CHAPTER 10

Assessment Methodology

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

The Australian Government is delivering Inland Rail through the Australian Rail Track Corporation (ARTC), in partnership with the private sector.

Contents

Figures

Tables

10. Assessment methodology

10.1 Introduction

This chapter outlines the assessment methodology for key issues for the North Star to NSW/Queensland Border project of Inland Rail (the proposal). Key issues refer to the likelihood of a material impact on a matter, but detailed assessment is required to fully understand potential impacts and identify proposal-specific mitigation measures. In accordance with the Secretary's Environmental Assessment Requirement (SEAR) 2.1 (j) key issues were nominated by ARTC in the *State Significant Infrastructure Scoping Report* (ARTC, 2018), and by public authorities consulted by the NSW Department of Planning, Industry and Environment (DPIE) when developing the SEARs. The context for this chapter is established principally by SEARs requirements 3.1, 3.2 and 3.3, which have been incorporated into the assessment methodology. The following key issues have been identified by the SEARs:

- Biodiversity
- Protected and sensitive lands
- Transport and traffic
- Flooding, hydrology and geomorphology
- Water—hydrology
- Water—quality
- Soils
- Heritage
- Noise and vibration—amenity
- Noise and vibration—structural
- Socio-economic, land use and property
- Visual amenity
- Waste
- Climate change risk
- Sustainability.

The methodology used to assess key issues was designed to provide a structured and objective approach to identifying environmental, social and economic impacts and opportunities, and develop effective mitigation measures.

10.2 Approach

The first step in the impact assessment process was to define the proposal. The description of the proposal (Chapter 6: The Proposal and Chapter 7: Construction of the Proposal) includes information on the scale, type, duration and location of proposal elements to be assessed.

For each key issue to be assessed:

- A study area was defined. The study area is specific to the key issue being assessed. The study area is defined based on the nature of the key issue and the scale, type and duration of proposal elements that may impact on that key issue.
- Desktop review of reports, studies and spatial datasets was undertaken to establish existing conditions and sensitive receptors relevant to the key issue being assessed.
- If the desktop review revealed significant data gaps, fieldwork was undertaken to identify and/or ground truth existing environmental values and sensitive receptors. Further detail on desktop reviews and fieldwork is in Chapters 11 to 25.
- The impact assessment method was selected (Section 10.3).

- In accordance with the selected impact assessment method, potential impacts and opportunities were identified and assessed using criteria set out in legislation, statutes, guidelines or policies. Where such criteria do not exist, the assessment was based on industry standards and professional judgement:
  - The impact assessment considered construction, operation and decommissioning phases
  - The impact assessment considered short-term, long-term and cumulative impacts
  - Initial mitigation measures (i.e. steps taken during the planning and feasibility design phases to avoid or minimise potential impacts) were factored into the initial impact assessment
  - Depending on the outcomes of the initial impact assessment, additional or revised mitigation measures were proposed to further avoid or minimise impacts. Additional or revised mitigation measures have been considered to date and will be considered during future stages of the proposal (design, pre-construction, construction, operation and decommissioning)
  - Additional mitigation measures were factored into the residual risk assessment
  - The outcomes of the initial impact assessment were compared to the outcomes of the residual risk assessment to assess the effectiveness of any additional mitigation measures
  - Residual risks will be captured for further consideration during detailed design regarding opportunities to further minimise impacts.
- Mitigation measures (initial and additional) are documented in the Environmental Management Plan (Section 10.3.5).

10.3 Impact assessment

Three methods were used to assess potential impacts and opportunities: compliance assessment (quantitative); risk assessment (qualitative); and significance assessment (qualitative). Applicable assessment methods and the environmental values they apply to are summarised in Table 10.1.

For each environmental value, the decision tree shown in Figure 10.1 was used to select an appropriate impact assessment method. In some cases, the assessment method was adapted to meet the needs of a particular environmental value. For example, biodiversity and land resources were assessed using both compliance and significance assessment methods.

TABLE 10.1 ASSESSMENT METHODOLOGIES

Methodology	Type	Relevance	Environmental values
Compliance assessment	Quantitative	Used where compliance with a known guideline or standard (e.g. published limits or thresholds) can be quantitatively assessed	▸ Biodiversity ▸ Land resources (soil properties) ▸ Land use and property ▸ Flooding and hydrology ▸ Economics ▸ Air quality (operation) ▸ Noise and vibration ▸ Traffic and transport ▸ Sustainability
Risk assessment	Qualitative	Used where there are no relevant quantified guidelines, an impact may occur and the impact depends on how aspects or materials are managed	▸ Air quality (construction) ▸ Hazard and risk) ▸ Land resources (contamination and geomorphology) ▸ Social ▸ Waste and resource management ▸ Climate change risk and adaptation
Significance assessment	Qualitative	Used where there are no quantitative guidelines, an impact will occur and it is the sensitivity or the vulnerability of the environmental value that is important	▸ Biodiversity ▸ Groundwater ▸ Surface water quality ▸ Landscape character and amenity ▸ Heritage

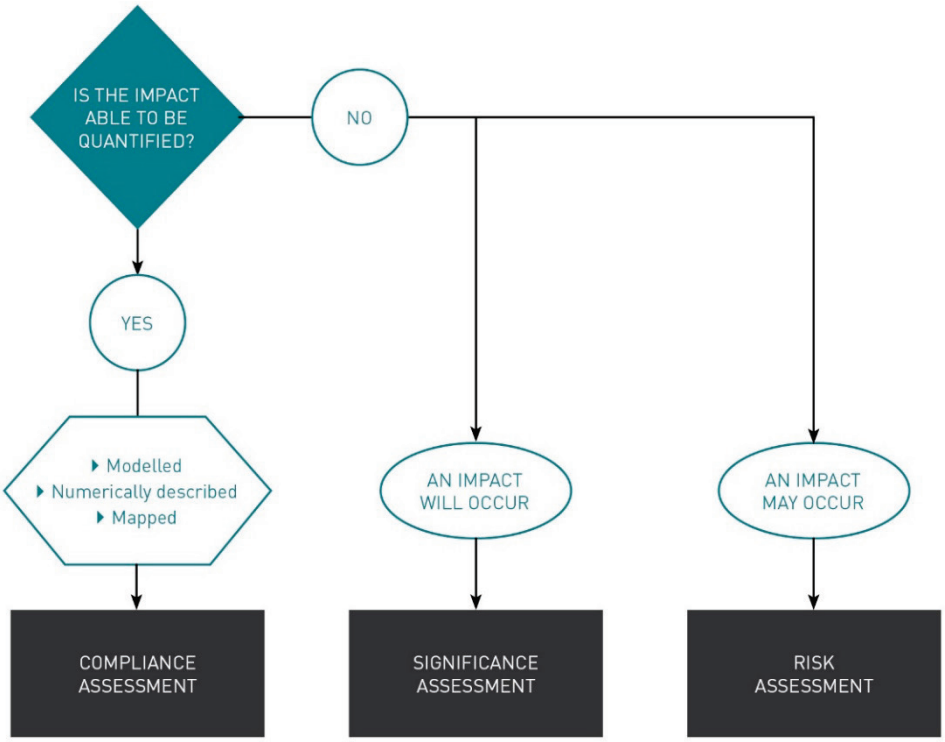

FIGURE 10.1 ASSESSMENT METHOD DECISION TREE

A general explanation of how each assessment methodology was applied is in Sections 10.3.1 to 10.3.3, with further detail provided in Chapters 11 to 25.

The EIS also includes a cumulative impact assessment. The cumulative impact assessment considers the combined effects of the proposal and relevant existing and proposed developments on environmental values. The cumulative impact assessment methodology is described in Chapter 26: Cumulative Impacts.

10.3.1 Compliance assessment

The compliance assessment methodology was applied to environmental values with quantifiable impacts (e.g. emissions and discharges from proposal infrastructure and activities). Field mapping, modelling and data was used to assess compliance, with performance criteria adopted from legislation, statutes, guidelines or policies.

If compliance with the adopted performance criteria could not be achieved with the initial mitigation measures, additional mitigation measures were proposed.

10.3.2 Risk assessment

The risk assessment method was applied to environmental values potentially impacted by the proposal, including unknown or unpredictable impacts, that cannot be quantified. Potential impacts are assessed in terms of how likely they are to occur and the consequences if they do.

Likelihood and consequence criteria, and the resulting risk matrix, are set out in Table 10.2, Table 10.3 and Table 10.4. The criteria are consistent with AS/New Zealand Standard (NZS) *ISO31000:2018 Risk Management—Principles and Guidelines*. Risk assessments have been documented in tables in the relevant EIS chapters.

TABLE 10.2 LIKELIHOOD CRITERIA

Likelihood	Description	Frequency of occurrence
Almost certain	Is expected to occur in most circumstances	Once per month
Likely	Will probably occur in most circumstances	Between one month and once a year
Possible	Might occur at some time	Between once a year and once in five years
Unlikely	Could occur at some time	Between once in 5 years and once in 20 years
Rare	May occur in exceptional circumstances	Once in more than 20 years

TABLE 10.3 CONSEQUENCE CRITERIA

Risk category	Not significant	Minor	Moderate	Major	Extreme
Safety	No medical treatment required	Lost Time Injury or medical treatment required	Serious injury	Single fatality	Multiple but localised fatality
Assets	<6 hours track closure	Between 6 and 24 hours track closure	Between 24 and 48 hours track closure	Between 48 hours and 5 days track closure	More than 5 days track closure
Financial	Up to 0.05% of program budget (i.e. up to $5 m in $10 b)	Up to 0.5% of program budget (i.e. up to $50 m in $10 b)	Up to 1.5% of program budget (i.e. up to $150 m in $10 b)	Up to 5% of program budget (i.e. up to $500 m in $10 b)	Greater than 5% of program budget (i.e. in excess of $500 m in $10 b)
	Up to 0.1% of project budget (i.e. up to $100 k in $100 m)	Up to 0.5% of project budget (i.e. up to $500 k in $100 m)	Up to 2.5% of project budget (i.e. up to $2.5 m in $100 m)	Up to 10% of project budget (i.e. up to $10 m in $100 m)	Greater than 10% of project budget (i.e. in excess of $10 m in $100 m)
Environment	Contained environmental damage—fully recoverable, no cost or ARTC action required	Isolated environmental damage—minimal ARTC remediation required	Localised/clustered environmental damage—requires remediation	Considerable environmental damage—requires remediation	Widespread long-term or permanent environmental damage—remediation required
Regulatory	Minimal or no regulatory involvement	Notice to produce information	Improvement notice or threatened action	Prohibition notice or fines	Prosecution of the company and/or its office holders
Reputation	Isolated event able to be resolved in under 7 days	Management intervention required—between 7 days and 3 months to resolve	Tactical intervention required—between 3 months and 18 months to resolve	Strategic intervention required—between 18 months and 3 years to resolve	Corporate loss of shareholder and/or customer support—tangible business impact taking more than 3 years to resolve
Schedule	Influences schedule up to 1% of program or approved schedule period	Influences schedule 1% to 2.5% of program-approved schedule period	Influences schedule 2.5% to 5% of program-approved schedule period	Influences schedule 5% to 10% of program approved schedule period	Influences schedule >10% of program-approved schedule period
	Influences schedule up to 2% of project-approved schedule period	Influences schedule 2% to 5% of project-approved schedule period	Influences schedule 5% to 10% of project-approved schedule period	Influences schedule 10% to 20% of project-approved schedule period	Influences schedule 20% of project-approved schedule period

TABLE 10.4 RISK MATRIX

Likelihood	Not significant	Minor	Moderate	Major	Extreme
Almost certain	Medium	Medium	High	Very high	Very high
Likely	Low	Medium	High	Very high	Very high
Possible	Low	Low	Medium	High	High
Unlikely	Low	Low	Low	Medium	Medium
Rare	Low	Low	Low	Low	Medium

10.3.3 Significance assessment

The significance assessment method was applied to environmental values that will be impacted by the proposal and where impacts cannot be quantified. The significance of a potential impact is assessed in terms of the sensitivity or vulnerability of the environmental value and the magnitude of the potential impact. The following sensitivity, magnitude and significance criteria were adopted for significance assessments. Significance assessments have been documented in tables in the relevant EIS chapters.

TABLE 10.5 SENSITIVITY CRITERIA

Sensitivity	Description
Major	▸ The environmental value is listed on a recognised or statutory state, national or international register as being of conservation significance ▸ The environmental value is entirely intact and wholly retains its intrinsic value ▸ The environmental value is unique to the environment in which it occurs. It is isolated to the affected system/area, which is poorly represented in the region, state, country and/or the world ▸ It has not been exposed to threatening processes, or they have not had a noticeable impact on the integrity of the environmental value ▸ Proposal activities would have an adverse effect on the value.
High	▸ The environmental value is listed on a recognised or statutory state, national or international register as being of conservation significance ▸ The environmental value is intact and retains its intrinsic value ▸ The environmental value is unique to the environment in which it occurs. It is isolated to the affected system/area, which is poorly represented in the region ▸ It has not been exposed to threatening processes, or they have not had a noticeable impact on the integrity of the environmental value ▸ Proposal activities would have an adverse effect on the value.
Moderate	▸ The environmental value is recorded as being important at a regional level, and may have been nominated for listing on recognised or statutory registers ▸ The environmental value is in a moderate to good condition despite it being exposed to threatening processes. It retains many of its intrinsic characteristics and structural elements ▸ It is relatively well represented in the systems/areas in which it occurs but its abundance and distribution are exposed to threatening processes ▸ Threatening processes have reduced its resilience to change. Consequently, changes resulting from proposal activities may lead to degradation of the prescribed value ▸ Replacement of unavoidable losses is possible due to its abundance and distribution.
Low	▸ The environmental value is not listed on any recognised or statutory register. It might be recognised locally by relevant suitably qualified experts or organisations (e.g. historical societies) ▸ The environmental value is in a poor to moderate condition as a result of threatening processes, which have degraded its intrinsic value ▸ It is not unique or rare and numerous representative examples exist throughout the system/area ▸ It is abundant and widely distributed throughout the host systems/areas ▸ There is no detectable response to change or change does not result in further degradation of the environmental value ▸ The abundance and wide distribution of the environmental value ensures replacement of unavoidable losses is achieved.

Sensitivity	Description
Negligible	▸ The environmental value is not listed on any recognised or statutory register and is not recognised locally by relevant suitable qualified experts or organisations ▸ It is not unique or rare and numerous representative examples exist throughout the system/area ▸ There is no detectable response to change or change does not result in further degradation of the environmental value.

TABLE 10.6 MAGNITUDE CRITERIA

Magnitude	Description
Major	An impact that is widespread, permanent and results in substantial irreversible change to the environmental value. Avoidance through appropriate design responses or the implementation of environmental management controls are required to address the impact.
High	An impact that is widespread, long lasting and results in substantial and possibly irreversible change to the environmental value. Avoidance through appropriate design responses or the implementation of site-specific environmental management controls are required to address the impact.
Moderate	An impact that extends beyond the area of disturbance to the surrounding area but is contained within the region where the proposal is being developed. The impacts are short term and result in changes that can be ameliorated with specific environmental management controls.
Low	A localised impact that is temporary or short term and either unlikely to be detectable or could be effectively mitigated through standard environmental management controls.
Negligible	An extremely localised impact that is barely discernible and is effectively mitigated through standard environmental management controls.

TABLE 10.7 SIGNIFICANCE MATRIX

Magnitude/sensitivity	Major	High	Moderate	Low	Negligible
Major	Major	Major	High	Moderate	Low
High	Major	Major	High	Moderate	Low
Moderate	High	High	Moderate	Low	Low
Low	Moderate	Moderate	Low	Negligible	Negligible
Negligible	Moderate	Low	Low	Negligible	Negligible

TABLE 10.8 SIGNIFICANCE CLASSIFICATIONS

Magnitude	Description
Major	Arises when an impact will potentially cause irreversible or widespread harm to an environmental value that is irreplaceable because of its uniqueness or rarity. Avoidance through appropriate design responses is the only effective mitigation.
High	Occurs when the proposed activities are likely to exacerbate threatening processes affecting the intrinsic characteristics and structural elements of the environmental value. While replacement of unavoidable losses is possible, avoidance through appropriate design responses is preferred to preserve its intactness or conservation status.
Moderate	Results in degradation of the environmental value due to the scale of the impact or its susceptibility to further change even though it may be reasonably resilient to change. The abundance of the environmental value ensures it is adequately represented in the region, and that replacement, if required, is achievable.
Low	Occurs where an environmental value is of local importance and temporary or transient changes will not adversely affect its viability provided standard environmental management controls are implemented.
Negligible	Does not result in any noticeable change and hence the proposed activities will have negligible effect on environmental values. This typically occurs where the activities are located in already disturbed areas.

10.3.4 Mitigation measures

Mitigation measures are designed to protect environmental values and sensitive receptors, achieve established environmental performance objectives, and enhance any positive impacts as a result of the proposal. The application of mitigation measures was in accordance with the hierarchy, with a preference for avoidance, prevention and minimisation. Initial and additional mitigation measures have been incorporated into all three assessment methods.

Initial mitigation measures are steps taken during the planning and feasibility design phases to avoid or minimise potential impacts. Additional mitigation measures may be applied during the detailed design, pre-construction, construction, operation or decommissioning phases to further avoid or minimise potential impacts. These measures include design treatments, design modifications or specific environmental management measures.

Both initial and additional mitigation measures have been documented in tables in the relevant EIS chapters and documented in Chapter 27: Environmental Management Plan.

10.3.5 Environmental Management Plan

Chapter 27: Environmental Management Plan addresses the SEARs and applicable legislation, statutes, guidelines and policies. The Environmental Management Plan establishes how adverse residual impacts as a result of the proposal will be managed during the detailed design, pre-construction, construction (including reinstatement) and operational phases. It also establishes environmental objectives, performance criteria, and a framework for continuous management, monitoring, reporting and training of site personnel.