal/recycling requirements ▸ effluent management for construction staff amenities ▸ procedures and reporting/documentation requirements for ensuring waste transporters and receivers are appropriately licensed according to the type of waste ▸ requirements for training, inspections, audits, corrective actions, notification and classification of environmental incidents, record keeping, monitoring and performance objectives for handover on completion of construction ▸ any other requirements necessary to comply with conditions of approval, subsequent approvals or regulatory requirements.	Construction

Ref	Impact	Mitigation measures	Timing
WM-2	Spoil management	A spoil management strategy would be developed to define the preferred approach to managing spoil. The strategy would include: ▸ confirming spoil quantities ▸ undertaking appropriate investigations and surveys, including geotechnical investigations ▸ consideration of the approvals and land application of waste exemptions required, associated lead time and any associated sampling and reporting obligations ▸ consultation with landowners for which borrow pits are located on their property ▸ defining the preferred option for reusing and/or disposing of any spoil not able to be reused at borrow pits. The outcomes of the strategy would inform the construction waste management plan.	Design and pre-construction
WM-3	Spoil management	Detailed design would include measures to minimise excess spoil generation. This would include a focus on optimising the design to minimise spoil volumes and the reuse of material onsite.	Design and pre-construction
WM-4	Waste management	All waste generated would be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014) and disposed of in accordance with the relevant requirements of the Protection of the Environment Operations (Waste) Regulation 2014.	Construction
WM-5	Waste management	Any hazardous or dangerous waste (e.g. asbestos, chemicals, oils) would be correctly stored and managed onsite and, if necessary, disposed of by a licensed contractor or facility and in accordance with the relevant state occupational health and safety legislative and regulatory obligations. This includes wastes generated as a result of demolition.	All stages
WM-6	Excess waste generation	Cut-and-fill balance and minimisation requirements for import/disposal of spoil have been considered and would be further refined during detailed design.	Detailed design and pre-construction
WM-7	Waste management	During detailed design a waste reduction review would be undertaken to identify opportunities to meaningfully achieve the waste reduction through design, construction and operation. Including the consideration of the following: ▸ decommissioning of redundant track ▸ opportunities for designing out waste ▸ alternative approaches to materials used during construction, operation and maintenance to ensure resource efficiencies, in accordance with relevant design standards.	Detailed design and pre-construction
WM-8	Waste Management	Arrangements would be made with landfill operators, prior to the delivery of waste and recyclables to any rural facility, to ensure that the waste types and quantities can be accepted.	Construction
WM-9	Waste management	A contaminated and hazardous materials survey would be undertaken prior to the demolition of structures. In the event that asbestos or other hazardous materials are identified in these structures, a contaminated and hazardous materials management plan would be developed and implemented.	Pre-construction/ construction
WM-10	Waste management	Appropriate waste bins for segregation of waste would be located at key site compounds to prevent cross contamination.	Construction
WM-11	Waste management	All excavated natural, non-contaminated soil, aggregate or rock (i.e. suitable material) would be stockpiled separately and re-used onsite where possible.	Construction

Ref	Impact	Mitigation measures	Timing

WM-12	Waste management	The following operational requirements would apply to the proposal, in addition to ARTC Access Agreements:
		▸ Operators must not conduct servicing or maintenance activities on ARTC property without prior agreement from ARTC Train Control and only in emergency situations.
		▸ If operators must perform emergency servicing and/or maintenance:
		  ▸ the operator is responsible for the removal and disposal of all wastes from ARTC infrastructure, in accordance with relevant legal requirements
		  ▸ spill kits would be provided where emergency maintenance activities are undertaken.
		▸ Operators would not dispose of wastes on ARTC property.
		▸ Operators would maintain a servicing and maintenance program for toilets and amenities to ensure efficient operation, and minimise environmental risks associated with their operation and decommissioning.
		▸ Operators would provide ARTC with an inventory of all trains operating drop-through toilets as soon as practicable and would provide ARTC with a plan for the phasing out of drop-through toilets within six months of receipt of the ARTC Environmental Management Plan.
		▸ Operators would be encouraged to seek opportunities to improve solid and liquid waste management practices through the adoption of best-practice technologies and/or procedures.
		▸ Contaminated waste would be classified and disposed of in accordance with relevant state requirements. The operator is responsible for ensuring all waste is correctly handled, transported and disposed of.
		▸ Waste management plans/procedures would be included in the operator's EMP.
			Operation

WM-13	Operational waste management	Operational waste, including general litter clean up, would be managed in accordance with ARTC's existing operational maintenance requirements and the waste hierarchy principles in the *Waste Avoidance and Resource Recovery Act 2001* (NSW).	Operation
Climate Change (Chapter 22)			
CC-1	Extreme temperature	Design and procurement of trackside equipment (e.g. signals, communication relay points) would account for an increase in ambient temperatures and extreme heat days.	Detailed design, pre-construction and construction
CC-2	Extreme temperature	The use of elastic fasteners and/or heavier sleepers to account for potential track buckle would be considered.	Detailed design, pre-construction and construction
CC-3	Extreme temperature	Shade for trackside equipment would be provided (double-ventilated signal boxes and/or double-skinned enclosures) and/or specify material and colour selection to reduce heat load.	Detailed design, pre-construction and construction
CC-4	Extreme temperature	The use of lighter coloured ballast or painted rails to reduce trackside temperature would be considered.	Detailed design
CC-5	Severe bushfire	Electrical equipment and supporting infrastructure would be located outside of bushfire-prone areas, where reasonable and feasible, to reduce risk of damage from bushfire.	Detailed design, pre-construction and construction
CC-6	Extreme rainfall	An allowance for climate change would be included in the design criteria for flooding based on a 10 per cent increase in rainfall event, particularly around track-side storage detention basins/stormwater infrastructure, in accordance with the *Practical Consideration of Climate Change* (Department of Environment and Climate Change, 2007).	Detailed design, pre-construction and construction
CC-7	Extreme rainfall	Sensitivity testing would be undertaken in line with climate change scenario planning for RCP 8.5 by reviewing implications of 20 per cent and 30 per cent increases in rainfall (in accordance with the *Australian Rainfall and Runoff Guidelines*, (Geoscience Australia, 2016)).	Detailed design, pre-construction and construction

Ref	Impact	Mitigation measures	Timing
CC-8	Extreme weather events	Vegetation clearance zones would be established across the corridor to minimise vegetation (debris and bushfire risk).	Detailed design, pre-construction and construction
CC-9	Extreme weather events	Backup power supply and/or built-in system redundancy (in case of substation failure) would be provided as standard to ensure continuous operation of electrical systems, including signalling and communications equipment along the corridor.	Detailed design, pre-construction and construction
CC-10	Extreme weather events	Solar PV and battery storage would be incorporated as built-in redundancy to ensure ongoing operation of signalling and communications equipment in the event of power failure.	Detailed design, pre-construction and construction
CC-11	Extreme weather events	Local emergency services would be engaged with to discuss and coordinate emergency response procedures. including (but not limited to) temperature, high wind and container topple.	Detailed design, pre-construction and construction
CC-12	Temperature	Train speeds would be reduced during days where trackside temperature exceeds 35°C as outlined in 'Speed Restrictions during hot weather' (ANGE 210 – Chapter 22).	Operation
CC-13	Temperature	Maintenance program/operational policy would be developed to avoid outdoor works during hotter times (i.e. over 35 °C) (where practicable)—refer to 'Monitoring and responding to Extreme Weather Events' (OPE-PR-014, Chapter 22).	Construction and operation
CC-14	Harsher fire weather conditions	Maintenance program/operational policy would be developed to monitor bush fire risk—refer to 'Monitoring and responding to Extreme Weather Events' (OPE-PR-014, Chapter 22).	Operation
CC-15	Extreme weather events	Thresholds for high winds, rainfall, and storms would be implemented to stop work if not already considered within existing ARTC operational framework—refer to 'Monitoring and responding to Extreme Weather Events (OPE-PR-014 – Chapter 22). ARTC would work towards minimising future risk in emergencies and engage with local governments and the Local Disaster Management Groups.	Operation
Sustainability (Chapter 23)			
S-1	Climate response	The design would consider climate and weather events to avoid an increase in flood risk to neighbouring properties and the environment for extreme rainfall and weather events, both now and in the future, including the 1 in 2,000 and 1 in 10,000 extreme rainfall events.	Detailed design
S-2	Climate response	The design would consider climate change in modelling used to inform design of drainage and waterways, including: ▸ application of the latest Australian Rainfall and Runoff Interim Climate Change Guidelines (Engineers Australia, 2014) ▸ assessment of impacts associated with the 1% AEP to determine the sensitivity of the design to potential changes in the rainfall intensity ▸ where new track is to be constructed in greenfield areas, track crossing and longitudinal drainage would have capacity to convey the 1% AEP without over topping formation ▸ where enhancement or upgrading to existing track is to be undertaken, no worsening of the existing track flood immunity would occur.	Detailed design
S-3	Climate response	Design would include mitigations for the potential increase in flood risk arising from any increase in extreme rainfall as a result of climatic change. Adaption strategies, such as installing an early flood warning system to alert ARTC to impending flood risks, locating critical electrical systems (signalling, communications huts, etc.) above potential flood zones, and considering the use of solar and battery devices to ensure uninterrupted operation of signalling and network communication in the event of power failure would be considered in detailed design.	Detailed design

Ref	Impact	Mitigation measures	Timing
S-4	Supporting local and Indigenous businesses	Consideration and preparation of local material sourcing strategies would be undertaken, including the use of existing borrow pits from previous projects, identifying opportunities for the use of local material sources, quarries and concrete suppliers (refer to Chapter 18: Economics).	EIS design and detailed design
S-5	Biodiversity conservation	The alignment would maximise the reuse of previously disturbed land, thereby avoiding agricultural land and native vegetation. Where possible, the alignment would be situated within the existing rail corridor to avoid impacting greenfield sites.	Detailed design
S-6	Efficient use of resources	Optimisation of road and rail interfaces, including bridge lengths and crossing angles would be considered.	Detailed design
S-7	Efficient use of resources	Cut-and-fill balancing and minimisation of transport requirements for import/disposal of spoil would be considered as part of the design process (refer to Chapter 21: Waste for the cut-and-fill balancing results): ▸ maximisation of the use of onsite cut during construction, including refinements to horizontal and vertical alignments. This would reduce the quantity of offsite fill required ▸ consideration of fill batter geometry to encourage cut-and-fill balancing ▸ locally sourced materials during construction ▸ sourcing materials with reduced embodied carbon and environmental impact, where possible ▸ earthworks materials assessment, including topsoil stripping, unsuitable materials, material reuse, bulking factors, excitability and mass haul has been undertaken to reduce the net import of materials, export of waste and reduced transportation distances.	Detailed design, pre-construction and construction
S-8	Efficient use of resources	Formation design would be optimised to consider the environment, use of local materials, reduced maintenance and ease of construction.	Detailed design
S-9	Efficient use of resources	Topsoil stripping and preservation for re-use within proposal and or local area would be considered and undertaken, where possible.	Detailed design, pre-construction and construction
S-10	Efficient use of resources	Waste reduction would be considered in the following ways during the detailed design phase: ▸ the cut-and-fill balance and minimisation of transport requirements for import/disposal of spoil ▸ maximisation of the use of onsite cut during construction, including refinements to horizontal and vertical alignments. This would reduce the quantity of offsite fill required ▸ reduce the volume of offsite materials required for construction. This would reduce impacts on local road networks as fewer trucks would be required to transport materials. This would also result in fuel savings and GHG emission reductions.	Detailed design
S-11	Efficient use of resources	Bridges and waterway crossings would be designed to minimise impacts to bed, banks and environmental flows.	Detailed design
S-12	Surface water and groundwater	The design would minimise impacts to waterways, riparian vegetation and in-stream flora and habitats. This includes: ▸ adoption of a crossing structure hierarchy (e.g. bridges preferred to culverts), as applicable and relevant to local conditions and constructability ▸ aim to avoid, then minimise, the extent of waterway diversions or realignments by using the existing rail corridor.	Detailed design
S-13	Respecting heritage and cultural values	Heritage (Indigenous and non-Indigenous) matters would be considered in response to impacts identified in the EIS, including community heritage values (refer to Chapter 15: Cultural heritage).	Detailed design

Ref	Impact	Mitigation measures	Timing
S-14	Building relationships	Consideration of MPSC plans associated with community health and wellbeing would be undertaken, as defined by the IS rating scheme, including local economic development and business activities, cultural and community values, opportunities for skill development.	Detailed design
S-15	Community safety, health and wellbeing	Consideration would be given to: ▸ potential impacts to sensitive receivers along the track alignment for operational noise and vibration ▸ optimisation of the radius of the curves where noise impacts are greater ▸ use of continuously welded rail ▸ impacts on sensitive receivers, and identification of noise and flooding management and mitigation measures to minimise impacts ▸ air quality design matters in response to impacts identified in the EIS ▸ level of existing lighting within the area and the orientation, design and timing of proposed construction-related lighting to reduce impacts on the sensitive receivers ▸ assessment of potential to disturb contaminated sites and impacts on the availability of locally sourced materials ▸ crime prevention, light pollution and urban design aspects of the IS rating scheme in the landscape and visual amenity assessment, including considerations to level crossings and interfaces with the proposal ▸ engagement with stakeholders, including directly affected landowners and provision of communication materials through the proposal's website ▸ identification of community priority issues.	Detailed design
S-16	Making informed decisions	The possible re-use of work sites and haul roads associated with projects being pursued within the region or neighbouring regions would be considered.	Construction and post-construction
S-17	Efficient use of resources	Opportunities for haulage and delivery via the rail network would be considered.	Detailed design and construction
S-18	Minimising carbon footprint	Design specifications and treatment methodologies would be investigated to optimise the re-use of onsite or nearby material.	Detailed design, pre-construction, construction and post-construction
S-19	Efficient use of resources	The possible re-use of recycled water and surplus water supply from landowners would be considered.	Detailed design, construction and post construction
S-20	Efficient use of resources	The use of stand-alone solar power systems for provision of power at the site offices would be considered.	Detailed design and pre-construction
S-21	Efficient use of resources	The use of stand-alone power systems for provision of power associated with signalling works would be considered.	Detailed design
S-22	Innovations	Continuous improvement, sharing knowledge and lessons learnt from the innovations that have been approved on other Inland Rail Projects would be incorporated. Innovations during detailed design and construction stage would be identified.	Detailed design, construction and post construction

Ref	Impact	Mitigation measures	Timing
Air Quality and Greenhouse Gas (Chapter 24)			
AQ-1	General air quality impacts	An air quality management plan (AQMP) would be prepared and implemented as part of the CEMP. It would include measures to minimise the potential for air quality impacts on the local community and environment. The air quality and dust management sub-plan would address all aspects of construction, including: ▸ spoil handling ▸ machinery operating procedures ▸ soil treatments (lime) ▸ stockpile management ▸ haulage ▸ dust suppression ▸ dust monitoring.	Pre-construction and construction
AQ-2	Dust control	Controls would be implemented to prevent or minimise dust generation during activities involving excavation or disturbance of soils or vegetation, or handling ballast (e.g. use of water sprays or water carts for dust suppression as required)	Construction
AQ-3	Dust control	A protocol would be established and implemented notifying relevant stakeholders when potential dust-generating activities are planned to be carried out. Where sensitive receivers are located within 150 m of construction works, or visible dust is generated, additional dust suppression measures (such as water carts, sealing haulage routes, and use of enclosures and wind breaks) would be implemented.	Pre-construction and construction
AQ-4	Dust monitoring	Dust monitoring would be conducted at sensitive receiver locations and would move along the corridor with progression of construction works. Any exceedances of assessment criteria would be investigated: ▸ to enable prompt identification and mitigation of activities producing excessive dust levels. For amenity issues, a 1-hour monitoring period would occur. For an assessment against the standards, a 24-hour average would be undertaken ▸ to establish the cause of any measured exceedances of assessment criteria, particularly during instances of region-wide dust events, a monitoring station at a location not expected to be impacted by construction activities would be used for the purpose of establishing local background concentrations.	Construction
AQ-5	Dust control for stockpiles	Long-term stockpiles would be avoided wherever possible; however, where necessary, long-term stockpiles would be established in locations with suitable separation from sensitive receivers. Long-term stockpiles would be stabilised and protected from erosive processes while not in use.	Construction
AQ-6	Rail vehicle emissions	Operations would be managed in accordance with the air quality management requirements specified in the relevant EPLs, which would likely cover air emissions from: ▸ locomotive idling and accelerating in the vicinity of Moree ▸ activities that generate dust.	Operation
AQ-7	Impacts during maintenance	Maintenance service vehicles and equipment would be maintained and operated in accordance with the manufacturer's specifications.	Operation
AQ-8	Air quality	Timely, meaningful responses to air quality or dust complaints would be provided. This may include investigations, corrective actions, monitoring or notification to relevant authorities.	Construction
AQ-9	Dust control	Water and any additives (where required) used in dust suppression would be of suitable quality and would not result in environmental or human health risks, or impact rehabilitation outcomes.	Construction

Ref	Impact	Mitigation measures	Timing
GHG-1	Construction GHG emissions targets	Targets to reduce GHG emissions during construction would be included in the proposal's sustainability management plan in line with Inland Rail's Sustainability Policy. As part of the ISCA IS rating, a GHG assessment would be undertaken based on the detailed design for the project and the final project when built.	Pre-construction and construction
GHG-2	Materials handling	Construction and operational works would be planned to reduce the construction program, avoid double handling of materials and minimise haulage distances, thereby minimising the use of fuel.	Construction
GHG-3	Energy efficiency	Energy efficiency design aspects would be incorporated into site offices, wherever possible, to reduce energy demand. Examples could include energy efficient lighting systems, natural ventilation, insulation and solar PV systems.	Pre-construction and construction
GHG-4	Procurement	The procurement of renewable energy, low carbon intensive fuel or carbon emission offsets would be investigated if feasible. The procurement of materials, goods and services would consider if they: ▸ are from local suppliers ▸ make use of recycled materials or materials with a low embodied energy content ▸ are energy efficient or have low embodied energy ▸ minimise the generation of waste.	Pre-construction and construction
GHG-5	Operational GHG emissions of signalling and lighting	As part of the ISCA IS rating, a GHG assessment that covers the operational phase emissions would be undertaken based on the detailed design for the project and the final project when built.	Operation
Health and Safety (Chapter 25)			
HS-1	Public safety	A hazard analysis would be undertaken during detailed design to identify risks to public safety from the proposal, and how these can be mitigated through safety in design.	Detailed design
HS-2	Utilities	The location of existing and planned utilities, services and other infrastructure would be identified prior to construction to determine requirements for access to, diversion, protection and/or support. ARTC would continue to consult with the affected landowner and alternative access arrangements would be provided to ensure safe access to residential property.	Detailed design
HS-3	Utilities	All structures would be located in accordance with *ARTC's Engineering Standard for Requirements—Electric Aerials Crossing ARTC Infrastructure* (ARTC, 2005) to ensure that electrical wires over ARTC rail would not fall outside the corridor and would not present any hazard to the public.	Detailed design/ Construction
HS-4	Utilities	Dial before you dig would be used prior to commencement of works to identify and confirm the presence of any utilities including telecommunication cables.	Detailed design/ Construction
HS-5	Materials handling and storage	All liquid chemicals, oils, fuels and liquid wastes would be stored in a bunded storage area, in accordance with relevant and applicable legislation, regulations or Australian Standards. This would include appropriate design, controls and procedures to eliminate, minimise and manage the water/liquid potentially present in the bund. All bunding, and hydrocarbon and chemical storage areas would be routinely checked, and their integrity and functionality maintained.	Detailed design/ Construction
HS-6	Materials handling and storage	A response plan to deal with accidental spills and leaks would be included as part of the hazardous chemicals, handling and storage sub-plan, developed as part of the CEMP.	Construction

Ref	Impact	Mitigation measures	Timing
HS-7	Materials handling and storage	Appropriate register and records of chemicals, hydrocarbons and hazardous substances and materials onsite would be kept up to date, as required by relevant legislation, regulations and project approval conditions. Where appropriate, this would include a relevant risk assessment prior to the substance coming to, and being used onsite, and a Safety Data Sheet (SDS) Register.	Construction
HS-8	Materials handling and storage	Spill kits would be clearly signed and maintained, and located near work zones, chemical, oil and fuel storage locations or within vehicles. An appropriate risk assessment would be completed to ensure that all high-risk locations for spills have an appropriate spill kit in the vicinity. Appropriate spill kit types would be located for the particular substance that may be spilt. (i.e. hydrocarbon, general or Hazchem spill kit).	Construction
HS-9	Materials handling and storage	All spills would be contained and cleaned up as per the spill and incident response procedures included in the CEMP or ARTC operations EMS.	Construction
HS-10	Materials handling and storage	Staff would be trained in the use of spill kits and associated equipment, and associated records would be retained.	Construction
HS-11	Asbestos	In the event that works would disturb older infrastructure or other areas which have the potential to contain asbestos, works would be undertaken in accordance with the *Safe Work Australia Model Code of Practice—How to Manage and Control Asbestos in the Workplace* (Safe Work Australia, 2020) and *Safe Work Australia Model Code of Practice – How to Safely Remove Asbestos 2018* (Safe Work Australia, 2018).	Construction
HS-12	Dangerous goods	Licensed transporters operating in compliance with *Australian Code for the Transport of Dangerous Goods by Road & Rail* (National Transport Commission, 2020) would be used for dangerous goods deliveries. Freight carts would be required to display appropriate Hazchem signage, including placards, and carry appropriate spill-containment equipment to be used by emergency services personnel in the event of an emergency.	Construction and Operation
HS-13	Materials handling and storage	A hazardous substances and dangerous goods risk management strategy would be developed to manage the potential for risks in situations where the minimum distance from sensitive receivers cannot be achieved, or the quantity of hazardous materials exceed relevant planning policy or regulatory threshold levels.	Construction
HS-14	Physical hazards	Materials and machinery would be stored tidily within works areas or construction compounds, and within fenced areas so as to be inaccessible to the public.	Construction
HS-15	Road safety	Truck loads would be covered.	Construction
HS-16	Health and community wellbeing/workforce management	A workforce safety plan that references the ARTC Safety Management System would be prepared and would outline any specific actions to ensure the safety of workers across the project area.	Construction
HS-17	Health and community wellbeing	Key community safety risks associated with construction and operational activities would be identified.	Construction
HS-18	Health and community wellbeing	A rail safety awareness program would be developed and implemented prior to the operation of Inland Rail to educate the community regarding safety around trains. This would include landowners with properties that are intersected by the proposal.	Construction
HS-19	Health and community wellbeing	Direct construction exposure to respirable silica and other airborne contaminants will be controlled through the use of appropriate personal protective equipment.	Construction
HS-20	Bushfire	The ARTC *Engineering (Track and Civil) Code of Practice—Section 17 Right of Way: Vegetation Management* (ARTC, 2013) would be implemented to minimise fire risk within the rail corridor, which includes specifications for vegetation management/fire hazard reduction within the corridor.	Operation