

CHAPTER

25

INLAND
RAIL 

Waste and resource management

NORTH STAR TO NSW/QUEENSLAND BORDER ENVIRONMENTAL IMPACT STATEMENT

**ARTC**

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25. Waste and resource management

25.1 Scope of chapter

This chapter is an assessment of waste and resource management in the context of the North Star to NSW/Queensland Border project (the proposal). It describes the regulatory framework for waste and resource management, as well as the expected quantities and characteristics of waste likely to be generated by the proposal during the construction, operation and maintenance phases of the proposal. From this assessment, the potential environmental impacts arising from waste generation are identified and assessed for significance. Mitigation measures have been developed for significant environmental risks and are proposed to reduce impacts on environmental values.

25.2 Secretary's Environmental Assessment Requirements

This chapter has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs), as shown in Table 25.1.

TABLE 25.1 SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS COMPLIANCE

Desired performance outcome	Item 19: Waste
	All wastes generated during the construction and operation of the project are effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.
Current guidelines	<i>NSW Waste Avoidance and Resource Recovery Strategy 2014–21</i> (EPA, 2014a) <i>Waste Classification Guidelines—Part 1: Classification of Waste</i> (EPA, 2014b) <i>NSW Sustainable Design Guidelines Version 4.0</i> (TfNSW, 2017) <i>Infrastructure Sustainability Rating Scheme v1.2</i> relating to energy and carbon for large infrastructure proposals, ISCA <i>Managing Urban Stormwater: Soils and Construction Volume 1</i> (Landcom, 2004) and <i>Managing Urban Stormwater: Soils and Construction Volume 2</i> (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008)
SEARs requirement	EIS section
Item 19.1	
The Proponent must assess predicted waste generated from the project during construction and operation, including:	
a) classification of the waste in accordance with the current guidelines;	Section 25.6
b) estimates/details of the quantity of each classification of waste to be generated during the construction of the project, including bulk earthworks and spoil balance;	Section 25.6
c) handling of waste including measures to facilitate segregation and prevent cross contamination;	Sections 25.8.6, 25.4.7 and 25.10
d) management of waste including estimated location and volume of stockpiles;	Section 25.5.2
e) waste minimisation and reuse;	Sections 25.8 and 25.10
f) lawful recycling or disposal locations for each type of waste; and	Sections 25.5.3 and 25.5
g) contingencies for the above, including managing unexpected waste volumes.	Section 25.10
Item 19.2	Sections 25.8.6 and 25.10
The Proponent must assess potential environmental impacts from the excavation, handling, storage on site and transport of the waste, particularly with relation to sediment/leachate control, noise and dust.	Chapter 13: Surface Water and Hydrology Chapter 16: Noise and Vibration Chapter 17: Air Quality

In addition to the SEARS requirements, this chapter includes an assessment of wastewater and associated solid residues generated from the treatment of wastewater at the proposed construction camp. This has been included within the chapter in the absence of other chapters considering this aspect of the proposal.

25.3 Legislation, policies, standards and guidelines

The following sections describe Commonwealth and State legislation, policies, standards and guidelines regarding waste and resource management in the context of the proposal. Waste is primarily regulated at a State government level; however, the Australian Government provides some high-level guidance on achieving Australia’s national and international waste obligations.

The legislation, policies, standards and guidelines relevant to waste and resource management in the context of the proposal are summarised in Table 25.2.

TABLE 25.2 SUMMARY OF LEGISLATION, POLICIES, STRATEGIES AND GUIDELINES

Legislation, policy, standard or guideline	Relevance to the proposal
Commonwealth	
<i>National Environment Protection Measures (Implementation) Act 1998</i>	<p>The Act sets out National Environment Protection Measures (NEPM)—national objectives for protecting or managing aspects of the environment including air quality, contaminated land, hazardous waste, and reusing and recycling materials.</p> <p>The following NEPM relate to waste and resource management in the context of the proposal:</p> <ul style="list-style-type: none"> ▶ National Environment Protection (National Pollutant Inventory) Measure 1998: the framework for developing and implementing the National Pollutant Inventory. The National Pollutant Inventory is a publicly available, online database of emissions to air, land and water. The waste generated from the proposal will not trigger the threshold limits requiring reporting. ▶ National Environment Protection (Used Packaging Materials) Measure 2011: supports the Australian Packaging Covenant, a national agreement to reduce the environmental impacts of consumer packaging. It provides for sustainable packaging design, recycling used packaging, and reducing litter from packaging. ▶ National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998: ensures that controlled waste being transported between states and territories is appropriately identified, transported and handled. It includes the following management systems: <ul style="list-style-type: none"> ▶ Prior notification systems to ensure that appropriate transport methods and waste management facilities are selected for controlled waste ▶ Tracking systems to ensure that controlled waste is directed to, and reaches, suitable waste management facilities ▶ Licensing systems for controlled waste transporters. ▶ National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended 2013): a nation-wide approach to assessing contaminated sites and ensuring that sound management practices are applied. Chapter 15: Land Resources and Contamination assesses the potential for contamination in the vicinity of the proposal in accordance with the NEPM.
<i>2018 National Waste Policy: Less water, more resources (DoE, 2018)</i>	<p>The policy is a national framework for waste and resource recovery in Australia. It outlines roles and responsibilities for collective action by businesses, governments, communities and individuals. The policy identifies five overarching principles underpinning waste management in a circular economy:</p> <ul style="list-style-type: none"> ▶ Avoid waste ▶ Improve resource recovery ▶ Increase use of recycled material, and build demand and markets for recycled products ▶ Better manage material flows to benefit human health, the environment and the economy ▶ Improve information to support innovation, guide investment and enable informed consumer decisions. <p>The policy also facilitates annual reporting of emissions to air, land and water through the National Pollutant Inventory. As noted, the proposal is unlikely to have to report to the National Pollutant Inventory.</p> <p>The policy provides guidelines and a framework for how to better manage waste as a collective action by governments, individuals and communities.</p>

Legislation, policy, standard or guideline

Relevance to the proposal

Australian Code for the Transport of Dangerous Goods by Road and Rail (edition 7.6) (NTC, 2018)

The code sets out technical requirements and guidelines for transporting dangerous goods by road and rail. Dangerous goods expected to be used by the proposal (fuel, chemicals, etc.) are addressed in Chapter 24: Hazard and Risk.

The standard sets out technical requirements and guidelines for transporting dangerous goods (fuel, chemicals, etc.) by road and rail.

Infrastructure Sustainability Rating Scheme v1.2, (Infrastructure Sustainability Council of Australia, 2018)

The Infrastructure Sustainability Council of Australia (ISCA) developed and administers the Infrastructure Sustainability (IS) rating scheme, which provides a tool for embedding sustainability into the planning, design, construction and operation phases of infrastructure projects.

The proposal is pursuing an 'Excellent' rating against version 1.2 of the IS rating scheme during its planning phase. In the context of waste and resource management, the applicable ISCA credits include:

- ▶ Waste Management (Was-1)
- ▶ Diversion from Landfill (Was-2).

Opportunities to reuse spoil and excess materials on site will also contribute to the Materials Lifecycle Impact Measurement and Reduction (Mat-1) credit.

State (NSW)

Protection of the Environment Operations Act 1997 (NSW)

The regulatory framework for waste in NSW is centred on the *Protection of the Environment Operations Act 1997* (NSW). The *Protection of the Environment Operations Act 1997* establishes procedures for environmental control, and for issuing environment protection licences, regarding matters such as waste, air, water and noise.

Protection of the Environment Operations (Waste) Regulation 2014 (NSW)

Schedule 1 of the *Protection of the Environment Operations Act 1997* contains a list of scheduled activities. Under Section 48 of the *Protection of the Environment Operations Act 1997*, it is an offence to carry out a scheduled activity without first obtaining the appropriate licence. Proposal activities that may be scheduled activities include:

- ▶ Prescribed waste storage
- ▶ Contaminated soil treatment
- ▶ Excess spoil disposal
- ▶ Sewage treatment
- ▶ Transportation of trackable waste
- ▶ Road construction.

The regulatory requirements for sewage treatment plants are further detailed in Section 2 of the *Licensing Guidelines for Sewage Treatment Systems* (NSW EPA, 2003). An environment protection licence is required for sewage treatment systems (including the treatment works, pumping stations, sewage overflow structures and the reticulation system) that have an intended processing capacity of more than 2,500 persons equivalent or 750 kilolitres per day, and that involve the discharge or likely discharge of wastes or by-products to land or water. Licences are not required for smaller sewage treatment systems (such as the sewage treatment system proposed at the construction camp, which has an intended processing capacity of approximately 350 persons equivalent), provided it can be operated without causing water pollution.

Schedule 1 of the *Protection of the Environment Operations Act 1997* also contains definitions of the following waste classifications:

- ▶ General solid waste (non-putrescible)
- ▶ General solid waste (putrescible)
- ▶ Hazardous waste
- ▶ Liquid waste
- ▶ Restricted solid waste.

In support of the *Protection of the Environment Operations Act 1997*, the EPA developed the *Waste Classification Guidelines* (NSW EPA, 2014) a step-by-step process for classifying waste and determining an appropriate disposal method.

Legislation, policy, standard or guideline	Relevance to the proposal
	<p>The Protection of the Environment Operations (Waste) Regulation 2014 (NSW) sits under the <i>Protection of the Environment Operations Act 1997</i>. It specifies waste transport licensing and tracking requirements for consignors (producers and agents), transporters, and receivers of waste. It is an offence under the Protection of the Environment Operations (Waste) Regulation 2014 to transport waste generated in NSW more than 150 km from the place of generation or disposal, unless the waste is transported to one of the two lawful disposal facilities nearest to the place of generation. Schedule 1 of the Protection of the Environment Operations (Waste) Regulation 2014 contains a list of waste types, including asbestos, which must be tracked if transported within NSW or interstate.</p> <p>The Act and Regulation provide the procedures for environmental control and issuing environment protection licences regarding waste, air, water and noise. The proposal is subject to the provisions of the Act and Regulation that relate to waste and resource management.</p>
<p><i>NSW EPA Waste Classification Guidelines</i> (NSW EPA, 2014)</p>	<p>The guidelines have been developed as a guide for the classification of waste within NSW, in accordance with the <i>Protection of the Environment Operations Act 1997</i>.</p>
<p><i>Waste Avoidance and Resource Recovery Act 2001</i></p>	<p>The Act promotes waste avoidance and resource recovery by developing waste avoidance and resource recovery strategies and programs such as the extended producer responsibility scheme for industry. The Act establishes a waste hierarchy, which comprises the following principles:</p> <ul style="list-style-type: none"> ▶ Avoidance of waste: Minimising the amount of waste generated during construction by avoiding unnecessary resource consumption (that is, avoiding the use of inefficient plant and construction equipment and avoiding materials with excess embodied energy, waste and excessive packaging) ▶ Resource recovery: Re-using, reprocessing and recycling waste products generated during construction to minimise the amount of waste requiring disposal ▶ Disposal: Resources that cannot be recovered are to be disposed of appropriately to minimise potential adverse impacts on the environment. <p>In addition, the NSW Waste Avoidance and Resource Recovery Strategy 2014–21, prepared by the EPA, sets out clear targets to be achieved in NSW by 2021–22, namely:</p> <ul style="list-style-type: none"> ▶ Avoiding and reducing the amount of waste generated per person in NSW ▶ Increasing recycling rates to 70 per cent for municipal solid waste, 70 per cent for commercial and industrial waste, and 80 per cent for construction and demolition waste ▶ Increasing waste diverted from landfill to 75 per cent ▶ Managing problem wastes better, establishing 86 drop-off facilities and services across NSW ▶ Reducing litter, with 40 per cent fewer items (compared to 2012) by 2017 ▶ Combatting illegal dumping, with 30% fewer incidents (compared to 2011) by 2017. <p>The Act promotes waste avoidance and resource recovery in NSW, through a hierarchy of avoid, recover and dispose. Waste and resource management activities associated with the proposal will be undertaken strategically in line with the principles outlined in the Act.</p>
<p><i>Waste Avoidance and Resource Recovery Strategy 2014–21</i> (NSW EPA, 2014)</p>	<p>The strategy sets clear waste avoidance and resource recovery targets to be achieved in NSW by 2021–22, in accordance with the <i>Waste Avoidance and Resource Recovery Act 2001</i>.</p>
<p><i>NSW Sustainable Design Guidelines</i> Version 4.0 (Transport for NSW, 2017)</p>	<p>The guidelines are a framework for integrating sustainability into transport projects in NSW. They include compulsory and discretionary initiatives in relation to material consumption and waste generation that have been adopted by the proposal, such as waste diversion and beneficial spoil reuse. Sustainability initiatives for the proposal are further discussed in Chapter 18: Sustainability.</p>

Legislation, policy, standard or guideline

Relevance to the proposal

Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and *Volume 2*

(A. Installation of Services, B. Waste Landfills, C. Unsealed Roads, D. Main Roads and E. Mines and Quarries) (DECC, 2008)

This guideline provides information on the design, construction and implementation of stormwater management, which has been considered during the development of erosion and sediment control measures for the proposal. These aspects of the proposal are addressed in more detail within Chapter 13: Surface Water and Hydrology.

State (Queensland)

Environmental Protection Act 1994 (Qld)

The cross-boundary shipment of waste is likely to occur, as a result of proximities to waste facilities particularly in the northern reaches of the proposal. The regulatory framework for waste in Queensland is centred on the *Environmental Protection Act 1994*. ARTC has a general environmental duty and must report any potential environmental harm as a result of waste management activities. The movement of certain regulated wastes must also be tracked. The *Environmental Protection Regulation 2019* (Qld) prescribes the detail for processes contained within the *Environmental Protection Act 1994* for waste generators, waste transporter and waste receivers.

25.4 Methodology

25.4.1 Study area

The waste and resource study area has been defined by:

- ▶ Construction footprint
- ▶ Environmental values and sensitive receptors beyond this area, affected by waste generation
- ▶ Existing waste facilities (and areas of disposal) that will accept solid and construction camp generation liquid waste arising from the proposal.

Combined, these areas comprise the study area for waste and resource management. A description of the proposal is available in Chapter 6: The Proposal and Chapter 7: Construction of the Proposal.

25.4.2 Approach

The following tasks have been undertaken for assessing potential waste and resource management impacts, as a consequence of the proposal:

- ▶ Assessing the existing environment (including waste facilities and areas that will receive solid and camp generated liquid waste from the proposal)
- ▶ Identifying potential waste generation during construction, operation and maintenance
- ▶ Identifying potential impacts
- ▶ Assessment of identified impacts
- ▶ Identifying mitigation measures.

25.4.3 Assessing the existing environment

Environmental values that may be impacted by waste and resource management during the construction, operation and maintenance phases of the proposal were identified. The technical studies set out in Chapters 11 to 25 of this EIS were drawn on to identify relevant environmental values. Opportunities for waste avoidance have been explored for the proposal, prior to considering offsite disposal options. Waste facilities and areas that may be capable of managing waste from the proposal were then identified.

25.4.4 Identifying potential waste generation during construction, operation and maintenance

The potential types and volumes of waste that may be generated by the proposal have been derived from several sources, including a review of typical construction methods, feasibility design documentation, bill of quantities and constructability assessment.

25.4.5 Identifying potential impacts

The potential impacts due to waste and resource management were derived from the identified environmental values and an appreciation of waste generation/management issues that typically arise during the development of large-scale linear transport infrastructure.

25.4.6 Assessment of identified impacts

The potential impacts were assessed using a risk assessment methodology, where the impact rating is dependent on the likelihood of the impact occurring, and the consequence if it does occur. The risk assessment methodology is described in full in Chapter 10: Assessment Methodology.

25.4.7 Identifying mitigation measures

The mitigation measures were developed in accordance with the waste hierarchy outlined in the *Waste Avoidance and Resource Recovery Act 2007* (Section 25.3).

25.5 Description of the existing environment

25.5.1 Existing environment

The proposal is situated in the New England North West Region of NSW, between North Star and the NSW and Queensland border. The New England North West Region consists of over 32,000 km² of agricultural (predominantly cotton and grain growing) and grazing land. Population centres in the vicinity of the proposal include Goondiwindi in Queensland, and Boggabilla and North Star in NSW.

From a point approximately 900 m north of North Star, the proposal follows the existing, non-operational Boggabilla rail corridor for approximately 25 km towards Whalan Creek. The proposal then continues along a 5 km section of greenfield rail corridor towards the NSW and Queensland border. The NSW and Queensland border is defined by the centre point of the Macintyre River.

The condition of existing track and infrastructure on the Boggabilla line is such that significant upgrades would be needed to support the types and speeds of freight trains that would use the Inland Rail network. Therefore, as part of the proposal, all existing track and infrastructure must be removed and replaced.

Another key feature of the proposal from a waste perspective is that, to achieve flood immunity, much of the proposal is elevated on fill embankments (up to 7.5 m high). No significant cuttings (>10 m) are proposed. Therefore, all the general and structural fill needed to construct the embankments (approximately 1,500,000 m³) must be sourced from borrow pits. During the feasibility design phase, 11 borrow pits were identified. For more information on embankments and borrow pits refer to Chapter 7: Construction of the Proposal.

25.5.2 Environmental values

Environmental values that may be impacted by waste and resource management during the construction, operation and maintenance phases of the proposal include:

- ▶ Human receptors:
 - ▶ Site personnel
 - ▶ Landowners and communities adjacent to the proposal
 - ▶ Pedestrians and residents who use roads and footpaths within the study area
- ▶ Environmental receptors:
 - ▶ Receiving natural environments surrounding the proposal, such as land, surface water and air
 - ▶ Areas of recognised ecological significance
- ▶ Commercial and industrial receptors:
 - ▶ Existing land uses and the productive capacity of land
 - ▶ Vehicle operators travelling on the state-controlled and local government road networks
 - ▶ Waste collection, recycling and disposal facilities and areas.

25.5.3 Licensed waste contractors and waste facilities

Within the study, waste collection, recycling and disposal facilities primarily service residential properties. Therefore, waste collection, recycling and disposal for the proposal will likely be undertaken by appropriately licensed contractors and commercial facilities.

Existing waste management facilities within 150 km of the proposal are listed in Table 25.3. A preliminary assessment of the potential disposal and recycling options available within 150 km of the proposal indicates that there is sufficient capacity for the predicted waste streams and volumes (refer Table 25.5) to be disposed of in licensed facilities, including those listed in Table 25.3.

Any waste transported or disposed of at facilities interstate must comply with the relevant waste and resource management requirements and legislative requirements. The National Environment Protection (Movement of Controlled Waste between States and Territories) Measure (1998) covers the transport of controlled waste between Australian states and territories. In NSW, trackable wastes are listed in Parts 1 and 2 of Schedule 1 of the Protection of the Environment Operations (Waste) Regulation 2014. In Queensland, trackable wastes are listed in Schedule 11 of the Environmental Protection Regulation 2019.

TABLE 25.3 EXISTING WASTE MANAGEMENT FACILITIES WITHIN 150 KM OF THE PROPOSAL

Facility	Type	Operator	Contact details	Waste accepted	Licence to operate
Queensland					
Goondiwindi Transfer Facility and Landfill	Landfill and transfer station	Goondiwindi Regional Council (Proterra Group)	Rubbish Tip Road (off Kildonan Road), Goondiwindi Queensland, 15 km (07) 4671 7400	<ul style="list-style-type: none"> ▶ General solid waste (putrescible and non-putrescible) ▶ Construction and demolition waste ▶ Commercial and industrial waste ▶ Green waste ▶ Regulated waste 	EPPR00809313
Inglewood Landfill	Landfill	Goondiwindi Regional Council (Proterra Group)	Inglewood–Texas Road, Inglewood Queensland, 75 km (07) 4671 7440	<ul style="list-style-type: none"> ▶ General solid waste (putrescible and non-putrescible) ▶ Construction and demolition waste ▶ Commercial and industrial waste ▶ Green waste ▶ Regulated waste 	EPPR00809313
Yelarbon Landfill	Landfill	Goondiwindi Regional Council (Proterra Group)	East of Sawmill Road, Yelarbon Queensland, 30 km (07) 4671 7440	<ul style="list-style-type: none"> ▶ General solid waste (putrescible and non-putrescible) ▶ Construction and demolition waste ▶ Commercial and industrial waste ▶ Green waste 	EPPR00809313
New South Wales					
Moree Waste Management Facility	Landfill and transfer station	Cleanaway (Moree Plains Shire Council)	Evergreen Road (off Newell Highway), Moree NSW, 90 km (07) 4676 2915	<ul style="list-style-type: none"> ▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Restricted solid waste ▶ Hazardous waste ▶ Special waste 	EPL12788
Yarraman Landfill Controlled Waste Facility	Landfill and transfer station	Cleanaway (Moree Plains Shire Council)	Mungindi Road, Moree NSW, 80 km (07) 4676 2915	<ul style="list-style-type: none"> ▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Special waste 	EPL5903

Facility	Type	Operator	Contact details	Waste accepted	Licence to operate
Liquid Waste Removal	Sewage and wastewater treatment	Johnson & Son Liquid Waste	47 Gwydir Street, Moree NSW, 80 km 0407 973 096	▶ Liquid waste	Not applicable
Bingara Waste Recovery Centre	Landfill and transfer station	Cleanaway (Gwydir Shire Council)	Narrabri Road, Bingara NSW, 110 km (02) 6724 2000	▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Special waste	Exempt from environment protection licence requirement, operations are regulated by the EPA
Coolatai Waste Depot	Landfill and transfer station	Cleanaway (Gwydir Shire Council)	Yetman Road, Bingara NSW, 50 km (02) 6724 2000	▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Special waste	Exempt from environment protection licence requirement, operations are regulated by the EPA
Croppa Creek Waste Depot	Landfill and transfer station	Cleanaway (Gwydir Shire Council)	Gunyaerwarildi Croppa Road, Croppa Creek NSW, 25 km (02) 6724 2000	▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Special waste	Exempt from environment protection licence requirement, operations are regulated by the EPA
North Star Waste Depot	Landfill and transfer station	Gwydir Shire Council	Scotts Road, North Star NSW, 5 km (02) 6724 2000	▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Special waste	Exempt from environment protection licence requirement, operations are regulated by the EPA
Inverell Landfill	Landfill and transfer station	Blue Gem Contractors (Inverell Shire Council)	Burtenshaw Road, Inverell NSW, 120 km (02) 6721 3546	▶ General solid waste (putrescible and non-putrescible) ▶ Building and demolition waste ▶ Commercial and industrial waste ▶ Garden waste ▶ Restricted solid waste ▶ Hazardous waste ▶ Special waste	EPL7463

The lifespan of the potential waste facilities has been determined based on initial consultation with operators, a review of licences to operate and the proposal's contribution to the waste management network of the non-levied area. On this basis of preliminary analysis, the capacity of the waste facilities is deemed sufficient to accommodate waste generated from the proposal. The confirmation of waste acceptance criteria and available or permissible annual disposal rates will be undertaken in consultation with the relevant operator once the construction schedule and sequencing are confirmed.

The fate and management of waste material generated during the proposal will be finalised and documented within the Construction Environmental Management Plan (CEMP) to ensure that practical and pragmatic waste management solutions are implemented for the proposal. The management measures will be developed in consideration of the waste management hierarchy and to achieve, where possible, onsite processing and reuse. The viability of such management measures is contingent on a range of Contractor processes and construction methods that are not yet finalised and will need to be incorporated into the CEMP.

25.6 Waste generation

The generation of waste will occur throughout construction, operation and maintenance of the proposal. The waste types and quantities estimated as an outcome of this assessment are indicative and have been identified for the purpose of determining potential impacts and waste and resource management options. The waste types and quantities will be finalised during preparation of the Construction Environmental Management Plan to better inform mitigation measures (refer Table 25.9).

25.6.1 Existing waste generation

Table 25.4 presents an estimate of regional waste generation characteristics by headline waste types (i.e. municipal waste, building and demolition waste and commercial and industrial waste) on annual basis, as sourced from the *Waste Avoidance and Resource Recovery Strategy Progress Report 2017–18* (EPA, 2019). As identified on the EPA Waste Levy Area Boundaries map, the proposal is situated within a non-levied area.

TABLE 25.4 REGIONAL WASTE GENERATION CHARACTERISTICS

Waste	Waste classification	Non-levied area annual total
Municipal solid waste	General solid waste (non-putrescible)	505,000 t
Commercial and industrial waste	General solid waste (non-putrescible)	413,000 t
Building and demolition waste	General solid waste (non-putrescible)	592,000 t

25.6.2 Waste classification

The following classes of waste are defined in clause 49 of Schedule 1 of the *Protection of the Environment Operations Act 1997*:

- ▶ Special waste
- ▶ Liquid waste
- ▶ Hazardous waste
- ▶ Restricted solid waste
- ▶ General solid waste (putrescible)
- ▶ General solid waste (non-putrescible).

The classification of waste generated by the proposal will be undertaken in accordance with the steps stated in the *NSW Waste Classifications Guidelines* (NSW EPA, 2014), which include:

- ▶ Step 1: Is the waste special waste?
- ▶ Step 2: Is the waste liquid waste?
- ▶ Step 3: Is the waste pre-classified?
- ▶ Step 4: Does the waste possess hazardous characteristics?
- ▶ Step 5: Determining a waste's classification using chemical assessment
- ▶ Step 6: Is the waste putrescible or non-putrescible?

25.6.3 Construction wastes

The construction phase of the proposal is anticipated to occur over five years, from 2021 to 2025. The construction workforce will peak at approximately 350 persons equivalent. A portion of the workforce will be sourced from local communities (e.g. North Star, Boggabilla, Toomelah and Goondiwindi); however, most workers will live elsewhere and only reside in the region when rostered to work. A purpose-built, 24-hour construction camp will be established in North Star to accommodate upwards of 350 people. Key stages and activities undertaken within the construction phase of the proposal include:

- ▶ Site preparation:
 - ▶ Vegetation clearing and grubbing
 - ▶ Topsoil stripping
 - ▶ Demolition of existing infrastructure within the non-operational Boggabilla rail corridor (i.e. waste sleepers, rail and ballast)
 - ▶ Decommissioning, relocation and removal of utilities that may be impacted by the proposal
 - ▶ Removal of contaminated materials
 - ▶ Establishment of access tracks, laydown areas, site offices and the construction camp
 - ▶ Installation of temporary and permanent fencing
 - ▶ Installation of drainage and water management controls
- ▶ Civil works:
 - ▶ Bulk earthworks
 - ▶ Construction of cuts and embankments
 - ▶ Bridge and culvert construction
 - ▶ Road and level crossing works
- ▶ Track works:
 - ▶ Installation of ballast, sleepers and rails
- ▶ Rail systems infrastructure:
 - ▶ Installation of signals, turnouts and asset monitoring infrastructure.

A detailed discussion of construction activities for the proposal is presented in Chapter 7: Construction of the Proposal.

The waste types and volumes expected to be generated during the construction phase of the proposal are provided in Table 25.5, based on the activity and waste classification, as per Schedule 1 of the *Protection of the Environment Operations Act 1997* and the *EPA Waste Classifications Guidelines—Part 1: Classifying Waste*.

Quantities of wastes have been estimated based on information from the anticipated construction methods, feasibility design documentation and bill of quantities for the proposal. Estimates of waste quantities during the construction phase of the proposal have been compared with the existing waste generation within the non-levied area as detailed in Table 25.5.

TABLE 25.5 ESTIMATES OF WASTE TYPES AND QUANTITIES DURING THE CONSTRUCTION PHASE

Activity	Waste classification	Estimated quantity produced	Proportion of existing waste generation
Clearing and grubbing	General solid waste (non-putrescible)	19,000 t of dry matter	To be reused within the proposal where possible
Topsoil stripping	General solid waste (non-putrescible)	215,000 m ³ (279,500 t) of virgin excavated natural material	To be reused within the proposal where possible
Demolition of existing infrastructure within the Boggabilla rail corridor	General solid waste (non-putrescible)	1,300 t of concrete associated with bridges 230 t of crushed rock associated with bridges 230 t of concrete associated with culverts 3,100 t steel rail tracks 2,500 t timber sleepers	1%
Utility works	General solid waste (non-putrescible)	7 t of metal (aluminium, potentially with steel reinforcement)	<1%
Access tracks and laydown areas	General solid waste (non-putrescible)	0.5 t of litter per year over the construction duration	<1%
Occupying site offices	General solid waste (non-putrescible)	48 t over the construction duration	<1%
	General solid waste (non-putrescible)	2.5 t over the construction duration	<1%
	Liquid waste	2 kL over the construction duration	Data on regional proportion of special waste is not available
Occupying construction camp	General solid waste (non-putrescible)	235 t over the construction duration	<1%
	General solid waste (non-putrescible)	80 t over the construction duration	<1%
	Liquid waste	18,000 kL over the construction duration	Data on regional proportion of liquid waste is not available
	Special waste	90 kg over the construction duration	Data on regional proportion of special waste is not available
Civil works	General solid waste (non-putrescible)	5,000 m ³ (6,500 t) of virgin excavated natural material	To be reused within the proposal where possible
Track works	General solid waste (non-putrescible)	15 t of surplus steel rail tracks (potential for reuse) 3,250 (260 t) damaged concrete sleepers during construction	<1%

25.7 Spoil generation

During the construction phase, spoil will originate from surface works, which will involve the excavation of cuttings. No significant cuttings are proposed (>10 m). This is because, to achieve flood immunity, much of the proposal must be elevated on fill embankments up to 7.5 m high. All the general and structural fill needed to construct the embankments (approximately 1,500,000 m³) will be sourced from borrow pits. During the construction phase, an estimated 5,000 m³ of spoil will be produced from the excavation of cuttings and does not include the production of spoil from the borrow pits. The proposal has assumed that spoil produced from the borrow pits will be reused in the rehabilitation of the borrow areas post construction. Spoil management is described in Section 25.10.2.1.

25.8 Wastewater generation

Wastewater refers to both greywater (from baths, showers and washing machines) and blackwater (from toilets). Effluent refers to this wastewater after it has been treated. During the construction phase, wastewater will be derived from the proposal through several activities, including site preparation, civil works and operation of the construction camp. For the purposes of this chapter, the assessment is limited to the wastewater from the operation of the construction camp during the construction phase of the proposal. The assessment has assumed that the construction camp will be demobilised post completion of construction.

25.8.1 Disposal options

The generation of wastewater has been calculated based on 180 L per equivalent population per day, in accordance with *02-2014-3.1 Gravity Sewerage Code of Australia* (Water Services Association of Australia, 2014). The construction workforce is expected to peak at approximately 350 equivalent population in Q1 2022 (refer Chapter 7: Construction of the Proposal). As such, the estimated peak wastewater load from the operation of the construction camp is 63 kL per day.

The proposal seeks to manage wastewater in accordance with the principles of the waste hierarchy outlined in the *Waste Avoidance and Reuse Recovery Act 2007*. The reuse of wastewater is beneficial to the environment, as it draws on a resource that would otherwise be discarded and wasted. It also reduces water usage, which is an ongoing concern within the local government areas of Gwydir and Moree Plains as they experience prolonged periods of drought.

A package sewage treatment system is proposed to be constructed at the western periphery of the construction camp to manage wastewater from the associated construction camp facilities (refer Chapter 7: Construction of the Proposal). The effluent derived from the package sewage treatment system is proposed to be managed through irrigation. The fields to the north and south of the construction camp have been identified as a potential effluent disposal location, subject to further investigation in a future phase of the proposal. The opportunity to use this resource as non-potable water for agricultural purposes will also be explored with appropriate stakeholder engagement.

The ability of any environment to absorb effluent depends on many of the factors referred to in *AS/NZS 1547:2012 On-site domestic wastewater management* (Standards Australia, 2012).

25.8.2 Australian Soil Resource Information System

Australian Soil Classification mapping indicates that the fields to the north and south of the construction camp are primarily underlain by sodosols (refer Chapter 15: Land Resources and Contamination). Sodosols are characterised by naturally low fertility, high sodicity (susceptibility to disperse may vary), alkaline pH and poor drainage. Using this soil type and calculations derived from the *AS/NZS 1547:2012*, a preliminary estimate of 4.5 L/1m² has been made for the effluent irrigation disposal rate. Therefore, a 4,500 m² irrigation disposal area has been approximated for the proposal. The package sewage treatment system will also be equipped with storage to buffer the effluent irrigation disposal rate, ensuring volumes can be sufficiently managed. The effluent irrigation disposal rate and disposal area will be more accurately defined following the provision of site investigation information and geotechnical advice during detailed design.

The wastewater infrastructure will be subject to the specific design and sizing appropriate to its intended application. The construction contractor will install, construct, operate and maintain the wastewater infrastructure in accordance with principles of *AS/NZS 1546.3* and the design and manufacturer instructions to meet performance requirements.

The indicative siting of the package sewage treatment plant and disposal area for effluent irrigation has been informed by a review of the estimated wastewater load, disposal rate and environmental constraints. This location will be confirmed during detailed design through the outcomes of a desktop study and site investigation to identify the following:

- ▶ Soil and landscape (topography) features, including drainage patterns across the site
- ▶ Infrastructure information, including planned buildings and services
- ▶ Cumulative effects, such as soil salinity
- ▶ Offsite effects, such as impacts on groundwater quality and surface water quality
- ▶ The presence of areas of fill
- ▶ Erosion and land slippage hazards
- ▶ Exclusion areas
- ▶ Setback distances
- ▶ Potential public health effects.

While irrigation is considered the most appropriate disposal technique for a wastewater treatment facility of the size and the proposal duration, alternatives for disposal of treated effluent may include:

- ▶ Discharge to local watercourses
- ▶ Soakage trenches
- ▶ Managed aquifer recharge
- ▶ Storage and reuse for dust suppression.

The options presented above will require negotiation and agreement with the relevant authorities to ensure that the disposal of treated effluent meets environmental and public health and safety requirements.

25.8.3 Risk management

The protection of the environment and human health is paramount to the beneficial and sustainable recycling of waters generated from sewage, grey water and stormwater. The reuse of effluent for irrigation purposes is covered by the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1)* document (Environment Protection and Heritage Council, Natural Resource Management Ministerial Council and Australian Health Ministers' Conference, 2006).

Human health risks associated with the reuse of effluent for irrigation primarily comprise of microbial hazards to humans, which are defined as reference pathogen types (bacteria, viruses and protozoa). These risks depend on the type of source water, exposure pathways and exposure frequency. The *Australian Guidelines for Water Recycling* (Water Quality Australia, 2006) provide performance targets for various recycled water sources and end uses. The performance targets represent the minimum logarithmic reduction of the reference pathogens that are required to constitute an acceptable residual risk to human health.

Environmental risks associated with the use of recycled water are complex and varied. The physical, biological and chemical characteristics of wastewater can be potentially harmful to the environment. The assessment of environmental risks and selection of performance targets requires consideration on a case-by-case basis. The sewage treatment plant will only manage domestic sewer/wastewater produced by the proposed camp. Wastewater generated will be from the site kitchen, laundries, toilet and shower required to service the 350-person camp. All wastewater will be captured onsite and will be treated by a sewage treatment plant. The design and operation of the plant must ensure that the performance of the wastewater infrastructure meets the minimum requirements for human health and the environment relevant for the end use of the treated effluent, achieving water quality suitable for reuse in non-potable applications, e.g. irrigation.

25.8.4 Regulatory requirements

Local planning provisions relating to development approval do not apply to the proposal, as it is considered state-significant infrastructure; however, ARTC must still comply with relevant environmental legislation for the management of wastewater. As processing capacity will not exceed 2,500 persons equivalent or 750 kL per day, the package sewage treatment system is not a scheduled activity under Schedule 1 of the *Protection of the Environment Operations Act 1997*. Therefore, an environment protection licence will not be required; however, an environment protection licence may be required for the disposal of effluent through irrigation, depending upon several factors, including the nature of the disposal area and land use.

The mismanagement of wastewater can pose adverse environmental, public health and agricultural resource risks. The construction contractor will be required to consult with the EPA for the environmental criteria and

effluent quality requirements. The construction contractor will also be required to adhere to best environmental management practices for the management of wastewater.

25.8.5 Operation and maintenance wastes

Waste generation during the operational phase of the proposal is likely to originate from site inspections, vegetation management, replacing and upgrading infrastructure and general upkeep, including the collection of debris and litter.

The waste types and volumes that are expected to be generated during the operational phase of the proposal are provided in Table 25.6 based on the activity and waste classification, as per Schedule 1 of the *Protection of the Environment Operations Act 1997* and the *NSW EPA Waste Classifications Guidelines—Part 1: Classifying Waste*.

Quantities of wastes have been estimated based on information from the anticipated construction methods, feasibility design documentation and bill of quantities for the proposal and an appreciation of the design/service life of the asset. Estimates of waste quantities during the operational phase of the proposal have been compared with the existing waste generation within the non-levied area as detailed in Table 25.4.

TABLE 25.6 ESTIMATES OF WASTE TYPES AND QUANTITIES DURING THE OPERATION AND MAINTENANCE PHASES

Activity	Waste classification	Estimated quantity produced	Proportion of existing waste generation
Weed and vegetation control	General solid waste (non-putrescible)	Quantities expected to be minor	<1%
Site upkeep	General solid waste (non-putrescible)	0.5 t per year	<1%
Maintenance and infrastructure upgrades/replacement	General solid waste (non-putrescible)	On average, 240 t per year over the life of the proposal	<1%
	Hazardous waste (potentially contaminated)	On average, 140 t of concrete sleepers per year over the life of the proposal	Data on regional proportion of hazardous waste is not available
	General solid waste (non-putrescible)	On average, 165 t of steel track per year over the life of the proposal	<1%

25.8.6 Waste storage areas

Designated waste storage areas will be provided at each construction work front for sorting and segregating waste prior to collection by licensed contractors. Each storage area will be provided on hardstand and have a suitable containment system for the waste stream being stored. Good housekeeping and regular removal of residual waste would be practised at waste storage areas to maintain safety, facilitate identification of reusable items and minimise opportunities for pests to proliferate the area.

The estimated waste generated at the construction camp equates to approximately two tonnes per week for the duration of the proposal. Waste storage areas will need to be adequately sized to accommodate this waste, including separation areas for landfill and recyclable wastes. This volume of waste may require an additional waste collection service and at the time of execution, the proposal should determine the current waste collection frequency and system in proximity to the construction camp to ensure an acceptable level of service is maintained. Two tonnes of waste represent approximately 25 per cent of the capacity of a standard domestic waste collection vehicle.

25.9 Potential impacts

Waste generation during the construction, operation and maintenance phases of the proposal may result in the following potential impacts on the identified environmental values:

- ▶ Waste disposal additional to current levels, resulting in increased consumption of airspace and reduction in capacity of waste facilities for local communities surrounding the study area
- ▶ Uncontrolled release of waste from the improper storage or failure of management systems resulting in contamination of receiving environments (i.e. land, surface water and air)
- ▶ Increase in the incidence of vermin, insects and pests from the inappropriate storage and handling of putrescible wastes
- ▶ Reduced visual amenity of land uses adjacent to the proposal
- ▶ Transportation of waste materials on and offsite, resulting in:
 - ▶ The increase of greenhouse gas emissions due to the combustion of hydrocarbons from the operation of vehicles/plant
 - ▶ Decreased amenity of land uses adjacent to the proposal from the generation of dust and road deterioration
- ▶ Risks to human health and safety of site personnel, through the release of pollutants from the poor management of regulated wastes.

Table 25.7 identifies corresponding chapters of the EIS where the potential impacts that may arise from waste on environmental values are discussed.

TABLE 25.7 ENVIRONMENTAL VALUES POTENTIALLY IMPACTED BY THE PROPOSAL

Environmental value	Potential impacts	EIS chapter
Adjacent waste collection, recycling and disposal facilities	Loss of airspace and reduced capacity of waste facilities for local communities	Chapter 25: Waste and Resource Management, Sections 25.4 and 25.6
Adjacent land uses and productive capacity of land	Release of contaminants, including litter/debris, fuels, hydrocarbons and chemicals Potential overflow from package sewage treatment plant Spread of pests and disease Reduced visual amenity	Chapter 22: Land Use and Property, Sections 22.5 and 22.6 Chapter 21: Landscape and Visual Impact Assessment, Sections 21.5 and 21.6
Receiving environments surrounding the proposal (i.e. land, surface water and air quality) and areas of recognised ecological significance	Release of contaminants, including litter/debris, fuels, hydrocarbons and chemicals Potential overflow from package sewage treatment plant Loss of habitat from stockpiling of spoil and waste materials Reduced visual amenity	Chapter 22: Land Use and Property, Sections 22.5 and 22.6 Chapter 21: Landscape and Visual Impact Assessment, Sections 21.5 and 21.6 Chapter 11: Biodiversity, Sections 11.4 and 11.7 Chapter 14: Groundwater, Section 14.6.2.6
Health and safety of site personnel, adjacent landholders and communities	Release of contaminants, including litter/debris, fuels, hydrocarbons and chemicals Spread of pests and disease	Chapter 23: Socio-Economic Impact Assessment, Sections 23.3 and 23.5 Chapter 24: Hazard and Risk, Sections 24.6 and 24.7

25.10 Mitigation measures

ARTC will use a hierarchical approach to waste management from the most preferable (avoid or reduce, re-use, recycle, recover energy and treat) to the least preferable (disposal) and prioritise waste management strategies to avoid generation. Where waste cannot be avoided, waste materials will be segregated by type for collection and removal by licensed contractors.

25.10.1 Mitigations

This section outlines both the waste and resource mitigation measures included as part of design and mitigation measures that are proposed for the proposal to manage predicted environmental impacts. The impacts are initially assessed with consideration of the design mitigation measures and then reassessed to determine residual risk after the inclusion of the proposed mitigation measures.

25.10.1.1 Design considerations

The mitigation measures and controls presented in Table 25.8 have been factored into the design of the proposal. These design measures have been identified through collaborative development of the design and consideration of environmental constraints and issues. These design measures are relevant to both construction and operational phases of the proposal.

TABLE 25.8 INITIAL MITIGATIONS OF RELEVANCE TO WASTE AND RESOURCE MANAGEMENT

Aspect	Initial mitigation measures
Generation of waste	<ul style="list-style-type: none">▶ The quantity of spoil to be generated by the proposal has been reduced through development of the reference design to achieve as close to a net balance in earthworks as is practicable. This has been achieved through:<ul style="list-style-type: none">▶ Aligning the disturbance footprint within the non-operational Boggabilla rail corridor▶ Aligning the disturbance footprint to avoid, where possible, steep terrain and topographical constraints to minimise earthworks and provide more efficient track geometry and grade▶ Implementation of a value management process that highlights potential opportunities for defining, maximising and achieving efficiencies.

25.10.2 Proposed design objectives and mitigation measures

To manage residual significant risks during construction, a number of mitigation measures have been proposed for implementation in future phases of delivery, as presented in Table 25.9. These proposed mitigation measures have been identified to address the specific issues and opportunities associated with the proposal, address legislative requirements, accepted government plans, policy and practice.

Table 25.9 identifies the relevant proposal phase, the aspect to be managed and the proposed mitigation measure, which is factored into the assessment of residual risk in Table 25.12.

Chapter 27: Environmental Management Plan provides further context and the framework for implementation of these proposed mitigation measures.

TABLE 25.9 PROPOSED WASTE AND RESOURCE MANAGEMENT DESIGN OBJECTIVES AND MITIGATION MEASURES

Delivery phase	Aspect	Proposed design objectives and mitigation measures
Detailed design	Generation of waste	<ul style="list-style-type: none"> ▶ Minimisation of transport requirements for import/disposal of earthworks material considered further during detailed design by implementing the waste hierarchy in the <i>Waste Avoidance and Resource Recovery Act 2007</i> ▶ Establish waste reduction targets for design and construction ▶ A waste-reduction review will be undertaken to identify opportunities to meaningfully achieve the waste reduction targets through detailed design, construction and operation of the proposal ▶ Consideration of alternative approaches to materials used, construction and operational techniques and maintenance of a process to achieve a less resource intensive and more efficient process, in accordance with relevant design standards. For example, material specifications should consider aspects such as use of prefabricated materials, percentage of recycled content and percentage of material rejection to reduce waste generation from the proposal ▶ Investigate and develop a wastewater solution for the management of effluent from the construction camp, including an assessment of irrigation to fields and opportunity for beneficial reuse as non-potable water for agricultural purposes.
	Generation of waste	<ul style="list-style-type: none"> ▶ The Construction Environmental Management Plan (CEMP) must comply with the conditions of approval and relevant regulatory requirements, detailing waste management information, including: <ul style="list-style-type: none"> ▶ General protocols and performance objectives for keeping the work site clean and tidy ▶ Processes for documenting waste volumes, types and how these will be compared to waste targets ▶ Contingency measures for managing unexpected volumes of waste or other exceptional circumstances ▶ Requirements for secure temporary storage, collection frequency and disposal/recycling requirements ▶ 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.
Pre-construction	Hazardous waste	<ul style="list-style-type: none"> ▶ A contaminated and hazardous material survey will be undertaken prior to demolition of structures. If asbestos or other hazardous materials are identified in these structures, a Contaminated and Hazardous Materials Management Plan will be developed and implemented as part of the CEMP.
	Generation of waste	<ul style="list-style-type: none"> ▶ Identify opportunities to achieve waste reduction targets appropriate to the scope of the construction works ▶ Avoid disposal of excavated material to landfill by implementing the waste management hierarchy and measures in the Construction Environmental Management Plan relating to waste management ▶ All cut material of appropriate suitability as per organisational specifications should be stockpiled separately and reused on site where possible ▶ Purchase construction materials in bulk, where practical, to minimise packaging waste ▶ Plant and equipment used in the proposal is appropriately maintained ▶ Maintenance activities, refuelling, concrete washout will be carried out at an appropriate distance (relative to task risk) from riparian vegetation and waterways, with appropriate measures in place to reduce the potential for impacts to waterways, aquatic habitats, and groundwater
Construction	Generation of waste	<ul style="list-style-type: none"> ▶ Identify opportunities to achieve waste reduction targets appropriate to the scope of the construction works ▶ Avoid disposal of excavated material to landfill by implementing the waste management hierarchy and measures in the Construction Environmental Management Plan relating to waste management ▶ All cut material of appropriate suitability as per organisational specifications should be stockpiled separately and reused on site where possible ▶ Purchase construction materials in bulk, where practical, to minimise packaging waste ▶ Plant and equipment used in the proposal is appropriately maintained ▶ Maintenance activities, refuelling, concrete washout will be carried out at an appropriate distance (relative to task risk) from riparian vegetation and waterways, with appropriate measures in place to reduce the potential for impacts to waterways, aquatic habitats, and groundwater

Delivery phase	Aspect	Proposed design objectives and mitigation measures
		<ul style="list-style-type: none"> ▶ Effluent disposal from the construction camp facilities to be managed in accordance with EPA environmental criteria and effluent quality requirements. ▶ Contractors to adhere to the practices of the waste hierarchy in the <i>Waste Avoidance and Resource Recovery Act 2007</i> which sets out options for managing waste from avoiding, to reusing, recovering, treating and disposing of waste ▶ Appropriate waste bins, facilitating segregation of waste, should be located at key site compounds to facilitate segregation and prevent cross contamination.
	Hazardous waste	<ul style="list-style-type: none"> ▶ Contaminated waste must be classified and disposed in accordance with the CEMP ▶ Hazardous waste to be correctly stored, managed and disposed of by a licensed contractor or facility and in accordance with the relevant occupational health and safety legislative and regulatory obligations, including wastes generated as a result of demolition.
Operation	Generation of waste	<ul style="list-style-type: none"> ▶ Plant and equipment used in the proposal is appropriately maintained ▶ Operators to adhere to the practices of the waste hierarchy in the <i>Waste Avoidance and Resource Recovery Act 2007</i> (WA), which sets out options for managing waste from avoiding, to reusing, recovering, treating and disposing of waste.
	Hazardous waste	<ul style="list-style-type: none"> ▶ Contaminated waste must be classified and disposed in accordance with relevant legislative requirements.

ARTC will consult with operators of landfills and other waste receival facilities in proximity to the proposal during the next phase of the proposal to determine anticipated waste quantities over the construction period. The outcomes of these discussions will be used to inform the construction approach regarding staging of works and the assignment of waste disposal destinations from work fronts. This information will be used to develop the Construction Environmental Management Plan for the proposal.

The proposed management of waste types is further detailed in Table 25.10, as per the waste hierarchy in the *Waste Avoidance and Resource Recovery Act 2007*.

TABLE 25.10 MANAGEMENT OF WASTE GENERATED BY THE PROPOSAL

Waste stream	Waste classification	Avoid/reduce	Reuse/recycle	Treatment/disposal
Cleared vegetation	Green waste	Where practical minimise disturbance footprint	Reuse logs, stumps and mulch in rehabilitation areas or deliver to a licensed facility for recycling	Noxious weeds will be disposed of in accordance with legislative requirements
Concrete	General solid waste (non-putrescible)	Carefully specify material requirements to avoid overestimation Source good quality materials	Where possible, salvage concrete for reuse or recycling Segregate and store onsite in designated areas for removal to licensed facility for recycling	Transportation of waste by appropriately qualified personnel to licensed facility
Topsoil	Virgin extracted natural material	Where practical minimise disturbance footprint	Topsoil may be re-spread over batters or used for revegetation Suitable soil management approaches for soil type will be applied	No treatment or disposal proposed

Waste stream	Waste classification	Avoid/reduce	Reuse/recycle	Treatment/disposal
Debris and litter	General solid waste (non-putrescible)	Buy in bulk to minimise packaging waste	Segregate and store onsite in designated areas for removal to licensed facility for recycling	Appropriate provision of waste disposal vessels onsite Collection in covered bins/containers with appropriate signage Transportation of waste by appropriately qualified personnel to licensed facility
Coolant, paint, solvents and chemicals	Hazardous waste	Avoid spills through implementation of standard operating procedures Ensure staff are trained for the correct use of equipment	Segregate and store onsite in designated areas for removal to licensed facility for recycling	Waste tracking systems to be maintained for the disposal of hazardous waste Transportation of waste by appropriately qualified personnel to licensed facility
Waste oil, including absorbent materials, containers, filters and rags	Hazardous waste	Avoid spills through implementation of standard operating procedures Ensure staff are trained for the correct use of equipment	No reuse or recycling proposed	Waste tracking systems to be maintained for the disposal of hazardous waste Transportation of waste by appropriately qualified personnel to licensed facility
Asbestos	Special waste	Avoid risk of exposure by carrying out a risk assessment, including site investigation	No reuse or recycling proposed. It is illegal to reuse, recycle or dump asbestos	Waste tracking systems to be maintained for the disposal of special waste Transportation of waste by appropriately qualified personnel to licensed facility
Contaminated soil	Hazardous waste	Where practical minimise disturbance footprint Avoid risk of exposure by carrying out a risk assessment, including site investigation	No reuse or recycling proposed	Treat contaminated soil in accordance with outcomes from site investigation Waste tracking systems to be maintained for the disposal of hazardous waste Transportation of waste by appropriately qualified personnel to licensed facility
Recyclable materials (i.e. aluminium, cardboard and glass)	General solid waste (non-putrescible)	Buy in bulk to minimise packaging waste	Provide separate recyclable materials receptacle near site offices Transportation of recyclable materials by appropriately qualified personnel to licensed facility for recycling	No treatment or disposal proposed

Waste stream	Waste classification	Avoid/reduce	Reuse/recycle	Treatment/disposal
Metal	General solid waste (non-putrescible)	Carefully specify material requirements to avoid overestimation Source good quality materials	Salvage reusable metal, including stakes, drums and wire, where practical Segregate and store onsite in designated areas for removal by appropriately qualified personnel to licensed facility for recycling	Waste metals that are surplus to requirements should be disposed of via a licensed metal recycling/recovery contractor
Timber	General solid waste (non-putrescible)	Carefully specify material requirements to avoid overestimation Source good quality materials	Reuse or repurpose for applications onsite Segregate and store onsite in designated areas for removal by appropriately qualified personnel to licensed facility for recycling	No treatment or disposal proposed
Wastewater	Liquid waste	Avoid or reduce water consumption using water conservation measures, including the installation of water efficiency equipment	Reuse water within a single process or use harvested water for another purpose	Disposal of treated effluent from the construction camp through irrigation to field or investigate beneficial reuse opportunities (non-potable water for agriculture)

25.10.2.1 Spoil management

An excess (spoil that is not deemed immediately suitable for use in the rail construction) of 5,000m³ of spoil exists for the proposal. To further minimise spoil generation, as well as the amount of general and structural fill that must be sourced from borrow pits, the following mitigation measures will be implemented during the construction phase:

- ▶ Topsoil stripping and excavations will occur progressively during the construction phase to minimise soil exposure
- ▶ Surplus material will be assessed for re-use as fill material
- ▶ Surplus material that is unsuitable for re-use as fill material may be used to rehabilitate disturbed areas, or it may be formed into permanent spoil mounds within the rail corridor. Features of the spoil mounds include:
 - ▶ Located as close as possible to the source of excavated material
 - ▶ Maximum height of 2 m, and will not exceed the top height of the new rail line
 - ▶ May be located on both sides of the track
 - ▶ Would be stabilised as required
 - ▶ Gaps in the spoil mounds would be provided to allow water to drain away from the track.

The exact location, sizing and design of spoil mounds will be determined during the detailed design phase, with consideration given to the results of hydraulic modelling and sight distances.

Where practicable, spoil will be re-used within the proposal through treatment, amelioration or drying and any material that cannot be treated for appropriate reuse may then be disposed offsite. Offsite disposal to landfill will only occur if the material is considered unsuitable for other uses, e.g. due to geotechnical, contamination or saturation reasons.

A summary of the hierarchical approach to spoil management is presented in Table 25.11.

TABLE 25.11 HIERARCHICAL APPROACH TO SPOIL MANAGEMENT DURING THE CONSTRUCTION PHASE

Management option	Description
Avoid	<ul style="list-style-type: none"> ▶ The estimated volume of spoil will be refined during the detailed design phase ▶ Opportunities to reduce spoil quantities will be investigated.
Reuse onsite	<ul style="list-style-type: none"> ▶ Surplus material will be assessed for re-use as fill material. This may include treatment of the surplus material (if required and economically viable) ▶ Surplus material may also be used to rehabilitate disturbed areas within the construction footprint.
Storage within the rail corridor	<ul style="list-style-type: none"> ▶ If unsuitable for reuse, spoil may be formed into permanent spoil mounds within the rail corridor.
Offsite disposal	<ul style="list-style-type: none"> ▶ If not suitable for reuse or storage, spoil will be disposed of at a licensed facility.

25.11 Impact assessment

The potential impacts associated with waste and resource management from the proposal in the construction and operation phases are outlined in Table 25.12. These impacts have been subjected to a risk assessment, as per the methodology detailed in Chapter 10: Assessment Methodology.

The initial risk assessment is undertaken on the assumption that the design considerations (or initial mitigations) have been factored into the design phase of the proposal.

The proposed design objectives and mitigation measures presented in Table 25.9 were then applied as appropriate to the phase of the proposal to reduce the level of potential impact.

The residual risk level of the potential impacts was then reassessed after the proposed mitigation measures defined in Table 25.9 were applied. The outcomes of this assessment are presented in Table 25.12.

TABLE 25.12 IMPACT ASSESSMENT FOR POTENTIAL IMPACTS ASSOCIATED WITH WASTE AND RESOURCE MANAGEMENT

Potential impact	Phase	Initial risk			Residual risk		
		Likelihood	Consequence	Risk	Likelihood	Consequence	Risk
Municipal solid waste disposed to landfill (additional to current levels)	Construction	Likely	Not significant	Low	Unlikely	Not significant	Low
	Operation	Likely	Not significant	Low	Unlikely	Not significant	Low
	Maintenance	Likely	Not significant	Low	Unlikely	Not significant	Low
Building and demolition waste disposed to landfill (additional to current levels)	Construction	Likely	Minor	Medium	Unlikely	Minor	Low
	Operation	Unlikely	Minor	Low	Unlikely	Minor	Low
	Maintenance	Unlikely	Minor	Low	Unlikely	Minor	Low
Uncontrolled release of waste, including wastewater from the construction camp (may cause contamination)	Construction	Possible	Minor	Low	Unlikely	Minor	Low
	Operation	Possible	Minor	Low	Unlikely	Minor	Low
	Maintenance	Possible	Minor	Low	Unlikely	Minor	Low
Increase in greenhouse gas emissions arising from waste transportation activities	Construction	Likely	Not significant	Low	Likely	Not significant	Low
	Operation	Likely	Not significant	Low	Likely	Not significant	Low
	Maintenance	Likely	Not significant	Low	Likely	Not significant	Low
Decrease in air quality due to waste traffic increases	Construction	Possible	Minor	Low	Unlikely	Minor	Low
	Operation	Unlikely	Minor	Low	Rare	Minor	Low
	Maintenance	Possible	Minor	Low	Unlikely	Minor	Low
Release of pollutants and risks to human health and safety	Construction	Possible	Minor	Low	Unlikely	Minor	Low
	Operation	Possible	Minor	Low	Unlikely	Minor	Low
	Maintenance	Possible	Minor	Low	Unlikely	Minor	Low

25.12 Cumulative impact assessment

The construction of the proposal will generate several waste streams that will be managed by maximising opportunities to avoid or reduce, re-use and recycle; however, there will be waste streams for which this cannot be achieved, and they will be disposed of within appropriately licensed facilities.

Cumulative impacts arising from waste management activities on surrounding environmental values and sensitive receptors will largely be the product of waste disposal adversely affecting airspace consumption of local waste management infrastructure, thereby reducing the local community's access to such services. The projects considered to have a potential for cumulative impacts relating to waste and resource management are those with an overlapping construction timeframe and potential for shared demand on existing waste management facilities. In this context, the projects that may result in cumulative impacts have been identified as:

- ▶ Border to Gowrie—potential for construction and operational phase interactions
- ▶ Narrabri to North Star—potential for construction and operational phase interactions.

Both projects are part of the broader Inland Rail Program. Therefore, despite the potential for cumulative impacts on receiving waste management facilities, ARTC will be able to liaise with the relevant operators to negotiate appropriate waste disposal arrangements across the three Inland Rail projects. Furthermore, the impact significance of the potential cumulative impacts will be managed in accordance with ARTC standard mitigation measures. Therefore, the risk of cumulative impacts from the interaction of these projects is of low significance (refer Table 25.13).

Mitigation measures will be implemented during the construction as well as operation and maintenance phases to encourage diversion from landfill and avoid impacts on environmental values. Avoiding, reducing, re-using or recycling waste is preferred over treating and disposing of waste. Key mitigation measures include:

- ▶ A waste management strategy will be developed as a sub-plan to the Construction Environmental Management Plan and will comply with the conditions of approval and all relevant legislation, policies, standards and guidelines. The waste management sub-plan will comply with the conditions of approval and all relevant legislation, policies, standards and guidelines.
- ▶ Spoil generated by the proposal will be assessed for re-use as fill material. It may also be used to rehabilitate disturbed areas within the construction footprint.
- ▶ All wastes generated by the proposal will be effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.

Only licensed facilities would be used for waste disposal. A preliminary assessment of the potential disposal and recycling options available within 150 km of the proposal indicates that there is sufficient capacity for the predicted waste streams and volumes to be disposed of in licensed facilities. Further information on the assessment of cumulative impacts is provided in Chapter 26: Cumulative Impacts.

TABLE 25.13 CUMULATIVE IMPACT ASSESSMENT FOR WASTE

Impact	Impact characteristic	Relevance factor	Sum of relevance factors	Impact significance
Increased waste generation and airspace consumption of local waste management infrastructure, thereby reducing the local community's access to such services	Probability of the impact	2	5	Low
	Duration of the impact	1		
	Magnitude/intensity of the impact	1		
	Sensitivity of the receiving environment	1		

25.13 Conclusion

This chapter has described the potential impacts and relevant mitigation measures in relation to waste and resource management during the different phases of the proposal.

The assessment of significance indicates that the amounts of waste likely to be produced from the proposal are expected to be minor in the context of broader waste generation practices within the non-levied area of NSW.

The construction phase of the proposal is considered to have the most potential for waste generation, primarily relating to the production of 5,000m³ of spoil material from the excavation of cuttings. The operational phase is considered to produce wastes typical of the current networks of freight rail that experience on current operations shows is of insignificant quantities.

The identified waste streams will be managed through waste avoidance and mitigation strategies to minimise potential impacts on surrounding environmental values and sensitive receptors, in accordance with the *Waste Avoidance and Resource Recovery Act 2007* are listed in the preferred order:

- ▶ Avoid or reduce
- ▶ Reuse
- ▶ Recycle
- ▶ Recover energy
- ▶ Treat
- ▶ Dispose.

There will be waste streams, including municipal solid waste from the construction camp, for which this hierarchy cannot be achieved, and these waste streams will be disposed of within appropriately licensed waste facilities. A review of waste collection practices at the time of execution will be required to determine if additional waste collection services are required or if current waste collection services have sufficient capacity to accommodate the proposal without detriment to existing service levels.

Waste and resource recovery activities associated with the proposal are not anticipated to pose a significant risk to the environment or public health with the implementation of effective waste management and resource recovery control measures. The relevant waste and resource management commitments for the proposal include:

- ▶ Integration of waste management strategies into the detailed design of the proposal
- ▶ Waste management requirements will be included as part of the Construction Environmental Management Plan. The Construction Environmental Management Plan will comply with the conditions of approval and all relevant legislation, policies, standards and guidelines
- ▶ Spoil generated by the proposal will be assessed for reuse as fill material. It may also be used to rehabilitate disturbed areas within the construction footprint
- ▶ All wastes generated by the proposal will be effectively stored, handled, treated, reused, recycled and/or disposed of lawfully and in a manner that protects environmental values.

The volume of waste generated by each of the waste streams would be further refined during detailed design to more accurately assess the receiving waste management facilities and waste disposal options for the proposal.